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Edition 2.0 2017-04

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NORME INTERNATIONALE

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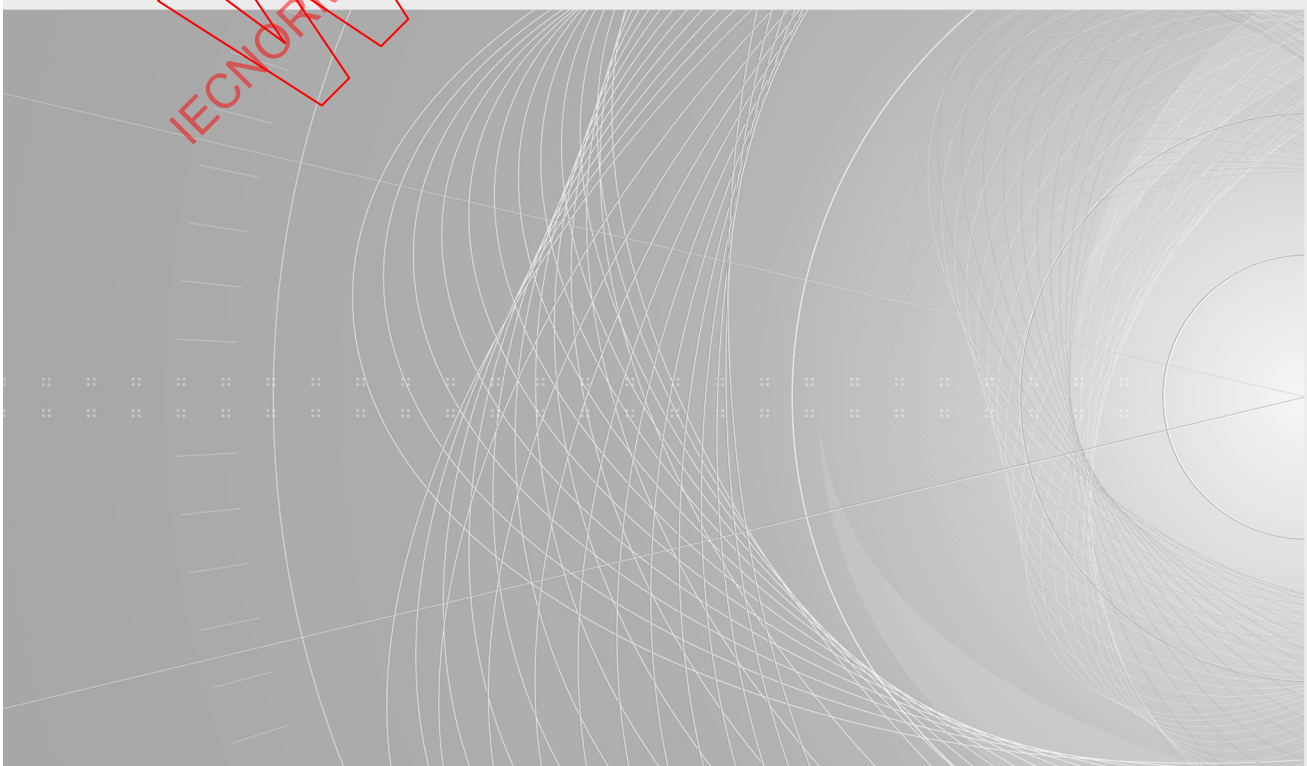
Application integration at electric utilities – System interfaces for distribution management – Part 3: Interface for network operations

Intégration d'applications pour les services électriques – Interfaces système pour la gestion de la distribution – Partie 3: Interface pour l'exploitation du réseau



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Partie 3: Interface pour l'exploitation du réseau

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APPLICATION INTEGRATION AT ELECTRIC UTILITIES – SYSTEM INTERFACES FOR DISTRIBUTION MANAGEMENT –

Part 3: Interface for network operations

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International Standard IEC 61968-3 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The text of this standard is based on the following documents:

FDIS	Report on voting
57/1810/FDIS	57/1841/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This second edition cancels and replaces the first edition published in 2004. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Replaced Measurement list with Measurement and Controls.
b) Replaced OperationalRestriction with Tag.
c) Replaced OutageRecord with Outage.
d) Replaced SafetyDocument with ClearanceDocument.
e) Replaced SwitchingSchedule with SwitchingOrder.
f) Added SwitchingPlan.
g) Added Temporary Network Change.
h) Added TroubleTicket.
i) Added Incident.
j) Added TroubleOrder.
k) Added use cases and sequence diagrams.

In this standard, the following print types are used:

– **tokens: in arial black type**

A list of all parts of the IEC 61968 series, under the general title: *Application integration at electric utilities – System interfaces for distribution management* can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The purpose of this part of IEC 61968 is to define a standard for the integration of network operations systems with each other and other systems and business functions within the scope of IEC 61968. The specific details of communication protocols those systems employ are outside the scope of this part of IEC 61968. Instead, this part of IEC 61968 will recognize and model the general capabilities that can be potentially provided by network operations systems. In this way, this part of IEC 61968 will not be impacted by the specification, development and/or deployment of next generation network operations systems, either through the use of standards or proprietary means.

The IEC 61968 series of standards is intended to facilitate inter-application integration as opposed to intra-application integration. Intra-application integration is aimed at programs in the same application system, usually communicating with each other using middleware that is embedded in their underlying runtime environment, and tends to be optimised for close, real-time, synchronous connections and interactive request/reply or conversation communication models. Therefore, these inter-application interface standards are relevant to loosely coupled applications with more heterogeneity in languages, operating systems, protocols and management tools. This series of standards is intended to support applications that need to exchange data every few seconds, minutes, or hours rather than waiting for a nightly batch run. This series of standards, which are intended to be implemented with middleware services that exchange messages among applications, will complement, not replace utility data warehouses, database gateways, and operational stores.

As used in IEC 61968, a distribution management system (DMS) consists of various distributed application components for the utility to manage electrical distribution networks. These capabilities include monitoring and control of equipment for power delivery, management processes to ensure system reliability, voltage management, demand-side management, outage management, work management, automated mapping and facilities management. Standard interfaces are defined for each class of applications identified in the interface reference model (IRM), which is described in IEC 61968-1.

APPLICATION INTEGRATION AT ELECTRIC UTILITIES – SYSTEM INTERFACES FOR DISTRIBUTION MANAGEMENT –

Part 3: Interface for network operations

1 Scope

Per the IEC 61968 Interface Reference Model, the Network Operations function defined in this part of IEC 61968 provides utilities the means to supervise main substation topology (breaker and switch state) and control equipment status. It also provides the means for handling network connectivity and loading conditions. Finally, it makes it possible for utilities to locate customer telephone complaints and supervise the location of field crews.

IEC 61968-3 specifies the information content of a set of message payloads that can be used to support many of the business functions related to network operations. Typical uses of the message payloads defined in IEC 61968-3 include data acquisition by external systems, fault isolation, fault restoration, trouble management, maintenance of plant, and the commissioning of plant.

The scope diagram shown in Figure 1 illustrates the possibility of implementing IEC 61968-3 functionality as either a single integrated advanced distribution management system or as a set of separate functions – OMS, DMS and SCADA. Utilities may chose to buy these systems from different vendors and integrate them using the IEC 61968-3 messages. Alternatively, a single vendor could provide two or all of these components as a single integrated system. In the case of more than one system being provided by the same vendor, the vendor may chose to use either extensions of the IEC 61968-messages or a proprietary integration mechanism to provide enhanced functionality over and above what is required/supported by the IEC 61968-3 specification.

An additional part of IEC 61968 will document integration scenarios or use cases, which are informative examples showing typical ways of using the message payloads defined in this document as well as message payloads to be defined in other parts of the IEC 61968 series.

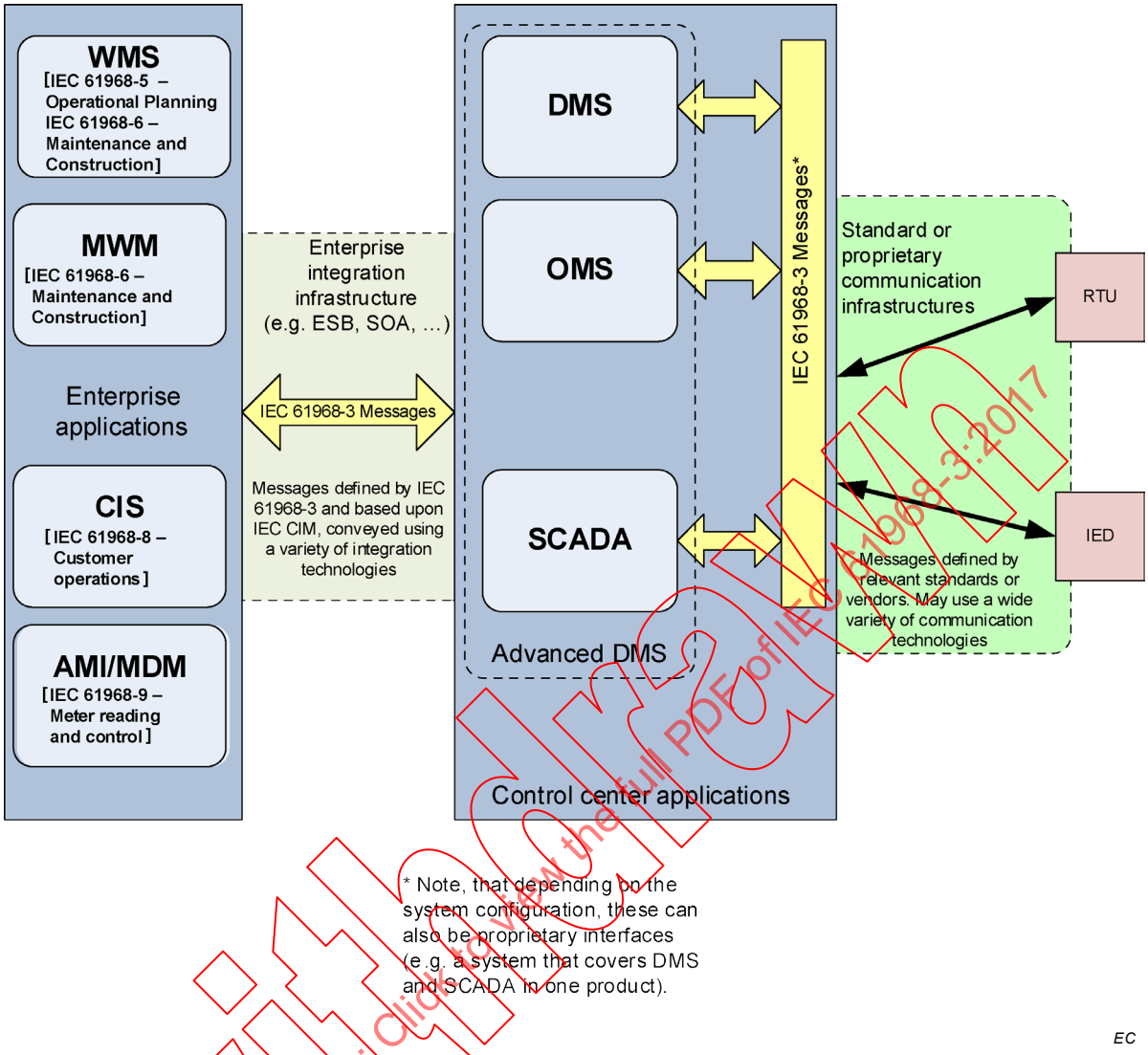

Figure 1 – IEC 61968-3 Scope

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61968-1, *Application integration at electric utilities – System interfaces for distribution management – Part 1: Interface architecture and general recommendations*

IEC TS 61968-2, *Application integration at electric utilities – System interfaces for distribution management – Part 2: Glossary*

IEC 61968-100, *Application integration at electric utilities – System interfaces for distribution management – Part 100: Implementation profiles*

IEC 61970-301, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

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3.2 Abbreviated terms

For the purposes of this document, the abbreviations given in IEC 61968-2 as well as the following apply.

NOTE Refer to International Electrotechnical Vocabulary, IEC 60050, for general glossary definitions.

FLISR Fault Location, Isolation and Service Restoration

WMS Work Management System

4 Reference and Information Models

4.1 General approach to network operations

Traditionally there have been two types of systems to manage distribution operations: Distribution Management Systems (DMS) and Outage Management Systems (OMS). Often a DMS has been delivered as an extension to a SCADA system, but some DMS can be delivered as a standalone set of distribution applications with no SCADA.

Outage Management Systems are used extensively in many parts of the world (typically with large service territories and a large amount of primary overhead conductor) to manage their distribution systems. Such distribution systems are typically configured radially and cover large distances. For this reason it has been historically expensive to monitor the status of the distribution system, particularly outside of the substation. In more dense populations the cost of telemetry and automation is lower, and can be justified on a cost per customer basis.

Thus often the only way that a distribution utility knows that there is a problem with the system is when a customer calls to report an outage. The utility then collects a set of outage calls, and from the pattern of calls received, determines the likely location and cause of the outage. A crew is then sent to the location of the outage to investigate further and affect repairs.

Distribution management systems have their roots in transmission SCADA systems. As automation has moved downwards and into distribution substations, there has been an increasing need to provide functionality for distribution applications. Distribution management systems originated as either extensions to the existing transmission SCADA, by adding additional points to cover the feeder breakers, or by adding a standalone distribution SCADA system. Both types of system usually have RTUs, communication front-ends, alarm systems and displays.

What characterizes these systems as distribution management systems are the addition of functions such as the ability to add temporary devices, such as line cuts and jumper lines. Such temporary devices are uncommon in transmission systems, but are very common in distribution systems. Since many distribution systems are operated in a radial configuration, it is often necessary to operate feeder tie switches to reconfigure feeders, either to restore outages or to adjust to different loading situations. This dictates a need for the ability to dynamically color lines according to which direction they are being energized from and also

for the ability to color lines according to whether they are energized or not. In addition, in certain parts of the world, such systems can be unbalanced, meaning that each electrical phase is operated independently. Another characteristic of a distribution system is that change is the norm. New residential construction and routine maintenance means that the distribution network model changes frequently. It is not uncommon for 10 000 or even 100 000 changes to occur to a distribution system in a single week.

The thing that both the DMS and OMS have in common is the need for an as operated near real-time network model. Thus this part of IEC 61968 includes the ability to exchange distribution network models between two such systems and to keep them synchronized. Increasingly, vendors are beginning to realize that this integration is non-trivial to implement and maintain, are therefore offering integrated DMS/OMS, and even integrated DMS/OMS/SCADA systems in order to provide reduced total cost of ownership and consistent views of the real-time distribution network. The term ADMS (Advanced Distribution Management System) has been coined to describe such systems.

4.2 Reference Model

Figure 2 serves as reference models and provide examples of the logical components and data flows related to this International Standard. Clause 3 provides references to terms that are defined by the CIM.

The diagram in Figure 2 describes the flows between the components in the reference model.

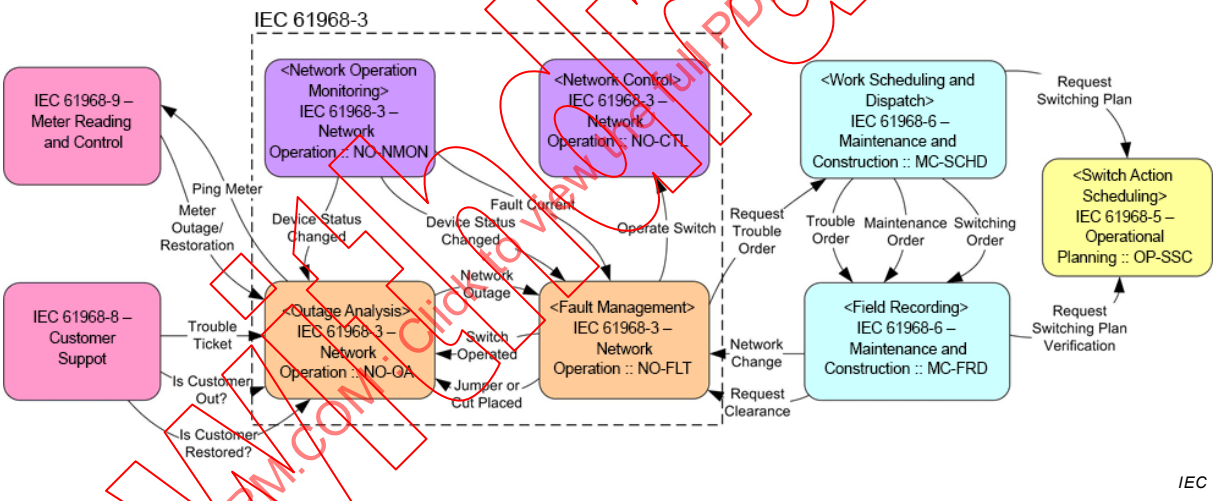

Figure 2 – IEC 61968-3 Reference Model

The reference architecture reflects five main logical components (potentially realized as systems or subsystems) related to network operations:

IEC 61968-9, *Meter Reading & Control, for associating outage events and meter pings with operations*

IEC 61968-8, *Customer Operations for trouble call management associated with outages*

IEC 61968-6, *Maintenance & Construction for work orders required for trouble and switching*

IEC 61968-5, *Operational Planning for switching plan generation for both planned and unplanned work*

4.3 Interface Reference Model

It is not the intention of this standard to define the applications and systems that vendors should produce. It is expected that a concrete (physical) application will provide the functionality of one or more abstract (logical) components as listed in this standard. These abstract components are grouped by the business functions of the Interface Reference Model.

In this standard, the term abstract component is used to refer to that portion of a software system that supports one or more of the interfaces defined in this part of IEC 61968 through IEC 61968-9. It does not necessarily mean that compliant software is delivered neither as separate modules nor as a single system.

IEC 61968-1 describes infrastructure services common to all abstract components while IEC 61968-3 through IEC 61968-9 define the details of the information exchanged for specific types of abstract component.

IEC 61968 defines that:

- An inter-application infrastructure is compliant if it supplies services defined in Part 1 to support at least two applications with interfaces compliant to sections of Parts 3 to 9.
- An application interface is compliant if it supports the interface standards defined in Parts 3 to 9 for the relevant abstract components defined in the Interface Reference Model.
- An application is only required to support interface standards of the applicable components listed under abstract components. An application is not required to support interfaces required by other abstract components of the same business sub-function or within the same business function. While this standard primarily defines information exchanged among components in different business functions, it will occasionally also define information exchanged among components within a single business function when a strong market need for this capability has been realised.

4.4 Network operations functions and components

It should be noted that the message payloads defined in this document, IEC 61968-3, *Interfaces for Network Operations*, may be sent or received by any type of component within a distribution management system (DMS) system.

Table 1 shows these functions and typical abstract components that are expected to be producers of information for these message payloads. This is not intended to be an exhaustive list of functions and abstract components, rather they are examples. Typical consumers of the information include, but are not restricted to, the other components as listed in IEC 61968-1.

Table 1 – Business Functions and Abstract Components

Business Functions	Business Sub-Functions	Abstract Components
Network Operations (NO)	Network Operation Monitoring (NMON)	Substation state supervision
		Network state supervision
		Switching action supervision
		Switching pinning action supervision
		Process and network data management
		Operation data management
		Regulation step supervision
		Alarm supervision
		Operation and event logs
		Weather monitoring (lightning detection)
	Network Control (CTL)	User access control
		Automatic controls
		Assisted control
		Safety document management
		Safety checking and interlocks
		Major incident coordination
	Fault Management (FLT)	Trouble call handling
		Protective relays analysis
		Fault location
		Supply restoration assessment
		Customer incident information usage
		Distribution circuit energization supervision
	Operation Feedback Analysis (OFA)	Mal-operation analysis
		Network fault analysis
		Quality index analysis
		Device operation history
		Post-disturbance review
	Operation Statistics and Reporting (OST)	Maintenance information
		Information for planning
		Information for management control
	Network Calculations real-time (CLC)	Load estimation
		Energy trading analysis
		Load flow/voltage profile
		Fault current analysis
		Adaptive relay settings
	Dispatcher training (TRN)	SCADA simulation

The use case sequence diagrams presented in this document assume a simplified interpretation of the business functions listed in Table 1. This allowed for easier mapping of business functions to systems familiar to the participated vendors.

Table 2 shows the interpretation of the business functions defined in Table 1 as it relates to 61968-3 use cases. These interpretations are used to assist the reader understand of the use cases.

Table 2 – Interpretation of Network Operations Business Functions

Business Function	IRM Description	61968-3 Use Case Interpretation
NO-NMON	Network Operation Monitoring	Distribution Management System (DMS) as used in the control room for network operations management
NO-CTL	Network Control	SCADA as used for network monitoring and control
NO-FTL	Fault Management	Outage Management System (OMS)

4.5 Static Information Model

4.5.1 General

The information model relevant to network operations consists of classes that provide a template for the attributes for each message payload.

The classes are defined in detail in IEC 61968-11, Common Information Model (CIM) Extensions for Distribution or in IEC 61970-301, Energy Management System Application Program Interfaces – Common Information Model Core.

4.5.2 Classes related to network operations

Table 3 lists those classes that are associated with network operations classes but only the name of an instance is given within message payloads defined in this standard. The detailed attributes of these classes are used in message payloads defined in other parts of IEC 61968.

Table 3 – Classes related to network operations

Related Class	Reference	Description
TroubleTicket	IEC 61968-8	A type of document that contains the information of one or more customer calls.
Work	IEC 61968-6	A type of document that contains information used to request, initiate, track and record work, particularly construction and maintenance tasks.

NOTE The class definitions provided here are for convenience purposes only. The normative definitions are provided by IEC 61968-11, which describes the distribution extensions to the IEC CIM.

5 Network operations message payloads

5.1 General

The purpose of this clause is to describe the message payloads related to IEC 61968-3. It is important to note that some of these message payloads may also be used by other parts of IEC 61968. The general approach to the realization of message structures and XML schemas for IEC 61968 message payloads is described in IEC 61968-1 and IEC 61968-100.

Although they may be represented in sequence diagrams for context and completeness, this document does not describe message formats that are defined by other parts of IEC 61968. The message payload structures defined by this part of IEC 61968 are described in Clause 5.

The normative XML schemas for message payloads defined by this part are provided in Annex B, providing more detailed, annotated descriptions of the message structures. Message

structures are diagrammed within Clause 5. Note that these diagrams are examples and not intended to be exhaustive. The notation convention shows required elements with a solid outline, and optional elements with dashed outlines.

It is also important to note that the use cases and sequence diagrams provided in Annex A are informative in nature, and are intended to provide examples of usage for the normative message payload definitions. There is no intent by this standard to standardize specific business processes.

5.2 **OperationsConfiguration** payload

5.2.1 General

All messages rely on unique identifiers (**mRIDs**) for all objects that are part of the common network model, in this case the common distribution network model which is defined as part of CIM. In order to publish those unique identifiers, the respective system needs either to import that network model or load the necessary identifiers as part of the systems configuration step.

5.2.2 Message payload

This message payload, shown in Figure 3, includes the configuration needed to define **Assets**, **FaultCauseTypes**, and **UsagePoints** consistently among the specific messages and can be used to load the map of **mRIDs** that are necessary to uniquely identify the objects like **equipments**, **asset**, etc. Depending on the use cases a system needs to address and which messages should be supported by that system, the operations configuration has to include different sets of objects. For example to support the message **TagAction**, **PowerSystemResources** need to be configured.

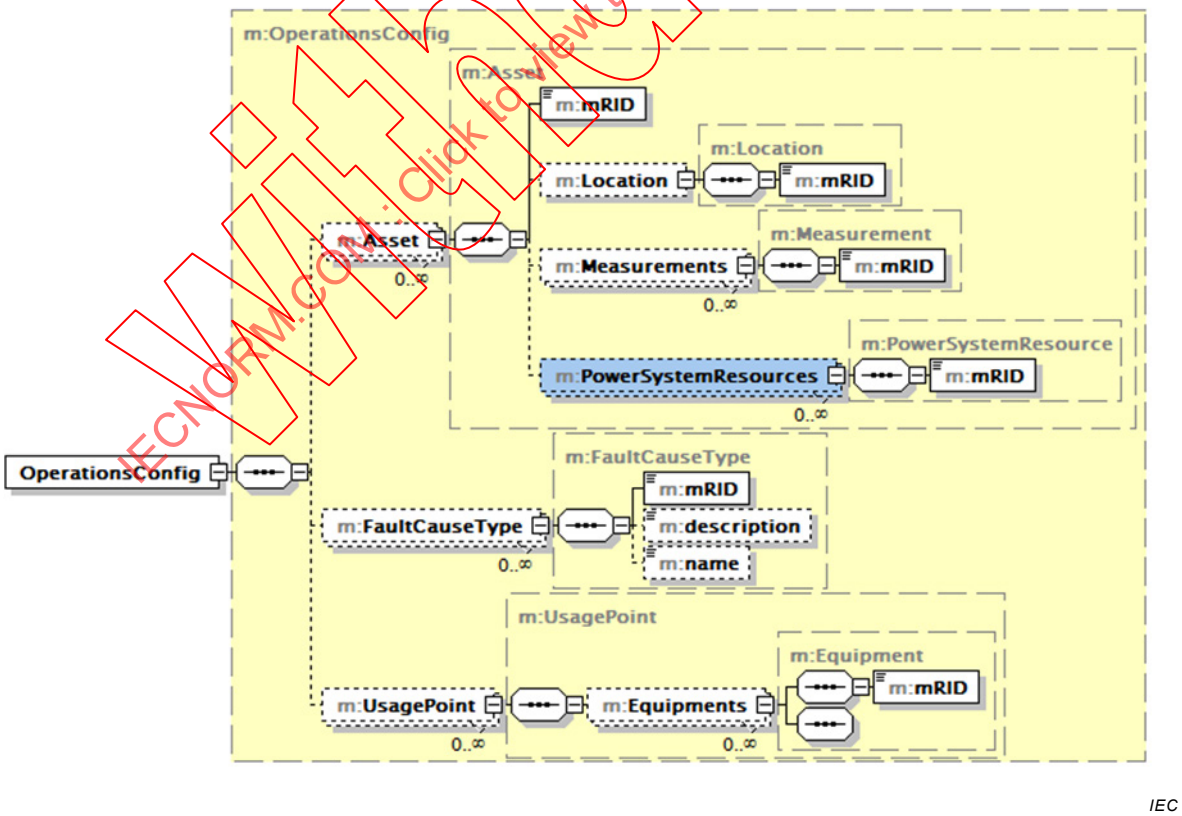

Figure 3 – OperationsConfiguration message payload

5.3 **MeasurementsAndControls** payload

5.3.1 General

MeasurementsAndControls message payloads are designed to communicate network state information such as the current switch status, the state of a fault relay, the current tap position or the current value of a voltage measurement as well as requests to change the network state such as open or close a switch, control the position of a transformer tap or set a new set point for a local controller.

Network state is monitored by SCADA and communicated to other systems that need to consider the current network state for further processing and analysis, i.e. an OMS system (for the Fault Management function) or a DMS (for the Network Operations and Monitoring function). Controls are typically sent from a DMS system to a SCADA system.

Typically, the payload contains either measurements or controls, as shown in Figure 4. Note that the arrows are bidirectional because the arrow from NO-NMON to NO-FLT is for a measurement, while the arrow from NO-FLT to NO-NMON is a control.

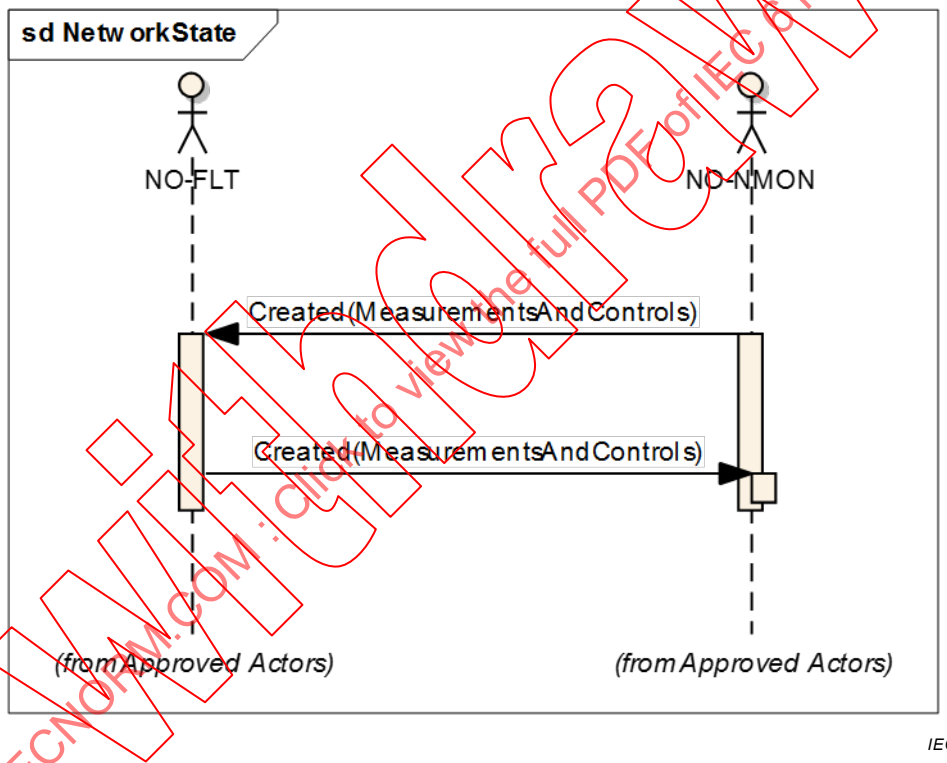

Figure 4 – MeasurementsAndControls

5.3.2 Measurement

Measurements communicate the current value of network information. This includes digital network information (**Digital Measurement**) such as switch status, tap position or fault relay status as well as analog network information (**Analog Measurement**) such as current, voltage, active power and reactive power. Use cases include:

- SCADA notifies interested parties of changes in the status of a protective device due to an outage (i.e. trip of a circuit breaker). This notification can be used as a trigger for outage analysis or fault location in Fault Management or Network Operations.
- SCADA notifies interested parties changes in the status of a fault indicator. This notification can be used by fault location for further analysis to narrow down the faulted area.

- SCADA notifies interested parties changes in the status of a switch or a tap changer as result of a switching operation. This information may be used by any system that needs to process network state changes.
- SCADA notifies interested parties of changed fault current or fault reactance at a protective device. These values can be used by fault location to calculate the faulted area.
- SCADA notifies interested parties of changed values like active power, reactive power, current, voltage and frequency. This information may be used by any system that needs to process network state changes.

5.3.3 Control

Controls request remote control to change the status of a switchable device such as open or close a switch, change a transformer tap position or set a new set point for a local controller. Controls may either be requested as single action or as part of a switching plan. Use cases include:

- Fault Management requests to open or close a switch as part of a switching plan for fault isolation and/or service restoration. Such a switch control operation may affect all phases or a single phase.
  - In case of a multi-phase configuration, one control will switch all available phases (i.e. two or three phases)
  - In case of a single-phase configuration, one control will switch all available phases, if the corresponding switch is gang-operated. Otherwise one control will switch one phase. In that case the phase to be switched is identified via the terminal
- Volt/var control proposes to change the tap position of a transformer as part of the calculated switching plan.
- Volt/var control proposes to set a new setpoint for a local controller as part of the calculated switching plan

5.3.4 Message payload

This message payload, shown in Figure 5, can be used for exchanging measurement data including 0 to many measurement value and/or measurement control objects.

Measurement value objects:

- Accumulator value
- Analog value (for example active and reactive power)
- Discrete value (for example status of a breaker)
- String measurement value

Measurement control objects:

- Accumulator reset
- Setpoint (for example setpoint for local voltage control)
- Command (for example open or close a switch)
- RaiseLowerCommand (for example raise or lower a transformers tap position)

The detailed format for analog value is shown in Figure 6 and setpoint control is shown in Figure 7 as an example for the different measurement value and measurement control formats.

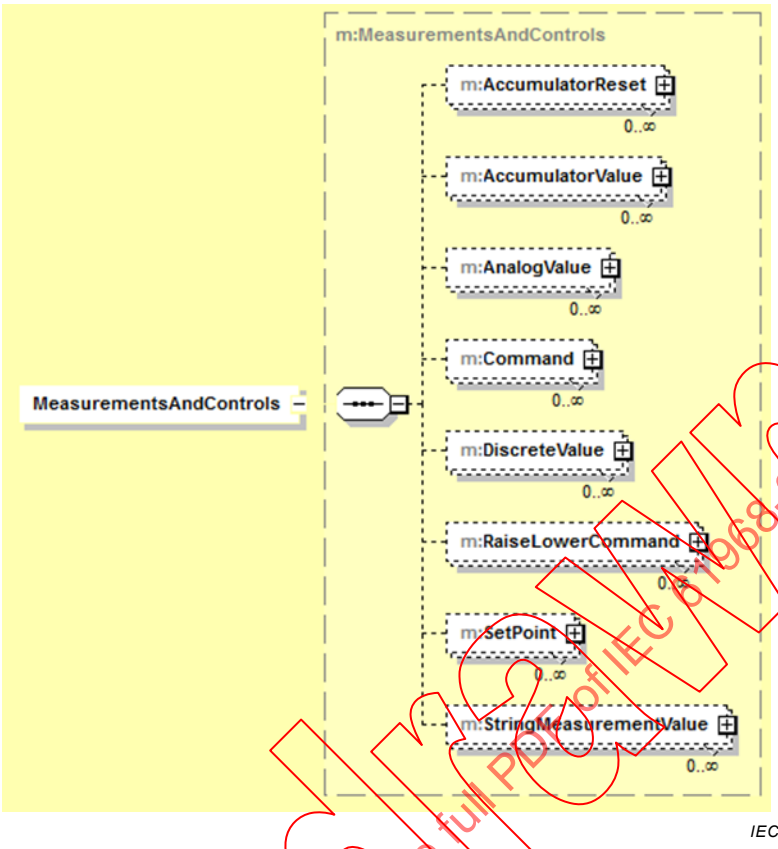

Figure 5 – MeasurementsAndControls message payload

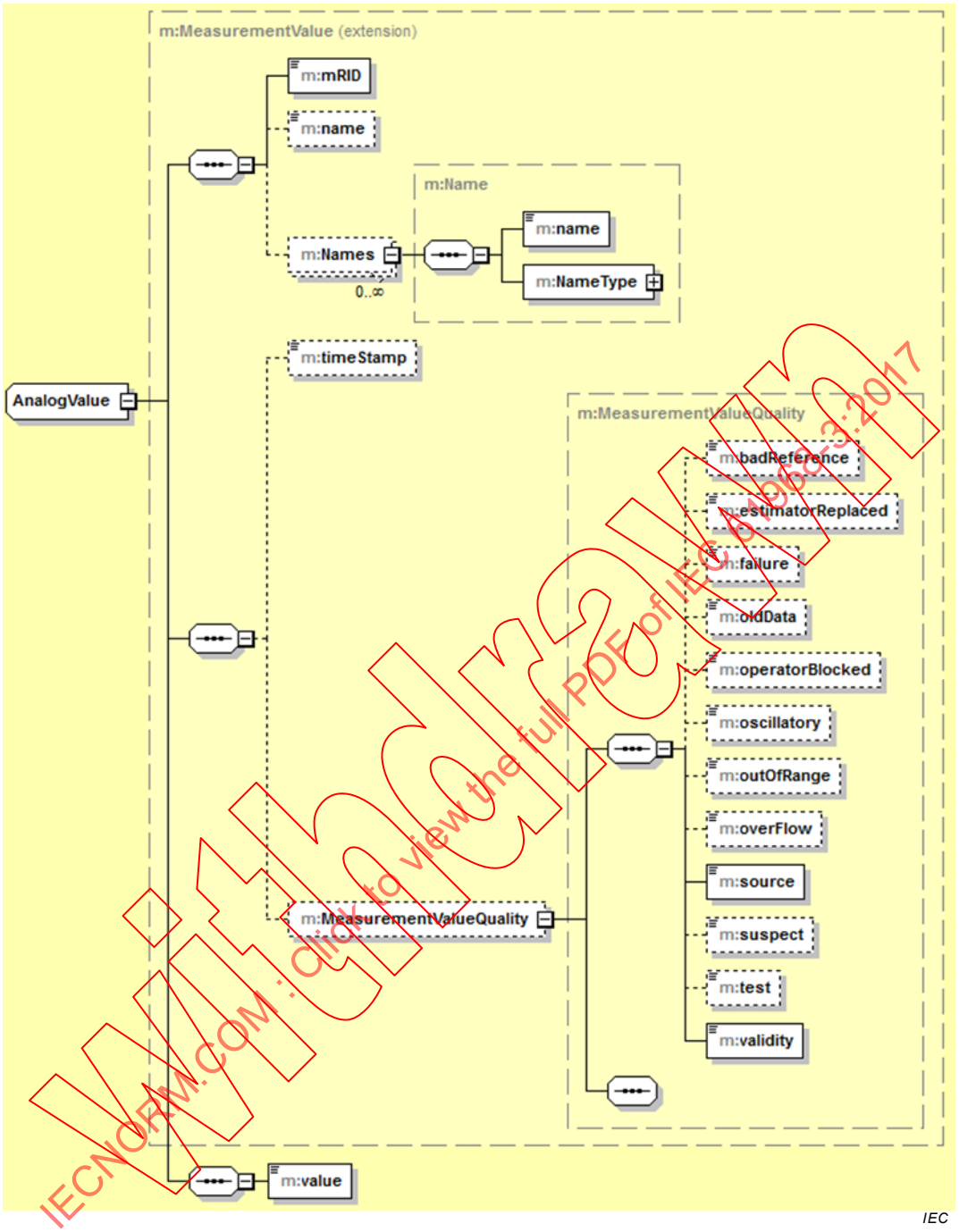

Figure 6 – MeasurementsAndControls message payload, AnalogValue detail

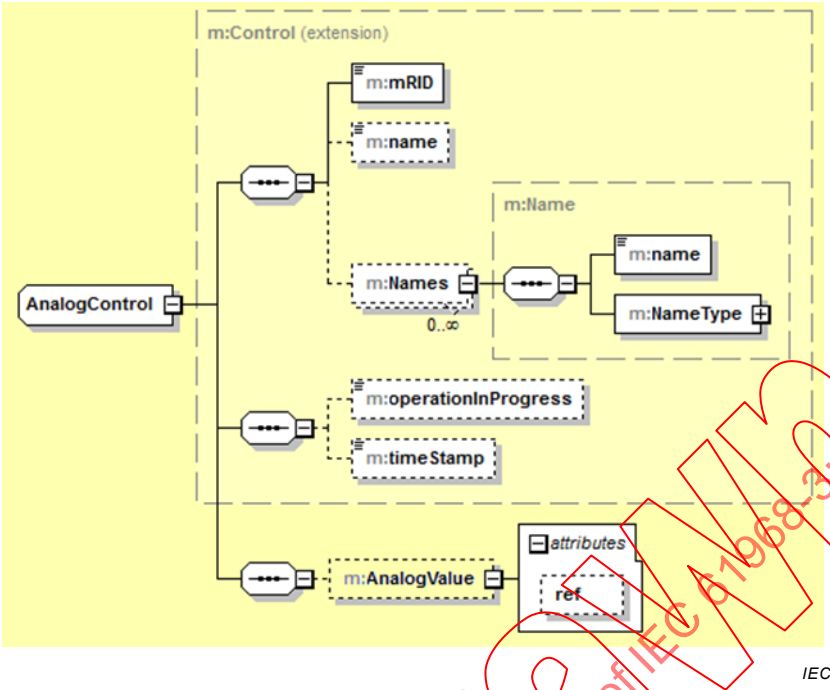

Figure 7 – MeasurementsAndControls message payload, Setpoint (AnalogControl) detail

5.4 TemporaryNetworkChanges payload

5.4.1 General

Temporary network changes are of special importance in the case of network construction, during outages caused by severe weather or other disaster, or as emergency backup during maintenance of the network or power plants. In those scenarios, the power utilities are forced to still maintain the balance between generation and consumption as well as to re-supply as fast as possible affected customers. Temporary network changes such as jumpers, cuts and grounds, are used to temporarily reconfigure the respective part of the network.

Temporary Network Changes message payloads are designed to communicate creation and deletion of temporary network changes such as jumpers, cuts and grounds typically in the context of switching operations for fault isolation and service restoration. The sequence diagram for creating and deleting temporary network changes is shown in Figure 8.

Depending on the type of the network (balanced / unbalanced), a temporary network change may affect either three phases, two phases or a single phase. In the case of creating a single phase jumper, this jumper may connect two different phases of the respective field resources (cross phase jumper).

The creation and deletion of temporary network changes may be defined as part of a switching plan as **Cut**, **Ground** or **Jumper Action**.

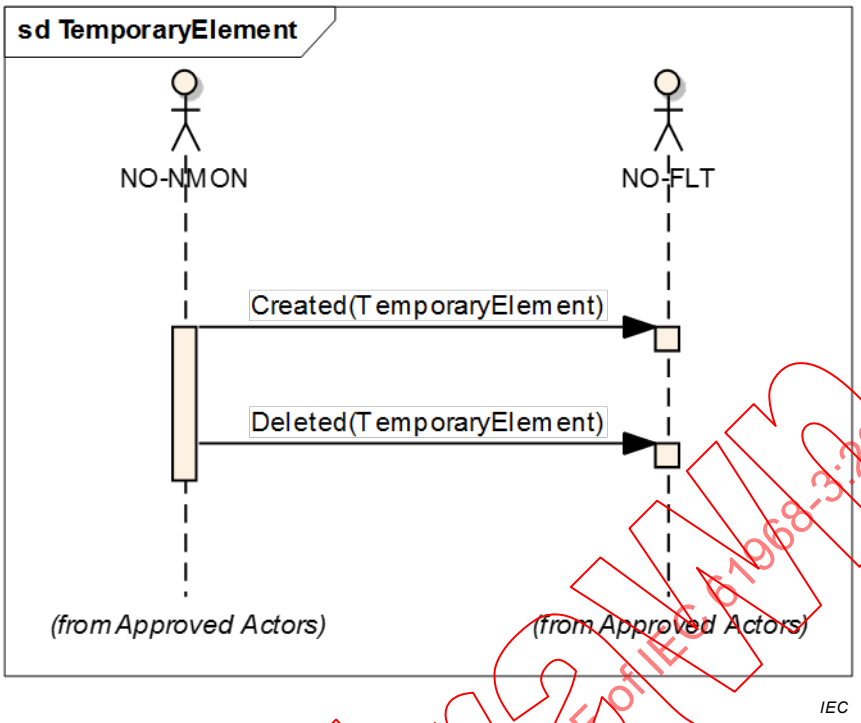

Figure 8 – Temporary Network Changes

5.4.2 Message payloads

These message payloads, shown in Figures 9, 10, 11, 12, 13 and 14 can be used to communicate creation and deletion of temporary network changes.

Figure 9 shows the **TemporaryNetworkChanges** message payload, which is further broken down into payloads for **Clamp**, **Cut**, **EnergySource**, **Ground** and **Jumper**.

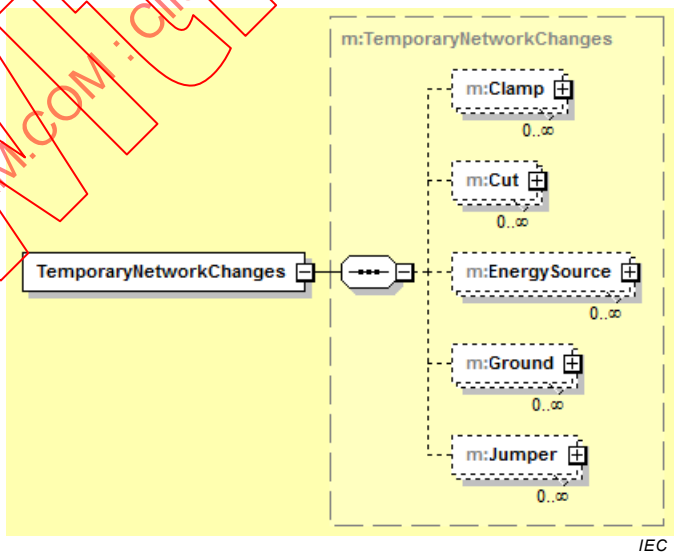

Figure 9 – TemporaryNetworkChanges message payload

Figure 10 shows the payload for a **Clamp** temporary network change. **Clamp**s are used as a connection point for connecting temporary equipment to permanent lines.

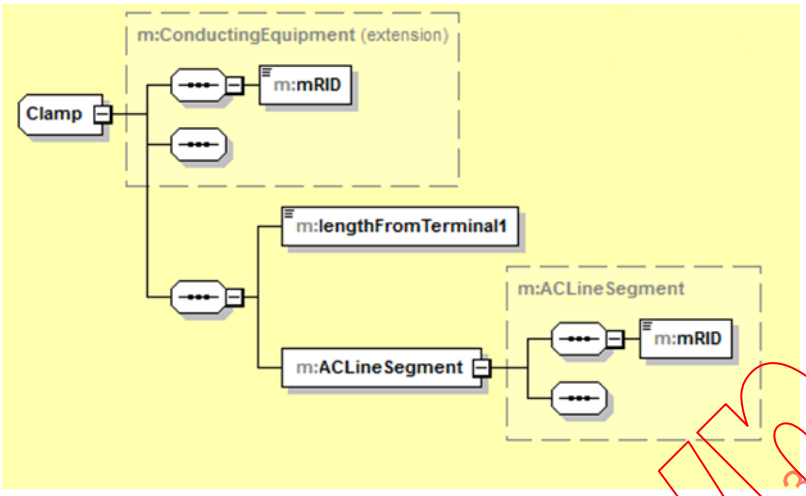

Figure 10 – TemporaryNetworkChanges message payload, Clamp detail

Figure 11 shows the message payload for a **cut** temporary network change. A **cut** is used to model a temporary break in the connectivity of a permanent conductor.

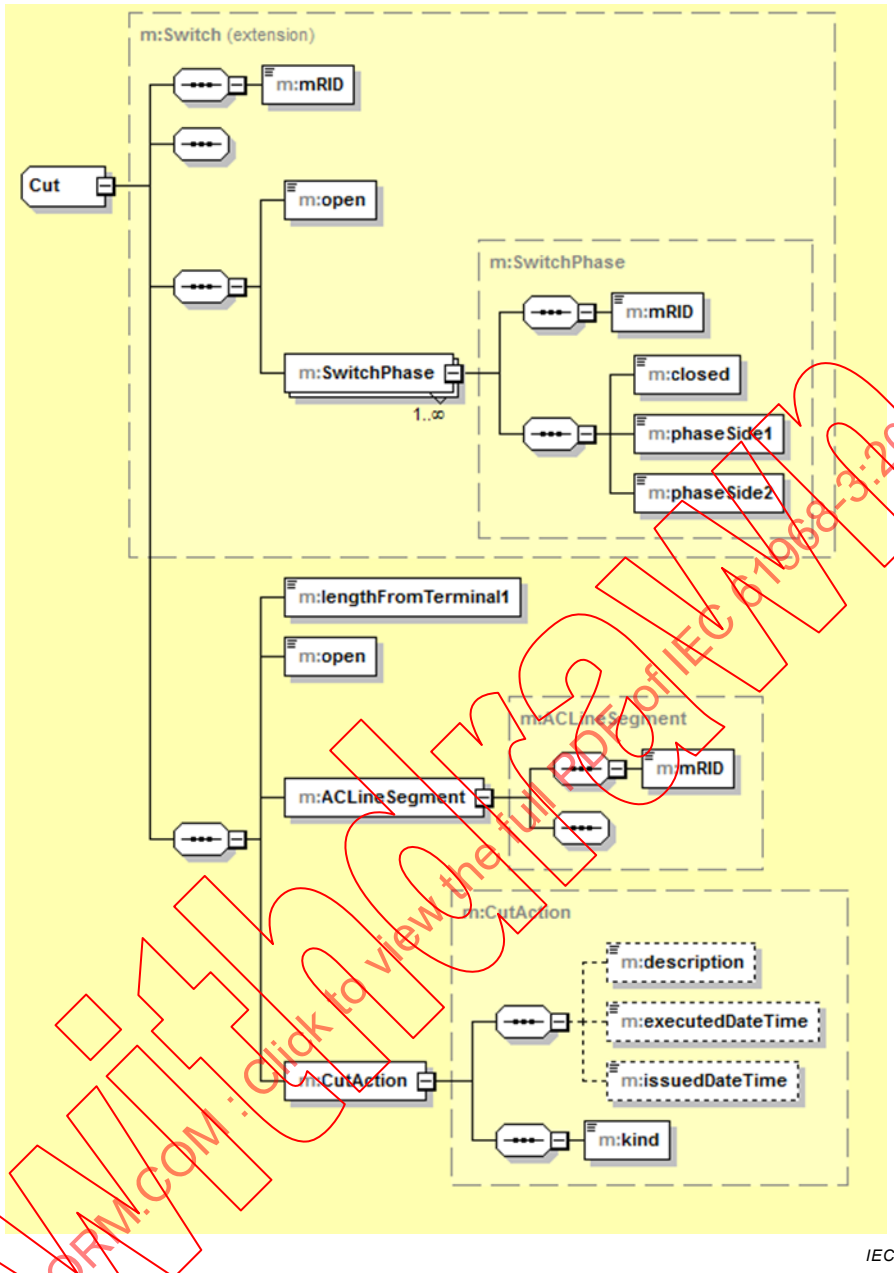

Figure 11 – TemporaryNetworkChanges message payload, Cut detail

Figure 12 shows the message payload for an **EnergySource** temporary network change. An **EnergySource** is used to model a temporary generator or mobile transformer, for example.

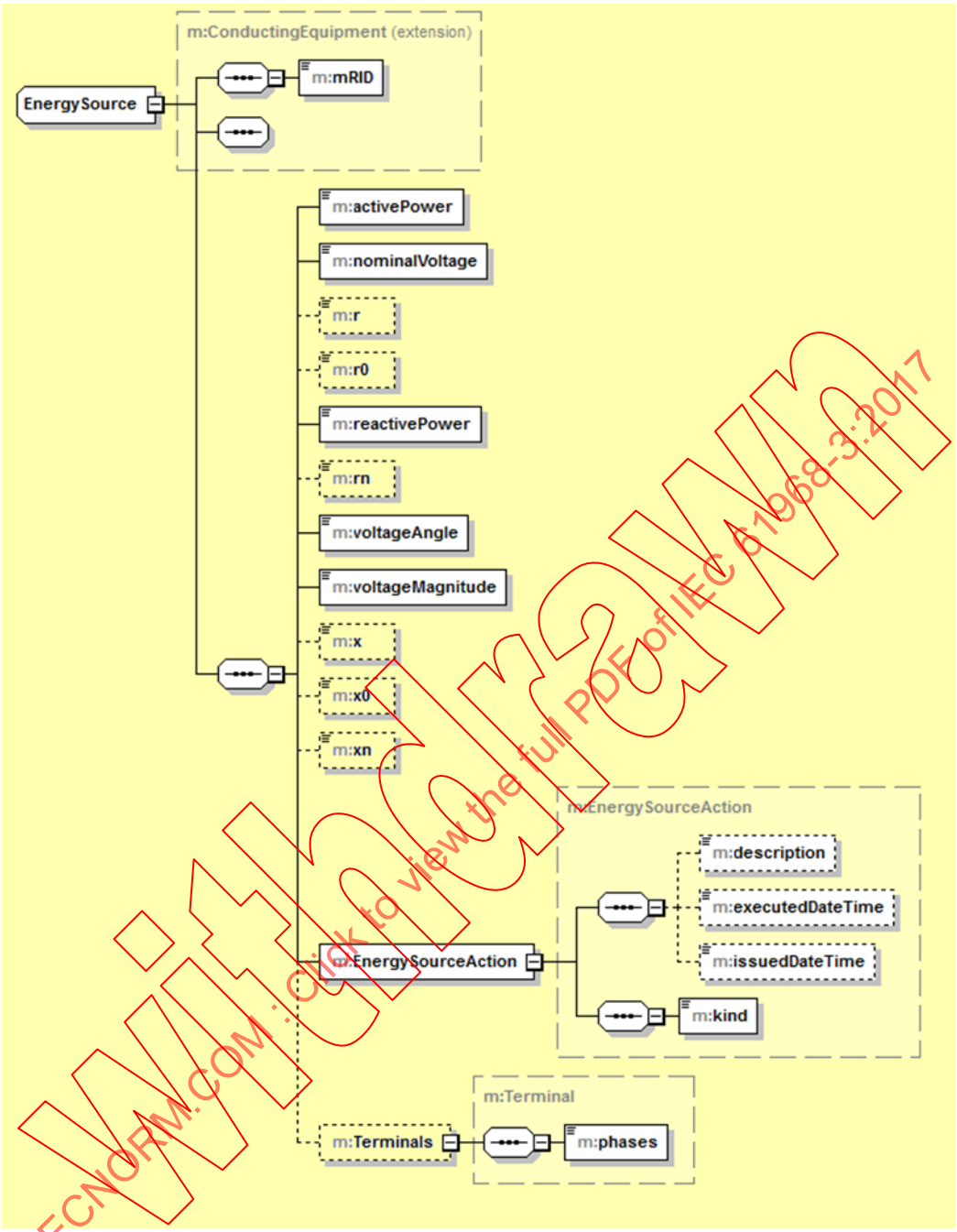

Figure 12 – TemporaryNetworkChanges message payload, EnergySource Details

Figure 13 shows the payload for a **ground** temporary network change. **Ground**s are used to model temporary grounds placed on equipment while crews are working in a de-energized area, for safety reasons.

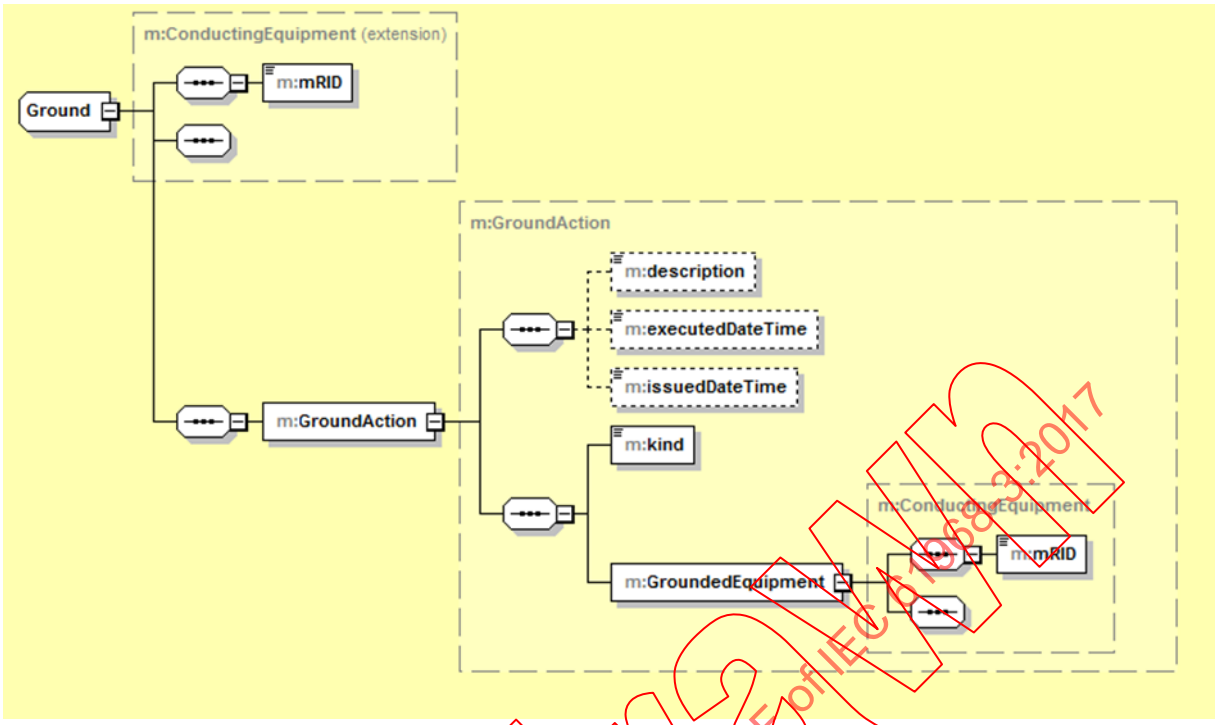

Figure 13 – TemporaryNetworkChanges message payload, Ground details

Figure 14 shows the payload for a **jumper** temporary network change. A **jumper** is used to model a temporary conductor, used to temporarily energize the network when the permanent equipment is unable to do so, for example when there is a network fault.

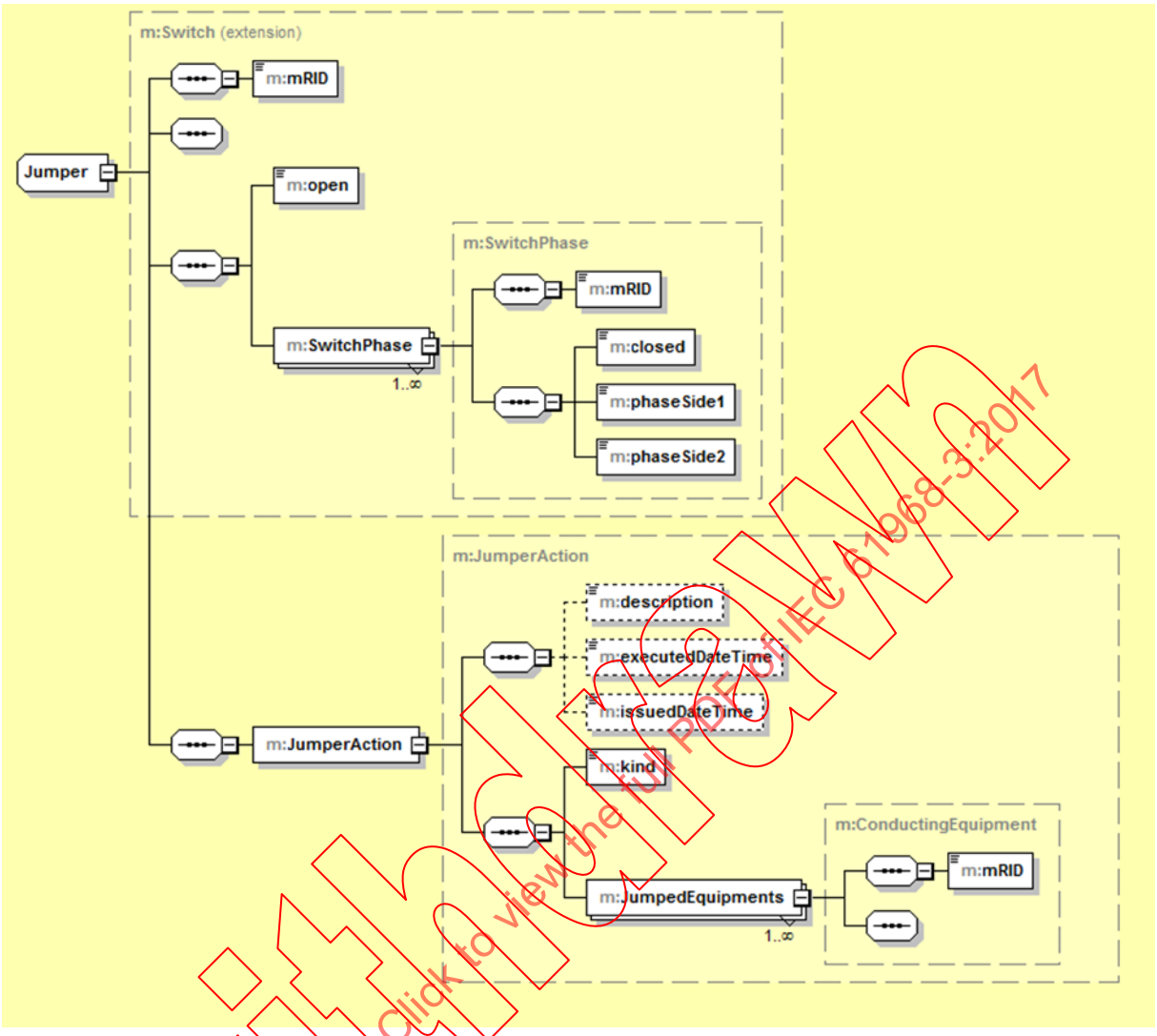

Figure 14 – TemporaryNetworkChanges message payload, Jumper Details

5.5 SwitchingPlan payload

5.5.1 General

SwitchingPlan message payloads are designed to communicate a set of switching actions that form a sequence to manage a complete operational task. Figure 15 shows a sequence diagram that illustrates the creation of a switching plan. Use cases include:

- Fault Management proposes one or more switching plans as alternative solutions for fault or work area isolations and/or service restoration.
- Network optimization applications such as Volt/Var control, optimal feeder reconfiguration, etc. propose one or more switching plans as alternative solutions to optimize the entire distribution grid or selected parts of the distribution grid.
- A request to generate a switching plan may be result of a user interaction or issued from an application as part of a complete workflow like fault location, isolation and restoration.

A switching plan may include non-network actions such as placement or removal of tags, placement or removal of temporary elements, or general instructions to a field crew or operator.

A switching plan may be communicated between different parties during its life cycle

- A switching plan is created
- A switching plan is validated
- A switching plan is approved
- A switching plan is executed

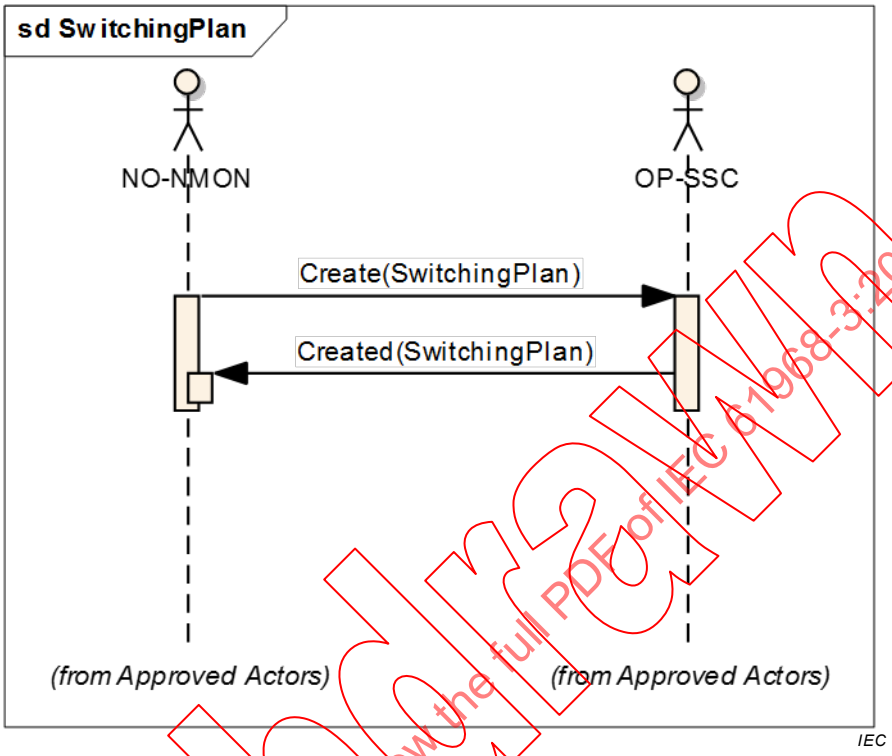

Figure 15 – Switching Plan

5.5.2 Message payload

This message payload, shown in Figure 16, can be used for exchanging 0 to many switching plans. Each switching plan may include 0 to many switching actions and/or switching step groups. Switching step groups are used to define the sequence (order) for groups of actions. Optionally, each switching plan may include safety documents (shown in Figure 17).

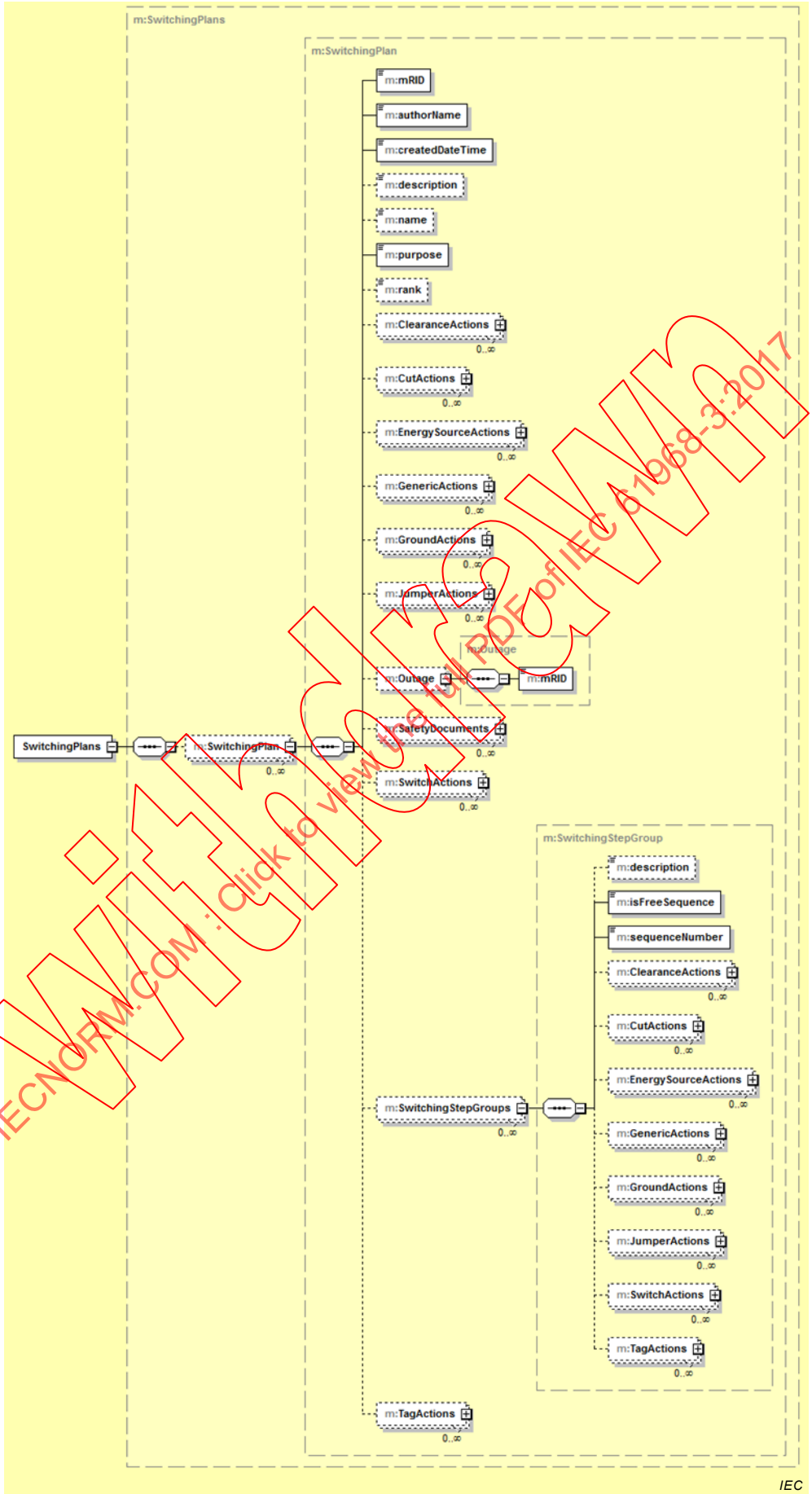

Figure 16 – SwitchingPlans message payload

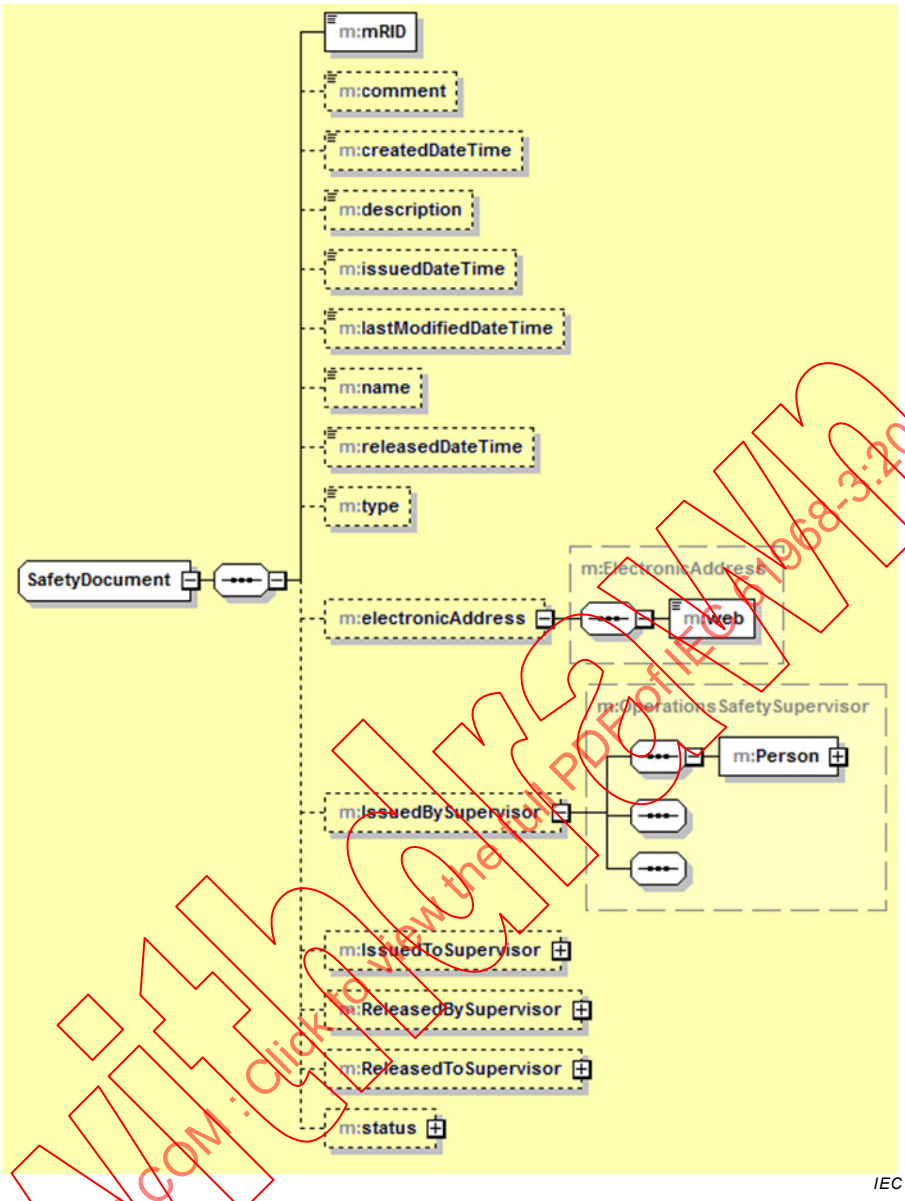

Figure 17 – SwitchingPlans message payload, SafetyDocument detail

ClearanceActions, shown in Figure 18, covers the steps to clear equipment for maintenance work and document the corresponding switching actions to isolate the respective equipment.

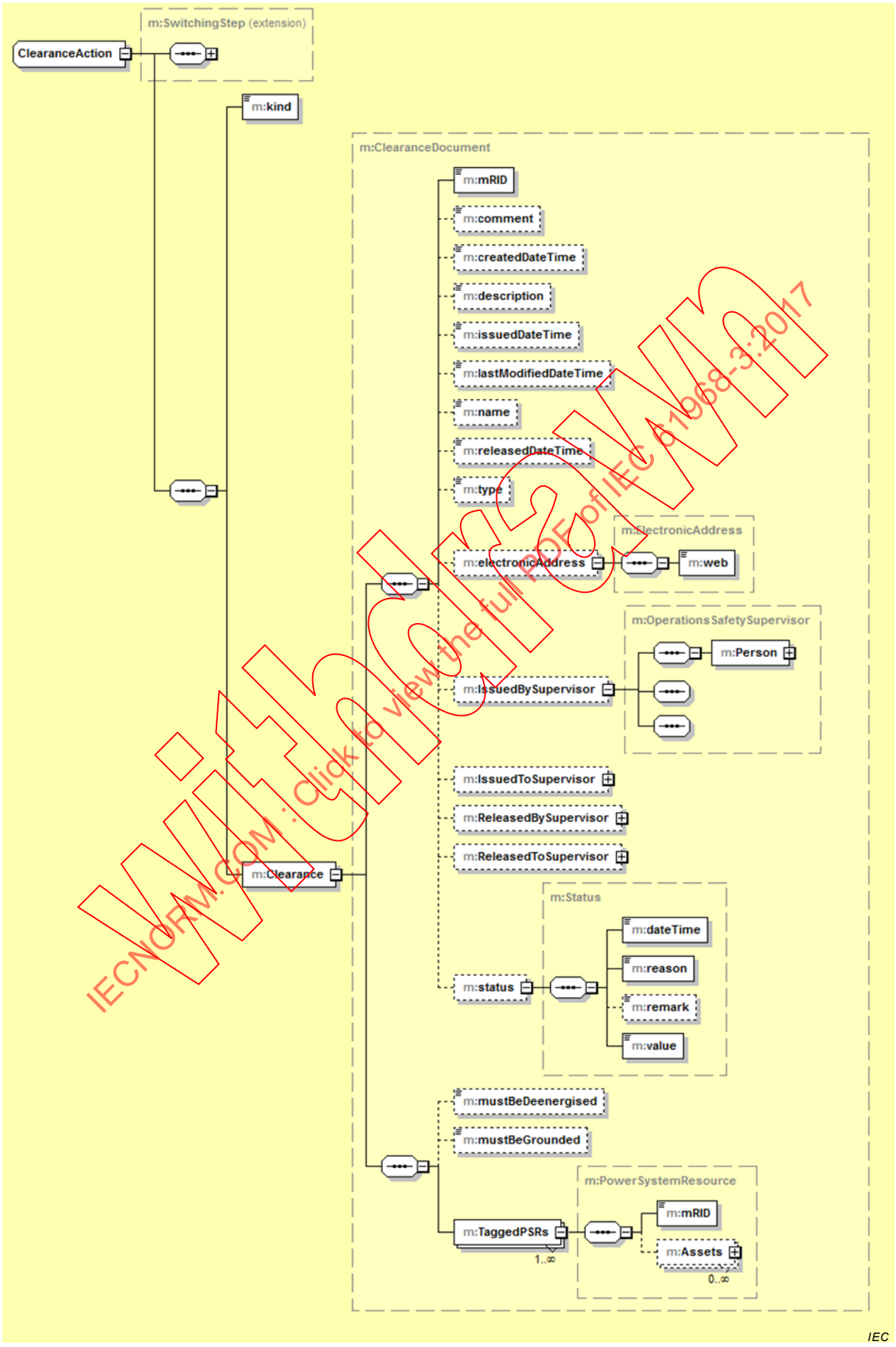

Figure 18 – SwitchingPlan message payload, ClearanceAction detail

Figure 19 shows the **GenericAction** message payload. Generic actions within a switching plan define the set of actions that are performed as a switching step that do not impact the state of the network or perform an action on the network that is not modelled.

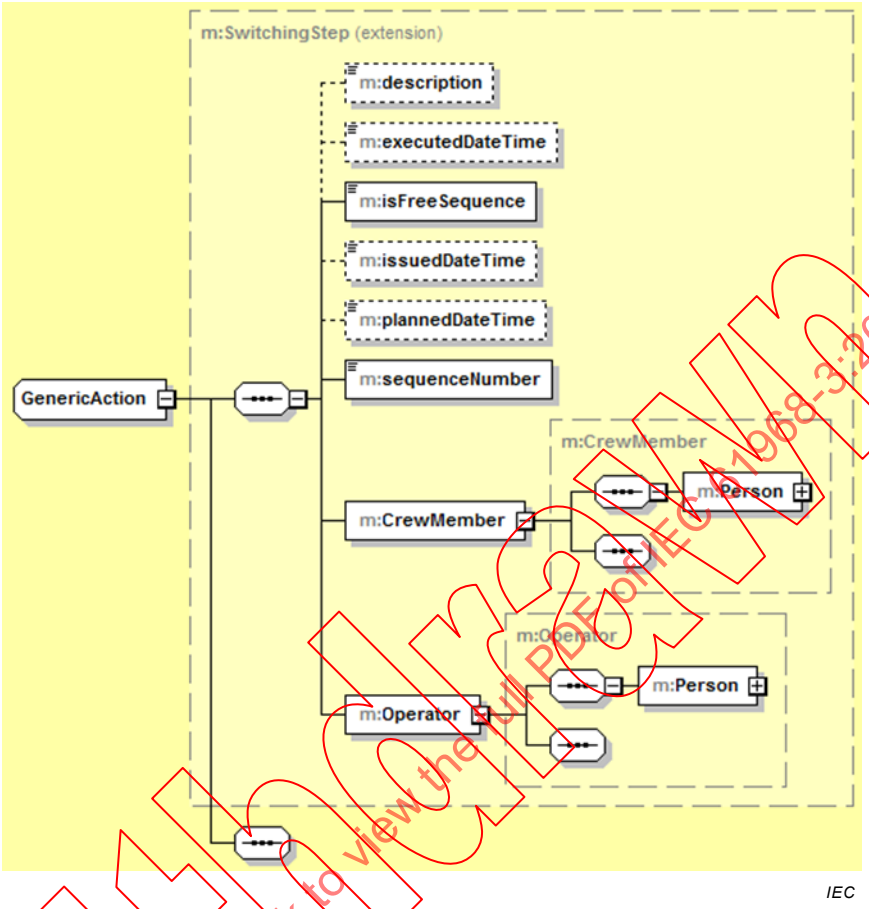

Figure 19 – SwitchingPlan message payload, GenericAction detail

Figure 20 defines the payload for **EnergySourceAction**, which is used to specify a switching step to add or remove a temporary **EnergySource**.

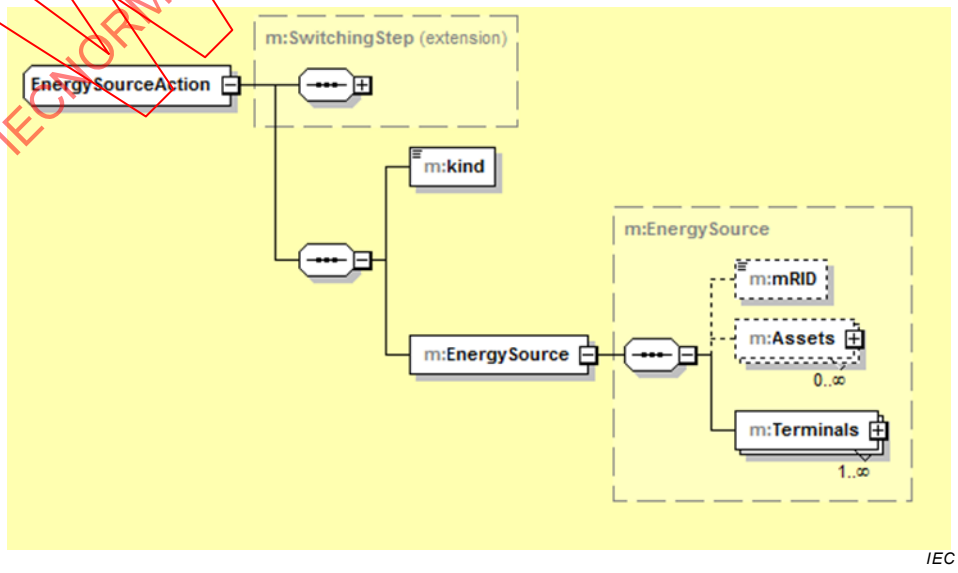

Figure 20 – SwitchingPlan message payload, EnergySourceAction detail

Figure 21 defines the payload for a **CutAction**, which is used to specify a switching step to add or remove a **Cut** to/from a conductor.

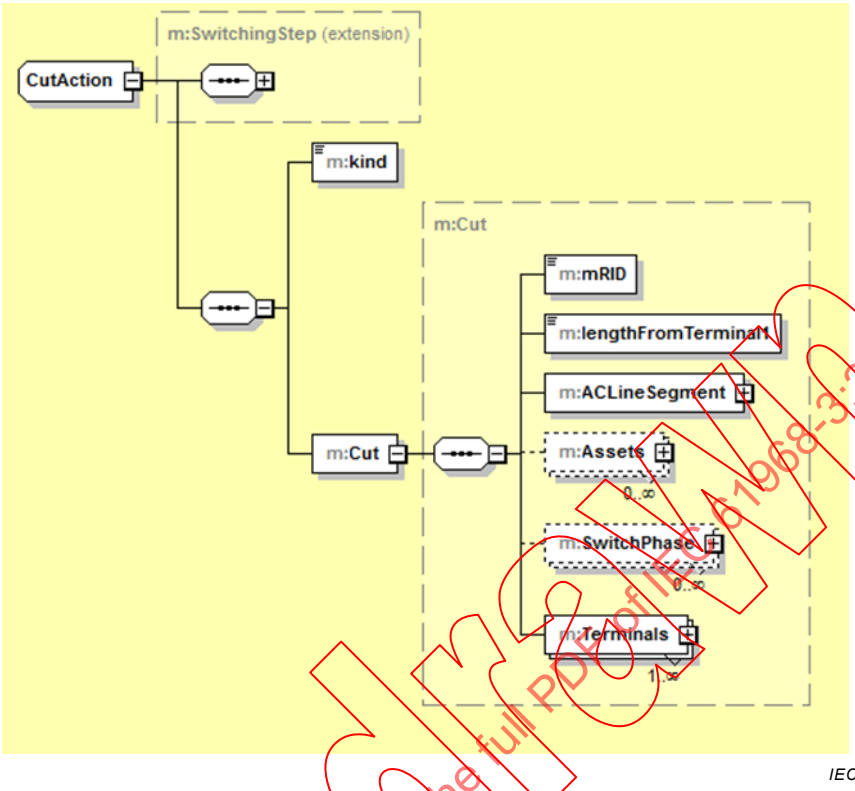

Figure 21 – SwitchingPlan message payload, CutAction detail

Figure 22 defines the payload for a **GroundAction**, which is used to specify a switching step to add or remove a **Ground** to/from a conductor or equipment.

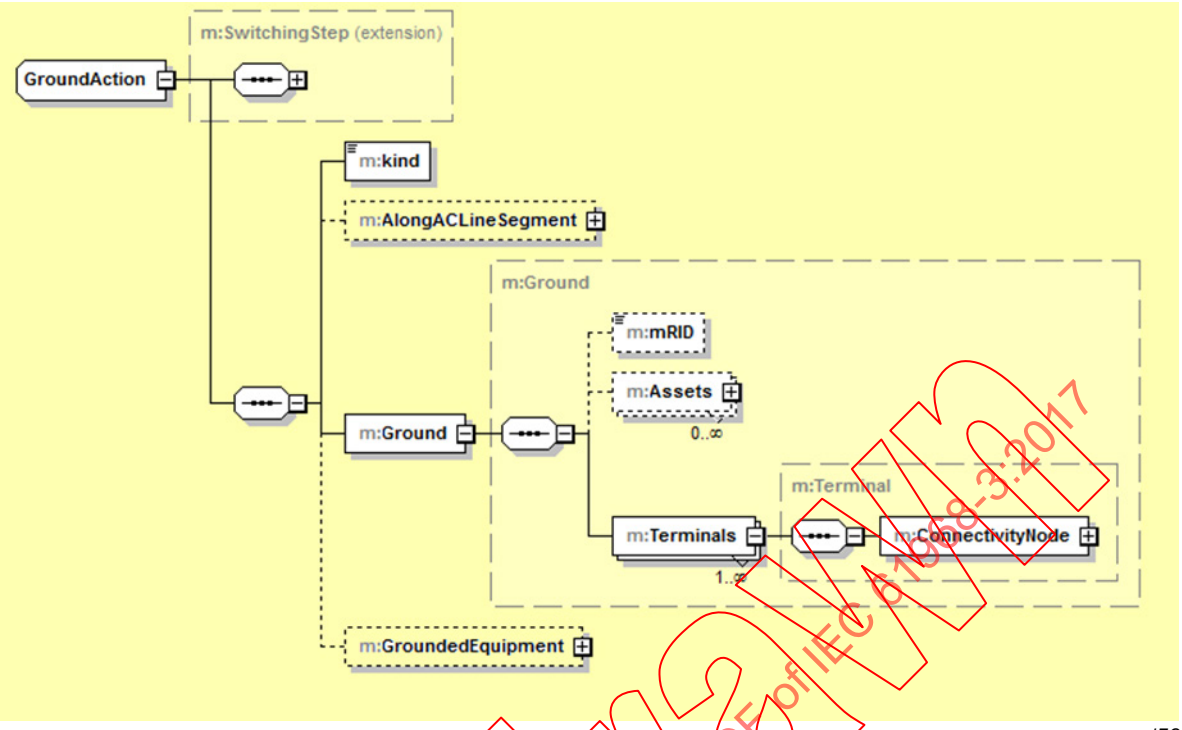

Figure 22 – SwitchingPlan message payload, GroundAction detail

Figure 23 defines the payload for a **JumperAction**, which is used to specify a switching step to add or remove a **Jumper**.

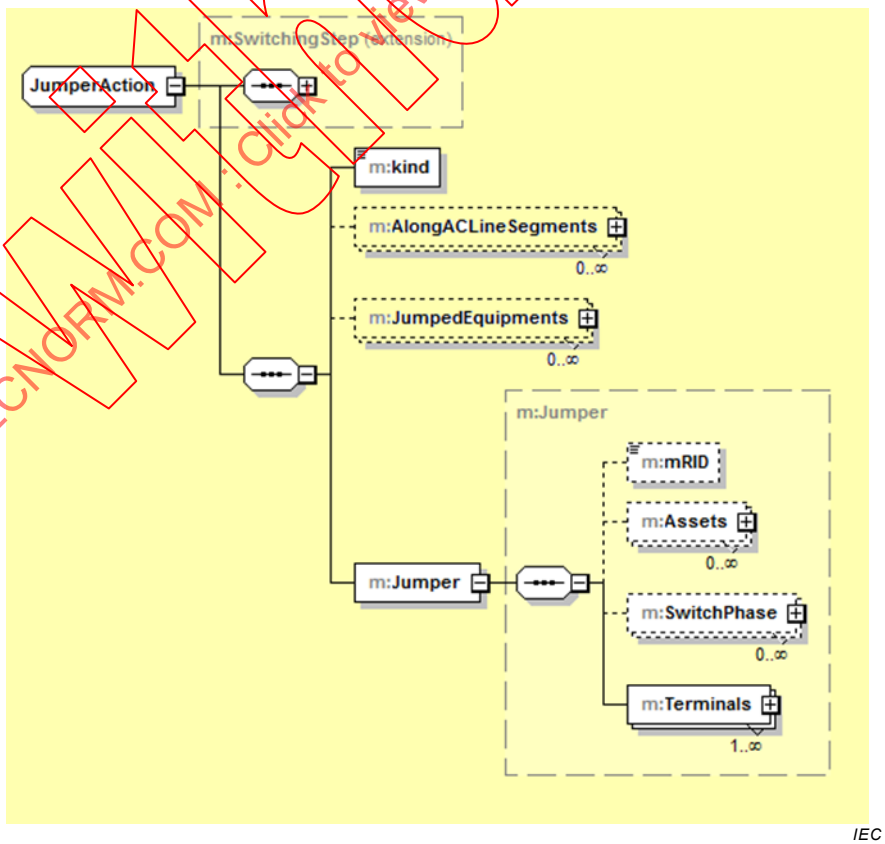

Figure 23 – SwitchingPlan message payload, JumperAction detail

Figure 24 defines the payload for **SwitchingAction**, which is used to specify a switching step to open or close one or more phases of an **OperatedSwitch**.

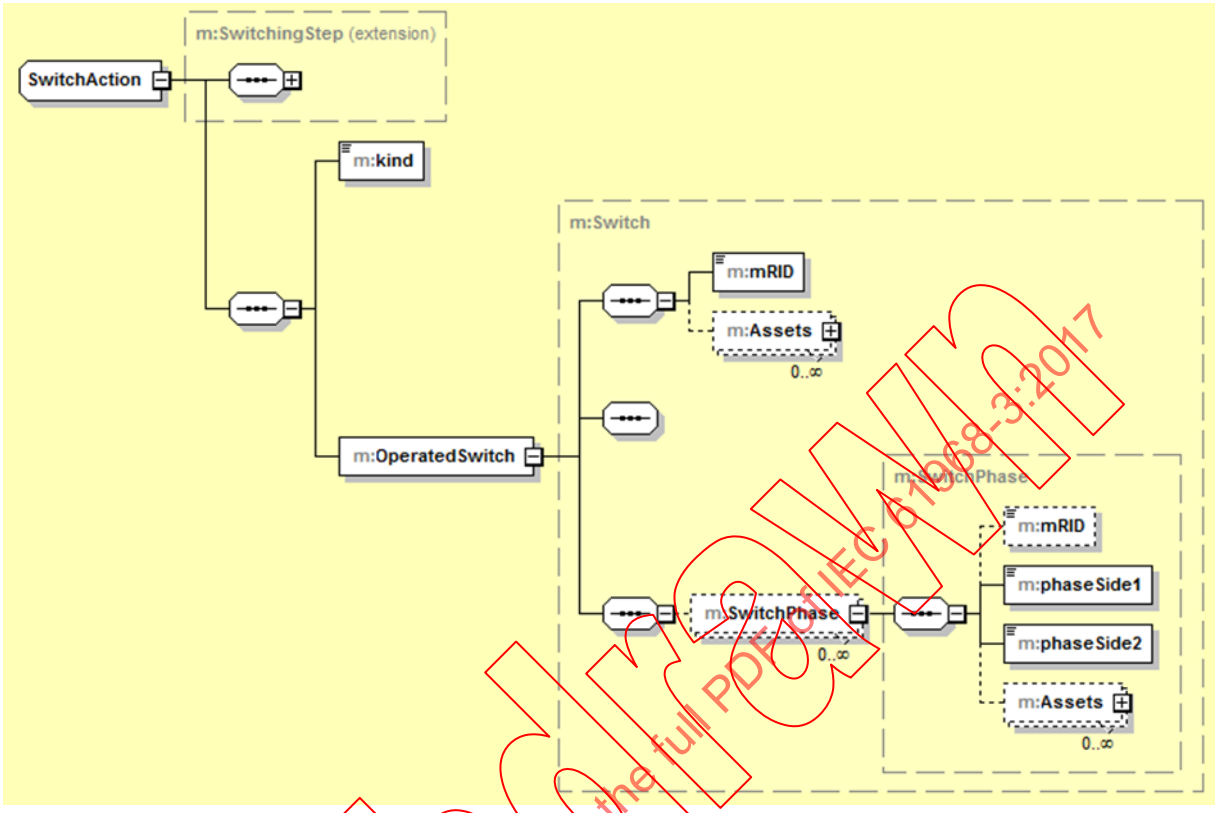

Figure 24 – SwitchingPlan message payload, SwitchingAction detail

Figure 25 defines the payload for **TagAction**, which is used to specify a switching step to add or remove an **OperationalTag**.

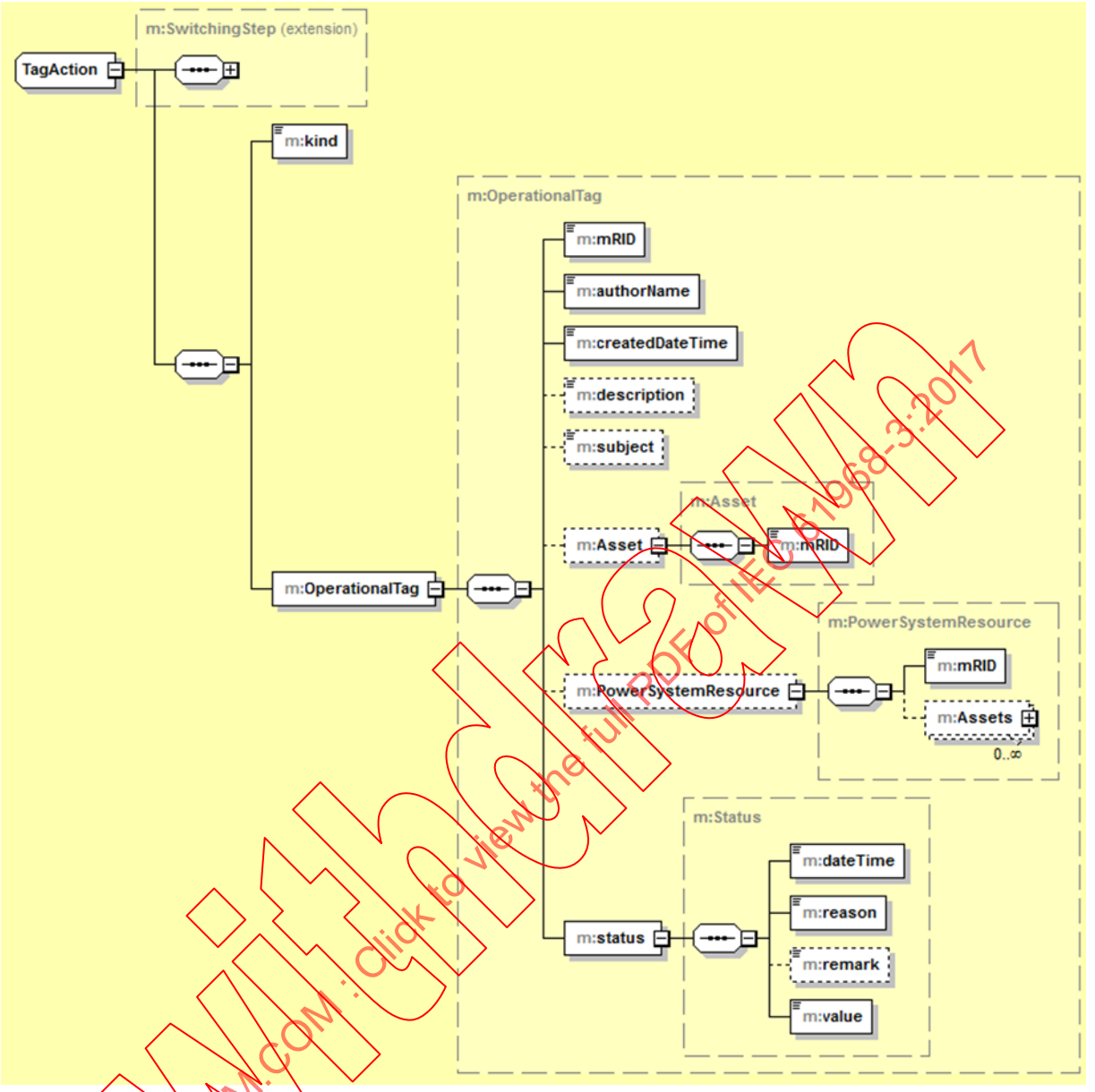

Figure 25 – SwitchingPlan message payload, TagAction detail

For details of Temporary Network Changes such as **Cut**, **Ground** and **Jumpers**, see also 5.4.

For details of Operation Tags see also 5.6.

5.6 OperationalTags payload

5.6.1 General

OperationalTags message payloads are designed to communicate creation and removal of tags such as Do Not Operate, Control Inhibit, Out of Service, etc. A tag is associated with a field resource and typically constrains the operation of the respective field resource. Tags are created and removed in SCADA typically upon a user's request. Tags may also be created and deleted as part of switching plans. Figure 26 shows the sequence diagram to create and delete an **OperationalTag**.

Tag message payloads may be used by applications that need to consider the existence of tags as constraints when operating field resources. Use cases include:

- When performing fault isolation, the field crew applies a Do Not Operate tag to all isolating switches, which means those switches may not be operated for purposes other than isolating the respective equipment as long as the fault is under repair
- After a fault is repaired, the Do Not Operate tags are removed by the field crew.
- An operator may apply a control inhibit tag to a switch in case the equipment may not be operated due to known technical or communication problems.
- An operator changes the comments on a tag to communicate details with the next operator after a shift change
- After the problems are resolved, the control inhibit tag is removed by the operator.

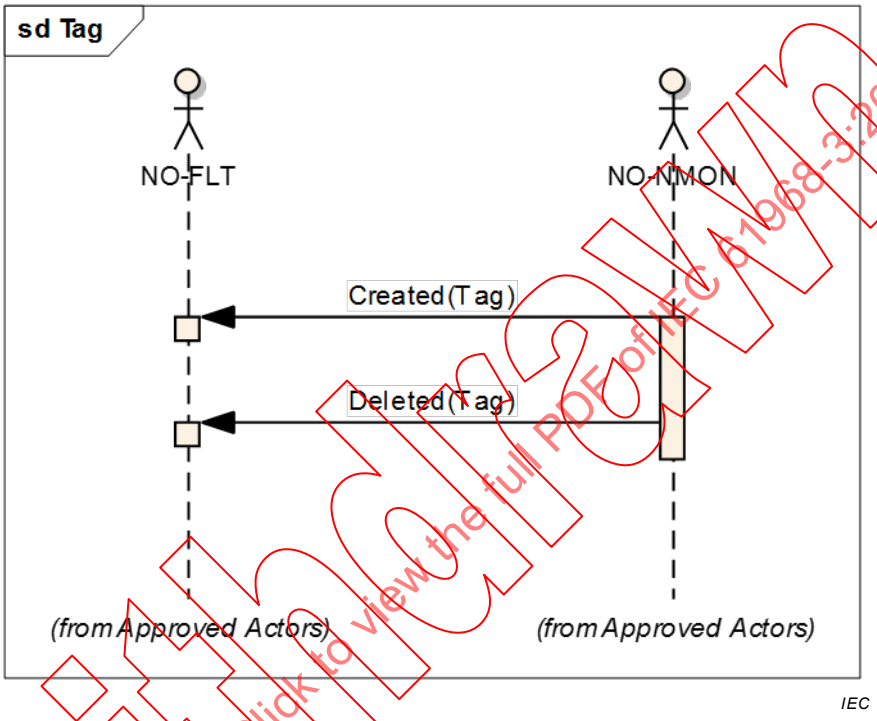

Figure 26 – Tags

5.6.2 Message payload

This message payload, shown in Figure 27, can be used to communicate creation and removal of operational tags.

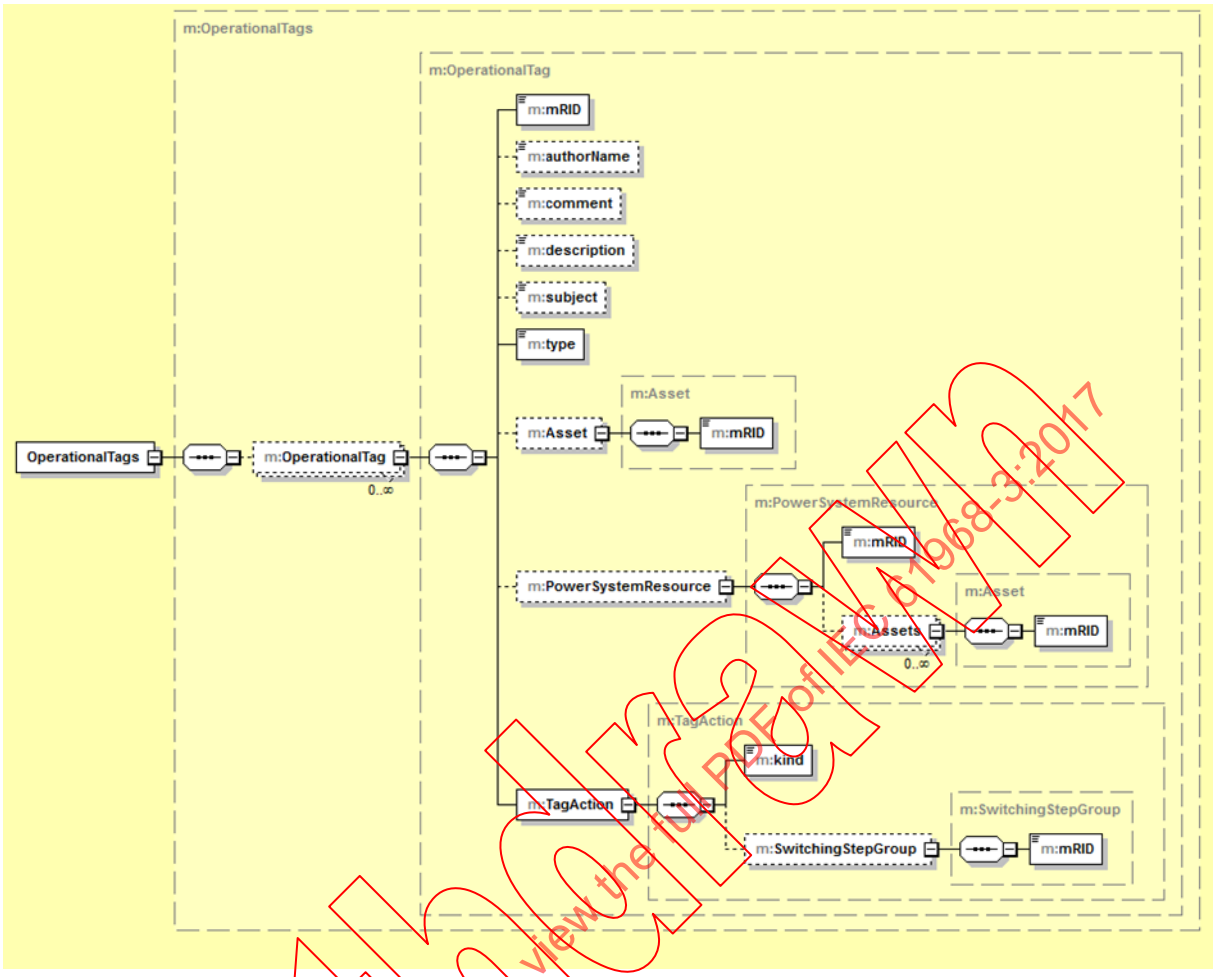

Figure 27 – OperationalTags message payload

5.7 TroubleTicket payload

TroubleTicket message payloads are designed to communicate customer reported outages and related information through the lifecycle of a trouble call. Typically Trouble Call Management (TCM) notifies of new outages reported by customers. OMS and DMS may use this information for outage/fault analysis. After the outage is identified, an incident is created for response to the outage. Figure 28 shows the sequence for creating a **TroubleTicket**, creating an **Incident** and updating an **Incident**.

- TCM creates a Trouble Ticket to notify fault management of a new outage
- TCM updates a Trouble Ticket to notify of changes due to another call from the customer
- Fault management checks whether this trouble ticket relates to an outage that is already in progress.
  - If the trouble ticket relates to an outage that is already in progress, Fault Management replies with the corresponding Incident. The incident includes the information whether the outage is already confirmed or still in a predicted state
  - If the trouble ticket identifies a new outage, fault management replies with a new created incident
- Fault Management processes the outage based on all available information such as SCADA events, meter power off events and information from the field crew. As result of this processing, the outage will be confirmed or not confirmed. In both cases, fault management will update TCM with the Incident which will show the confirmation status to either “confirmed” or “not confirmed”.

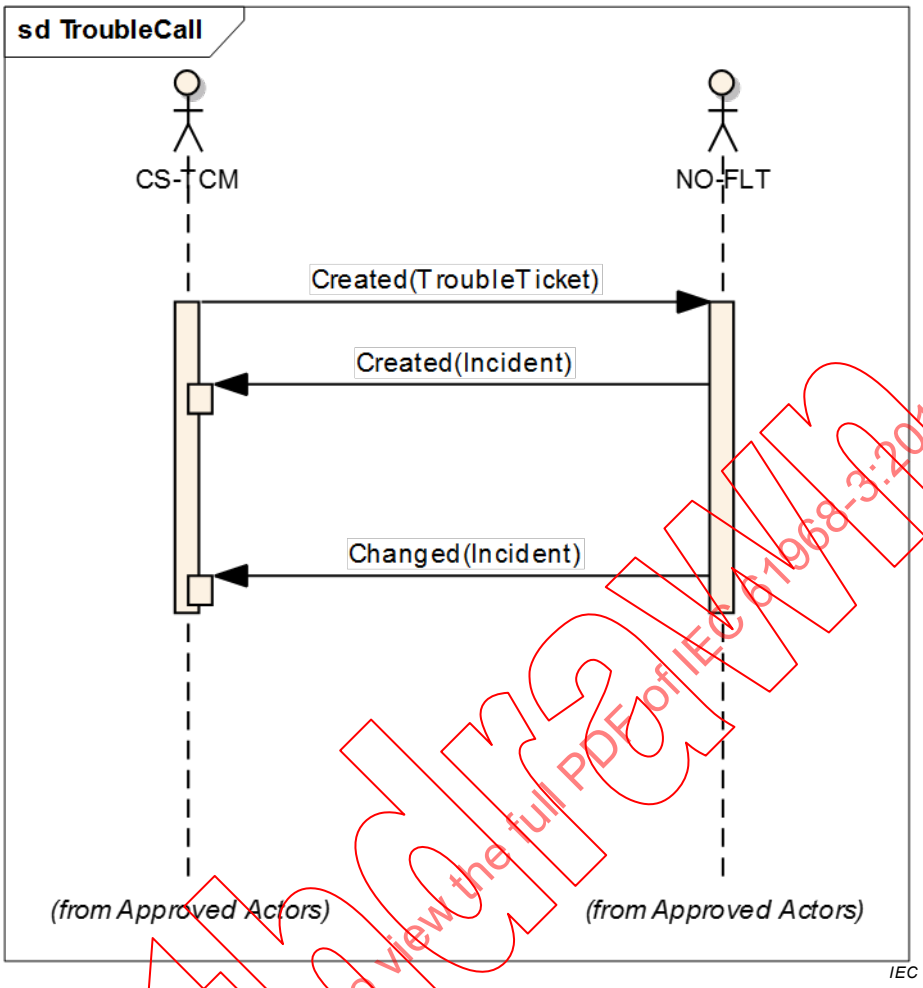

Figure 28 – Trouble Ticket

For further details regarding TroubleTickets payload, see IEC 61968-8.

5.8 Incident payload

5.8.1 General

Incident message payloads are designed to communicate a problem in the field and are shown in Figure 30. Typically, but not always, an **Incident** is associated with an **Outage**.

- Fault Management creates an incident for each identified outage (see Figure 29). An outage is identified based on any of the following inputs or any combination of these inputs:
  - A customer reported outage reported through a Trouble Ticket from TCM
  - A breaker trip reported through a Digital Measurement by a SCADA system
  - A meter power down status reported through an End Device Event by an AMI.
- Fault Management updates the Incident based on the state of outage analysis (see Figure 29); this is to provide the following information to TCM:
  - Is the corresponding outage confirmed or not
  - Is the respective customer still out of power or is the outage already resolved and the trouble ticket can be closed.
  - The hazard that is causing the trouble, e.g. line down, transformer fire, etc.

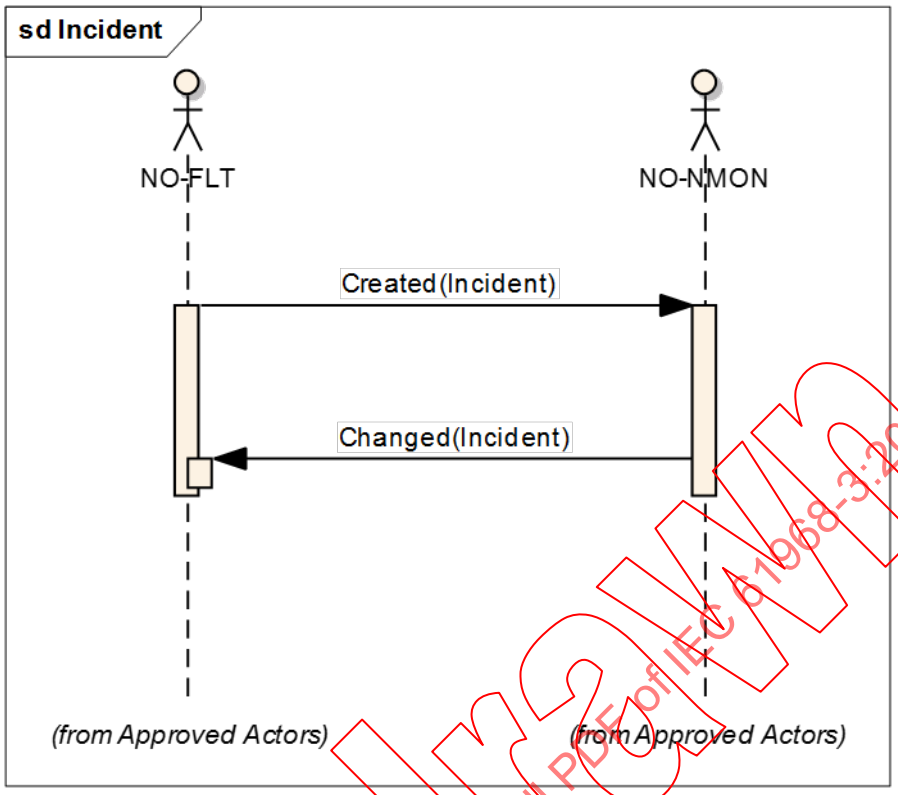

Figure 29 – Incident

5.8.2 Message payload

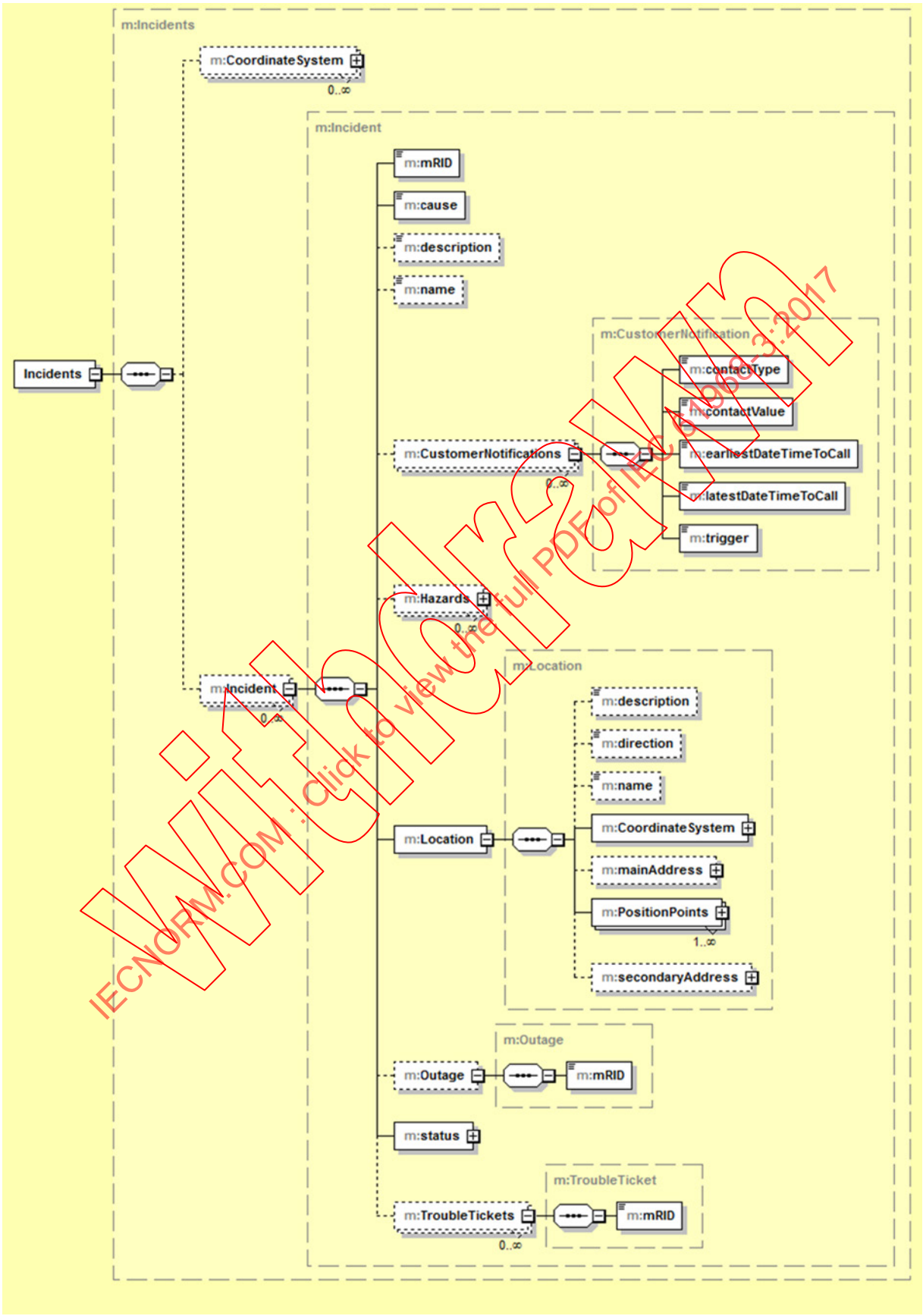

Figure 30 – Incident message payload

5.9 **Outage** payload

5.9.1 General

Outage message payloads, shown in Figure 32, are designed to communicate planned or unplanned outages. An **outage** is created and changed as shown the sequence diagram, Figure 31.

- Unplanned outages occur as result of faults such as short circuit faults and downed lines.
- Planned outages occur during maintenance work and during network extension and modification work.

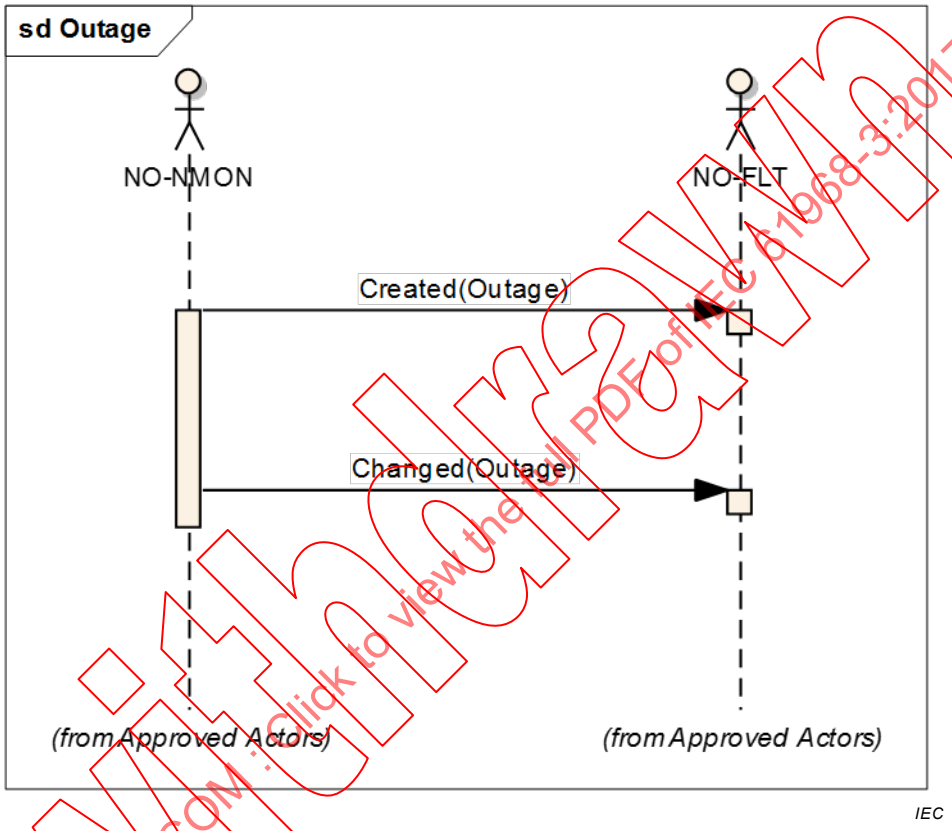

Figure 31 – Outage

Outage information may be used by different applications depending on the type and cause of the outage.

- Unplanned outages
  - After an outage is detected via remote devices, for instance a device trip detected by SCADA, Network Management will inform Fault Management for further processing of this outage.
  - In the case of a customer reported outage, Trouble Call Management will inform Fault Management for further processing of this outage as part of the Incident information.
  - In case AMI detects and reports meter power out, Trouble Call Management will inform Fault Management for further processing after this is evaluated to be a potential outage.
  - After an outage is confirmed, Fault Management will request a switching plan for isolation and service restoration. Based on this request an application (i.e. Switch Action Scheduling) will determine the necessary steps to isolate the fault and to restore power to the healthy islands of the network. The variants may show additional information that supports the user in choosing the best alternative.

  - During the lifecycle of outages, the outage information is updated, e.g. to notify about changed outage state (expected restoration time, customers are partially or completely restored to power, etc.).

- Planned outages
  - While planning maintenance and construction work, Fault Management notifies interested parties about outages that will occur as result of this work. This notification includes affected customers, outage schedule, etc.
  - During the lifecycle of those outages, the outage information is updated, including changed outage state (outage is in effect, outage is completed, customers are partially or completely restored to power, etc.)

5.9.2 Message payload

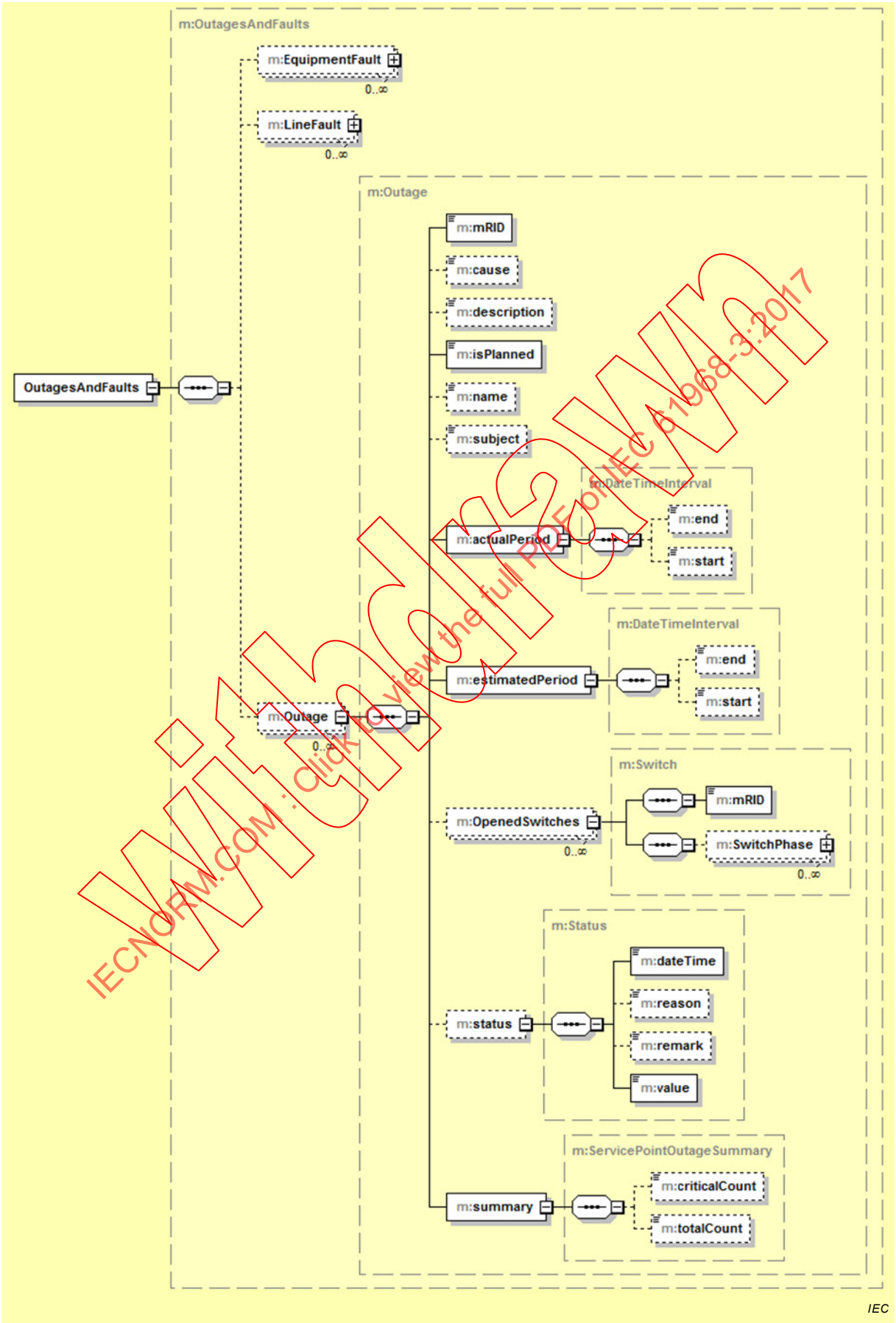

Figure 32 – OutagesAndFaults message payload

5.10 Metering message payloads

5.10.1 EndDeviceEvent

EndDeviceEvent message payloads are designed to communicate state changes of a metering device. This information may be used by applications e.g. for outage management. A sequence diagram for **EndDeviceEvent** is shown in Figure 33.

- One or multiple meters report power down status. This information may indicate an outage in the respective area of the network.

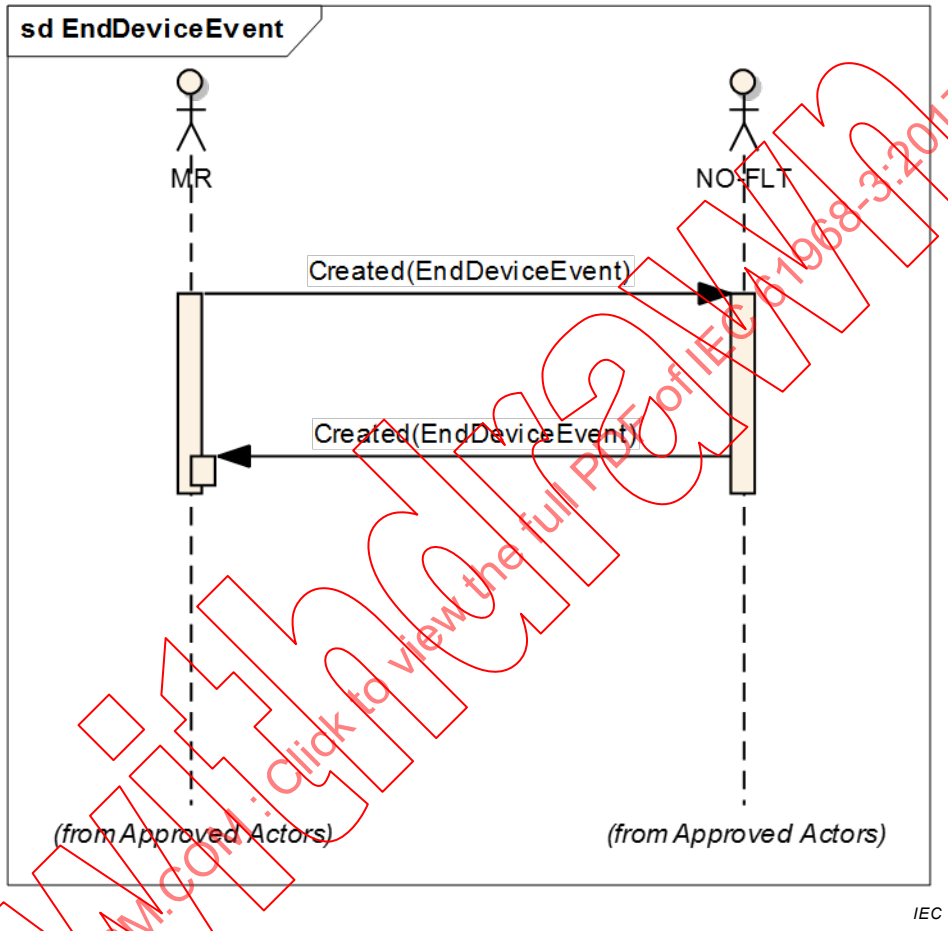

Figure 33 – End Device Event

For further details regarding End Device Event payload, see IEC 61968-9.

5.10.2 MeterReading

MeterReading message payloads are designed to read the state of one or multiple metering devices. This information may be used by applications e.g. for outage management. Figure 34 shows a typical meter reading sequence.

- The state of one or multiple metering devices is requested to check if the power is restored in the respective area of the network.

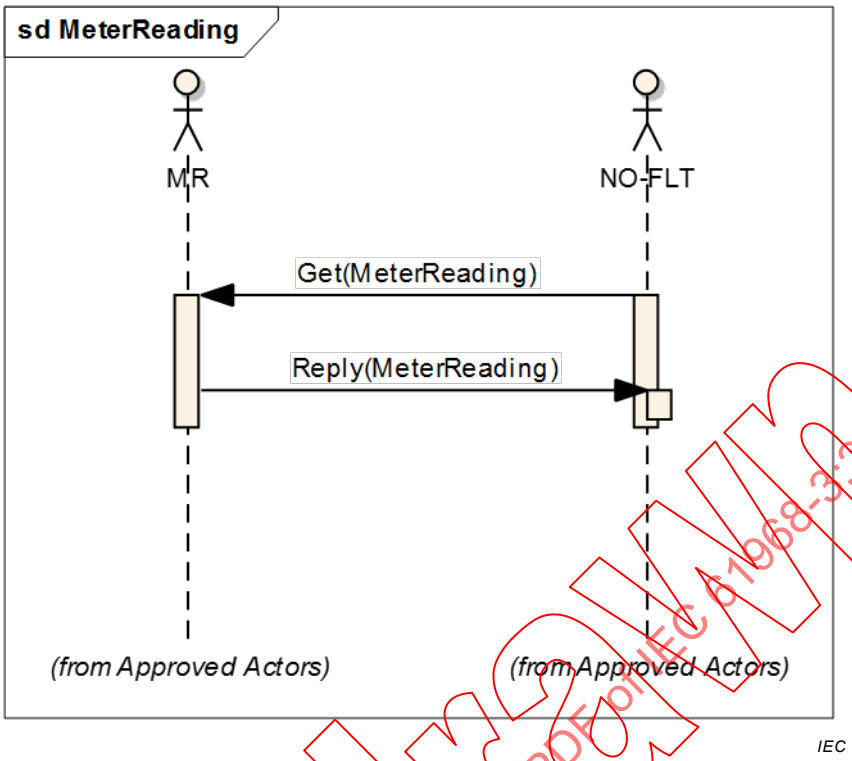

Figure 34 – Meter Reading

For further details regarding Meter Reading payload, see IEC 61968-9.

5.11 Work message payloads

5.11.1 WorkOrder

WorkOrder message payloads are designed to communicate requests for maintenance work including the work progress. The requested work includes

- Isolating the equipment that needs to be taken out of service
- Possible alternate means of supplying customers during the outage
- Maintenance and construction work
- Reconfiguration and resupply after the maintenance work is completed

The actual switching actions are included as a switching plan.

A work order may be communicated between different parties during its life cycle as shown in Figure 35:

- A work order is created
- A work order is partly or completely executed

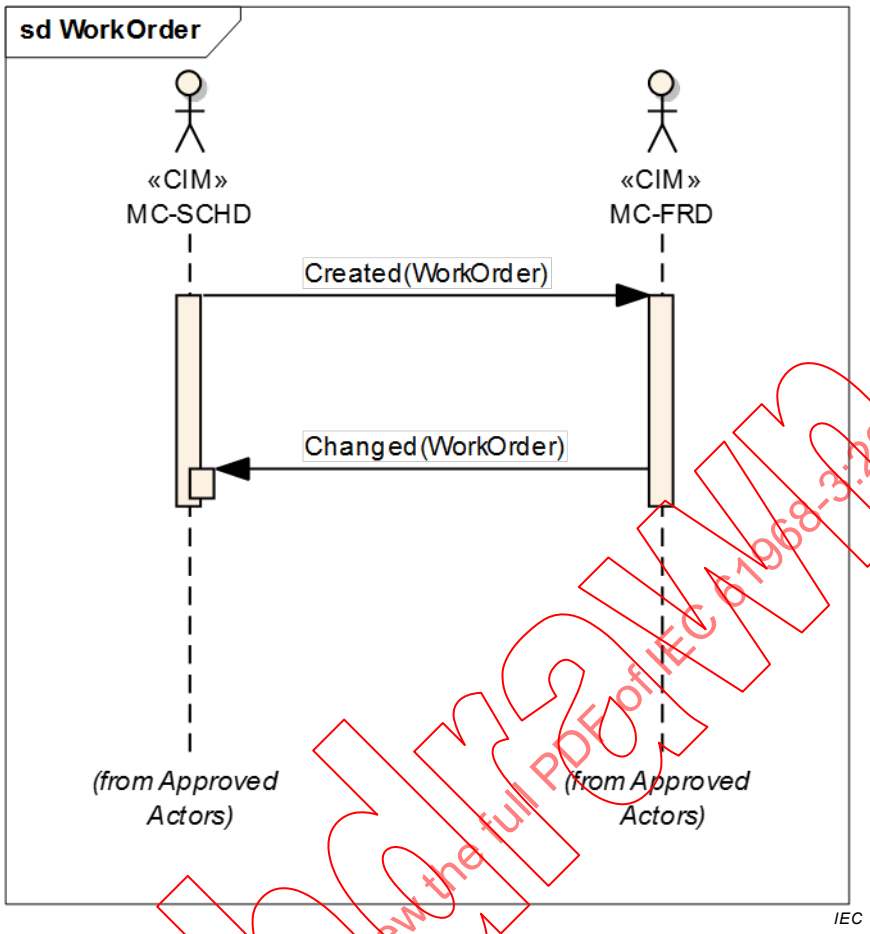

Figure 35 – Work Order

For further details regarding Work Order, see MaintenanceOrder and ServiceOrder in IEC 61968-6.

5.12 SwitchingOrder

5.12.1 General

SwitchingOrder message payloads are designed to communicate requests for execution of one or more switching actions for fault isolation and service restoration, including the progress of the execution. The actual switching actions are included as a switching plan.

A switching order may be communicated between different parties during its life cycle as shown in Figure 36:

- A switching order is created
- A switching order is partly or completely executed

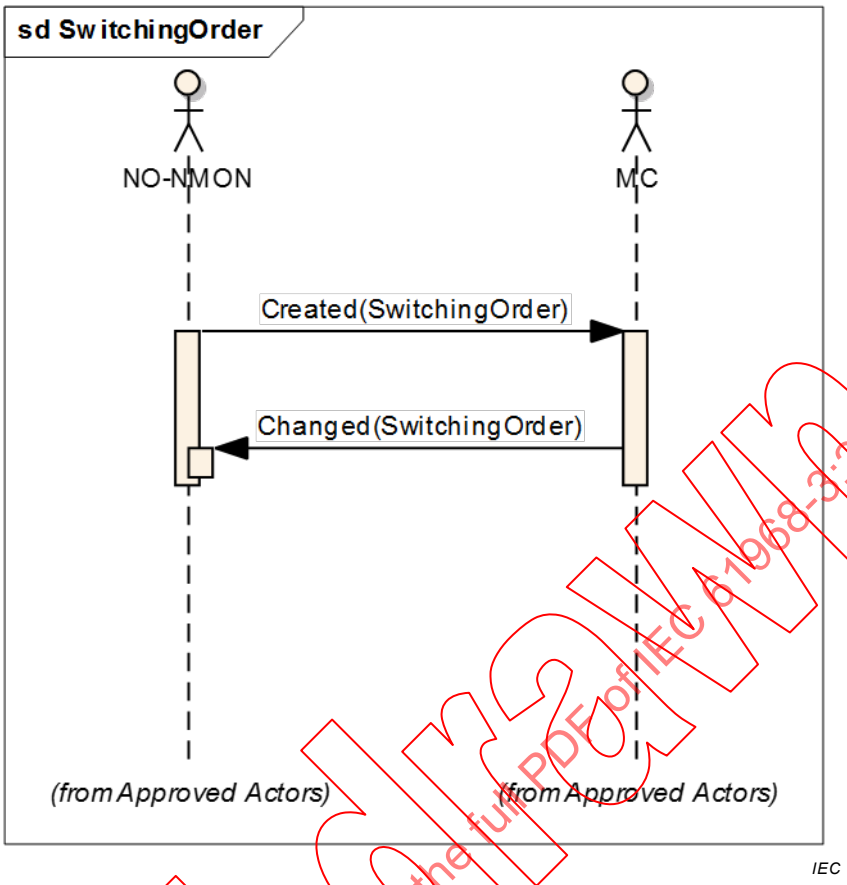

Figure 36 – Switching Order

A switching order may be created / updated as part of the following example use cases;

- Request to execute a switching plan to isolate a fault and / or to restore power to the healthy part of the network.
- Request to execute a switching plan for isolation of equipment for a planned outage and / or for service restoration after a planned outage.

5.12.2 Message payload

The **SwitchingOrders** payload is shown in Figure 37.

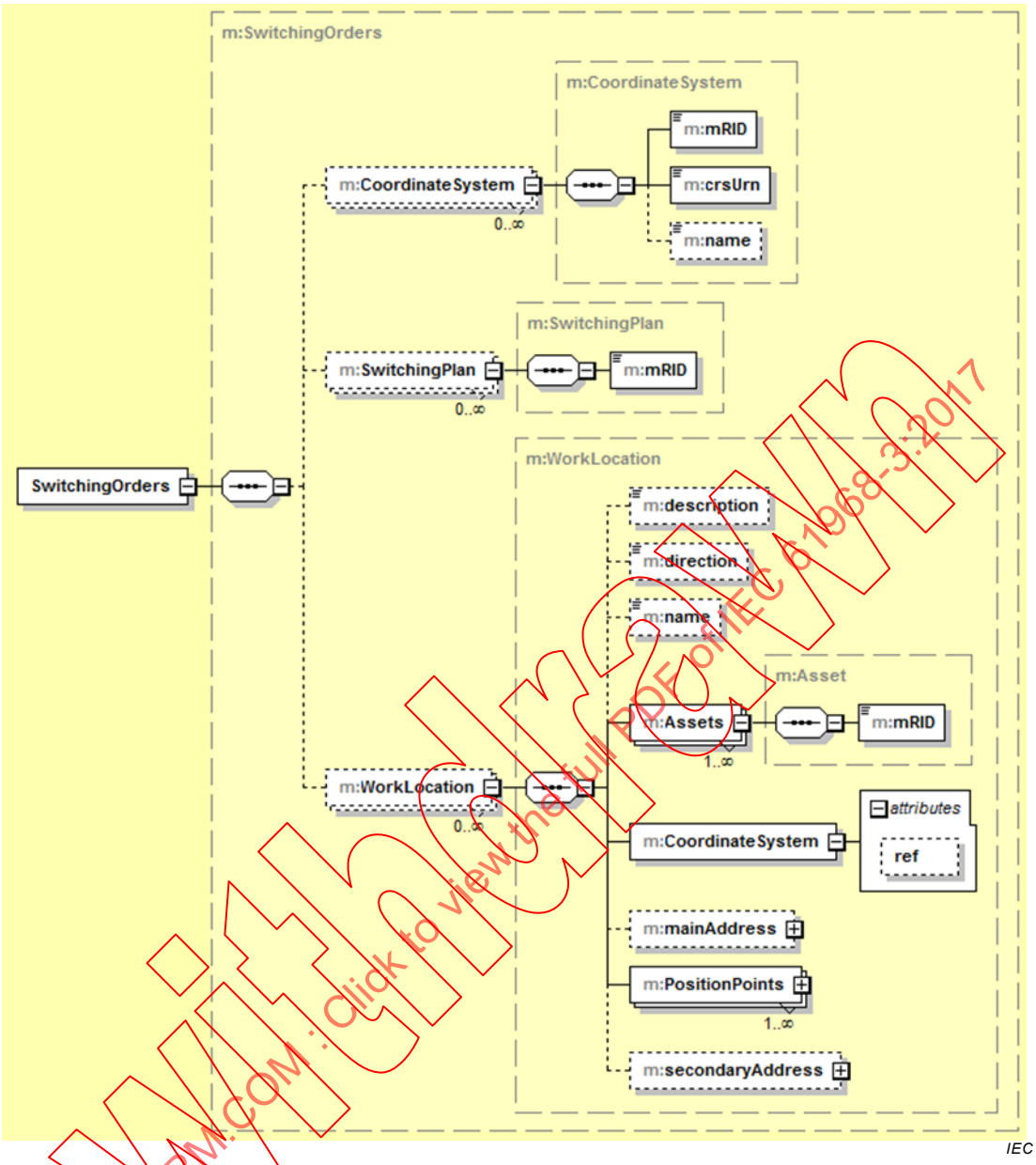

Figure 37 – SwitchingOrder message payload

5.13 TroubleOrder

5.13.1 General

TroubleOrder message payloads are designed to communicate work requests for analyzing unplanned outages including the work progress. The requested work includes

- Dispatch a crew
- Confirm protective device where the outage is predicted
- Determine the fault location
- Determine the cause of the fault

A trouble order may be communicated between different parties during its life cycle as shown in Figure 38:

- A trouble order is created to initiate the work

- A trouble order is partly or completely executed

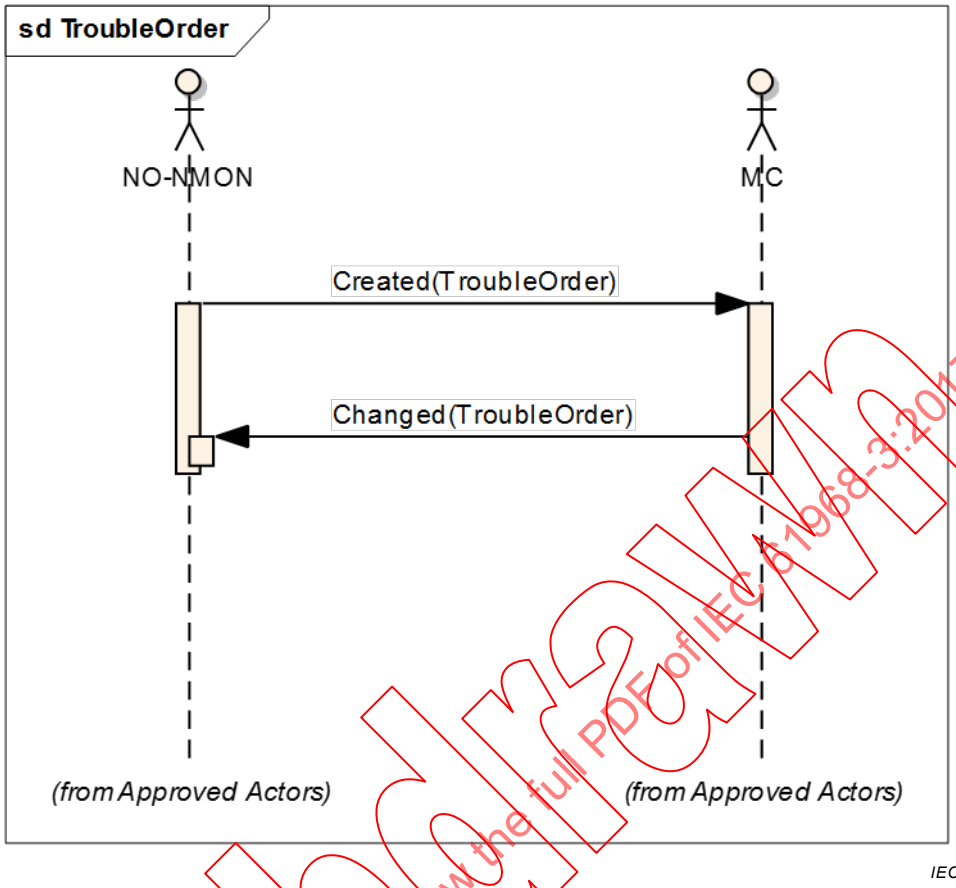

Figure 38 – Trouble Order

5.13.2 Message payload

The **TroubleOrders** payload is shown in Figure 39.

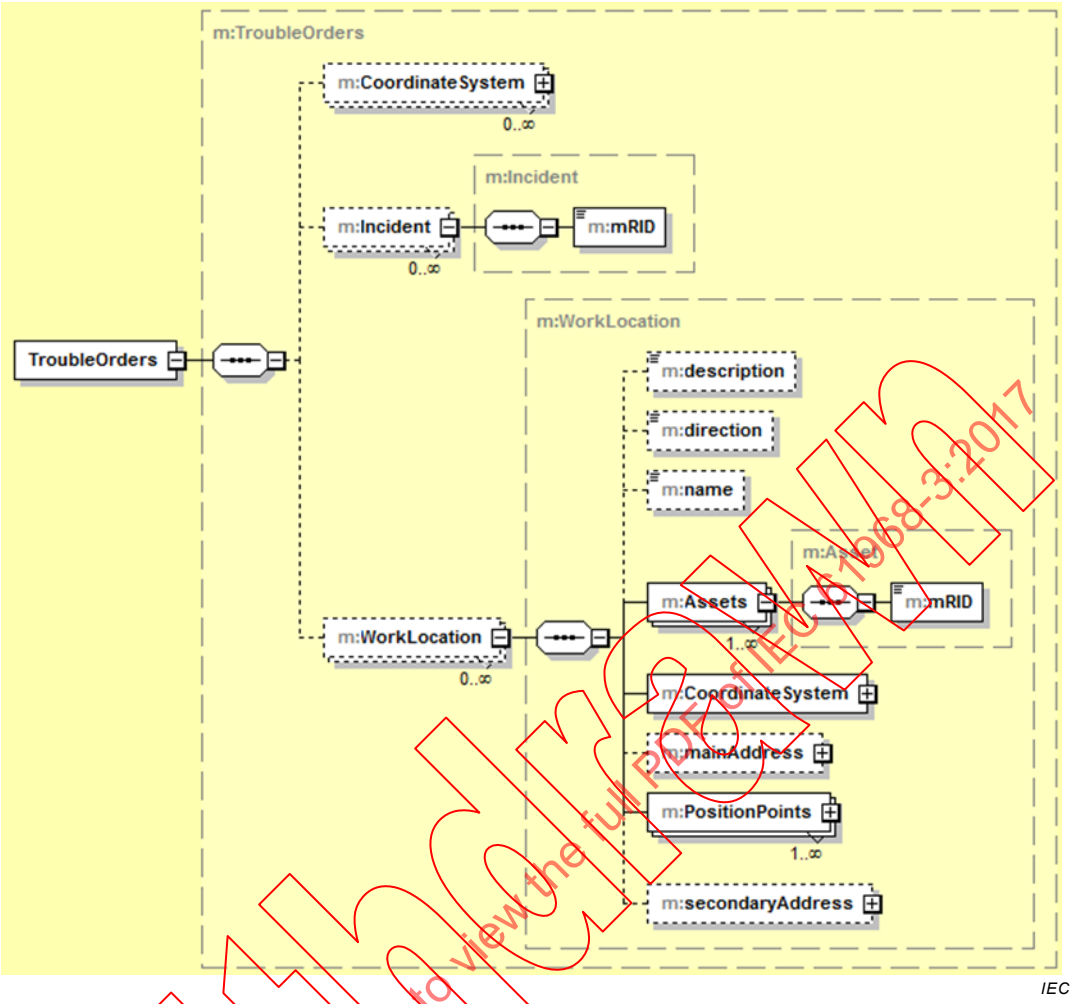

Figure 39 – TroubleOrder message payload

For details of **MainAddress**, see 5.8 **Incident** payload.

5.14 OutageSchedule

5.14.1 General

OutageSchedule message payloads are designed to initiate planned outages due to maintenance and construction work. A sequence diagram for **OutageSchedule** is shown in Figure 40.

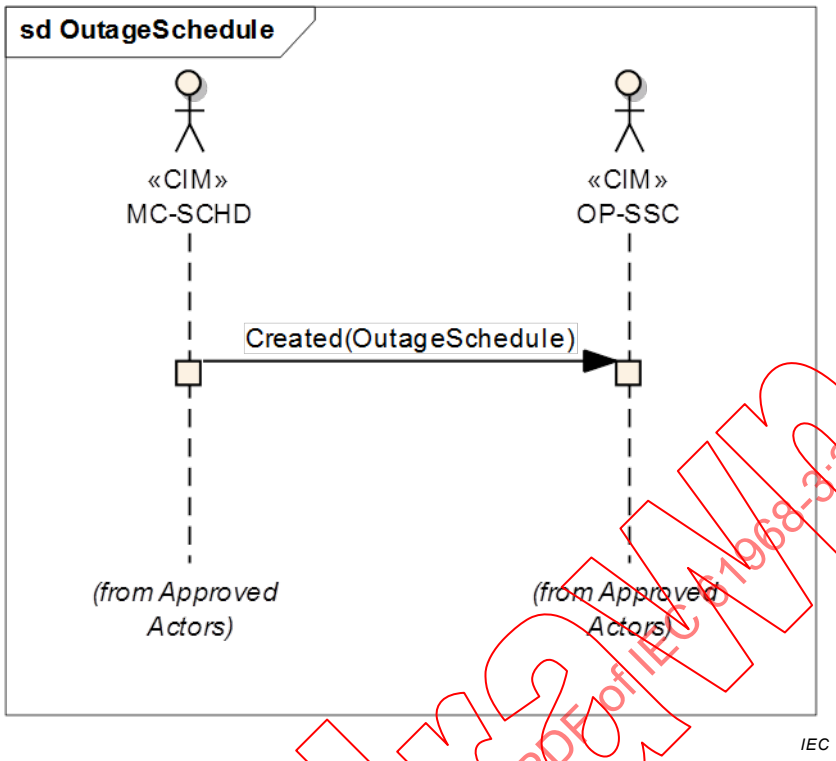

Figure 40 – Outage Schedule

5.14.2 Message payload

Figure 41 shows the payload for **OutageSchedules**.

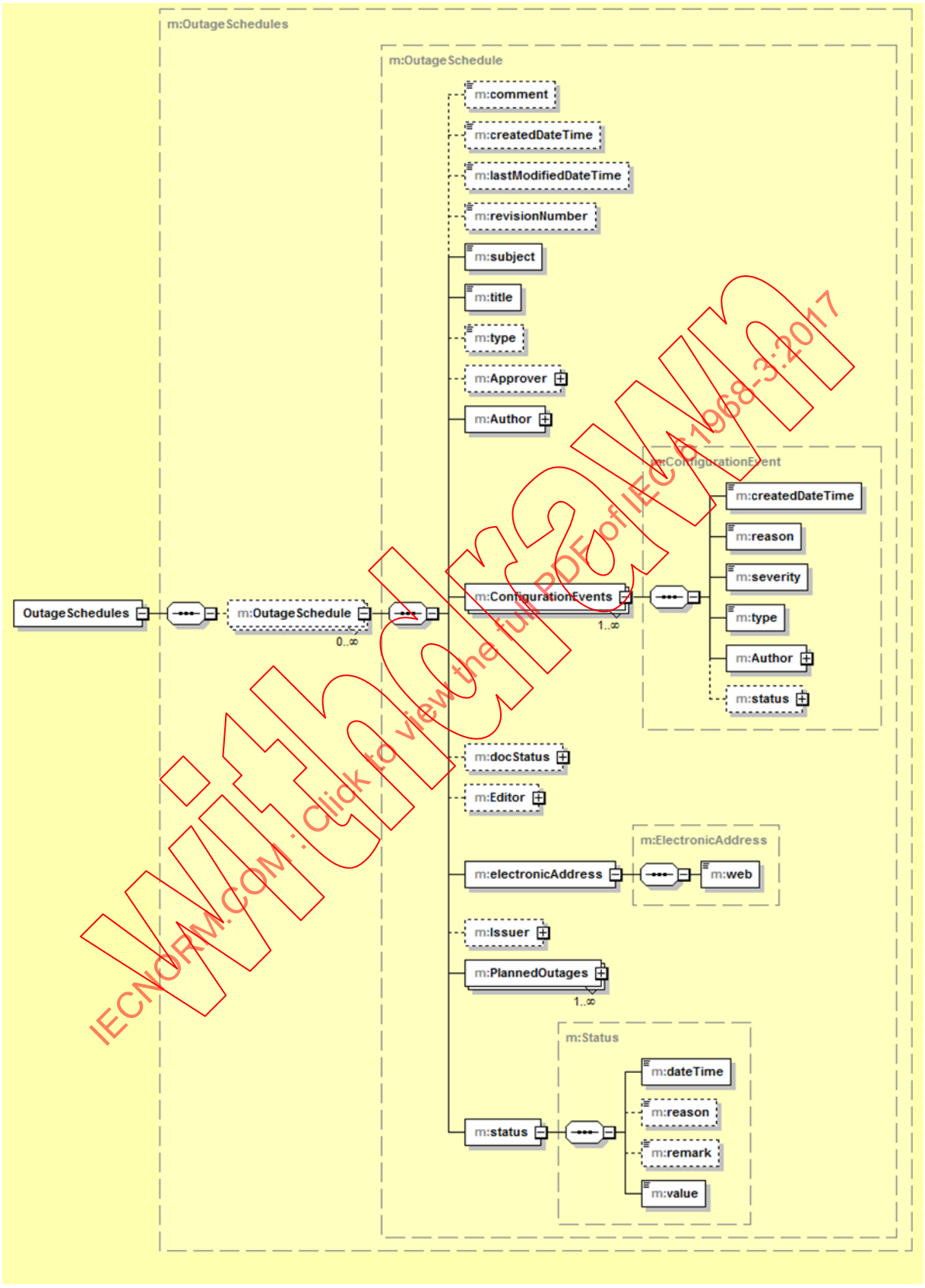

Figure 41 – OutageSchedule message payload

Figure 42 shows the details of the **OutageSchedule** payload for **PlannedOutages**.

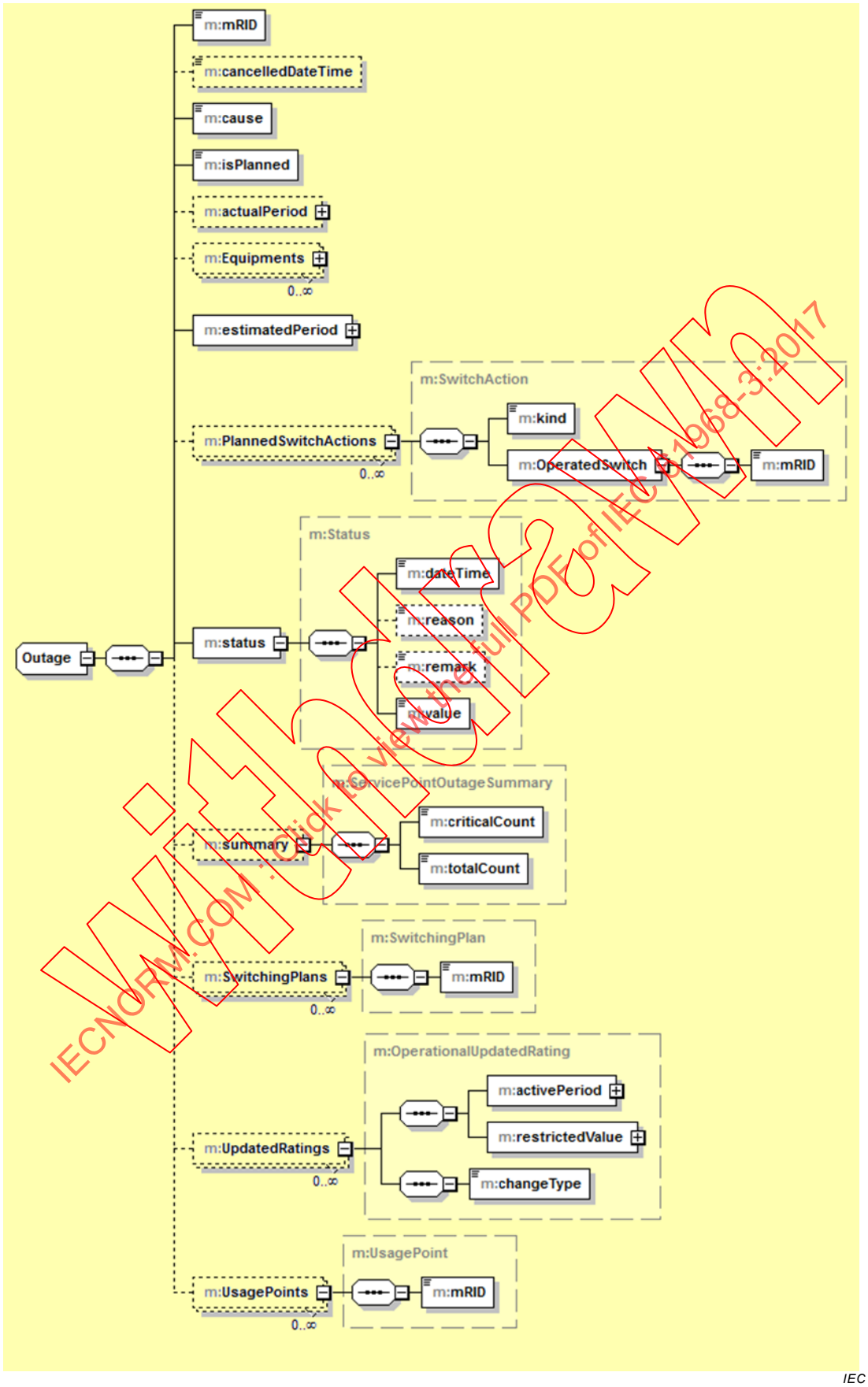

Figure 42 – OutageSchedule message payload, PlannedOutages detail

6 Document Conventions

6.1 UML diagrams

All UML-based sequence diagrams contained herein are to be considered as informative examples of how a message exchange could occur.

NOTE One of the strengths of the CIM is its flexibility. As technology advances, and new needs develop, new messages can be created. These new messages might involve additional systems (not pictured.) These new messages may leverage different options than the ones depicted in the example.

All UML-based communication diagrams and message flow diagrams contained herein are to be considered informative.

All UML-based class diagrams contained herein are to be considered informative. The reader is referred to IEC 61968-1 to locate the document that contains the normative definitions of the classes used in the CIM.

6.2 Message payload definitions

6.2.1 General

Message payload diagrams contained in the body of this document are to be considered as either normative or informative, with the normative XML Schemas being supplied in Annex B.

Use cases and sequence diagrams presented in this document are for informative purposes only, and represent usage examples for the normative message payloads.

6.2.2 Mandatory versus Optional

The message payloads described within this standard were derived from use cases in Annex A which satisfy an underlying business need for a specific information exchange. Each use case provides a given context for the use of the CIM. Message payload diagrams describe the elements which are passed. The elements depicted in dashed-line boxes are to be considered optional in a given context. The elements depicted in solid boxes are to be considered mandatory in a given context. If a diagram should depict an entire class as mandatory or optional, the reader should interpret this to mean that the use of the class is either mandatory or optional, but not that every element within the class is now mandatory or optional. The reader must refer to the normative definition of the class to determine this.

6.3 Synchronous versus Asynchronous Messages

The use of asynchronous or synchronous messages in the sequence diagrams in this document is for illustrative purposes only and is not prescriptive.

6.4 Message exchanges

Refer to IEC 61968-100 for further information on message exchanges.

Annex A
(informative)

Use Cases

A.1 General

This annex provides examples of network operations use cases associated with network outage detection and response. It is important to note that the use cases and sequence diagrams provided in this part of IEC 61968 are informative in nature, and are intended to provide examples of usage for the normative messages payloads. There is no intent by this part of IEC 61968 to standardize specific business processes.

The FLISR use case describes the workflow necessary for informing operational systems of an outage and fault location, and for responding with fault isolation and restoration of healthy islands of network.

Some names in these use cases will not match exactly with names shown in the CIM model or the message payloads in this document, as the use cases were predecessor to modeling and profiling.

A.2 FLISR

A.2.1 Overview

FLISR stands for Fault Location, Isolation, and Service Restoration. When an outage is detected by SCADA or predicted by outage analysis, typically the best information is association of outage with a protective device that has tripped. Fault location refers to the additional observations, signals, and analysis necessary to identify the true cause of the outage, typically a line fault downstream of the protective device. Isolation is the process of switching and cutting that allows the fault location to be safely isolated for repaires. The process of restoring power to healthy islands of network around the isolated area is referred to as service restoration.

A.2.2 FLISR for SCADA-detected outage, SCADA switching

This FLISR workflow assumes a self-healing network, with all monitoring and control of the system provided by SCADA and automatic outage response directed by the Fault Management function of a DMS. The message flow is shown in the sequence diagram in Figure A.1, along with a description of the message flow in Table A.1.

When Network Control (NO-CTL, aka SCADA) detects an unexpected change in status of a protective device, it can inform Network Operations (NO-NMON, aka DMS in the control room) of the event. Network Operations will also receive fault indicator statuses and fault current/reactance measurements from Network Control in order to calculate actual fault location on the line downstream of the device. Network Operations will report a confirmed outage to Fault Management (NO-FLT, aka OMS) so it can coordinate with Customer Operations (CS-TCM).

At this point, Customer Operations might be notifying Fault Management of trouble tickets. Fault Management can correlate tickets to the outage and inform Customer Operations of the incident used for management of the problem.

Meanwhile, Network Operations can request a switching plan to isolate the problem and restore power to healthy islands of network. Switch Action Scheduling (OP-SSC) will provide one or more switching plan variations for this purpose, and Network Operations will chose the one that provides the most optimal balance of reserve current in neighboring circuits.

Network Operations will direct Network Control to execute each step of the selected switching plan. With the execution of each step, Fault Management will receive notification of changes to the network due to switching, as well as operational safety tags for specific devices. Fault Management will inform Customer Operations when customers who called become restored to power during the process.

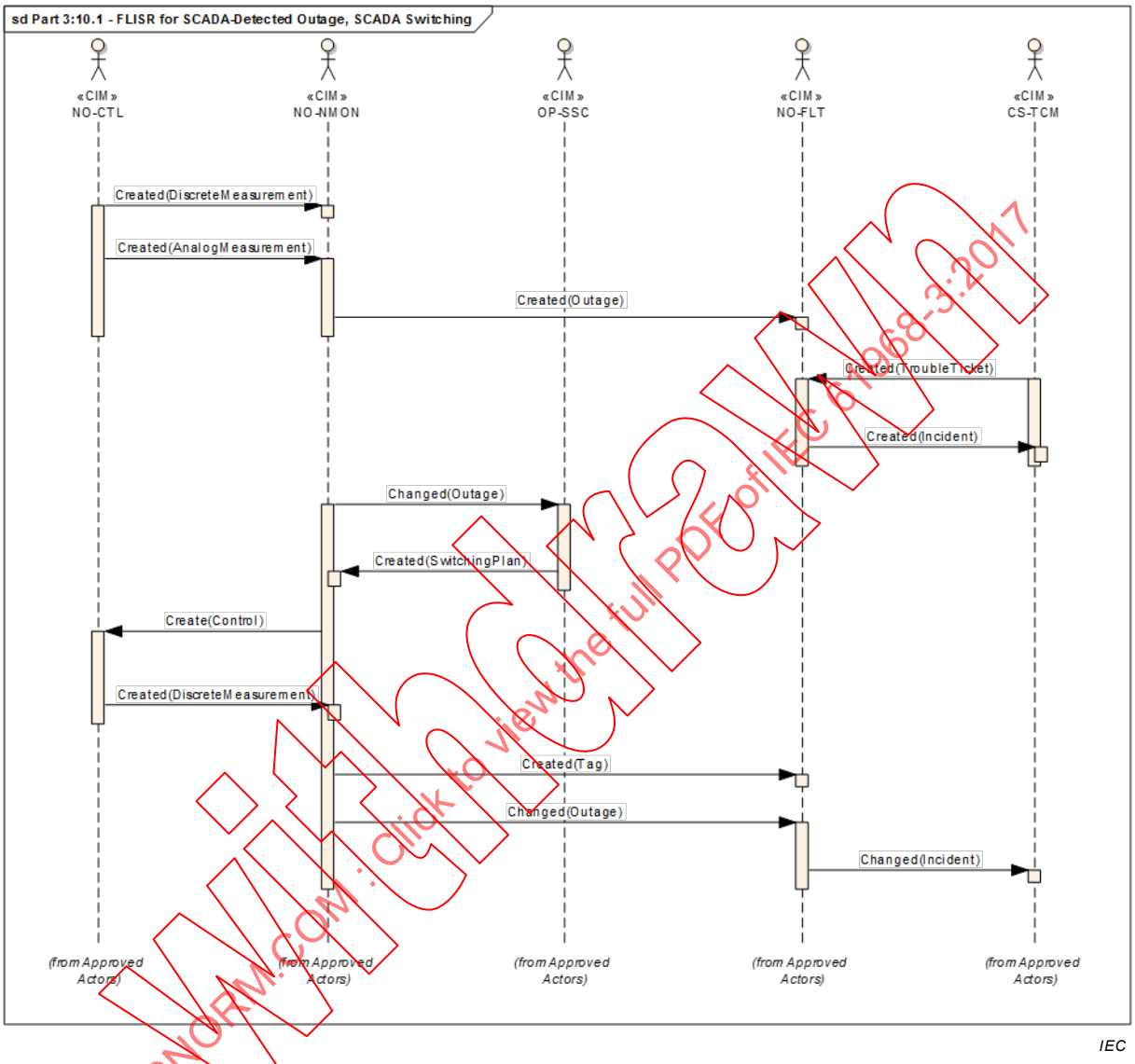

Figure A.1 – FLISR for SCADA-Detected Outage, SCADA Switching

Table A.1 – Message Flow for FLISR SCADA-Detected Outage, SCADA Switching

from	to	message	description
NO-CTL	NO-NMON	Created **DiscreteMeasurement**	Notification of change in status of a protective device due to an outage.
NO-CTL	NO-NMON	Created **AnalogMeasurement**	Notification of fault current/reactance at the protective device, to allow FLT to calculate fault location.
NO-NMON	NO-FLT	Created **Outage**	Based on fault current information, NMON notifies of an outage with location of wire down fault downstream of tripped protective device. At this point, outage device and fault location are confirmed.
CS-TCM	NO-FLT	Created **TroubleTicket**	Notification of customer-reported outage.
NO-FLT	CS-TCM	Created **Incident**	OA notifies of an incident created for an outage.
NO-NMON	OP-SSC	Changed **Outage**	Request for a switching plan to isolate the fault and restore power to healthy islands of network.
OP-SSC	NO-NMON	Created **SwitchingPlan**	Notification of new switching plan to isolate the outage and restore power to healthy islands of network. Note that SSC may provide multiple switching plans for alternatives in supply restoration.
NO-NMON	NO-CTL	Create **Control**	Request for SCADA-commanded operation of switches for execution of switching plan.
NO-CTL	NO-NMON	Created **DiscreteMeasurement**	Notification of change in status of a switch due to switching operation.
NO-NMON	NO-FLT	Created **Tag**	Notification of tag placement associated with execution of switching operations.
NO-NMON	NO-FLT	Changed **Outage**	Notification of restoration of the outage.
NO-FLT	CS-TCM	Changed **Incident**	Notification of restoration of customers that called in before restoration.

A.2.3 FLISR for trouble call and AMI outage, crew switching

This FLISR workflow assumes a manually monitored and controlled network, with field crews investigating and addressing outages at the direction of a dispatcher who is aided by the Fault Management function of a DMS. The message flow is shown in the sequence diagram in Figure A.2, along with a description of the message flow in Table A.2.

When a customer calls reporting no power, Customer Operations (CS-TCM) will create a trouble ticket and submit it to Fault Management (NO-FLT, aka OMS). Fault Management will reply with an incident, either new or existing, for this trouble. Also, Metering (MR) may detect power off events at meters and notify Fault Management. Based on outage information from multiple sources, Fault Management can predict the protective device in the network that has tripped. Fault Management will report the device outage to Network Operations (NO-NMON, aka DMS in the control room) for coordination of a response.

At this point, the Network Operations dispatcher would request Workforce Management (MC) to dispatch a crew to confirm the network trouble causing the outage. The dispatched crew can confirm that the predicted device has tripped or another device. Also, the field crew can check the status of fault indicators downstream of the tripped device. With this information and other observations from the field crew, the dispatcher aided by Network Operations can determine the actual fault location.

Network Operations can notify Fault Management of the of the confirmed device outage, and Fault Management can then inform Customer Operations of all customers affected by the

outage, as well as cause and estimated time of restoration. Fault Management can also inform Metering of the confirmed meter outages.

Network Operations can now request a switching plan to isolate the problem and restore power to healthy islands of network. Switch Action Scheduling (OP-SSC) will provide one or more switching plan variations for this purpose, and Network Operations will chose the one that provides the most optimal balance of reserve current in neighboring circuits.

Network Operations provides the selected switching plan to Workforce Management. A field crew will execute each step of the selected switching plan. Workforce Management will keep Network Operations informed of the progress of the switching plan. With the execution of each step, Network Operations will notify Fault Management of changes to the network due to switching, jumpers, and cuts, as well as operational safety tags for specific devices.

To verify restoration of customers, Fault Management may ping Metering. Fault Management will inform Customer Operations of customers it believes have become restored to power. If callbacks to customers by Customer Operations reveal that a customer is still out of power, Customer Operations will submit a new trouble ticket to Fault Management.

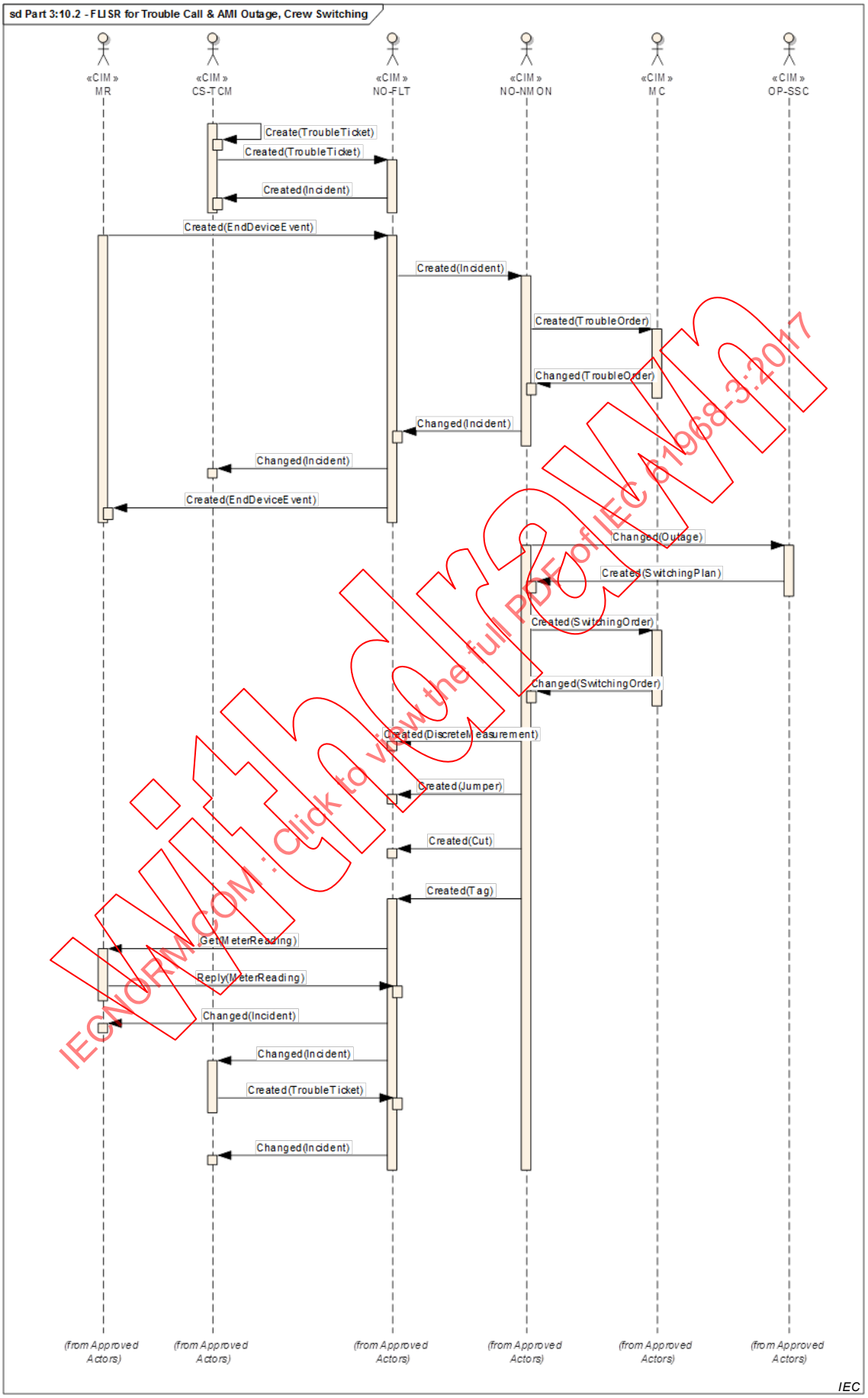

Figure A.2 – FLISR for trouble call and AMI outage, crew switching

Table A.2 – Message flows for FLISR for trouble call and AMI outage, crew switching

from	to	message	description
CS-TCM	CS-TCM	Create **TroubleTicket**	Create TroubleTicket for customer call.
CS-TCM	NO-FLT	Created **TroubleTicket**	Notification of customer-reported trouble, in this case a power outage.
NO-FLT	CS-TCM	Created **Incident**	Notification of an incident created for a trouble ticket. This could also be an existing incident based on a prediction from earlier trouble tickets.
MR	NO-FLT	Created **EndDeviceEvent**	Notification that meters have power down status.
NO-FLT	NO-NMON	Created **Incident**	Notification of predicted trip at a specific protective device in the network. At this point, outage device is predicted and not confirmed.
O-NMON	MC	Created **TroubleOrder**	Request for dispatch of crew to confirm protective device where outage is predicted, and determine fault location and cause downstream of protective device. Note that the dispatcher will assign the crew to the outage for this initial investigation.
MC	NO-NMON	Changed **TroubleOrder**	Field crew confirms outage location. The outage location could be the predicted tripped device or another protective device.
NO-NMON	NO-FLT	Changed **Incident**	Based on information from crew, notification of updates to the outage with location of wire down fault downstream of tripped protective device. At this point, outage device and fault location are confirmed.
NO-FLT	CS-TCM	Changed(**Incident**)	Notification of an incident created for a trouble ticket. This could also be an existing incident based on a prediction from earlier trouble tickets.
NO-FLT	MR	Created **EndDeviceEvent**	Notification of confirmed outage for meters.
NO-NMON	OP-SSC	Changed **Outage**	Request for a switching plan to isolate the fault and restore power to healthy islands of network.
OP-SSC	NO-NMON	Created **SwitchingPlan**	Notification of new switching plan to isolate the outage and restore power to healthy islands of network. Note that SSC may provide multiple switching plans for alternatives in supply restoration.
NO-NMON	MC	Created **SwitchingOrder**	Request for execution of new SwitchingPlan to isolate the outage and restore power to healthy islands of network.
MC	NO-NMON	Changed **SwitchingOrder**	Field crew reports completion of one or more switching steps.
NO-NMON	NO-FLT	Created **DiscreteMeasurement**	Notification of device status change due to execution of switching operations.
NO-NMON	NO-FLT	Created **Jumper**	Notification of jumper placement due to execution of switching operations.
NO-NMON	NO-FLT	Created **Cut**	Notification of jumper placement due to execution of switching operations.
NO-NMON	NO-FLT	Created **Tag**	Notification of jumper placement due to execution of switching operations.
NO-FLT	MR	Get **MeterReading**	Ping meter to check if power restored.
MR	NO-FLT	Reply **MeterReading**	Reply with power status of meter.
NO-FLT	MR	Changed **Incident**	Notification of outage restoration for meters.

from	to	message	description
NO-FLT	CS-TCM	Changed **Incident**	Notification of restoration of customers that called in before restoration.
CS-TCM	NO-FLT	Created **TroubleTicket**	Notification that customer reported power still out when called.
NO-FLT	CS-TCM	Changed **Incident**	Notification of incident completion.

A.3 Planned outage

A.3.1 Planned outage for maintenance – Manual process

The sequence shown in Figure A.3 is based on the business process of a large European utility. The current process includes very little interoperability between systems, but instead manual interactions. Also this sequence assumes that all switches are not telemetered and require manual operation.

When planned work requires isolation of an area for maintenance, a work manager first submits a work request to the work management system (in this case SAP). The work manager then separately makes a request to a control room operator via email for a switching plan to isolate the work area. The operator creates "switching schedules", which are essentially a work order and switching plan combined (perhaps the closest concept in CIM would be a SwitchingOrder). One switching schedule contains all steps for isolation, supply restoration, and return to normal state. After the necessary approvals, the operator emails the switching schedules to the work manager.

The work manager now assigns the switching schedules to a field crew, and assigns individual switching steps to crew members based on qualifications. For example, only some of the crew members may be able to perform switching and grounding. The work manager either emails the switching schedules to the crew leader, or just prints it out and hands it to him.

The field crew travels to the work area. Upon arrival, the crew leader contacts the operator to say they are ready for work. The operator validates that the switching schedule is still valid in the current state of the network. Now the crew is free to execute all isolation and supply restoration steps in the switching schedule, and informs the operator when this switching is complete. The operator updates the DMS to reflect the changes.

The work area is now de-energized. The maintenance crew contacts the operator to request a "permit for work", also known as a clearance. The crew lead receives and owns the permit to work during the maintenance. Note that only one person can receive the permit to work, typically the crew lead. This person cannot reassign the permit to work to another crew member – only the operator can do this.

After completion of the maintenance work, the crew lead contacts the operator to return the permit to work. Then the crew continues execution of the switching schedule to return the network to normal state and informs the operator.

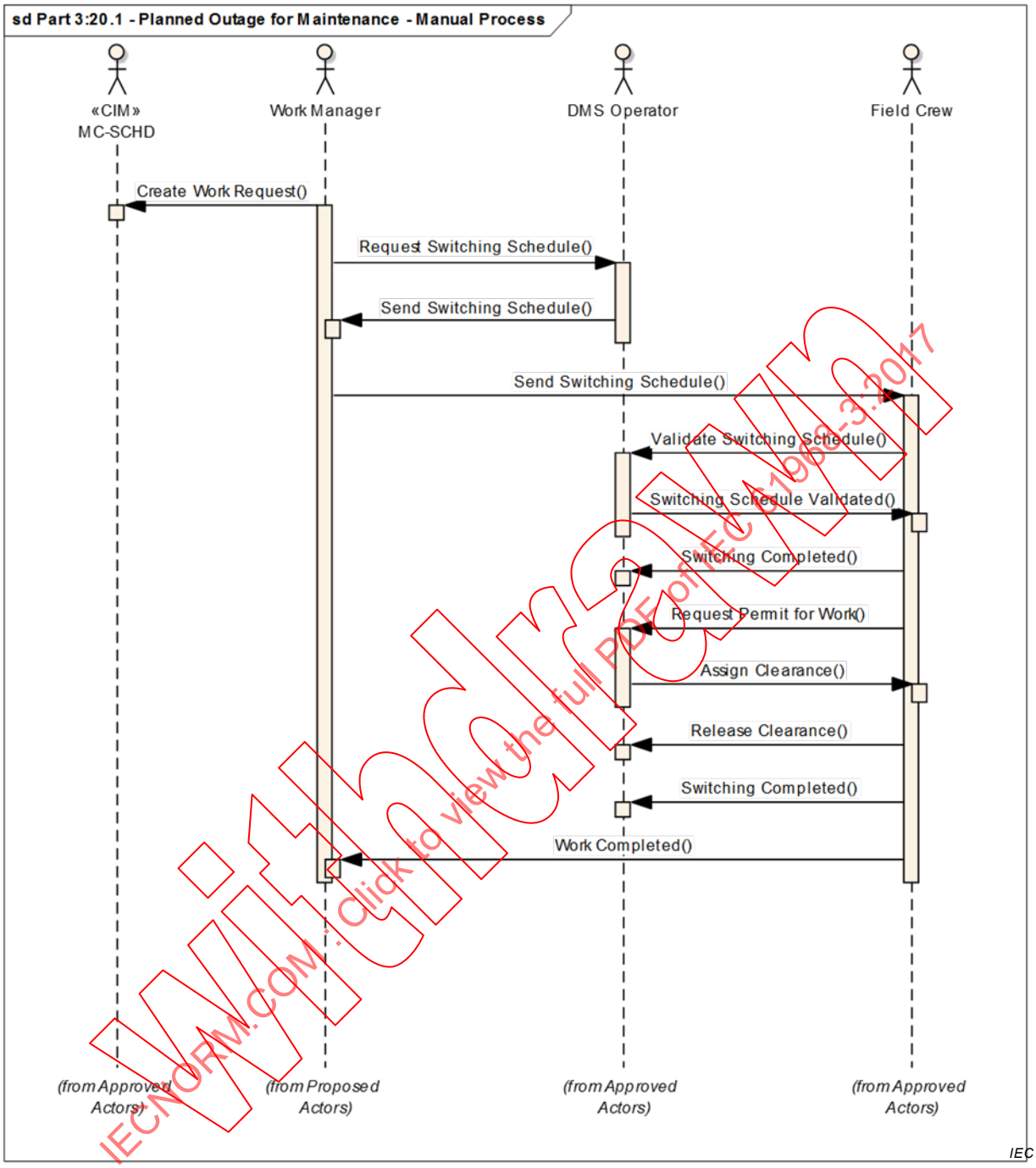

Figure A.3 – Planned outage for maintenance – Manual process

A.3.2 Planned outage for maintenance – Crew switching

The sequence shown in Figure A.4 and Table A.3 is a proposed workflow for interoperability between systems to accomplish a planned outage for maintenance of equipment on the network. It is derived from the manual version of this workflow described previously. This sequence assumes that some switches SCADA-controlled and some require manual operation.

When planned work requires isolation of an area for maintenance, a work manager first submits a work request to the Work Scheduling (MC-SCHD) system. Work Scheduling creates a work order and makes a request to Switch Action Scheduling (OP-SCC) for a switching plan to isolate the work area. Switch Action Scheduling creates a switching plan that contains all steps for isolation, restoration of power to healthy islands of network, and return to normal

state. After the necessary approvals in the control room, Switch Action Scheduling sends the switching plan to Work Scheduling. Also, Switch Action Scheduling sends the switching plan to Fault Management (NO-FLT, aka OMS), which derives a list of planned outages from the switching plan and sends it to Customer Service (CS-TCM). Note there can be multiple planned outages since the customers affected can change with each step in the switching plan. Each planned outage includes the usage points and number of affected customers, as well as estimated times of outage and restoration.

Work Scheduling now requests dispatch of a field crew for switching plan execution through Workforce Management (MC-FRD), which optionally assigns individual switching steps to crew members based on qualifications. For example, only some of the crew members may be able to perform switching and grounding.

The field crew travels to the work area. Upon crew arrival, they request through Workforce Management validation of the switching plan based on the current state of the network. Network Operations (NO-NMON, aka DMS in the control room) validates that the switching schedule is still valid. Now the crew works with the control room operator to execute all isolation and supply restoration steps in the switching schedule. The crew also places tags on the isolation switches as defined in the switching order. For SCADA-controlled switching, Network Operations instructs Network Control (NO-CTL, aka SCADA) to perform the switching. Both Network Operations and Network Control can notify Fault Management of completed switching and tagging, which in turn notifies Customer Service that the planned outage is now in effect.

The work area is now de-energized. The maintenance crew requests a clearance through Workforce Management. The crew lead receives and owns the clearance for maintenance work. The clearance has an association to the isolation switch tags, meaning the tags cannot be removed as long as the clearance is in effect.

After completion of the maintenance work, the crew lead releases the clearance through Workforce Management. Then the crew again works with the operator for execution of the switching schedule to remove tags return the network to normal state. Upon notification of the switching, Fault Management informs Customer Service of restoration of the outage. Workforce Management also notifies Work Scheduling that the work order is complete.

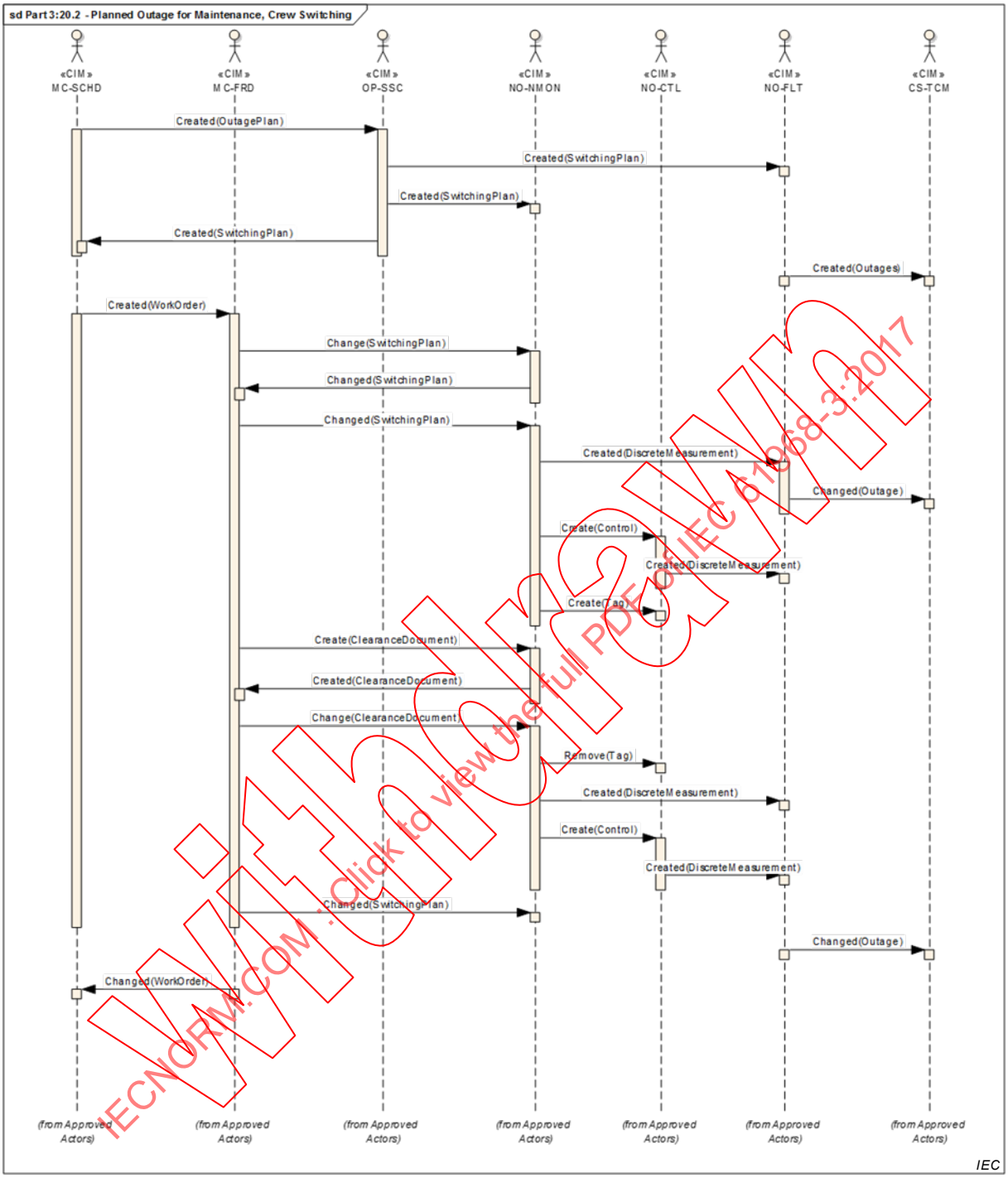

Figure A.4 – Planned outage for maintenance, crew switching

Table A.3 – Message flows for planned outage for maintenance, crew switching

from	to	message	description
MC-SCHD	OP-SSC	Created **OutageSchedule**	Request for a switching plan to isolate the work area.
OP-SSC	NO-FLT	Created **SwitchingPlan**	Notification of new switching plan to isolate the work area and restore power to healthy islands of network. Note that SSC may provide multiple switching plans for alternatives in supply restoration.
OP-SSC	NO-NMON	Created **SwitchingPlan**	Notification of new switching plan to isolate the work area and restore power to healthy islands of network. Note that SSC may provide multiple switching plans for alternatives in supply restoration.
OP-SSC	MC-SCHD	Created(**SwitchingPlan**)	Notification of new switching plan to isolate the work area and restore power to healthy islands of network. Note that SSC may provide multiple switching plans for alternatives in supply restoration This notification is required so that MC-SCHD can schedule field crews to execute the switching plan.
NO-FLT	CS-TCM	Created **Outages**	Notification of outages that will occur when the switching plan is executed.
MC-SCHD	MC-FRD	Created **WorkOrder**	Request for work to isolate work area and perform maintenance.
MC-FRD	NO-NMON	Change **SwitchingPlan**	Crew requests verification of switching plan before proceeding with execution.
NO-NMON	MC-FRD	Changed **SwitchingPlan**	Notification of switching plan marked as verified.
MC-FRD	NO-NMON	Changed **SwitchingPlan**	Field crew reports completion of one or more switching steps.
NO-NMON	NO-FLT	Created **DiscreteMeasurement**	Notification of device status change due to execution of switching operations.
NO-FLT	CS-TCM	Changed(**Outage**)	Notification that an outage is in effect.
NO-NMON	NO-CTL	Create **Control**	Request for SCADA-commanded operation of switches for execution of switching plan.
NO-CTL	NO-FLT	Created **DiscreteMeasurement**	Notification of device status change due to execution of switching operations.
NO-NMON	NO-CTL	Create **Tag**	Create a safety tag in SCADA on the switches operated for the switching plan.
MC-FRD	NO-NMON	Create **ClearanceDocument**	Field crew requests clearance for maintenance work.
NO-NMON	MC-FRD	Created **ClearanceDocument**	Notification of clearance assigned to a field crew member.
MC-FRD	NO-NMON	Change **ClearanceDocument**	Notification of clearance released by a field crew member.
NO-NMON	NO-CTL	Remove **Tag**	Remove a safety tag in SCADA on the switches operated for the switching plan.
NO-NMON	NO-FLT	Created **DiscreteMeasurement**	Notification of device status change due to execution of switching operations.
NO-NMON	NO-CTL	Create **Control**	Request for SCADA-commanded operation of switches for execution of switching plan.
NO-CTL	NO-FLT	Created **DiscreteMeasurement**	Notification of device status change due to execution of switching operations.

from	to	message	description
MC-FRD	NO-NMON	Changed **SwitchingPlan**	Field crew reports completion of one or more switching steps to return network to normal state.
NO-FLT	CS-TCM	Changed **Outage**	Notification that planned outage is now completed and customers are back in power.
MC-FRD	MC-SCHD	Changed **WorkOrder**	Notification that the work plan is complete.

Annex B
(normative)

XML Schemas for message payloads

B.1 General

The purpose of this Annex B is to provide XML schemas for message payloads to augment the descriptions provided earlier in this document. These XML schemas were defined using profile definitions within CIMTool. These schemas may be extended as needed for specific implementation needs.

B.2 Incidents message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/Incidents/2#" targetNamespace="http://iec.ch/TC57/2014/Incidents/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation/>
  <xs:element name="Incidents" type="m:Incidents"/>
  <xs:complexType name="Incidents">
    <xs:sequence>
      <xs:element name="CoordinateSystem" type="m:CoordinateSystem" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Incident" type="m:Incident" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="CoordinateSystem" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#CoordinateSystem">
    <xs:annotation>
      <xs:documentation>Coordinate reference system.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="crsUrn" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CoordinateSystem.crsUrn">
        <xs:annotation>
          <xs:documentation>A Uniform Resource Name (URN) for the coordinate reference system (crs) used to define
'Location.PositionPoints'.</xs:documentation>
          <xs:documentation>An example would be the European Petroleum Survey Group (EPSG) code for a coordinate
reference system, defined in URN under the Open Geospatial Consortium (OGC) namespace as:
urn:ogc:def:uom:EPSG::XXXX, where XXXX is an EPSG code (a full list of codes can be found at the EPSG Registry web site
http://www.epsg-registry.org/). To define the coordinate system as being WGS84 (latitude, longitude) using an EPSG OGC, this
attribute would be urn:ogc:def:uom:EPSG::4236.</xs:documentation>
          <xs:documentation>A profile should limit this code to a set of allowed URNs agreed to by all sending and receiving
parties.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="CustomerNotification" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#CustomerNotification">
    <xs:annotation>
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        <xs:documentation>Conditions for notifying the customer about the changes in the status of their service (e.g., outage restore, estimated restoration time, tariff or service level change, etc.)</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="contactType" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.contactType">
          <xs:annotation>
            <xs:documentation>Type of contact (e.g., phone, email, etc.).</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="contactValue" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.contactValue">
          <xs:annotation>
            <xs:documentation>Value of contact type (e.g., phone number, email address, etc.).</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="earliestDateTimeToCall" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.earliestDateTimeToCall">
          <xs:annotation>
            <xs:documentation>Earliest date time to call the customer.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="latestDateTimeToCall" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.latestDateTimeToCall">
          <xs:annotation>
            <xs:documentation>Latest date time to call the customer.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="trigger" type="m:NotificationTriggerKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.trigger">
          <xs:annotation>
            <xs:documentation>Trigger for this notification.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="Incident" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident">
      <xs:annotation>
        <xs:documentation>Description of a problem in the field that may be reported in a trouble ticket or come from another source. It may have to do with an outage.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="cause" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.cause">
          <xs:annotation>
            <xs:documentation>Cause of this incident.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
          <xs:annotation>
            <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
          <xs:annotation>
            <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="CustomerNotifications" type="m:CustomerNotification" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.CustomerNotifications">
          <xs:annotation>
            <xs:documentation>All notifications for a customer related to the status change of this incident.</xs:documentation>
          </xs:annotation>
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      </xs:element>
      <xs:element name="Hazards" type="m:IncidentHazard" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.Hazards">
        <xs:annotation>
          <xs:documentation>All hazards associated with this incident.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Location" type="m:Location" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.Location">
        <xs:annotation>
          <xs:documentation>Location of this incident.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Outage" type="m:Outage" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.Outage">
        <xs:annotation>
          <xs:documentation>Outage for this incident.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.status">
        <xs:annotation>
          <xs:documentation>Status of subject matter (e.g., Agreement, Work) this document represents. For status of the
document itself, use 'docStatus' attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="TroubleTickets" type="m:TroubleTicket" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.TroubleTickets">
        <xs:annotation>
          <xs:documentation>All trouble tickets reporting this incident.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="IncidentHazard" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#IncidentHazard">
    <xs:annotation>
      <xs:documentation>Hazardous situation associated with an incident. Examples are line down, gas leak, fire,
etc.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Hazard.status">
        <xs:annotation>
          <xs:documentation>Status of this hazard.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Location" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location">
    <xs:annotation>
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        <xs:documentation>The place, scene, or point of something where someone or something has been, is, and/or will be at a given moment in time. It can be defined with one or more postition points (coordinates) in a given coordinate system.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
          <xs:annotation>
            <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="direction" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.direction">
          <xs:annotation>
            <xs:documentation>(if applicable) Direction that allows field crews to quickly find a given asset. For a given location, such as a street address, this is the relative direction in which to find the asset. For example, a streetlight may be located at the 'NW' (northwest) corner of the customer's site, or a usage point may be located on the second floor of an apartment building.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
          <xs:annotation>
            <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="CoordinateSystem" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.CoordinateSystem">
          <xs:annotation>
            <xs:documentation>Coordinate system used to describe position points of this location.</xs:documentation>
          </xs:annotation>
          <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CoordinateSystem">
            <xs:attribute name="ref" type="xs:string"/>
          </xs:complexType>
        </xs:element>
        <xs:element name="mainAddress" type="m:StreetAddress" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.mainAddress">
          <xs:annotation>
            <xs:documentation>Main address of the location.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="PositionPoints" type="m:PositionPoint" minOccurs="1" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.PositionPoints">
          <xs:annotation>
            <xs:documentation>Sequence of position points describing this location, expressed in coordinate system 'Location.CoordinateSystem'.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="secondaryAddress" type="m:StreetAddress" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.secondaryAddress">
          <xs:annotation>
            <xs:documentation>Secondary address of the location. For example, PO Box address may have different ZIP code than that in the 'mainAddress'.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:simpleType name="NotificationTriggerKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NotificationTriggerKind">
      <xs:annotation>
        <xs:documentation>Kind of trigger to notify customer.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:string">
        <xs:enumeration value="etrChange">
          <xs:annotation>
            <xs:documentation>Notify customer if estimated restoration time changes.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="informDispatched">
          <xs:annotation>
            <xs:documentation>Notify customer that a crew has been dispatched to investigate the problem.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="initialEtr">
          <xs:annotation>
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            <xs:documentation>Notify customer for the first time that estimated restoration time is available.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="powerOut">
          <xs:annotation>
            <xs:documentation>Notify customer of planned outage.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="powerRestored">
          <xs:annotation>
            <xs:documentation>Notify customer when power has been restored.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
      </xs:restriction>
    </xs:simpleType>
    <xs:complexType name="Outage" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage">
      <xs:annotation>
        <xs:documentation>Document describing details of an active or planned outage in a part of the electrical
network.</xs:documentation>
        <xs:documentation>A non-planned outage may be created upon:</xs:documentation>
        <xs:documentation>- a breaker trip,</xs:documentation>
        <xs:documentation>- a fault indicator status change,</xs:documentation>
        <xs:documentation>- a meter event indicating customer outage,</xs:documentation>
        <xs:documentation>- a reception of one or more customer trouble calls, or</xs:documentation>
        <xs:documentation>- an operator command, reflecting information obtained from the field crew.</xs:documentation>
        <xs:documentation>Outage restoration may be performed using a switching plan which complements the outage
information with detailed switching activities, including the relationship to the crew and work.</xs:documentation>
        <xs:documentation>A planned outage may be created upon:</xs:documentation>
        <xs:documentation>- a request for service, maintenance or construction work in the field, or</xs:documentation>
        <xs:documentation>- an operator-defined outage for what-if/contingency network analysis.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="PositionPoint" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#PositionPoint">
      <xs:annotation>
        <xs:documentation>Set of spatial coordinates that determine a point, defined in the coordinate system specified in
'Location.CoordinateSystem'. Use a single position point instance to desribe a point-oriented location. Use a sequence of
position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of
an object (like a substation or a geographical zone – in this case, have first and last position point with the same
values).</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="sequenceNumber" type="xs:integer" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.sequenceNumber">
          <xs:annotation>
            <xs:documentation>Zero-relative sequence number of this point within a series of points.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="xPosition" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.xPosition">
          <xs:annotation>
            <xs:documentation>X axis position.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="yPosition" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.yPosition">
          <xs:annotation>
            <xs:documentation>Y axis position.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="zPosition" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.zPosition">
          <xs:annotation>
            <xs:documentation>(if applicable) Z axis position.</xs:documentation>
          </xs:annotation>
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      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Status" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status">
    <xs:annotation>
      <xs:documentation>Current status information relevant to an entity.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="dateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.dateTime">
        <xs:annotation>
          <xs:documentation>Date and time for which status 'value' applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="reason" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.reason">
        <xs:annotation>
          <xs:documentation>Reason code or explanation for why an object went to the current status
'value'.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="remark" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.remark">
        <xs:annotation>
          <xs:documentation>Pertinent information regarding the current 'value', as free form text.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.value">
        <xs:annotation>
          <xs:documentation>Status value at 'dateTime'; prior status changes may have been kept in instances of activity
records associated with the object to which this status applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="StreetAddress" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StreetAddress">
    <xs:annotation>
      <xs:documentation>General purpose street and postal address information.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="poBox" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.poBox">
        <xs:annotation>
          <xs:documentation>Post office box.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="postalCode" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.postalCode">
        <xs:annotation>
          <xs:documentation>Postal code for the address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.status">
        <xs:annotation>
          <xs:documentation>Status of this address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="streetDetail" type="m:StreetDetail" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.streetDetail">
        <xs:annotation>
          <xs:documentation>Street detail.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="townDetail" type="m:TownDetail" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.townDetail">
        <xs:annotation>
          <xs:documentation>Town detail.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="StreetDetail" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StreetDetail">
    <xs:annotation>
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      <xs:documentation>Street details, in the context of address.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="addressGeneral" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral">
        <xs:annotation>
          <xs:documentation>First line of a free form address or some additional address information (for example a mail
stop).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="addressGeneral2" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral2">
        <xs:annotation>
          <xs:documentation>(if applicable) Second line of a free form address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="addressGeneral3" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral3">
        <xs:annotation>
          <xs:documentation>(if applicable) Third line of a free form address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="buildingName" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.buildingName">
        <xs:annotation>
          <xs:documentation>(if applicable) In certain cases the physical location of the place of interest does not have a direct
point of entry from the street, but may be located inside a larger structure such as a building, complex, office block, apartment,
etc.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="code" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.code">
        <xs:annotation>
          <xs:documentation>(if applicable) Utilities often make use of external reference systems, such as those of the town-
planner's department or surveyor general's mapping system, that allocate global reference codes to
streets.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.name">
        <xs:annotation>
          <xs:documentation>Name of the street.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="number" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.number">
        <xs:annotation>
          <xs:documentation>Designator of the specific location on the street.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="prefix" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.prefix">
        <xs:annotation>
          <xs:documentation>Prefix to the street name. For example: North, South, East, West.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="suffix" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.suffix">
        <xs:annotation>
          <xs:documentation>Suffix to the street name. For example: North, South, East, West.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="suiteNumber" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.suiteNumber">
        <xs:annotation>
          <xs:documentation>Number of the apartment or suite.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="type" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.type">
        <xs:annotation>
          <xs:documentation>Type of street. Examples include: street, circle, boulevard, avenue, road, drive,
etc.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="withinTownLimits" type="xs:boolean" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.withinTownLimits">
```

```
        <xs:annotation>
          <xs:documentation>True if this street is within the legal geographical boundaries of the specified town
(default).</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="TownDetail" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#TownDetail">
    <xs:annotation>
      <xs:documentation>Town details, in the context of address.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="code" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.code">
        <xs:annotation>
          <xs:documentation>Town code.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="country" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.country">
        <xs:annotation>
          <xs:documentation>Name of the country.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.name">
        <xs:annotation>
          <xs:documentation>Town name.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="section" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.section">
        <xs:annotation>
          <xs:documentation>Town section. For example, it is common for there to be 36 sections per
township.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="stateOrProvince" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.stateOrProvince">
        <xs:annotation>
          <xs:documentation>Name of the state or province.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="TroubleTicket" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#TroubleTicket">
    <xs:annotation/>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:schema>
```

B.3 MeasurementsAndControls message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/MeasurementsAndControls/1#"
targetNamespace="http://iec.ch/TC57/2014/MeasurementsAndControls/1#" elementFormDefault="qualified"
attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation>This profile is to be used mainly for exchange of data that have telemetry representation for near-real
time exchanges during power system operation.</xs:documentation>
```

```
    <xs:documentation>With this profile, one can exchange the same value with different timestamps, there is no constraint on uniqueness of the mRID within the file.</xs:documentation>
  </xs:annotation>
  <xs:element name="MeasurementsAndControls" type="m:MeasurementsAndControls"/>
  <xs:complexType name="MeasurementsAndControls">
    <xs:sequence>
      <xs:element name="AccumulatorReset" type="m:AccumulatorReset" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="AccumulatorValue" type="m:AccumulatorValue" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="AnalogValue" type="m:AnalogValue" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Command" type="m:Command" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="DiscreteValue" type="m:DiscreteValue" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="RaiseLowerCommand" type="m:RaiseLowerCommand" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="SetPoint" type="m:SetPoint" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="StringMeasurementValue" type="m:StringMeasurementValue" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="AccumulatorReset" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorReset">
    <xs:annotation>
      <xs:documentation>This command reset the counter value to zero.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Control">
        <xs:sequence>
          <xs:element name="AccumulatorValue" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorReset.AccumulatorValue">
            <xs:annotation>
              <xs:documentation>The accumulator value that is reset by the command.</xs:documentation>
            </xs:annotation>
            <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorValue">
              <xs:attribute name="ref" type="xs:string"/>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="AccumulatorValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorValue">
    <xs:annotation>
      <xs:documentation>AccumulatorValue represents an accumulated (counted) MeasurementValue.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:MeasurementValue">
        <xs:sequence>
          <xs:element name="value" type="xs:integer" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorValue.value">
            <xs:annotation>
              <xs:documentation>The value to supervise. The value is positive.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="AnalogControl" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogControl">
    <xs:annotation>
      <xs:documentation>An analog control used for supervisory control.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Control">
        <xs:sequence>
          <xs:element name="AnalogValue" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogControl.AnalogValue">
            <xs:annotation>
              <xs:documentation>The MeasurementValue that is controlled.</xs:documentation>
            </xs:annotation>
            <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogValue">
              <xs:attribute name="ref" type="xs:string"/>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
```

```
  </xs:complexType>
  <xs:complexType name="AnalogValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogValue">
    <xs:annotation>
      <xs:documentation>AnalogValue represents an analog MeasurementValue.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:MeasurementValue">
        <xs:sequence>
          <xs:element name="value" type="xs:float" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogValue.value">
            <xs:annotation>
              <xs:documentation>The value to supervise.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Command" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Command">
    <xs:annotation>
      <xs:documentation>A Command is a discrete control used for supervisory control.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Control">
        <xs:sequence>
          <xs:element name="value" type="xs:integer" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Command.value">
            <xs:annotation>
              <xs:documentation>The value representing the actuator output.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="DiscreteValue" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Command.DiscreteValue">
            <xs:annotation>
              <xs:documentation>The MeasurementValue that is controlled.</xs:documentation>
            </xs:annotation>
            <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DiscreteValue">
              <xs:attribute name="ref" type="xs:string"/>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Control" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Control">
    <xs:annotation>
      <xs:documentation>Control is used for supervisory/device control. It represents control outputs that are used to change the state in a process, e.g. close or open breaker, a set point value or a raise lower command.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:IdentifiedObject">
        <xs:sequence>
          <xs:element name="operationInProgress" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Control.operationInProgress">
            <xs:annotation>
              <xs:documentation>Indicates that a client is currently sending control commands that has not completed.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="timeStamp" type="xs:dateTime" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Control.timeStamp">
            <xs:annotation>
              <xs:documentation>The last time a control output was sent.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="DiscreteValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DiscreteValue">
    <xs:annotation>
      <xs:documentation>DiscreteValue represents a discrete MeasurementValue.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
```

```
      <xs:extension base="m:MeasurementValue">
        <xs:sequence>
          <xs:element name="value" type="xs:integer" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DiscreteValue.value">
            <xs:annotation>
              <xs:documentation>The value to supervise.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="IdentifiedObject" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#IdentifiedObject">
    <xs:annotation>
      <xs:documentation>This is a root class to provide common identification for all classes needing identification and naming
attributes.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Names" type="m:Name" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.Names">
        <xs:annotation>
          <xs:documentation>All names of this identified object.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="MeasurementValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#MeasurementValue">
    <xs:annotation>
      <xs:documentation>The current state for a measurement. A state value is an instance of a measurement from a specific
source. Measurements can be associated with many state values, each representing a different source for the
measurement.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:IdentifiedObject">
        <xs:sequence>
          <xs:element name="timeStamp" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#MeasurementValue.timeStamp">
            <xs:annotation>
              <xs:documentation>The time when the value was last updated</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="MeasurementValueQuality" type="m:MeasurementValueQuality" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#MeasurementValue.MeasurementValueQuality">
            <xs:annotation>
              <xs:documentation>A MeasurementValue has a MeasurementValueQuality associated with
it.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="MeasurementValueQuality" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#MeasurementValueQuality">
    <xs:annotation>
      <xs:documentation>Measurement quality flags. Bits 0-10 are defined for substation automation in draft IEC 61850 part 7-
3. Bits 11-15 are reserved for future expansion by that document. Bits 16-31 are reserved for EMS
applications.</xs:documentation>
```

```
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Quality61850">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Name" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Name">
    <xs:annotation>
      <xs:documentation>The Name class provides the means to define any number of human readable  names for an object. A name is &lt;b&gt;not&lt;/b&gt; to be used for defining inter-object relationships. For inter-object relationships instead use the object identification 'mRID'.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Name.name">
        <xs:annotation>
          <xs:documentation>Any free text that name the object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="NameType" type="m:NameType" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Name.NameType">
        <xs:annotation>
          <xs:documentation>Type of this name.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="NameType" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameType">
    <xs:annotation>
      <xs:documentation>Type of name. Possible values for attribute 'name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple IT systems each having its own local name for the same object, e.g. a planning system may have different names from an EMS. An object may also have different names within the same IT system, e.g. localName as defined in CIM version 14. The definition from CIM14 is:</xs:documentation>
      <xs:documentation>The localName is a human readable name of the object. It is a free text name local to a node in a naming hierarchy similar to a file directory structure. A power system related naming hierarchy may be: Substation, VoltageLevel, Equipment etc. Children of the same parent in such a hierarchy have names that typically are unique among them.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameType.description">
        <xs:annotation>
          <xs:documentation>Description of the name type.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameType.name">
        <xs:annotation>
          <xs:documentation>Name of the name type.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="NameTypeAuthority" type="m:NameTypeAuthority" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameType.NameTypeAuthority">
        <xs:annotation>
          <xs:documentation>Authority responsible for managing names of this type.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="NameTypeAuthority" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameTypeAuthority">
    <xs:annotation>
      <xs:documentation>Authority responsible for creation and management of names of a given type; typically an organization or an enterprise system.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameTypeAuthority.description">
        <xs:annotation>
          <xs:documentation>Description of the name type authority.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameTypeAuthority.name">
        <xs:annotation>
```

```
            <xs:documentation>Name of the name type authority.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="Quality61850" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850">
      <xs:annotation>
        <xs:documentation>Quality flags in this class are as defined in IEC 61850, except for estimatorReplaced, which has been included in this class for convenience.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="badReference" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.badReference">
          <xs:annotation>
            <xs:documentation>Measurement value may be incorrect due to a reference being out of calibration.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="estimatorReplaced" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.estimatorReplaced">
          <xs:annotation>
            <xs:documentation>Value has been replaced by State Estimator. estimatorReplaced is not an IEC61850 quality bit but has been put in this class for convenience.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="failure" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.failure">
          <xs:annotation>
            <xs:documentation>This identifier indicates that a supervision function has detected an internal or external failure, e.g. communication failure.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="oldData" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.oldData">
          <xs:annotation>
            <xs:documentation>Measurement value is old and possibly invalid, as it has not been successfully updated during a specified time interval.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="operatorBlocked" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.operatorBlocked">
          <xs:annotation>
            <xs:documentation>Measurement value is blocked and hence unavailable for transmission.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="oscillatory" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.oscillatory">
          <xs:annotation>
            <xs:documentation>To prevent some overload of the communication it is sensible to detect and suppress oscillating (fast changing) binary inputs. If a signal changes in a defined time (tosc) twice in the same direction (from 0 to 1 or from 1 to 0) then oscillation is detected and the detail quality identifier "oscillatory" is set. If it is detected a configured numbers of transient changes could be passed by. In this time the validity status "questionable" is set. If after this defined numbers of changes the signal is still in the oscillating state the value shall be set either to the opposite state of the previous stable value or to a defined default value. In this case the validity status "questionable" is reset and "invalid" is set as long as the signal is oscillating. If it is configured such that no transient changes should be passed by then the validity status "invalid" is set immediately in addition to the detail quality identifier "oscillatory" (used for status information only).</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="outOfRange" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.outOfRange">
          <xs:annotation>
            <xs:documentation>Measurement value is beyond a predefined range of value.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="overFlow" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.overFlow">
          <xs:annotation>
            <xs:documentation>Measurement value is beyond the capability of being  represented properly. For example, a counter value overflows from maximum count back to a value of zero.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="source" type="m:Source" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.source">
          <xs:annotation>
            <xs:documentation>Source gives information related to the origin of a value. The value may be acquired from the process, defaulted or substituted.</xs:documentation>
```

```
        </xs:annotation>
      </xs:element>
      <xs:element name="suspect" type="xs:boolean" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.suspect">
        <xs:annotation>
          <xs:documentation>A correlation function has detected that the value is not consitent with other values. Typically set
by a network State Estimator.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="test" type="xs:boolean" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.test">
        <xs:annotation>
          <xs:documentation>Measurement value is transmitted for test purposes.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="validity" type="m:Validity" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.validity">
        <xs:annotation>
          <xs:documentation>Validity of the measurement value.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="RaiseLowerCommand" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#RaiseLowerCommand">
    <xs:annotation>
      <xs:documentation>An analog control that increase or decrease a set point value with pulses.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:AnalogControl">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="SetPoint" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SetPoint">
    <xs:annotation>
      <xs:documentation>An analog control that issue a set point value.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:AnalogControl">
        <xs:sequence>
          <xs:element name="value" type="xs:float" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SetPoint.value">
            <xs:annotation>
              <xs:documentation>The value representing the actuator output.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:simpleType name="Source" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Source">
    <xs:annotation>
      <xs:documentation>Source gives information related to the origin of a value.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="DEFAULTED">
        <xs:annotation>
          <xs:documentation>The value contains a default value.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="PROCESS">
        <xs:annotation>
          <xs:documentation>The value is provided by input from the process I/O or being calculated from some
function.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="SUBSTITUTED">
        <xs:annotation>
          <xs:documentation>The value is provided by input of an operator or by an automatic source.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="StringMeasurementValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StringMeasurementValue">
    <xs:annotation>
```

```
      <xs:documentation>StringMeasurementValue represents a measurement value of type string.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:MeasurementValue">
        <xs:sequence>
          <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StringMeasurementValue.value">
            <xs:annotation>
              <xs:documentation>The value to supervise.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:simpleType name="Validity" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Validity">
    <xs:annotation>
      <xs:documentation>Validity for MeasurementValue.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="GOOD">
        <xs:annotation>
          <xs:documentation>The value is marked good if no abnormal condition of the acquisition function or the information
source is detected.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="INVALID">
        <xs:annotation>
          <xs:documentation>The value is marked invalid when a supervision function recognises abnormal conditions of the
acquisition function or the information source (missing or non-operating updating devices). The value is not defined under this
condition. The mark invalid is used to indicate to the client that the value may be incorrect and shall not be
used.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="QUESTIONABLE">
        <xs:annotation>
          <xs:documentation>The value is marked questionable if a supervision function detects an abnormal behaviour,
however the value could still be valid. The client is responsible for determining whether or not values marked "questionable"
should be used.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

B.4 OperationalTags message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/OperationalTags/2#" targetNamespace="http://iec.ch/TC57/2014/OperationalTags/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="OperationalTags" type="m:OperationalTags"/>
  <xs:complexType name="OperationalTags">
    <xs:sequence>
      <xs:element name="OperationalTag" type="m:OperationalTag" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Asset" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset">
    <xs:annotation>
      <xs:documentation>Tangible resource of the utility, including power system equipment, various end devices, cabinets,
buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its
subclasses, defined mainly in the Wires model (refer to IEC61970-301 and model package IEC61970::Wires). Asset description
places emphasis on the physical characteristics of the equipment fulfilling that role.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
```

```
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="OperationalTag" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag">
    <xs:annotation>
      <xs:documentation>Operational tag placed on a power system resource or asset in the context of switching plan execution or other work in the field.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="authorName" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.authorName">
        <xs:annotation>
          <xs:documentation>Name of the author of this document.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="comment" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.comment">
        <xs:annotation>
          <xs:documentation>Free text comment.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="subject" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.subject">
        <xs:annotation>
          <xs:documentation>Document subject.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="type" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.type">
        <xs:annotation>
          <xs:documentation>Utility-specific classification of this document, according to its corporate standards, practices, and existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Asset" type="m:Asset" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag.Asset">
        <xs:annotation>
          <xs:documentation>Asset on which this tag has been placed.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="PowerSystemResource" type="m:PowerSystemResource" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag.PowerSystemResource">
        <xs:annotation>
          <xs:documentation>Power system resource on which this tag has been placed.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="TagAction" type="m:TagAction" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag.TagAction">
        <xs:annotation>
          <xs:documentation>Tag action associated with this tag.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="PowerSystemResource" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource">
    <xs:annotation>
```

```
      <xs:documentation>A power system resource can be an item of equipment such as a switch, an equipment container containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power system resources can have measurements associated.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.Assets">
        <xs:annotation>
          <xs:documentation>All assets represented by this power system resource. For example, multiple conductor assets are electrically modelled as a single AC line segment.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="SwitchingStepGroup" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup">
    <xs:annotation>
      <xs:documentation>A logical step, grouping atomic switching steps that are important to distinguish when they may change topology (e.g. placing a jumper between two cuts).</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="TagAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagAction">
    <xs:annotation>
      <xs:documentation>Action on operation tag as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="kind" type="m:TagActionKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagAction.kind">
        <xs:annotation>
          <xs:documentation>Kind of tag action.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="SwitchingStepGroup" type="m:SwitchingStepGroup" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagAction.SwitchingStepGroup">
        <xs:annotation>
          <xs:documentation>Group to which this step belongs.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="TagActionKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagActionKind">
    <xs:annotation>
      <xs:documentation>Kind of action on tag.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="place">
        <xs:annotation>
          <xs:documentation>Place the tag.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="remove">
        <xs:annotation>
          <xs:documentation>Remove the tag.</xs:documentation>
```

```
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="verify">
        <xs:annotation>
          <xs:documentation>Verify the tag.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

B.5 OperationsConfig message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/OperationsConfig#" targetNamespace="http://iec.ch/TC57/2014/OperationsConfig#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="OperationsConfig" type="m:OperationsConfig"/>
  <xs:complexType name="OperationsConfig">
    <xs:sequence>
      <xs:element name="Asset" type="m:Asset" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="FaultCauseType" type="m:FaultCauseType" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="UsagePoint" type="m:UsagePoint" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Asset" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset">
    <xs:annotation>
      <xs:documentation>Tangible resource of the utility, including power system equipment, various end devices, cabinets,
buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its
subclasses, defined mainly in the Wires model (refer to IEC61970-301 and model package IEC61970::Wires). Asset description
places emphasis on the physical characteristics of the equipment fulfilling that role.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Location" type="m:Location" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset.Location">
        <xs:annotation>
          <xs:documentation>Location of this asset.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Measurements" type="m:Measurement" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset.Measurements">
        <xs:annotation/>
      </xs:element>
      <xs:element name="PowerSystemResources" type="m:PowerSystemResource" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset.PowerSystemResources">
        <xs:annotation>
          <xs:documentation>All power system resources used to electrically model this asset. For example, transformer asset
is electrically modelled with a transformer and its windings and tap changer.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Equipment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Equipment">
    <xs:annotation>
      <xs:documentation>The parts of a power system that are physical devices, electronic or mechanical.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:PowerSystemResource">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
```

```
  </xs:complexType>
  <xs:complexType name="FaultCauseType" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultCauseType">
    <xs:annotation>
      <xs:documentation>Type of cause of the fault.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Location" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location">
    <xs:annotation>
      <xs:documentation>The place, scene, or point of something where someone or something has been, is, and/or will be at a given moment in time. It can be defined with one or more postition points (coordinates) in a given coordinate system.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Measurement" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Measurement">
    <xs:annotation>
      <xs:documentation>A Measurement represents any measured, calculated or non-measured non-calculated quantity. Any piece of equipment may contain Measurements, e.g. a substation may have temperature measurements and door open indications, a transformer may have oil temperature and tank pressure measurements, a bay may contain a number of power flow measurements and a Breaker may contain a switch status measurement.</xs:documentation>
      <xs:documentation>The PSR – Measurement association is intended to capture this use of Measurement and is included in the naming hierarchy based on EquipmentContainer. The naming hierarchy typically has Measurements as leafs, e.g. Substation-VoltageLevel-Bay-Switch-Measurement.</xs:documentation>
      <xs:documentation>Some Measurements represent quantities related to a particular sensor location in the network, e.g. a voltage transformer (PT) at a busbar or a current transformer (CT) at the bar between a breaker and an isolator. The sensing position is not captured in the PSR – Measurement association. Instead it is captured by the Measurement – Terminal association that is used to define the sensing location in the network topology. The location is defined by the connection of the Terminal to ConductingEquipment.</xs:documentation>
      <xs:documentation>If both a Terminal and PSR are associated, and the PSR is of type ConductingEquipment, the associated Terminal should belong to that ConductingEquipment instance.</xs:documentation>
      <xs:documentation>When the sensor location is needed both Measurement-PSR and Measurement-Terminal are used. The Measurement-Terminal association is never used alone.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
```

```
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="PowerSystemResource" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource">
      <xs:annotation>
        <xs:documentation>A power system resource can be an item of equipment such as a switch, an equipment container containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power system resources can have measurements associated.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="UsagePoint" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#UsagePoint">
      <xs:annotation>
        <xs:documentation>Logical or physical point in the network to which readings or events may be attributed. Used at the place where a physical or virtual meter may be located; however, it is not required that a meter be present.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="Equipments" type="m:Equipment" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#UsagePoint.Equipments">
          <xs:annotation>
            <xs:documentation>All equipment connecting this usage point to the electrical grid.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
</xs:schema>
```

B.6 OutagesAndFaults message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#" xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#" xmlns:m="http://iec.ch/TC57/2014/OutagesAndFaults/1#" targetNamespace="http://iec.ch/TC57/2014/OutagesAndFaults/1#" elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="OutagesAndFaults" type="m:OutagesAndFaults"/>
  <xs:complexType name="OutagesAndFaults">
    <xs:sequence>
      <xs:element name="EquipmentFault" type="m:EquipmentFault" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="LineFault" type="m:LineFault" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Outage" type="m:Outage" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="ACLineSegment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ACLineSegment">
    <xs:annotation>
      <xs:documentation>A wire or combination of wires, with consistent electrical characteristics, building a single electrical system, used to carry alternating current between points in the power system.</xs:documentation>
      <xs:documentation>For symmetrical, transposed 3ph lines, it is sufficient to use  attributes of the line segment, which describe impedances and admittances for the entire length of the segment. Additionally impedances can be computed by using length and associated per length impedances.</xs:documentation>
      <xs:documentation>The BaseVoltage at the two ends of ACLineSegments in a Line shall have the same BaseVoltage.nominalVoltage. However, boundary lines  may have slightly different BaseVoltage.nominalVoltages and  variation is allowed. Larger voltage difference in general requires use of an equivalent branch.</xs:documentation>
    </xs:annotation>
```

```
    <xs:complexContent>
      <xs:extension base="m:Equipment">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="DateTimeInterval" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#DateTimeInterval">
    <xs:annotation>
      <xs:documentation>Interval between two date and time points.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="end" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DateTimeInterval.end">
        <xs:annotation>
          <xs:documentation>End date and time of this interval.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="start" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DateTimeInterval.start">
        <xs:annotation>
          <xs:documentation>Start date and time of this interval.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Equipment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Equipment">
    <xs:annotation>
      <xs:documentation>The parts of a power system that are physical devices, electronic or mechanical.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="EquipmentFault" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#EquipmentFault">
    <xs:annotation>
      <xs:documentation>A fault applied at the terminal, external to the equipment. This class is not used to specify faults
internal to the equipment.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Fault">
        <xs:sequence>
          <xs:element name="FaultyEquipment" type="m:Equipment" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.FaultyEquipment">
            <xs:annotation>
              <xs:documentation>Equipment carrying this fault.</xs:documentation>
              <xs:documentation>Use if you don't have detailed terminals (connectivity) model.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="Terminal" type="m:Terminal" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EquipmentFault.Terminal">
            <xs:annotation>
              <xs:documentation>The terminal connecting to the bus to which the fault is applied.</xs:documentation>
              <xs:documentation>Use if you have designation of the terminal (of the faulty equipment).</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Fault" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault">
    <xs:annotation>
      <xs:documentation>Abnormal condition causing current flow through conducting equipment, such as caused by
equipment failure or short circuits from objects not typically modeled (for example, a tree falling on a line).</xs:documentation>
    </xs:annotation>
    <xs:sequence>
```

```
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
          <xs:annotation>
            <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="kind" type="m:PhaseConnectedFaultKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.kind">
          <xs:annotation>
            <xs:documentation>The kind of phase fault.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
          <xs:annotation>
            <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="phases" type="m:PhaseCode" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.phases">
          <xs:annotation>
            <xs:documentation>The phases participating in the fault. The fault connections into these phases are further specified
by the type of fault.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="FaultCauseTypes" type="m:FaultCauseType" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.FaultCauseTypes">
          <xs:annotation>
            <xs:documentation>All types of fault cause.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="impedance" type="m:FaultImpedance" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.impedance">
          <xs:annotation>
            <xs:documentation>Fault impedance. Its usage is described by 'kind'.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Outage" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-
schema-cim17-dcim12#Fault.Outage">
          <xs:annotation>
            <xs:documentation>Outage associated with this fault.</xs:documentation>
          </xs:annotation>
          <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage">
            <xs:attribute name="ref" type="xs:string"/>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="FaultCauseType" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#FaultCauseType">
      <xs:annotation>
        <xs:documentation>Type of cause of the fault.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
```

```
  </xs:complexType>
  <xs:complexType name="FaultImpedance" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#FaultImpedance">
    <xs:annotation>
      <xs:documentation>Impedance description for the fault.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="rGround" type="m:Resistance" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultImpedance.rGround">
        <xs:annotation>
          <xs:documentation>The resistance of the fault between phases and ground.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="rLineToLine" type="m:Resistance" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultImpedance.rLineToLine">
        <xs:annotation>
          <xs:documentation>The resistance of the fault between phases.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="xGround" type="m:Reactance" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultImpedance.xGround">
        <xs:annotation>
          <xs:documentation>The reactance of the fault between phases and ground.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="xLineToLine" type="m:Reactance" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultImpedance.xLineToLine">
        <xs:annotation>
          <xs:documentation>The reactance of the fault between phases.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="LineFault" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#LineFault">
    <xs:annotation>
      <xs:documentation>A fault that occurs on an AC line segment at some point along the length.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Fault">
        <xs:sequence>
          <xs:element name="lengthFromTerminal1" type="m:Length" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#LineFault.lengthFromTerminal1">
            <xs:annotation>
              <xs:documentation>The length to the place where the fault is located starting from terminal with sequence
number 1 of the faulted line segment.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="ACLineSegment" type="m:ACLineSegment" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#LineFault.ACLineSegment">
            <xs:annotation>
              <xs:documentation>The line segment of this line fault.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Outage" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage">
    <xs:annotation>
      <xs:documentation>Document describing details of an active or planned outage in a part of the electrical
network.</xs:documentation>
      <xs:documentation>A non-planned outage may be created upon:</xs:documentation>
      <xs:documentation>- a breaker trip,</xs:documentation>
      <xs:documentation>- a fault indicator status change,</xs:documentation>
      <xs:documentation>- a meter event indicating customer outage,</xs:documentation>
      <xs:documentation>- a reception of one or more customer trouble calls, or</xs:documentation>
      <xs:documentation>- an operator command, reflecting information obtained from the field crew.</xs:documentation>
      <xs:documentation>Outage restoration may be performed using a switching plan which complements the outage
information with detailed switching activities, including the relationship to the crew and work.</xs:documentation>
      <xs:documentation>A planned outage may be created upon:</xs:documentation>
      <xs:documentation>- a request for service, maintenance or construction work in the field, or</xs:documentation>
      <xs:documentation>- an operator-defined outage for what-if/contingency network analysis.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
```

```
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="cause" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.cause">
        <xs:annotation>
          <xs:documentation>One or more causes of this outage.</xs:documentation>
          <xs:documentation>Note: At present, this is a free text; could be replaced with a separate associated class in case we have multiple causes (e.g. OutageCauseType, inheriting from IdentifiedObject).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="isPlanned" type="xs:boolean" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.isPlanned">
        <xs:annotation>
          <xs:documentation>True if planned, false otherwise (for example due to a breaker trip).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="subject" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.subject">
        <xs:annotation>
          <xs:documentation>Document subject.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="actualPeriod" type="m:DateTimeInterval" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.actualPeriod">
        <xs:annotation>
          <xs:documentation>Actual outage period; end of the period corresponds to the actual restoration time.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="estimatedPeriod" type="m:DateTimeInterval" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.estimatedPeriod">
        <xs:annotation>
          <xs:documentation>Estimated outage period. The start of the period makes sense in case of a planned outage only, whereas the end of the period corresponds to the estimated restoration time in general.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="OpenedSwitches" type="m:Switch" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.OpenedSwitches">
        <xs:annotation>
          <xs:documentation>All potentially open switches causing this outage. This realationship is meant to be used as "indication" for initiation of outage-related business processes, whereas for actual actions of switches, SwitchAction-Switch relationship should be used.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.status">
        <xs:annotation>
          <xs:documentation>Status of subject matter (e.g., Agreement, Work) this document represents. For status of the document itself, use 'docStatus' attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="summary" type="m:ServicePointOutageSummary" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.summary">
        <xs:annotation>
          <xs:documentation>Summary counts of service points (customers) affected by this outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
```

```
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="PhaseCode" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PhaseCode">
    <xs:annotation>
      <xs:documentation>An unordered enumeration of phase identifiers. Allows designation of phases for both transmission and distribution equipment, circuits and loads.  The enumeration, by itself, does not describe how the phases are connected together or connected to ground. Ground is not explicitly denoted as a phase.</xs:documentation>
      <xs:documentation>Residential and small commercial loads are often served from single-phase, or split-phase, secondary circuits. For example of s12N, phases 1 and 2 refer to hot wires that are 180 degrees out of phase, while N refers to the neutral wire. Through single-phase transformer connections, these secondary circuits may be served from one or two of the primary phases A, B, and C. For three-phase loads, use the A, B, C phase codes instead of s12N.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="A">
        <xs:annotation>
          <xs:documentation>Phase A.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="AB">
        <xs:annotation>
          <xs:documentation>Phases A and B.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ABC">
        <xs:annotation>
          <xs:documentation>Phases A, B, and C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ABCN">
        <xs:annotation>
          <xs:documentation>Phases A, B, C, and N.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ABN">
        <xs:annotation>
          <xs:documentation>Phases A, B, and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="AC">
        <xs:annotation>
          <xs:documentation>Phases A and C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ACN">
        <xs:annotation>
          <xs:documentation>Phases A, C and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="AN">
        <xs:annotation>
          <xs:documentation>Phases A and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="B">
        <xs:annotation>
          <xs:documentation>Phase B.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="BC">
        <xs:annotation>
          <xs:documentation>Phases B and C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="BCN">
        <xs:annotation>
          <xs:documentation>Phases B, C, and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="BN">
        <xs:annotation>
          <xs:documentation>Phases B and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="C">
        <xs:annotation>
          <xs:documentation>Phase C.</xs:documentation>
```

```
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="CN">
        <xs:annotation>
          <xs:documentation>Phases C and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="N">
        <xs:annotation>
          <xs:documentation>Neutral phase.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="none">
        <xs:annotation>
          <xs:documentation>No phases specified.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s1">
        <xs:annotation>
          <xs:documentation>Secondary phase 1.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s12">
        <xs:annotation>
          <xs:documentation>Secondary phase 1 and 2.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s12N">
        <xs:annotation>
          <xs:documentation>Secondary phases 1, 2, and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s1N">
        <xs:annotation>
          <xs:documentation>Secondary phase 1 and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s2">
        <xs:annotation>
          <xs:documentation>Secondary phase 2.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s2N">
        <xs:annotation>
          <xs:documentation>Secondary phase 2 and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="PhaseConnectedFaultKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PhaseConnectedFaultKind">
    <xs:annotation>
      <xs:documentation>The type of fault connection among phases.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="lineToGround">
        <xs:annotation>
          <xs:documentation>The fault connects the indicated phases to ground. The line to line fault impedance is not used and assumed infinite. The full ground impedance is connected between each phase specified in the fault and ground, but not between the phases.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="lineToLine">
        <xs:annotation>
          <xs:documentation>The fault connects the specified phases together without a connection to ground. The ground impedance of this fault is ignored. The line to line impedance is connected between each of the phases specified in the fault. For example three times for a three phase fault, one time for a two phase fault. A single phase fault should not be specified.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="lineToLineToGround">
        <xs:annotation>
          <xs:documentation>The fault connects the indicated phases to ground and to each other. The line to line impedance is connected between each of the phases specified in the fault in a full mesh. For example three times for a three phase fault, one time for a two phase fault. A single phase fault should not be specified. The full ground impedance is connected between each phase specified in the fault and ground.</xs:documentation>
        </xs:annotation>
```

```
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="ProtectedSwitch" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ProtectedSwitch">
    <xs:annotation>
      <xs:documentation>A ProtectedSwitch is a switching device that can be operated by ProtectionEquipment.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Switch">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="ServicePointOutageSummary" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ServicePointOutageSummary">
    <xs:annotation>
      <xs:documentation>Summary counts of service points affected by an outage. These counts are sometimes referred to as total and critical customer count.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="criticalCount" type="xs:integer" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ServicePointOutageSummary.criticalCount">
        <xs:annotation>
          <xs:documentation>Number of critical service (delivery) points affected by an outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="totalCount" type="xs:integer" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ServicePointOutageSummary.totalCount">
        <xs:annotation>
          <xs:documentation>Number of all service (delivery) points affected by an outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="SinglePhaseKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SinglePhaseKind">
    <xs:annotation>
      <xs:documentation>Enumeration of single phase identifiers. Allows designation of single phases for both transmission and distribution equipment, circuits and loads.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="A">
        <xs:annotation>
          <xs:documentation>Phase A.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="B">
        <xs:annotation>
          <xs:documentation>Phase B.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="C">
        <xs:annotation>
          <xs:documentation>Phase C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="N">
        <xs:annotation>
          <xs:documentation>Neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s1">
        <xs:annotation>
          <xs:documentation>Secondary phase 1.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s2">
        <xs:annotation>
          <xs:documentation>Secondary phase 2.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="Status" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status">
    <xs:annotation>
```

```
      <xs:documentation>Current status information relevant to an entity.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="dateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.dateTime">
        <xs:annotation>
          <xs:documentation>Date and time for which status 'value' applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="reason" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.reason">
        <xs:annotation>
          <xs:documentation>Reason code or explanation for why an object went to the current status
'value'.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="remark" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.remark">
        <xs:annotation>
          <xs:documentation>Pertinent information regarding the current 'value', as free form text.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.value">
        <xs:annotation>
          <xs:documentation>Status value at 'dateTime'; prior status changes may have been kept in instances of activity
records associated with the object to which this status applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Switch" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch">
    <xs:annotation>
      <xs:documentation>A generic device designed to close, or open, or both, one or more electric circuits. All switches are
two terminal devices including grounding switches.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Equipment">
        <xs:sequence>
          <xs:element name="SwitchPhase" type="m:SwitchPhase" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch.SwitchPhase">
            <xs:annotation>
              <xs:documentation>The individual switch phases for the switch.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="SwitchPhase" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#SwitchPhase">
    <xs:annotation>
      <xs:documentation>Single phase of a multi-phase switch when its attributes might be different per
phase.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="closed" type="xs:boolean" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.closed">
        <xs:annotation>
          <xs:documentation>The attribute tells if the switch is considered closed when used as input to topology
processing.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
```

```
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="normalOpen" type="xs:boolean" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.normalOpen">
        <xs:annotation>
          <xs:documentation>Used in cases when no Measurement for the status value is present. If the SwitchPhase has a
status measurement the Discrete.normalValue is expected to match with this value.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="phaseSide1" type="m:SinglePhaseKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.phaseSide1">
        <xs:annotation>
          <xs:documentation>Phase of this SwitchPhase on the side with terminal sequence number equal 1. Should be a
phase contained in that terminal&amp;rsquo;s phases attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="phaseSide2" type="m:SinglePhaseKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.phaseSide2">
        <xs:annotation>
          <xs:documentation>Phase of this SwitchPhase on the side with terminal sequence number equal 2. Should be a
phase contained in that terminal&amp;rsquo;s Terminal.phases attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Terminal" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Terminal">
    <xs:annotation>
      <xs:documentation>An AC electrical connection point to a piece of conducting equipment. Terminals are connected at
physical connection points called connectivity nodes.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="Resistance" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Resistance">
    <xs:annotation>
      <xs:documentation>Resistance (real part of impedance).</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:float"/>
  </xs:simpleType>
  <xs:simpleType name="Length" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Length">
    <xs:annotation>
      <xs:documentation>Unit of length. Never negative.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:float"/>
  </xs:simpleType>
  <xs:simpleType name="Reactance" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Reactance">
    <xs:annotation>
      <xs:documentation>Reactance (imaginary part of impedance), at rated frequency.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:float"/>
  </xs:simpleType>
</xs:schema>
```

B.7 OutageSchedules message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/OutageSchedules/2#" targetNamespace="http://iec.ch/TC57/2014/OutageSchedules/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
```

```
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="OutageSchedules" type="m:OutageSchedules"/>
  <xs:complexType name="OutageSchedules">
    <xs:sequence>
      <xs:element name="OutageSchedule" type="m:OutageSchedule" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Approver" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Approver">
    <xs:annotation>
      <xs:documentation>Person who accepted/signed or rejected the document.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:DocumentPersonRole">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Author" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Author">
    <xs:annotation>
      <xs:documentation>Person who created document or activity record.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:DocumentPersonRole">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="ConfigurationEvent" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#ConfigurationEvent">
    <xs:annotation>
      <xs:documentation>Used to report details on creation, change or deletion of an entity or its
configuration.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="createdDateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ActivityRecord.createdDateTime">
        <xs:annotation>
          <xs:documentation>Date and time this activity record has been created (different from the 'status.dateTime', which is
the time of a status change of the associated object, if applicable).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="reason" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ActivityRecord.reason">
        <xs:annotation>
          <xs:documentation>Reason for event resulting in this activity record, typically supplied when user
initiated.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="severity" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ActivityRecord.severity">
        <xs:annotation>
          <xs:documentation>Severity level of event resulting in this activity record.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="type" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ActivityRecord.type">
        <xs:annotation>
          <xs:documentation>Type of event resulting in this activity record.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Author" type="m:Author" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ActivityRecord.Author">
        <xs:annotation>
          <xs:documentation>Author of this activity record.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ActivityRecord.status">
        <xs:annotation>
          <xs:documentation>Information on consequence of event resulting in this activity record.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
```

```
  <xs:complexType name="DateTimeInterval" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DateTimeInterval">
    <xs:annotation>
      <xs:documentation>Interval between two date and time points.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="end" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DateTimeInterval.end">
        <xs:annotation>
          <xs:documentation>End date and time of this interval.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="start" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DateTimeInterval.start">
        <xs:annotation>
          <xs:documentation>Start date and time of this interval.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="DocumentPersonRole" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DocumentPersonRole">
    <xs:annotation>
      <xs:documentation>Person role with respect to documents.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:PersonRole">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Editor" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Editor">
    <xs:annotation>
      <xs:documentation>Person who modified the document.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:DocumentPersonRole">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="ElectronicAddress" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ElectronicAddress">
    <xs:annotation>
      <xs:documentation>Electronic address information.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="web" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ElectronicAddress.web">
        <xs:annotation>
          <xs:documentation>World wide web address.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Equipment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Equipment">
    <xs:annotation>
      <xs:documentation>The parts of a power system that are physical devices, electronic or mechanical.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:PowerSystemResource">
        <xs:sequence>
          <xs:element name="OperationalRestrictions" type="m:OperationalRestriction" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Equipment.OperationalRestrictions">
            <xs:annotation>
              <xs:documentation>All operational restrictions for this equipment.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="PSREvents" type="m:PSREvent" minOccurs="1" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.PSREvents">
            <xs:annotation>
              <xs:documentation>All events associated with this power system resource.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
```

```
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="FloatQuantity" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FloatQuantity">
    <xs:annotation>
      <xs:documentation>Quantity with float value and associated unit information.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="multiplier" type="m:UnitMultiplier" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FloatQuantity.multiplier">
        <xs:annotation/>
      </xs:element>
      <xs:element name="unit" type="m:UnitSymbol" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FloatQuantity.unit">
        <xs:annotation/>
      </xs:element>
      <xs:element name="value" type="xs:float" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FloatQuantity.value">
        <xs:annotation/>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Issuer" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Issuer">
    <xs:annotation>
      <xs:documentation>Person who issued the document and is responsible for its content.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:DocumentPersonRole">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="OperationalRestriction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalRestriction">
    <xs:annotation>
      <xs:documentation>A document that can be associated with equipment to describe any sort of restrictions compared with the original manufacturer's specification or with the usual operational practice e.g. temporary maximum loadings, maximum switching current, do not operate if bus couplers are open, etc.</xs:documentation>
      <xs:documentation>In the UK, for example, if a breaker or switch ever mal-operates, this is reported centrally and utilities use their asset systems to identify all the installed devices of the same manufacturer's type. They then apply operational restrictions in the operational systems to warn operators of potential problems. After appropriate inspection and maintenance, the operational restrictions may be removed.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="activePeriod" type="m:DateTimeInterval" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalRestriction.activePeriod">
        <xs:annotation>
          <xs:documentation>Interval during which this restriction is applied.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="restrictedValue" type="m:FloatQuantity" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalRestriction.restrictedValue">
        <xs:annotation>
          <xs:documentation>Restricted (new) value; includes unit of measure and potentially multiplier.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="OperationalUpdatedRating" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalUpdatedRating">
    <xs:annotation>
      <xs:documentation>Lowered capability because of deterioration or inadequacy (sometimes referred to as derating or partial outage) or other kind of operational rating change.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:OperationalRestriction">
        <xs:sequence>
          <xs:element name="changeType" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalUpdatedRating.changeType">
            <xs:annotation>
              <xs:documentation>Type of operational updated rating, e.g. a derate, a rerate or a return to normal.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
```

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    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Outage" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage">
    <xs:annotation>
      <xs:documentation>Document describing details of an active or planned outage in a part of the electrical
network.</xs:documentation>
      <xs:documentation>A non-planned outage may be created upon:</xs:documentation>
      <xs:documentation>- a breaker trip,</xs:documentation>
      <xs:documentation>- a fault indicator status change,</xs:documentation>
      <xs:documentation>- a meter event indicating customer outage,</xs:documentation>
      <xs:documentation>- a reception of one or more customer trouble calls, or</xs:documentation>
      <xs:documentation>- an operator command, reflecting information obtained from the field crew.</xs:documentation>
      <xs:documentation>Outage restoration may be performed using a switching plan which complements the outage
information with detailed switching activities, including the relationship to the crew and work.</xs:documentation>
      <xs:documentation>A planned outage may be created upon:</xs:documentation>
      <xs:documentation>- a request for service, maintenance or construction work in the field, or</xs:documentation>
      <xs:documentation>- an operator-defined outage for what-if/contingency network analysis.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="cancelledDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.cancelledDateTime">
        <xs:annotation>
          <xs:documentation>Date and time planned outage has been cancelled.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="cause" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.cause">
        <xs:annotation>
          <xs:documentation>One or more causes of this outage.</xs:documentation>
          <xs:documentation>Note: At present, this is a free text; could be replaced with a separate associated class in case we
have multiple causes (e.g. OutageCauseType, inheriting from IdentifiedObject).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="isPlanned" type="xs:boolean" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.isPlanned">
        <xs:annotation>
          <xs:documentation>True if planned, false otherwise (for example due to a breaker trip).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="actualPeriod" type="m:DateTimeInterval" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.actualPeriod">
        <xs:annotation>
          <xs:documentation>Actual outage period; end of the period corresponds to the actual restoration
time.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Equipments" type="m:Equipment" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.Equipments">
        <xs:annotation>
          <xs:documentation>All equipments associated with this outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="estimatedPeriod" type="m:DateTimeInterval" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.estimatedPeriod">
        <xs:annotation>
          <xs:documentation>Estimated outage period. The start of the period makes sense in case of a planned outage only,
whereas the end of the period corresponds to the estimated restoration time in general.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="PlannedSwitchActions" type="m:SwitchAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.PlannedSwitchActions">
        <xs:annotation>
          <xs:documentation>All switch actions to apply within the scope of this planned outage. Each such action groups
switches to which the action is to apply in order to produce the desired network state considered as outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
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      <xs:element name="status" type="m:Status" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.status">
        <xs:annotation>
          <xs:documentation>Status of subject matter (e.g., Agreement, Work) this document represents. For status of the
document itself, use 'docStatus' attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="summary" type="m:ServicePointOutageSummary" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.summary">
        <xs:annotation>
          <xs:documentation>Summary counts of service points (customers) affected by this outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="SwitchingPlans" type="m:SwitchingPlan" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.SwitchingPlans">
        <xs:annotation>
          <xs:documentation>All switching plans that lead to supply restoration due to this outage. Only one will be retained for
execution.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="UpdatedRatings" type="m:OperationalUpdatedRating" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.UpdatedRatings">
        <xs:annotation>
          <xs:documentation>All updated ratings for this planned equipment outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="UsagePoints" type="m:UsagePoint" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.UsagePoints">
        <xs:annotation>
          <xs:documentation>All usage points associated with this outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="OutageSchedule" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#OutageSchedule">
    <xs:annotation>
      <xs:documentation>Document containing the definition of planned outages of equipment and/or service (delivery) points
(sometimes referred to as customers). It is used as specification for producing switching plans.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="comment" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.comment">
        <xs:annotation>
          <xs:documentation>Free text comment.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="createdDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.createdDateTime">
        <xs:annotation>
          <xs:documentation>Date and time that this document was created.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="lastModifiedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.lastModifiedDateTime">
        <xs:annotation>
          <xs:documentation>Date and time this document was last modified. Documents may potentially be modified many
times during their lifetime.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="revisionNumber" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.revisionNumber">
        <xs:annotation>
          <xs:documentation>Revision number for this document.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="subject" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.subject">
        <xs:annotation>
          <xs:documentation>Document subject.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="title" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.title">
        <xs:annotation>
          <xs:documentation>Document title.</xs:documentation>
        </xs:annotation>
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        </xs:element>
        <xs:element name="type" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.type">
          <xs:annotation>
            <xs:documentation>Utility-specific classification of this document, according to its corporate standards, practices, and
existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Approver" type="m:Approver" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.Approver">
          <xs:annotation>
            <xs:documentation>Approver of this document.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Author" type="m:Author" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.Author">
          <xs:annotation>
            <xs:documentation>Author of this document.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="ConfigurationEvents" type="m:ConfigurationEvent" minOccurs="1" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.ConfigurationEvents">
          <xs:annotation>
            <xs:documentation>All configuration events created for this document.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="docStatus" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.docStatus">
          <xs:annotation>
            <xs:documentation>Status of this document. For status of subject matter this document represents (e.g., Agreement,
Work), use 'status' attribute.</xs:documentation>
            <xs:documentation>Example values for 'docStatus.status' are draft, approved, cancelled, etc.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Editor" type="m:Editor" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.Editor">
          <xs:annotation>
            <xs:documentation>Editor of this document.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="electronicAddress" type="m:ElectronicAddress" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.electronicAddress">
          <xs:annotation>
            <xs:documentation>Electronic address.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Issuer" type="m:Issuer" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.Issuer">
          <xs:annotation>
            <xs:documentation>Issuer of this document.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="PlannedOutages" type="m:Outage" minOccurs="1" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OutageSchedule.PlannedOutages">
          <xs:annotation>
            <xs:documentation>All outages resulting from the execution of this outage schedule.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="status" type="m:Status" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.status">
          <xs:annotation>
            <xs:documentation>Status of subject matter (e.g., Agreement, Work) this document represents. For status of the
document itself, use 'docStatus' attribute.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="PSREvent" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#PSREvent">
      <xs:annotation>
        <xs:documentation>Event recording the change in operational status of a power system resource; may be for an event
that has already occurred or for a planned activity.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
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            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="createdDateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ActivityRecord.createdDateTime">
          <xs:annotation>
            <xs:documentation>Date and time this activity record has been created (different from the 'status.dateTime', which is the time of a status change of the associated object, if applicable).</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
          <xs:annotation>
            <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="kind" type="m:PSREventKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PSREvent.kind">
          <xs:annotation>
            <xs:documentation>Kind of event.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="reason" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ActivityRecord.reason">
          <xs:annotation>
            <xs:documentation>Reason for event resulting in this activity record, typically supplied when user initiated.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ActivityRecord.status">
          <xs:annotation>
            <xs:documentation>Information on consequence of event resulting in this activity record.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:simpleType name="PSREventKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PSREventKind">
      <xs:annotation>
        <xs:documentation>Kind of power system resource event.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:string">
        <xs:enumeration value="inService">
          <xs:annotation>
            <xs:documentation>Power system resource state change to in service.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="outOfService">
          <xs:annotation>
            <xs:documentation>Power system resource state change to out of service.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="pendingAdd">
          <xs:annotation>
            <xs:documentation>Power system resource state change to pending add.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="pendingRemove">
          <xs:annotation>
            <xs:documentation>Power system resource state change to pending remove.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="pendingReplace">
          <xs:annotation>
            <xs:documentation>Power system resource state change to pending replace.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
      </xs:restriction>
    </xs:simpleType>
    <xs:complexType name="Person" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Person">
      <xs:annotation>
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      <xs:documentation>General purpose information for name and other information to contact people.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="PersonRole" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#PersonRole">
    <xs:annotation/>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Person" type="m:Person" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PersonRole.Person">
        <xs:annotation>
          <xs:documentation>Person having this role.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="PowerSystemResource" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#PowerSystemResource">
    <xs:annotation>
      <xs:documentation>A power system resource can be an item of equipment such as a switch, an equipment container
containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power
system resources can have measurements associated.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="ServicePointOutageSummary" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-
cim17-dcim12#ServicePointOutageSummary">
    <xs:annotation>
      <xs:documentation>Summary counts of service points affected by an outage. These counts are sometimes referred to as
total and critical customer count.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="criticalCount" type="xs:integer" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ServicePointOutageSummary.criticalCount">
        <xs:annotation>
          <xs:documentation>Number of critical service (delivery) points affected by an outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
```

```
      <xs:element name="totalCount" type="xs:integer" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ServicePointOutageSummary.totalCount">
        <xs:annotation>
          <xs:documentation>Number of all service (delivery) points affected by an outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Status" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status">
    <xs:annotation>
      <xs:documentation>Current status information relevant to an entity.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="dateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.dateTime">
        <xs:annotation>
          <xs:documentation>Date and time for which status 'value' applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="reason" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.reason">
        <xs:annotation>
          <xs:documentation>Reason code or explanation for why an object went to the current status
'value'.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="remark" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.remark">
        <xs:annotation>
          <xs:documentation>Pertinent information regarding the current 'value', as free form text.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.value">
        <xs:annotation>
          <xs:documentation>Status value at 'dateTime'; prior status changes may have been kept in instances of activity
records associated with the object to which this status applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="SwitchAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#SwitchAction">
    <xs:annotation>
      <xs:documentation>Action on switch as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="kind" type="m:SwitchActionKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchAction.kind">
        <xs:annotation>
          <xs:documentation>Switching action to perform.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="OperatedSwitch" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchAction.OperatedSwitch">
        <xs:annotation>
          <xs:documentation>Switch that is the object of this switch action.</xs:documentation>
        </xs:annotation>
        <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch">
          <xs:sequence>
            <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
              <xs:annotation>
                <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an
exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of
UUID is strongly recommended.</xs:documentation>
                <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
              </xs:annotation>
            </xs:element>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="SwitchActionKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#SwitchActionKind">
```

```
    <xs:annotation>
      <xs:documentation>Kind of action on switch.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="close">
        <xs:annotation>
          <xs:documentation>Close the switch.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="open">
        <xs:annotation>
          <xs:documentation>Open the switch.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="SwitchingPlan" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#SwitchingPlan">
    <xs:annotation>
      <xs:documentation>A sequence of grouped or atomic steps intended to:</xs:documentation>
      <xs:documentation>- de-energise equipment or part of the network for safe work, and/or</xs:documentation>
      <xs:documentation>- bring back in service previously de-energised equipment or part of the network.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="UnitMultiplier" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#UnitMultiplier">
    <xs:annotation>
      <xs:documentation>The unit multipliers defined for the CIM. When applied to unit symbols that already contain a
multiplier, both multipliers are used. For example, to exchange kilograms using unit symbol of kg, one uses the "none" multiplier,
to exchange metric ton (Mg), one uses the "k" multiplier.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="E">
        <xs:annotation>
          <xs:documentation>Exa 10**18.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="G">
        <xs:annotation>
          <xs:documentation>Giga 10**9.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="M">
        <xs:annotation>
          <xs:documentation>Mega 10**6.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="P">
        <xs:annotation>
          <xs:documentation>Peta 10**15</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="T">
        <xs:annotation>
          <xs:documentation>Tera 10**12.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="Y">
        <xs:annotation>
          <xs:documentation>Yotta 10**24</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="Z">
        <xs:annotation>
          <xs:documentation>Zetta 10**21</xs:documentation>
```

```
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="a">
        <xs:annotation>
          <xs:documentation>atto 10**-18.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="c">
        <xs:annotation>
          <xs:documentation>Centi 10**-2.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="d">
        <xs:annotation>
          <xs:documentation>Deci 10**-1.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="da">
        <xs:annotation>
          <xs:documentation>deca 10**1.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="f">
        <xs:annotation>
          <xs:documentation>femto 10**-15.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="h">
        <xs:annotation>
          <xs:documentation>hecto 10**2.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="k">
        <xs:annotation>
          <xs:documentation>Kilo 10**3.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="m">
        <xs:annotation>
          <xs:documentation>Milli 10**-3.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="micro">
        <xs:annotation>
          <xs:documentation>Micro 10**-6.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="n">
        <xs:annotation>
          <xs:documentation>Nano 10**-9.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="none">
        <xs:annotation>
          <xs:documentation>No multiplier or equivalently multiply by 1.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="p">
        <xs:annotation>
          <xs:documentation>Pico 10**-12.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="y">
        <xs:annotation>
          <xs:documentation>yocto 10**-24.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="z">
        <xs:annotation>
          <xs:documentation>zepto 10**-21.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="UnitSymbol" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#UnitSymbol">
    <xs:annotation>
```

```
      <xs:documentation>The units defined for usage in the CIM.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="A">
        <xs:annotation>
          <xs:documentation>Current in Ampere.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="A2">
        <xs:annotation>
          <xs:documentation>Ampere squared (A²).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="A2h">
        <xs:annotation>
          <xs:documentation>ampere-squared hour, Ampere-squared hour.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="A2s">
        <xs:annotation>
          <xs:documentation>Ampere squared time in square ampere (A²s).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="APerA">
        <xs:annotation>
          <xs:documentation>Current, Ratio of Amperages  Note: Users may need to supply a prefix such as ‘m’ to show rates
such as ‘mA/A’.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="APerm">
        <xs:annotation>
          <xs:documentation>A/m, magnetic field strength, Ampere per metre.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="Ah">
        <xs:annotation>
          <xs:documentation>Ampere-hours, Ampere-hours.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="As">
        <xs:annotation>
          <xs:documentation>Ampere seconds (A·s).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="Bq">
        <xs:annotation>
          <xs:documentation>Radioactivity in Becquerel (1/s).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="Btu">
        <xs:annotation>
          <xs:documentation>Energy, British Thermal Unit.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="C">
        <xs:annotation>
          <xs:documentation>Electric charge in Coulomb (A·s).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="CPerkg">
        <xs:annotation>
          <xs:documentation>exposure (x rays), Coulomb per kilogram.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="CPerm2">
        <xs:annotation>
          <xs:documentation>surface charge density, Coulomb per square metre.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="CPerm3">
        <xs:annotation>
          <xs:documentation>electric charge density, Coulomb per cubic metre.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="F">
        <xs:annotation>
          <xs:documentation>Electric capacitance in Farad (C/V).</xs:documentation>
```

```
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="FPerm">
      <xs:annotation>
        <xs:documentation>permittivity, Farad per metre.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="G">
      <xs:annotation>
        <xs:documentation>Magnetic flux density, Gauss (1 G = 10-4 T).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Gy">
      <xs:annotation>
        <xs:documentation>Absorbed dose in Gray (J/kg).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="GyPers">
      <xs:annotation>
        <xs:documentation>absorbed dose rate, Gray per second.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="H">
      <xs:annotation>
        <xs:documentation>Electric inductance in Henry (Wb/A).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="HPerm">
      <xs:annotation>
        <xs:documentation>permeability, Henry per metre.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Hz">
      <xs:annotation>
        <xs:documentation>Frequency in Hertz (1/s).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="HzPerHz">
      <xs:annotation>
        <xs:documentation>Frequency, Rate of frequency change  Note: Users may need to supply a prefix such as ‘m’ to
show rates such as ‘mHz/Hz’.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="HzPers">
      <xs:annotation>
        <xs:documentation>Rate of change of frequency in Hertz per second.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="J">
      <xs:annotation>
        <xs:documentation>Energy in joule (N·m = C·V = W·s).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="JPerK">
      <xs:annotation>
        <xs:documentation>Heat capacity in Joule/Kelvin.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="JPerkg">
      <xs:annotation>
        <xs:documentation>Specific energy, Joule / kg.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="JPerkgK">
      <xs:annotation>
        <xs:documentation>Specific heat capacity, specific entropy, Joule per kilogram Kelvin.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="JPerm3">
      <xs:annotation>
        <xs:documentation>energy density, Joule per cubic metre.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="JPermol">
      <xs:annotation>
        <xs:documentation>molar energy, Joule per mole.</xs:documentation>
      </xs:annotation>
```

```
    </xs:enumeration>
    <xs:enumeration value="JPermolK">
      <xs:annotation>
        <xs:documentation>molar entropy, molar heat capacity, Joule per mole kelvin.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="JPers">
      <xs:annotation>
        <xs:documentation>Energy rate joule per second (J/s),</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="K">
      <xs:annotation>
        <xs:documentation>Temperature in Kelvin.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="M">
      <xs:annotation>
        <xs:documentation>Length, nautical mile (1 M = 1852 m).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Mx">
      <xs:annotation>
        <xs:documentation>Magnetic flux, Maxwell (1 Mx = 10-8 Wb).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="N">
      <xs:annotation>
        <xs:documentation>Force in Newton (kg·m/s²).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="NPerm">
      <xs:annotation>
        <xs:documentation>Surface tension, Newton per metre.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Nm">
      <xs:annotation>
        <xs:documentation>Moment of force, Newton metre.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Oe">
      <xs:annotation>
        <xs:documentation>Magnetic field, Ørsted (1 Oe = (103/4p) A/m).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Pa">
      <xs:annotation>
        <xs:documentation>Pressure in Pascal (N/m²). Note: the absolute or relative measurement of pressure is implied with this entry. See below for more explicit forms.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Pas">
      <xs:annotation>
        <xs:documentation>Dynamic viscosity, Pascal second.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Q">
      <xs:annotation>
        <xs:documentation>Quantity power, Q.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Qh">
      <xs:annotation>
        <xs:documentation>Quantity energy, Qh.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="S">
      <xs:annotation>
        <xs:documentation>Conductance in Siemens.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="SPerm">
      <xs:annotation>
        <xs:documentation>Conductance per length (F/m).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
```

```
      <xs:enumeration value="Sv">
        <xs:annotation>
          <xs:documentation>Dose equivalent in Sievert (J/kg).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="T">
        <xs:annotation>
          <xs:documentation>Magnetic flux density in Tesla (Wb/m2).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="V">
        <xs:annotation>
          <xs:documentation>Electric potential in Volt (W/A).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="V2">
        <xs:annotation>
          <xs:documentation>Volt squared (W²/A²).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="V2h">
        <xs:annotation>
          <xs:documentation>volt-squared hour, Volt-squared-hours.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="VA">
        <xs:annotation>
          <xs:documentation>Apparent power in Volt Ampere (See also real power and reactive power.)</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="VAh">
        <xs:annotation>
          <xs:documentation>Apparent energy in Volt Ampere hours.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="VAr">
        <xs:annotation>
          <xs:documentation>Reactive power in Volt Ampere reactive. The “reactive” or “imaginary” component of electrical
power (VIsin(phi)). (See also real power and apparent power).</xs:documentation>
          <xs:documentation>Note: Different meter designs use different methods to arrive at their results. Some meters may
compute reactive power as an arithmetic value, while others compute the value vectorially. The data consumer should
determine the method in use and the suitability of the measurement for the intended purpose.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="VArh">
        <xs:annotation>
          <xs:documentation>Reactive energy in Volt Ampere reactive hours.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="VPerHz">
        <xs:annotation>
          <xs:documentation>Magnetic flux in Volt per Hertz.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="VPerV">
        <xs:annotation>
          <xs:documentation>Voltage, Ratio of voltages Note: Users may need to supply a prefix such as ‘m’ to show rates
such as ‘mV/V’.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="VPerVA">
        <xs:annotation>
          <xs:documentation>Power factor, PF, the ratio of the active power to the apparent power. Note: The sign convention
used for power factor will differ between IEC meters and EEI (ANSI) meters. It is assumed that the data consumers understand
the type of meter being used and agree on the sign convention in use at any given utility.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="VPerVAr">
        <xs:annotation>
          <xs:documentation>Power factor, PF, the ratio of the active power to the apparent power. Note: The sign convention
used for power factor will differ between IEC meters and EEI (ANSI) meters. It is assumed that the data consumers understand
the type of meter being used and agree on the sign convention in use at any given utility.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="VPerm">
        <xs:annotation>
          <xs:documentation>electric field strength, Volt per metre.</xs:documentation>
```

```
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Vh">
      <xs:annotation>
        <xs:documentation>Volt-hour, Volt hours.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Vs">
      <xs:annotation>
        <xs:documentation>Volt second (Ws/A).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="W">
      <xs:annotation>
        <xs:documentation>Real power in Watt (J/s). Electrical power may have real and reactive components. The real portion of electrical power (I²R or VIcos(phi)), is expressed in Watts. (See also apparent power and reactive power.)</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="WPerA">
      <xs:annotation>
        <xs:documentation>Active power per current flow, watt per Ampere.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="WPerW">
      <xs:annotation>
        <xs:documentation>Signal Strength, Ratio of power  Note: Users may need to supply a prefix such as ‘m’ to show rates such as ‘mW/W’.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="WPerm2">
      <xs:annotation>
        <xs:documentation>Heat flux density, irradiance, Watt per square metre.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="WPerm2sr">
      <xs:annotation>
        <xs:documentation>radiance, Watt per square metre steradian.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="WPermK">
      <xs:annotation>
        <xs:documentation>Thermal conductivity in Watt/metre Kelvin.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="WPers">
      <xs:annotation>
        <xs:documentation>Ramp rate in Watt per second.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="WPersr">
      <xs:annotation>
        <xs:documentation>Radiant intensity, Watt per steradian.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Wb">
      <xs:annotation>
        <xs:documentation>Magnetic flux in Weber (V·s).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="Wh">
      <xs:annotation>
        <xs:documentation>Real energy in Watt hours.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="anglemin">
      <xs:annotation>
        <xs:documentation>Plane angle, minute.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="anglesec">
      <xs:annotation>
        <xs:documentation>Plane angle, second.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="bar">
      <xs:annotation>
```

```
            <xs:documentation>Pressure, bar (1 bar = 100 kPa).</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="cd">
          <xs:annotation>
            <xs:documentation>Luminous intensity in candela.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="charPers">
          <xs:annotation>
            <xs:documentation>Data rate (baud) in characters per second.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="character">
          <xs:annotation>
            <xs:documentation>Number of characters.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="cosPhi">
          <xs:annotation>
            <xs:documentation>Power factor, dimensionless.</xs:documentation>
            <xs:documentation>Note 1: This definition of power factor only holds for balanced systems. See the alternative definition under code 153.</xs:documentation>
            <xs:documentation>Note 2: Beware of differing sign conventions in use between the IEC and EEI. It is assumed that the data consumer understands the type of meter in use and the sign convention in use by the utility.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="count">
          <xs:annotation>
            <xs:documentation>Amount of substance, Counter value.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="d">
          <xs:annotation>
            <xs:documentation>Time, day = 24 h = 86400 s.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="dB">
          <xs:annotation>
            <xs:documentation>Sound pressure level in decibel. Note: multiplier “d” is included in this unit symbol for compatibility with IEC 61850-7-3.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="dBm">
          <xs:annotation>
            <xs:documentation>Power level (logrithmic ratio of signal strength , Bel-mW), normalized to 1mW. Note: multiplier “d” is included in this unit symbol for compatibility with IEC 61850-7-3.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="deg">
          <xs:annotation>
            <xs:documentation>Plane angle in degrees.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="degC">
          <xs:annotation>
            <xs:documentation>Relative temperature in degrees Celsius.</xs:documentation>
            <xs:documentation>In the SI unit system the symbol is ºC. Electric charge is measured in coulomb that has the unit symbol C. To distinguish degree Celsius form coulomb the symbol used in the UML is degC. Reason for not using ºC is the special character º is difficult to manage in software.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="ft3">
          <xs:annotation>
            <xs:documentation>Volume, cubic foot.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="gPerg">
          <xs:annotation>
            <xs:documentation>Concentration, The ratio of the mass of a solute divided by the mass of the solution. Note: Users may need use a prefix such a ‘µ’ to express a quantity such as ‘µg/g’.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="gal">
          <xs:annotation>
            <xs:documentation>Volume, US gallon (1 gal = 231 in3 = 128 fl ounce).</xs:documentation>
          </xs:annotation>
```

```
      </xs:enumeration>
      <xs:enumeration value="h">
        <xs:annotation>
          <xs:documentation>Time, hour = 60 min = 3600 s.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ha">
        <xs:annotation>
          <xs:documentation>Area, hectare.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="kat">
        <xs:annotation>
          <xs:documentation>Catalytic activity, katal = mol / s.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="katPerm3">
        <xs:annotation>
          <xs:documentation>catalytic activity concentration, katal per cubic metre.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="kg">
        <xs:annotation>
          <xs:documentation>Mass in kilogram. Note: multiplier “k” is included in this unit symbol for compatibility with
IEC 61850-7-3.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="kgPerJ">
        <xs:annotation>
          <xs:documentation>Weigh per energy in kilogram/joule (kg/J). Note: multiplier “k” is included in this unit symbol for
compatibility with IEC 61850-7-3.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="kgPerm3">
        <xs:annotation>
          <xs:documentation>Density in kilogram/cubic metre (kg/m³). Note: multiplier “k” is included in this unit symbol for
compatibility with IEC 61850-7-3.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="kgm">
        <xs:annotation>
          <xs:documentation>Moment of mass in kilogram metre (kg·m) (first moment of mass). Note: multiplier “k” is included
in this unit symbol for compatibility with IEC 61850-7-3.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="kgm2">
        <xs:annotation>
          <xs:documentation>Moment of mass in kilogram square metre (kg·m²) (Second moment of mass, commonly called
the moment of inertia). Note: multiplier “k” is included in this unit symbol for compatibility with IEC 61850-7-
3.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="kn">
        <xs:annotation>
          <xs:documentation>Speed, knot (1 kn = 1852/3600) m/s.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="l">
        <xs:annotation>
          <xs:documentation>Volume, litre = dm3 = m3/1000.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="lPerh">
        <xs:annotation>
          <xs:documentation>Volumetric flow rate, litre per hour.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="lPerl">
        <xs:annotation>
          <xs:documentation>Concentration, The ratio of the volume of a solute divided by the volume of  the solution. Note:
Users may need use a prefix such a ‘µ’ to express a quantity such as ‘µL/L’.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="lPers">
        <xs:annotation>
          <xs:documentation>Volumetric flow rate in litre per second.</xs:documentation>
        </xs:annotation>
```

```
</xs:enumeration>
<xs:enumeration value="lm">
  <xs:annotation>
    <xs:documentation>Luminous flux in lumen (cd·sr).</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="lx">
  <xs:annotation>
    <xs:documentation>Illuminance in lux (lm/m²).</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="m">
  <xs:annotation>
    <xs:documentation>Length in meter.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="m2">
  <xs:annotation>
    <xs:documentation>Area in square metre (m²).</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="m2Pers">
  <xs:annotation>
    <xs:documentation>Viscosity in metre square / second (m²/s).</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="m3">
  <xs:annotation>
    <xs:documentation>Volume in cubic metre (m³).</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="m3Compensated">
  <xs:annotation>
    <xs:documentation>Volume, cubic metre, with the value compensated for weather effects.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="m3Perh">
  <xs:annotation>
    <xs:documentation>Volumetric flow rate, cubic metre per hour.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="m3Perkg">
  <xs:annotation>
    <xs:documentation>Specific volume, cubic metre per kilogram, v.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="m3Pers">
  <xs:annotation>
    <xs:documentation>Volumetric flow rate in cubic metres per second (m³/s).</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="m3Uncompensated">
  <xs:annotation>
    <xs:documentation>Volume, cubic metre, with the value uncompensated for weather effects.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="mPerm3">
  <xs:annotation>
    <xs:documentation>Fuel efficiency in metre per cubic metre (m/m³).</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="mPers">
  <xs:annotation>
    <xs:documentation>Velocity in metre per second (m/s).</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="mPers2">
  <xs:annotation>
    <xs:documentation>Acceleration in metre per second squared (m/s²).</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="min">
  <xs:annotation>
    <xs:documentation>Time, minute  = 60 s.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value="mmHg">
```

```
      <xs:annotation>
        <xs:documentation>Pressure, millimeter of mercury (1 mmHg is approximately 133.3 Pa).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="mol">
      <xs:annotation>
        <xs:documentation>Amount of substance in mole.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="molPerkg">
      <xs:annotation>
        <xs:documentation>Concentration, Molality, the amount of solute in moles and the amount of solvent in
kilograms.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="molPerm3">
      <xs:annotation>
        <xs:documentation>Concentration, The amount of substance concentration, (c), the amount of solvent in moles
divided by the volume of solution in m³.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="molPermol">
      <xs:annotation>
        <xs:documentation>Concentration, Molar fraction (?), the ratio of the molar amount of a solute divided by the molar
amount of the solution.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="none">
      <xs:annotation>
        <xs:documentation>Dimension less quantity, e.g. count, per unit, etc.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="ohm">
      <xs:annotation>
        <xs:documentation>Electric resistance in ohm (V/A).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="ohmPerm">
      <xs:annotation>
        <xs:documentation>Electric resistance per length in ohm per metre ((V/A)/m).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="ohmm">
      <xs:annotation>
        <xs:documentation>resistivity, Ohm metre, (rho).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="onePerHz">
      <xs:annotation>
        <xs:documentation>Reciprocal of frequency (1/Hz).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="onePerm">
      <xs:annotation>
        <xs:documentation>Wavenumber, reciprocal metre,  (1/m).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="ppm">
      <xs:annotation>
        <xs:documentation>Concentration in parts per million.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="rad">
      <xs:annotation>
        <xs:documentation>Plane angle in radian (m/m).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="radPers">
      <xs:annotation>
        <xs:documentation>Angular velocity in radians per second (rad/s).</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="radPers2">
      <xs:annotation>
        <xs:documentation>Angular acceleration, radian per second squared.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
```

```
        <xs:enumeration value="rev">
          <xs:annotation>
            <xs:documentation>Amount of rotation, Revolutions.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="rotPers">
          <xs:annotation>
            <xs:documentation>Rotations per second (1/s). See also Hz (1/s).</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="s">
          <xs:annotation>
            <xs:documentation>Time in seconds.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="sPers">
          <xs:annotation>
            <xs:documentation>Time, Ratio of time Note: Users may need to supply a prefix such as 'μ' to show rates such as
'μs/s'</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="sr">
          <xs:annotation>
            <xs:documentation>Solid angle in steradian (m2/m2).</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="therm">
          <xs:annotation>
            <xs:documentation>Energy, Therm.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="tonne">
          <xs:annotation>
            <xs:documentation>mass, "tonne" or "metric  ton" (1000 kg = 1 Mg).</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
      </xs:restriction>
    </xs:simpleType>
    <xs:complexType name="UsagePoint" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#UsagePoint">
      <xs:annotation>
        <xs:documentation>Logical or physical point in the network to which readings or events may be attributed. Used at the
place where a physical or virtual meter may be located; however, it is not required that a meter be present.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
</xs:schema>
```

B.8 SwitchingOrders message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/SwitchingOrders/2#" targetNamespace="http://iec.ch/TC57/2014/SwitchingOrders/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="SwitchingOrders" type="m:SwitchingOrders"/>
  <xs:complexType name="SwitchingOrders">
    <xs:sequence>
      <xs:element name="CoordinateSystem" type="m:CoordinateSystem" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="SwitchingPlan" type="m:SwitchingPlan" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="WorkLocation" type="m:WorkLocation" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
```

```
  </xs:complexType>
  <xs:complexType name="Asset" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset">
    <xs:annotation>
      <xs:documentation>Tangible resource of the utility, including power system equipment, various end devices, cabinets, buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its subclasses, defined mainly in the Wires model (refer to IEC61970-301 and model package IEC61970::Wires). Asset description places emphasis on the physical characteristics of the equipment fulfilling that role.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="CoordinateSystem" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CoordinateSystem">
    <xs:annotation>
      <xs:documentation>Coordinate reference system.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="crsUrn" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CoordinateSystem.crsUrn">
        <xs:annotation>
          <xs:documentation>A Uniform Resource Name (URN) for the coordinate reference system (crs) used to define 'Location.PositionPoints'.</xs:documentation>
          <xs:documentation>An example would be the European Petroleum Survey Group (EPSG) code for a coordinate reference system, defined in URN under the Open Geospatial Consortium (OGC) namespace as: urn:ogc:def:uom:EPSG::XXXX, where XXXX is an EPSG code (a full list of codes can be found at the EPSG Registry web site http://www.epsg-registry.org/). To define the coordinate system as being WGS84 (latitude, longitude) using an EPSG OGC, this attribute would be urn:ogc:def:uom:EPSG::4236.</xs:documentation>
          <xs:documentation>A profile should limit this code to a set of allowed URNs agreed to by all sending and receiving parties.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="PositionPoint" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint">
    <xs:annotation>
      <xs:documentation>Set of spatial coordinates that determine a point, defined in the coordinate system specified in 'Location.CoordinateSystem'. Use a single position point instance to desribe a point-oriented location. Use a sequence of position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of an object (like a substation or a geographical zone – in this case, have first and last position point with the same values).</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="sequenceNumber" type="xs:integer" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.sequenceNumber">
        <xs:annotation>
          <xs:documentation>Zero-relative sequence number of this point within a series of points.</xs:documentation>
        </xs:annotation>
      </xs:element>
```

```
        <xs:element name="xPosition" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.xPosition">
          <xs:annotation>
            <xs:documentation>X axis position.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="yPosition" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.yPosition">
          <xs:annotation>
            <xs:documentation>Y axis position.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="zPosition" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.zPosition">
          <xs:annotation>
            <xs:documentation>(if applicable) Z axis position.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="Status" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status">
      <xs:annotation>
        <xs:documentation>Current status information relevant to an entity.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="dateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.dateTime">
          <xs:annotation>
            <xs:documentation>Date and time for which status 'value' applies.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="reason" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.reason">
          <xs:annotation>
            <xs:documentation>Reason code or explanation for why an object went to the current status
'value'.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="remark" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.remark">
          <xs:annotation>
            <xs:documentation>Pertinent information regarding the current 'value', as free form text.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.value">
          <xs:annotation>
            <xs:documentation>Status value at 'dateTime'; prior status changes may have been kept in instances of activity
records associated with the object to which this status applies.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="StreetAddress" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StreetAddress">
      <xs:annotation>
        <xs:documentation>General purpose street and postal address information.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="poBox" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.poBox">
          <xs:annotation>
            <xs:documentation>Post office box.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="postalCode" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.postalCode">
          <xs:annotation>
            <xs:documentation>Postal code for the address.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.status">
          <xs:annotation>
            <xs:documentation>Status of this address.</xs:documentation>
          </xs:annotation>
        </xs:element>
```

```
      <xs:element name="streetDetail" type="m:StreetDetail" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.streetDetail">
        <xs:annotation>
          <xs:documentation>Street detail.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="townDetail" type="m:TownDetail" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.townDetail">
        <xs:annotation>
          <xs:documentation>Town detail.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="StreetDetail" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StreetDetail">
    <xs:annotation>
      <xs:documentation>Street details, in the context of address.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="addressGeneral" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral">
        <xs:annotation>
          <xs:documentation>First line of a free form address or some additional address information (for example a mail
stop).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="addressGeneral2" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral2">
        <xs:annotation>
          <xs:documentation>(if applicable) Second line of a free form address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="addressGeneral3" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral3">
        <xs:annotation>
          <xs:documentation>(if applicable) Third line of a free form address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="buildingName" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.buildingName">
        <xs:annotation>
          <xs:documentation>(if applicable) In certain cases the physical location of the place of interest does not have a direct
point of entry from the street, but may be located inside a larger structure such as a building, complex, office block, apartment,
etc.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="code" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.code">
        <xs:annotation>
          <xs:documentation>(if applicable) Utilities often make use of external reference systems, such as those of the town-
planner's department or surveyor general's mapping system, that allocate global reference codes to
streets.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.name">
        <xs:annotation>
          <xs:documentation>Name of the street.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="number" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.number">
        <xs:annotation>
          <xs:documentation>Designator of the specific location on the street.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="prefix" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.prefix">
        <xs:annotation>
          <xs:documentation>Prefix to the street name. For example: North, South, East, West.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="suffix" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.suffix">
        <xs:annotation>
          <xs:documentation>Suffix to the street name. For example: North, South, East, West.</xs:documentation>
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        </xs:annotation>
      </xs:element>
      <xs:element name="suiteNumber" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.suiteNumber">
        <xs:annotation>
          <xs:documentation>Number of the apartment or suite.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="type" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.type">
        <xs:annotation>
          <xs:documentation>Type of street. Examples include: street, circle, boulevard, avenue, road, drive,
etc.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="withinTownLimits" type="xs:boolean" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.withinTownLimits">
        <xs:annotation>
          <xs:documentation>True if this street is within the legal geographical boundaries of the specified town
(default).</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="SwitchingPlan" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#SwitchingPlan">
    <xs:annotation>
      <xs:documentation>A sequence of grouped or atomic steps intended to:</xs:documentation>
      <xs:documentation>- de-energise equipment or part of the network for safe work, and/or</xs:documentation>
      <xs:documentation>- bring back in service previously de-energised equipment or part of the network.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="TownDetail" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#TownDetail">
    <xs:annotation>
      <xs:documentation>Town details, in the context of address.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="code" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.code">
        <xs:annotation>
          <xs:documentation>Town code.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="country" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.country">
        <xs:annotation>
          <xs:documentation>Name of the country.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.name">
        <xs:annotation>
          <xs:documentation>Town name.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="section" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.section">
        <xs:annotation>
          <xs:documentation>Town section. For example, it is common for there to be 36 sections per
township.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="stateOrProvince" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.stateOrProvince">
```

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        <xs:annotation>
          <xs:documentation>Name of the state or province.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="WorkLocation" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#WorkLocation">
    <xs:annotation>
      <xs:documentation>Information about a particular location for various forms of work.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="direction" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.direction">
        <xs:annotation>
          <xs:documentation>(if applicable) Direction that allows field crews to quickly find a given asset. For a given location,
such as a street address, this is the relative direction in which to find the asset. For example, a streetlight may be located at the
'NW' (northwest) corner of the customer's site, or a usage point may be located on the second floor of an apartment
building.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="1" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.Assets">
        <xs:annotation>
          <xs:documentation>All assets at this location.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="CoordinateSystem" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.CoordinateSystem">
        <xs:annotation>
          <xs:documentation>Coordinate system used to describe position points of this location.</xs:documentation>
        </xs:annotation>
        <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CoordinateSystem">
          <xs:attribute name="ref" type="xs:string"/>
        </xs:complexType>
      </xs:element>
      <xs:element name="mainAddress" type="m:StreetAddress" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.mainAddress">
        <xs:annotation>
          <xs:documentation>Main address of the location.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="PositionPoints" type="m:PositionPoint" minOccurs="1" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.PositionPoints">
        <xs:annotation>
          <xs:documentation>Sequence of position points describing this location, expressed in coordinate system
'Location.CoordinateSystem'.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="secondaryAddress" type="m:StreetAddress" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.secondaryAddress">
        <xs:annotation>
          <xs:documentation>Secondary address of the location. For example, PO Box address may have different ZIP code
than that in the 'mainAddress'.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:schema>
```

B.9 SwitchingPlans message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/SwitchingPlans/2#" targetNamespace="http://iec.ch/TC57/2014/SwitchingPlans/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="SwitchingPlans" type="m:SwitchingPlans"/>
  <xs:complexType name="SwitchingPlans">
    <xs:sequence>
      <xs:element name="SwitchingPlan" type="m:SwitchingPlan" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="ACLineSegment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#ACLineSegment">
    <xs:annotation>
      <xs:documentation>A wire or combination of wires, with consistent electrical characteristics, building a single electrical
system, used to carry alternating current between points in the power system.</xs:documentation>
      <xs:documentation>For symmetrical, transposed 3ph lines, it is sufficient to use  attributes of the line segment, which
describe impedances and admittances for the entire length of the segment. Additionally impedances can be computed by using
length and associated per length impedances.</xs:documentation>
      <xs:documentation>The BaseVoltage at the two ends of ACLineSegments in a Line shall have the same
BaseVoltage.nominalVoltage. However, boundary lines  may have slightly different BaseVoltage.nominalVoltages and  variation
is allowed. Larger voltage difference in general requires use of an equivalent branch.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:ConductingEquipment">
        <xs:sequence>
          <xs:element name="Clamp" type="m:Clamp" minOccurs="1" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ACLineSegment.Clamp">
            <xs:annotation>
              <xs:documentation>The clamps connected to the line segment.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Asset" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset">
    <xs:annotation>
      <xs:documentation>Tangible resource of the utility, including power system equipment, various end devices, cabinets,
buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its
subclasses, defined mainly in the Wires model (refer to IEC61970-301 and model package IEC61970::Wires). Asset description
places emphasis on the physical characteristics of the equipment fulfilling that role.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Clamp" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Clamp">
    <xs:annotation>
      <xs:documentation>A Clamp is a galvanic connection at a line segment where other equipment is connected. A Clamp
does not cut the line segment.</xs:documentation>
      <xs:documentation>A Clamp is ConductingEquipment and has one Terminal with an associated ConnectivityNode. Any
other ConductingEquipment can be connected to the Clamp ConnectivityNode.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
```

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          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="lengthFromTerminal1" type="m:Length" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Clamp.lengthFromTerminal1">
        <xs:annotation>
          <xs:documentation>The length to the place where the clamp is located starting from side one of the line segment, i.e. the line segment terminal with sequence number equal to 1.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.Assets">
        <xs:annotation>
          <xs:documentation>All assets represented by this power system resource. For example, multiple conductor assets are electrically modelled as a single AC line segment.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Terminals" type="m:Terminal" minOccurs="1" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ConductingEquipment.Terminals">
        <xs:annotation>
          <xs:documentation>Conducting equipment have terminals that may be connected to other conducting equipment terminals via connectivity nodes or topological nodes.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="ClearanceAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ClearanceAction">
    <xs:annotation>
      <xs:documentation>Action on clearance document as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:ClearanceActionKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ClearanceAction.kind">
            <xs:annotation>
              <xs:documentation>Clearance action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="Clearance" type="m:ClearanceDocument" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ClearanceAction.Clearance">
            <xs:annotation>
              <xs:documentation>Clearance associated with this clearance action.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:simpleType name="ClearanceActionKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ClearanceActionKind">
    <xs:annotation>
      <xs:documentation>Type of clearance action.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="issue">
        <xs:annotation>
          <xs:documentation>Issue clearance.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="release">
        <xs:annotation>
          <xs:documentation>Release clearance.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="update">
        <xs:annotation>
          <xs:documentation>Update clearance.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="ClearanceDocument" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ClearanceDocument">
    <xs:annotation>
```

```
      <xs:documentation>Safety document used to authorise work on conducting equipment in the field. Tagged equipment is not allowed to be operated.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SafetyDocument">
        <xs:sequence>
          <xs:element name="mustBeDeenergised" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ClearanceDocument.mustBeDeenergised">
            <xs:annotation>
              <xs:documentation>If true, the equipment must be deenergised.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="mustBeGrounded" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ClearanceDocument.mustBeGrounded">
            <xs:annotation>
              <xs:documentation>If true, the equipment must be grounded.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="TaggedPSRs" type="m:PowerSystemResource" minOccurs="1" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ClearanceDocument.TaggedPSRs">
            <xs:annotation>
              <xs:documentation>All power system resources tagged through this clearance.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="ConductingEquipment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ConductingEquipment">
    <xs:annotation>
      <xs:documentation>The parts of the AC power system that are designed to carry current or that are conductively connected through terminals.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:PowerSystemResource">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="ConnectivityNode" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ConnectivityNode">
    <xs:annotation>
      <xs:documentation>Connectivity nodes are points where terminals of AC conducting equipment are connected together with zero impedance.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="CrewMember" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CrewMember">
    <xs:annotation>
      <xs:documentation>Member of a crew.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:OperationPersonRole">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Cut" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Cut">
    <xs:annotation>
      <xs:documentation>A cut separates a line segment into two parts. The cut appears as a switch inserted between these two parts and connects them together. As the cut is normally open there is no galvanic connection between the two line segment parts. But it is possible to close the cut to get galvanic connection.</xs:documentation>
```

```
      <xs:documentation>The cut terminals are oriented towards the line segment terminals with the same sequence number. Hence the cut terminal with sequence number equal to 1 is oriented to the line segment's terminal with sequence number equal to 1.</xs:documentation>
      <xs:documentation>The cut terminals also act as connection points for jumpers and other equipment, e.g. a mobile generator. To enable this, connectivity nodes are placed at the cut terminals. Once the connectivity nodes are in place any conducting equipment can be connected at them.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="lengthFromTerminal1" type="m:Length" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Cut.lengthFromTerminal1">
        <xs:annotation>
          <xs:documentation>The length to the place where the cut is located starting from side one of the cut line segment, i.e. the line segment Terminal with sequenceNumber equal to 1.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="ACLineSegment" type="m:ACLineSegment" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Cut.ACLineSegment">
        <xs:annotation>
          <xs:documentation>The line segment to which the cut is applied.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.Assets">
        <xs:annotation>
          <xs:documentation>All assets represented by this power system resource. For example, multiple conductor assets are electrically modelled as a single AC line segment.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="SwitchPhase" type="m:SwitchPhase" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch.SwitchPhase">
        <xs:annotation>
          <xs:documentation>The individual switch phases for the switch.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Terminals" type="m:Terminal" minOccurs="1" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ConductingEquipment.Terminals">
        <xs:annotation>
          <xs:documentation>Conducting equipment have terminals that may be connected to other conducting equipment terminals via connectivity nodes or topological nodes.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="CutAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CutAction">
    <xs:annotation>
      <xs:documentation>Action on cut as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:TempEquipActionKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CutAction.kind">
            <xs:annotation>
              <xs:documentation>Switching action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="Cut" type="m:Cut" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CutAction.Cut">
            <xs:annotation>
              <xs:documentation>Cut on which this action is taken.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
```

```
  <xs:complexType name="ElectronicAddress" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ElectronicAddress">
    <xs:annotation>
      <xs:documentation>Electronic address information.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="web" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ElectronicAddress.web">
        <xs:annotation>
          <xs:documentation>World wide web address.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="EnergySource" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource">
    <xs:annotation>
      <xs:documentation>A generic equivalent for an energy supplier on a transmission or distribution voltage level.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.Assets">
        <xs:annotation>
          <xs:documentation>All assets represented by this power system resource. For example, multiple conductor assets are electrically modelled as a single AC line segment.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Terminals" type="m:Terminal" minOccurs="1" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ConductingEquipment.Terminals">
        <xs:annotation>
          <xs:documentation>Conducting equipment have terminals that may be connected to other conducting equipment terminals via connectivity nodes or topological nodes.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="EnergySourceAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySourceAction">
    <xs:annotation>
      <xs:documentation>Action on energy source as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:TempEquipActionKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySourceAction.kind">
            <xs:annotation>
              <xs:documentation>Switching action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="EnergySource" type="m:EnergySource" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySourceAction.EnergySource">
            <xs:annotation>
              <xs:documentation>Energy source on which this action is taken.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="FieldSafetySupervisor" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FieldSafetySupervisor">
    <xs:annotation>
      <xs:documentation>Crew member on work site responsible for all local safety measures for the work crew doing maintenance, construction and repair in a substation or on a power line/cable.</xs:documentation>
    </xs:annotation>
```

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    <xs:complexContent>
      <xs:extension base="m:CrewMember">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="GenericAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#GenericAction">
    <xs:annotation>
      <xs:documentation>An arbitrary switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Ground" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Ground">
    <xs:annotation>
      <xs:documentation>A point where the system is grounded used for connecting conducting equipment to ground. The power system model can have any number of grounds.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.Assets">
        <xs:annotation>
          <xs:documentation>All assets represented by this power system resource. For example, multiple conductor assets are electrically modelled as a single AC line segment.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Terminals" type="m:Terminal" minOccurs="1" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ConductingEquipment.Terminals">
        <xs:annotation>
          <xs:documentation>Conducting equipment have terminals that may be connected to other conducting equipment terminals via connectivity nodes or topological nodes.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="GroundAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#GroundAction">
    <xs:annotation>
      <xs:documentation>Action on ground as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:TempEquipActionKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#GroundAction.kind">
            <xs:annotation>
              <xs:documentation>Switching action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="AlongACLineSegment" type="m:ACLineSegment" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#GroundAction.AlongACLineSegment">
            <xs:annotation>
              <xs:documentation>The line segment that this ground action will affect. This is the only way to access relationship to clamp in case the ground needs to be placed along the line segment.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="Ground" type="m:Ground" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#GroundAction.Ground">
            <xs:annotation>
              <xs:documentation>Ground on which this action is taken.</xs:documentation>
            </xs:annotation>
          </xs:element>
```

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          <xs:element name="GroundedEquipment" type="m:ConductingEquipment" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#GroundAction.GroundedEquipment">
            <xs:annotation>
              <xs:documentation>Equipment being grounded with this operation. In case of placing a ground anywhere along a
line segment, you must use the clamp (to get the distance from one terminal), so use the explicit relation with line segment. In all
other cases (including placing the ground at a line segment terminal), reference to one or more conducting equipment is
sufficient.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Jumper" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Jumper">
    <xs:annotation>
      <xs:documentation>A short section of conductor with negligible impedance which can be manually removed and replaced
if the circuit is de-energized. Note that zero-impedance branches can potentially be modeled by other equipment
types.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.Assets">
        <xs:annotation>
          <xs:documentation>All assets represented by this power system resource. For example, multiple conductor assets
are electrically modelled as a single AC line segment.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="SwitchPhase" type="m:SwitchPhase" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch.SwitchPhase">
        <xs:annotation>
          <xs:documentation>The individual switch phases for the switch.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Terminals" type="m:Terminal" minOccurs="1" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ConductingEquipment.Terminals">
        <xs:annotation>
          <xs:documentation>Conducting equipment have terminals that may be connected to other conducting equipment
terminals via connectivity nodes or topological nodes.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="JumperAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#JumperAction">
    <xs:annotation>
      <xs:documentation>Action on jumper as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:TempEquipActionKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#JumperAction.kind">
            <xs:annotation>
              <xs:documentation>Switching action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="AlongACLineSegments" type="m:ACLineSegment" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#JumperAction.AlongACLineSegments">
            <xs:annotation>
              <xs:documentation>The line segment that this jumper action will affect. This is the only way to access relationship
to clamp in case the jumper needs to connect along the line segment.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="JumpedEquipments" type="m:ConductingEquipment" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#JumperAction.JumpedEquipments">
            <xs:annotation>
```

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            <xs:documentation>The conducting equipment that this jumper action will affect. In case of placing a jumper anywhere along a line segment, you must use the clamp (to get the distance from one terminal), so use the explicit relation with line segment. In all other cases (including placing the jumper at a line segment terminal), reference to one or more conducting equipment is sufficient.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Jumper" type="m:Jumper" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#JumperAction.Jumper">
          <xs:annotation>
            <xs:documentation>Jumper on which this action is taken.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
 </xs:complexType>
 <xs:complexType name="OperationPersonRole" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationPersonRole">
  <xs:annotation>
    <xs:documentation>Person role in the context of utility operations.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="Person" type="m:Person" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PersonRole.Person">
      <xs:annotation>
        <xs:documentation>Person having this role.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
 </xs:complexType>
 <xs:complexType name="OperationalTag" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag">
  <xs:annotation>
    <xs:documentation>Operational tag placed on a power system resource or asset in the context of switching plan execution or other work in the field.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
      <xs:annotation>
        <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
        <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="authorName" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.authorName">
      <xs:annotation>
        <xs:documentation>Name of the author of this document.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="createdDateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.createdDateTime">
      <xs:annotation>
        <xs:documentation>Date and time that this document was created.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
      <xs:annotation>
        <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="subject" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.subject">
      <xs:annotation>
        <xs:documentation>Document subject.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="Asset" type="m:Asset" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag.Asset">
      <xs:annotation>
        <xs:documentation>Asset on which this tag has been placed.</xs:documentation>
      </xs:annotation>
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      </xs:element>
      <xs:element name="PowerSystemResource" type="m:PowerSystemResource" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag.PowerSystemResource">
        <xs:annotation>
          <xs:documentation>Power system resource on which this tag has been placed.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.status">
        <xs:annotation>
          <xs:documentation>Status of subject matter (e.g., Agreement, Work) this document represents. For status of the
document itself, use 'docStatus' attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="OperationsSafetySupervisor" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-
cim17-dcim12#OperationsSafetySupervisor">
    <xs:annotation>
      <xs:documentation>Operator with responsibility that the work in high voltage installation is executed in a safe manner and
according to safety regulation.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Operator">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Operator" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Operator">
    <xs:annotation>
      <xs:documentation>Control room operator.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:OperationPersonRole">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Outage" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage">
    <xs:annotation>
      <xs:documentation>Document describing details of an active or planned outage in a part of the electrical
network.</xs:documentation>
      <xs:documentation>A non-planned outage may be created upon:</xs:documentation>
      <xs:documentation>- a breaker trip,</xs:documentation>
      <xs:documentation>- a fault indicator status change,</xs:documentation>
      <xs:documentation>- a meter event indicating customer outage,</xs:documentation>
      <xs:documentation>- a reception of one or more customer trouble calls, or</xs:documentation>
      <xs:documentation>- an operator command, reflecting information obtained from the field crew.</xs:documentation>
      <xs:documentation>Outage restoration may be performed using a switching plan which complements the outage
information with detailed switching activities, including the relationship to the crew and work.</xs:documentation>
      <xs:documentation>A planned outage may be created upon:</xs:documentation>
      <xs:documentation>- a request for service, maintenance or construction work in the field, or</xs:documentation>
      <xs:documentation>- an operator-defined outage for what-if/contingency network analysis.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Person" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Person">
    <xs:annotation>
      <xs:documentation>General purpose information for name and other information to contact people.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
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            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="PowerSystemResource" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource">
      <xs:annotation>
        <xs:documentation>A power system resource can be an item of equipment such as a switch, an equipment container containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power system resources can have measurements associated.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Assets" type="m:Asset" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.Assets">
          <xs:annotation>
            <xs:documentation>All assets represented by this power system resource. For example, multiple conductor assets are electrically modelled as a single AC line segment.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="SafetyDocument" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SafetyDocument">
      <xs:annotation>
        <xs:documentation>Document restricting or authorising works on electrical equipment (for example a permit to work, sanction for test, limitation of access, or certificate of isolation), defined based upon organisational practices.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="comment" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.comment">
          <xs:annotation>
            <xs:documentation>Free text comment.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="createdDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.createdDateTime">
          <xs:annotation>
            <xs:documentation>Date and time that this document was created.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
          <xs:annotation>
            <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="issuedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SafetyDocument.issuedDateTime">
          <xs:annotation>
            <xs:documentation>Date and time this safety document has been issued.</xs:documentation>
```

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        </xs:annotation>
      </xs:element>
      <xs:element name="lastModifiedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.lastModifiedDateTime">
        <xs:annotation>
          <xs:documentation>Date and time this document was last modified. Documents may potentially be modified many
times during their lifetime.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="releasedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SafetyDocument.releasedDateTime">
        <xs:annotation>
          <xs:documentation>Date and time this safety document has been released.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="type" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.type">
        <xs:annotation>
          <xs:documentation>Utility-specific classification of this document, according to its corporate standards, practices, and
existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="electronicAddress" type="m:ElectronicAddress" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.electronicAddress">
        <xs:annotation>
          <xs:documentation>Electronic address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="IssuedBySupervisor" type="m:OperationsSafetySupervisor" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SafetyDocument.IssuedBySupervisor">
        <xs:annotation>
          <xs:documentation>Supervisor that issued this safety document.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="IssuedToSupervisor" type="m:FieldSafetySupervisor" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SafetyDocument.IssuedToSupervisor">
        <xs:annotation>
          <xs:documentation>Supervisor to whom this safety document is issued.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="ReleasedBySupervisor" type="m:FieldSafetySupervisor" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SafetyDocument.ReleasedBySupervisor">
        <xs:annotation>
          <xs:documentation>Supervisor that released this safety document.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="ReleasedToSupervisor" type="m:OperationsSafetySupervisor" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SafetyDocument.ReleasedToSupervisor">
        <xs:annotation>
          <xs:documentation>Supervisor to which this safety document is released.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.status">
        <xs:annotation>
          <xs:documentation>Status of subject matter (e.g., Agreement, Work) this document represents. For status of the
document itself, use 'docStatus' attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="SinglePhaseKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#SinglePhaseKind">
    <xs:annotation>
      <xs:documentation>Enumeration of single phase identifiers. Allows designation of single phases for both transmission
and distribution equipment, circuits and loads.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="A">
        <xs:annotation>
```

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            <xs:documentation>Phase A.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="B">
          <xs:annotation>
            <xs:documentation>Phase B.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="C">
          <xs:annotation>
            <xs:documentation>Phase C.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="N">
          <xs:annotation>
            <xs:documentation>Neutral.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="s1">
          <xs:annotation>
            <xs:documentation>Secondary phase 1.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="s2">
          <xs:annotation>
            <xs:documentation>Secondary phase 2.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
      </xs:restriction>
    </xs:simpleType>
    <xs:complexType name="Status" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status">
      <xs:annotation>
        <xs:documentation>Current status information relevant to an entity.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="dateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.dateTime">
          <xs:annotation>
            <xs:documentation>Date and time for which status 'value' applies.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="reason" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.reason">
          <xs:annotation>
            <xs:documentation>Reason code or explanation for why an object went to the current status
'value'.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="remark" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.remark">
          <xs:annotation>
            <xs:documentation>Pertinent information regarding the current 'value', as free form text.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.value">
          <xs:annotation>
            <xs:documentation>Status value at 'dateTime'; prior status changes may have been kept in instances of activity
records associated with the object to which this status applies.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="Switch" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch">
      <xs:annotation>
        <xs:documentation>A generic device designed to close, or open, or both, one or more electric circuits. All switches are
two terminal devices including grounding switches.</xs:documentation>
      </xs:annotation>
      <xs:complexContent>
        <xs:extension base="m:ConductingEquipment">
          <xs:sequence>
            <xs:element name="SwitchPhase" type="m:SwitchPhase" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch.SwitchPhase">
              <xs:annotation>
                <xs:documentation>The individual switch phases for the switch.</xs:documentation>
              </xs:annotation>
            </xs:element>
```

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        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="SwitchAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchAction">
    <xs:annotation>
      <xs:documentation>Action on switch as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:SwitchActionKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchAction.kind">
            <xs:annotation>
              <xs:documentation>Switching action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="OperatedSwitch" type="m:Switch" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchAction.OperatedSwitch">
            <xs:annotation>
              <xs:documentation>Switch that is the object of this switch action.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:simpleType name="SwitchActionKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchActionKind">
    <xs:annotation>
      <xs:documentation>Kind of action on switch.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="close">
        <xs:annotation>
          <xs:documentation>Close the switch.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="disableReclosing">
        <xs:annotation>
          <xs:documentation>Disable (automatic) switch reclosing.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="enableReclosing">
        <xs:annotation>
          <xs:documentation>Enable (automatic) switch reclosing.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="open">
        <xs:annotation>
          <xs:documentation>Open the switch.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="SwitchPhase" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase">
    <xs:annotation>
      <xs:documentation>Single phase of a multi-phase switch when its attributes might be different per phase.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="phaseSide1" type="m:SinglePhaseKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.phaseSide1">
        <xs:annotation>
```

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          <xs:documentation>Phase of this SwitchPhase on the side with terminal sequence number equal 1. Should be a phase contained in that terminal&amp;rsquo;s phases attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="phaseSide2" type="m:SinglePhaseKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.phaseSide2">
        <xs:annotation>
          <xs:documentation>Phase of this SwitchPhase on the side with terminal sequence number equal 2. Should be a phase contained in that terminal&amp;rsquo;s Terminal.phases attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.Assets">
        <xs:annotation>
          <xs:documentation>All assets represented by this power system resource. For example, multiple conductor assets are electrically modelled as a single AC line segment.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="SwitchingPlan" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingPlan">
    <xs:annotation>
      <xs:documentation>A sequence of grouped or atomic steps intended to:</xs:documentation>
      <xs:documentation>- de-energise equipment or part of the network for safe work, and/or</xs:documentation>
      <xs:documentation>- bring back in service previously de-energised equipment or part of the network.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="authorName" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.authorName">
        <xs:annotation>
          <xs:documentation>Name of the author of this document.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="createdDateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.createdDateTime">
        <xs:annotation>
          <xs:documentation>Date and time that this document was created.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="purpose" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingPlan.purpose">
        <xs:annotation>
          <xs:documentation>Purpose of  this plan, such as whether it is to move the state from normal to some abnormal condition, or to restore the normal state after an abnormal condition, or to perform some kind of optimisation such as correction of overload, voltage control, etc.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="rank" type="xs:integer" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingPlan.rank">
        <xs:annotation>
          <xs:documentation>Ranking in comparison to other switching plans.</xs:documentation>
        </xs:annotation>
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      </xs:element>
      <xs:element name="ClearanceActions" type="m:ClearanceAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.ClearanceActions">
        <xs:annotation>
          <xs:documentation>All clearance action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="CutActions" type="m:CutAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.CutActions">
        <xs:annotation>
          <xs:documentation>All cut action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="EnergySourceActions" type="m:EnergySourceAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.EnergySourceActions">
        <xs:annotation>
          <xs:documentation>All energy source action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="GenericActions" type="m:GenericAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.GenericActions">
        <xs:annotation>
          <xs:documentation>All generic action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="GroundActions" type="m:GroundAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.GroundActions">
        <xs:annotation>
          <xs:documentation>All ground action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="JumperActions" type="m:JumperAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.JumperActions">
        <xs:annotation>
          <xs:documentation>All jumper action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Outage" type="m:Outage" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingPlan.Outage">
        <xs:annotation>
          <xs:documentation>Outage that will be activated or eliminated when this switching plan gets
executed.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="SafetyDocuments" type="m:SafetyDocument" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingPlan.SafetyDocuments">
        <xs:annotation>
          <xs:documentation>All safety documents applicable to this swtiching plan.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="SwitchActions" type="m:SwitchAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.SwitchActions">
        <xs:annotation>
          <xs:documentation>All switch action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="SwitchingStepGroups" type="m:SwitchingStepGroup" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingPlan.SwitchingStepGroups">
        <xs:annotation>
          <xs:documentation>All groups of switching steps within this switching plan.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="TagActions" type="m:TagAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.TagActions">
        <xs:annotation>
          <xs:documentation>All tag action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="SwitchingStep" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#SwitchingStep">
    <xs:annotation>
      <xs:documentation>Atomic switching step; can be part of a switching step group, or part of a switching
plan.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
```

```
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.description">
        <xs:annotation>
          <xs:documentation>Free text description of this activity.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="executedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.executedDateTime">
        <xs:annotation>
          <xs:documentation>Actual date and time of this switching step.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="isFreeSequence" type="xs:boolean" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.isFreeSequence">
        <xs:annotation>
          <xs:documentation>If true, the sequence number serves for presentation purposes only, and the activity itself may be
executed at any time.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="issuedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.issuedDateTime">
        <xs:annotation>
          <xs:documentation>Date and time when the crew was given the instruction to execute the action; not applicable if the
action is performed by operator remote control.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="plannedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.plannedDateTime">
        <xs:annotation>
          <xs:documentation>Planned date and time of this switching step.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="sequenceNumber" type="xs:integer" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.sequenceNumber">
        <xs:annotation>
          <xs:documentation>Order of this activity in the sequence of activities within the switching plan.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="CrewMember" type="m:CrewMember" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.CrewMember">
        <xs:annotation>
          <xs:documentation>Crew member responsible for this switching step.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Operator" type="m:Operator" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.Operator">
        <xs:annotation>
          <xs:documentation>Operator responsible for this switching step.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="SwitchingStepGroup" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#SwitchingStepGroup">
    <xs:annotation>
      <xs:documentation>A logical step, grouping atomic switching steps that are important to distinguish when they may
change topology (e.g. placing a jumper between two cuts).</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="isFreeSequence" type="xs:boolean" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.isFreeSequence">
        <xs:annotation>
          <xs:documentation>If true, the sequence number serves for presentation purposes only, and the activity itself may be
executed at any time.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="sequenceNumber" type="xs:integer" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.sequenceNumber">
        <xs:annotation>
          <xs:documentation>Order of this activity in the sequence of activities within the switching plan.</xs:documentation>
```

```
        </xs:annotation>
      </xs:element>
      <xs:element name="ClearanceActions" type="m:ClearanceAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.ClearanceActions">
        <xs:annotation>
          <xs:documentation>All clearance action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="CutActions" type="m:CutAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.CutActions">
        <xs:annotation>
          <xs:documentation>All cut action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="EnergySourceActions" type="m:EnergySourceAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.EnergySourceActions">
        <xs:annotation>
          <xs:documentation>All energy source action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="GenericActions" type="m:GenericAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.GenericActions">
        <xs:annotation>
          <xs:documentation>All generic action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="GroundActions" type="m:GroundAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.GroundActions">
        <xs:annotation>
          <xs:documentation>All ground action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="JumperActions" type="m:JumperAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.JumperActions">
        <xs:annotation>
          <xs:documentation>All jumper action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="SwitchActions" type="m:SwitchAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.SwitchActions">
        <xs:annotation>
          <xs:documentation>All switch action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="TagActions" type="m:TagAction" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup.TagActions">
        <xs:annotation>
          <xs:documentation>All tag action steps in this group.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="TagAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#TagAction">
    <xs:annotation>
      <xs:documentation>Action on operation tag as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:TagActionKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagAction.kind">
            <xs:annotation>
              <xs:documentation>Kind of tag action.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="OperationalTag" type="m:OperationalTag" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagAction.OperationalTag">
            <xs:annotation>
              <xs:documentation>Tag associated with this tag action.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
```

```
  <xs:simpleType name="TagActionKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagActionKind">
    <xs:annotation>
      <xs:documentation>Kind of action on tag.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="place">
        <xs:annotation>
          <xs:documentation>Place the tag.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="remove">
        <xs:annotation>
          <xs:documentation>Remove the tag.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="verify">
        <xs:annotation>
          <xs:documentation>Verify the tag.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="TempEquipActionKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TempEquipActionKind">
    <xs:annotation>
      <xs:documentation>Kind of action on temporary equipment (such as cut, jumper, ground, energy source).</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="place">
        <xs:annotation>
          <xs:documentation>Place the jumper (close) or the cut (open).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="remove">
        <xs:annotation>
          <xs:documentation>Remove the jumper (open) or the cut (close).</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="Terminal" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Terminal">
    <xs:annotation>
      <xs:documentation>An AC electrical connection point to a piece of conducting equipment. Terminals are connected at physical connection points called connectivity nodes.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="ConnectivityNode" type="m:ConnectivityNode" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Terminal.ConnectivityNode">
        <xs:annotation>
          <xs:documentation>The connectivity node to which this terminal connects with zero impedance.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="Length" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Length">
    <xs:annotation>
      <xs:documentation>Unit of length. Never negative.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:float"/>
  </xs:simpleType>
</xs:schema>
```

B.10 TemporaryNetworkChanges message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#" xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#" xmlns:m="http://iec.ch/TC57/2014/TemporaryNetworkChanges/2#" targetNamespace="http://iec.ch/TC57/2014/TemporaryNetworkChanges/2#" elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation/>
  <xs:element name="TemporaryNetworkChanges" type="m:TemporaryNetworkChanges"/>
  <xs:complexType name="TemporaryNetworkChanges">
```

```
    <xs:sequence>
      <xs:element name="Clamp" type="m:Clamp" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Cut" type="m:Cut" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="EnergySource" type="m:EnergySource" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Ground" type="m:Ground" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Jumper" type="m:Jumper" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="ACLineSegment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#ACLineSegment">
    <xs:annotation>
      <xs:documentation>A wire or combination of wires, with consistent electrical characteristics, building a single electrical
system, used to carry alternating current between points in the power system.</xs:documentation>
      <xs:documentation>For symmetrical, transposed 3ph lines, it is sufficient to use  attributes of the line segment, which
describe impedances and admittances for the entire length of the segment. Additionally impedances can be computed by using
length and associated per length impedances.</xs:documentation>
      <xs:documentation>The BaseVoltage at the two ends of ACLineSegments in a Line shall have the same
BaseVoltage.nominalVoltage. However, boundary lines  may have slightly different BaseVoltage.nominalVoltages and  variation
is allowed. Larger voltage difference in general requires use of an equivalent branch.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:PowerSystemResource">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Clamp" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Clamp">
    <xs:annotation>
      <xs:documentation>A Clamp is a galvanic connection at a line segment where other equipment is connected. A Clamp
does not cut the line segment.</xs:documentation>
      <xs:documentation>A Clamp is ConductingEquipment and has one Terminal with an associated ConnectivityNode. Any
other ConductingEquipment can be connected to the Clamp ConnectivityNode.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:ConductingEquipment">
        <xs:sequence>
          <xs:element name="lengthFromTerminal1" type="m:Length" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Clamp.lengthFromTerminal1">
            <xs:annotation>
              <xs:documentation>The length to the place where the clamp is located starting from side one of the line segment,
i.e. the line segment terminal with sequence number equal to 1.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="ACLineSegment" type="m:ACLineSegment" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Clamp.ACLineSegment">
            <xs:annotation>
              <xs:documentation>The line segment to which the clamp is connected.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="ConductingEquipment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#ConductingEquipment">
    <xs:annotation>
      <xs:documentation>The parts of the AC power system that are designed to carry current or that are conductively
connected through terminals.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:PowerSystemResource">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Cut" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Cut">
    <xs:annotation>
      <xs:documentation>A cut separates a line segment into two parts. The cut appears as a switch inserted between these
two parts and connects them together. As the cut is normally open there is no galvanic connection between the two line
segment parts. But it is possible to close the cut to get galvanic connection.</xs:documentation>
      <xs:documentation>The cut terminals are oriented towards the line segment terminals with the same sequence number.
Hence the cut terminal with sequence number equal to 1 is oriented to the line segment's terminal with sequence number equal
to 1.</xs:documentation>
      <xs:documentation>The cut terminals also act as connection points for jumpers and other equipment, e.g. a mobile
generator. To enable this, connectivity nodes are placed at the cut terminals. Once the connectivity nodes are in place any
conducting equipment can be connected at them.</xs:documentation>
    </xs:annotation>
```

```
    <xs:complexContent>
      <xs:extension base="m:Switch">
        <xs:sequence>
          <xs:element name="lengthFromTerminal1" type="m:Length" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Cut.lengthFromTerminal1">
            <xs:annotation>
              <xs:documentation>The length to the place where the cut is located starting from side one of the cut line segment,
i.e. the line segment Terminal with sequenceNumber equal to 1.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="open" type="xs:boolean" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch.open">
            <xs:annotation>
              <xs:documentation>The attribute tells if the switch is considered open when used as input to topology
processing.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="ACLineSegment" type="m:ACLineSegment" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Cut.ACLineSegment">
            <xs:annotation>
              <xs:documentation>The line segment to which the cut is applied.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="CutAction" type="m:CutAction" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Cut.CutAction">
            <xs:annotation>
              <xs:documentation>Action taken with this cut.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="CutAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#CutAction">
    <xs:annotation>
      <xs:documentation>Action on cut as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:TempEquipActionKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CutAction.kind">
            <xs:annotation>
              <xs:documentation>Switching action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="EnergySource" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#EnergySource">
    <xs:annotation>
      <xs:documentation>A generic equivalent for an energy supplier on a transmission or distribution voltage
level.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:ConductingEquipment">
        <xs:sequence>
          <xs:element name="activePower" type="m:ActivePower" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.activePower">
            <xs:annotation>
              <xs:documentation>High voltage source active injection. Load sign convention is used, i.e. positive sign means
flow out from a node.</xs:documentation>
              <xs:documentation>Starting value for steady state solutions.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="nominalVoltage" type="m:Voltage" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.nominalVoltage">
            <xs:annotation>
              <xs:documentation>Phase-to-phase nominal voltage.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="r" type="m:Resistance" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.r">
            <xs:annotation>
```

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            <xs:documentation>Positive sequence Thevenin resistance.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="r0" type="m:Resistance" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.r0">
          <xs:annotation>
            <xs:documentation>Zero sequence Thevenin resistance.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="reactivePower" type="m:ReactivePower" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.reactivePower">
          <xs:annotation>
            <xs:documentation>High voltage source reactive injection. Load sign convention is used, i.e. positive sign means
flow out from a node.</xs:documentation>
            <xs:documentation>Starting value for steady state solutions.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="rn" type="m:Resistance" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.rn">
          <xs:annotation>
            <xs:documentation>Negative sequence Thevenin resistance.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="voltageAngle" type="m:AngleRadians" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.voltageAngle">
          <xs:annotation>
            <xs:documentation>Phase angle of a-phase open circuit.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="voltageMagnitude" type="m:Voltage" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.voltageMagnitude">
          <xs:annotation>
            <xs:documentation>Phase-to-phase open circuit voltage magnitude.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="x" type="m:Reactance" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.x">
          <xs:annotation>
            <xs:documentation>Positive sequence Thevenin reactance.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="x0" type="m:Reactance" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.x0">
          <xs:annotation>
            <xs:documentation>Zero sequence Thevenin reactance.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="xn" type="m:Reactance" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.xn">
          <xs:annotation>
            <xs:documentation>Negative sequence Thevenin reactance.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="EnergySourceAction" type="m:EnergySourceAction" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySource.EnergySourceAction">
          <xs:annotation>
            <xs:documentation>Action taken with this energy source.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Terminals" type="m:Terminal" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ConductingEquipment.Terminals">
          <xs:annotation>
            <xs:documentation>Conducting equipment have terminals that may be connected to other conducting equipment
terminals via connectivity nodes or topological nodes.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
 </xs:complexType>
 <xs:complexType name="EnergySourceAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#EnergySourceAction">
  <xs:annotation>
   <xs:documentation>Action on energy source as a switching step.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
   <xs:extension base="m:SwitchingStep">
```

```
        <xs:sequence>
          <xs:element name="kind" type="m:TempEquipActionKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EnergySourceAction.kind">
            <xs:annotation>
              <xs:documentation>Switching action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Ground" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Ground">
    <xs:annotation>
      <xs:documentation>A point where the system is grounded used for connecting conducting equipment to ground. The
power system model can have any number of grounds.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:ConductingEquipment">
        <xs:sequence>
          <xs:element name="GroundAction" type="m:GroundAction" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Ground.GroundAction">
            <xs:annotation>
              <xs:documentation>Action taken with this ground.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="GroundAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#GroundAction">
    <xs:annotation>
      <xs:documentation>Action on ground as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:TempEquipActionKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#GroundAction.kind">
            <xs:annotation>
              <xs:documentation>Switching action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="GroundedEquipment" type="m:ConductingEquipment" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#GroundAction.GroundedEquipment">
            <xs:annotation>
              <xs:documentation>Equipment being grounded with this operation. In case of placing a ground anywhere along a
line segment, you must use the clamp (to get the distance from one terminal), so use the explicit relation with line segment. In all
other cases (including placing the ground at a line segment terminal), reference to one or more conducting equipment is
sufficient.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Jumper" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Jumper">
    <xs:annotation>
      <xs:documentation>A short section of conductor with negligible impedance which can be manually removed and replaced
if the circuit is de-energized. Note that zero-impedance branches can potentially be modeled by other equipment
types.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Switch">
        <xs:sequence>
          <xs:element name="JumperAction" type="m:JumperAction" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Jumper.JumperAction">
            <xs:annotation>
              <xs:documentation>Action taken with this jumper.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="JumperAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#JumperAction">
```

```
    <xs:annotation>
      <xs:documentation>Action on jumper as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:SwitchingStep">
        <xs:sequence>
          <xs:element name="kind" type="m:TempEquipActionKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#JumperAction.kind">
            <xs:annotation>
              <xs:documentation>Switching action to perform.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="JumpedEquipments" type="m:ConductingEquipment" minOccurs="1" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#JumperAction.JumpedEquipments">
            <xs:annotation>
              <xs:documentation>The conducting equipment that this jumper action will affect. In case of placing a jumper
anywhere along a line segment, you must use the clamp (to get the distance from one terminal), so use the explicit relation with
line segment. In all other cases (including placing the jumper at a line segment terminal), reference to one or more conducting
equipment is sufficient.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:simpleType name="PhaseCode" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#PhaseCode">
    <xs:annotation>
      <xs:documentation>An unordered enumeration of phase identifiers. Allows designation of phases for both transmission
and distribution equipment, circuits and loads.  The enumeration, by itself, does not describe how the phases are connected
together or connected to ground. Ground is not explicitly denoted as a phase.</xs:documentation>
      <xs:documentation>Residential and small commercial loads are often served from single-phase, or split-phase, secondary
circuits. For example of s12N, phases 1 and 2 refer to hot wires that are 180 degrees out of phase, while N refers to the neutral
wire. Through single-phase transformer connections, these secondary circuits may be served from one or two of the primary
phases A, B, and C. For three-phase loads, use the A, B, C phase codes instead of s12N.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="A">
        <xs:annotation>
          <xs:documentation>Phase A.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="AB">
        <xs:annotation>
          <xs:documentation>Phases A and B.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ABC">
        <xs:annotation>
          <xs:documentation>Phases A, B, and C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ABCN">
        <xs:annotation>
          <xs:documentation>Phases A, B, C, and N.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ABN">
        <xs:annotation>
          <xs:documentation>Phases A, B, and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="AC">
        <xs:annotation>
          <xs:documentation>Phases A and C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ACN">
        <xs:annotation>
          <xs:documentation>Phases A, C and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="AN">
        <xs:annotation>
          <xs:documentation>Phases A and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
```

```
      <xs:enumeration value="B">
        <xs:annotation>
          <xs:documentation>Phase B.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="BC">
        <xs:annotation>
          <xs:documentation>Phases B and C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="BCN">
        <xs:annotation>
          <xs:documentation>Phases B, C, and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="BN">
        <xs:annotation>
          <xs:documentation>Phases B and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="C">
        <xs:annotation>
          <xs:documentation>Phase C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="CN">
        <xs:annotation>
          <xs:documentation>Phases C and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="N">
        <xs:annotation>
          <xs:documentation>Neutral phase.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="none">
        <xs:annotation>
          <xs:documentation>No phases specified.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s1">
        <xs:annotation>
          <xs:documentation>Secondary phase 1.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s12">
        <xs:annotation>
          <xs:documentation>Secondary phase 1 and 2.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s12N">
        <xs:annotation>
          <xs:documentation>Secondary phases 1, 2, and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s1N">
        <xs:annotation>
          <xs:documentation>Secondary phase 1 and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s2">
        <xs:annotation>
          <xs:documentation>Secondary phase 2.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s2N">
        <xs:annotation>
          <xs:documentation>Secondary phase 2 and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="PowerSystemResource" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#PowerSystemResource">
    <xs:annotation>
```

```
        <xs:documentation>A power system resource can be an item of equipment such as a switch, an equipment container containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power system resources can have measurements associated.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:simpleType name="SinglePhaseKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SinglePhaseKind">
      <xs:annotation>
        <xs:documentation>Enumeration of single phase identifiers. Allows designation of single phases for both transmission and distribution equipment, circuits and loads.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:string">
        <xs:enumeration value="A">
          <xs:annotation>
            <xs:documentation>Phase A.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="B">
          <xs:annotation>
            <xs:documentation>Phase B.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="C">
          <xs:annotation>
            <xs:documentation>Phase C.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="N">
          <xs:annotation>
            <xs:documentation>Neutral.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="s1">
          <xs:annotation>
            <xs:documentation>Secondary phase 1.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="s2">
          <xs:annotation>
            <xs:documentation>Secondary phase 2.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
      </xs:restriction>
    </xs:simpleType>
    <xs:complexType name="Switch" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch">
      <xs:annotation>
        <xs:documentation>A generic device designed to close, or open, or both, one or more electric circuits. All switches are two terminal devices including grounding switches.</xs:documentation>
      </xs:annotation>
      <xs:complexContent>
        <xs:extension base="m:ConductingEquipment">
          <xs:sequence>
            <xs:element name="open" type="xs:boolean" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch.open">
              <xs:annotation>
                <xs:documentation>The attribute tells if the switch is considered open when used as input to topology processing.</xs:documentation>
              </xs:annotation>
            </xs:element>
            <xs:element name="SwitchPhase" type="m:SwitchPhase" minOccurs="1" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch.SwitchPhase">
              <xs:annotation>
                <xs:documentation>The individual switch phases for the switch.</xs:documentation>
              </xs:annotation>
            </xs:element>
```

```
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="SwitchPhase" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase">
    <xs:annotation>
      <xs:documentation>Single phase of a multi-phase switch when its attributes might be different per phase.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:PowerSystemResource">
        <xs:sequence>
          <xs:element name="closed" type="xs:boolean" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.closed">
            <xs:annotation>
              <xs:documentation>The attribute tells if the switch is considered closed when used as input to topology processing.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="phaseSide1" type="m:SinglePhaseKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.phaseSide1">
            <xs:annotation>
              <xs:documentation>Phase of this SwitchPhase on the side with terminal sequence number equal 1. Should be a phase contained in that terminal&amp;amp;rsquo;s phases attribute.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="phaseSide2" type="m:SinglePhaseKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.phaseSide2">
            <xs:annotation>
              <xs:documentation>Phase of this SwitchPhase on the side with terminal sequence number equal 2. Should be a phase contained in that terminal&amp;amp;rsquo;s Terminal.phases attribute.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="SwitchingStep" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep">
    <xs:annotation>
      <xs:documentation>Atomic switching step; can be part of a switching step group, or part of a switching plan.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.description">
        <xs:annotation>
          <xs:documentation>Free text description of this activity.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="executedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.executedDateTime">
        <xs:annotation>
          <xs:documentation>Actual date and time of this switching step.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="issuedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStep.issuedDateTime">
        <xs:annotation>
          <xs:documentation>Date and time when the crew was given the instruction to execute the action; not applicable if the action is performed by operator remote control.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="TempEquipActionKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TempEquipActionKind">
    <xs:annotation>
      <xs:documentation>Kind of action on temporary equipment (such as cut, jumper, ground, energy source).</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="place">
        <xs:annotation>
          <xs:documentation>Place the jumper (close) or the cut (open).</xs:documentation>
        </xs:annotation>
```

```
        </xs:enumeration>
        <xs:enumeration value="remove">
          <xs:annotation>
            <xs:documentation>Remove the jumper (open) or the cut (close).</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
      </xs:restriction>
    </xs:simpleType>
    <xs:complexType name="Terminal" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Terminal">
      <xs:annotation>
        <xs:documentation>An AC electrical connection point to a piece of conducting equipment. Terminals are connected at
physical connection points called connectivity nodes.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="phases" type="m:PhaseCode" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Terminal.phases">
          <xs:annotation>
            <xs:documentation>Represents the normal network phasing condition.</xs:documentation>
            <xs:documentation>If the attribute is missing three phases (ABC or ABCN) shall be assumed.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:simpleType name="ReactivePower" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#ReactivePower">
      <xs:annotation>
        <xs:documentation>Product of RMS value of the voltage and the RMS value of the quadrature component of the
current.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
    <xs:simpleType name="Voltage" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Voltage">
      <xs:annotation>
        <xs:documentation>Electrical voltage, can be both AC and DC.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
    <xs:simpleType name="Resistance" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Resistance">
      <xs:annotation>
        <xs:documentation>Resistance (real part of impedance).</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
    <xs:simpleType name="ActivePower" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#ActivePower">
      <xs:annotation>
        <xs:documentation>Product of RMS value of the voltage and the RMS value of the in-phase component of the
current.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
    <xs:simpleType name="Length" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Length">
      <xs:annotation>
        <xs:documentation>Unit of length. Never negative.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
    <xs:simpleType name="Reactance" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Reactance">
      <xs:annotation>
        <xs:documentation>Reactance (imaginary part of impedance), at rated frequency.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
    <xs:simpleType name="AngleRadians" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#AngleRadians">
      <xs:annotation>
        <xs:documentation>Phase angle in radians.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
</xs:schema>
```

B.11 TroubleOrders message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/TroubleOrders/2#" targetNamespace="http://iec.ch/TC57/2014/TroubleOrders/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation/>
  <xs:element name="TroubleOrders" type="m:TroubleOrders"/>
  <xs:complexType name="TroubleOrders">
    <xs:sequence>
      <xs:element name="CoordinateSystem" type="m:CoordinateSystem" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Incident" type="m:Incident" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="WorkLocation" type="m:WorkLocation" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Asset" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset">
    <xs:annotation>
      <xs:documentation>Tangible resource of the utility, including power system equipment, various end devices, cabinets,
buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its
subclasses, defined mainly in the Wires model (refer to IEC61970-301 and model package IEC61970::Wires). Asset description
places emphasis on the physical characteristics of the equipment fulfilling that role.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="CoordinateSystem" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#CoordinateSystem">
    <xs:annotation>
      <xs:documentation>Coordinate reference system.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="crsUrn" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CoordinateSystem.crsUrn">
        <xs:annotation>
          <xs:documentation>A Uniform Resource Name (URN) for the coordinate reference system (crs) used to define
'Location.PositionPoints'.</xs:documentation>
          <xs:documentation>An example would be the European Petroleum Survey Group (EPSG) code for a coordinate
reference system, defined in URN under the Open Geospatial Consortium (OGC) namespace as:
urn:ogc:def:uom:EPSG::XXXX, where XXXX is an EPSG code (a full list of codes can be found at the EPSG Registry web site
http://www.epsg-registry.org/). To define the coordinate system as being WGS84 (latitude, longitude) using an EPSG OGC, this
attribute would be urn:ogc:def:uom:EPSG::4236.</xs:documentation>
          <xs:documentation>A profile should limit this code to a set of allowed URNs agreed to by all sending and receiving
parties.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Incident" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident">
```

```
    <xs:annotation>
      <xs:documentation>Description of a problem in the field that may be reported in a trouble ticket or come from another source. It may have to do with an outage.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="PositionPoint" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint">
    <xs:annotation>
      <xs:documentation>Set of spatial coordinates that determine a point, defined in the coordinate system specified in 'Location.CoordinateSystem'. Use a single position point instance to desribe a point-oriented location. Use a sequence of position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of an object (like a substation or a geographical zone – in this case, have first and last position point with the same values).</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="sequenceNumber" type="xs:integer" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.sequenceNumber">
        <xs:annotation>
          <xs:documentation>Zero-relative sequence number of this point within a series of points.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="xPosition" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.xPosition">
        <xs:annotation>
          <xs:documentation>X axis position.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="yPosition" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.yPosition">
        <xs:annotation>
          <xs:documentation>Y axis position.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="zPosition" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.zPosition">
        <xs:annotation>
          <xs:documentation>(if applicable) Z axis position.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Status" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status">
    <xs:annotation>
      <xs:documentation>Current status information relevant to an entity.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="dateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.dateTime">
        <xs:annotation>
          <xs:documentation>Date and time for which status 'value' applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="reason" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.reason">
        <xs:annotation>
          <xs:documentation>Reason code or explanation for why an object went to the current status 'value'.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="remark" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.remark">
        <xs:annotation>
          <xs:documentation>Pertinent information regarding the current 'value', as free form text.</xs:documentation>
        </xs:annotation>
      </xs:element>
```

```
        <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.value">
          <xs:annotation>
            <xs:documentation>Status value at 'dateTime'; prior status changes may have been kept in instances of activity
records associated with the object to which this status applies.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="StreetAddress" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StreetAddress">
      <xs:annotation>
        <xs:documentation>General purpose street and postal address information.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="poBox" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.poBox">
          <xs:annotation>
            <xs:documentation>Post office box.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="postalCode" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.postalCode">
          <xs:annotation>
            <xs:documentation>Postal code for the address.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.status">
          <xs:annotation>
            <xs:documentation>Status of this address.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="streetDetail" type="m:StreetDetail" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.streetDetail">
          <xs:annotation>
            <xs:documentation>Street detail.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="townDetail" type="m:TownDetail" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.townDetail">
          <xs:annotation>
            <xs:documentation>Town detail.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="StreetDetail" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StreetDetail">
      <xs:annotation>
        <xs:documentation>Street details, in the context of address.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="addressGeneral" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral">
          <xs:annotation>
            <xs:documentation>First line of a free form address or some additional address information (for example a mail
stop).</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="addressGeneral2" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral2">
          <xs:annotation>
            <xs:documentation>(if applicable) Second line of a free form address.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="addressGeneral3" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral3">
          <xs:annotation>
            <xs:documentation>(if applicable) Third line of a free form address.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="buildingName" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.buildingName">
          <xs:annotation>
```

```
            <xs:documentation>(if applicable) In certain cases the physical location of the place of interest does not have a direct point of entry from the street, but may be located inside a larger structure such as a building, complex, office block, apartment, etc.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="code" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.code">
          <xs:annotation>
            <xs:documentation>(if applicable) Utilities often make use of external reference systems, such as those of the town-planner's department or surveyor general's mapping system, that allocate global reference codes to streets.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.name">
          <xs:annotation>
            <xs:documentation>Name of the street.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="number" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.number">
          <xs:annotation>
            <xs:documentation>Designator of the specific location on the street.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="prefix" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.prefix">
          <xs:annotation>
            <xs:documentation>Prefix to the street name. For example: North, South, East, West.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="suffix" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.suffix">
          <xs:annotation>
            <xs:documentation>Suffix to the street name. For example: North, South, East, West.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="suiteNumber" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.suiteNumber">
          <xs:annotation>
            <xs:documentation>Number of the apartment or suite.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="type" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.type">
          <xs:annotation>
            <xs:documentation>Type of street. Examples include: street, circle, boulevard, avenue, road, drive, etc.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="withinTownLimits" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.withinTownLimits">
          <xs:annotation>
            <xs:documentation>True if this street is within the legal geographical boundaries of the specified town (default).</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="TownDetail" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail">
      <xs:annotation>
        <xs:documentation>Town details, in the context of address.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="code" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.code">
          <xs:annotation>
            <xs:documentation>Town code.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="country" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.country">
          <xs:annotation>
            <xs:documentation>Name of the country.</xs:documentation>
          </xs:annotation>
        </xs:element>
```

```
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.name">
        <xs:annotation>
          <xs:documentation>Town name.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="section" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.section">
        <xs:annotation>
          <xs:documentation>Town section. For example, it is common for there to be 36 sections per
township.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="stateOrProvince" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.stateOrProvince">
        <xs:annotation>
          <xs:documentation>Name of the state or province.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="WorkLocation" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#WorkLocation">
    <xs:annotation>
      <xs:documentation>Information about a particular location for various forms of work.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="direction" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.direction">
        <xs:annotation>
          <xs:documentation>(if applicable) Direction that allows field crews to quickly find a given asset. For a given location,
such as a street address, this is the relative direction in which to find the asset. For example, a streetlight may be located at the
'NW' (northwest) corner of the customer's site, or a usage point may be located on the second floor of an apartment
building.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="1" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.Assets">
        <xs:annotation>
          <xs:documentation>All assets at this location.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="CoordinateSystem" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.CoordinateSystem">
        <xs:annotation>
          <xs:documentation>Coordinate system used to describe position points of this location.</xs:documentation>
        </xs:annotation>
        <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CoordinateSystem">
          <xs:attribute name="ref" type="xs:string"/>
        </xs:complexType>
      </xs:element>
      <xs:element name="mainAddress" type="m:StreetAddress" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.mainAddress">
        <xs:annotation>
          <xs:documentation>Main address of the location.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="PositionPoints" type="m:PositionPoint" minOccurs="1" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.PositionPoints">
        <xs:annotation>
          <xs:documentation>Sequence of position points describing this location, expressed in coordinate system
'Location.CoordinateSystem'.</xs:documentation>
        </xs:annotation>
```

```
        </xs:element>
        <xs:element name="secondaryAddress" type="m:StreetAddress" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.secondaryAddress">
          <xs:annotation>
            <xs:documentation>Secondary address of the location. For example, PO Box address may have different ZIP code
than that in the 'mainAddress'.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
</xs:schema>
```

TroubleTickets message payload

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/TroubleTickets/2#" targetNamespace="http://iec.ch/TC57/2014/TroubleTickets/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="TroubleTickets" type="m:TroubleTickets"/>
  <xs:complexType name="TroubleTickets">
    <xs:sequence>
      <xs:element name="TroubleTicket" type="m:TroubleTicket" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Customer" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Customer">
    <xs:annotation>
      <xs:documentation>Organisation receiving services from service supplier.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="CustomerNotification" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#CustomerNotification">
    <xs:annotation>
      <xs:documentation>Conditions for notifying the customer about the changes in the status of their service (e.g., outage
restore, estimated restoration time, tariff or service level change, etc.)</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="contactType" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.contactType">
        <xs:annotation>
          <xs:documentation>Type of contact (e.g., phone, email, etc.).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="contactValue" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.contactValue">
        <xs:annotation>
          <xs:documentation>Value of contact type (e.g., phone number, email address, etc.).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="earliestDateTimeToCall" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.earliestDateTimeToCall">
        <xs:annotation>
          <xs:documentation>Earliest date time to call the customer.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="latestDateTimeToCall" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.latestDateTimeToCall">
        <xs:annotation>
          <xs:documentation>Latest date time to call the customer.</xs:documentation>
        </xs:annotation>
      </xs:element>
```

```
      <xs:element name="trigger" type="m:NotificationTriggerKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.trigger">
        <xs:annotation>
          <xs:documentation>Trigger for this notification.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Incident" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident">
    <xs:annotation>
      <xs:documentation>Description of a problem in the field that may be reported in a trouble ticket or come from another
source. It may have to do with an outage.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
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        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="IncidentHazard" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#IncidentHazard">
    <xs:annotation>
      <xs:documentation>Hazardous situation associated with an incident. Examples are line down, gas leak, fire,
etc.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID,  as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
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      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
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        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Hazard.status">
        <xs:annotation>
          <xs:documentation>Status of this hazard.</xs:documentation>
        </xs:annotation>
      </xs:element>
```

```
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="NotificationTriggerKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NotificationTriggerKind">
    <xs:annotation>
      <xs:documentation>Kind of trigger to notify customer.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="etrChange">
        <xs:annotation>
          <xs:documentation>Notify customer if estimated restoration time changes.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="informDispatched">
        <xs:annotation>
          <xs:documentation>Notify customer that a crew has been dispatched to investigate the problem.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="initialEtr">
        <xs:annotation>
          <xs:documentation>Notify customer for the first time that estimated restoration time is available.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="powerOut">
        <xs:annotation>
          <xs:documentation>Notify customer of planned outage.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="powerRestored">
        <xs:annotation>
          <xs:documentation>Notify customer when power has been restored.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="Status" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status">
    <xs:annotation>
      <xs:documentation>Current status information relevant to an entity.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="dateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.dateTime">
        <xs:annotation>
          <xs:documentation>Date and time for which status 'value' applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="reason" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.reason">
        <xs:annotation>
          <xs:documentation>Reason code or explanation for why an object went to the current status 'value'.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="remark" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.remark">
        <xs:annotation>
          <xs:documentation>Pertinent information regarding the current 'value', as free form text.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.value">
        <xs:annotation>
          <xs:documentation>Status value at 'dateTime'; prior status changes may have been kept in instances of activity records associated with the object to which this status applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="TroubleReportingKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TroubleReportingKind">
    <xs:annotation>
      <xs:documentation>Kind of trouble reporting.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="call">
        <xs:annotation>
          <xs:documentation>Trouble call received by customer service representative.</xs:documentation>
```

```
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="email">
        <xs:annotation>
          <xs:documentation>Trouble reported by email.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ivr">
        <xs:annotation>
          <xs:documentation>Trouble reported through interactive voice response system.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="letter">
        <xs:annotation>
          <xs:documentation>Trouble reported by letter.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="other">
        <xs:annotation>
          <xs:documentation>Trouble reported by other means.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="TroubleTicket" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#TroubleTicket">
    <xs:annotation/>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="authorName" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.authorName">
        <xs:annotation>
          <xs:documentation>Name of the author of this document.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="dateTimeOfReport" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TroubleTicket.dateTimeOfReport">
        <xs:annotation>
          <xs:documentation>Date and time the trouble has been reported.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="firstResponder" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TroubleTicket.firstResponder">
        <xs:annotation>
          <xs:documentation>A first responder on site such as police, fire department etc.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="reportingKind" type="m:TroubleReportingKind" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TroubleTicket.reportingKind">
        <xs:annotation>
          <xs:documentation>Indicates how the customer reported trouble.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="resolvedDateTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TroubleTicket.resolvedDateTime">
        <xs:annotation>
          <xs:documentation>Date and time this trouble ticket has been resolved.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="troubleCode" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TroubleTicket.troubleCode">
```

```
        <xs:annotation>
          <xs:documentation>Trouble code (e.g., power down, flickering lights, partial power, etc).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Customer" type="m:Customer" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TroubleTicket.Customer">
        <xs:annotation>
          <xs:documentation>Customer for whom this trouble ticket is relevant.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Hazards" type="m:IncidentHazard" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TroubleTicket.Hazards">
        <xs:annotation>
          <xs:documentation>All hazards reported with this trouble ticket.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Notification" type="m:CustomerNotification" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TroubleTicket.Notification">
        <xs:annotation>
          <xs:documentation>Notification for this trouble ticket.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:schema>
```

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

_____

INTÉGRATION D'APPLICATIONS POUR LES SERVICES ÉLECTRIQUES – INTERFACES SYSTÈME POUR LA GESTION DE LA DISTRIBUTION –

Partie 3: Interface pour l'exploitation du réseau

AVANT-PROPOS

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Le texte de cette Norme est issu des documents suivants:

FDIS	Rapport de vote
57/1810/FDIS	57/1841/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Cette deuxième édition annule et remplace la première édition, parue en 2004. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) Liste de mesures remplacée par Mesurage et Commandes.
b) OperationalRestriction remplacé par Tag.
c) OutageRecord remplacé par Outage.
d) SafetyDocument remplacé par ClearanceDocument.
e) SwitchingSchedule remplacé par SwitchingOrder.
f) SwitchingPlan ajouté.
g) Temporary Network Change ajouté.
h) TroubleTicket ajouté.
i) Incident ajouté.
j) TroubleOrder ajouté.
k) Cas d'utilisation et diagrammes de séquence ajoutés.

Dans cette norme, les caractères d'imprimerie suivants sont utilisés:

– **jetons: en arial black**

Une liste de toutes les parties de la série IEC 61968, publiées sous le titre général: *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de la distribution* peut être consultée sur le site Web de l'IEC.

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INTRODUCTION

La présente partie de l'IEC 61968 a pour objet de définir une norme relative à l'intégration de systèmes d'exploitation du réseau les uns avec les autres et avec d'autres systèmes, ainsi que les fonctions métier relevant du domaine d'application de l'IEC 61968. Les détails particuliers des protocoles de communication utilisés par ces systèmes sont hors du domaine d'application de la présente partie de l'IEC 61968. La présente partie de l'IEC 61968 prend en considération et modélise plutôt les capacités générales que peuvent potentiellement fournir des systèmes d'exploitation du réseau. Ainsi, la spécification, le développement et/ou le déploiement de la génération suivante de systèmes d'exploitation du réseau n'auront aucune incidence sur la présente partie de l'IEC 61968, tant par l'utilisation de normes que par celle de moyens propriétaires.

La série de normes IEC 61968 est prévue pour faciliter l'intégration interapplications, par opposition à l'intégration intra-applications. L'intégration intra-applications concerne l'interrelation de programmes au sein d'un même système, qui communiquent généralement au moyen de logiciels intermédiaires (intergiciels) intégrés dans leur environnement d'exécution sous-jacent et tendent à être optimisés dans le cadre de connexions proches, en temps réel et synchrones, et des interrogations/réponses interactives ou des modèles de communication conversationnels. Par conséquent, ces normes d'interfaces interapplications sont appropriées pour les applications faiblement couplées avec une plus grande hétérogénéité dans le langage, les systèmes d'exploitation, les protocoles et les outils de gestion. Cette série de normes est prévue pour supporter des applications qui nécessitent l'échange de données toutes les secondes, minutes ou heures, plutôt que d'attendre un traitement de nuit par lot. Cette série de normes, qui est destinée à être mise en œuvre avec des services de logiciels intermédiaires, qui échangent des messages parmi des applications, complétera, mais ne remplacera pas les centrales de données de l'entreprise de distribution, les passerelles de base de données et les archives opérationnelles.

Au sens de l'IEC 61968, un Système de Gestion de la Distribution (DMS – Distribution Management System) se compose de divers composants d'application distribués permettant à l'entreprise de distribution de gérer les réseaux de distribution électriques. Ces possibilités incluent la surveillance et la commande des équipements de fourniture d'énergie, les processus de gestion qui assurent la fiabilité du système, la gestion de la tension électrique, la gestion de la demande collatérale, la gestion des interruptions de service, la gestion des travaux, la cartographie automatisée et la gestion des équipements. Des interfaces normalisées sont définies pour chaque classe d'applications identifiée dans le Modèle d'Interface de Référence (IRM – Interface Reference Model), qui est décrit dans l'IEC 61968-1.

INTÉGRATION D'APPLICATIONS POUR LES SERVICES ÉLECTRIQUES – INTERFACES SYSTÈME POUR LA GESTION DE LA DISTRIBUTION –

Partie 3: Interface pour l'exploitation du réseau

1 Domaine d'application

Conformément à l'IEC 61968 Modèle d'Interface de Référence, la Fonction d'exploitation du réseau définie dans la présente partie de l'IEC 61968 donne aux entreprises de distribution les moyens de surveiller la topologie de poste principale (état de disjoncteur et d'organe de coupure) et le statut d'équipement de commande. Elle fournit également les moyens pour gérer l'état de charge et de connectivité du réseau. Enfin, elle rend possible la localisation des plaintes téléphoniques des clients et la surveillance de la localisation des équipes de terrain.

L'IEC 61968-3 spécifie le contenu d'informations d'un ensemble de charges utiles de messages qui peuvent être utilisées pour prendre en charge la plupart des fonctions métier liées à l'exploitation du réseau. Les utilisations classiques des charges utiles de messages définies dans l'IEC 61968-3 incluent l'acquisition de données par des systèmes externes, l'isolement du défaut, le traitement des pannes, la gestion des dysfonctionnements, la maintenance des installations et la mise en service des installations.

Le diagramme de la Figure 1 représente la possibilité de mise en œuvre de la fonctionnalité de l'IEC 61968-3 soit comme un seul système de gestion de la distribution avancé intégré, soit comme un ensemble de fonctions distinctes (OMS, DMS et SCADA). Les entreprises de distribution peuvent choisir d'acheter ces systèmes auprès de différents fournisseurs et de les intégrer à l'aide des messages de l'IEC 61968-3. D'autre part, un seul fournisseur peut fournir au moins deux de ces composants dans un seul système intégré. Si plusieurs systèmes sont fournis par le même fournisseur, ce dernier peut choisir d'utiliser soit des extensions des messages de l'IEC 61968-3 soit un mécanisme d'intégration propriétaire pour améliorer la fonctionnalité par rapport à ce que la spécification de l'IEC 61968-3 exige/prend en charge.

Une autre partie de l'IEC 61968 présentera des scénarii d'intégration ou des cas d'utilisation, afin de représenter les différents moyens d'utiliser les charges utiles de messages définies dans le présent document, ainsi que les charges utiles de messages à définir dans d'autres parties de la série IEC 61968.

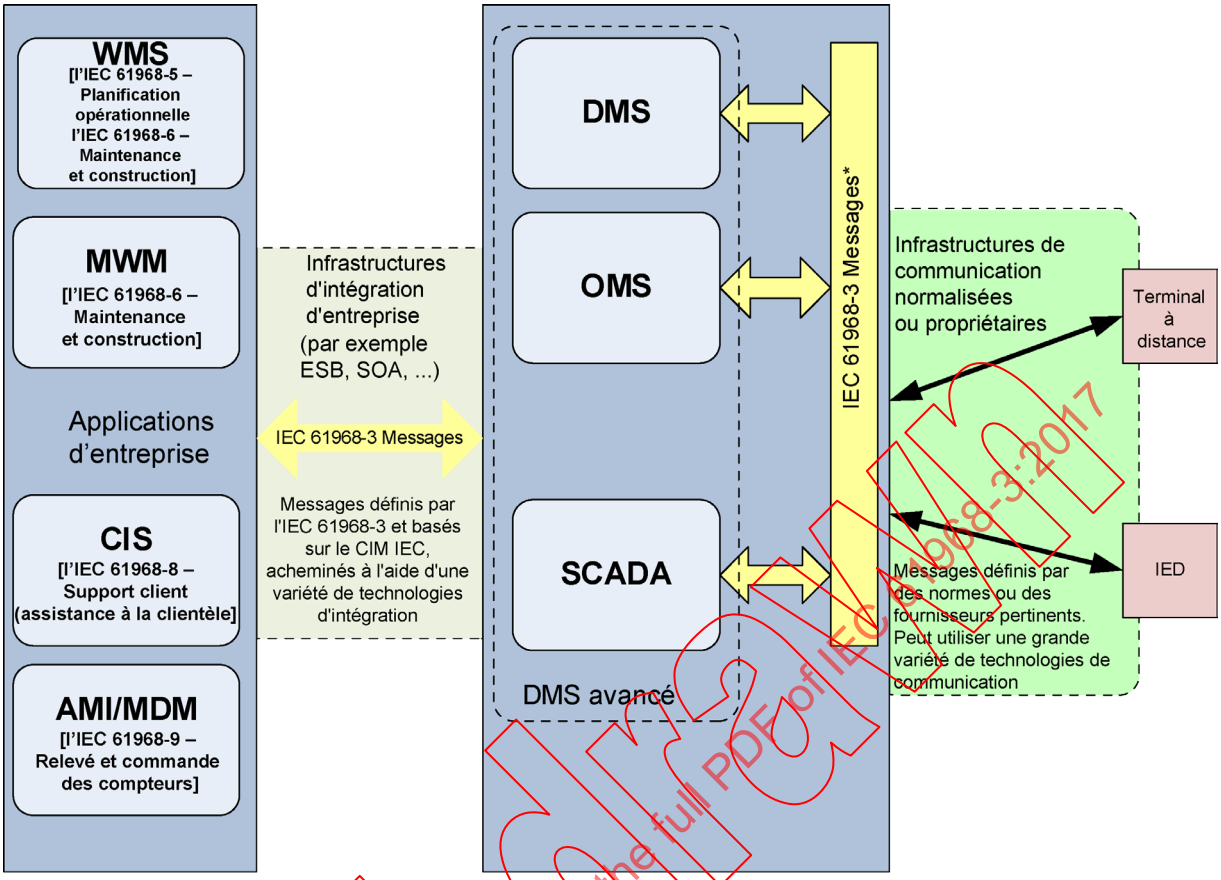


Figure 1 – Domaine d'application de l'IEC 61968-3

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 61968-1, *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de distribution – Partie 1: Architecture des interfaces et recommandations générales*

IEC TS 61968-2, *Application integration at electric utilities – System interfaces for distribution management – Part 2: Glossary* (disponible en anglais seulement)

IEC 61968-100, *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de distribution – Partie 100: Profils de mise en œuvre*

IEC 61970-301, *Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Partie 301: Base de modèle d'information commun (CIM)*

3 Termes, définitions et termes abrégés

3.1 Termes et définitions

Aucun terme n'est défini dans le présent document.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

3.2 Termes abbrégés

Pour les besoins du présent document, les abréviations données dans l'IEC 61968-2, ainsi que les suivantes, s'appliquent.

NOTE Voir le Vocabulaire électrotechnique international, IEC 60050, pour les définitions générales du glossaire.

FLISR Fault Location, Isolation and Service Restoration (Localisation de défaut, isolement et restauration de services)

WMS Work Management System (Système de gestion des travaux)

4 Modèles de référence et d'informations

4.1 Approche générale de l'exploitation du réseau

Traditionnellement, il existe deux types de systèmes de gestion des opérations de distribution: les systèmes de gestion de la distribution (DMS) et les systèmes de gestion des interruptions (OMS). La plupart du temps, un DMS fait office d'extension d'un système SCADA, mais certains DMS peuvent être un ensemble autonome d'applications de distribution sans SCADA.

Les systèmes de gestion des interruptions sont très largement utilisés dans le monde entier (souvent dans des territoires de service étendus et avec une grande quantité de conducteurs aériens primaires) pour gérer leurs systèmes de distribution. Ces systèmes de distribution sont généralement configurés de manière radiale et couvrent des distances importantes. C'est la raison pour laquelle la surveillance de l'état du système de distribution s'est révélée historiquement onéreuse, particulièrement à l'extérieur du poste. Dans les populations plus denses, les coûts liés à la télémétrie et à l'automatisation sont inférieurs et peuvent être justifiés sur une base coût/client.

Par conséquent, une entreprise de distribution n'est souvent avertie d'un problème avec le système que lorsqu'un client appelle pour signaler une interruption. L'entreprise collecte ensuite un ensemble d'appels sur panne, et selon les appels reçus, détermine l'emplacement probable et la cause de l'interruption. Une équipe est alors envoyée sur place pour procéder à une enquête approfondie et aux réparations.

Les systèmes de gestion de la distribution trouvent leur origine dans les systèmes SCADA de transmission. L'automatisation s'étant déplacée vers le bas et dans les postes de distribution, le besoin d'assurer la fonctionnalité des applications de distribution s'est intensifié. Les systèmes de gestion de la distribution se sont étendus au système SCADA de transmission existant, en ajoutant des points pour couvrir les disjoncteurs d'alimentation ou en ajoutant un système SCADA de distribution autonome. En général, ces deux types de systèmes sont équipés de terminaux à distance (RTU), de systèmes frontaux de communication, de systèmes d'alarme et d'écrans.

Ces systèmes de gestion de la distribution se caractérisent comme tels par la possibilité qu'ils offrent d'ajouter des fonctions (la possibilité d'ajouter des dispositifs temporaires, comme des

séparations de ligne et des lignes de raccordement. Ces dispositifs temporaires sont rarement utilisés dans les systèmes de transmission, mais le sont très fréquemment dans les systèmes de distribution. La plupart des systèmes de distribution fonctionnant dans le cadre d'une configuration radiale, il est souvent nécessaire d'utiliser des commutateurs de ligne d'alimentation pour reconfigurer les lignes d'alimentation, soit pour assurer la restauration après interruption soit pour s'adapter à différentes situations de charge. Cela impose d'être en mesure de colorier les lignes de manière dynamique selon la direction dans laquelle elles sont alimentées, mais également de les colorier selon qu'elles sont alimentées ou pas. De plus, dans certaines régions du monde, ces systèmes peuvent être asymétriques, ce qui implique que chaque phase électrique fonctionne de manière indépendante. Autre caractéristique d'un système de distribution: la modification est la norme. Les nouvelles constructions résidentielles et l'entretien courant impliquent de modifier fréquemment le modèle de réseau. Il n'est pas inhabituel de constater 10 000, voire 100 000 modifications par semaine dans un seul système de distribution.

Le DMS et l'OMS ont en commun d'avoir tous deux besoin d'un modèle de réseau en fonctionnement quasiment en temps réel. Par conséquent, la présente partie de l'IEC 61968 inclut l'aptitude à échanger des modèles de réseau de distribution entre ces deux types de systèmes et à les maintenir synchronisés. Les fournisseurs comprennent de plus en plus que cette intégration n'est pas sans importance pour la mise en œuvre et l'entretien, et proposent donc des systèmes DMS/OMS intégrés (voire des systèmes DMS/OMS/SCADA intégrés) afin de réduire le coût total de propriété et avoir une vision cohérente du réseau de distribution en temps réel. Le terme ADMS (Advanced Distribution Management System – système de gestion de la distribution avancé) a été choisi pour décrire ces systèmes.

4.2 Modèle de référence

La Figure 2 sert de modèle de référence et donne des exemples de composants logiques et de flux de données liés à la présente Norme internationale. L'Article 3 fait référence aux termes définis par le CIM.

Le diagramme de la Figure 2 décrit les flux entre les composants du modèle de référence.

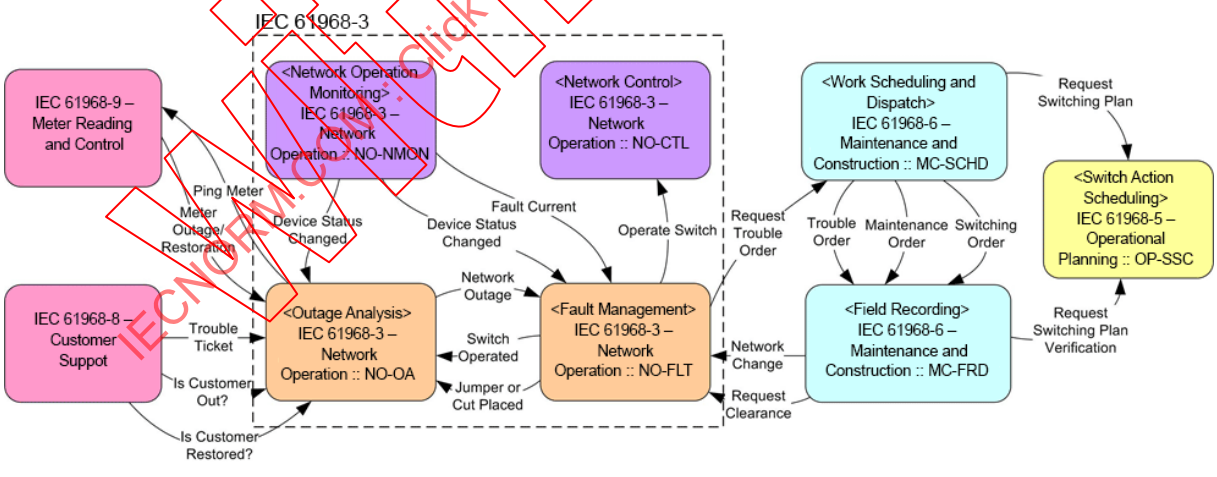


Figure 2 – Modèle de référence de l'IEC 61968-3

L'architecture de référence présente cinq principaux composants logiques (potentiellement réalisés en systèmes ou sous-systèmes) liés à l'exploitation du réseau:

IEC 61968-9, *Relevé et commande des compteurs, pour associer les événements d'interruption et les pings de compteur à l'exploitation*

IEC 61968-8, *Assistance à la clientèle pour la gestion des appels sur incident liés à des interruptions*

IEC 61968-6, *Maintenance et construction pour les bons de travaux exigés pour les dysfonctionnements et la commutation*

IEC 61968-5, *Planification opérationnelle pour le plan de commutation d'un travail planifié et non planifié*

4.3 Modèle d'interface de référence

La présente norme n'a pas pour objet de définir les applications et les systèmes qu'il convient que les fournisseurs produisent. Une application (physique) concrète est supposée fournir la fonctionnalité d'un ou de plusieurs composants (logiques) abstraits, comme cela est mentionné dans la présente Norme. Ces composants abstraits sont groupés par fonctions métier du Modèle d'Interface de Référence.

Dans la présente norme, le terme "composant abstrait" est utilisé en référence à la partie d'un système logiciel qui prend en charge une ou plusieurs des interfaces définies de la présente partie de l'IEC 61968 à l'IEC 61968-9. Il ne signifie pas nécessairement que le logiciel conforme soit livré ni en tant que modules séparés ni en tant que système unique.

L'IEC 61968-1 décrit des services d'infrastructures communs à tous les composants abstraits, tandis que l'IEC 61968-3 à l'IEC 61968-9 définissent les détails des informations échangées pour des types spécifiques de composants abstraits.

L'IEC 61968 définit les éléments suivants:

- Une infrastructure interapplications est conforme si elle fournit les services définis dans la Partie 1 pour prendre en charge au moins deux applications, avec des interfaces conformes aux indications de la Partie 3 à la Partie 9.
- Une interface d'application est conforme si elle prend en charge les normes d'interface définies de la Partie 3 à la Partie 9 pour les composants abstraits concernés, définis dans le Modèle d'Interface de Référence.
- Une application n'est exigée que pour prendre en charge les normes d'interface de composants applicables mentionnés sous la rubrique Composants Abstraits. Il n'est pas exigé qu'une application prenne en charge les interfaces exigées par d'autres composants abstraits de la même sous-fonction métier ou au sein de la même fonction métier. La présente norme définit principalement les informations échangées entre des composants dans différentes fonctions métier, mais elle définit également occasionnellement les informations échangées entre des composants au sein d'une seule fonction métier, lorsqu'une forte demande du marché concernant ces possibilités a été appréhendée.

4.4 Fonctions et composants d'exploitation du réseau

Il convient de noter que les charges utiles de messages définies dans le présent document, IEC 61968-3, *Interfaces pour l'exploitation du réseau*, peuvent être envoyées ou reçues par tous les types de composants au sein d'un système de gestion de la distribution (DMS).

Le Tableau 1 indique les fonctions et les composants abstraits habituels réputés être des sources d'informations pour ces charges utiles de messages. La liste fournie des fonctions et composants abstraits n'est pas exhaustive, elle n'est donnée qu'à titre d'exemple. Les consommateurs habituels d'informations comprennent, sans toutefois s'y limiter, les autres composants mentionnés dans l'IEC 61968-1.

Tableau 1 – Fonctions métier et composants abstraits

Fonctions métier	Sous-fonctions métier	Composants abstraits
Exploitation du réseau (NO)	Surveillance de l'exploitation du réseau (NMON)	Surveillance d'état du poste source
		Surveillance d'état du réseau
		Surveillance des actions de commutation
		Surveillance des actions de marquage de la commutation
		Gestion de données de processus et de réseau
		Gestion des données d'exploitation
		Surveillance des étapes de régulation
		Surveillance des alarmes
		Journaux des opérations et des événements
		Surveillance météorologique (détection des orages)
	Commande/Contrôle du réseau (CTL)	Contrôle d'accès utilisateur
		Commandes/Contrôles automatiques
		Commandes assistées
		Gestion des documents de sécurité
		Vérification de sécurité et blocages
		Coordination d'incident majeur
	Gestion de défauts (FLT)	Prise en compte des appels sur incident
		Analyse des relais de protection
		Localisation de défaut
		Évaluation de la restauration de l'alimentation
		Usage des informations clientèle en cas d'incident
		Surveillance de l'alimentation en énergie du circuit de distribution
	Analyse en retour d'exploitation (OFA)	Analyse de fausse manœuvre
		Analyse de panne de réseau
		Analyse de la qualité du service
		Historique des manœuvres des équipements
		Revue après dérangement
	Statistiques et rapports d'exploitation	Informations de maintenance
		Informations pour la planification
		Informations pour le contrôle de gestion
	Calculs réseau temps réel (CLC)	Estimation des charges
		Analyse commerciale de l'énergie
		Profil des flux de charge / des tensions
		Analyse de courant de défaut
		Réglages adaptatifs des relais
	Formation des opérateurs (TRN)	Simulation SCADA

Les diagrammes de séquences de cas d'utilisation présentés dans le présent document sont fondés sur l'hypothèse d'une interprétation simplifiée des fonctions métier mentionnées dans le Tableau 1. Il s'agit de simplifier la cartographie des fonctions métier en fonction des systèmes auxquels sont familiarisés les fournisseurs.

Le Tableau 2 présente l'interprétation des fonctions métier définies dans le Tableau 1 en fonction des cas d'utilisation de l'IEC 61968-3. Ces interprétations sont destinées à aider le lecteur à mieux comprendre les cas d'utilisation.

Tableau 2 – Interprétation des fonctions métier d'exploitation du réseau

Fonction métier	Description IRM	IEC 61968-3 – Interprétation du cas d'utilisation
NO-NMON	Surveillance de l'exploitation du réseau	Système de gestion de la distribution (DMS) utilisé dans la salle de commande pour la gestion de l'exploitation du réseau
NO-CTL	Commande/Contrôle du réseau	SCADA utilisé pour la surveillance et la commande/le contrôle du réseau
NO-FTL	Gestion de défauts	Système de gestion des interruptions (OMS)

4.5 Modèle statique d'informations

4.5.1 Généralités

Le modèle d'informations concernant l'exploitation du réseau se compose de classes qui fournissent un canevas relatif aux attributs de chaque charge utile de message.

Les classes sont détaillées dans l'IEC 61968-11, *Extensions du modèle d'information commun (CIM) pour la distribution* ou dans l'*IEC 61970-301, Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Base de modèle d'information commun (CIM).*

4.5.2 Classes connexes à l'exploitation du réseau

Le Tableau 3 répertorie les classes qui sont associées aux classes d'exploitation du réseau, mais seul le nom d'une instance est donné dans les charges utiles de messages définies dans la présente Norme. Les attributs détaillés de ces classes sont utilisés dans les charges utiles de messages définies dans d'autres parties de l'IEC 61968.

Tableau 3 – Classes connexes à l'exploitation du réseau

Classe connexe	Référence	Description
TroubleTicket	IEC 61968-8	Type de document qui contient les informations d'un ou de plusieurs appels clients.
Work	IEC 61968-6	Type de document qui contient les informations utilisées pour demander, lancer, suivre et consigner des travaux, en particulier des tâches de construction et d'entretien.

NOTE Dans le présent document, les définitions de classes sont fournies pour des raisons pratiques uniquement. Les définitions normatives sont fournies par l'IEC 61968-11, qui décrit les extensions de distribution au CIM IEC.

5 Charges utiles de messages d'exploitation du réseau

5.1 Généralités

Le présent Article a pour objet de décrire les charges utiles de messages liées à l'IEC 61968-3. Il est important de noter que certaines de ces charges utiles de messages peuvent

également être utilisées par d'autres parties de l'IEC 61968. L'approche générale quant à la réalisation des structures de messages et des schémas XML pour les charges utiles de messages de l'IEC 61968 est spécifiée dans l'IEC 61968-1 et dans l'IEC 61968-100.

Même s'ils peuvent être représentés dans des diagrammes de séquences pour des raisons de contexte et d'exhaustivité, le présent document ne décrit pas les formats de messages définis par d'autres parties de l'IEC 61968. Les structures des charges utiles de messages définies par la présente partie de l'IEC 61968 sont décrites à l'Article 5.

Les schémas XML normatifs des charges utiles de messages définies par la présente partie sont fournis à l'Annexe B, qui donne des descriptions plus détaillées et annotées des structures de messages. Les structures de messages sont présentées sous forme de diagramme à l'Article 5. Noter que ces diagrammes sont donnés à titre d'exemple et ne sont pas exhaustifs. La convention de notation caractérise les éléments exigés par un trait plein, et les éléments facultatifs par une ligne en pointillés.

Il est également important de noter que les cas d'utilisation et les diagrammes de séquences fournis à l'Annexe A sont par nature informatifs, et sont destinés à donner des exemples d'utilisation pour les définitions normatives de la charge utile de message. La présente Norme n'a pas vocation à normaliser les processus métier spécifiques.

5.2 Charge utile **OperationsConfiguration (Configuration d'exploitation)**

5.2.1 Généralités

Tous les messages s'appuient sur des identifiants uniques (**mRIDs**) pour tous les objets faisant partie intégrante du modèle de réseau commun, en l'occurrence le modèle de réseau de distribution commun qui est défini comme faisant partie du CIM. Pour publier ces identifiants uniques, il est nécessaire que le système concerné importe ce modèle de réseau ou charge les identifiants nécessaires lors de la procédure de configuration des systèmes.

5.2.2 Charge utile de message

Cette charge utile de message, représentée à la Figure 3, inclut la configuration nécessaire à la définition cohérente d'**Assets**, de **FaultCauseTypes** et d'**UsagePoints** entre les messages spécifiques. Elle peut être utilisée pour charger la carte des **mRIDs** nécessaires pour identifier de manière unique les objets tels que les **equipments**, **asset**, etc. En fonction des cas d'utilisation qu'un système a besoin d'adresser et des messages qu'il convient qu'il prenne en charge, la **OperationsConfiguration** (configuration d'exploitation) doit comprendre différents ensembles d'objets. Par exemple, pour prendre en charge le message **TagAction**, il est nécessaire de configurer **PowerSystemResources.**

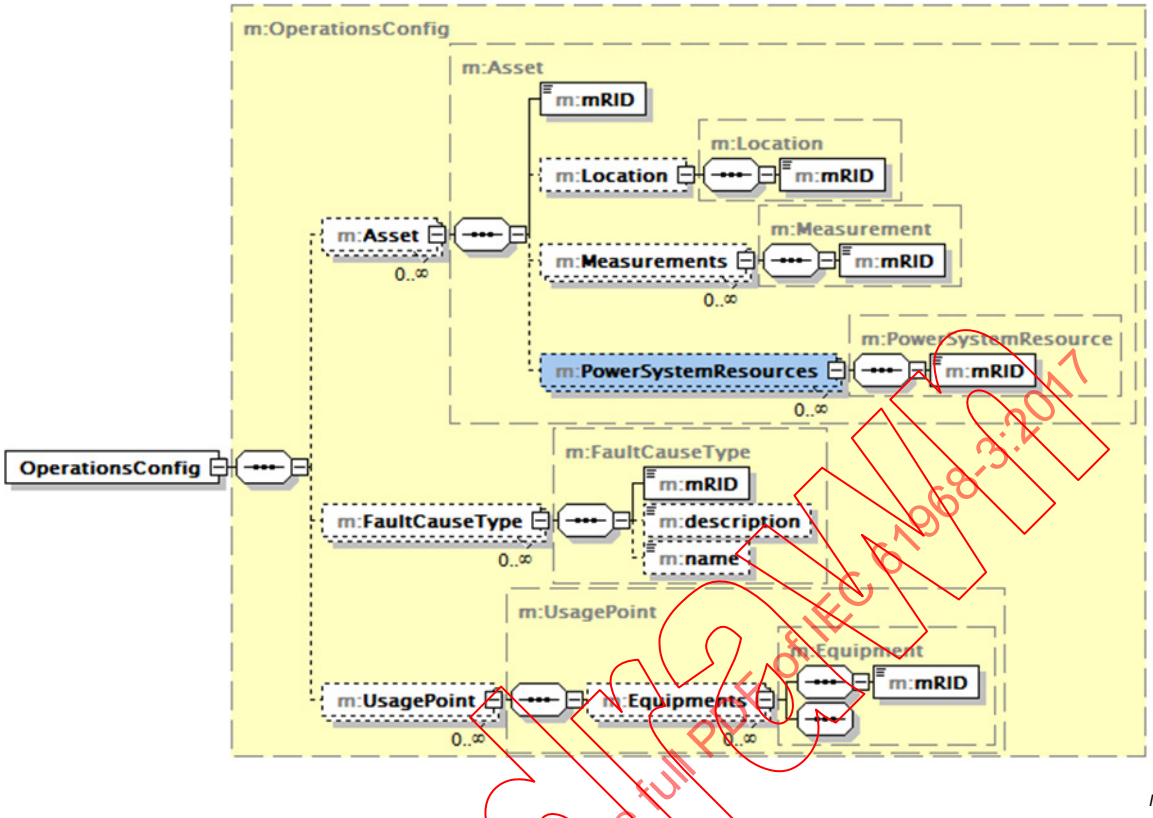


Figure 3 – Charge utile de message OperationsConfiguration (configuration d'exploitation)

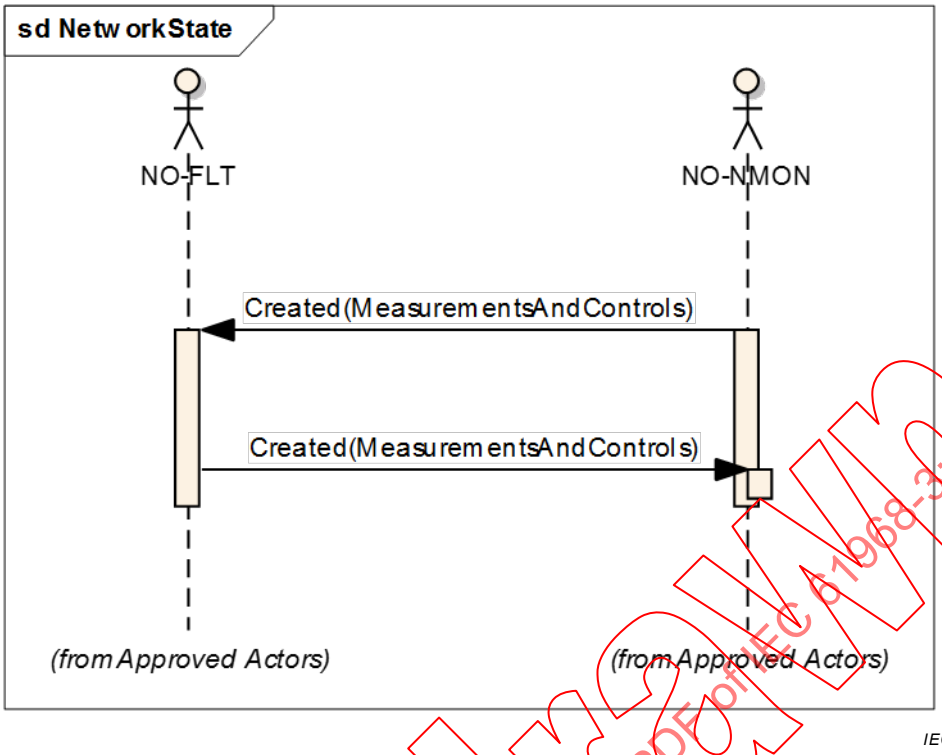
5.3 Charge utile MeasurementsAndControls (Mesurages et commandes)

5.3.1 Généralités

Les charges utiles de messages **MeasurementsAndControls** (Mesurages et commandes) sont conçues pour signaler les informations sur l'état du réseau (état du commutateur, état d'un relais de défaut, position de la prise de courant ou valeur du courant d'un mesurage de tension, par exemple), ainsi que les demandes de modification d'état du réseau (ouverture ou fermeture d'un commutateur, commande de la position d'une prise de transformateur ou définition d'un nouveau point de consigne d'un contrôleur local, par exemple).

L'état du réseau est surveillé par SCADA et signalé aux autres systèmes qui ont besoin de tenir compte de l'état en cours du réseau pour procéder à des traitements et analyses supplémentaires, c'est-à-dire un système OMS (pour la fonction Gestion de défauts) ou DMS (pour la fonction Surveillance de l'exploitation du réseau). Les commandes sont souvent envoyées d'un système DMS à un système SCADA.

En règle générale, la charge utile contient soit des mesurages soit des commandes, comme représenté à la Figure 4. Noter que les flèches sont bidirectionnelles, en effet la flèche dirigée de NO-NMON à NO-FLT concerne un mesurage et la flèche dirigée de NO-FLT à NO-NMON concerne une commande.



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 4 – MeasurementsAndControls (Mesurages et commandes)

5.3.2 Measurement (Mesurage)

Les mesurages indiquent la valeur en cours des informations du réseau. Il s'agit des informations numériques du réseau (**Digital Measurement – Mesurage numérique**) comme l'état du commutateur, la position de la prise ou l'état du relais de défaut, et des informations analogiques du réseau (**Analog Measurement – Mesurage analogique**) telles que le courant, la tension, la puissance active et la puissance réactive. Les cas d'utilisation incluent les éléments suivants:

- SCADA informe les parties intéressées de la modification d'état d'un dispositif de protection par suite d'une interruption (c'est-à-dire le déclenchement d'un disjoncteur). Cette notification peut être utilisée pour procéder à une analyse des interruptions ou localiser un défaut dans la fonction Gestion de défauts ou Exploitation du réseau.
- SCADA informe les parties intéressées de la modification d'état d'un indicateur de défaut. Cette notification peut être utilisée par la fonction de localisation de défaut pour procéder à une analyse approfondie et délimiter la zone défaillante.
- SCADA informe les parties intéressées de la modification d'état d'un commutateur ou d'un changeur de prises par suite d'une opération de commutation. Ces informations peuvent être utilisées par tous les systèmes qui nécessitent de traiter les modifications d'état du réseau.
- SCADA informe les parties intéressées de la modification du courant de défaut ou de la réactance de défaut au niveau d'un dispositif de protection. Ces valeurs peuvent être utilisées par la fonction de localisation de défaut pour calculer la zone défaillante.
- SCADA informe les parties intéressées de la modification des valeurs comme la puissance active, la puissance réactive, le courant, la tension et la fréquence. Ces informations peuvent être utilisées par tous les systèmes qui nécessitent de traiter les modifications d'état du réseau.

5.3.3 Controls (Commandes)

Les commandes demandent la commande à distance pour modifier l'état d'un dispositif commutable (ouverture ou fermeture d'un commutateur, modification de la position d'une prise de transformateur ou définition du nouveau point de consigne d'un contrôleur local, par exemple). Les commandes peuvent être demandées comme une seule action ou faire partie d'un plan de commutation. Les cas d'utilisation incluent les éléments suivants:

- La fonction Gestion de défauts demande d'ouvrir ou de fermer un commutateur dans le cadre d'un plan de commutation pour l'isolement du défaut et/ou la restauration de services. Ce type d'opération de commande de commutateur peut avoir un impact sur toutes les phases ou sur une seule phase.
  - Dans une configuration multiphase, une commande commute toutes les phases disponibles (c'est-à-dire deux ou trois phases)
  - Dans une configuration à une seule phase, une commande commute toutes les phases disponibles, si le commutateur correspondant est à commande simultanée. Sinon, une commande commute une phase. Dans ce cas, la phase à commuter est identifiée grâce au terminal associé à la commande
- La commande volt/var propose de modifier la position d'une prise d'un transformateur dans le cadre du plan de commutation calculé.
- La commande volt/var propose de définir un nouveau point de consigne pour un contrôleur local dans le cadre du plan de commutation calculé.

5.3.4 Charge utile de message

Cette charge utile de message, représentée à la Figure 5, peut être utilisée pour échanger des données de mesure, y compris de 0 à plusieurs valeurs de mesure et/ou objets de commande de mesure.

Objets de valeur de mesure:

- AccumulatorValue
- AnalogValue (puissance active et puissance réactive, par exemple)
- DiscreteValue (état d'un disjoncteur, par exemple)
- Valeur de mesure de chaîne

Objets de commande de mesure:

- AccumulatorReset
- SetPoint (point de consigne pour la commande de tension locale, par exemple)
- Command (ouverture ou fermeture d'un commutateur, par exemple)
- RaiseLowerCommand (soulever ou abaisser une prise de transformateur, par exemple)

Un exemple de format détaillé des commandes AnalogValue et SetPoint est représenté respectivement à la Figure 6 et à la Figure 7 pour les différents formats de valeur de mesure et de commande de mesure.

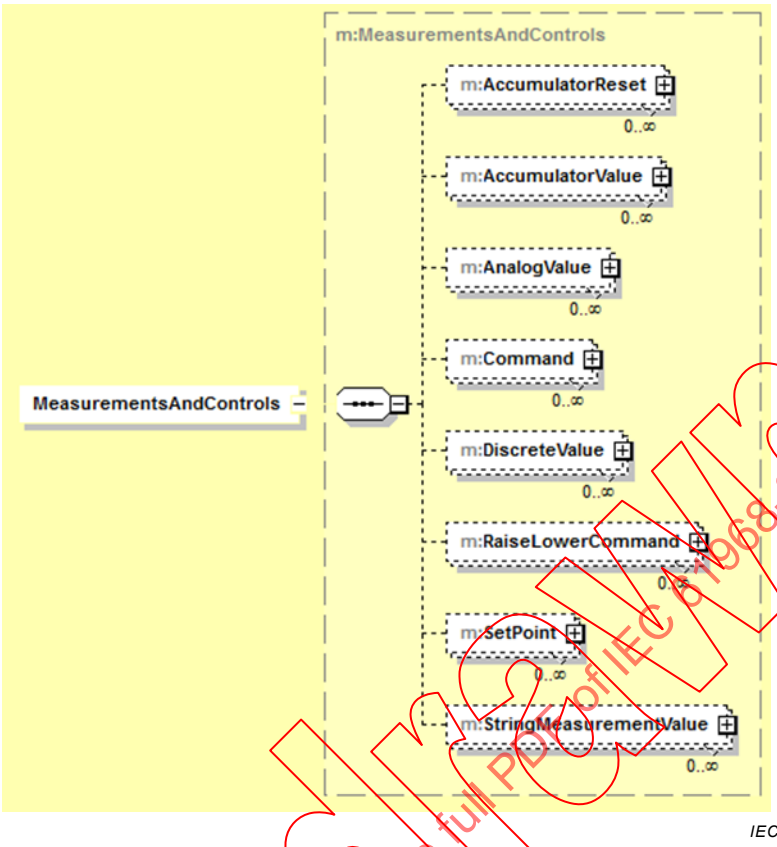


Figure 5 – Charge utile de message MeasurementsAndControls (Mesurages et commandes)

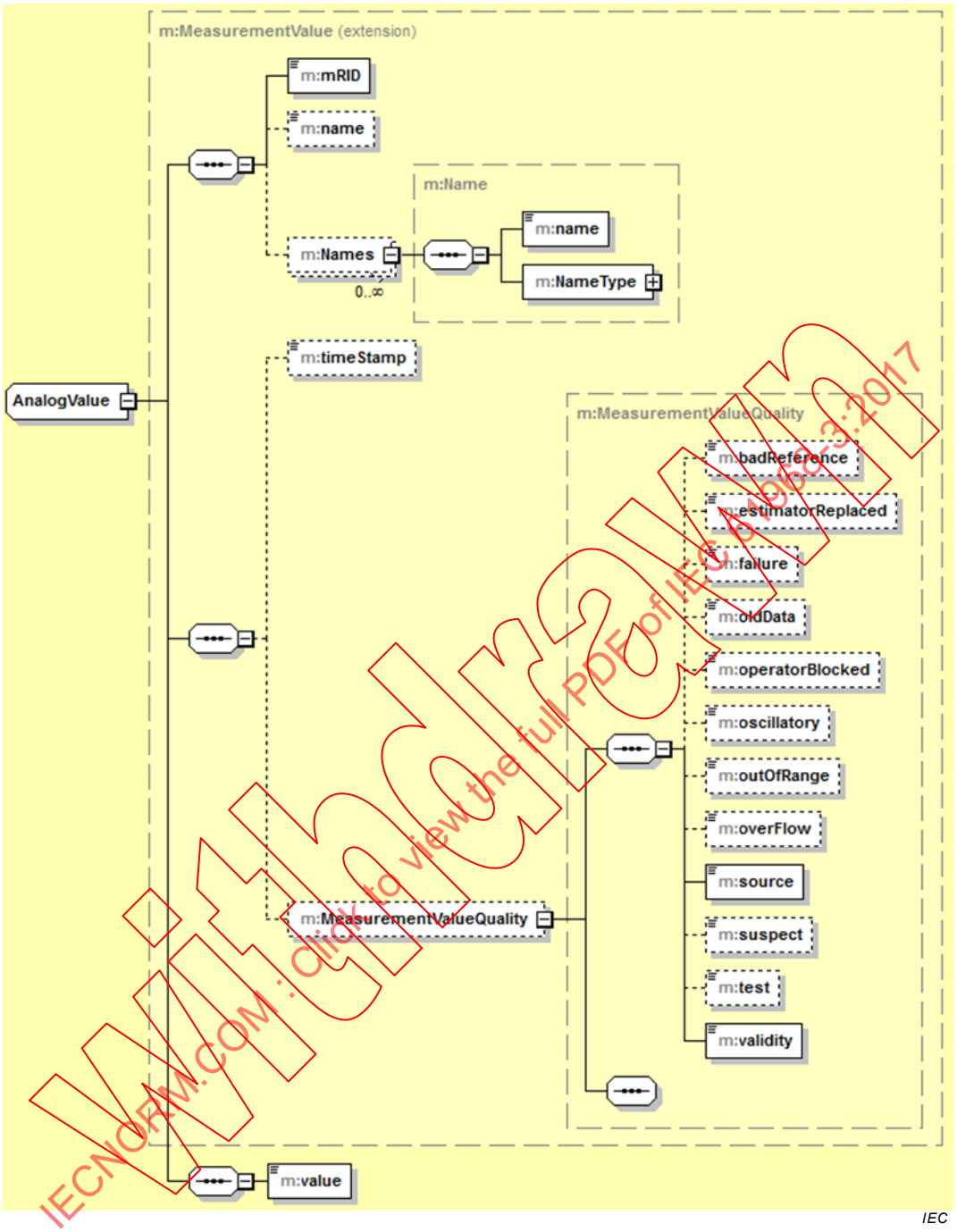


Figure 6 – Charge utile de message MeasurementsAndControls, détails d'AnalogValue

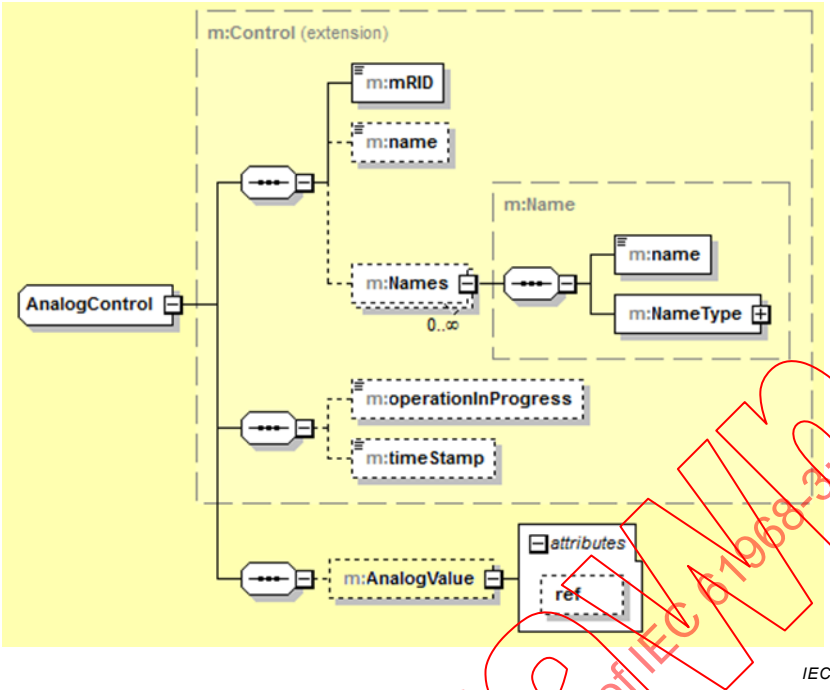


Figure 7 – Charge utile de message MeasurementsAndControls, détails de SetPoint (AnalogControl)

5.4 Charge utile TemporaryNetworkChanges (Modifications temporaires de réseau)

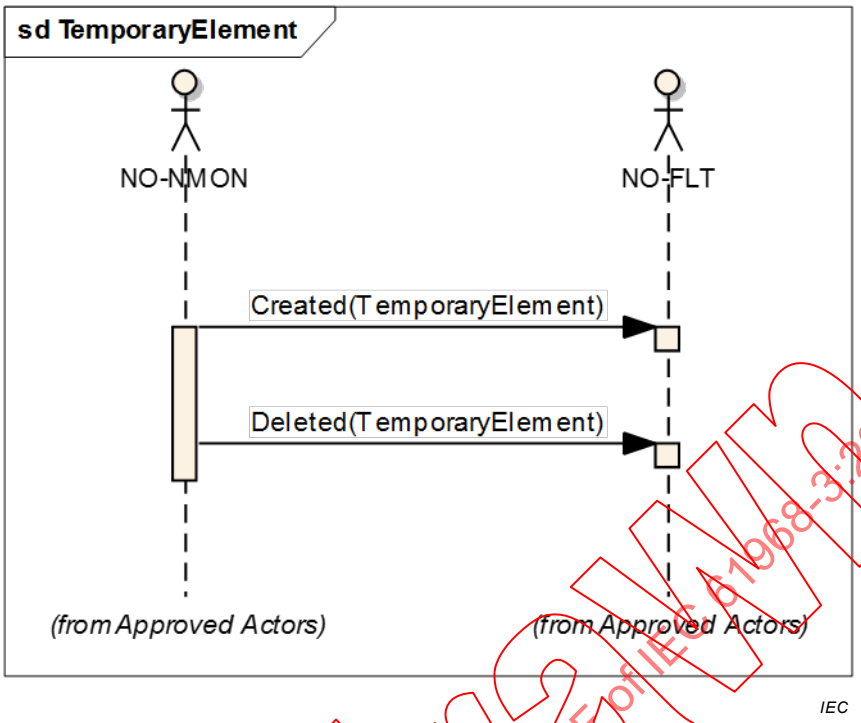
5.4.1 Généralités

Les modifications temporaires de réseau revêtent une importance particulière en cas de construction de réseau, lors d'interruptions provoquées par des conditions climatiques sévères ou de graves catastrophes ou comme sauvegarde d'urgence lors de la maintenance du réseau ou des centrales électriques. Dans ces scénarii, les systèmes électriques sont obligés de toujours maintenir l'équilibre entre génération et consommation, et de réalimenter aussi rapidement que possible les clients concernés. Les modifications temporaires de réseau (les Jumpers (raccordements), les Cuts (séparations) et les Grounds (terres), par exemple) sont utilisées pour reconfigurer temporairement la partie concernée du réseau.

Les charges utiles de messages Modifications temporaires de réseau permettent de signaler la création et la suppression de modifications temporaires de réseau (les Jumpers (raccordements), les Cuts (séparations) et les Grounds (terres), par exemple), généralement dans le cadre d'opérations de commutation pour l'isolement du défaut et la restauration de services. La Figure 8 représente le diagramme de séquence de création et de suppression de modifications temporaires de réseau.

Selon le type de réseaux (symétrique / asymétrique), une modification temporaire de réseau peut affecter les réseaux triphasés, biphasés ou monophasés. En cas de création d'un raccordement monophasé, ce raccordement peut connecter deux phases différentes de ressources de terrain respectives (raccordement de phases croisé).

La création et la suppression de modifications temporaires de réseau peuvent être définies dans le cadre d'un plan de commutation comme **Cut** (séparation), **Ground** (terre) ou **Jumper Action** (action de raccordement).



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 8 – TemporaryNetworkChanges (Modifications temporaires de réseau)

5.4.2 Charges utiles de messages

Ces charges utiles de messages, représentées aux Figures 9, 10, 11, 12, 13 et 14, peuvent être utilisées pour signaler la création et la suppression de modifications temporaires de réseau.

La Figure 9 représente la charge utile de message **TemporaryNetworkChanges** qui est décomposée en charges utiles pour **Clamp**, **Cut**, **EnergySource**, **Ground** et **Jumper**.

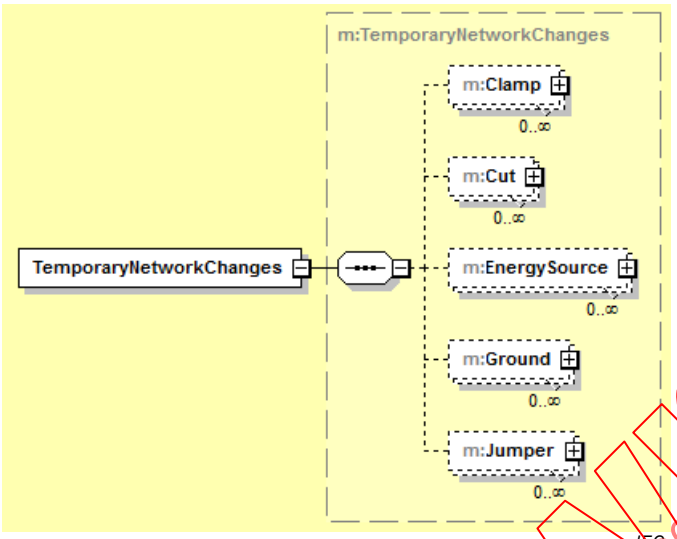


Figure 9 – Charge utile de message TemporaryNetworkChanges (Modifications temporaires de réseau)

La Figure 10 représente la charge utile pour une modification temporaire de réseau **Clamp**. Les **Clamp**s sont utilisés comme un point de connexion entre l'équipement temporaire et les lignes permanentes.

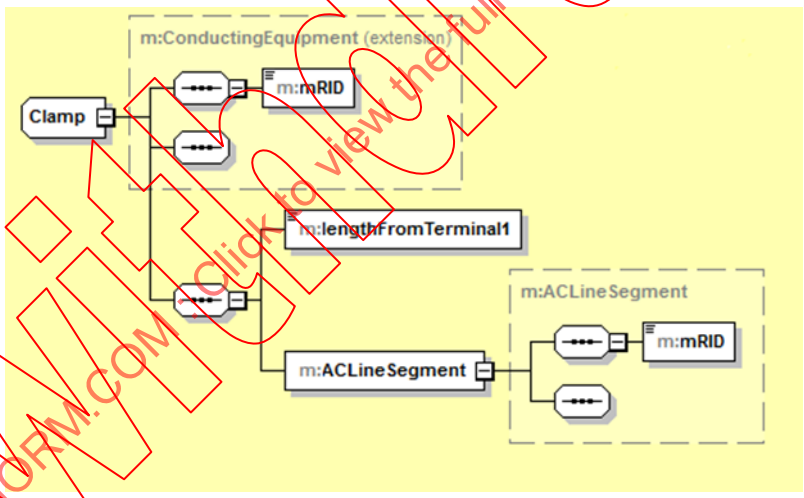


Figure 10 – Charge utile de message TemporaryNetworkChanges, détails de Clamp

La Figure 11 représente la charge utile de message pour une modification temporaire de réseau **cut**. Une **cut** (séparation) est utilisée pour modéliser une coupure temporaire de la connectivité d'un conducteur permanent.

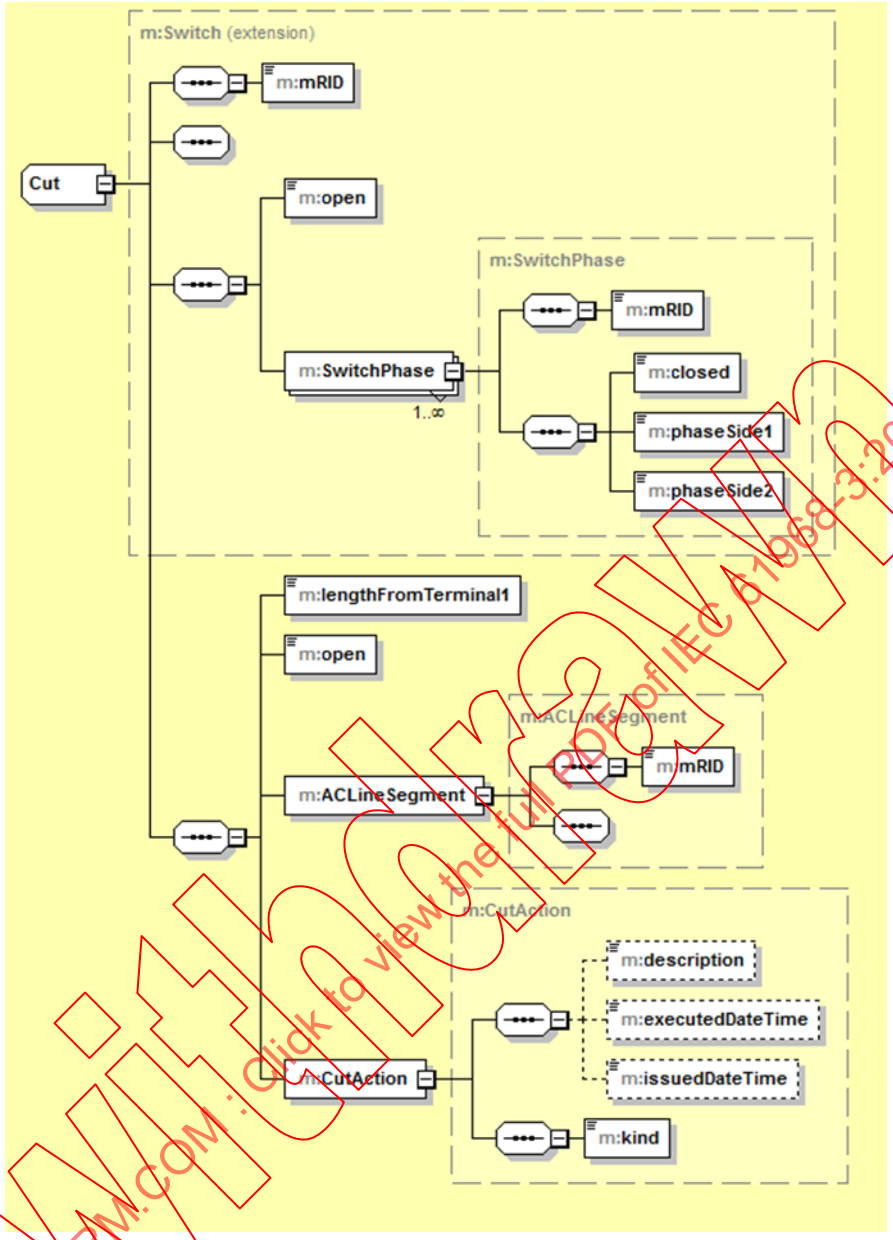


Figure 11 – Charge utile de message TemporaryNetworkChanges, détails de Cut

La Figure 12 représente la charge utile de message pour une modification temporaire de réseau **EnergySource**. Une **EnergySource** est utilisée pour modéliser un générateur temporaire ou un transformateur mobile, par exemple.

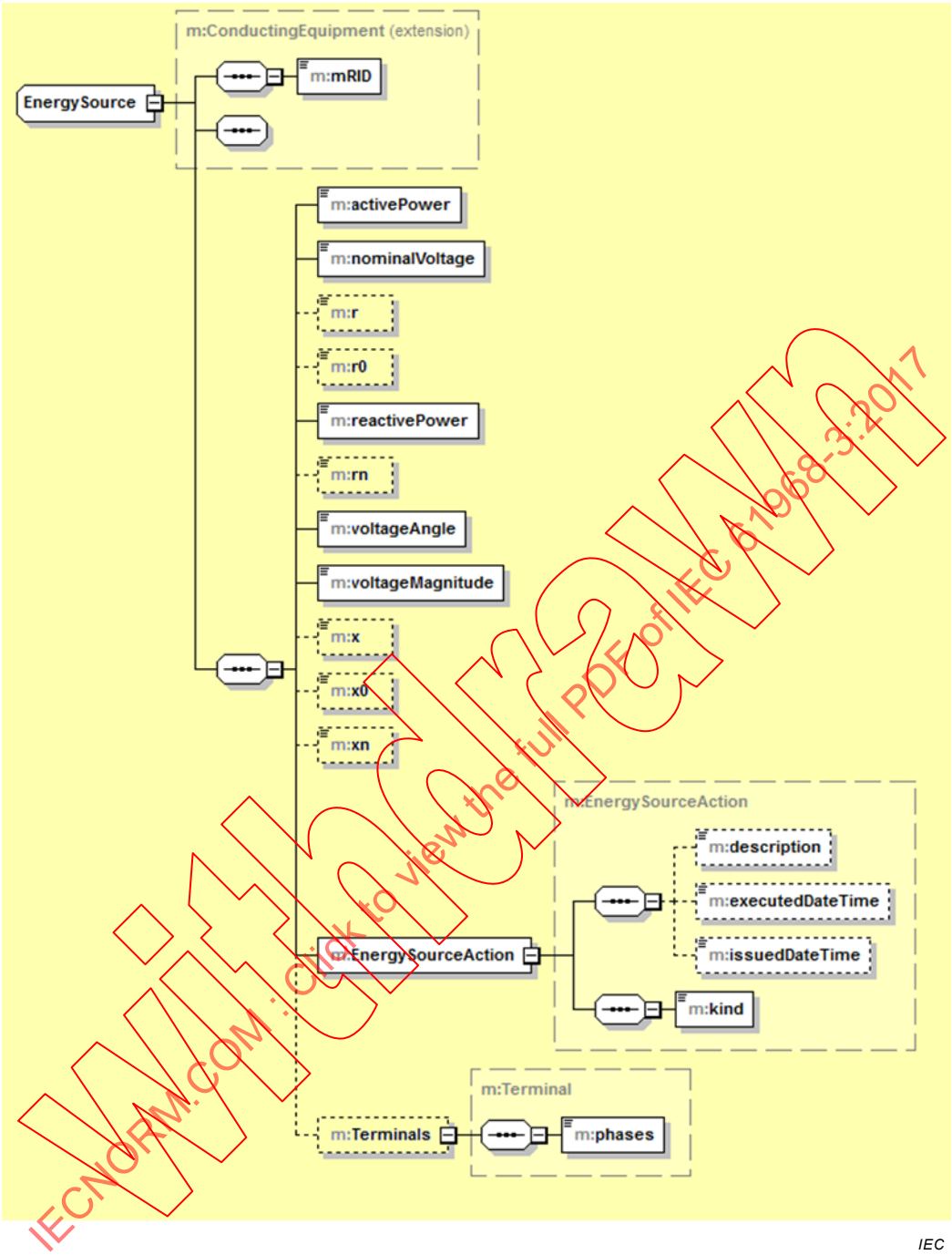


Figure 12 – Charge utile de message TemporaryNetworkChanges, détails d'EnergySource

La Figure 13 représente la charge utile pour une modification temporaire de réseau **ground**. Les **grounds** sont utilisées pour modéliser des terres temporaires placées sur l'équipement pendant l'intervention de l'équipe dans une zone mise hors tension, pour des raisons de sécurité.

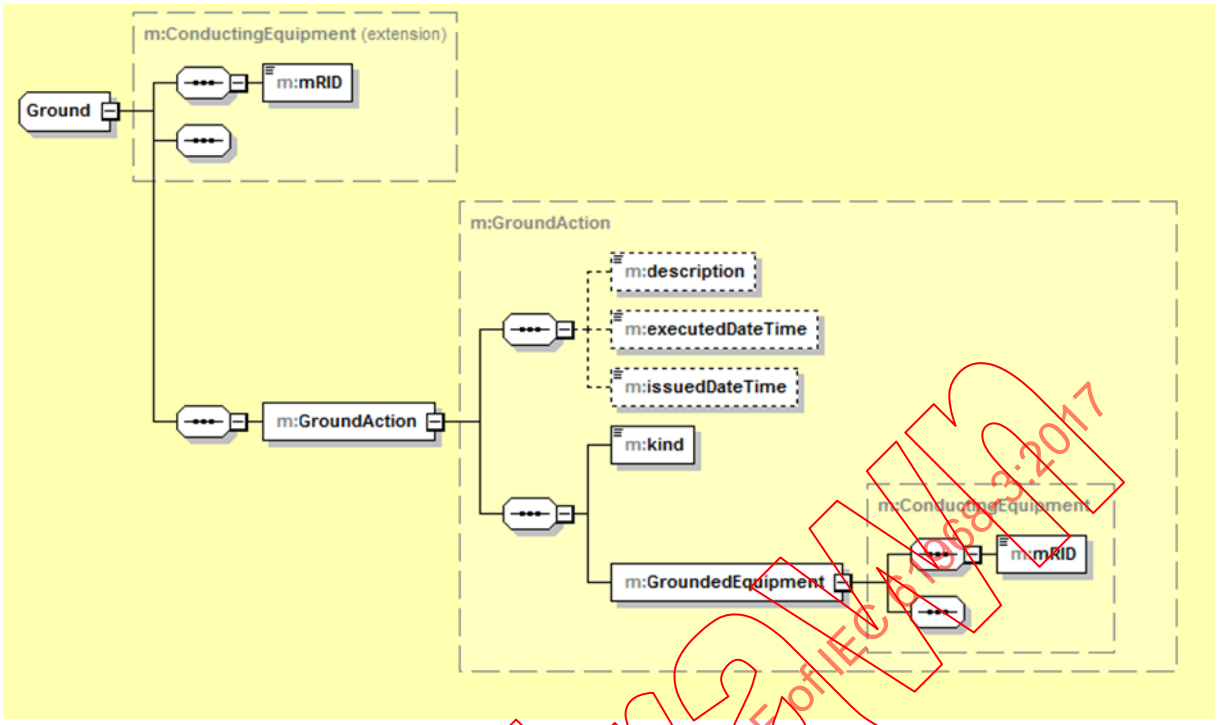


Figure 13 – Charge utile de message TemporaryNetworkChanges, détails de Ground

La Figure 14 représente la charge utile pour une modification temporaire de réseau **jumper**. Un **jumper** est utilisé pour modéliser un conducteur temporaire destiné à mettre temporairement sous tension le réseau en cas de défaillance de l'équipement permanent, par exemple en cas de panne du réseau.

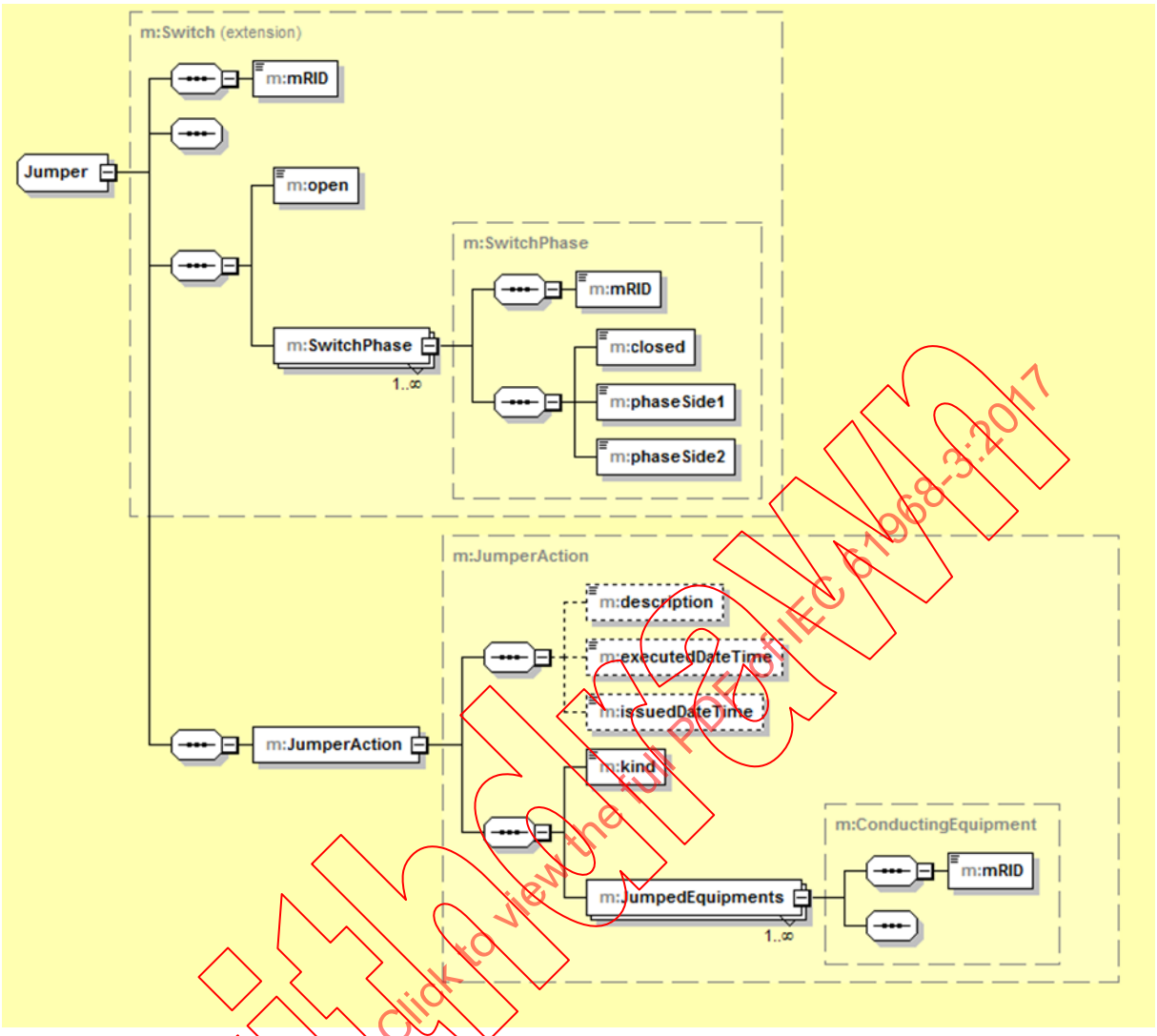


Figure 14 – Charge utile de message TemporaryNetworkChanges, détails de Jumper

5.5 Charge utile SwitchingPlan (Plan de commutation)

5.5.1 Généralités

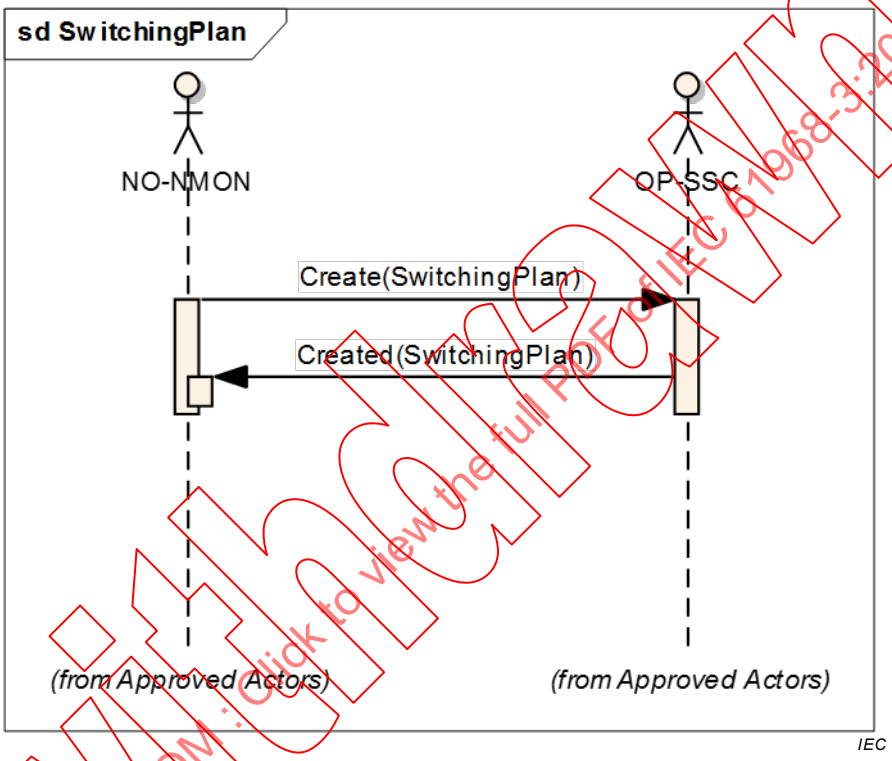
Les charges utiles de messages **SwitchingPlan** (Plan de commutation) sont conçues pour signaler un ensemble d'actions de commutation formant une séquence de gestion d'une tâche opérationnelle complète. La Figure 15 représente un diagramme de séquence de création d'un plan de commutation. Les cas d'utilisation incluent les éléments suivants:

- La fonction Gestion de défauts propose un ou plusieurs plans de commutation comme solutions alternatives aux isolements de défaut ou de zone de travail et/ou à la restauration de services.
- Les applications d'optimisation du réseau (commande Volt/Var, reconfiguration optimale de ligne d'alimentation, etc.) proposent un ou plusieurs plans de commutation comme solutions alternatives pour optimiser l'ensemble du réseau de distribution ou des parties sélectionnées de ce réseau.
- Une demande de génération d'un plan de commutation peut être le fruit de l'interaction d'utilisateurs ou peut être formulée par une application dans le cadre d'un flux de travail complet (localisation et isolement du défaut, et restauration).

Un plan de commutation peut inclure des actions non réalisées sur le réseau (mise en place ou retrait de balises, mise en place ou retrait d'éléments temporaires ou instructions générales données à l'équipe sur le terrain ou à l'opérateur, par exemple).

Un plan de commutation peut être communiqué entre différentes parties au cours de son cycle de vie

- Un plan de commutation est créé
- Un plan de commutation est validé
- Un plan de commutation est approuvé
- Un plan de commutation est exécuté



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 15 – Switching Plan (Plan de commutation)

5.5.2 Charge utile de message

Cette charge utile de message, représentée à la Figure 16, peut être utilisée pour échanger 0 à plusieurs plans de commutation. Chaque plan de commutation peut contenir 0 à plusieurs actions de commutation et/ou groupes des étapes. Les groupes des étapes sont utilisés pour définir la séquence (l'ordre) des groupes d'actions. Éventuellement, chaque plan de commutation peut contenir des documents de sécurité (voir Figure 17).

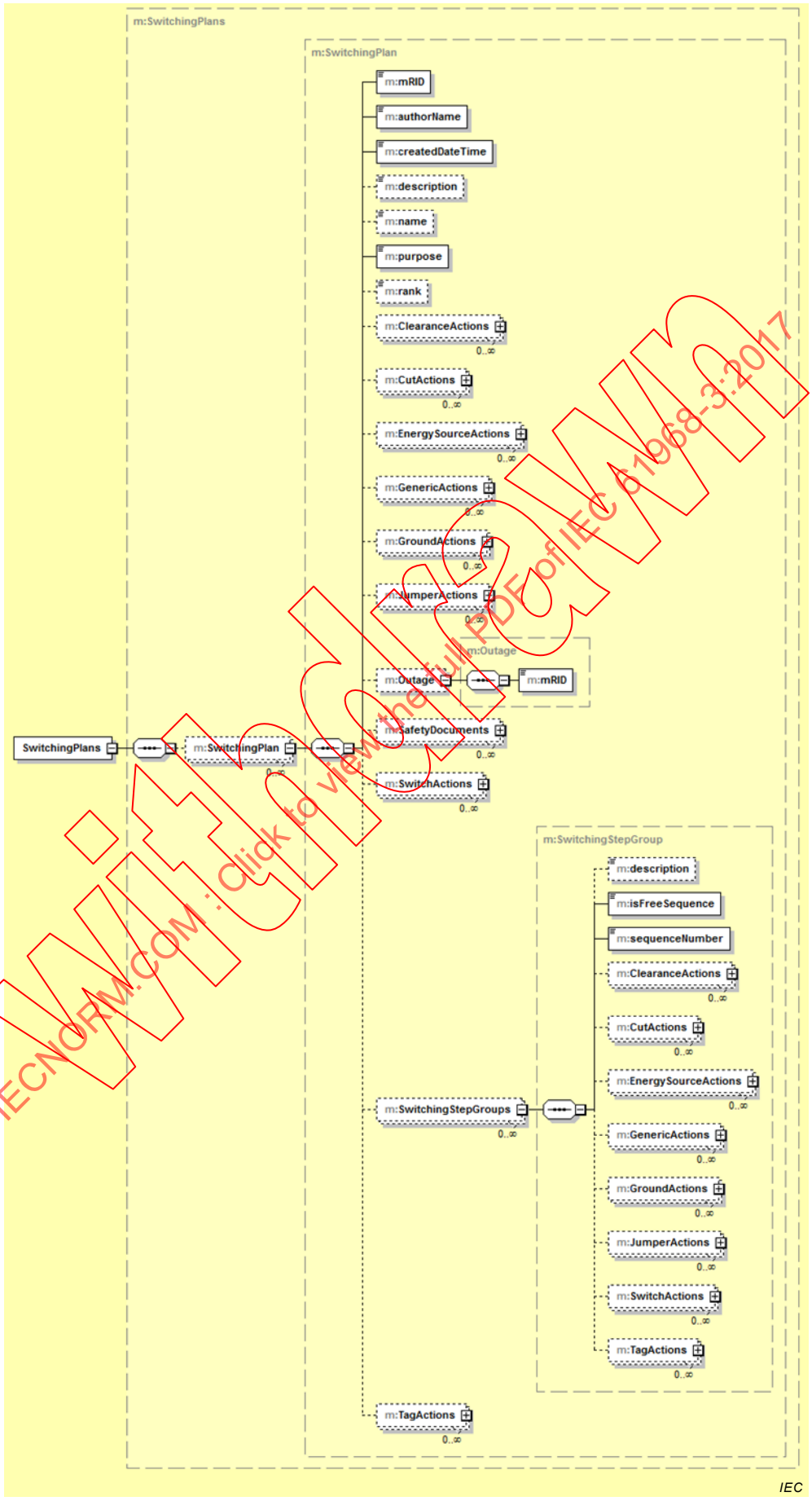


Figure 16 – Charge utile de message SwitchingPlans (Plans de commutation)

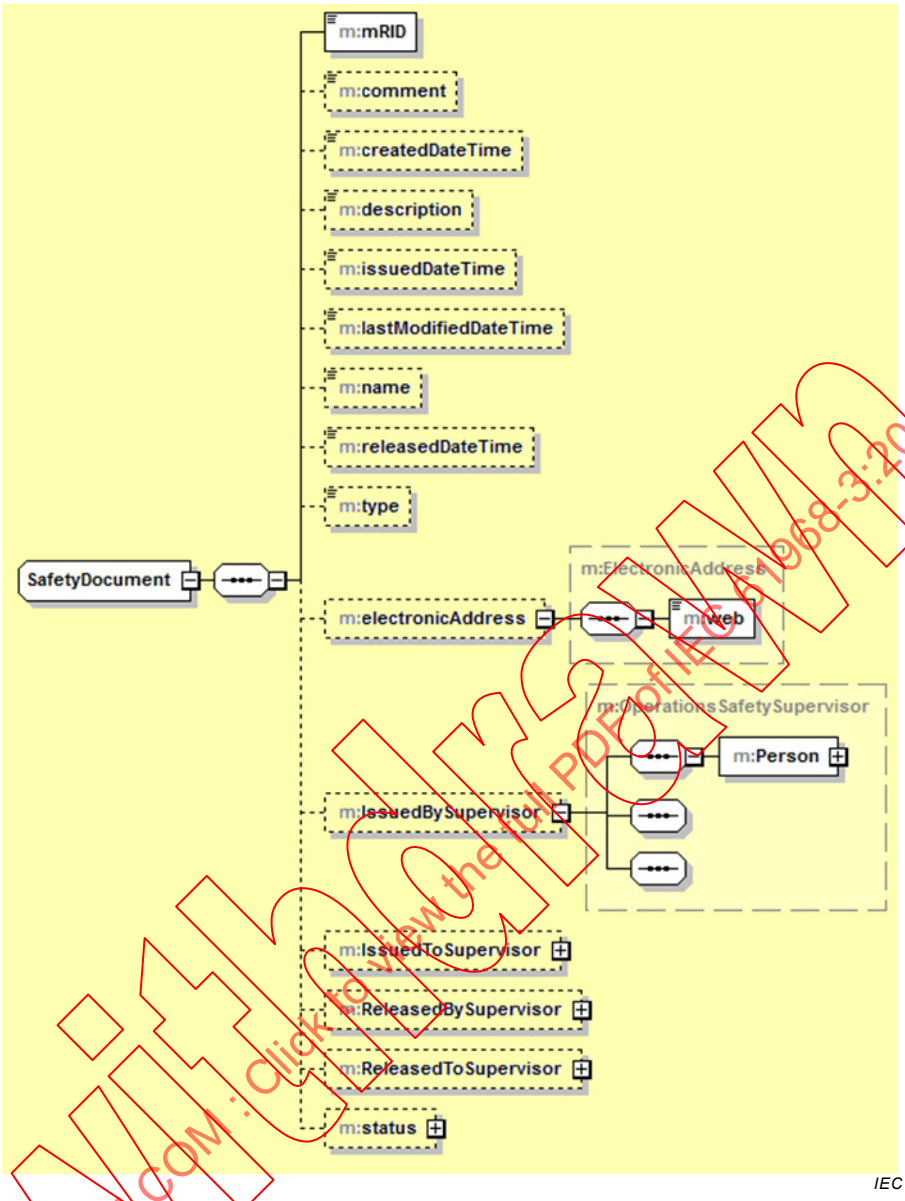


Figure 17 – Charge utile de message SwitchingPlans, détails de SafetyDocument

ClearanceActions, représentée à la Figure 18, couvre les étapes d'enlèvement de l'équipement pour les travaux de maintenance et documente les actions de commutation correspondantes pour isoler l'équipement concerné.

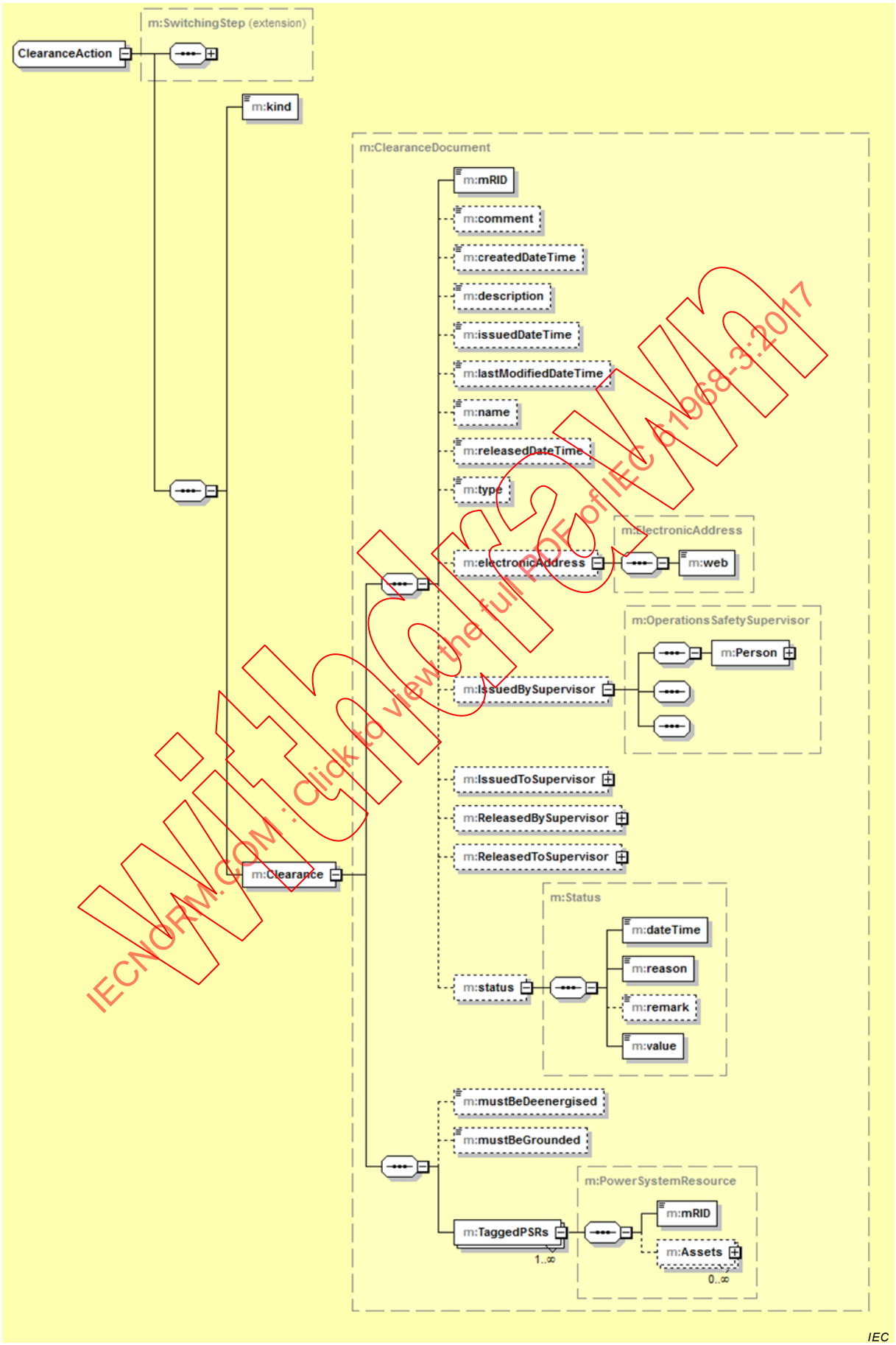


Figure 18 – Charge utile de message SwitchingPlan, détails de ClearanceAction

La Figure 19 représente la charge utile de message **GenericAction**. Au sein du plan de commutation, les actions génériques définissent l'ensemble des actions réalisées à chaque étape de commutation qui n'ont pas d'incidence sur l'état du réseau ou entreprennent une action non modélisée sur le réseau.

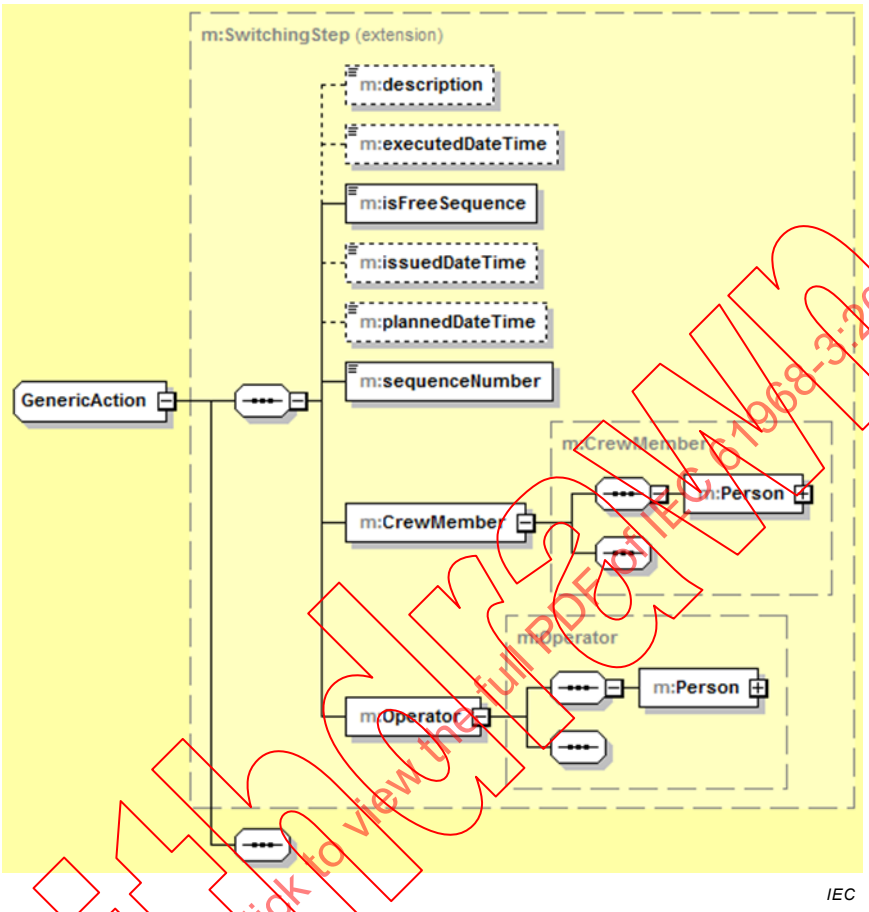


Figure 19 – Charge utile de message SwitchingPlan, détails de GenericAction

La Figure 20 définit la charge utile pour **EnergySourceAction**, qui est utilisée pour spécifier une étape de commutation destinée à ajouter ou retirer une **EnergySource** temporaire.

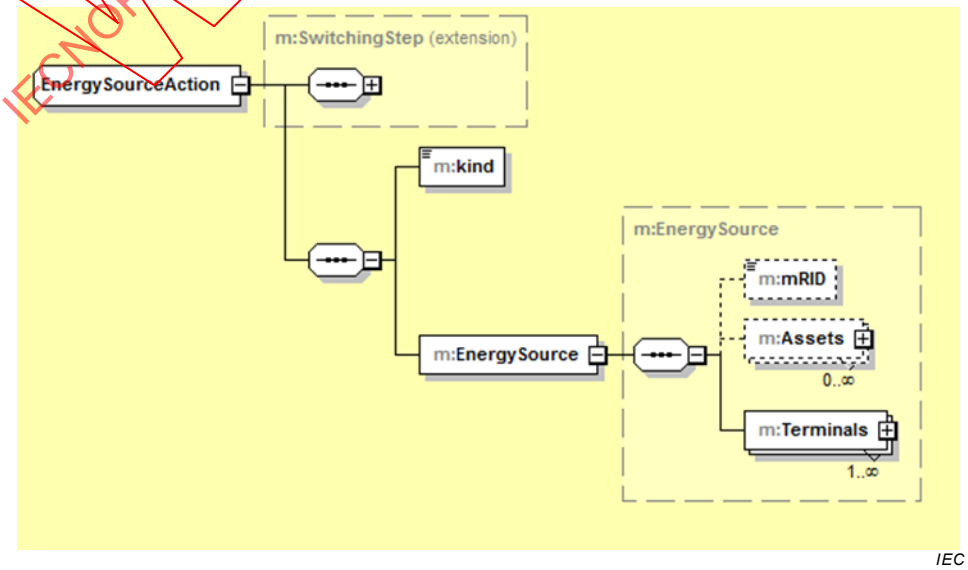


Figure 20 – Charge utile de message SwitchingPlan, détails d'EnergySourceAction

La Figure 21 définit la charge utile pour **CutAction**, qui est utilisée pour spécifier une étape de commutation destinée à ajouter à ou à retirer une **Cut** d'un conducteur.

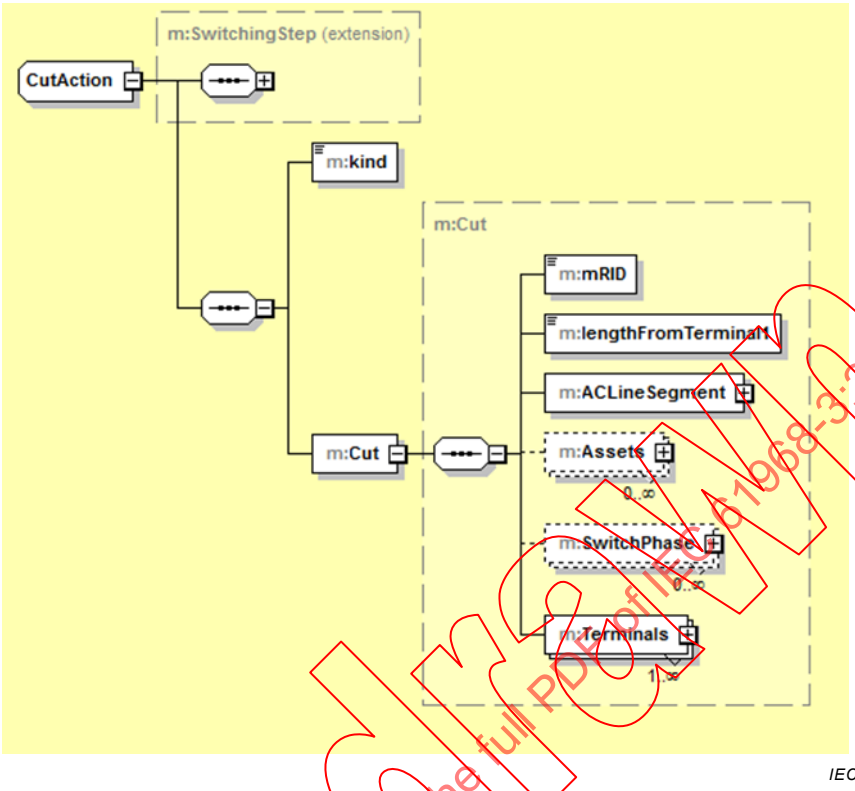


Figure 21 – Charge utile de message SwitchingPlan, détails de CutAction

La Figure 22 définit la charge utile pour **GroundAction**, qui est utilisée pour spécifier une étape de commutation destinée à ajouter à ou à retirer une **Ground** d'un conducteur ou d'un équipement.

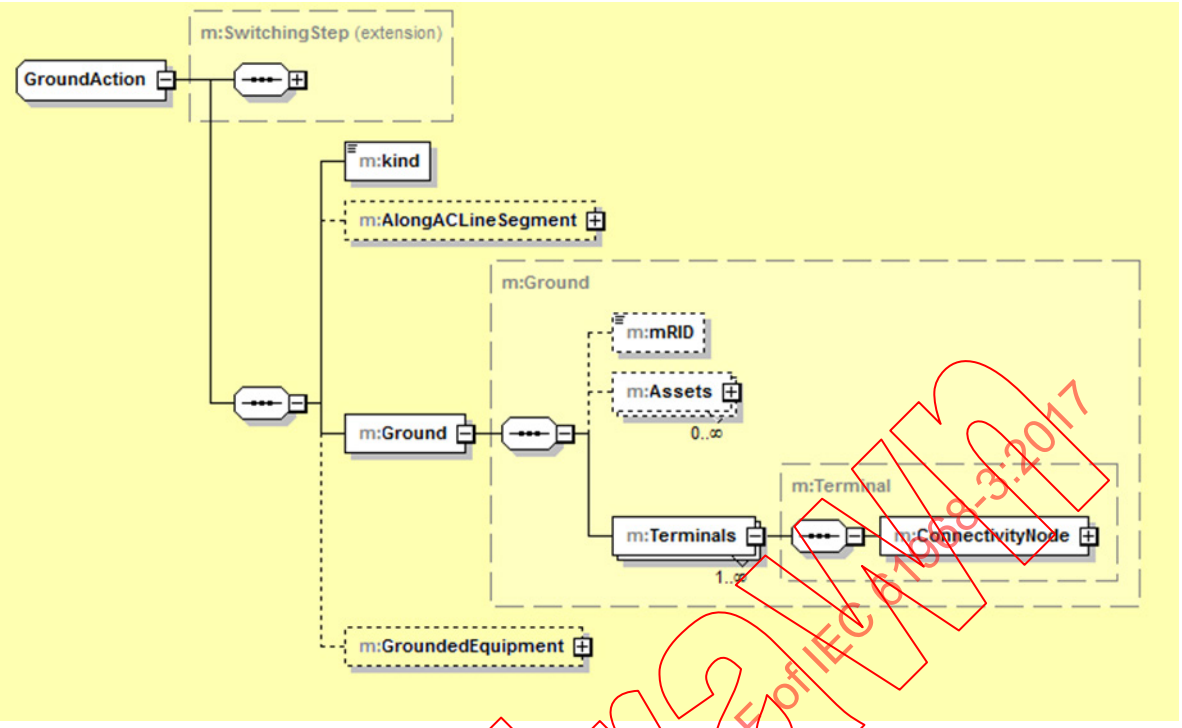


Figure 22 – Charge utile de message SwitchingPlan, détails de GroundAction

La Figure 23 définit la charge utile pour **JumperAction**, qui est utilisée pour spécifier une étape de commutation destinée à ajouter ou à retirer un **Jumper**.

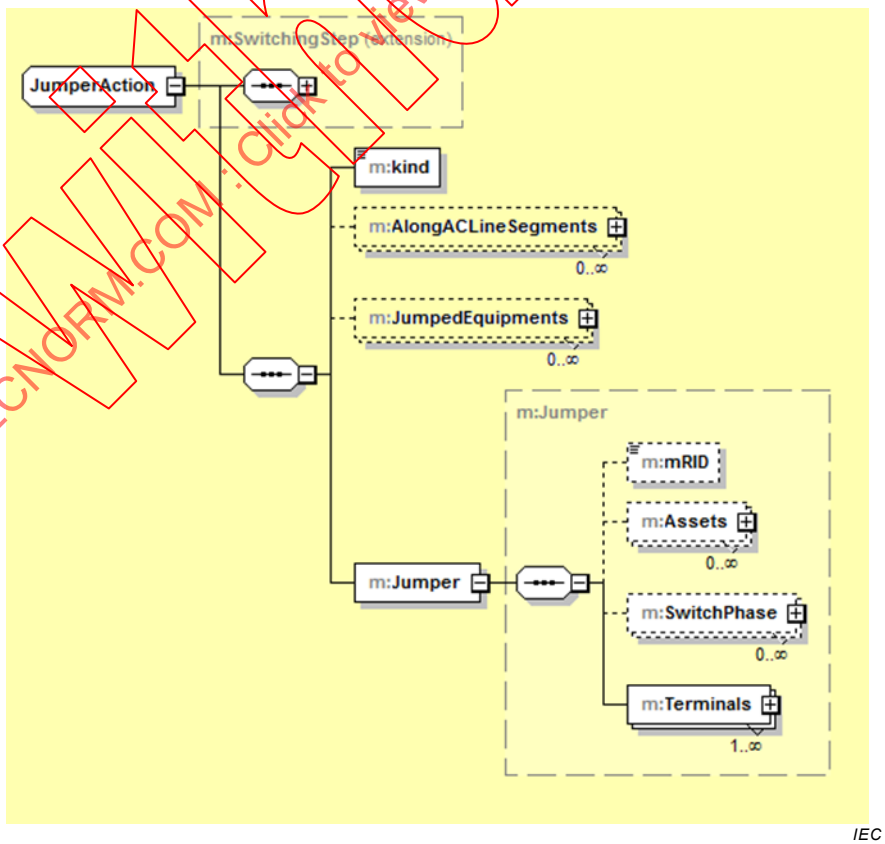


Figure 23 – Charge utile de message SwitchingPlan, détails de JumperAction

La Figure 24 définit la charge utile pour **SwitchingAction**, qui est utilisée pour spécifier une étape de commutation destinée à ouvrir ou à fermer une ou plusieurs phases d'un **OperatedSwitch**.

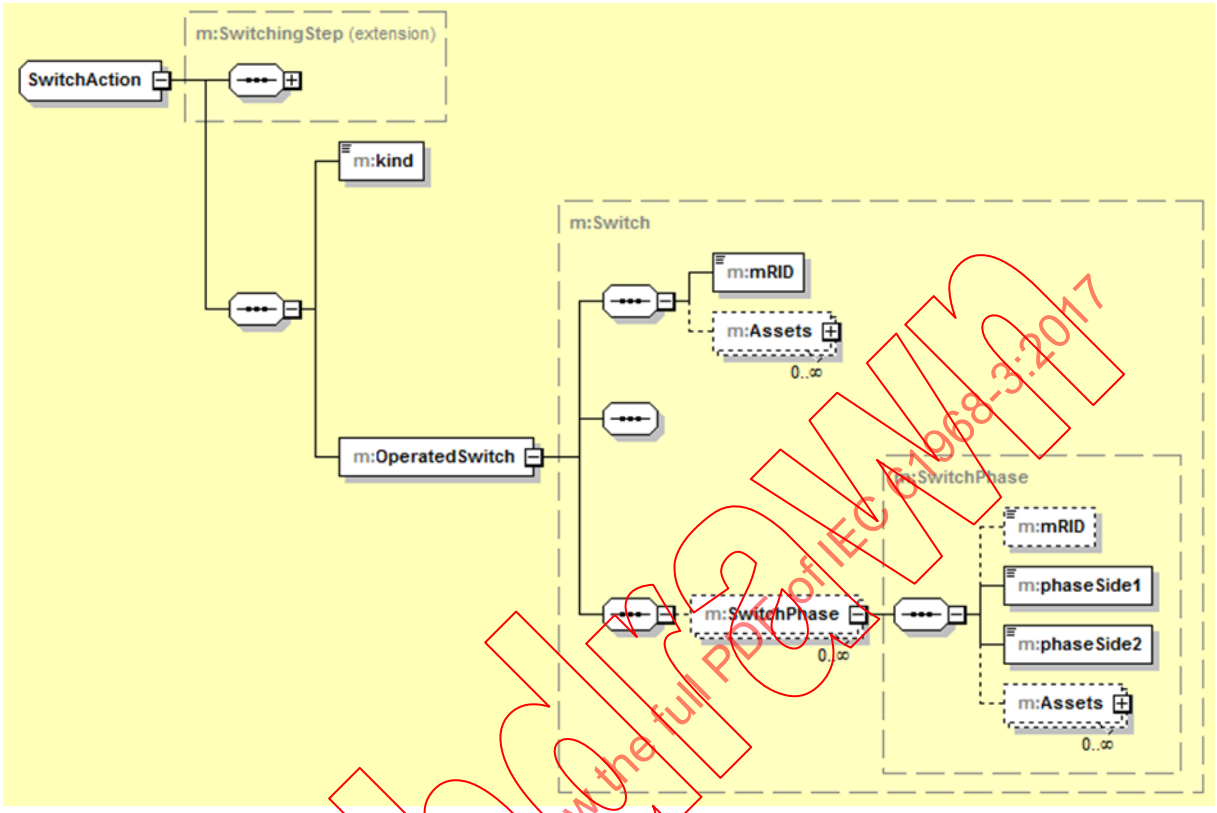


Figure 24 – Charge utile de message SwitchingPlan, détails de SwitchingAction

La Figure 25 définit la charge utile pour **TagAction**, qui est utilisée pour spécifier une étape de commutation destinée à ajouter ou à retirer une **OperationalTag**.

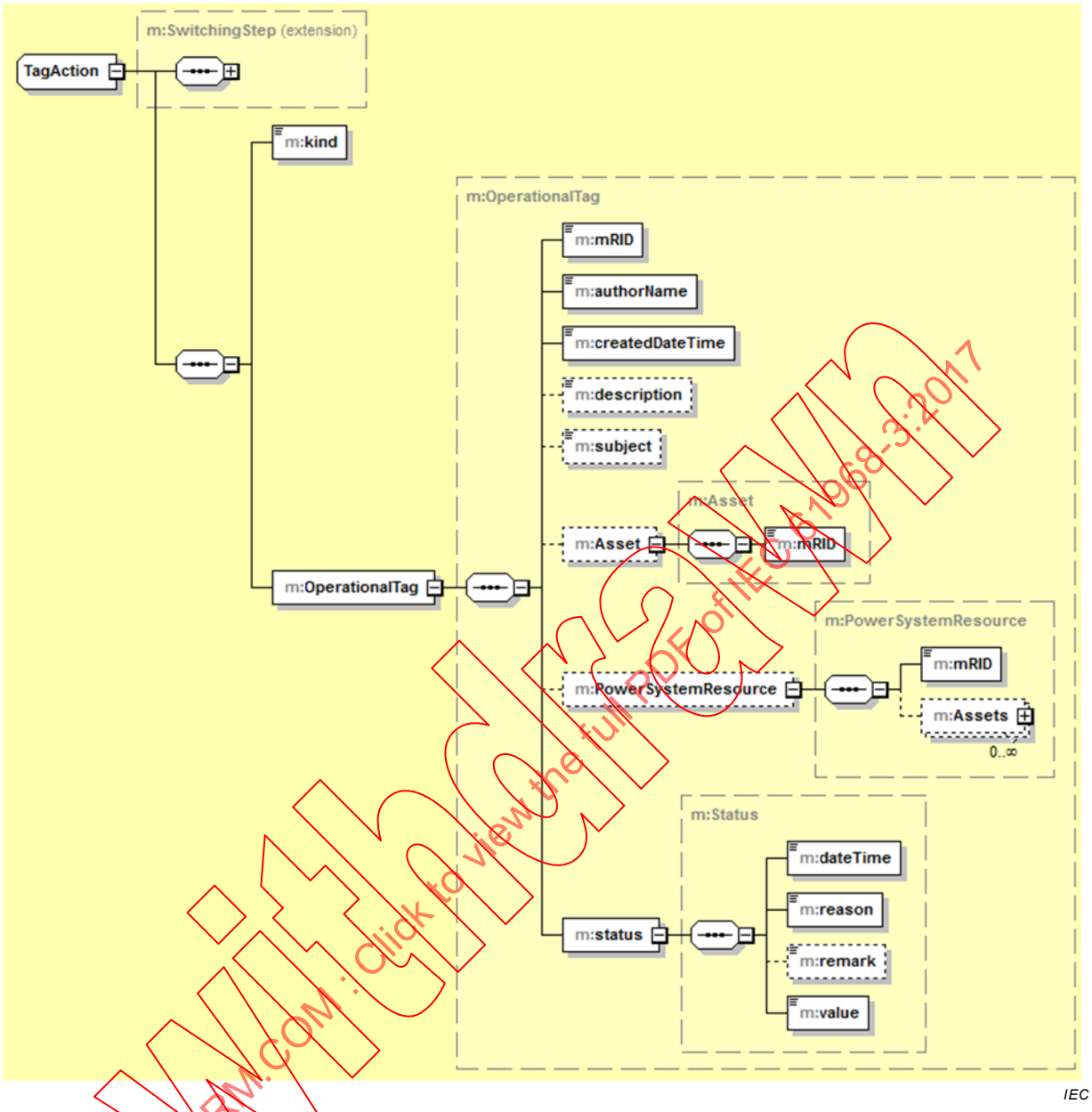


Figure 25 – Charge utile de message SwitchingPlan, détails de TagAction

Pour de plus amples informations sur les modifications temporaires de réseau (**Cut**, **Ground** et **Jumpers**, par exemple), voir également 5.4.

Pour de plus amples informations sur les **Operational Tags** (balises opérationnelles), voir également 5.6.

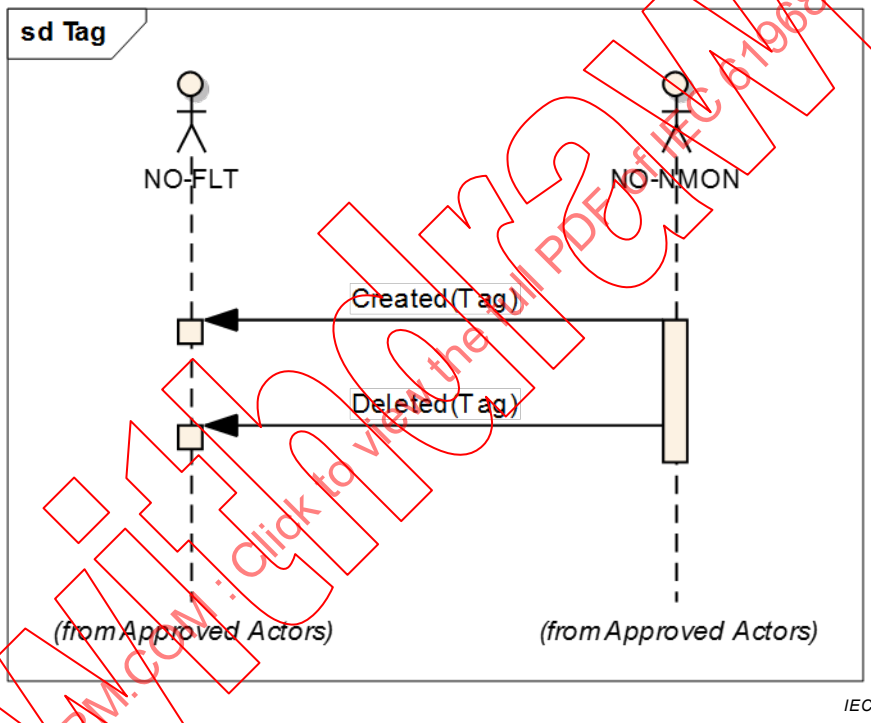
5.6 Charge utile OperationalTags (balises opérationnelles)

5.6.1 Généralités

Les charges utiles de messages **OperationalTags** (Balises opérationnelles) sont conçues pour signaler la création et le retrait de balises telles que "Do Not Operate", "Control Inhibit", "Out of Service", etc. Une balise est associée à une ressource de terrain et contraint en général le fonctionnement de la ressource de terrain correspondante. En règle générale, les balises sont créées et retirées dans SCADA à la demande de l'utilisateur. Les balises peuvent également être créées et supprimées dans le cadre de plans de commutation. La Figure 26 représente le diagramme de séquence de création et de suppression d'une **OperationalTag**.

Les charges utiles de messages **Tag** (balise) peuvent être utilisées par des applications qui nécessitent de prendre en compte l'existence de balises comme étant des contraintes lors de l'exploitation des ressources de terrain. Les cas d'utilisation incluent les éléments suivants:

- Lors de l'isolement du défaut, l'équipe sur le terrain applique la balise "Do Not Operate" à tous les interrupteurs d'isolement, ce qui signifie que ces interrupteurs peuvent ne pas fonctionner pour d'autres besoins que ceux d'isoler l'équipement concerné tant que le défaut n'a pas été réparé.
- Après la réparation d'un défaut, les balises "Do Not Operate" sont retirées par l'équipe sur le terrain.
- Un opérateur peut appliquer une balise "Control Inhibit" à un interrupteur si l'équipement peut ne pas être utilisé en raison de problèmes techniques ou de communication connus.
- Un opérateur modifie les commentaires sur une balise pour signaler les détails à l'opérateur suivant après un changement d'équipe
- Une fois les problèmes résolus, la balise "Control Inhibit" est retirée par l'opérateur.



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 26 – Tags (Balises)

5.6.2 Charge utile de message

Cette charge utile de message, représentée à la Figure 27, peut être utilisée pour signaler la création et le retrait de balises opérationnelles.

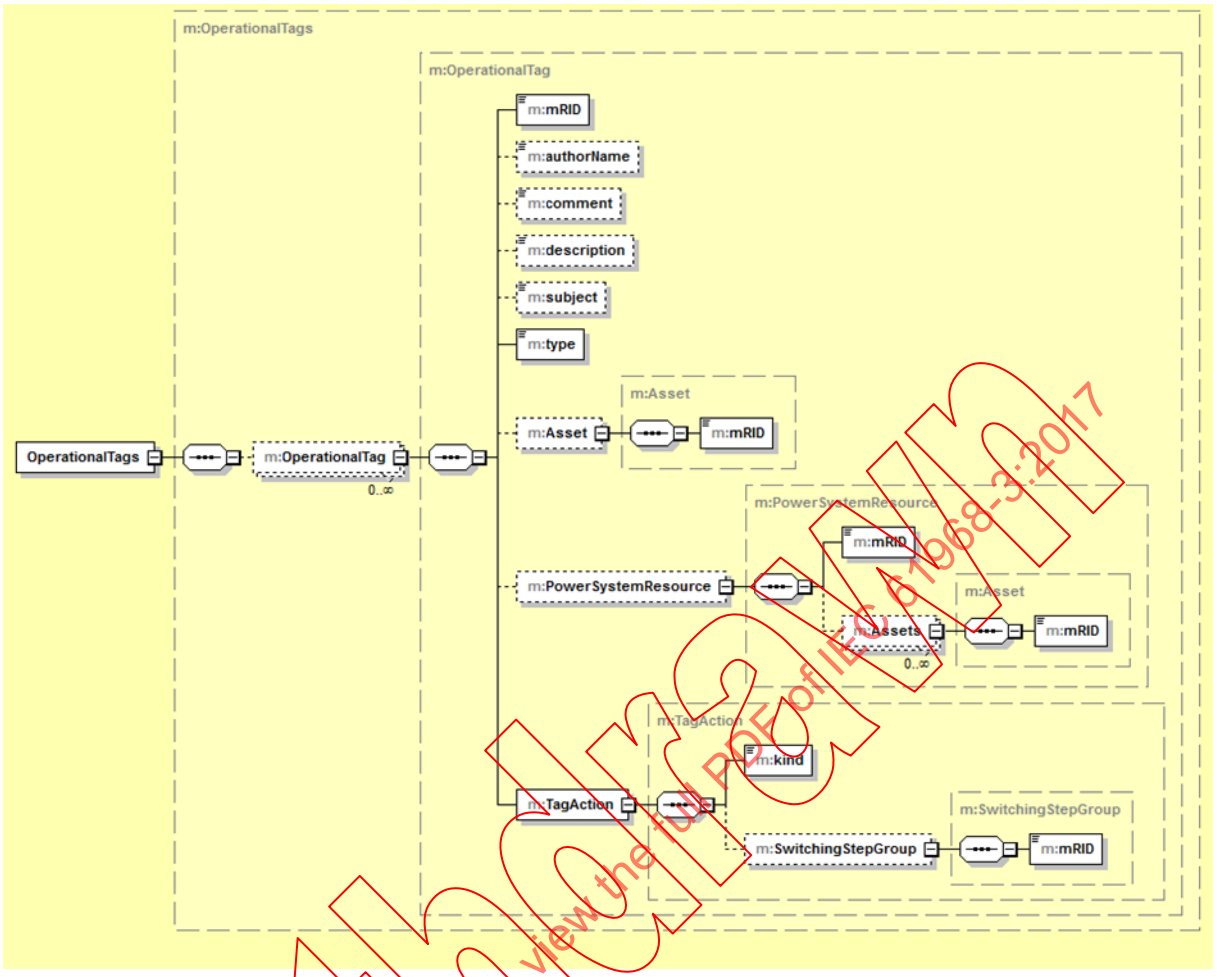


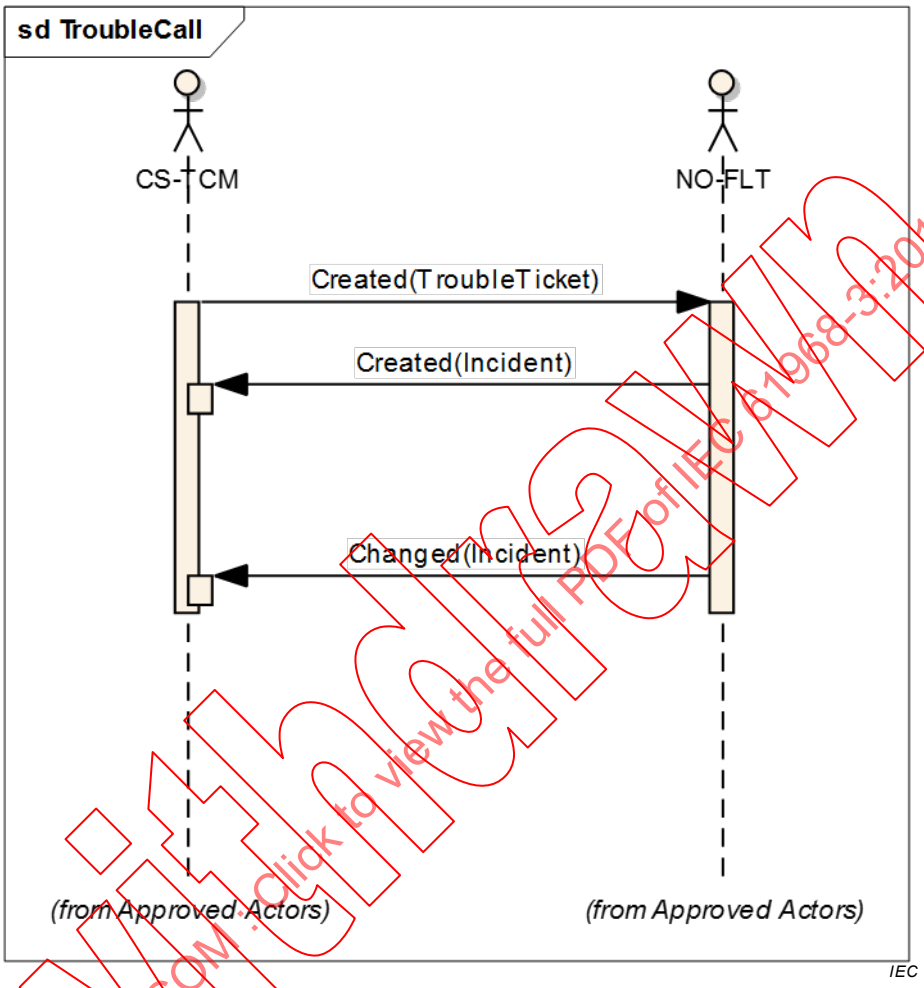
Figure 27 – Charge utile de message OperationalTags (Balises opérationnelles)

5.7 Charge utile TroubleTicket (Fiche incident)

Les charges utiles de messages **TroubleTicket** (Fiche incident) sont conçues pour signaler au client les interruptions signalées et les informations connexes tout au long du cycle de vie d'un appel sur incident. En règle générale, la gestion des appels sur incident (Trouble Call Management – TCM) informe des nouvelles interruptions signalées par les clients. Les systèmes OMS et DMS peuvent utiliser ces informations pour l'analyse des interruptions/pannes. Après identification de l'interruption, un incident est créé pour y répondre. La Figure 28 représente la séquence de création d'un **TroubleTicket**, de création d'un **Incident** et de mise à jour d'un **Incident**.

- TCM crée une Trouble Ticket (Fiche incident) pour informer la gestion de défauts d'une nouvelle interruption
- TCM met à jour une Trouble Ticket (Fiche incident) pour informer des modifications dues à un autre appel provenant du client
- La gestion de défauts vérifie si cette Fiche incident concerne une interruption qui est déjà en cours.
  - Si cette Fiche incident concerne une interruption qui est déjà en cours, la gestion de défauts répond avec l'Incident correspondant. L'incident contient les informations indiquant si l'interruption est déjà confirmée ou est toujours en prévision
  - Si la Fiche incident identifie une nouvelle interruption, la gestion de défauts répond en créant un incident

- La gestion de défauts traite l'interruption en fonction des informations disponibles (événements SCADA, événements de coupure d'alimentation du compteur, par exemple) et des informations provenant de l'équipe sur le terrain. À l'issue de ce traitement, l'interruption est confirmée ou ne l'est pas. Dans les deux cas, la gestion de défauts met à jour la gestion des appels sur incident (TCM) avec l'incident qui présente l'état de confirmations "confirmé" ou "non confirmé".



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 28 – Trouble Ticket (Fiche incident)

Pour de plus amples informations sur la charge utile TroubleTickets (Fiche incident), voir l'IEC 61968-8.

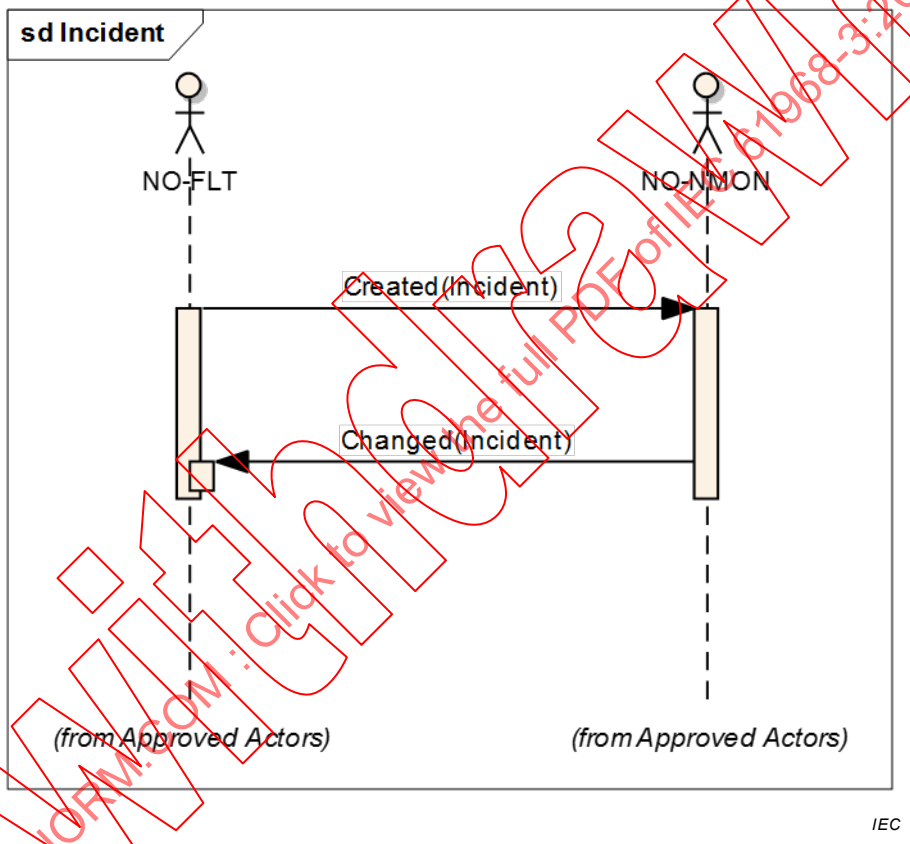
5.8 Charge utile **Incident**

5.8.1 Généralités

Les charges utiles de messages **Incident,** représentées à la Figure 30, sont conçues pour signaler un problème sur le terrain. En règle générale, mais pas toujours, un **Incident** est associé à une **Outage (interruption)**.

- La gestion de défauts crée un incident pour chaque interruption identifiée (voir Figure 29). Une interruption est identifiée en fonction des entrées suivantes ou d'une combinaison de ces entrées:

  - Un client a signalé une interruption grâce à une Trouble Ticket (Fiche incident) provenant de la gestion des appels sur incident (TCM)
  - Un déclenchement de disjoncteur a été signalé par un Digital Measurement (Mesurage Numérique) par un système SCADA
  - Un état d'arrêt du compteur a été signalé par un End Device Event (Événement de Dispositif Terminal) par une infrastructure de comptage avancée (AMI).
- La gestion de défauts met à jour l'Incident en fonction de l'état de l'analyse d'interruption (voir Figure 29). Il s'agit de donner les informations suivantes à la TCM:
  - L'interruption correspondante est-elle confirmée ou pas?
  - Le client respectif est-il toujours à l'arrêt ou l'interruption est-elle déjà résolue et la fiche incident peut-elle être fermée?
  - Le danger à l'origine de l'incident (ligne à l'arrêt, incendie du transformateur, etc.)



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 29 – Incident

5.8.2 Charge utile de message

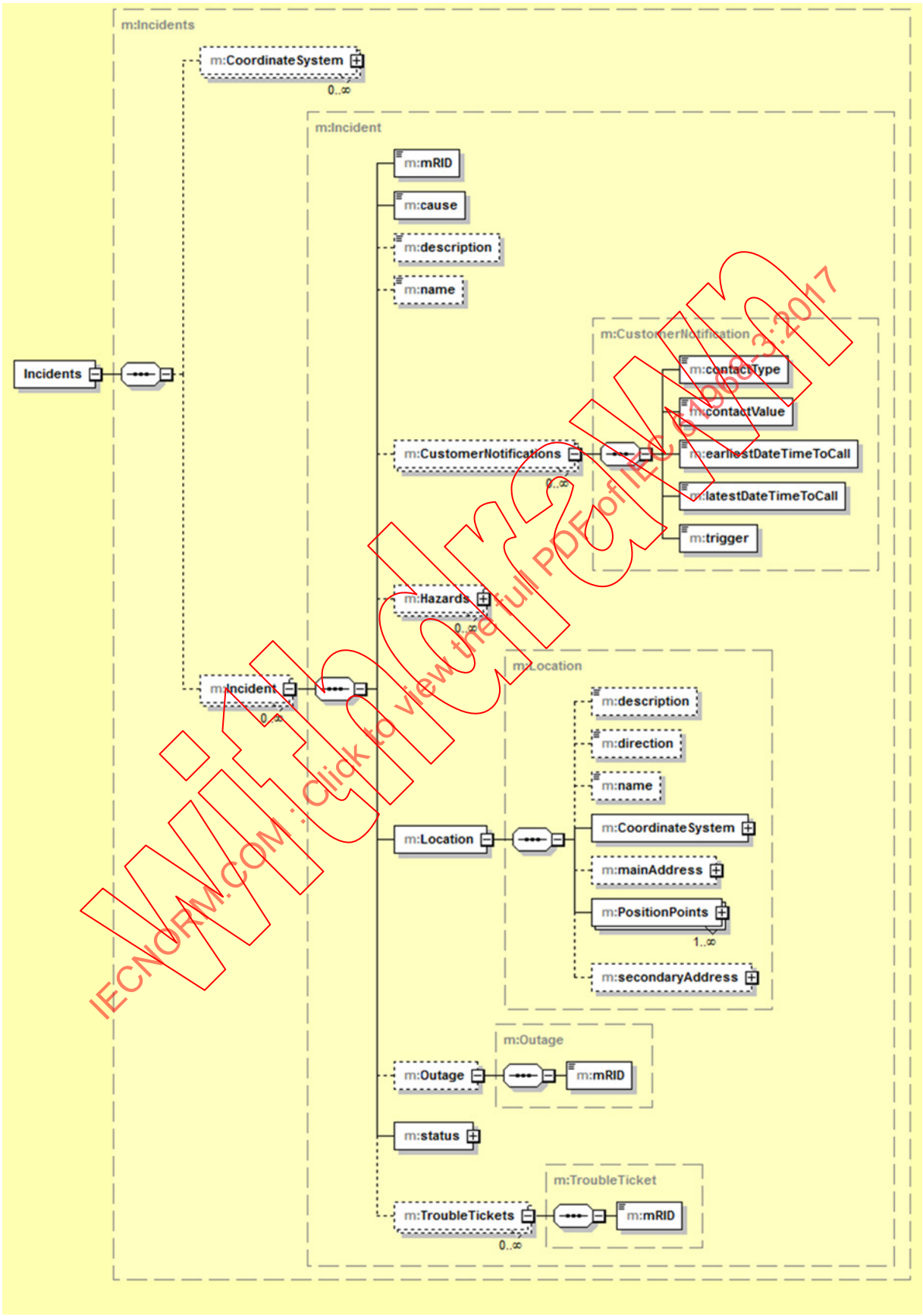


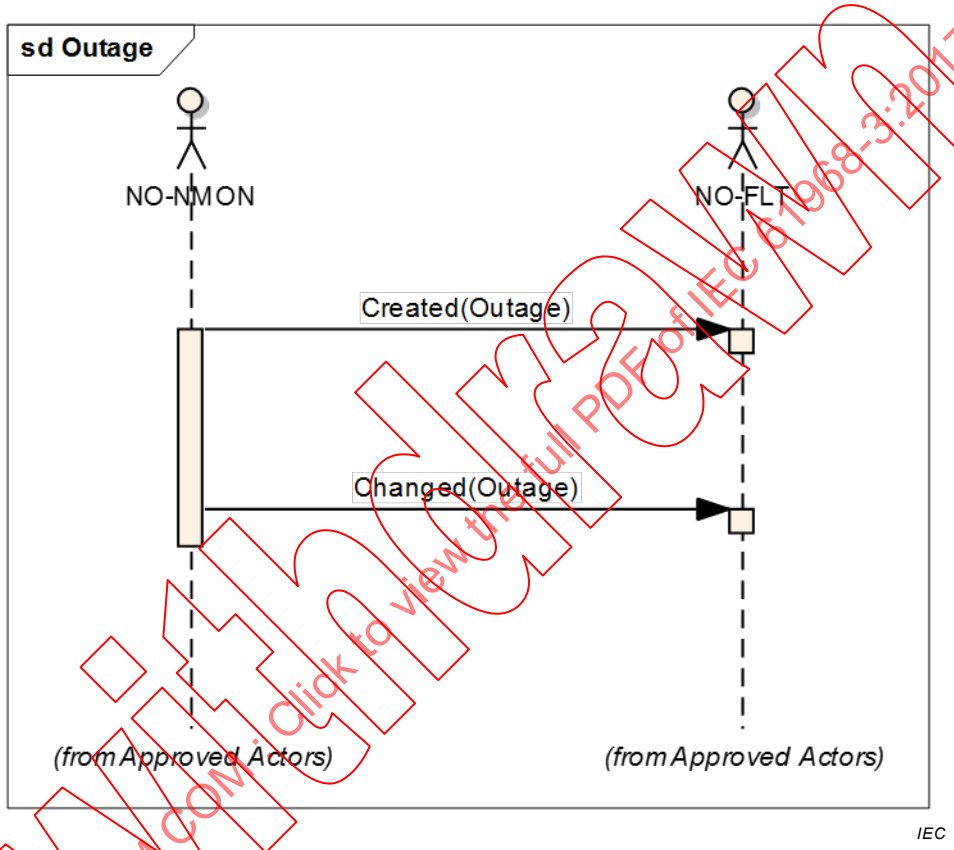
Figure 30 – Charge utile de message Incident

5.9 Charge utile **Outage (interruption)**

5.9.1 Généralités

Les charges utiles de messages **Outage (interruption)**, représentées à la Figure 32, sont conçues pour signaler les interruptions planifiées ou non planifiées. Une **Outage** est créée et modifiée comme représenté dans le diagramme de séquence de la Figure 31.

- Les interruptions non planifiées se produisent par suite de défauts tels que des courts-circuits et des lignes non alimentées.
- Les interruptions planifiées se produisent lors des travaux de maintenance et des travaux d'extension et de modification du réseau.



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 31 – Outage (interruption)

Des informations d'interruption peuvent être utilisées par différentes applications selon le type et la cause de l'interruption:

- Interruptions non planifiées
  - Après que des dispositifs à distance ont détecté une interruption (un déclenchement de dispositif détecté par SCADA, par exemple), la gestion de réseau informe la gestion de défauts d'un traitement plus approfondi de cette interruption.
  - Si un client a signalé une interruption, la gestion des appels sur incident (TCM) informe la gestion de défauts d'un traitement plus approfondi de cette interruption dans le cadre des informations en cas d'incident.

  - Si une AMI détecte et signale une interruption du compteur, la gestion des appels sur incident (TCM) informe la gestion de défauts d'un traitement plus approfondi après avoir évalué qu'il s'agit d'une interruption potentielle.
  - Après confirmation de l'interruption, la gestion de défauts demande un plan de commutation pour l'isolement et la restauration de services. En fonction de cette demande, une application (c'est-à-dire une Switch Action Scheduling – Programmation des actions de commutation) détermine les étapes nécessaires à l'isolement du défaut et à la restauration de la puissance des ilots sains du réseau. Les variantes peuvent donner des informations supplémentaires qui aident l'utilisateur à choisir la meilleure alternative.
  - Lors du cycle de vie des interruptions, les informations d'interruption sont mises à jour, pour indiquer par exemple la modification d'état de l'interruption (temps de restauration prévu, l'alimentation des clients est partiellement ou complètement rétablie, etc.).

- Interruptions planifiées
  - Au cours de la planification des travaux de maintenance et de construction, la gestion de défauts informe les parties intéressées sur les interruptions résultant de ces travaux. Cette notification comprend les clients affectés, les programmes d'interruption, etc.
  - Lors du cycle de vie de ces interruptions, les informations d'interruption sont mises à jour, y compris la modification d'état de l'interruption (l'interruption est en cours, l'interruption est terminée, l'alimentation des clients est partiellement ou complètement rétablie, etc.)

5.9.2 Charge utile de message

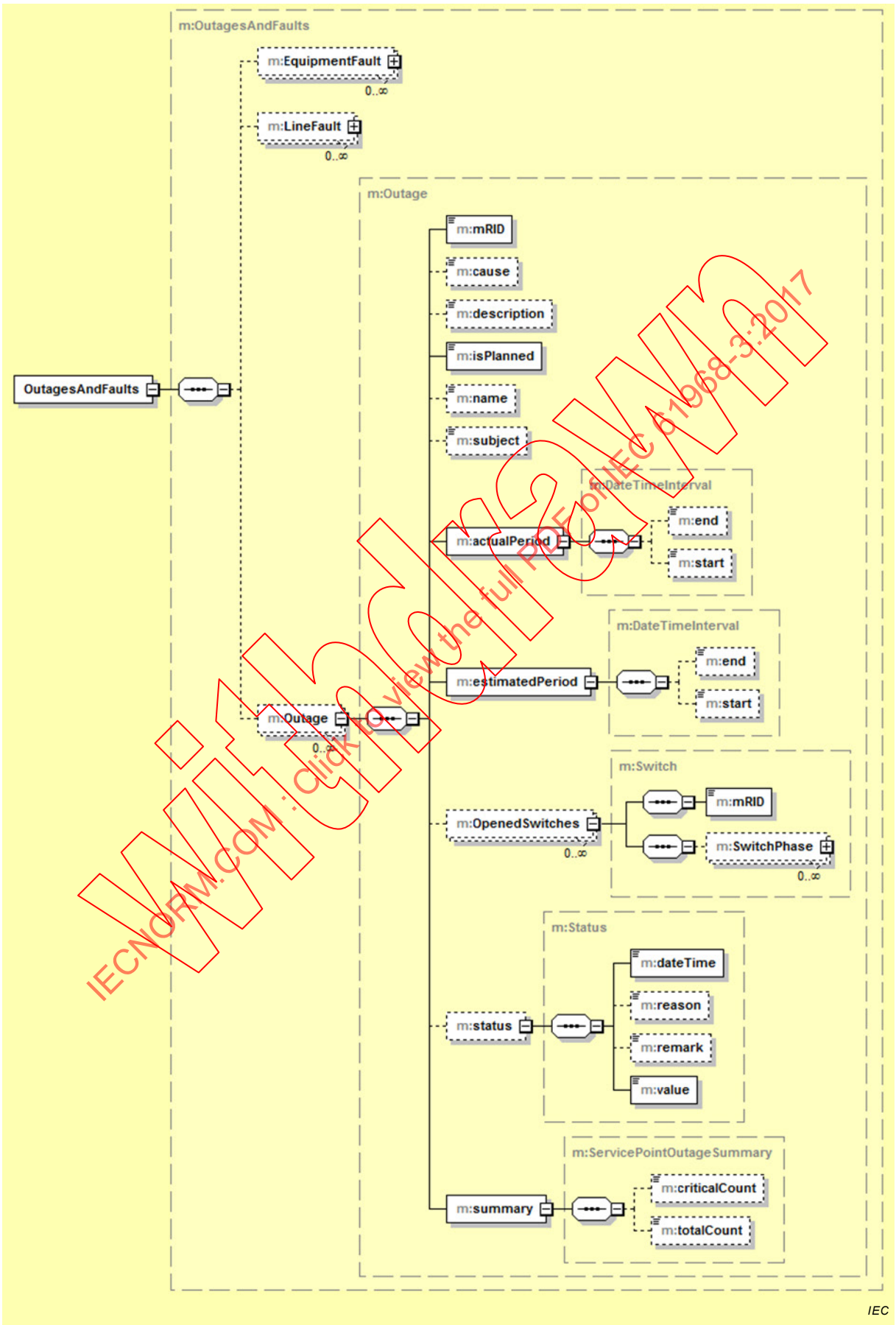


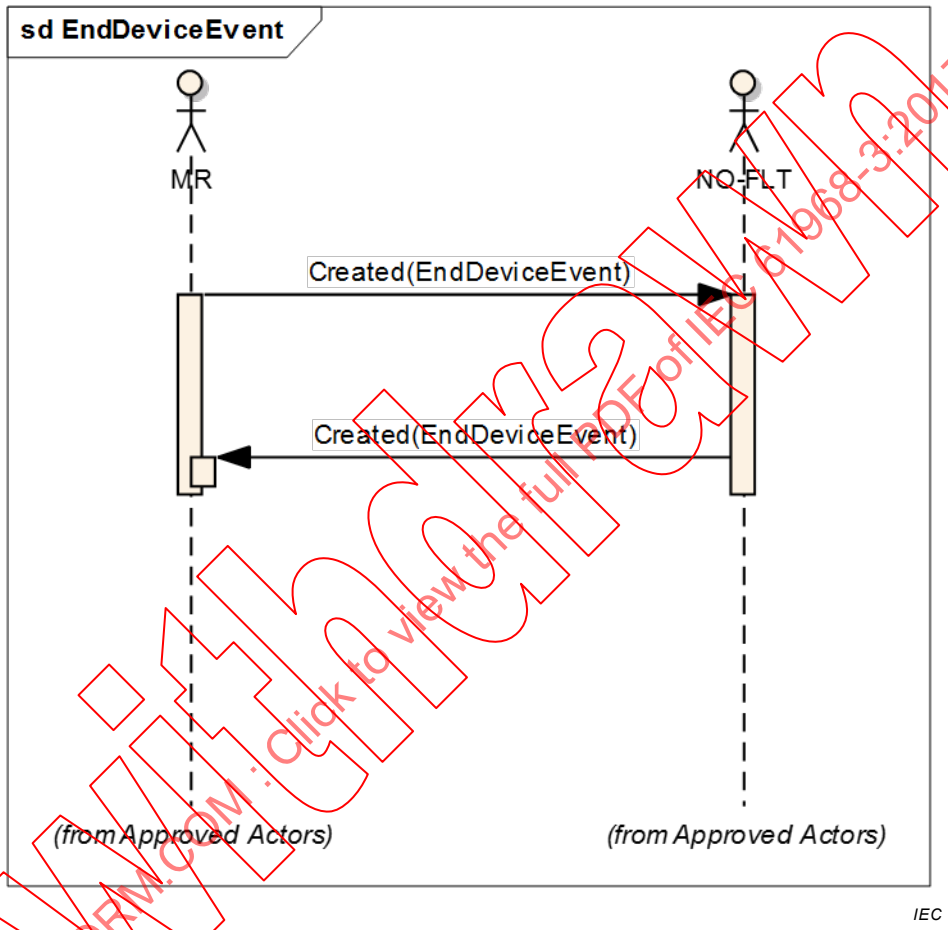
Figure 32 – Charge utile de message OutagesAndFaults (Interruptions et pannes)

5.10 Charges utiles de messages Metering (Comptage)

5.10.1 **EndDeviceEvent** (Événement de dispositif terminal)

Les charges utiles de messages **EndDeviceEvent** (Événement de dispositif terminal) sont conçues pour signaler les modifications d'état d'un dispositif de comptage. Ces informations peuvent être utilisées par des applications (pour la gestion des interruptions, par exemple). La Figure 33 représente un diagramme de séquence pour **EndDeviceEvent**.

- Un ou plusieurs compteurs signalent l'état d'arrêt de l'alimentation. Ces informations peuvent indiquer une interruption dans la zone correspondante du réseau.



Anglais	Français
From Approved Actors	Des Acteurs approuvés

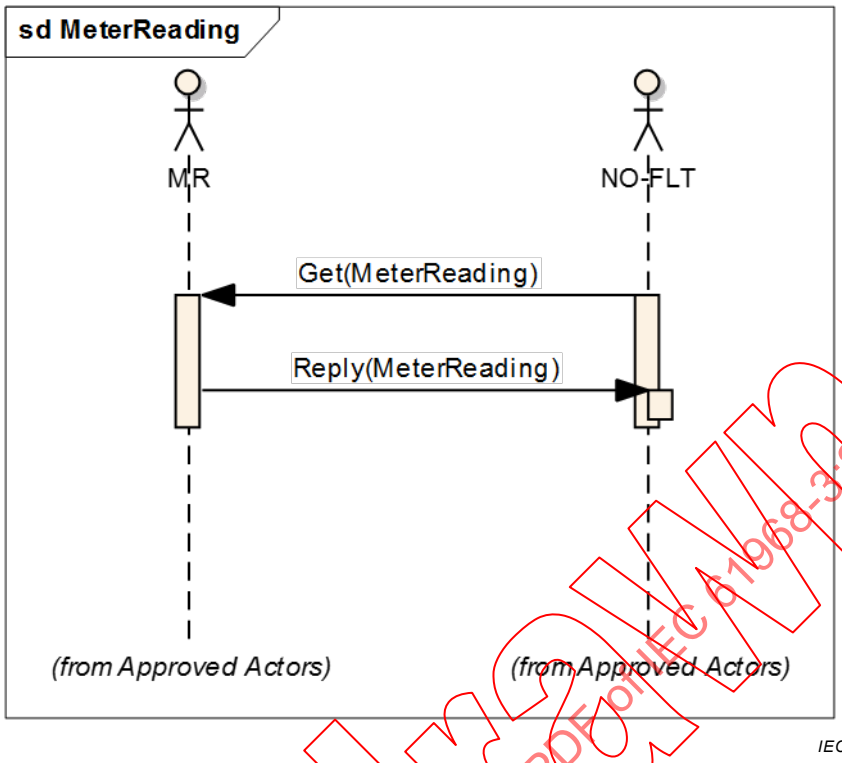
Figure 33 – End Device Event (Evénement de dispositif terminal)

Pour de plus amples informations sur la charge utile End Device Event (Événement de dispositif terminal), voir l'IEC 61968-9.

5.10.2 **MeterReading** (Relevé de compteur)

Les charges utiles de messages **MeterReading** (Relevé de compteur) sont conçues pour lire l'état d'un ou de plusieurs dispositifs de comptage. Ces informations peuvent être utilisées par des applications (pour la gestion des interruptions, par exemple). La Figure 34 représente une séquence de relevé de compteur type.

- L'état d'un ou de plusieurs dispositifs de comptage est demandé pour vérifier si l'alimentation est rétablie dans la zone correspondante du réseau.



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 34 – Meter Reading (Relevé de compteur)

Pour de plus amples informations sur la charge utile **Meter Reading** (Relevé de compteur), voir l'IEC 61968-9.

5.11 Charges utiles de messages Work (Travail)

5.11.1 WorkOrder (Bon de travail)

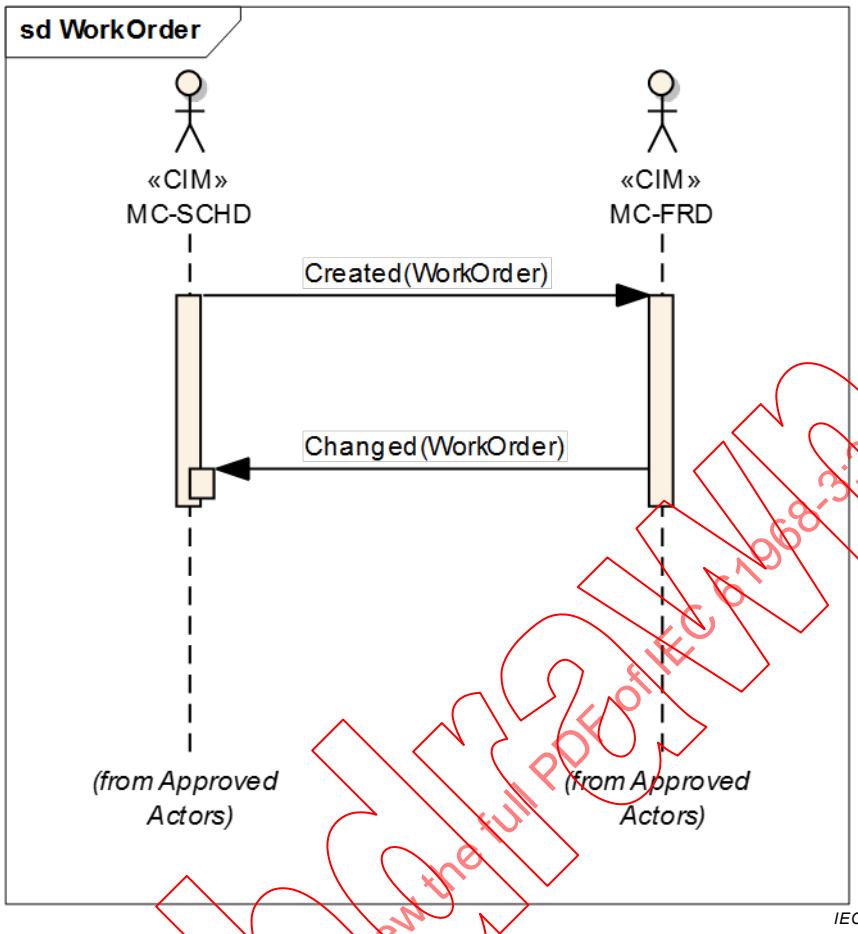
Les charges utiles de messages **WorkOrder** (Bon de travail) sont conçues pour signaler des demandes de travail de maintenance, y compris la progression des travaux. Le travail demandé comprend

- Isolement de l'équipement qu'il est nécessaire de mettre hors service
- Autres moyens possibles d'alimenter les clients pendant l'interruption
- Travaux de maintenance et de construction
- Reconfiguration et réalimentation à l'issue du travail de maintenance

Les actions de commutation réelles sont incluses comme un plan de commutation.

Un bon de travail peut être communiqué entre différentes parties au cours de son cycle de vie (voir Figure 35):

- Un bon de travail est créé
- Un bon de travail est partiellement ou complètement exécuté



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 35 – Work Order (Bon de travail)

Pour de plus amples informations sur le **Work Order** (Bon de travail), voir MaintenanceOrder et ServiceOrder dans l'IEC 61968-6.

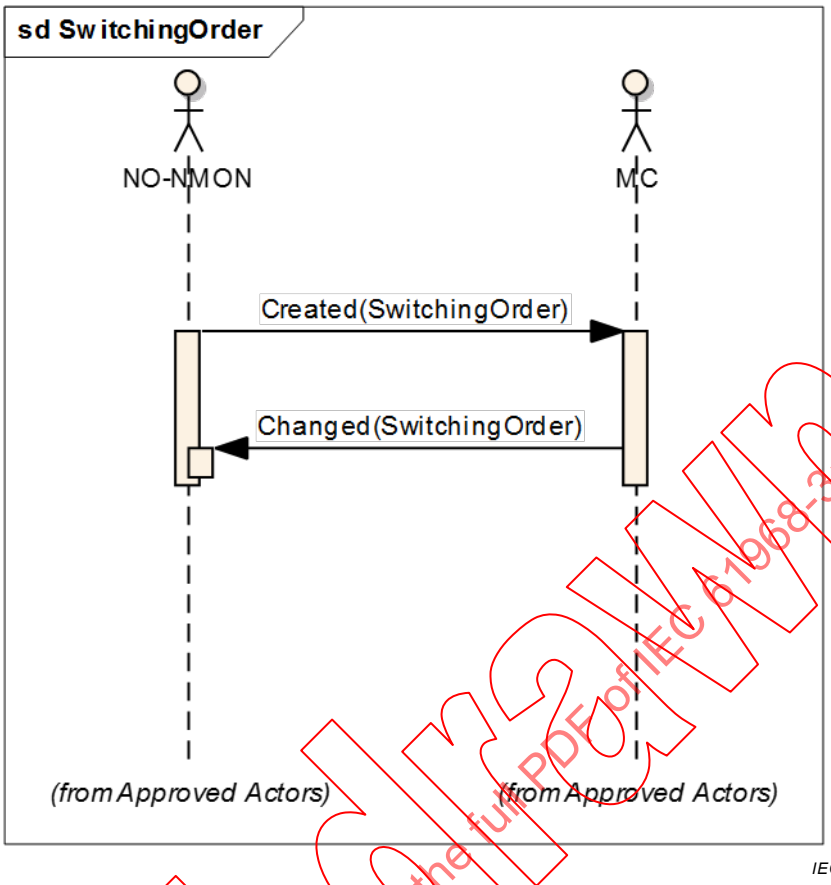
5.12 SwitchingOrder (Bon de commutation)

5.12.1 Généralités

Les charges utiles de messages **SwitchingOrder** (Bon de commutation) sont conçues pour signaler les demandes d'exécution d'une ou de plusieurs actions de commutation pour l'isolement du défaut et la restauration de services, y compris la progression de l'exécution. Les actions de commutation réelles sont incluses comme un plan de commutation.

Un bon de commutation peut être communiqué entre différentes parties au cours de son cycle de vie (voir Figure 36):

- Un bon de commutation est créé
- Un bon de commutation est partiellement ou complètement exécuté



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 36 – Switching Order (Bon de commutation)

Un bon de commutation peut être créé/mis à jour dans le cadre des exemples de cas d'utilisation suivants:

- Demande d'exécution d'un plan de commutation pour isoler un défaut et/ou rétablir l'alimentation de la partie saine du réseau.
- Demande d'exécution d'un plan de commutation pour isoler l'équipement en cas d'interruption planifiée et/ou de restauration de services après une interruption planifiée.

5.12.2 Charge utile de message

La Figure 37 représente la charge utile **SwitchingOrders**.

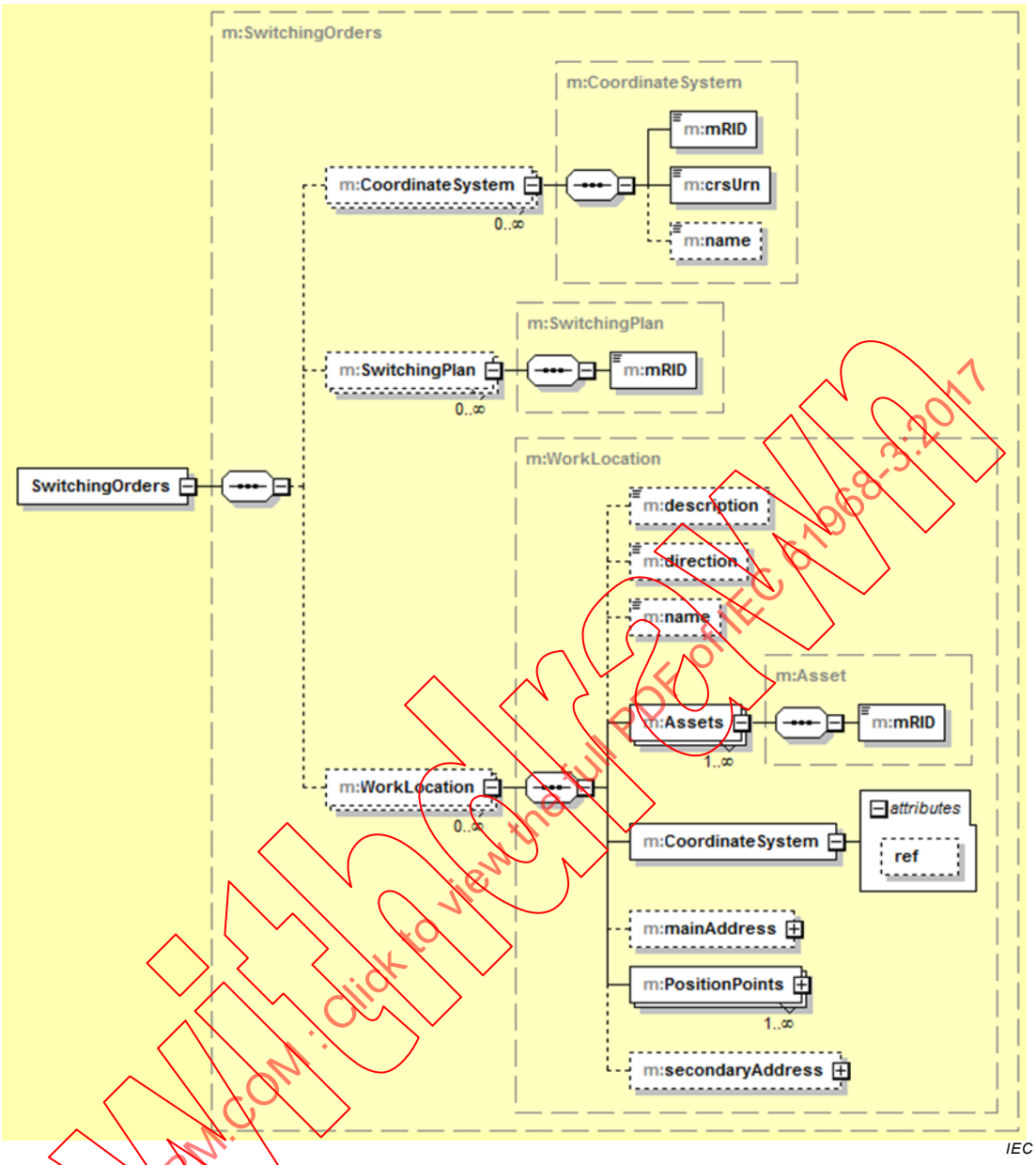


Figure 37 – Charge utile de message SwitchingOrder (Bon de commutation)

5.13 TroubleOrder (Bon d'incident)

5.13.1 Généralités

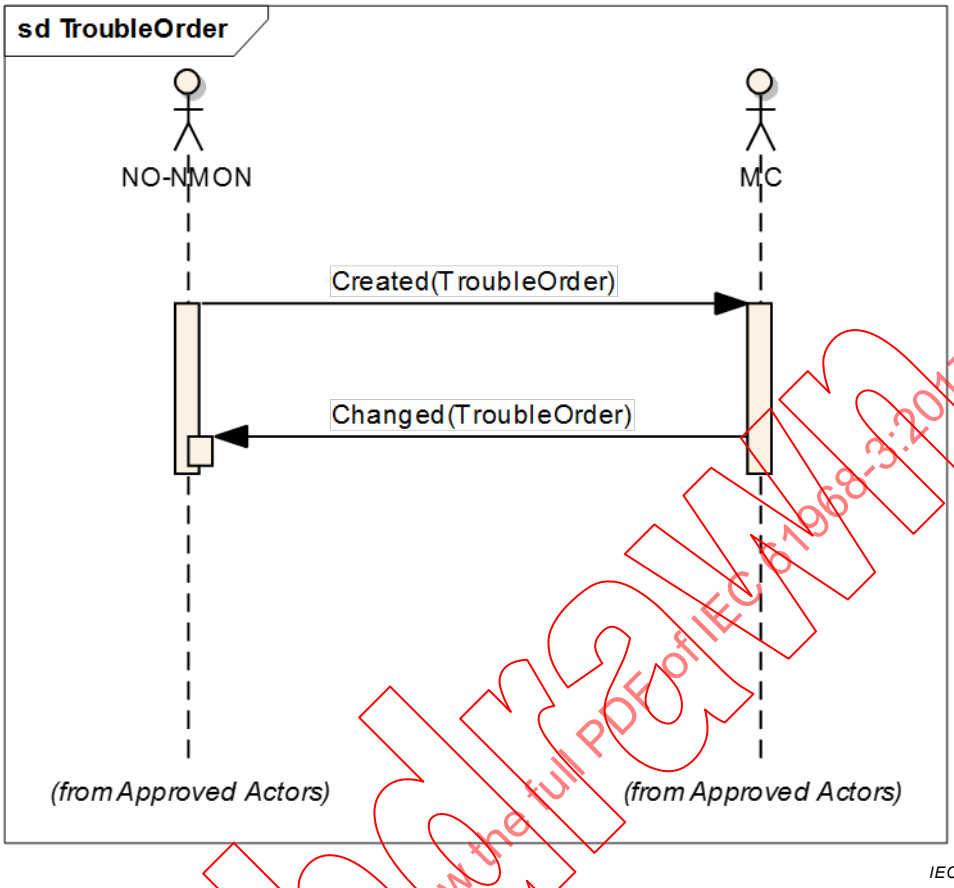
Les charges utiles de messages **TroubleOrder** (Bon d'incident) sont conçues pour signaler des demandes de travaux d'analyse des interruptions non planifiées, y compris la progression des travaux. Le travail demandé comprend

- La répartition du personnel
- La confirmation du dispositif de protection lorsque l'interruption est prévue
- La détermination de l'emplacement du défaut
- La détermination de la cause du défaut

Un bon d'incident peut être communiqué entre différentes parties au cours de son cycle de vie (voir Figure 38):

- Un bon d'incident est créé pour initier le travail

- Un bon d'incident est partiellement ou complètement exécuté



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 38 – Trouble Order (Bon d'incident)

5.13.2 Charge utile de message

La Figure 39 représente la charge utile **TroubleOrders**.

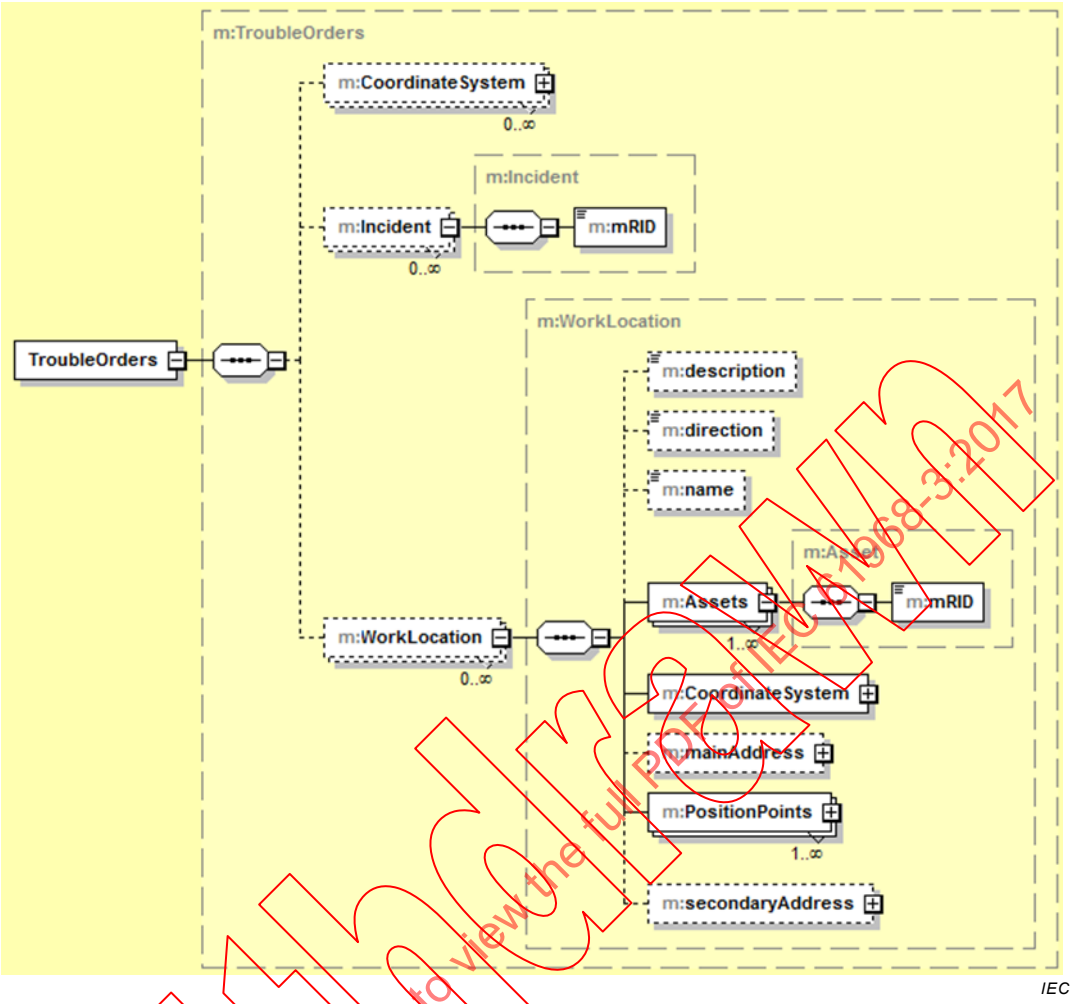


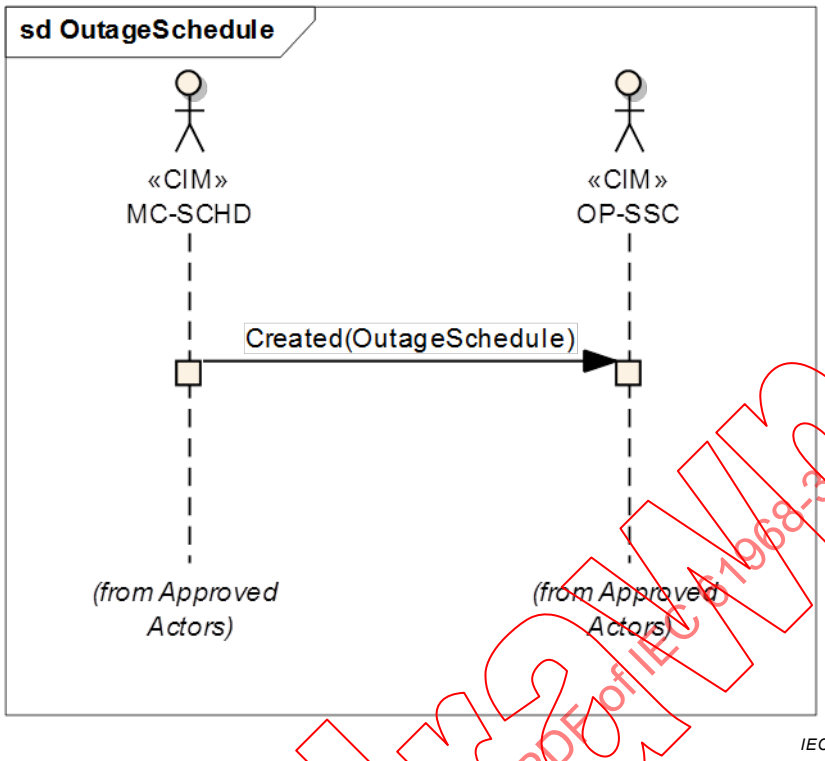
Figure 39 – Charge utile de message TroubleOrder (Bon d'incident)

Pour de plus amples informations sur **MainAddress**, voir 5.8 Charge utile **Incident**.

5.14 OutageSchedule (Programme d'interruption)

5.14.1 Généralités

Les charges utiles de messages **OutageSchedule** (Programme d'interruption) sont conçues pour initier les interruptions planifiées dans le cadre des travaux de maintenance et de construction. La Figure 40 représente un diagramme de séquence pour **OutageSchedule**.



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure 40 – Outage Schedule (Programmation d'interruption)

5.14.2 Charge utile de message

La Figure 41 représente la charge utile pour **OutageSchedules**.

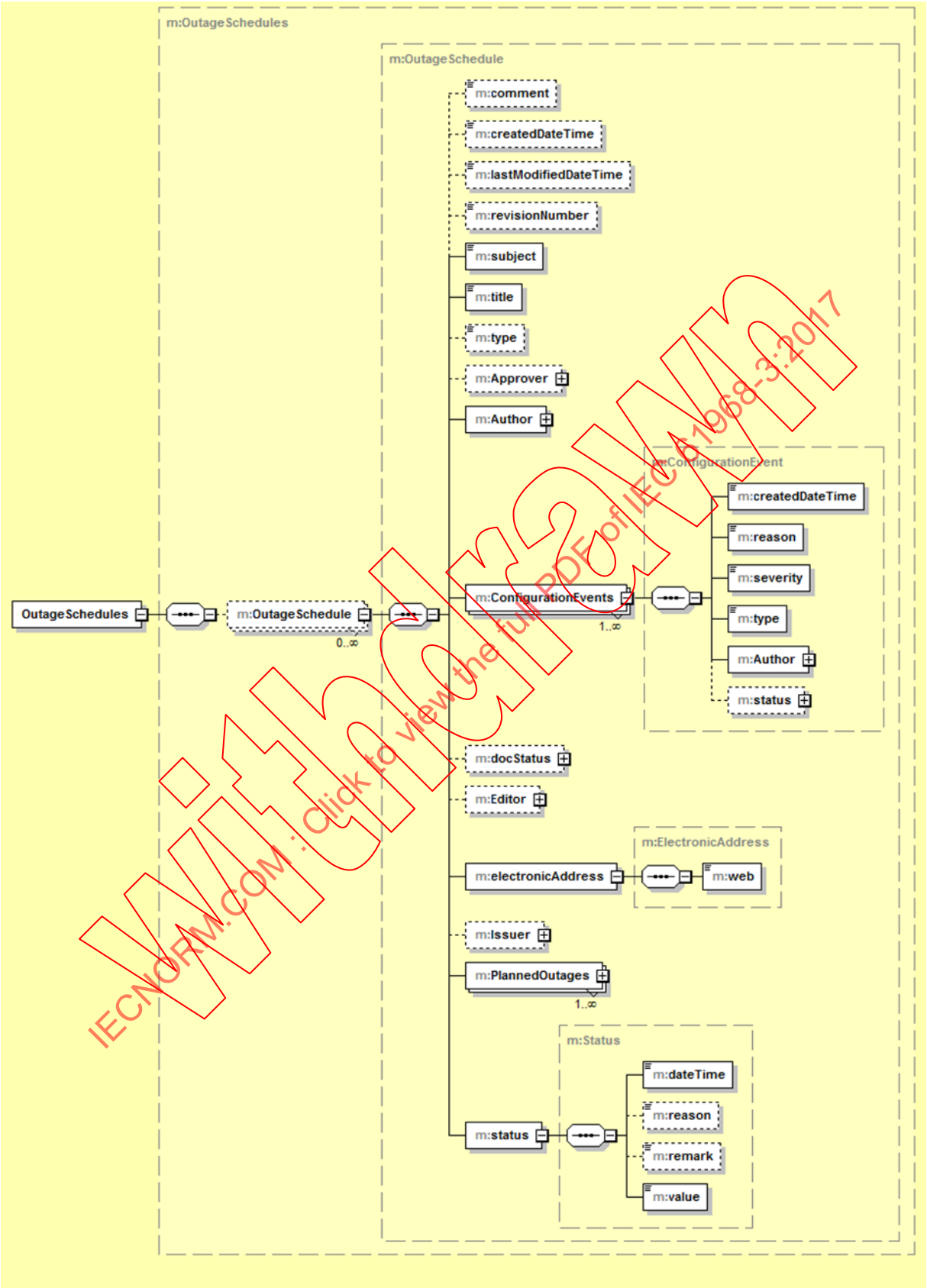


Figure 41 – Charge utile de message OutageSchedule (Programmation d'interruption)

La Figure 42 représente les détails de la charge utile **OutageSchedule** pour **PlannedOutages.**

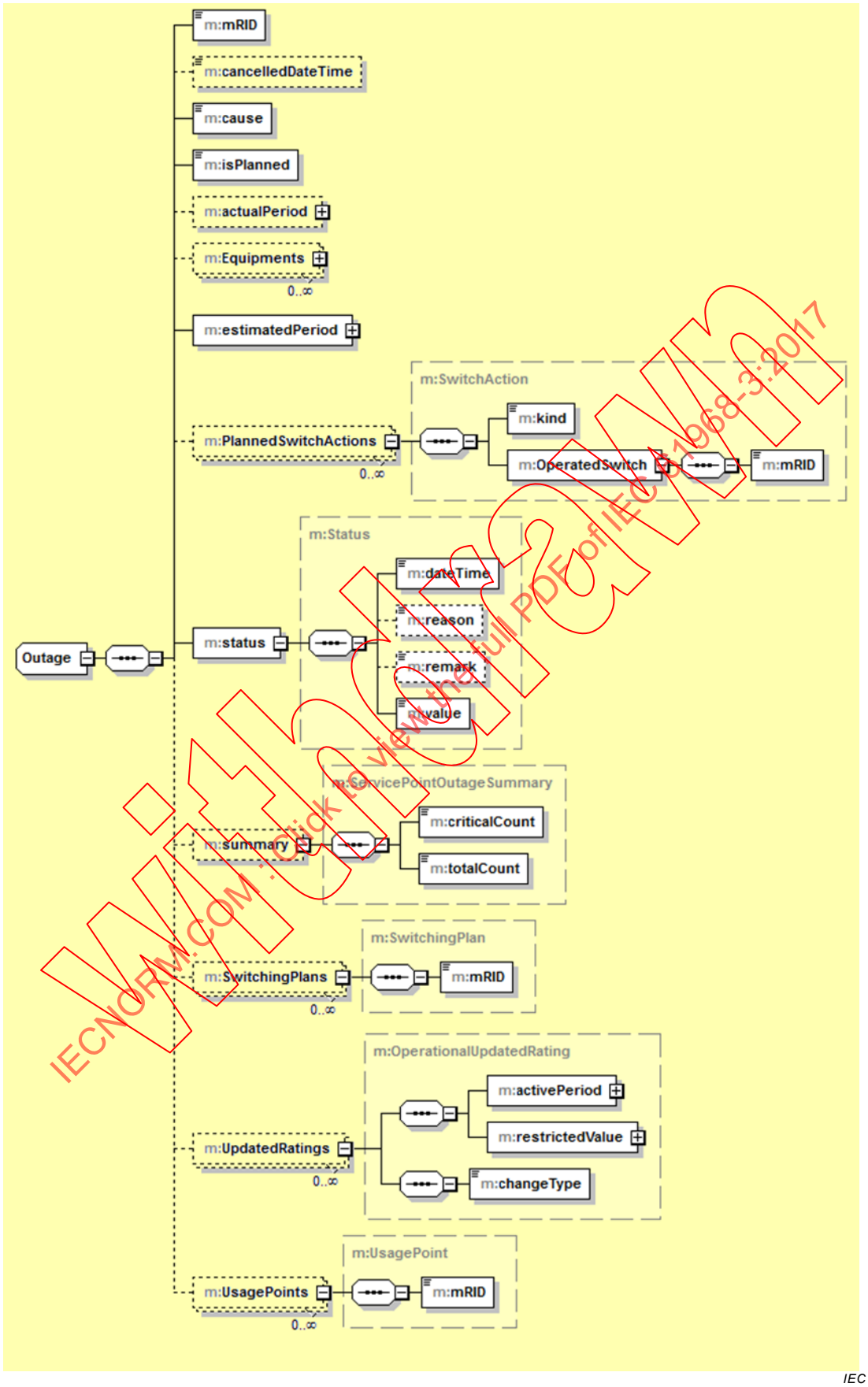


Figure 42 – Charge utile de message OutageSchedule, détails de PlannedOutages

6 Conventions du document

6.1 Diagrammes UML

Tous les diagrammes de séquences UML présentés ici doivent être considérés comme des exemples informatifs de la manière dont un échange de message peut avoir lieu.

NOTE La souplesse constitue l'un des points forts du modèle d'information commun (CIM). Au fur et à mesure des avancées technologiques, et des nouveaux besoins, de nouveaux messages peuvent être créés. Ces nouveaux messages peuvent impliquer des systèmes supplémentaires (non représentés.) Ces nouveaux messages peuvent proposer des options différentes de celles décrites dans l'exemple.

Tous les diagrammes de communication UML et diagrammes de flux de messages présentés ici doivent être considérés comme étant informatifs.

Tous les diagrammes de classe UML présentés ici doivent être considérés comme étant informatifs. Le lecteur est invité à consulter l'IEC 61968-1 pour localiser le document contenant les définitions normatives des classes utilisées dans le CIM.

6.2 Définitions de charges utiles de messages

6.2.1 Généralités

Les diagrammes de charges utiles de messages présentés dans le présent document doivent être considérés comme normatifs ou informatifs, les schémas XML normatifs étant fournis à l'Annexe B.

Les cas d'utilisation et les diagrammes de séquences présentés dans le présent document sont donnés à titre informatif uniquement. Ils représentent des exemples d'utilisation des charges utiles de messages normatives.

6.2.2 Obligatoire/Facultatif

Les charges utiles de messages spécifiées dans la présente Norme ont été déduites des cas d'utilisation de l'Annexe A, qui répondent à des besoins métier sous-jacents pour un échange d'informations particulier. Chaque cas d'utilisation s'inscrit dans un contexte donné pour l'utilisation du CIM. Les diagrammes de charges utiles de messages décrivent les éléments qui sont transmis. Les éléments placés dans les cadres en pointillés doivent être considérés comme facultatifs dans un contexte donné. Les éléments placés dans les cadres en ligne continue doivent être considérés comme obligatoires dans un contexte donné. S'il convient qu'un diagramme décrive une classe complète comme étant obligatoire ou facultative, il convient que le lecteur comprenne bien qu'il s'agit de l'utilisation de la classe qui est obligatoire ou facultative, et ne considère donc pas que chaque élément au sein de la classe est de ce fait obligatoire ou facultatif. A cet effet, le lecteur doit se référer à la définition normative de la classe.

6.3 Messages synchrones/asynchrones

L'utilisation de messages asynchrones ou synchrones dans les diagrammes de séquences du présent document est indiquée à titre représentatif uniquement, et n'a pas de caractère normatif.

6.4 Échanges de messages

Voir l'IEC 61968-100 pour des informations supplémentaires relatives aux échanges de messages.

Annexe A
(informative)

Cas d'utilisation

A.1 Généralités

La présente annexe donne des exemples de cas d'utilisation d'exploitation du réseau liés à la détection d'interruption de réseau et à la réponse donnée. Il est important de noter que les cas d'utilisation et les diagrammes de séquences fournis dans la présente partie de l'IEC 61968 sont par nature informatifs, et sont destinés à donner des exemples d'utilisation de charges utiles de messages normatives. La présente partie de l'IEC 61968 n'a pas vocation à normaliser les processus métier spécifiques.

Le cas d'utilisation FLISR (Localisation de défaut, isolement et restauration de l'alimentation) décrit le flux de travaux nécessaire pour informer les systèmes opérationnels d'une interruption et de la localisation du défaut, et pour y répondre par un isolement du défaut et la restauration des ilots sains du réseau.

Certains noms de ces cas d'utilisation ne correspondent pas exactement à ceux indiqués dans le modèle CIM ou dans les charges utiles de messages du présent document, les cas d'utilisation étant antérieurs à la modélisation et au profilage.

A.2 FLISR

A.2.1 Vue d'ensemble

FLISR est l'acronyme de Fault Location, Isolation and Service Restoration (Localisation de défaut, isolement et restauration de services). Si une interruption est détectée par SCADA ou prévue par une analyse d'interruption, les meilleures informations sont en général obtenues de l'association de l'interruption à un dispositif de protection qui a été déclenché. La localisation de défaut fait référence à des observations, des signaux et des analyses supplémentaires nécessaires à l'identification de la véritable cause de l'interruption (généralement un défaut de ligne en aval du dispositif de protection). L'isolement est le processus de commutation et de séparation permettant d'isoler en toute sécurité la localisation du défaut pour procéder à des réparations. Le processus de restauration de l'alimentation des ilots sains du réseau autour de la zone isolée est appelé "restauration de services".

A.2.2 FLISR pour l'interruption détectée par SCADA, commutation SCADA

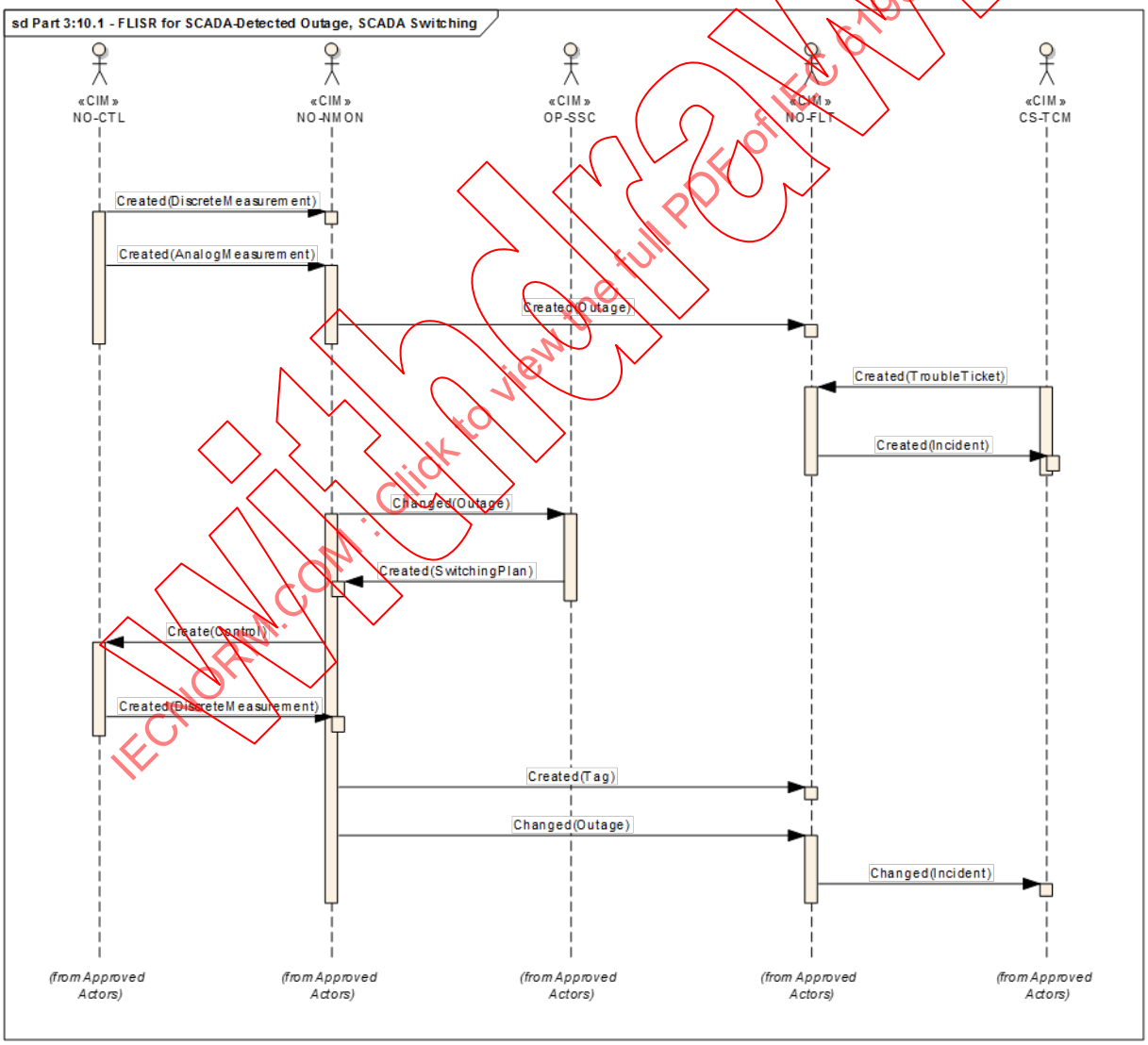
Le flux de travaux FLISR prend pour hypothèse un réseau autorégénérateur, la surveillance et la commande du système étant assurées par SCADA et la réponse automatique aux interruptions étant gérée par la fonction Gestion de défauts d'un DMS. La Figure A.1 représente le diagramme de séquence du flux de messages avec une description du flux de messages du Tableau A.1.

Lorsque la fonction Commande/Contrôle du réseau (NO-CTL, alias SCADA) détecte une modification imprévue de l'état d'un dispositif de protection, elle peut informer la fonction Exploitation du réseau (NO-NMON, alias DMS dans la salle de commande) de l'événement. La fonction Exploitation du réseau reçoit également des états d'indicateur de défaut et des mesurages de courant/réactance de défaut de la part de la fonction Commande/Contrôle du réseau, afin de calculer l'emplacement réel du défaut sur la ligne en aval du dispositif. La fonction Exploitation du réseau confirme l'interruption à la fonction Gestion de défauts (NO-FLT, alias OMS), afin de pouvoir se coordonner avec la fonction Assistance à la clientèle (CS-TCM).

À ce stade, la fonction Assistance à la clientèle est susceptible d'informer la fonction Gestion de défauts de la présence de fiches incident. La fonction Gestion de défauts peut établir une corrélation entre les fiches et l'interruption, puis informer la fonction Assistance à la clientèle de l'incident utilisé pour gérer le problème.

Pendant ce temps, la fonction Exploitation du réseau peut demander un plan de commutation afin d'isoler le problème et restaurer l'alimentation des ilots sains du réseau. La fonction Programmation des actions de commutation (OP-SSC) propose à cet effet une ou plusieurs variations du plan de commutation, la fonction Exploitation du réseau choisissant celle qui offre le meilleur équilibre de courant de retour dans les circuits avoisinants.

La fonction Exploitation du réseau invite la fonction Commande/Contrôle du réseau à exécuter chaque étape du plan de commutation sélectionné. À l'exécution de chaque étape, la fonction Gestion de défauts reçoit une notification des modifications apportées au réseau en raison de la commutation, ainsi que les balises opérationnelles de sécurité pour les dispositifs spécifiques. La fonction Gestion de défauts indique à la fonction Assistance à la clientèle à quel moment l'alimentation des clients qui ont appelé a été rétablie pendant le processus.



IEC

Anglais	Français
FLISR for SCADA-Detected Outage, SCADA Switching	FLISR pour l'interruption détectée par SCADA, commutation SCADA
From Approved Actors	Des Acteurs approuvés

Figure A.1 – FLISR pour l'interruption détectée par SCADA, commutation SCADA

Tableau A.1 – Flux de messages FLISR pour interruption détectée par SCADA, commutation SCADA

De	A	message	description
NO-CTL	NO-NMON	Created **DiscreteMeasurement**	Notification de modification d'état d'un dispositif de protection par suite d'une interruption.
NO-CTL	NO-NMON	Created **AnalogMeasurement**	Notification d'un courant/d'une réactance de défaut au niveau du dispositif de protection, permettant à la FLT de calculer la localisation du défaut.
NO-NMON	NO-FLT	Created **Outage**	Selon les informations relatives au courant de défaut, NMON informe d'une interruption avec la localisation du défaut de câble au sol en aval du dispositif de protection déclenché. À ce stade, l'interruption et la localisation du défaut sont confirmées.
CS-TCM	NO-FLT	Created **TroubleTicket**	Notification de l'interruption signalée par le client.
NO-FLT	CS-TCM	Created **Incident**	OA informe de la création d'un incident pour une interruption.
NO-NMON	OP-SSC	Changed **Outage**	Demande d'un plan de commutation afin d'isoler le défaut et restaurer l'alimentation des ilots sains du réseau.
OP-SSC	NO-NMON	Created **SwitchingPlan**	Notification d'un nouveau plan de commutation afin d'isoler l'interruption et restaurer l'alimentation des ilots sains du réseau. Noter que SSC peut fournir plusieurs plans de commutation pour des alternatives de restauration de l'alimentation.
NO-NMON	NO-CTL	Create **Control**	Demande de fonctionnement des commutateurs commandé par SCADA pour l'exécution du plan de commutation.
NO-CTL	NO-NMON	Created **DiscreteMeasurement**	Notification de modification d'état d'un commutateur par suite d'une opération de commutation.
NO-NMON	NO-FLT	Created **Tag**	Notification de la mise en place de la balise liée à l'exécution des opérations de commutation.
NO-NMON	NO-FLT	Changed **Outage**	Notification de la restauration de l'interruption.
NO-FLT	CS-TCM	Changed **Incident**	Notification de la restauration de l'alimentation des clients qui ont appelé avant la restauration.

A.2.3 FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe

Ce flux de travaux FLISR part du principe que le réseau est surveillé et commandé manuellement, l'équipe sur le terrain enquêtant et signalant les interruptions à un opérateur aidé par la fonction Gestion de défauts d'un DMS. La Figure A.2 représente le diagramme de séquence du flux de messages avec une description du flux de messages du Tableau A.2.

Lorsqu'un client appelle pour signaler l'absence d'alimentation, la fonction Assistance à la clientèle (CS-TCM) crée une fiche incident et la soumet à la fonction Gestion de défauts (NO-FLT, alias OMS). La fonction Gestion de défauts répond par un incident, nouveau ou existant, correspondant à ce problème. De même, la fonction Comptage (MR) peut détecter les événements de coupure d'alimentation au niveau des compteurs et en informer la fonction

Gestion de défauts. Selon les informations relatives à l'interruption provenant de plusieurs sources, la fonction Gestion de défauts peut prédire quel dispositif de protection dans le réseau a été déclenché. La fonction Gestion de défauts signale l'interruption du dispositif à la fonction Exploitation du réseau (NO-NMON, alias DMS dans la salle de commande) pour la coordination d'une réponse.

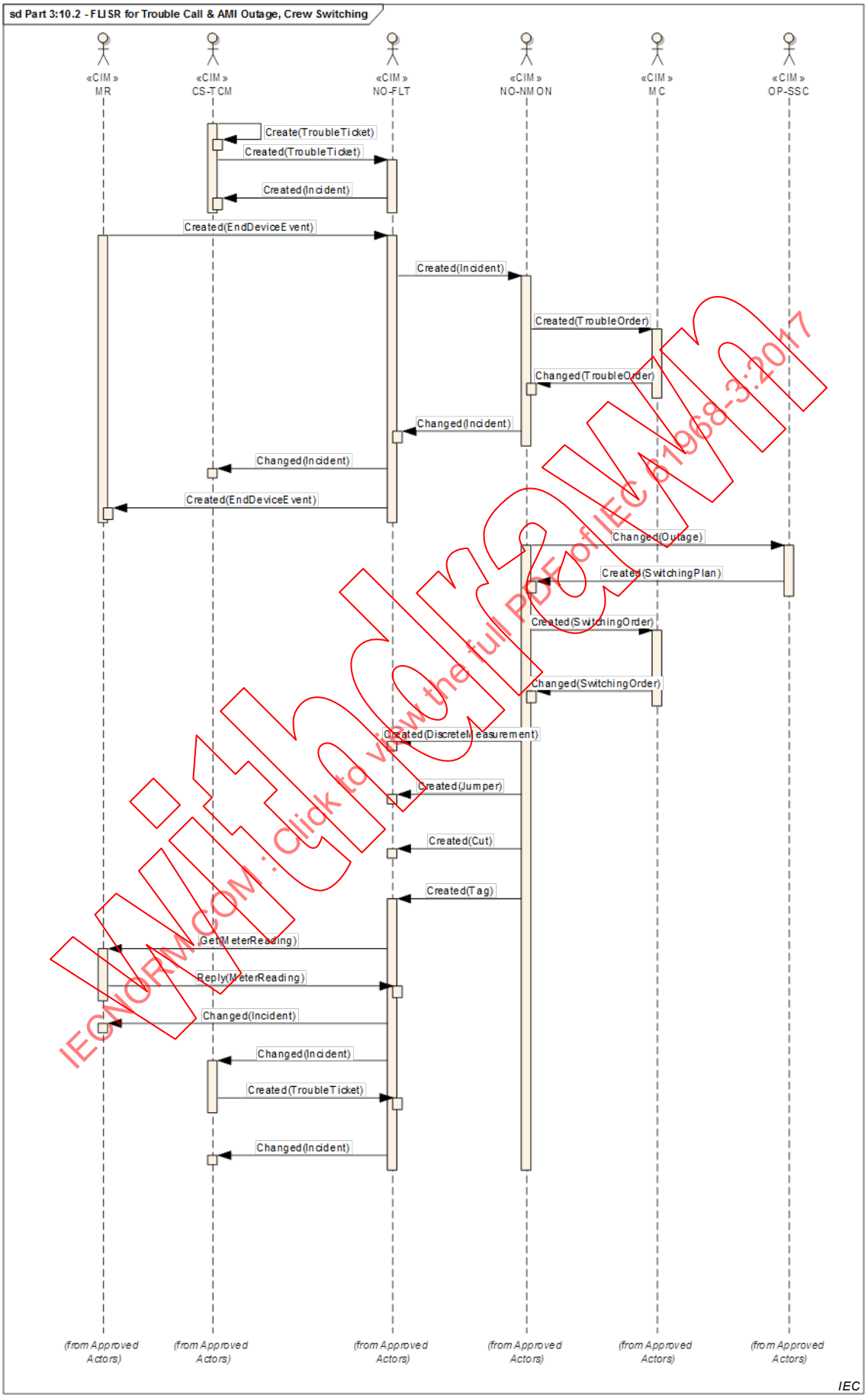
À ce stade, l'opérateur Exploitation du réseau demande à la fonction Gestion de la main-d'œuvre (MC) de dépêcher du personnel pour confirmer le problème de réseau à l'origine de l'interruption. Le personnel dépêché peut confirmer que le dispositif prévu ou un autre dispositif s'est déclenché. De même, l'équipe sur le terrain peut vérifier l'état des indicateurs de défaut en aval du dispositif déclenché. Ces informations et d'autres observations provenant de l'équipe sur le terrain permettent à l'opérateur, aidé de la fonction Exploitation du réseau, de déterminer l'emplacement réel du défaut.

La fonction Exploitation du réseau peut informer la fonction Gestion de défauts de l'interruption confirmée du dispositif. La fonction Gestion de défauts peut ensuite indiquer à la fonction Assistance à la clientèle tous les clients affectés par l'interruption ainsi que sa cause et l'heure estimée de la restauration. La fonction Gestion de défauts peut également informer la fonction Comptage des interruptions confirmées du compteur.

La fonction Exploitation du réseau peut à présent demander un plan de commutation afin d'isoler le problème et restaurer l'alimentation des îlots sains du réseau. La Programmation des actions de commutation (OP-SSC) propose à cet effet une ou plusieurs variations du plan de commutation, la fonction Exploitation du réseau choisissant celle qui offre le meilleur équilibre de courant de retour dans les circuits avoisinants.

La fonction Exploitation du réseau fournit le plan de commutation sélectionné à la fonction Gestion de la main d'œuvre. L'équipe sur le terrain exécute chaque étape du plan de commutation sélectionné. La fonction Gestion de la main-d'œuvre tient la fonction Exploitation du réseau informée de la progression du plan de commutation. Après l'exécution de chaque étape, la fonction Exploitation du réseau informe la fonction Gestion de défauts des modifications apportées au réseau en raison de la commutation, des raccordements et des séparations, ainsi que les balises opérationnelles de sécurité pour les dispositifs spécifiques.

Pour vérifier la restauration de l'alimentation des clients, la fonction Gestion de défauts peut envoyer un ping à la fonction Compteur. La fonction Gestion de défauts indique à la fonction Assistance à la clientèle les clients dont elle pense que leur alimentation a été rétablie. S'il apparaît qu'un client n'est toujours pas alimenté lorsque la fonction Assistance à la clientèle rappelle des clients, elle soumet une nouvelle Fiche incident à la fonction Gestion de défauts.



Anglais	Français
FLISR for Trouble Call and AMI Outage, Crew Switching	FLISR pour appel sur incident et interruption d'AMI, commutation par l'équipe
From Approved Actors	Des Acteurs approuvés

Figure A.2 – FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe

Tableau A.2 – Flux de messages FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe

De	A	message	description
CS-TCM	CS-TCM	Create **TroubleTicket**	Créer une TroubleTicket (Fiche incident) correspondant à l'appel du client.
CS-TCM	NO-FLT	Created **TroubleTicket**	Notification du problème signalé par le client, en l'occurrence une coupure d'alimentation.
NO-FLT	CS-TCM	Created **Incident**	Notification d'un incident créé pour une fiche incident. Il peut également s'agir d'un incident existant basé sur une prédiction issue de fiches incident antérieures.
MR	NO-FLT	Created **EndDeviceEvent**	Notification que les compteurs sont à l'état d'arrêt.
NO-FLT	NO-NMON	Created **Incident**	Notification du déclenchement prévu au niveau d'un dispositif de protection particulier dans le réseau. A ce stade, le dispositif d'interruption est prévu et non confirmé.
NO-NMON	MC	Created **TroubleOrder**	Demande d'expédition du personnel pour confirmer le dispositif de protection dans lequel l'interruption est prévue, et déterminer l'emplacement et la cause du défaut en aval du dispositif de protection. Noter que l'opérateur attribue le personnel à l'interruption pour cette enquête initiale.
MC	NO-NMON	Changed **TroubleOrder**	L'équipe sur le terrain confirme l'emplacement de l'interruption. L'emplacement de l'interruption peut être le dispositif déclenché prévu ou un autre dispositif de protection.
NO-NMON	NO-FLT	Changed **Incident**	En fonction des informations données par le personnel, notification des mises à jour apportées à l'interruption avec la localisation du défaut de câble au sol en aval du dispositif de protection déclenché. À ce stade, l'interruption et la localisation du défaut sont confirmées.
NO-FLT	CS-TCM	Changed(**Incident**)	Notification d'un incident créé pour une fiche incident. Il peut également s'agir d'un incident existant basé sur une prédiction issue de fiches incident antérieures.
NO-FLT	MR	Created **EndDeviceEvent**	Notification de l'interruption confirmée des compteurs.
NO-NMON	OP-SSC	Changed **Outage**	Demande d'un plan de commutation afin d'isoler le défaut et restaurer l'alimentation des ilots sains du réseau.
OP-SSC	NO-NMON	Created **SwitchingPlan**	Notification d'un nouveau plan de commutation afin d'isoler l'interruption et restaurer l'alimentation des ilots sains du réseau. Noter que SSC peut fournir plusieurs plans de commutation pour des alternatives de restauration de l'alimentation.
NO-NMON	MC	Created **SwitchingOrder**	Demande d'exécution du nouveau SwitchingPlan (plan de commutation) afin d'isoler l'interruption et restaurer l'alimentation des ilots sains du réseau.
MC	NO-NMON	Changed **SwitchingOrder**	L'équipe sur le terrain signale la fin d'une ou de plusieurs étapes de la commutation.
NO-NMON	NO-FLT	Created **DiscreteMeasurement**	Notification de la modification d'état du dispositif par suite de l'exécution des opérations de commutation.

De	A	message	description
NO-NMON	NO-FLT	Created **Jumper**	Notification de la mise en place de raccordement par suite de l'exécution des opérations de commutation.
NO-NMON	NO-FLT	Created **Cut**	Notification de la mise en place de raccordement par suite de l'exécution des opérations de commutation.
NO-NMON	NO-FLT	Created **Tag**	Notification de la mise en place de raccordement par suite de l'exécution des opérations de commutation.
NO-FLT	MR	Get **MeterReading**	Compteur de ping pour vérifier si l'alimentation a été rétablie.
MR	NO-FLT	Reply **MeterReading**	Réponse avec l'état de l'alimentation du compteur.
NO-FLT	MR	Changed **Incident**	Notification de la restauration de l'interruption des compteurs.
NO-FLT	CS-TCM	Changed **Incident**	Notification de la restauration de l'alimentation des clients qui ont appelé avant la restauration.
CS-TCM	NO-FLT	Created **TroubleTicket**	Notification que le client a signalé que l'alimentation est toujours coupée lors de l'appel.
NO-FLT	CS-TCM	Changed **Incident**	Notification de la fin de l'incident Incident – État = terminé

A.3 Interruption planifiée

A.3.1 Interruption planifiée pour maintenance – Processus manuel

La séquence représentée à la Figure A.3 s'appuie sur le processus métier d'une grande entreprise européenne. Dans le processus en cours, l'interopérabilité entre les systèmes est très limitée, s'agissant plutôt d'interactions manuelles. De même, cette séquence part du principe que tous les commutateurs ne sont pas télémesurés et qu'ils exigent une opération manuelle.

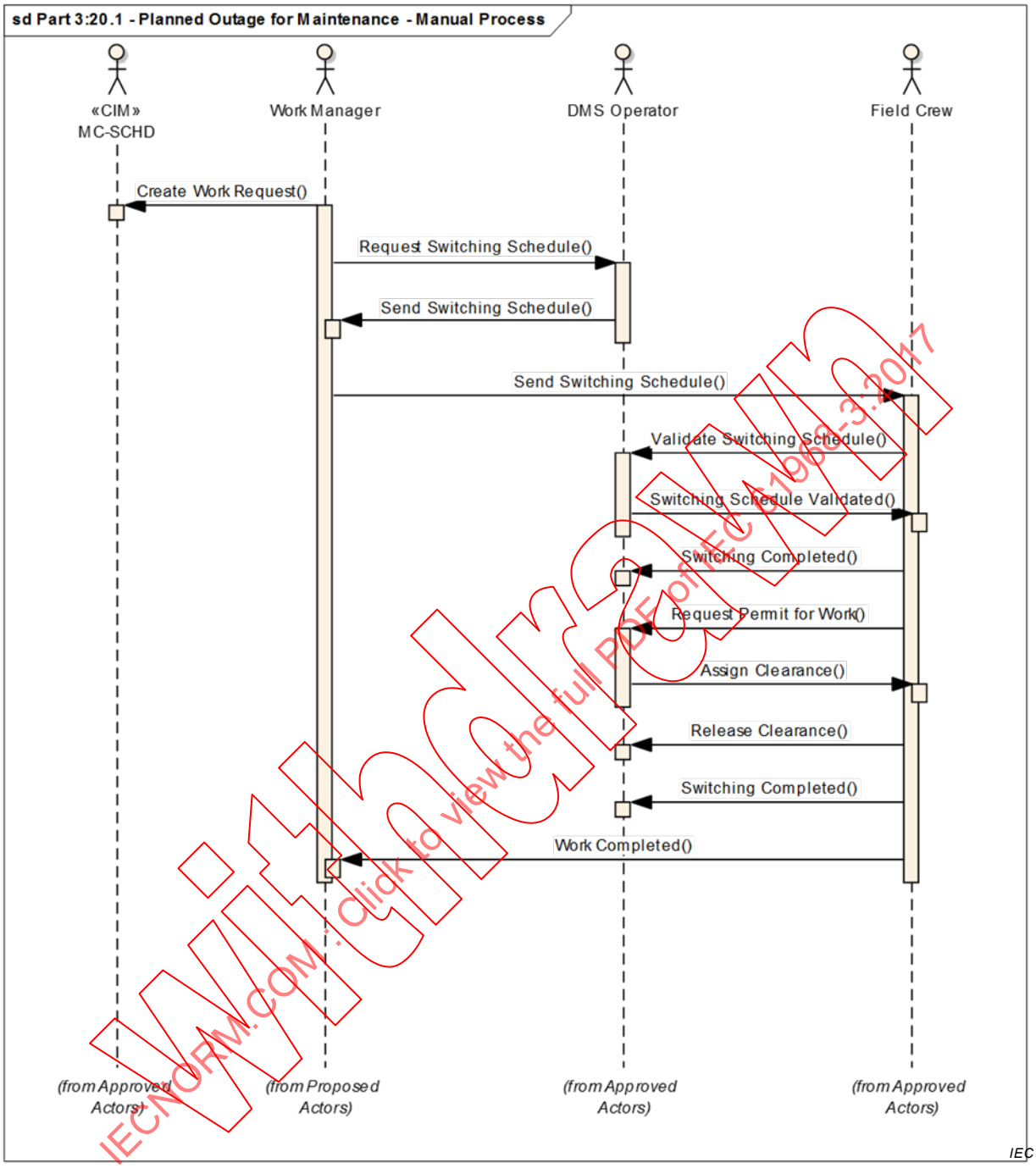
Si le travail planifié exige d'isoler une zone pour les besoins de la maintenance, un directeur technique soumet en premier lieu une demande au système de gestion des travaux (SAP en l'occurrence). Ensuite, le directeur technique formule une demande séparée de plan de commutation en vue d'isoler la zone de travail, adressée par courriel à un opérateur de salle de commande. L'opérateur crée des "programmes de commutation", à savoir un bon de travail combiné à un plan de commutation (le concept le plus proche dans le CIM serait peut-être un SwitchingOrder). Un programme de commutation contient toute la procédure d'isolement, de restauration de l'alimentation et de retour à l'état normal. Après les nécessaires approbations, l'opérateur envoie un courriel contenant les programmes de commutation au directeur technique.

Le directeur technique attribue les programmes de commutation à une équipe sur le terrain, puis les étapes de commutation individuelles aux membres de l'équipe en fonction de leurs qualifications. Par exemple, seuls quelques membres de l'équipe peuvent être en mesure de procéder à la commutation et à la mise à la terre. Soit le directeur technique envoie par courriel les programmes de commutation au chef d'équipe, soit il les imprime et les lui remet en mains propres.

L'équipe sur le terrain se rend sur le lieu de travail. Dès son arrivée, le chef d'équipe contacte l'opérateur pour l'informer que tout le monde est prêt à travailler. L'opérateur valide le fait que le programme de commutation est toujours valable dans l'état actuel du réseau. Désormais, l'équipe est libre d'exécuter toute la procédure d'isolement et de restauration de l'alimentation prévue dans le programme de commutation, et informe l'opérateur que la commutation est terminée. L'opérateur met à jour le DMS pour indiquer les modifications.

L'alimentation dans la zone de travail est maintenant coupée. L'équipe de maintenance contacte l'opérateur pour demander un "permis de travail", également appelé "habilitation". Le chef d'équipe reçoit et conserve par-devers lui le permis de travail lors de la maintenance. Noter qu'une seule personne peut recevoir le permis de travail (en général le chef d'équipe). Cette personne ne peut pas réattribuer le permis de travail à un autre membre de l'équipe (seul l'opérateur peut le faire).

A l'issue du travail de maintenance, le chef d'équipe contacte l'opérateur pour renvoyer le permis de travail. Ensuite, l'équipe continue d'exécuter le programme de commutation afin de remettre le réseau à l'état normal, puis en informe l'opérateur.



Anglais	Français
Planned Outage for Maintenance – Manual Process	Interruption planifiée pour maintenance – Processus manuel
From Approved Actors	Des Acteurs approuvés

Figure A.3 – Interruption planifiée pour maintenance – Processus manuel

A.3.2 Interruption planifiée pour maintenance – Commutation par l'équipe

La séquence représentée à la Figure A.4 et au Tableau A.3 est un flux de travaux proposé pour assurer l'interopérabilité entre les systèmes afin de procéder à une interruption planifiée pour maintenance de l'équipement sur le réseau. Elle est déduite de la version manuelle du flux de travaux décrite ci-dessus. Cette séquence part du principe que certains commutateurs sont commandés par SCADA et que d'autres exigent un fonctionnement manuel.

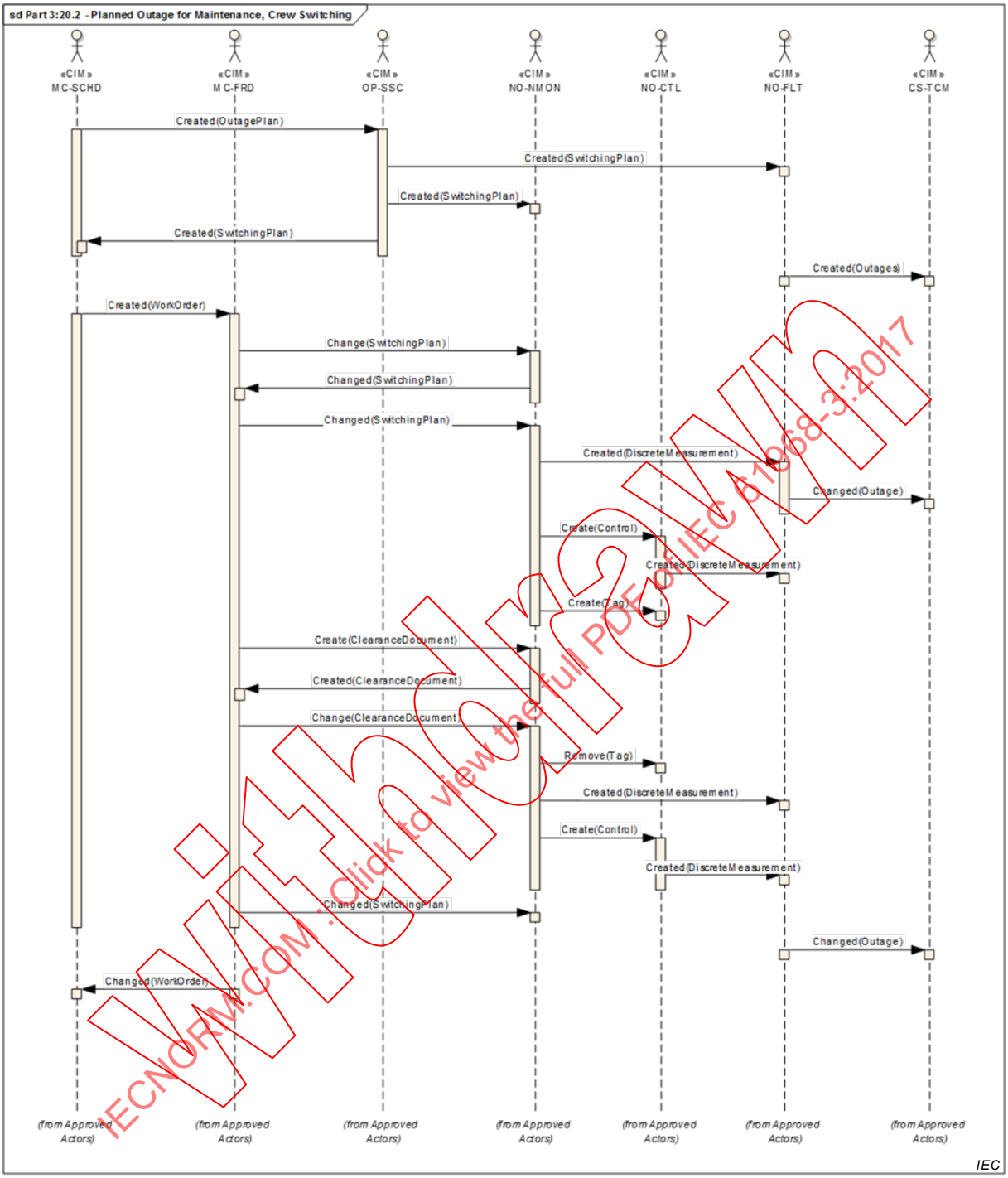
Si le travail planifié exige d'isoler une zone pour les besoins de la maintenance, un directeur technique soumet en premier lieu une demande de travail au système de programmation des travaux (MC-SCHD). Le système de programmation des travaux crée un bon de travail et demande à la fonction Programmation des actions de commutation (OP-SCC) un plan de commutation en vue d'isoler la zone de travail. La fonction Programmation des actions de commutation crée un plan de commutation contenant toutes les étapes d'isolement, de restauration de l'alimentation des ilots sains du réseau et de retour à l'état normal. Après les nécessaires approbations dans la salle de commande, la fonction Programmation des actions de commutation envoie le plan de commutation au système de programmation des travaux. De même, la fonction Programmation des actions de commutation envoie le plan de commutation à la fonction Gestion de défauts (NO-FLT, alias OMS), qui en déduit une liste d'interruptions planifiées qu'elle envoie au Service client (CS-TCM). Noter qu'il peut y avoir plusieurs interruptions planifiées étant donné que les clients affectés peuvent changer à chaque étape du plan de commutation. Chaque interruption planifiée inclut les points d'utilisation et le nombre de clients affectés, ainsi que les heures estimées de l'interruption et de la restauration.

Le système de programmation des travaux demande à présent de dépêcher l'équipe sur le terrain pour l'exécution du plan de commutation par l'intermédiaire de la fonction Gestion de la main-d'œuvre (MC-FRD), qui attribue éventuellement les étapes de commutation individuelles aux membres de l'équipe en fonction des qualifications. Par exemple, seuls quelques membres de l'équipe peuvent être en mesure de procéder à la commutation et la mise à la terre.

L'équipe sur le terrain se rend sur le lieu de travail. Dès son arrivée sur place, l'équipe demande par l'intermédiaire de la fonction Gestion de la main-d'œuvre la validation du plan de commutation en fonction de l'état en cours du réseau. La fonction Exploitation du réseau (NO-NMON, alias DMS dans la salle de commande) valide que le programme de commutation est toujours valable. Maintenant, l'équipe travaille avec l'opérateur de la salle de commande pour exécuter toute la procédure d'isolement et de restauration de l'alimentation du programme de commutation. L'équipe place également des balises sur les commutateurs d'isolement comme indiqué dans le bon de commutation. Pour la commutation commandée par SCADA, la fonction Exploitation du réseau demande à la fonction Commande/Contrôle du réseau (NO-CTL, alias SCADA) de procéder à la commutation. Les fonctions Exploitation du réseau et Commande/Contrôle du réseau peuvent informer la fonction Gestion de défauts de la fin de la commutation et du balisage, laquelle, en retour, informe le Service client que l'interruption planifiée est à présent effective.

L'alimentation dans la zone de travail est maintenant coupée. L'équipe de maintenance demande une habilitation par l'intermédiaire de la fonction Gestion de la main d'œuvre. Le chef d'équipe reçoit et garde par-devers lui l'habilitation correspondant au travail de maintenance. L'habilitation est associée aux balises du commutateur d'isolement, ce qui implique que les balises ne peuvent pas être supprimées tant que l'habilitation est en vigueur.

A l'issue du travail de maintenance, le chef d'équipe libère l'habilitation par l'intermédiaire de la fonction Gestion de la main d'œuvre. Ensuite, l'équipe travaille de nouveau avec l'opérateur pour l'exécution du programme de commutation afin de retirer les balises et remettre le réseau à l'état normal. Dès la notification de la commutation, la fonction Gestion de défauts informe le Service client de la restauration de l'interruption. La fonction Gestion de la main-d'œuvre informe également la programmation des travaux que le bon de travail est honoré.



Anglais	Français
From Approved Actors	Des Acteurs approuvés

Figure A.4 – Interruption planifiée pour maintenance – Commutation par l'équipe

Tableau A.3 – Flux de messages correspondant à l'interruption planifiée pour maintenance, Commutation par l'équipe

De	A	message	description
MC-SCHD	OP-SSC	Created **OutageSchedule**	Requête pour un plan de commutation afin d'isoler la zone de travail.
OP-SSC	NO-FLT	Created **SwitchingPlan**	Notification d'un nouveau plan de commutation afin d'isoler la zone de travail et restaurer l'alimentation des ilots sains du réseau. Noter que SSC peut fournir plusieurs plans de commutation pour des alternatives de restauration de l'alimentation.
OP-SSC	NO-NMON	Created **SwitchingPlan**	Notification d'un nouveau plan de commutation afin d'isoler la zone de travail et rétablir l'alimentation au zone saine du réseau. Noter que SSC peut fournir plusieurs plans de commutation pour des alternatives de restauration de l'alimentation.
OP-SSC	MC-SCHD	Created(**SwitchingPlan**)	Notifivation d'un nouveau plan de commutation pour isoler une zone de travail et rétablir l'alimentation au zone sain du réseau. Note que SSC peut fournir plusieurs plans de commutation pour des alternatives de restauration de l'alimentation. Cette notification est exigée pour que le MC-SCHD puisse prévoir effectuer le plan de commutation.
NO-FLT	CS-TCM	Created **Outages**	Notification des interruptions qui se produiront lors de l'exécution du plan de commutation.
MC-SCHD	MC-FRD	Created **WorkOrder**	Demande de travail pour isoler la zone de travail et procéder à la maintenance.
MC-FRD	NO-NMON	Change **SwitchingPlan**	L'équipe demande la vérification du plan de commutation avant de procéder à son exécution.
NO-NMON	MC-FRD	Changed **SwitchingPlan**	Notification du plan de commutation marqué comme étant vérifié.
MC-FRD	NO-NMON	Changed **SwitchingPlan**	L'équipe sur le terrain signale la fin d'une ou de plusieurs étapes de la commutation.
NO-NMON	NO-FLT	Created **DiscreteMeasurement**	Notification de la modification d'état du dispositif par suite de l'exécution des opérations de commutation.
NO-FLT	CS-TCM	Changed(**Outage**)	Notification qu'une interruption est en cours.
NO-NMON	NO-CTL	Create **Control**	Demande de fonctionnement des commutateurs commandé par SCADA pour l'exécution du plan de commutation.
NO-CTL	NO-FLT	Created **DiscreteMeasurement**	Notification de la modification d'état du dispositif par suite de l'exécution des opérations de commutation.
NO-NMON	NO-CTL	Create **Tag**	Créer une balise de sécurité dans SCADA sur les commutateurs actionnés dans le cadre du plan de commutation.
MC-FRD	NO-NMON	Create **ClearanceDocument**	L'équipe sur le terrain demande une habilitation pour le travail de maintenance.
NO-NMON	MC-FRD	Created **ClearanceDocument**	Notification de l'habilitation attribuée à un membre de l'équipe sur le terrain.
MC-FRD	NO-NMON	Change **ClearanceDocument**	Notification de l'habilitation libérée par un membre de l'équipe sur le terrain.
NO-NMON	NO-CTL	Remove **Tag**	Supprimer une balise de sécurité dans SCADA sur les commutateurs actionnés dans le cadre du plan de commutation.

De	A	message	description
NO-NMON	NO-FLT	Created **DiscreteMeasurement**	Notification de la modification d'état du dispositif par suite de l'exécution des opérations de commutation.
NO-NMON	NO-CTL	Create **Control**	Requête pour l'opération de commutation SCADA-commandée dans le cadre de l'exécution du plan de commutation.
NO-CTL	NO-FLT	Created **DiscreteMeasurement**	Notification de la modification d'état du dispositif par suite de l'exécution des opérations de commutation.
MC-FRD	NO-NMON	Changed **SwitchingPlan**	L'équipe sur le terrain signale la fin d'une ou de plusieurs étapes de la commutation pour remettre le réseau à l'état normal.
NO-FLT	CS-TCM	Changed **Outage**	Notification que l'interruption planifiée est désormais terminée et que l'alimentation des clients est rétablie.
MC-FRD	MC-SCHD	Changed **WorkOrder**	Notification que le plan de travail est terminé.

Annexe B
(normative)

Schémas XML des charges utiles de messages

B.1 Généralités

La présente Annexe B a pour objet de fournir les schémas XML des charges utiles de messages afin d'améliorer les descriptions préalablement indiquées dans le présent document. Ces schémas XML ont été définis à l'aide des définitions de profils de CIMTool. Ces schémas peuvent être étendus en fonction des besoins de mise en œuvre spécifiques.

B.2 Charge utile de message **Incidents**

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/Incidents/2#" targetNamespace="http://iec.ch/TC57/2014/Incidents/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation/>
  <xs:element name="Incidents" type="m:Incidents"/>
  <xs:complexType name="Incidents">
    <xs:sequence>
      <xs:element name="CoordinateSystem" type="m:CoordinateSystem" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Incident" type="m:Incident" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="CoordinateSystem" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#CoordinateSystem">
    <xs:annotation>
      <xs:documentation>Coordinate reference system.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="crsUrn" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CoordinateSystem.crsUrn">
        <xs:annotation>
          <xs:documentation>A Uniform Resource Name (URN) for the coordinate reference system (crs) used to define
'Location.PositionPoints'.</xs:documentation>
          <xs:documentation>An example would be the European Petroleum Survey Group (EPSG) code for a coordinate
reference system, defined in URN under the Open Geospatial Consortium (OGC) namespace as:
urn:ogc:def:uom:EPSG::XXXX, where XXXX is an EPSG code (a full list of codes can be found at the EPSG Registry web site
http://www.epsg-registry.org/). To define the coordinate system as being WGS84 (latitude, longitude) using an EPSG OGC, this
attribute would be urn:ogc:def:uom:EPSG::4236.</xs:documentation>
          <xs:documentation>A profile should limit this code to a set of allowed URNs agreed to by all sending and receiving
parties.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="CustomerNotification" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#CustomerNotification">
    <xs:annotation>
```

```
        <xs:documentation>Conditions for notifying the customer about the changes in the status of their service (e.g., outage restore, estimated restoration time, tariff or service level change, etc.)</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="contactType" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.contactType">
          <xs:annotation>
            <xs:documentation>Type of contact (e.g., phone, email, etc.).</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="contactValue" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.contactValue">
          <xs:annotation>
            <xs:documentation>Value of contact type (e.g., phone number, email address, etc.).</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="earliestDateTimeToCall" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.earliestDateTimeToCall">
          <xs:annotation>
            <xs:documentation>Earliest date time to call the customer.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="latestDateTimeToCall" type="xs:dateTime" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.latestDateTimeToCall">
          <xs:annotation>
            <xs:documentation>Latest date time to call the customer.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="trigger" type="m:NotificationTriggerKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CustomerNotification.trigger">
          <xs:annotation>
            <xs:documentation>Trigger for this notification.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="Incident" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident">
      <xs:annotation>
        <xs:documentation>Description of a problem in the field that may be reported in a trouble ticket or come from another source. It may have to do with an outage.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="cause" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.cause">
          <xs:annotation>
            <xs:documentation>Cause of this incident.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
          <xs:annotation>
            <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
          <xs:annotation>
            <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="CustomerNotifications" type="m:CustomerNotification" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.CustomerNotifications">
          <xs:annotation>
            <xs:documentation>All notifications for a customer related to the status change of this incident.</xs:documentation>
          </xs:annotation>
```

```
      </xs:element>
      <xs:element name="Hazards" type="m:IncidentHazard" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.Hazards">
        <xs:annotation>
          <xs:documentation>All hazards associated with this incident.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Location" type="m:Location" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.Location">
        <xs:annotation>
          <xs:documentation>Location of this incident.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Outage" type="m:Outage" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.Outage">
        <xs:annotation>
          <xs:documentation>Outage for this incident.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.status">
        <xs:annotation>
          <xs:documentation>Status of subject matter (e.g., Agreement, Work) this document represents. For status of the
document itself, use 'docStatus' attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="TroubleTickets" type="m:TroubleTicket" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Incident.TroubleTickets">
        <xs:annotation>
          <xs:documentation>All trouble tickets reporting this incident.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="IncidentHazard" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#IncidentHazard">
    <xs:annotation>
      <xs:documentation>Hazardous situation associated with an incident. Examples are line down, gas leak, fire,
etc.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Hazard.status">
        <xs:annotation>
          <xs:documentation>Status of this hazard.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Location" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location">
    <xs:annotation>
```

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        <xs:documentation>The place, scene, or point of something where someone or something has been, is, and/or will be at a given moment in time. It can be defined with one or more postition points (coordinates) in a given coordinate system.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
          <xs:annotation>
            <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="direction" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.direction">
          <xs:annotation>
            <xs:documentation>(if applicable) Direction that allows field crews to quickly find a given asset. For a given location, such as a street address, this is the relative direction in which to find the asset. For example, a streetlight may be located at the 'NW' (northwest) corner of the customer's site, or a usage point may be located on the second floor of an apartment building.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
          <xs:annotation>
            <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="CoordinateSystem" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.CoordinateSystem">
          <xs:annotation>
            <xs:documentation>Coordinate system used to describe position points of this location.</xs:documentation>
          </xs:annotation>
          <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#CoordinateSystem">
            <xs:attribute name="ref" type="xs:string"/>
          </xs:complexType>
        </xs:element>
        <xs:element name="mainAddress" type="m:StreetAddress" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.mainAddress">
          <xs:annotation>
            <xs:documentation>Main address of the location.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="PositionPoints" type="m:PositionPoint" minOccurs="1" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.PositionPoints">
          <xs:annotation>
            <xs:documentation>Sequence of position points describing this location, expressed in coordinate system 'Location.CoordinateSystem'.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="secondaryAddress" type="m:StreetAddress" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location.secondaryAddress">
          <xs:annotation>
            <xs:documentation>Secondary address of the location. For example, PO Box address may have different ZIP code than that in the 'mainAddress'.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:simpleType name="NotificationTriggerKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NotificationTriggerKind">
      <xs:annotation>
        <xs:documentation>Kind of trigger to notify customer.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:string">
        <xs:enumeration value="etrChange">
          <xs:annotation>
            <xs:documentation>Notify customer if estimated restoration time changes.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="informDispatched">
          <xs:annotation>
            <xs:documentation>Notify customer that a crew has been dispatched to investigate the problem.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="initialEtr">
          <xs:annotation>
```

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            <xs:documentation>Notify customer for the first time that estimated restoration time is available.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="powerOut">
          <xs:annotation>
            <xs:documentation>Notify customer of planned outage.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value="powerRestored">
          <xs:annotation>
            <xs:documentation>Notify customer when power has been restored.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
      </xs:restriction>
    </xs:simpleType>
    <xs:complexType name="Outage" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage">
      <xs:annotation>
        <xs:documentation>Document describing details of an active or planned outage in a part of the electrical
network.</xs:documentation>
        <xs:documentation>A non-planned outage may be created upon:</xs:documentation>
        <xs:documentation>- a breaker trip,</xs:documentation>
        <xs:documentation>- a fault indicator status change,</xs:documentation>
        <xs:documentation>- a meter event indicating customer outage,</xs:documentation>
        <xs:documentation>- a reception of one or more customer trouble calls, or</xs:documentation>
        <xs:documentation>- an operator command, reflecting information obtained from the field crew.</xs:documentation>
        <xs:documentation>Outage restoration may be performed using a switching plan which complements the outage
information with detailed switching activities, including the relationship to the crew and work.</xs:documentation>
        <xs:documentation>A planned outage may be created upon:</xs:documentation>
        <xs:documentation>- a request for service, maintenance or construction work in the field, or</xs:documentation>
        <xs:documentation>- an operator-defined outage for what-if/contingency network analysis.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="PositionPoint" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#PositionPoint">
      <xs:annotation>
        <xs:documentation>Set of spatial coordinates that determine a point, defined in the coordinate system specified in
'Location.CoordinateSystem'. Use a single position point instance to desribe a point-oriented location. Use a sequence of
position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of
an object (like a substation or a geographical zone – in this case, have first and last position point with the same
values).</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="sequenceNumber" type="xs:integer" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.sequenceNumber">
          <xs:annotation>
            <xs:documentation>Zero-relative sequence number of this point within a series of points.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="xPosition" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.xPosition">
          <xs:annotation>
            <xs:documentation>X axis position.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="yPosition" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.yPosition">
          <xs:annotation>
            <xs:documentation>Y axis position.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="zPosition" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PositionPoint.zPosition">
          <xs:annotation>
            <xs:documentation>(if applicable) Z axis position.</xs:documentation>
          </xs:annotation>
```

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      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Status" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status">
    <xs:annotation>
      <xs:documentation>Current status information relevant to an entity.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="dateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.dateTime">
        <xs:annotation>
          <xs:documentation>Date and time for which status 'value' applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="reason" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.reason">
        <xs:annotation>
          <xs:documentation>Reason code or explanation for why an object went to the current status
'value'.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="remark" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.remark">
        <xs:annotation>
          <xs:documentation>Pertinent information regarding the current 'value', as free form text.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.value">
        <xs:annotation>
          <xs:documentation>Status value at 'dateTime'; prior status changes may have been kept in instances of activity
records associated with the object to which this status applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="StreetAddress" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StreetAddress">
    <xs:annotation>
      <xs:documentation>General purpose street and postal address information.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="poBox" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.poBox">
        <xs:annotation>
          <xs:documentation>Post office box.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="postalCode" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.postalCode">
        <xs:annotation>
          <xs:documentation>Postal code for the address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.status">
        <xs:annotation>
          <xs:documentation>Status of this address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="streetDetail" type="m:StreetDetail" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.streetDetail">
        <xs:annotation>
          <xs:documentation>Street detail.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="townDetail" type="m:TownDetail" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetAddress.townDetail">
        <xs:annotation>
          <xs:documentation>Town detail.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="StreetDetail" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StreetDetail">
    <xs:annotation>
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      <xs:documentation>Street details, in the context of address.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="addressGeneral" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral">
        <xs:annotation>
          <xs:documentation>First line of a free form address or some additional address information (for example a mail
stop).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="addressGeneral2" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral2">
        <xs:annotation>
          <xs:documentation>(if applicable) Second line of a free form address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="addressGeneral3" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.addressGeneral3">
        <xs:annotation>
          <xs:documentation>(if applicable) Third line of a free form address.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="buildingName" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.buildingName">
        <xs:annotation>
          <xs:documentation>(if applicable) In certain cases the physical location of the place of interest does not have a direct
point of entry from the street, but may be located inside a larger structure such as a building, complex, office block, apartment,
etc.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="code" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.code">
        <xs:annotation>
          <xs:documentation>(if applicable) Utilities often make use of external reference systems, such as those of the town-
planner's department or surveyor general's mapping system, that allocate global reference codes to
streets.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.name">
        <xs:annotation>
          <xs:documentation>Name of the street.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="number" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.number">
        <xs:annotation>
          <xs:documentation>Designator of the specific location on the street.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="prefix" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.prefix">
        <xs:annotation>
          <xs:documentation>Prefix to the street name. For example: North, South, East, West.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="suffix" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.suffix">
        <xs:annotation>
          <xs:documentation>Suffix to the street name. For example: North, South, East, West.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="suiteNumber" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.suiteNumber">
        <xs:annotation>
          <xs:documentation>Number of the apartment or suite.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="type" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.type">
        <xs:annotation>
          <xs:documentation>Type of street. Examples include: street, circle, boulevard, avenue, road, drive,
etc.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="withinTownLimits" type="xs:boolean" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StreetDetail.withinTownLimits">
```

```
        <xs:annotation>
          <xs:documentation>True if this street is within the legal geographical boundaries of the specified town
(default).</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="TownDetail" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#TownDetail">
    <xs:annotation>
      <xs:documentation>Town details, in the context of address.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="code" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.code">
        <xs:annotation>
          <xs:documentation>Town code.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="country" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.country">
        <xs:annotation>
          <xs:documentation>Name of the country.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.name">
        <xs:annotation>
          <xs:documentation>Town name.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="section" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.section">
        <xs:annotation>
          <xs:documentation>Town section. For example, it is common for there to be 36 sections per
township.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="stateOrProvince" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TownDetail.stateOrProvince">
        <xs:annotation>
          <xs:documentation>Name of the state or province.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="TroubleTicket" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#TroubleTicket">
    <xs:annotation/>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:schema>
```

B.3 Charges utiles de messages **MeasurementsAndControls**

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/MeasurementsAndControls/1#"
targetNamespace="http://iec.ch/TC57/2014/MeasurementsAndControls/1#" elementFormDefault="qualified"
attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation>This profile is to be used mainly for exchange of data that have telemetry representation for near-real
time exchanges during power system operation.</xs:documentation>
```

```
    <xs:documentation>With this profile, one can exchange the same value with different timestamps, there is no constraint on uniqueness of the mRID within the file.</xs:documentation>
  </xs:annotation>
  <xs:element name="MeasurementsAndControls" type="m:MeasurementsAndControls"/>
  <xs:complexType name="MeasurementsAndControls">
    <xs:sequence>
      <xs:element name="AccumulatorReset" type="m:AccumulatorReset" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="AccumulatorValue" type="m:AccumulatorValue" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="AnalogValue" type="m:AnalogValue" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Command" type="m:Command" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="DiscreteValue" type="m:DiscreteValue" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="RaiseLowerCommand" type="m:RaiseLowerCommand" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="SetPoint" type="m:SetPoint" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="StringMeasurementValue" type="m:StringMeasurementValue" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="AccumulatorReset" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorReset">
    <xs:annotation>
      <xs:documentation>This command reset the counter value to zero.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Control">
        <xs:sequence>
          <xs:element name="AccumulatorValue" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorReset.AccumulatorValue">
            <xs:annotation>
              <xs:documentation>The accumulator value that is reset by the command.</xs:documentation>
            </xs:annotation>
            <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorValue">
              <xs:attribute name="ref" type="xs:string"/>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="AccumulatorValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorValue">
    <xs:annotation>
      <xs:documentation>AccumulatorValue represents an accumulated (counted) MeasurementValue.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:MeasurementValue">
        <xs:sequence>
          <xs:element name="value" type="xs:integer" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AccumulatorValue.value">
            <xs:annotation>
              <xs:documentation>The value to supervise. The value is positive.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="AnalogControl" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogControl">
    <xs:annotation>
      <xs:documentation>An analog control used for supervisory control.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Control">
        <xs:sequence>
          <xs:element name="AnalogValue" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogControl.AnalogValue">
            <xs:annotation>
              <xs:documentation>The MeasurementValue that is controlled.</xs:documentation>
            </xs:annotation>
            <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogValue">
              <xs:attribute name="ref" type="xs:string"/>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
```

```
  </xs:complexType>
  <xs:complexType name="AnalogValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogValue">
    <xs:annotation>
      <xs:documentation>AnalogValue represents an analog MeasurementValue.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:MeasurementValue">
        <xs:sequence>
          <xs:element name="value" type="xs:float" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#AnalogValue.value">
            <xs:annotation>
              <xs:documentation>The value to supervise.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Command" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Command">
    <xs:annotation>
      <xs:documentation>A Command is a discrete control used for supervisory control.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Control">
        <xs:sequence>
          <xs:element name="value" type="xs:integer" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Command.value">
            <xs:annotation>
              <xs:documentation>The value representing the actuator output.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="DiscreteValue" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Command.DiscreteValue">
            <xs:annotation>
              <xs:documentation>The MeasurementValue that is controlled.</xs:documentation>
            </xs:annotation>
            <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DiscreteValue">
              <xs:attribute name="ref" type="xs:string"/>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Control" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Control">
    <xs:annotation>
      <xs:documentation>Control is used for supervisory/device control. It represents control outputs that are used to change the state in a process, e.g. close or open breaker, a set point value or a raise lower command.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:IdentifiedObject">
        <xs:sequence>
          <xs:element name="operationInProgress" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Control.operationInProgress">
            <xs:annotation>
              <xs:documentation>Indicates that a client is currently sending control commands that has not completed.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="timeStamp" type="xs:dateTime" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Control.timeStamp">
            <xs:annotation>
              <xs:documentation>The last time a control output was sent.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="DiscreteValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DiscreteValue">
    <xs:annotation>
      <xs:documentation>DiscreteValue represents a discrete MeasurementValue.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
```

```
      <xs:extension base="m:MeasurementValue">
        <xs:sequence>
          <xs:element name="value" type="xs:integer" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DiscreteValue.value">
            <xs:annotation>
              <xs:documentation>The value to supervise.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="IdentifiedObject" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#IdentifiedObject">
    <xs:annotation>
      <xs:documentation>This is a root class to provide common identification for all classes needing identification and naming
attributes.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Names" type="m:Name" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.Names">
        <xs:annotation>
          <xs:documentation>All names of this identified object.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="MeasurementValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#MeasurementValue">
    <xs:annotation>
      <xs:documentation>The current state for a measurement. A state value is an instance of a measurement from a specific
source. Measurements can be associated with many state values, each representing a different source for the
measurement.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:IdentifiedObject">
        <xs:sequence>
          <xs:element name="timeStamp" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#MeasurementValue.timeStamp">
            <xs:annotation>
              <xs:documentation>The time when the value was last updated</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="MeasurementValueQuality" type="m:MeasurementValueQuality" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#MeasurementValue.MeasurementValueQuality">
            <xs:annotation>
              <xs:documentation>A MeasurementValue has a MeasurementValueQuality associated with
it.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="MeasurementValueQuality" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#MeasurementValueQuality">
    <xs:annotation>
      <xs:documentation>Measurement quality flags. Bits 0-10 are defined for substation automation in draft IEC 61850 part 7-
3. Bits 11-15 are reserved for future expansion by that document. Bits 16-31 are reserved for EMS
applications.</xs:documentation>
```

```
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Quality61850">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Name" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Name">
    <xs:annotation>
      <xs:documentation>The Name class provides the means to define any number of human readable names for an object. A name is &lt;b&gt;not&lt;/b&gt; to be used for defining inter-object relationships. For inter-object relationships instead use the object identification 'mRID'.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Name.name">
        <xs:annotation>
          <xs:documentation>Any free text that name the object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="NameType" type="m:NameType" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Name.NameType">
        <xs:annotation>
          <xs:documentation>Type of this name.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="NameType" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#NameType">
    <xs:annotation>
      <xs:documentation>Type of name. Possible values for attribute (name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple IT systems each having its own local name for the same object, e.g. a planning system may have different names from an EMS. An object may also have different names within the same IT system, e.g. localName as defined in CIM version 14. The definition from CIM14 is:</xs:documentation>
      <xs:documentation>The localName is a human readable name of the object. It is a free text name local to a node in a naming hierarchy similar to a file directory structure. A power system related naming hierarchy may be: Substation, VoltageLevel, Equipment etc. Children of the same parent in such a hierarchy have names that typically are unique among them.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameType.description">
        <xs:annotation>
          <xs:documentation>Description of the name type.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameType.name">
        <xs:annotation>
          <xs:documentation>Name of the name type.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="NameTypeAuthority" type="m:NameTypeAuthority" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameType.NameTypeAuthority">
        <xs:annotation>
          <xs:documentation>Authority responsible for managing names of this type.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="NameTypeAuthority" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#NameTypeAuthority">
    <xs:annotation>
      <xs:documentation>Authority responsible for creation and management of names of a given type; typically an organization or an enterprise system.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameTypeAuthority.description">
        <xs:annotation>
          <xs:documentation>Description of the name type authority.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#NameTypeAuthority.name">
        <xs:annotation>
```

```
        <xs:documentation>Name of the name type authority.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
 </xs:complexType>
 <xs:complexType name="Quality61850" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850">
  <xs:annotation>
   <xs:documentation>Quality flags in this class are as defined in IEC 61850, except for estimatorReplaced, which has been included in this class for convenience.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
   <xs:element name="badReference" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.badReference">
    <xs:annotation>
     <xs:documentation>Measurement value may be incorrect due to a reference being out of calibration.</xs:documentation>
    </xs:annotation>
   </xs:element>
   <xs:element name="estimatorReplaced" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.estimatorReplaced">
    <xs:annotation>
     <xs:documentation>Value has been replaced by State Estimator. estimatorReplaced is not an IEC61850 quality bit but has been put in this class for convenience.</xs:documentation>
    </xs:annotation>
   </xs:element>
   <xs:element name="failure" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.failure">
    <xs:annotation>
     <xs:documentation>This identifier indicates that a supervision function has detected an internal or external failure, e.g. communication failure.</xs:documentation>
    </xs:annotation>
   </xs:element>
   <xs:element name="oldData" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.oldData">
    <xs:annotation>
     <xs:documentation>Measurement value is old and possibly invalid, as it has not been successfully updated during a specified time interval.</xs:documentation>
    </xs:annotation>
   </xs:element>
   <xs:element name="operatorBlocked" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.operatorBlocked">
    <xs:annotation>
     <xs:documentation>Measurement value is blocked and hence unavailable for transmission.</xs:documentation>
    </xs:annotation>
   </xs:element>
   <xs:element name="oscillatory" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.oscillatory">
    <xs:annotation>
     <xs:documentation>To prevent some overload of the communication it is sensible to detect and suppress oscillating (fast changing) binary inputs. If a signal changes in a defined time (tosc) twice in the same direction (from 0 to 1 or from 1 to 0) then oscillation is detected and the detail quality identifier "oscillatory" is set. If it is detected a configured numbers of transient changes could be passed by. In this time the validity status "questionable" is set. If after this defined numbers of changes the signal is still in the oscillating state the value shall be set either to the opposite state of the previous stable value or to a defined default value. In this case the validity status "questionable" is reset and "invalid" is set as long as the signal is oscillating. If it is configured such that no transient changes should be passed by then the validity status "invalid" is set immediately in addition to the detail quality identifier "oscillatory" (used for status information only).</xs:documentation>
    </xs:annotation>
   </xs:element>
   <xs:element name="outOfRange" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.outOfRange">
    <xs:annotation>
     <xs:documentation>Measurement value is beyond a predefined range of value.</xs:documentation>
    </xs:annotation>
   </xs:element>
   <xs:element name="overFlow" type="xs:boolean" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.overFlow">
    <xs:annotation>
     <xs:documentation>Measurement value is beyond the capability of being represented properly. For example, a counter value overflows from maximum count back to a value of zero.</xs:documentation>
    </xs:annotation>
   </xs:element>
   <xs:element name="source" type="m:Source" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.source">
    <xs:annotation>
     <xs:documentation>Source gives information related to the origin of a value. The value may be acquired from the process, defaulted or substituted.</xs:documentation>
```

```
        </xs:annotation>
      </xs:element>
      <xs:element name="suspect" type="xs:boolean" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.suspect">
        <xs:annotation>
          <xs:documentation>A correlation function has detected that the value is not consitent with other values. Typically set
by a network State Estimator.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="test" type="xs:boolean" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.test">
        <xs:annotation>
          <xs:documentation>Measurement value is transmitted for test purposes.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="validity" type="m:Validity" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Quality61850.validity">
        <xs:annotation>
          <xs:documentation>Validity of the measurement value.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="RaiseLowerCommand" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#RaiseLowerCommand">
    <xs:annotation>
      <xs:documentation>An analog control that increase or decrease a set point value with pulses.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:AnalogControl">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="SetPoint" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SetPoint">
    <xs:annotation>
      <xs:documentation>An analog control that issue a set point value.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:AnalogControl">
        <xs:sequence>
          <xs:element name="value" type="xs:float" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SetPoint.value">
            <xs:annotation>
              <xs:documentation>The value representing the actuator output.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:simpleType name="Source" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Source">
    <xs:annotation>
      <xs:documentation>Source gives information related to the origin of a value.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="DEFAULTED">
        <xs:annotation>
          <xs:documentation>The value contains a default value.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="PROCESS">
        <xs:annotation>
          <xs:documentation>The value is provided by input from the process I/O or being calculated from some
function.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="SUBSTITUTED">
        <xs:annotation>
          <xs:documentation>The value is provided by input of an operator or by an automatic source.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="StringMeasurementValue" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#StringMeasurementValue">
    <xs:annotation>
```

```
      <xs:documentation>StringMeasurementValue represents a measurement value of type string.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:MeasurementValue">
        <xs:sequence>
          <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#StringMeasurementValue.value">
            <xs:annotation>
              <xs:documentation>The value to supervise.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:simpleType name="Validity" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Validity">
    <xs:annotation>
      <xs:documentation>Validity for MeasurementValue.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="GOOD">
        <xs:annotation>
          <xs:documentation>The value is marked good if no abnormal condition of the acquisition function or the information
source is detected.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="INVALID">
        <xs:annotation>
          <xs:documentation>The value is marked invalid when a supervision function recognises abnormal conditions of the
acquisition function or the information source (missing or non-operating updating devices). The value is not defined under this
condition. The mark invalid is used to indicate to the client that the value may be incorrect and shall not be
used.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="QUESTIONABLE">
        <xs:annotation>
          <xs:documentation>The value is marked questionable if a supervision function detects an abnormal behaviour,
however the value could still be valid. The client is responsible for determining whether or not values marked "questionable"
should be used.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

B.4 Charges utiles de messages OperationalTags

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/OperationalTags/2#" targetNamespace="http://iec.ch/TC57/2014/OperationalTags/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="OperationalTags" type="m:OperationalTags"/>
  <xs:complexType name="OperationalTags">
    <xs:sequence>
      <xs:element name="OperationalTag" type="m:OperationalTag" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Asset" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset">
    <xs:annotation>
      <xs:documentation>Tangible resource of the utility, including power system equipment, various end devices, cabinets,
buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its
subclasses, defined mainly in the Wires model (refer to IEC61970-301 and model package IEC61970::Wires). Asset description
places emphasis on the physical characteristics of the equipment fulfilling that role.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
```

```
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="OperationalTag" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag">
    <xs:annotation>
      <xs:documentation>Operational tag placed on a power system resource or asset in the context of switching plan execution or other work in the field.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="authorName" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.authorName">
        <xs:annotation>
          <xs:documentation>Name of the author of this document.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="comment" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.comment">
        <xs:annotation>
          <xs:documentation>Free text comment.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="subject" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.subject">
        <xs:annotation>
          <xs:documentation>Document subject.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="type" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.type">
        <xs:annotation>
          <xs:documentation>Utility-specific classification of this document, according to its corporate standards, practices, and existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Asset" type="m:Asset" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag.Asset">
        <xs:annotation>
          <xs:documentation>Asset on which this tag has been placed.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="PowerSystemResource" type="m:PowerSystemResource" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag.PowerSystemResource">
        <xs:annotation>
          <xs:documentation>Power system resource on which this tag has been placed.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="TagAction" type="m:TagAction" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#OperationalTag.TagAction">
        <xs:annotation>
          <xs:documentation>Tag action associated with this tag.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="PowerSystemResource" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource">
    <xs:annotation>
```

```
      <xs:documentation>A power system resource can be an item of equipment such as a switch, an equipment container containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power system resources can have measurements associated.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Assets" type="m:Asset" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource.Assets">
        <xs:annotation>
          <xs:documentation>All assets represented by this power system resource. For example, multiple conductor assets are electrically modelled as a single AC line segment.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="SwitchingStepGroup" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchingStepGroup">
    <xs:annotation>
      <xs:documentation>A logical step, grouping atomic switching steps that are important to distinguish when they may change topology (e.g. placing a jumper between two cuts).</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="TagAction" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagAction">
    <xs:annotation>
      <xs:documentation>Action on operation tag as a switching step.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="kind" type="m:TagActionKind" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagAction.kind">
        <xs:annotation>
          <xs:documentation>Kind of tag action.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="SwitchingStepGroup" type="m:SwitchingStepGroup" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagAction.SwitchingStepGroup">
        <xs:annotation>
          <xs:documentation>Group to which this step belongs.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="TagActionKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#TagActionKind">
    <xs:annotation>
      <xs:documentation>Kind of action on tag.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="place">
        <xs:annotation>
          <xs:documentation>Place the tag.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="remove">
        <xs:annotation>
          <xs:documentation>Remove the tag.</xs:documentation>
```

```
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="verify">
        <xs:annotation>
          <xs:documentation>Verify the tag.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

B.5 Charges utiles de messages **OperationsConfig**

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/OperationsConfig#" targetNamespace="http://iec.ch/TC57/2014/OperationsConfig#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="OperationsConfig" type="m:OperationsConfig"/>
  <xs:complexType name="OperationsConfig">
    <xs:sequence>
      <xs:element name="Asset" type="m:Asset" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="FaultCauseType" type="m:FaultCauseType" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="UsagePoint" type="m:UsagePoint" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Asset" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset">
    <xs:annotation>
      <xs:documentation>Tangible resource of the utility, including power system equipment, various end devices, cabinets,
buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its
subclasses, defined mainly in the Wires model (refer to IEC61970-301 and model package IEC61970::Wires). Asset description
places emphasis on the physical characteristics of the equipment fulfilling that role.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Location" type="m:Location" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset.Location">
        <xs:annotation>
          <xs:documentation>Location of this asset.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Measurements" type="m:Measurement" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset.Measurements">
        <xs:annotation/>
      </xs:element>
      <xs:element name="PowerSystemResources" type="m:PowerSystemResource" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Asset.PowerSystemResources">
        <xs:annotation>
          <xs:documentation>All power system resources used to electrically model this asset. For example, transformer asset
is electrically modelled with a transformer and its windings and tap changer.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Equipment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Equipment">
    <xs:annotation>
      <xs:documentation>The parts of a power system that are physical devices, electronic or mechanical.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:PowerSystemResource">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
```

```
  </xs:complexType>
  <xs:complexType name="FaultCauseType" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultCauseType">
    <xs:annotation>
      <xs:documentation>Type of cause of the fault.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Location" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Location">
    <xs:annotation>
      <xs:documentation>The place, scene, or point of something where someone or something has been, is, and/or will be at a given moment in time. It can be defined with one or more postition points (coordinates) in a given coordinate system.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Measurement" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Measurement">
    <xs:annotation>
      <xs:documentation>A Measurement represents any measured, calculated or non-measured non-calculated quantity. Any piece of equipment may contain Measurements, e.g. a substation may have temperature measurements and door open indications, a transformer may have oil temperature and tank pressure measurements, a bay may contain a number of power flow measurements and a Breaker may contain a switch status measurement.</xs:documentation>
      <xs:documentation>The PSR – Measurement association is intended to capture this use of Measurement and is included in the naming hierarchy based on EquipmentContainer. The naming hierarchy typically has Measurements as leafs, e.g. Substation-VoltageLevel-Bay-Switch-Measurement.</xs:documentation>
      <xs:documentation>Some Measurements represent quantities related to a particular sensor location in the network, e.g. a voltage transformer (PT) at a busbar or a current transformer (CT) at the bar between a breaker and an isolator. The sensing position is not captured in the PSR – Measurement association. Instead it is captured by the Measurement – Terminal association that is used to define the sensing location in the network topology. The location is defined by the connection of the Terminal to ConductingEquipment.</xs:documentation>
      <xs:documentation>If both a Terminal and PSR are associated, and the PSR is of type ConductingEquipment, the associated Terminal should belong to that ConductingEquipment instance.</xs:documentation>
      <xs:documentation>When the sensor location is needed both Measurement-PSR and Measurement-Terminal are used. The Measurement-Terminal association is never used alone.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
```

```
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="PowerSystemResource" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PowerSystemResource">
      <xs:annotation>
        <xs:documentation>A power system resource can be an item of equipment such as a switch, an equipment container containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power system resources can have measurements associated.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="UsagePoint" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#UsagePoint">
      <xs:annotation>
        <xs:documentation>Logical or physical point in the network to which readings or events may be attributed. Used at the place where a physical or virtual meter may be located; however, it is not required that a meter be present.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="Equipments" type="m:Equipment" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#UsagePoint.Equipments">
          <xs:annotation>
            <xs:documentation>All equipment connecting this usage point to the electrical grid.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
</xs:schema>
```

B.6 Charges utiles de messages OutagesAndFaults

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#" xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#" xmlns:m="http://iec.ch/TC57/2014/OutagesAndFaults/1#" targetNamespace="http://iec.ch/TC57/2014/OutagesAndFaults/1#" elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:element name="OutagesAndFaults" type="m:OutagesAndFaults"/>
  <xs:complexType name="OutagesAndFaults">
    <xs:sequence>
      <xs:element name="EquipmentFault" type="m:EquipmentFault" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="LineFault" type="m:LineFault" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="Outage" type="m:Outage" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="ACLineSegment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ACLineSegment">
    <xs:annotation>
      <xs:documentation>A wire or combination of wires, with consistent electrical characteristics, building a single electrical system, used to carry alternating current between points in the power system.</xs:documentation>
      <xs:documentation>For symmetrical, transposed 3ph lines, it is sufficient to use attributes of the line segment, which describe impedances and admittances for the entire length of the segment. Additionally impedances can be computed by using length and associated per length impedances.</xs:documentation>
      <xs:documentation>The BaseVoltage at the two ends of ACLineSegments in a Line shall have the same BaseVoltage.nominalVoltage. However, boundary lines may have slightly different BaseVoltage.nominalVoltages and variation is allowed. Larger voltage difference in general requires use of an equivalent branch.</xs:documentation>
    </xs:annotation>
```

```
    <xs:complexContent>
      <xs:extension base="m:Equipment">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="DateTimeInterval" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#DateTimeInterval">
    <xs:annotation>
      <xs:documentation>Interval between two date and time points.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="end" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DateTimeInterval.end">
        <xs:annotation>
          <xs:documentation>End date and time of this interval.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="start" type="xs:dateTime" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#DateTimeInterval.start">
        <xs:annotation>
          <xs:documentation>Start date and time of this interval.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Equipment" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Equipment">
    <xs:annotation>
      <xs:documentation>The parts of a power system that are physical devices, electronic or mechanical.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="EquipmentFault" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#EquipmentFault">
    <xs:annotation>
      <xs:documentation>A fault applied at the terminal, external to the equipment. This class is not used to specify faults
internal to the equipment.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Fault">
        <xs:sequence>
          <xs:element name="FaultyEquipment" type="m:Equipment" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.FaultyEquipment">
            <xs:annotation>
              <xs:documentation>Equipment carrying this fault.</xs:documentation>
              <xs:documentation>Use if you don't have detailed terminals (connectivity) model.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="Terminal" type="m:Terminal" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#EquipmentFault.Terminal">
            <xs:annotation>
              <xs:documentation>The terminal connecting to the bus to which the fault is applied.</xs:documentation>
              <xs:documentation>Use if you have designation of the terminal (of the faulty equipment).</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Fault" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault">
    <xs:annotation>
      <xs:documentation>Abnormal condition causing current flow through conducting equipment, such as caused by
equipment failure or short circuits from objects not typically modeled (for example, a tree falling on a line).</xs:documentation>
    </xs:annotation>
    <xs:sequence>
```

```
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
          <xs:annotation>
            <xs:documentation>The description is a free human readable text describing or naming the object. It may be non
unique and may not correlate to a naming hierarchy.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="kind" type="m:PhaseConnectedFaultKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.kind">
          <xs:annotation>
            <xs:documentation>The kind of phase fault.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
          <xs:annotation>
            <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="phases" type="m:PhaseCode" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.phases">
          <xs:annotation>
            <xs:documentation>The phases participating in the fault. The fault connections into these phases are further specified
by the type of fault.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="FaultCauseTypes" type="m:FaultCauseType" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.FaultCauseTypes">
          <xs:annotation>
            <xs:documentation>All types of fault cause.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="impedance" type="m:FaultImpedance" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Fault.impedance">
          <xs:annotation>
            <xs:documentation>Fault impedance. Its usage is described by 'kind'.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Outage" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-
schema-cim17-dcim12#Fault.Outage">
          <xs:annotation>
            <xs:documentation>Outage associated with this fault.</xs:documentation>
          </xs:annotation>
          <xs:complexType sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage">
            <xs:attribute name="ref" type="xs:string"/>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="FaultCauseType" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#FaultCauseType">
      <xs:annotation>
        <xs:documentation>Type of cause of the fault.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
```

```
  </xs:complexType>
  <xs:complexType name="FaultImpedance" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#FaultImpedance">
    <xs:annotation>
      <xs:documentation>Impedance description for the fault.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="rGround" type="m:Resistance" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultImpedance.rGround">
        <xs:annotation>
          <xs:documentation>The resistance of the fault between phases and ground.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="rLineToLine" type="m:Resistance" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultImpedance.rLineToLine">
        <xs:annotation>
          <xs:documentation>The resistance of the fault between phases.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="xGround" type="m:Reactance" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultImpedance.xGround">
        <xs:annotation>
          <xs:documentation>The reactance of the fault between phases and ground.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="xLineToLine" type="m:Reactance" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#FaultImpedance.xLineToLine">
        <xs:annotation>
          <xs:documentation>The reactance of the fault between phases.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="LineFault" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#LineFault">
    <xs:annotation>
      <xs:documentation>A fault that occurs on an AC line segment at some point along the length.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Fault">
        <xs:sequence>
          <xs:element name="lengthFromTerminal1" type="m:Length" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#LineFault.lengthFromTerminal1">
            <xs:annotation>
              <xs:documentation>The length to the place where the fault is located starting from terminal with sequence
number 1 of the faulted line segment.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="ACLineSegment" type="m:ACLineSegment" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#LineFault.ACLineSegment">
            <xs:annotation>
              <xs:documentation>The line segment of this line fault.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="Outage" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage">
    <xs:annotation>
      <xs:documentation>Document describing details of an active or planned outage in a part of the electrical
network.</xs:documentation>
      <xs:documentation>A non-planned outage may be created upon:</xs:documentation>
      <xs:documentation>- a breaker trip,</xs:documentation>
      <xs:documentation>- a fault indicator status change,</xs:documentation>
      <xs:documentation>- a meter event indicating customer outage,</xs:documentation>
      <xs:documentation>- a reception of one or more customer trouble calls, or</xs:documentation>
      <xs:documentation>- an operator command, reflecting information obtained from the field crew.</xs:documentation>
      <xs:documentation>Outage restoration may be performed using a switching plan which complements the outage
information with detailed switching activities, including the relationship to the crew and work.</xs:documentation>
      <xs:documentation>A planned outage may be created upon:</xs:documentation>
      <xs:documentation>- a request for service, maintenance or construction work in the field, or</xs:documentation>
      <xs:documentation>- an operator-defined outage for what-if/contingency network analysis.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
```

```
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="cause" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.cause">
        <xs:annotation>
          <xs:documentation>One or more causes of this outage.</xs:documentation>
          <xs:documentation>Note: At present, this is a free text; could be replaced with a separate associated class in case we have multiple causes (e.g. OutageCauseType, inheriting from IdentifiedObject).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.description">
        <xs:annotation>
          <xs:documentation>The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="isPlanned" type="xs:boolean" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.isPlanned">
        <xs:annotation>
          <xs:documentation>True if planned, false otherwise (for example due to a breaker trip).</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
          <xs:documentation>The name is any free human readable and possibly non unique text naming the object.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="subject" type="xs:string" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.subject">
        <xs:annotation>
          <xs:documentation>Document subject.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="actualPeriod" type="m:DateTimeInterval" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.actualPeriod">
        <xs:annotation>
          <xs:documentation>Actual outage period; end of the period corresponds to the actual restoration time.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="estimatedPeriod" type="m:DateTimeInterval" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.estimatedPeriod">
        <xs:annotation>
          <xs:documentation>Estimated outage period. The start of the period makes sense in case of a planned outage only, whereas the end of the period corresponds to the estimated restoration time in general.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="OpenedSwitches" type="m:Switch" minOccurs="0" maxOccurs="unbounded" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.OpenedSwitches">
        <xs:annotation>
          <xs:documentation>All potentially open switches causing this outage. This realationship is meant to be used as "indication" for initiation of outage-related business processes, whereas for actual actions of switches, SwitchAction-Switch relationship should be used.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="status" type="m:Status" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Document.status">
        <xs:annotation>
          <xs:documentation>Status of subject matter (e.g., Agreement, Work) this document represents. For status of the document itself, use 'docStatus' attribute.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="summary" type="m:ServicePointOutageSummary" minOccurs="1" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Outage.summary">
        <xs:annotation>
          <xs:documentation>Summary counts of service points (customers) affected by this outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
```

```
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="PhaseCode" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PhaseCode">
    <xs:annotation>
      <xs:documentation>An unordered enumeration of phase identifiers. Allows designation of phases for both transmission and distribution equipment, circuits and loads. The enumeration, by itself, does not describe how the phases are connected together or connected to ground. Ground is not explicitly denoted as a phase.</xs:documentation>
      <xs:documentation>Residential and small commercial loads are often served from single-phase, or split-phase, secondary circuits. For example of s12N, phases 1 and 2 refer to hot wires that are 180 degrees out of phase, while N refers to the neutral wire. Through single-phase transformer connections, these secondary circuits may be served from one or two of the primary phases A, B, and C. For three-phase loads, use the A, B, C phase codes instead of s12N.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="A">
        <xs:annotation>
          <xs:documentation>Phase A.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="AB">
        <xs:annotation>
          <xs:documentation>Phases A and B.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ABC">
        <xs:annotation>
          <xs:documentation>Phases A, B, and C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ABCN">
        <xs:annotation>
          <xs:documentation>Phases A, B, C, and N.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ABN">
        <xs:annotation>
          <xs:documentation>Phases A, B, and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="AC">
        <xs:annotation>
          <xs:documentation>Phases A and C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="ACN">
        <xs:annotation>
          <xs:documentation>Phases A, C and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="AN">
        <xs:annotation>
          <xs:documentation>Phases A and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="B">
        <xs:annotation>
          <xs:documentation>Phase B.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="BC">
        <xs:annotation>
          <xs:documentation>Phases B and C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="BCN">
        <xs:annotation>
          <xs:documentation>Phases B, C, and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="BN">
        <xs:annotation>
          <xs:documentation>Phases B and neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="C">
        <xs:annotation>
          <xs:documentation>Phase C.</xs:documentation>
```

```
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="CN">
      <xs:annotation>
        <xs:documentation>Phases C and neutral.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="N">
      <xs:annotation>
        <xs:documentation>Neutral phase.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="none">
      <xs:annotation>
        <xs:documentation>No phases specified.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="s1">
      <xs:annotation>
        <xs:documentation>Secondary phase 1.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="s12">
      <xs:annotation>
        <xs:documentation>Secondary phase 1 and 2.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="s12N">
      <xs:annotation>
        <xs:documentation>Secondary phases 1, 2, and neutral.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="s1N">
      <xs:annotation>
        <xs:documentation>Secondary phase 1 and neutral.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="s2">
      <xs:annotation>
        <xs:documentation>Secondary phase 2.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="s2N">
      <xs:annotation>
        <xs:documentation>Secondary phase 2 and neutral.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
  </xs:restriction>
 </xs:simpleType>
 <xs:simpleType name="PhaseConnectedFaultKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#PhaseConnectedFaultKind">
  <xs:annotation>
    <xs:documentation>The type of fault connection among phases.</xs:documentation>
  </xs:annotation>
  <xs:restriction base="xs:string">
    <xs:enumeration value="lineToGround">
      <xs:annotation>
        <xs:documentation>The fault connects the indicated phases to ground. The line to line fault impedance is not used and assumed infinite. The full ground impedance is connected between each phase specified in the fault and ground, but not between the phases.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="lineToLine">
      <xs:annotation>
        <xs:documentation>The fault connects the specified phases together without a connection to ground. The ground impedance of this fault is ignored. The line to line impedance is connected between each of the phases specified in the fault. For example three times for a three phase fault, one time for a two phase fault. A single phase fault should not be specified.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="lineToLineToGround">
      <xs:annotation>
        <xs:documentation>The fault connects the indicated phases to ground and to each other. The line to line impedance is connected between each of the phases specified in the fault in a full mesh. For example three times for a three phase fault, one time for a two phase fault. A single phase fault should not be specified. The full ground impedance is connected between each phase specified in the fault and ground.</xs:documentation>
      </xs:annotation>
```

```
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="ProtectedSwitch" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ProtectedSwitch">
    <xs:annotation>
      <xs:documentation>A ProtectedSwitch is a switching device that can be operated by ProtectionEquipment.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Switch">
        <xs:sequence/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="ServicePointOutageSummary" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ServicePointOutageSummary">
    <xs:annotation>
      <xs:documentation>Summary counts of service points affected by an outage. These counts are sometimes referred to as total and critical customer count.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="criticalCount" type="xs:integer" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ServicePointOutageSummary.criticalCount">
        <xs:annotation>
          <xs:documentation>Number of critical service (delivery) points affected by an outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="totalCount" type="xs:integer" minOccurs="0" maxOccurs="1" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#ServicePointOutageSummary.totalCount">
        <xs:annotation>
          <xs:documentation>Number of all service (delivery) points affected by an outage.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="SinglePhaseKind" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SinglePhaseKind">
    <xs:annotation>
      <xs:documentation>Enumeration of single phase identifiers. Allows designation of single phases for both transmission and distribution equipment, circuits and loads.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="A">
        <xs:annotation>
          <xs:documentation>Phase A.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="B">
        <xs:annotation>
          <xs:documentation>Phase B.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="C">
        <xs:annotation>
          <xs:documentation>Phase C.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="N">
        <xs:annotation>
          <xs:documentation>Neutral.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s1">
        <xs:annotation>
          <xs:documentation>Secondary phase 1.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value="s2">
        <xs:annotation>
          <xs:documentation>Secondary phase 2.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="Status" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status">
    <xs:annotation>
```

```
      <xs:documentation>Current status information relevant to an entity.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="dateTime" type="xs:dateTime" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.dateTime">
        <xs:annotation>
          <xs:documentation>Date and time for which status 'value' applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="reason" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.reason">
        <xs:annotation>
          <xs:documentation>Reason code or explanation for why an object went to the current status
'value'.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="remark" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.remark">
        <xs:annotation>
          <xs:documentation>Pertinent information regarding the current 'value', as free form text.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="value" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Status.value">
        <xs:annotation>
          <xs:documentation>Status value at 'dateTime'; prior status changes may have been kept in instances of activity
records associated with the object to which this status applies.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="Switch" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch">
    <xs:annotation>
      <xs:documentation>A generic device designed to close, or open, or both, one or more electric circuits. All switches are
two terminal devices including grounding switches.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="m:Equipment">
        <xs:sequence>
          <xs:element name="SwitchPhase" type="m:SwitchPhase" minOccurs="0" maxOccurs="unbounded"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Switch.SwitchPhase">
            <xs:annotation>
              <xs:documentation>The individual switch phases for the switch.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name="SwitchPhase" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#SwitchPhase">
    <xs:annotation>
      <xs:documentation>Single phase of a multi-phase switch when its attributes might be different per
phase.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
        <xs:annotation>
          <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
          <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="closed" type="xs:boolean" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.closed">
        <xs:annotation>
          <xs:documentation>The attribute tells if the switch is considered closed when used as input to topology
processing.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.name">
        <xs:annotation>
```

```
            <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="normalOpen" type="xs:boolean" minOccurs="0" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.normalOpen">
          <xs:annotation>
            <xs:documentation>Used in cases when no Measurement for the status value is present. If the SwitchPhase has a
status measurement the Discrete.normalValue is expected to match with this value.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="phaseSide1" type="m:SinglePhaseKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.phaseSide1">
          <xs:annotation>
            <xs:documentation>Phase of this SwitchPhase on the side with terminal sequence number equal 1. Should be a
phase contained in that terminal&amp;rsquo;s phases attribute.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="phaseSide2" type="m:SinglePhaseKind" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#SwitchPhase.phaseSide2">
          <xs:annotation>
            <xs:documentation>Phase of this SwitchPhase on the side with terminal sequence number equal 2. Should be a
phase contained in that terminal&amp;rsquo;s Terminal.phases attribute.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="Terminal" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Terminal">
      <xs:annotation>
        <xs:documentation>An AC electrical connection point to a piece of conducting equipment. Terminals are connected at
physical connection points called connectivity nodes.</xs:documentation>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="mRID" type="xs:string" minOccurs="1" maxOccurs="1"
sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#IdentifiedObject.mRID">
          <xs:annotation>
            <xs:documentation>Master resource identifier issued by a model authority. The mRID is unique within an exchange
context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is
strongly recommended.</xs:documentation>
            <xs:documentation>For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is
mapped to rdf:ID or rdf:about attributes that identify CIM object elements.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:simpleType name="Resistance" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Resistance">
      <xs:annotation>
        <xs:documentation>Resistance (real part of impedance).</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
    <xs:simpleType name="Length" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-dcim12#Length">
      <xs:annotation>
        <xs:documentation>Unit of length. Never negative.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
    <xs:simpleType name="Reactance" sawsdl:modelReference="http://iec.ch/TC57/2014/CIM-schema-cim17-
dcim12#Reactance">
      <xs:annotation>
        <xs:documentation>Reactance (imaginary part of impedance), at rated frequency.</xs:documentation>
      </xs:annotation>
      <xs:restriction base="xs:float"/>
    </xs:simpleType>
</xs:schema>
```

B.7 Charges utiles de messages **OutageSchedules**

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:a="http://langdale.com.au/2005/Message#"
xmlns:sawsdl="http://www.w3.org/ns/sawsdl" xmlns="http://langdale.com.au/2005/Message#"
xmlns:m="http://iec.ch/TC57/2014/OutageSchedules/2#" targetNamespace="http://iec.ch/TC57/2014/OutageSchedules/2#"
elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:annotation>
```