IEC TS 61400-26-3

Edition 1.0 2016-08

TECHNICAL SPECIFICATION

colour inside

Wind energy generation systems – Part 26-3: Availability for wind power stations

IEC TS 61400-26-3:2016-08(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 27.180

ISBN 978-2-8322-3572-0

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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WIND ENERGY GENERATION SYSTEMS –

Part 26-3: Availability for wind power stations

FOREWORD

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 61400-26-3, which is a technical specification, has been prepared by IEC technical committee 88: Wind energy generation systems.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
88/571/DTS	88/588/RVC

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

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

A list of all parts of the IEC 61400 series, under the general title *Wind turbines* (previous title), and *Wind energy generation systems* (new title), can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

Mandatory information categories defined in this Technical Specification are written in capital letters; optional information categories defined are written in capital letters and bold letters.

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

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

The intention of this Technical Specification is to define a common basis for exchange of information on availability indicators between owners, utilities, lenders, operators, manufacturers, consultants, regulatory bodies, certification bodies, insurance companies and other stakeholders in the wind power generation business. From this diverse group of stakeholders a number of external and internal interfaces arise in the operation and delivery of power. Some of these are energy related and many are informational. Since the intention is for a common basis of informational exchange, many of these interfaces are illustrated in Figure 1, which identifies external and internal elements related to energy production and asset management and which also benefit from a defined set of terms. This is achieved by providing an information model specifying how time designations shall be split into information categories. The information model forms the basis for how to allocate time for reporting availability indicators.

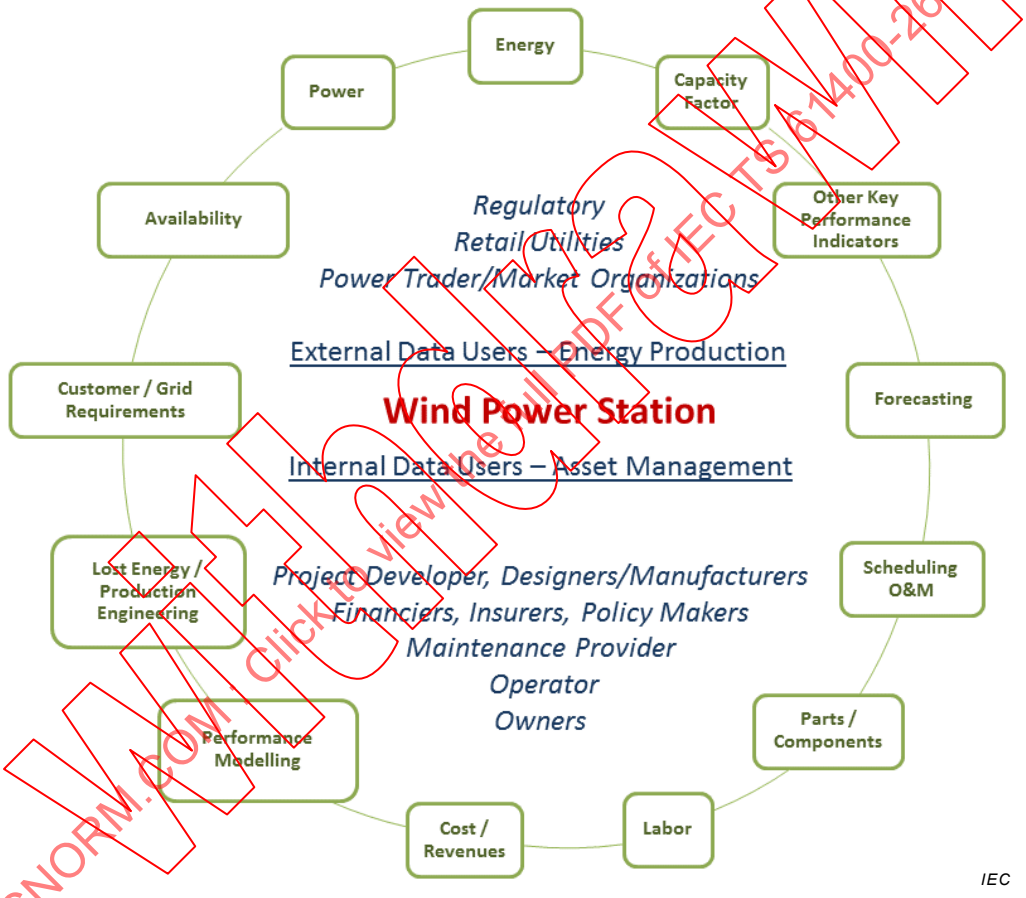


Figure 1 – Data stakeholders for a wind power station

This Technical Specification defines generic terms of wind turbine systems and environmental constraints in describing system and component availability, lifetime expectancy, repairs and criteria for determining overhaul intervals. The specification defines terminology and generic terms for reporting energy based generating unit availability measurement. A generating unit includes all equipment up to the point of interconnection[1]. Availability measurements are concerned with fractions of time and/or energy a unit is capable of providing service, taking environmental aspects into account. Environmental aspects will be wind and other weather conditions, as well as grid and substation conditions. The specification furthermore defines terminology and terms for reporting availability indicators based on energy production.

[1] Defined in IEC 60050-415:1999, 415-04-01.

The project scope is accomplished by separating the technical specification into three parts:

1) IEC TS 61400-26-1, which specifies terms for time based availability of a wind turbine generating system;
2) IEC TS 61400-26-2, which specifies terms for production based availability of a wind turbine generating system;
3) IEC TS 61400-26-3, which specifies terms for time based and production based availability and services of a wind power station.

IEC TS 61400-26-3 is based on the models developed in IEC TS 61400-26-1 and IEC TS 61400-26-2.

WIND ENERGY GENERATION SYSTEMS –

Part 26-3: Availability for wind power stations

1 Scope

This part of IEC 61400, which is a technical specification, provides a framework from which time-based and production-based availability indicators of a wind power station can be derived. It unambiguously describes how data is categorised and provides examples of how the data can be used to derive availability indicators.

The approach is to apply the terms and definitions for the applied information models introduced in IEC TS 61400-26-1 and IEC TS 61400-26-2 to a wind power station.

The basic approach is based on the assumption that a wind power station may be modelled as one 'WTGS' representing a complete wind power station. The wind power station is made up of all WTGSs, functional services and balance of plant elements as seen from the point of common coupling.

It is not the intention of this specification to define how time-based and production-based availability shall be calculated. Nor is it the intention to form the basis for power curve performance measurements – which is the objective of IEC 61400-12. However, the annexes should be regarded as examples and guidelines for developing methods for calculation of availability indicators.

This document also includes informative annexes with:

- examples of how to expand the model to more services,
- examples of how to determine the information category for the wind power station,
- examples of how to expand the model to balance of plant elements,
- examples of determination of lost production,
- examples of availability algorithms for production based indicators,
- examples of other availability indicators,
- examples of application scenarios.

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 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org/)

IEC 60050-415, *International Electrotechnical Vocabulary – Part 415 : Wind turbine generator systems* (available at <http://www.electropedia.org/)

IEC TS 61400-26-1:2011, *Wind turbines – Part 26-1: Time-based availability for wind turbine generating systems*

IEC TS 61400-26-2:2014, *Wind turbines – Part 26-2: Production-based availability for wind turbines*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TS 61400-26-1, IEC TS 61400-26-2 and IEC 60050-415 and the following apply.

3.1.1
actual service
actual level of a Service provided by the WPS as measured at the network connection point

Note 1 to entry: Actual service can only be assigned to measureable Services.

3.1.2
balance of plant
BOP
infrastructural components of the WPS with the exception of the WTGS(s) and its internal components and subsystems

Note 1 to entry: The infrastructure normally consists of site electrical facilities, monitoring and control (often called SCADA) as well as civil plant (such as foundations and roads) which support the operation and maintenance of the WTGS(s).

3.1.3
constrained potential service
calculated level of a Service provided by the WPS as measured at the network connection point based on design criteria, technical and operating specifications, and site conditions

Note 1 to entry: Operating specifications shall include externally caused set-points such as Grid or contractually imposed constraints.

3.1.4
grid
electrical network to which the WPS is electrically connected

Note 1 to entry: The WPS delivers its services into the Grid. The interface between the Grid and the WPS internal electrical system is the network connection point often referred to as the Point of Common Coupling (PCC).

3.1.5
intended function
ability of an apparatus, machine or system to consistently perform its required function within its design specification

3.1.6
lost service
service not supplied

Note 1 to entry: See 3.1.10.

3.1.7
physical potential service
calculated level of a Service provided by the WPS as measured at the network connection point based on design criteria, technical specifications and site conditions

Note 1 to entry: The potential service is the physically possible level of service.

3.1.8
potential service
calculated value of Physical potential service or Constrained potential service as is appropriate

3.1.9
supervisory control and data acquisition
SCADA
system operating with signals over communication channels so as to provide control of equipment and for gathering and analysing real-time data

3.1.10
service
provision delivered by the WPS

Note 1 to entry: Services may include, but are not limited to, supply of active energy, reactive energy and support of electrical stability of the Grid. Aviation warning is another example of a service.

3.1.11
transmission system operator
TSO
operator that transmits electrical power from generation plants over the Grid to regional or local electricity distribution operators

3.1.12
wind power station
WPS
station consisting of the WTGS(s) and the infrastructure (often called BOP) which support transfer of energy between the WTGS(s) and the Grid

3.1.13
WPS maintenance provider
provider typically providing the maintenance of the WPS or parts therein

Note 1 to entry: WPS maintenance can be performed by multiple providers.

3.1.14
WPS operator
operator typically responsible for providing the services of the WPS to off-takers

3.2 Abbreviations for 'information available'

IA	Information available category
IAO	Information available operative category
IAOS	Information available operative in service category
IAOSFP	Information available operative in service with full performance category
IAOSPP	Information available operative in service with partial performance category
IAOSRS	Information available operative in service with ready standby category
IAOOS	Information available operative out of service category
IAOOSTS	Information available operative out of service technical standby category
IAOOSEN	Information available operative out of service out of environmental specification category
IAOOSRS	Information available operative out of service requested shutdown category
IAOOSEL	Information available operative out of service out of electrical specification category
IANO	Information available non operative category

IANOSM	Information available non operative scheduled maintenance category
IANOPCA	Information available non operative planned corrective action category
IANOFO	Information available non operative forced outage category
IANOS	Information available non operative suspended category
IAFM	Information available force majeure category
IAP_P	Information available category – Potential service
IAP_A	Information available category – Actual service
$IAOP_P$	Information available operative category – Potential service
$IAOP_A$	Information available operative category – Actual service
$IAOSP_P$	Information available operative in service category – Potential service
$IAOSP_A$	Information available operative in service category – Actual service
$IAOSFPP_P$	Information available operative in service with full performance category – Potential service
$IAOSFPP_A$	Information available operative in service with full performance category – Actual service
$IAOSPPP_P$	Information available operative in service with partial performance category – Potential service
$IAOSPPP_A$	Information available operative in service with partial performance category – Actual service
$IAOSPP_{DR}P_P$	Information available operative in service with partial performance category, optional derated – Potential service
$IAOSPP_{DR}P_A$	Information available operative in service with partial performance category, optional derated – Actual service
$IAOSPP_{DG}P_P$	Information available operative in service with partial performance category, optional degraded – Potential service
$IAOSPP_{DG}P_A$	Information available operative in service with partial performance category, optional degraded – Actual service
$IAOSRSP_P$	Information available operative in service with ready standby category – Potential service
$IAOSRSP_A$	Information available operative in service with ready standby category – Actual service
$IAOOSP_P$	Information available operative out of service category – Potential service
$IAOOSP_A$	Information available operative out of service category – Actual service
$IAOOSTSP_P$	Information available operative out of service technical standby category – Potential service
$IAOOSTSP_A$	Information available operative out of service technical standby category – Actual service
$IAOOSENP_P$	Information available operative out of service out of environmental specification category – Potential service
$IAOOSENP_A$	Information available operative out of service out of environmental specification category – Actual service
$IAOOSEN_CP_P$	Information available operative out of service out of environmental specification optional category calm winds – Potential service
$IAOOSEN_CP_A$	Information available operative out of service out of environmental specification optional category calm winds – Actual service
$IAOOSEN_OP_P$	Information available operative out of service out of environmental specification optional category other environmental – Potential service
$IAOOSEN_OP_A$	Information available operative out of service out of environmental specification optional category other environmental – Actual service

$IAOOSELP_P$	Information available operative out of service out of electrical specification category – Potential service
$IAOOSELP_A$	Information available operative out of service out of electrical specification category – Actual service
$IAOOSRSP_P$	Information available operative out of service requested shutdown category – Potential service
$IAOOSRSP_A$	Information available operative out of service requested shutdown category – Actual service
$IANOP_P$	Information available non operative category – Potential service
$IANOP_A$	Information available non operative category – Actual service
$IANOSMP_P$	Information available non operative scheduled maintenance category – Potential service
$IANOSMP_A$	Information available non operative scheduled maintenance category – Actual service
$IANOPCAP_P$	Information available non operative planned corrective action category – Potential service
$IANOPCAP_A$	Information available non operative planned corrective action category – Actual service
$IANOFOP_P$	Information available non operative forced outage category – Potential service
$IANOFOP_A$	Information available non operative forced outage category – Actual service
$IANOSP_P$	Information available non operative suspended category – Potential service
$IANOSP_A$	Information available non operative suspended category – Actual service
$IAFMP_P$	Information available force majeure category – Potential service
$IAFMP_A$	Information available force majeure category – Actual service

3.3 Abbreviations for 'Information unavailable'

IU	Information unavailable category

4 Information model for WPS

4.1 General

Figure 2 provides an information category overview for the WPS.

<table>
<tr><th colspan="5">Information categories</th></tr>
<tr><th>Mandatory
level 1</th><th>Mandatory
level 2</th><th>Mandatory
level 3</th><th>Mandatory
level 4</th><th>Optional – see IEC TS 61400-26-1</th></tr>
<tr><td rowspan="11">INFORMATION AVAILABLE
(IA)</td><td rowspan="7">OPERATIVE
(IAO)</td><td rowspan="3">IN SERVICE
(IAOS)</td><td>FULL PERFORMANCE
(IAOSFP)</td><td></td></tr>
<tr><td rowspan="2">PARTIAL PERFORMANCE
(IAOSPP)</td><td>Derated</td></tr>
<tr><td>Degraded</td></tr>
<tr><td>READY STANDBY
(IAOSRS)</td><td></td></tr>
<tr><td rowspan="4">OUT OF SERVICE
(IAOOS)</td><td>TECHNICAL STANDBY
(IAOOSTS)</td><td></td></tr>
<tr><td rowspan="2">OUT OF ENVIRONMENTAL SPECIFICATION
(IAOOSEN)</td><td>Calm winds</td></tr>
<tr><td>Other environmental</td></tr>
<tr><td>REQUESTED SHUTDOWN
(IAOOSRS)</td><td></td></tr>
<tr><td>OUT OF ELECTRICAL SPECIFICATION
(IAOOSEL)</td><td></td></tr>
<tr><td rowspan="4">NON-OPERATIVE
(IANO)</td><td colspan="2">SCHEDULED MAINTENANCE
(IANOSM)</td><td></td></tr>
<tr><td colspan="2">PLANNED CORRECTIVE ACTION (IANOPCA)</td><td>Retrofit
Upgrade
Other corrective action</td></tr>
<tr><td colspan="2">FORCED OUTAGE
(IANOFO)</td><td>Response
Diagnostic
Logistic
Failure repair</td></tr>
<tr><td colspan="2">SUSPENDED
(IANOS)</td><td>Scheduled maintenance
Planned corrective action
Forced outage</td></tr>
<tr><td colspan="2">FORCE MAJEURE
(IAFM)</td><td></td></tr>
<tr><td colspan="3">INFORMATION UNAVAILABLE
(IU)</td><td></td></tr>
</table>

Figure 2 – Information category overview for a WPS

The information model is identical to the model specified in IEC TS 61400-26-1 with the addition of the category READY STANDBY as illustrated in Figure 2. The time-based model for the WPS works on the same principles for allocating time to information categories as the model specified in IEC TS 61400-26-1. The mandatory information categories are identical to the mandatory information categories defined for the WTGS, but for the WPS model the categories apply to the resulting category of the WPS.

The production-based model for the WPS works on the model specified in IEC TS 61400-26-2. The extended information category model is also applied for the WPS. The mandatory information categories are identical to the mandatory information categories defined for the WTGS, but for the WPS model the categories apply to the resulting category of the WPS.

Determination of the proper information category for the WPS is complex, as the resulting category is not simply made up of the minimum, maximum, sum or average of the elements making up the WPS. The key to determining the proper information category is by evaluating compliance with exit and entry criteria defined in Clauses 5 and 6. Methods for determining the information categories are discussed in Annex B.

Basic principles and assumptions for the WPS information model are

- Mandatory categories are identical in the WTGS model and the WPS model.
- Optional categories are not necessarily identical in the WTGS model and the WPS model.
- WPS actual production is the measured value at the PCC.
- The Potential production shall be either the Physical potential production or Constrained potential production depending on what is relevant for the Service. Typically, for active production, it may be appropriate to select the Physical potential production and for reactive production the Constrained potential production. See Annex D for methods to determine potential production.

4.2 Services

The extended information category model described in IEC TS 61400-26-2 shall be applied to the individual services provided by the WPS. Active power and reactive power are examples of services that may be assessed separately. The services should always be analysed in parallel to obtain individual availability indicators for each service. Some services are of a nature where it is not possible or meaningful to measure the level of the service; this could be if the service is of a more binary nature. An example is aviation lights, which can be either 'in service' or 'out of service' but not have a value attached to it and nothing in between. So for some services actual, potential and lost production cannot be calculated and accumulated, hence only the category will be determined and used to calculate time based availability indicators.

The model supports split-up of services as illustrated in Figure 3 and may be applied for the WTGS level as well as for the WPS level.

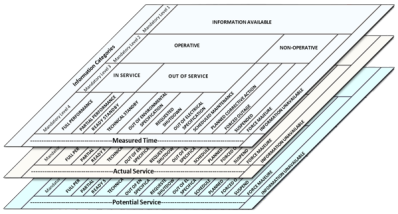
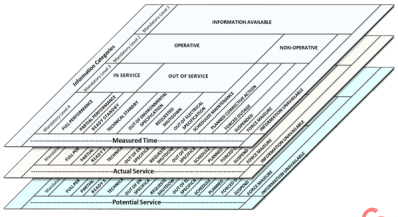
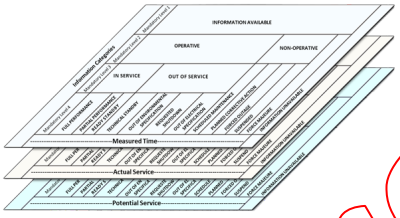
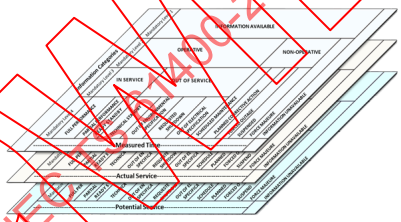
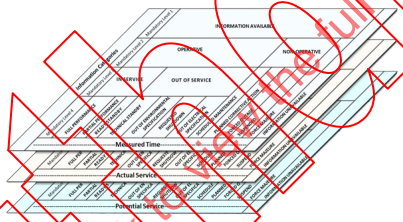
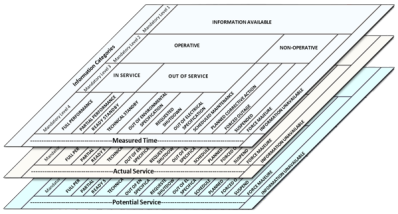
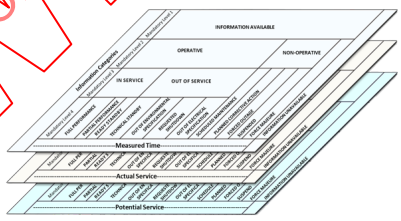
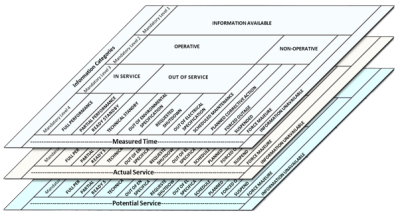
	WTGS	WPS
Active power service		
Reactive power service		
High frequency grid compensation		
Low frequency grid compensation		

Figure 3 – Example of a model split-up in active power, reactive power high and low frequency compensation services

4.3 Information category priority

Priorities of the information categories are as specified in IEC TS 61400-26-1 with the addition of the category READY STANDBY. Figure 4 illustrates the information category priority for the WPS[2].

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	IN SERVICE (**IAOS**)	FULL PERFORMANCE (**IAOSFP**)	**1**
			PARTIAL PERFORMANCE (**IAOSPP**)	**2**
			READY STANDBY (**IAOSRS**)	**3**
		OUT OF SERVICE (**IAOOS**)	TECHNICAL STANDBY (**IAOOSTS**)	**4**
			OUT OF ENVIRONMENTAL SPECIFICATION (**IAOOSEN**)	**5**
			REQUESTED SHUTDOWN (**IAOOSRS**)	**6**
			OUT OF ELECTRICAL SPECIFICATION (**IAOOSEL**)	**7**
	NON-OPERATIVE (**IANO**)	SCHEDULED MAINTENANCE (**IANOSM**)		**8**
		PLANNED CORRECTIVE ACTION (**IANOPCA**)		**9**
		FORCED OUTAGE (**IANOFO**)		**10**
		SUSPENDED (**IANOS**)		**11**
	FORCE MAJEURE (**IAFM**)			**12**
INFORMATION UNAVAILABLE (**IU**)				**13**

Figure 4 – Information category priority for WPS

4.4 Information model for BOP

An information model for BOP may be developed based on the principles for the WPS model. An example of how to apply the principles for BOP is discussed and illustrated in Annex C. The model illustrated in Annex C is optional.

[2] While evaluating the priority, the issue is not to confuse the priorities of the individual WTG with the priority of the WPS, e.g. a WTG can be in FORCED OUTAGE information category and the WPS can at the same time be in PARTIAL PERFORMANCE. The specification permits the user, with caution, to prioritize data based on alternate views of the model, WPS or WTG. When the model view is applied consistently there is no inconsistency in the expression of availability.

5 INFORMATION AVAILABLE (WPS)

5.1 General

Definition – The category INFORMATION AVAILABLE covers all time periods, during which information on the WPS and external conditions is retrieved, logged and stored manually or automatically to the extent that at least one information category can be established.

It is recognised that there may be circumstances when information is partially available. Qualification for INFORMATION AVAILABLE requires sufficient information to determine that criteria for mandatory level 4 category are achieved.

Information to determine the mandatory information category can be derived from multiple sources. Sources can be

- the information category from the individual WTGSs,
- BOP,
- metering information,
- manual entries.

For example the information category can be determined as INFORMATION AVAILABLE if data transmission from every single WTGS of a WPS is interrupted, as long as data from a measurement system still gives adequate information to determine the category of the WPS.

This category covers all mandatory information categories as depicted in Figure 5.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	IN SERVICE (**IAOS**)	FULL PERFORMANCE (**IAOSFP**)	**1**
			PARTIAL PERFORMANCE (**IAOSPP**)	**2**
			READY STANDBY (**IAOSRS**)	**3**
		OUT OF SERVICE (**IAOOS**)	TECHNICAL STANDBY (**IAOOSTS**)	**4**
			OUT OF ENVIRONMENTAL SPECIFICATION (**IAOOSEN**)	**5**
			REQUESTED SHUTDOWN (**IAOOSRS**)	**6**
			OUT OF ELECTRICAL SPECIFICATION (**IAOOSEL**)	**7**
	NON-OPERATIVE (**IANO**)	SCHEDULED MAINTENANCE (**IANOSM**)		**8**
		PLANNED CORRECTIVE ACTION (**IANOPCA**)		**9**
		FORCED OUTAGE (**IANOFO**)		**10**
		SUSPENDED (**IANOS**)		**11**
	FORCE MAJEURE (**IAFM**)			**12**

Figure 5 – Mandatory INFORMATION AVAILABLE categories for WPS

Entry point – The WPS operating status data is available to the extent that a WPS category at level 4 can be determined, logged and stored.

Exit point – It is not possible to determine, log or store the level 4 category of the WPS.

5.2 OPERATIVE

Definition – The WPS is in the category OPERATIVE when capable of performing the intended functions, regardless of whether it is actually active and regardless of the capacity level that can be provided.

The OPERATIVE category is underlying the INFORMATION AVAILABLE category and has two underlying information categories as listed below and depicted in Figure 6:

- IN SERVICE – as defined in 5.3,
- OUT OF SERVICE– as defined in 5.4.

The OPERATIVE category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVILABLE (**IA**)	**OPERATIVE** (**IAO**)	IN SERVICE (**IAOS**)	FULL PERFORMANCE (**IAOSFP**)	**1**
			PARTIAL PERFORMANCE (**IAOSPP**)	**2**
			READY STANDBY (**IAOSRS**)	**3**
		OUT OF SERVICE (**IAOOS**)	TECHNICAL STANDBY (**IAOOSTS**)	**4**
			OUT OF ENVIRONMENTAL SPECIFICATION (**IAOOSEN**)	**5**
			REQUESTED SHUTDOWN (**IAOOSRS**)	**6**
			OUT OF ELECTRICAL SPECIFICATION (**IAOOSEL**)	**7**

Figure 6 – OPERATIVE category

Entry point – The WPS is able to perform the intended functions, regardless of whether it is actually active and regardless of the capacity level that can be provided.

Exit point – The WPS is not able to maintain the intended functions.

5.3 IN SERVICE

5.3.1 General

Definition – The WPS is performing the Service.

The IN SERVICE category is an underlying category of the OPERATIVE category and has two underlying mandatory information categories as listed below and depicted in Figure 7:

- FULL PERFORMANCE – as defined in 5.3.2,
- PARTIAL PERFORMANCE – as defined in 5.3.3,
- READY STANDBY – as defined in 5.3.4.

The IN SERVICE information category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	**IN SERVICE (IAOS)**	FULL PERFORMANCE (**IAOSFP**)	**1**
			PARTIAL PERFORMANCE (**IAOSPP**)	**2**
			READY STANDBY **(IAOSRS)**	**3**

Figure 7 – IN SERVICE category

Entry point – The WPS starts performing the intended functions.

Exit point – The WPS stops performing the intended functions.

5.3.2 FULL PERFORMANCE

Definition – The WPS is operative and functioning according to design specifications with no technical restrictions or limitations beyond the ones specified in the design specifications.

No lost production shall be associated with the respective information category, when the WPS is operating in FULL PERFORMANCE.

This may include, but is not limited to, the following examples:

- All WTGSs performing according to design specification.
- All WTGSs delivering active power according to design power curve.
- All BOP equipment performing its designed function at rated capacity.
- All WTGS delivering full rotor inertial energy for low frequency compensation.

The FULL PERFORMANCE category is an underlying category of IN SERVICE and has no predefined underlying mandatory information categories as depicted in Figure 8.

The FULL PERFORMANCE category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE (**IAOS**)	**FULL PERFORMANCE** (**IAOSFP**)	**1**
			PARTIAL PERFORMANCE (**IAOSPP**)	**2**
			READY STANDBY (**IAOSRS**)	**3**

Figure 8 – FULL PERFORMANCE category

Entry point – The WPS is performing the intended function with the full capacity at the given conditions.

Exit point – The WPS is not delivering the intended function with the full capacity at the given conditions.

5.3.3 PARTIAL PERFORMANCE

Definition – Some of the intended functions of the WPS may be operating at reduced performance due to internal or external conditions.

This may include, but is not limited to, the following examples:

- Information is not available to ensure that the WPS is in FULL PERFORMANCE.
- Technical fault or safety related events (e.g. shut down of individual WTGSs).
- Shortage in capacity (BOP components).
- Grid management (partial curtailment).
- Reduced load capability (individual WTGSs).
- Financial considerations.
- Asset management.
- WTGS(s) constrained but still operating within design specification.

The PARTIAL PERFORMANCE category is an underlying category of IN SERVICE and has no predefined underlying mandatory information categories as depicted in Figure 9.

The PARTIAL PERFORMANCE category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	IN SERVICE (**IAOS**)	FULL PERFORMANCE (**IAOSFP**)	**1**
			PARTIAL PERFORMANCE (IAOSPP)	**2**
			READY STANDBY (**IAOSRS**)	**3**

Figure 9 – PARTIAL PERFORMANCE category

Entry point – The WPS is not providing the intended function with the full specified capacity.

Exit point – The conditions for being in PARTIAL PERFORMANCE no longer exist.

5.3.4 READY STANDBY

Definition – The WPS is in the category READY STANDBY when ready to respond to a predefined event.

This may include, but is not limited to, the following examples:

- A low frequency compensation service is activated and awaiting a frequency drop.
- Aviation warning light service awaiting an indication of nearby aeroplanes.
- Radar for bird migration awaiting a reading.

- VAr compensation system having elements disconnected but ready to engage.

READY STANDBY is not applicable for the Active power Service.

The READY STANDBY category is an underlying category of IN SERVICE and has no predefined underlying mandatory information categories as depicted in Figure 10.

The READY STANDBY category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	IN SERVICE (**IAOS**)	FULL PERFORMANCE (**IAOSFP**)	**1**
			PARTIAL PERFORMANCE (**IAOSPP**)	**2**
			READY STANDBY (IAOSRS)	**3**

Figure 10 – READY STANDBY category

Entry point – The Service is ready and able to respond to a pre-defined event.

Exit point – The Service is no longer able to respond to a pre-defined event or is now responding.

5.4 OUT OF SERVICE

5.4.1 General

Definition – The category OUT OF SERVICE is obtained when the WPS is OPERATIVE but not IN SERVICE.

The OUT OF SERVICE category is an underlying category of OPERATIVE and has four predefined underlying mandatory information categories as listed below and depicted in Figure 11.

- TECHNICAL STANDBY – as defined in 5.4.2.
- OUT OF ENVIRONMENTAL SPECIFICATION – as defined in 5.4.3.
- REQUESTED SHUTDOWN – as defined in 5.4.4.
- OUT OF ELECTRICAL SPECIFICATION – as defined in 5.4.5.

The OUT OF SERVICE category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	**OUT OF SERVICE** (**IAOOS**)	TECHNICAL STANDBY (**IAOOSTS**)	**4**
			OUT OF ENVIRONMENTAL SPECIFICATION (**IAOOSEN**)	**5**
			REQUESTED SHUTDOWN (**IAOOSRS**)	**6**
			OUT OF ELECTRICAL SPECIFICATION (**IAOOSEL**)	**7**

Figure 11 – OUT OF SERVICE category

Entry point – The WPS is OUT OF SERVICE due to one of the restrictive conditions described in the underlying information categories.

Exit point – All restrictive conditions in all underlying categories are cleared.

5.4.2 TECHNICAL STANDBY

Definition – The category TECHNICAL STANDBY is defined as periods where the WPS service is temporarily not functioning due to performance of autonomous tasks required for maintaining the intended functions.

This may include, but is not limited to, the following examples:

- Component and system self-testing,
- Changeover of components, lines or interconnections,
- Heating up, drying out or cooling down after a period of “out of environmental specification” on temperature,
- De-icing after a period of “out of environmental specification” due to ice build-up.

The TECHNICAL STANDBY category is an underlying category of the OUT OF SERVICE and has no predefined underlying mandatory information categories as depicted in Figure 12.

The TECHNICAL STANDBY category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	OUT OF SERVICE (**IAOOS**)	**TECHNICAL STANDBY** (**IAOOSTS**)	**4**
			OUT OF ENVIRONMENTAL SPECIFICATION (**IAOOSEN**)	**5**
			REQUESTED SHUTDOWN (**IAOOSRS**)	**6**
			OUT OF ELECTRICAL SPECIFICATION (**IAOOSEL**)	**7**

Figure 12 – TECHNICAL STANDBY category

Entry point – The WPS determines or receives information that technical standby tasks have to be executed.

Exit point – The condition for being in TECHNICAL STANDBY no longer exists.

5.4.3 OUT OF ENVIRONMENTAL SPECIFICATION

Definition – The category OUT OF ENVIRONMENTAL SPECIFICATION is obtained when the WPS is operative but not functioning as the conditions of the environment are out of the design specifications.

This may include, but is not limited to, the following examples:

- Ambient temperature above or below specifications,
- Wind speed below specified cut in or above specified cut out,
- Ice build-up on BOP or all WTGSs.

The OUT OF ENVIRONMENTAL SPECIFICATION category is an underlying category of OUT OF SERVICE and has no predefined underlying mandatory information categories as depicted in Figure 13.

The OUT OF ENVIRONMENTAL SPECIFICATION category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	OUT OF SERVICE (**IAOOS**)	TECHNICAL STANDBY (**IAOOSTS**)	**4**
			OUT OF ENVIRONMENTAL SPECIFICATION (**IAOOSEN**)	**5**
			REQUESTED SHUTDOWN (**IAOOSRS**)	**6**
			OUT OF ELECTRICAL SPECIFICATION (**IAOOSEL**)	**7**

Figure 13 – OUT OF ENVIRONMENTAL SPECIFICATION category

Entry point – One or more of the environmental conditions go out of design specification of the WPS, prohibiting the WPS from functioning.

Exit point – All natural environmental conditions change to be within the WPS design specification.

5.4.4 REQUESTED SHUTDOWN

Definition – The category REQUESTED SHUTDOWN is obtained when the WPS is operative but not functioning as it has been stopped by an external request.

This may include, but is not limited to, the following examples:

- Safety related events.
- Inspections.

REQUESTED SHUTDOWN category is mandatory.

The REQUESTED SHUTDOWN category is an underlying category of the OUT OF SERVICE and has no predefined underlying mandatory information categories as depicted in Figure 14.

The REQUESTED SHUTDOWN category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (IA)	OPERATIVE (**IAO**)	OUT OF SERVICE (**IAOOS**)	TECHNICAL STANDBY (**IAOOSTS**)	**4**
			OUT OF ENVIRONMENTAL SPECIFICATION (**IAOOSEN**)	**5**
			REQUESTED SHUTDOWN (**IAOOSRS**)	**6**
			OUT OF ELECTRICAL SPECIFICATION (**IAOOSEL**)	**7**

Figure 14 – REQUESTED SHUTDOWN category

Entry point – The WPS is ordered to shut down by an external request.

Exit point – All active external requests to shut down are cleared.

5.4.5 OUT OF ELECTRICAL SPECIFICATION

Definition – The category OUT OF ELECTRICAL SPECIFICATION is active when the WPS is operative but not functioning as the electrical parameters of the WPS are out of design specifications. This may be caused by GRID parameters exceeding operational specifications or internal faults in the WPS.

This may include, but is not limited to, the following examples:

- Voltage,
- Frequency,
- Phase imbalance,

- Short circuit in BOP elements.

The OUT OF ELECTRICAL SPECIFICATION category is an underlying category of the OUT OF SERVICE and has no predefined underlying mandatory information category as depicted in Figure 15.

The OUT OF ELECTRICAL SPECIFICATION category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	OUT OF SERVICE (**IAOOS**)	TECHNICAL STANDBY (**IAOOSTS**)	**4**
			OUT OF ENVIRONMENTAL SPECIFICATION (**IAOOSEN**)	**5**
			REQUESTED SHUTDOWN (IAOOSRS)	**6**
			OUT OF ELECTRICAL SPECIFICATION (**IAOOSEL**)	**7**

Figure 15 – OUT OF ELECTRICAL SPECIFICATION category

Entry point – One or more of the electrical parameters of the WPS go out of the operational and/or design specifications, prohibiting the WPS from functioning.

Exit point – All electrical parameters of the WPS change to be within the operational and/or design specifications.

5.5 NON-OPERATIVE

5.5.1 General

Definition – The NON-OPERATIVE category covers all situations when a WPS is not capable of performing the intended functions.

The NON-OPERATIVE category is an underlying category of the INFORMATION AVAILABLE and has four underlying mandatory information categories as listed below and depicted in Figure 16.

- SCHEDULED MAINTENANCE – as defined in 5.5.2.
- PLANNED CORRECTIVE ACTION – as defined in 5.5.3.
- FORCED OUTAGE – as defined in 5.5.4.
- SUSPENDED – as defined in 5.5.5.

The NON-OPERATIVE category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	**NON-OPERATIVE (IANO)**	SCHEDULED MAINTENANCE (**IANOSM**)		**8**
		PLANNED CORRECTIVE ACTION (**IANOPCA**)		**9**
		FORCED OUTAGE (**IANOFO**)		**10**
		SUSPENDED (**IANOS**)		**11**
	FORCE MAJEURE (**IAFM**)			**12**

Figure 16 – NON-OPERATIVE category

Entry point – The wind power plant is not operating or it stops operating due to one of the restricting conditions described in the underlying information categories.

Exit point – All restricting conditions in all underlying categories are cleared.

5.5.2 SCHEDULED MAINTENANCE

Definition – The category SCHEDULED MAINTENANCE is entered during scheduled maintenance of elements of the WPS (e.g. BOP) preventing the entire WPS from performing the intended functions.

The SCHEDULED MAINTENANCE category is an underlying category of the NON-OPERATIVE and has no predefined underlying mandatory information categories as depicted in Figure 17.

The SCHEDULED MAINTENANCE category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	NON-OPERATIVE (**IANO**)	**SCHEDULED MAINTENANCE (IANOSM)**		**8**
		PLANNED CORRECTIVE ACTION (**IANOPCA**)		**9**
		FORCED OUTAGE (**IANOFO**)		**10**
		SUSPENDED (**IANOS**)		**11**
	FORCE MAJEURE (**IAFM**)			**12**

Figure 17 – SCHEDULED MAINTENANCE category

Entry point – The WPS functioning is stopped or prohibited with the intention of performing scheduled maintenance.

Exit point – The WPS exits this category by manual intervention confirming that the scheduled maintenance has been interrupted or completed.

5.5.3 PLANNED CORRECTIVE ACTION

Definition – The category PLANNED CORRECTIVE ACTION is entered during actions required to retain, restore, or improve the intended functions of the WPS when these actions are not part of normal scheduled maintenance. PLANNED CORRECTIVE ACTION is active when such work is on-going simultaneously on all WTGSs or on elements of the WPS (e.g. BOP) preventing the entire WPS from performing the intended functions.

PLANNED CORRECTIVE ACTION may include retrofits and upgrades, or required corrective actions identified through condition-based maintenance, inspections, investigations etc. and is intended to account for corrective actions where the need is identified prior to any actual failure_and early enough to be planned and completed before resulting in a possible forced outage.

The PLANNED CORRECTIVE ACTION category is an underlying category of the NON-OPERATIVE category and has no predefined underlying mandatory information categories as depicted in Figure 18.

The PLANNED CORRECTIVE ACTION category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	NON-OPERATIVE (**IANO**)	SCHEDULED MAINTENANCE (**IANOSM**)		**8**
		PLANNED CORRECTIVE ACTION (**IANOPCA**)		**9**
		FORCED OUTAGE (**IANOFO**)		**10**
		SUSPENDED (**IANOS**)		**11**
		FORCE MAJEURE (**IAFM**)		**12**

Figure 18 – PLANNED CORRECTIVE ACTION category

Entry point – The WPS functioning is stopped or prohibited with the intention of performing planned corrective actions.

Exit point – The WPS exits this category by manual intervention confirming the planned corrective actions are interrupted or completed.

5.5.4 FORCED OUTAGE

Definition – The category FORCED OUTAGE is obtained when damage, fault, failure or alarm has disabled the Service. This can be detected manually or automatically. FORCED OUTAGE is active when such events occur simultaneously on all WTGSs or on elements of the WPS (e.g. BOP) preventing the entire WPS from performing the Service.

The FORCED OUTAGE category is an underlying category of the NON-OPERATIVE and has no underlying mandatory information categories as depicted in Figure 19.

The FORCED OUTAGE category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	NON-OPERATIVE (**IANO**)	SCHEDULED MAINTENANCE (**IANOSM**)		**8**
		PLANNED CORRECTIVE ACTION (**IANOPCA**)		**9**
		FORCED OUTAGE (**IANOFO**)		**10**
		SUSPENDED (**IANOS**)		**11**
	FORCE MAJEURE (**IAFM**)			**12**

Figure 19 – FORCED OUTAGE category

Entry point – The WPS operation is disabled because of damage, faults, or failures or an alarm.

Exit point – The WPS exits this category when causes for the outage are cleared.

5.5.5 SUSPENDED

Definition – The category SUSPENDED covers all situations when activities in SCHEDULED MAINTENANCE, PLANNED CORRECTIVE ACTION and FORCED OUTAGE have to be interrupted or cannot be initiated due to conditions which compromise personal safety or equipment integrity.

The SUSPENDED category includes, but is not limited to:

- Access limitations because of e.g. high waves, ice, snow, storm,
- Severe weather conditions like lightning, tornados, hail,
- Reduction of risks initiated by the activities like bush fire,
- Public authorities' orders for suspension of the work because of personal safety,
- Site working conditions are not met.

The SUSPENDED category is an underlying category of the NON-OPERATIVE and has no underlying mandatory information category as depicted in Figure 20.

The SUSPENDED category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
INFORMATION AVAILABLE (**IA**)	NON-OPERATIVE (**IANO**)	SCHEDULED MAINTENANCE (**IANOSM**)		**8**
		PLANNED CORRECTIVE ACTION (**IANOPCA**)		**9**
		FORCED OUTAGE (**IANOFO**)		**10**
		SUSPENDED (**IANOS**)		**11**
	FORCE MAJEURE (**IAFM**)			**12**

Figure 20 – SUSPENDED category

Entry point – This category is entered by manual intervention when work is suspended according to conditions defined.

Exit point – This category is terminated by manual intervention when the conditions suspending the work have been cleared.

5.6 FORCE MAJEURE

Definition – The category FORCE MAJEURE covers all situations where an extraordinary event or circumstance beyond the control of the parties involved, prevents the parties from fulfilling their obligations.

FORCE MAJEURE is a common clause in contracts which essentially frees concerned parties from their liability or obligation when an extraordinary event or circumstance beyond the control of the parties occurs.

FORCE MAJEURE is not intended to excuse negligence or other malfeasance of a party, as where non-performance is caused by the usual and natural consequences of external forces or where the intervening circumstances are specifically contemplated.

The FORCE MAJEURE information category is underlying the INFORMATION AVAILABLE information category on level 2 and has no underlying mandatory information categories as depicted in Figure 21.

The FORCE MAJEURE category is mandatory.

Information categories				
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**
NFORMATION AVAILABLE (**IA**)	NON-OPERATIVE (**IANO**)	SCHEDULED MAINTENANCE (**IANOSM**)		**8**
		PLANNED CORRECTIVE ACTION (**IANOPCA**)		**9**
		FORCED OUTAGE (**IANOFO**)		**10**
		SUSPENDED (**IANOS**)		**11**
	FORCE MAJEURE (**IAFM**)			**12**

Figure 21 – FORCE MAJEURE category

Entry point – This category is entered by manual intervention when a force majeure situation is detected according to contract text.

Exit point – this category is terminated by manual intervention when a force majeure situation has been cleared according to contract text.

6 INFORMATION UNAVAILABLE (WPS)

Definition – The category INFORMATION UNAVAILABLE covers all time periods when the category INFORMATION AVAILABLE is not applicable.

The INFORMATION UNAVAILABLE information category is on level 1 and as such has no overlying information category. In addition this information category has no underlying mandatory information categories as depicted in Figure 22.

The INFORMATION UNAVAILABLE category is mandatory.

<table>
<tr><th colspan="5">Information categories</th></tr>
<tr><th>Mandatory
Level 1</th><th>Mandatory
Level 2</th><th>Mandatory
Level 3</th><th>Mandatory
Level 4</th><th>Mandatory
Priority</th></tr>
<tr><td rowspan="11">INFORMATION AVAILABLE
(IA)</td><td rowspan="8">OPERATIVE
(IAO)</td><td rowspan="3">IN SERVICE (IAOS)</td><td>FULL PERFORMANCE
(IAOSFP)</td><td>1</td></tr>
<tr><td>PARTIAL PERFORMANCE
(IAOSPP)</td><td>2</td></tr>
<tr><td>READY STANDBY
(IAOSRS)</td><td>3</td></tr>
<tr><td rowspan="5">OUT OF SERVICE
(IAOOS)</td><td>TECHNICAL STANDBY
(IAOOSTS)</td><td>4</td></tr>
<tr><td>OUT OF ENVIRONMENTAL SPECIFICATION
(IAOOSEN)</td><td>5</td></tr>
<tr><td>REQUESTED SHUTDOWN
(IAOOSRS)</td><td>6</td></tr>
<tr><td>OUT OF ELECTRICAL SPECIFICATION
(IAOOSEL)</td><td>7</td></tr>
<tr><td rowspan="4">NON-OPERATIVE
(IANO)</td><td colspan="2">SCHEDULED MAINTENANCE
(IANOSM)</td><td>8</td></tr>
<tr><td colspan="2">PLANNED CORRECTIVE ACTION (IANOPCA)</td><td>9</td></tr>
<tr><td colspan="2">FORCED OUTAGE
(IANOFO)</td><td>10</td></tr>
<tr><td colspan="2">SUSPENDED
(IANOS)</td><td>11</td></tr>
<tr><td colspan="3">FORCE MAJEURE
(IAFM)</td><td>12</td></tr>
<tr><td colspan="4">INFORMATION UNAVAILABLE
(IU)</td><td>13</td></tr>
</table>

Figure 22 – INFORMATION UNAVAILABLE category

Entry point – It is not possible to determine, log or store the level 4 category of the WPS.

Exit point – The WPS operating status data is available to the extent that a WPS category at level 4 can be determined, logged and stored.

Annex A
(informative)

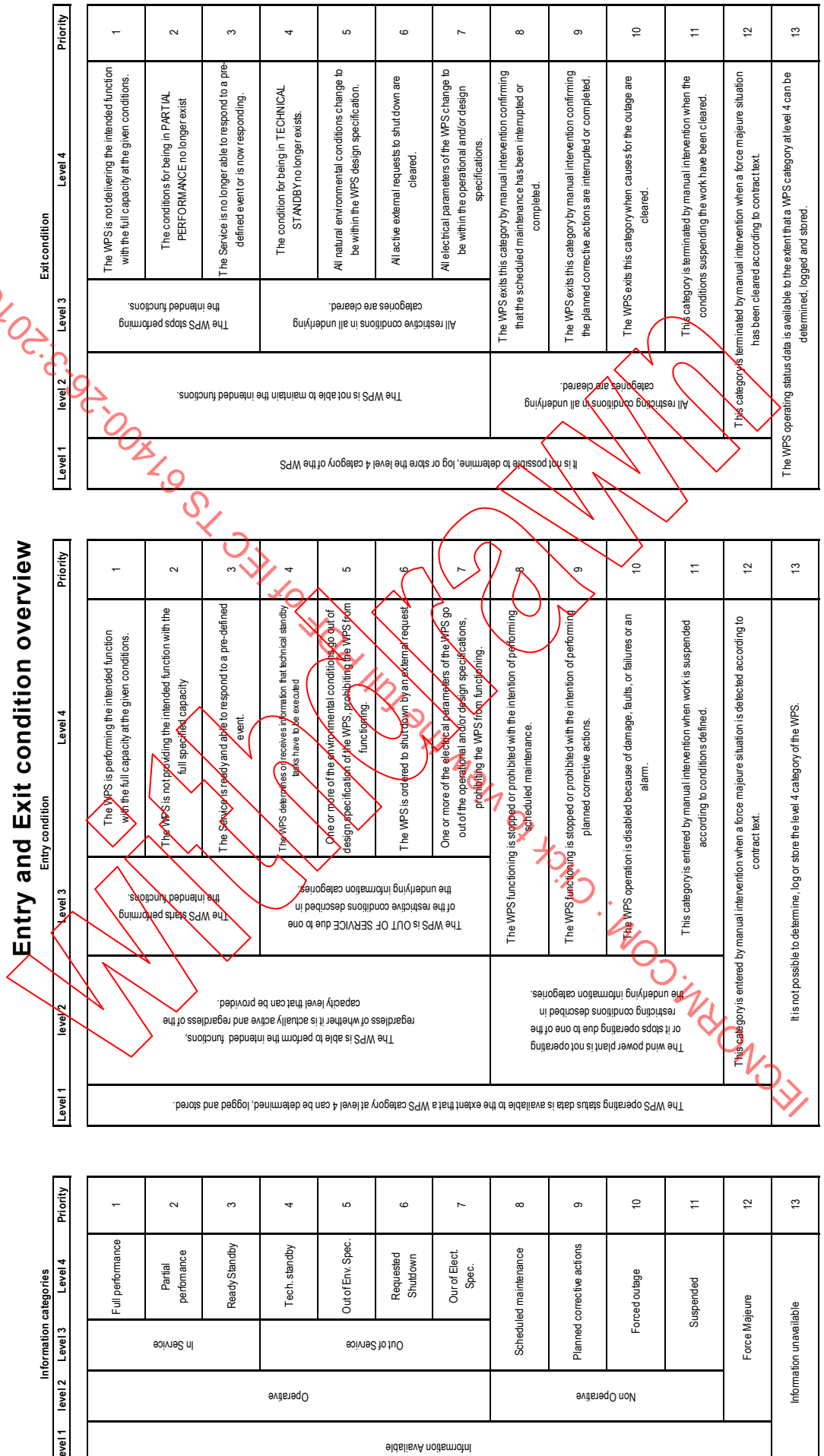


Figure A.1 – Overview of the entry and exit conditions of all mandatory information categories described in this document

Annex B
(informative)

Application scenarios – examples

B.1 Overview

Annex B illustrates examples of operational scenarios for some typical services, based on the information model set out in this Technical Specification. The examples illustrate resulting information categories and values for lost production.

(P): Indicates Physical potential service level.

(C): Indicates Constrained potential service level.

B.2 Application scenarios

B.2.1 Example 1: Normal operation – all WPS

Scenario (see Table B.1): For a period of time, all WTGSs within a WPS are producing active power at rated level and the wind energy resource for rated power is available for the whole time period.

The reactive power production is contractually agreed to be reported based on Constrained potential service.

The production is fed through to the grid with no restrictions. All communication and WPS control system is up and running. High frequency compensation is ready to respond but it is dormant. Low frequency compensation is disabled. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based level.

Actual active energy production for the period is 95 GWh. The potential production is estimated to be 95 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 9,5 GVArh. The reactive power set point is equivalent to 9,5 GVArh for the period. The Constrained potential service substitutes the Potential service for the reactive power service according to the reporting agreement/contracted.

Table B.1 – Scenario, Example 1: Normal operation – all WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	FULL PERFORMANCE	95 GWh	95 GWh (P)	0 GWh
Service: Reactive power	PARTIAL PERFORMANCE (Derated)	9,5 GVArh	9,5 GVArh (C)	0 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA

Active power: The WPS is performing the intended function with the full capacity at the given conditions, hence FULL PERFORMANCE according to 5.3.2.

Reactive power: The category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because the production is limited by a set point and not the capacity of the system according to 5.3.3 and according to IEC TS 61400-26-1:2011, A.2.1.

The loss of reactive production is 0 GVArh for the period according to the definition for Constrained potential service.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The service is ordered to shut down and thereby disabled, hence REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time based level only.

B.2.2 Example 2: Normal operation – part of WPS

Scenario (see Table B.2): For a period of time, part of the WTGSs within a WPS is producing active power at rated level, the other part is producing at lower level (some WTGS may be stopped). The wind energy resource for rated power is available for the whole time period but the set point for the active power is externally set to a value corresponding to 100 GWh.

The reactive power production is contractually agreed to be reported based on Constrained potential service.

The production is fed through to the grid with no restrictions. All communication and WPS control system is up and running. High frequency compensation is ready to respond but it is dormant. Low frequency compensation is disabled. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based level.

Actual active energy production for the period is 95 GWh. The Physically potential service is estimated to be 125 GWh. The Constrained potential service is 100 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 8,5 GVArh. The reactive power set point is equivalent to the physically possible for the period, determined to 9,5 GVArh.

Table B.2 – Scenario, Example 2: Normal operation – part of WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	PARTIAL PERFORMANCE (Degraded)	95 GWh	100 GWh (C)	5 GWh (2 GWh)
Service: Reactive power	PARTIAL PERFORMANCE (Degraded)	8,5 GVArh	9,5 GVArh (P)	1 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA

Active power: The Service is not delivering the intended function with the full capacity due to individual WTGS not producing at FULL PERFORMANCE. The category of the WPS is determined to be PARTIAL PERFORMANCE (Degraded), according to 5.3.3 and IEC TS 61400-26-1:2011, A.2.2. Degraded due to the production being limited by an internal constraint e.g. a WTGS defect. The calculated Lost service is 5 GWh but as the uncertainty associated with potential production is ±3 GWh, the stakeholders involved may decide to limit the loss to 2 GWh.

Reactive power: The Service is not delivering the intended function with the full capacity due to individual WTGS not producing at FULL PERFORMANCE. The category of the WPS is determined to be PARTIAL PERFORMANCE (Degraded), according to 5.3.3 and IEC TS 61400-26-1:2011, A.2.2. The calculated Lost service is 1 GVArh.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The service is ordered to shut down and thereby disabled, hence REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time based level only.

B.2.3 Example 3: Dirty WTGSs blades – all WPS

Scenario (see Table B.3): For a period of time, all WTGSs within a WPS are producing active power and the wind energy resource for rated power is available for the whole time period, but dirty blades limits power performance of the WTGSs.

The reactive power production is contractually agreed to be reported based on Constrained potential service.

The production is fed through to the grid with no restrictions. All communication and WPS control system is up and running. High frequency compensation is ready to respond but it's dormant. Low frequency compensation is disabled. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based level.

Actual active energy production for the period is 92,9 GWh. The potential production is estimated to be 95 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 9,5 GVArh. The reactive power set point is equivalent to 9,5 GVArh for the period. The Constrained potential production substitutes the Potential service for the reactive power service according to the reporting agreement/contracted.

Table B.3 – Scenario, Example 3: Dirty WTGSs blades – all WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	PARTIAL PERFORMANCE (Derated)	92,9 GWh	95 GWh (P)	2,1 GWh (0 GWh)
Service: Reactive power	PARTIAL PERFORMANCE (Derated)	9,5 GVArh	9,5 GVArh (C)	0 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA

Active power: The category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because of the information about dirty blades according to IEC TS 61400-26-1:2011, A.2.1. The calculated Lost service is 2,1 GWh but as the uncertainty associated with potential production is ±3 GWh, the stakeholders involved may decide to ignore the value as long as it is within the uncertainty.

Reactive power: The category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because the production is limited by a set point and not the capacity of the system according to 5.3.3.

The loss of reactive production is 0 GVArh for the period according to the definition for Constrained potential service.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time-based level only.

Low frequency compensation: The service is ordered to shut down and thereby disabled, hence REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time-based level only.

B.2.4 Example 4: Dirty WTGSs blades – part of WPS

Scenario (see Table B.4): For a period of time, most WTGSs within a WPS are producing active power at rated level as the wind energy resource for rated power is available for the whole time period, but dirty blades limits power performance of some of the WTGSs.

The reactive power production is contractually agreed to be reported based on Constrained potential service.

The production is fed through to the grid with no restrictions. All communication and WPS control system is up and running. High frequency compensation is ready to respond but it's dormant. Low frequency compensation is disabled. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based level.

Actual active energy production for the period is 90,5 GWh. The potential production is estimated to be 95 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 9,5 GVArh. The reactive power set point is equivalent to 9,5 GVArh for the period. The Constrained potential service substitutes the

Potential service for the reactive power service according to the reporting agreement/contracted.

Table B.4 – Scenario, Example 4: Dirty WTGSs blades – part of WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	PARTIAL PERFORMANCE (Derated)	90,5 GWh	95 GWh (P)	4,5 GWh (1,5 GWh)
Service: Reactive power	PARTIAL PERFORMANCE (Derated)	9,5 GVArh	9,5 GVArh (C)	0 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA

Active power: Even though some of the individual WTGS are at FULL PERFORMANCE, the category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because of the information about dirty blades, according to IEC TS 61400-26-1:2011, A.2.1. The calculated Lost service is 4,5 GWh but as the uncertainty associated with potential production is ±3 GWh, the stakeholders involved may decide to limit the value to 1,5 GWh.

Reactive power: The category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because the production is limited by a set point and not the capacity of the system according to 5.3.3. The loss of reactive production is 0 GVArh for the period according to the definition for Constrained potential service.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The service is ordered to shut down and thereby disabled, hence REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time based level only.

B.2.5 Example 5: BOP limitations – all WPS

Scenario (see Table B.5): For a period of time, all WTGSs within a WPS are producing active power and the wind energy resource for rated power is available for the whole time period, but deteriorated transformers within the WPS limits the power capacity of the BOP and all of the WPS. All WTGSs are curtailed. The production is fed through to the grid with restrictions.

The reactive power production is contractually agreed to be reported based on Constrained potential service.

All communication and WPS control system is up and running. High frequency compensation is ready to respond but it's dormant. Low frequency compensation is disabled. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based level.

Actual active energy production for the period is 55 GWh. The potential production is estimated to be 105 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 75 GVArh. The reactive power set point is equivalent to 75 GVArh for the period. The Constrained potential service substitutes the Potential service for the reactive power service according to the reporting agreement/contracted.

Table B.5 – Scenario, Example 5: BOP limitations – all WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	PARTIAL PERFORMANCE (Degraded)	55 GWh	105 GWh (P)	50 GWh (47 GWh)
Service: Reactive power	PARTIAL PERFORMANCE (Derated)	75 GVArh	75 GVArh (C)	0 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA

Active power: The Service is not delivering the intended function with the full capacity due to issues with BOP transformers. The category of the WPS is determined to be PARTIAL PERFORMANCE (Degraded), according to 5.3.3 and IEC TS 61400-26-1:2011, A.2.2, because transformers are considered an internal condition prohibiting the WPS from operating at full performance. The calculated Lost service is 50 GWh but as the uncertainty associated with potential production is ±3 GWh, the stakeholders involved may decide to limit the loss to 47 GWh.

Reactive power: The category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because the production is limited by a set point and not the capacity of the system, according to 5.3.3.

The loss of reactive production is 0 GVArh for the period according to the definition for Constrained potential service.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The service is ordered to shut down and thereby disabled, hence REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time based level only.

B.2.6 Example 6: BOP limitations – part of WPS

Scenario (see Table B.6): For a period of time, all WTGSs within a WPS are producing active power and the wind energy resource for rated power is available for the whole time period, but deteriorated transformers within the WPS limits the power capacity of the BOP and of the total output of the WPS. A number of WTGSs, but not all, are shot down or curtailed. The production is fed through to the grid with restrictions.

The reactive power production is contractually agreed to be reported based on Constrained potential service.

All communication and WPS control system is up and running. High frequency compensation is ready to respond but it's dormant. Low frequency compensation is disabled. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based level.

Actual active energy production for the period is 45 GWh. The potential production is estimated to be 105 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 75 GVArh. The reactive power set point is equivalent to 75 GVArh for the period. The Constrained potential service substitutes the Potential service for the reactive power service according to the reporting agreement/contracted.

Table B.6 – Scenario, Example 6: BOP limitations – part of WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	PARTIAL PERFORMANCE (Degraded)	45 GWh	105 GWh (P)	60 GWh (57 GWh)
Service: Reactive power	PARTIAL PERFORMANCE (Derated)	75 GVArh	75 GVArh (C)	0 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA

Active power: The Service is not delivering the intended function with the full capacity due to issues with BOP transformers. The category of the WPS is determined to be PARTIAL PERFORMANCE (Degraded), according to 5.3.3 and IEC TS 61400-26-1:2011, A.2.2, because transformers are considered an internal condition prohibiting the WPS from operating at full performance. The calculated Lost service is 60 GWh but as the uncertainty associated with potential production is ±3 GWh, the stakeholders involved may decide to limit the loss to 57 GWh.

Reactive power: The category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because the production is limited by a set point and not the capacity of the system, according to 5.3.3.

The loss of reactive production is 0 GVArh for the period according to the definition for Constrained potential service.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The service is ordered to shut down and thereby disabled, hence REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time based level only.

B.2.7 Example 7: 'Spinning reserve' – all WPS

Scenario (see Table B.7): For a period of time, all WTGSs within a WPS are operating at a set point for active power at 0 for grid support service. The wind energy resource for rated

power is available for the whole time period. No active production is fed through to the grid but transmission is possible.

The reactive power production is contractually agreed to be reported based on Physically potential service.

All communication and WPS control system is up and running. High frequency compensation is ready to respond but it's dormant. Low frequency compensation is ready but dormant. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based-level.

Actual active energy production for the period is 0 GWh. The potential production is estimated to be 100 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 11 GVArh. The reactive power set point is equivalent to 11 GVArh for the period. The Physically potential service substitutes the Potential service for the reactive power service according to the reporting agreement/contracted.

Table B.7 – Scenario, Example 7: 'Spinning reserve' – all WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	PARTIAL PERFORMANCE (Derated)	0 GWh	100 GWh (P)	100 GWh (97 GWh)
Service: Reactive power	FULL PERFORMANCE	11 GVArh	11 GVArh (P)	0 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	READY STAND-BY	NA	NA	NA

Active power: Though active production is 0, the WPS is operative and in service as the WTGSs are operating. The category of the WPS is PARTIAL PERFORMANCE according to 5.3.3 and according to IEC TS 61400-26-1:2011, A.2.1. The WPS is Derated at a set point from an external source. The calculated Lost service is 100 GWh but as the production has been set to 0 by an external request, the stakeholders involved may decide to exclude this loss from the availability calculation.

Reactive power: The category of the WPS is determined to FULL PERFORMANCE, according to 5.3.2, as the production is at rated value according to the set point and the full capacity of the system, the loss of reactive production is 0 GVArh for the period according to the definition for Physical potential service.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

NOTE The Constrained potential service for active power can be used for calculating a loss. The value of this service is closer to the value of the Actual service, thus resulting in a different (lower) Lost service. Depending on the purpose, either the Constrained potential service, the Physical potential service or both can be determined.

B.2.8 Example 8: 'Spinning reserve' – part of WPS

Scenario (see Table B.8): For a period of time, part of the WTGS are producing at rated level, part of the WTGSs are operating at a set point for active power at 0 for grid support service. The wind energy resource for rated power is available for the whole time period. Production is fed through to the grid.

The reactive power production is contractually agreed to be reported based on Physically potential service.

All communication and WPS control system is up and running. High frequency compensation is ready to respond but dormant. Low frequency compensation is ready but dormant. Both frequency compensation services are considered as on/off services, the reporting requirements are only on a time based level.

Actual active energy production for the period is 60 GWh. The potential production is estimated to be 100 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 51 GVArh. The reactive power set point is equivalent to 51 GVArh for the period. The Physically potential service substitutes the Potential service for the reactive power service according to the reporting agreement/contracted.

Table B.8 – Scenario, Example 8: 'Spinning reserve' – part of WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	PARTIAL PERFORMANCE (Derated)	60 GWh	100 GWh (P)	40 GWh (37 GWh)
Service: Reactive power	FULL PERFORMANCE	51 GVArh	51 GVArh (P)	0 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	READY STAND-BY	NA	NA	NA

Active power: The category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because the production is limited by a set point and not the capacity of the system, according to 5.3.3. The calculated Lost service is 40 GWh but as the production has been set to 60 GWh by an external request, hence the stakeholders involved may decide exclude this loss from the availability calculation.

Reactive power: The category of the WPS is determined to FULL PERFORMANCE, according to 5.3.2, as the production is at rated value according to the set point and the full capacity of the system, the loss of reactive production is 0 GVArh for the period according to the definition for Physical potential service.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

NOTE The Constrained potential service for active power can be used for calculating a loss. The value of this service is closer to the value of the Actual service, thus resulting in a different (lower) Lost service. Depending on the purpose, either the Constrained potential service, the Physical potential service or both can be determined.

B.2.9 Example 9: Noise restrictions – Warranty related

Scenario (see Table B.9): For a period of time, noise from the WTGSs is above the warranted level but operation is acceptable if the WPS output is capped to half. Wind energy for the rated power is available for the whole time period. All WTGSs within the WPS are producing active power.

The reactive power production is contractually agreed to be reported based on Constrained potential service.

The production is fed through to the grid with an internal restriction (lowered set point) due to the noise level. All communication and WPS control system is up and running. High frequency compensation is ready to respond but it's dormant. Low frequency compensation is disabled. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based level.

Actual active energy production for the period is 50 GWh. The potential production is estimated to be 95 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 9,5 GVArh. The reactive power set point is equivalent to 9,5 GVArh for the period. The Constrained potential service substitutes the Potential service for the reactive power service according to the reporting agreement/contracted.

Table B.9 – Scenario, Example 9: Noise restrictions – all WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	PARTIAL PERFORMANCE (Degraded)	50 GWh	95 GWh (P)	45 GWh (42 GWh)
Service: Reactive power	PARTIAL PERFORMANCE (Derated)	9,5 GVArh	9,5 GVArh (C)	0 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA

Active power: The WPS is not delivering the intended function with the full capacity at the given conditions. An internal condition exists which prohibits the WPS from operating at full performance, but the active power output from the wind power plant is greater than zero, hence PARTIAL PERFORMANCE (Degraded) according to 5.3.3. The calculated Lost service is 45 GWh, but as the uncertainty associated with potential production is ±3 GWh, the stakeholders involved may decide to limit the loss to 42 GWh.

Reactive power: The category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because the production is limited by a set point and not the capacity of the system

according to 5.3.3. The loss of reactive production is 0 GVArh for the period according to the definition for Constrained potential service.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The service is ordered to shut down and thereby disabled, hence REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time based level only.

NOTE An example with only part of the WTGS being curtailed due to noise restrictions will result in the same information categories.

B.2.10 Example 10: Noise restrictions – environmentally related

Scenario (see Table B.10): For a period of time, noise from the WTGSs is within the warranted level but due to local environmental noise constraints the operation is acceptable if the WPS output is capped to half. Wind energy for the rated power is available for the whole time period. All WTGSs within the WPS are producing active power.

The reactive power production is contractually agreed to be reported based on Constrained potential service.

The production is fed through to the grid with an internal restriction (lowered set point) due to the noise level. All communication and WPS control system is up and running. High frequency compensation is ready to respond but it's dormant. Low frequency compensation is disabled. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based level.

Actual active energy production for the period is 50 GWh. The potential production is estimated to be 95 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 9,5 GVArh. The reactive power set point is equivalent to 9,5 GVArh for the period. The Constrained potential service substitutes the Potential service for the reactive power service according to the reporting agreement/contracted.

Table B.10 – Scenario, Example 10: Noise restrictions – all WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	PARTIAL PERFORMANCE (Derated)	50 GWh	95 GWh (P)	45 GWh (42 GWh)
Service: Reactive power	PARTIAL PERFORMANCE (Derated)	9,5 GVArh	9,5 GVArh (C)	0 GVArh
Service: High frequency compensation	READY STAND-BY	NA	NA	NA
Service: Low frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA

Active power: The WPS is not delivering the intended function with the full capacity at the given conditions. An external condition exists which prohibits the WPS from operating at full performance, but the active power output from the wind power plant is greater than zero,

hence PARTIAL PERFORMANCE (Derated) according to 5.3.3. The calculated Lost service is 45 GWh, but as the uncertainty associated with potential production is ±3 GWh, the stakeholders involved may decide to limit the loss to 42 GWh.

Reactive power: The category of the WPS is determined to be PARTIAL PERFORMANCE (Derated) because the production is limited by a set point and not the capacity of the system according to 5.3.3. The loss of reactive production is 0 GVArh for the period according to the definition for Constrained potential service.

High frequency compensation: The service is ready to respond, hence READY STANDBY according to 5.3.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The service is ordered to shut down and thereby disabled, hence REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time based level only.

NOTE An example with only part of the WTGS being curtailed due to noise restrictions will result in the same information categories.

B.2.11 Example 11: Ice storm on Grid – all WPS

Scenario (see Table B.11): For a period of time, the Grid suffers transmission outage at a location beyond the point of common coupling disabling the WPS from delivering its services. The WPS is requested to shut down all services by the grid operator in order to avoid loss of transmission service hence the grid is in operation. Wind energy for the rated power is available for the entire time.

No production is fed through to the grid due to shut down of the grid. All communication and WPS control system is up and running. High frequency compensation and Low frequency compensation is disabled. Both frequency compensation services are considered as on/off services; the reporting requirements are only on a time based level.

Actual active energy production for the period is 0 GWh. The potential production is estimated to be 125 GWh. Uncertainty associated with potential production is ±3 GWh.

Actual reactive energy production for the period is 0 GVArh. The Physical potential production is equivalent to 12 GVArh for the period.

Table B.11 – Scenario, Example 11: Ice storm on Grid – all WPS

	Information category	Actual service	Potential service	Lost service
Service: Active power	REQUESTED SHUTDOWN	0 GWh	125 GWh (P)	125 GWh (122 GWh)
Service: Reactive power	REQUESTED SHUTDOWN	0 GVArh	12 GVArh (P)	12 GVArh
Service: High frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA
Service: Low frequency compensation	REQUESTED SHUTDOWN	NA	NA	NA

Active power: The WPS is not delivering the intended function due to an external condition prohibiting the WPS from operating. Due to the external request the active power output from

the wind power plant is disrupted, hence the category REQUESTED SHUTDOWN according to 5.4.4. The calculated Lost service is 125 GWh, but as the uncertainty associated with potential production is ±3 GWh, the stakeholders involved may decide to limit the loss to 122 GWh.

Reactive power: The WPS is not delivering the intended function due to an external condition prohibiting the WPS from operating. Due to the external request the reactive power output from the wind power plant is disrupted, hence the category REQUESTED SHUTDOWN according to 5.4.4. The loss of reactive production is 12 GVArh for the period according to the definition for Physical potential service.

High frequency compensation: The WPS is not delivering the intended function due to an external condition prohibiting the WPS from operating. Due to the external request the service from the wind power plant is disrupted, hence the category REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time based level only.

Low frequency compensation: The WPS is not delivering the intended function due to an external condition prohibiting the WPS from operating. Due to the external request the service from the wind power plant is disrupted, hence the category REQUESTED SHUTDOWN according to 5.4.4. No loss is estimated as the reporting requirements are on a time based level only.

NOTE In case the external request for shut down is not issued or if the electrical parameters of the Grid becomes out of design specifications before or about the same time as the issue of the shutdown request, the information category will change to OUT OF ELECTRICAL SPECIFICATION for all services. It is most likely that this category will replace REQUESTED SHUTDOWN anyway shortly after REQUESTED SHUTDOWN.

Annex C
(informative)

Balance of plant integration

C.1 WPS functions and services

As defined, the Wind Power Station (WPS) consists of the WTGS(s) and the Balance of Plant (BOP) which supports transfer of energy Services between the WTGS(s) and the Grid. Examined as a system, the BOP provides the WTGSs with the required infrastructure of the energy collection subsystem and other services needed to keep the WTGSs operational and for delivery of Services to the grid. In addition to the site electrical facilities, other capabilities exist such as SCADA as well as civil plant, i.e. roads, which support the operation of the WTGS. These functions may be considered to serve for external and internal purposes for Service delivery and asset management which necessarily exist in the WPS.

C.2 Externally required functions and services

The intended functions and services (see 4.2) act to integrate desired operational and associated capabilities as the WPS interconnects with the Grid. Functionally, these may include reactive power, high frequency compensation, low frequency compensation, and even energy storage. Further, the off-takers, grid authorities and energy markets will need information about plant status and future performance expectations. Examples of this include forecasting, loss of plant availability, generation capacity, performance rating and scheduling. Note that some of this is automated function of the WPS while some are the result of human processing of information.

C.3 Internally required functions and services

Asset management functions may be varied but will certainly include the human factors needed for operations and maintenance of the WPS and the management of activities and information. Communications with grid operators, except for required automated information streams, will be performed as part of the internal asset management function and will be accomplished at the plant or perhaps a remote site. The operations and maintenance function is broad and includes management and technical staff with equipment such as fleet vehicles, other heavy equipment, and tools/parts/consumables. Reporting of key performance metrics and other required information is also part of operations. In terms of plant system and component availability, repairs, replacements and restoration of component functionality depends on an efficient asset management function. Intervention in the anticipation of plant needs and conduct of upkeep and repairs to keep components and systems available and operating is a common part of maintenance.

It is expected that the BOP infrastructure will function at high reliability and availability. However, if there is a BOP outage, its consequence could be most severe. During common mode system failures, relatively large numbers of WTGS will be unable to operate as intended. An understanding of the consequences of BOP outages at various points in the WPS is needed to appropriately mitigate consequences. All failures or events that result in service outages should be allocated in the information model.

C.4 Expansion of the Information Model for BOP functions and services

The model for BOP elements works on the same principles and model for allocating time to information categories as specified in IEC TS 61400-26-1 and IEC TS 61400-26-2. The mandatory information categories are identical to the mandatory information categories defined for the WTGS but optional categories are individual to different BOP elements. It is

possible to develop a model for individual BOP elements and allocate information categories representing the service and possible categories on the principles developed in IEC TS 61400-26-1 and IEC TS 61400-26-2. For example:

Resulting BOP actual energy transfer is the sum of actually measured transferred power of each BOP element (when distributed).

Resulting BOP potential energy transfer is the minimum of the technical capability of the BOP and the potential production of the WTGSs.

The BOP will change information category only when it affects the production/services of the WTGSs and/or the WPS.

The BOP will change from FULL PERFORMANCE to PARTIAL PERFORMANCE when the resulting BOP actual energy transfer is less than the sum of individual WTGS potential productions, or the ability to deliver other electrical services is temporarily unavailable.

The optional information categories are specific to the Information Model for the BOP, based on the properties of the BOP and may differ from the optional categories of the WTGS. They are defined as far as they can be attributed to at least one element of the BOP. For example, TECHNICAL STANDBY is not attributable to a WTGS foundation but makes sense to attribute to a cable, a breaker or a similar electrical part of a substation. It is the intention of the model to specify generic categories, so that any part of the BOP can be allocated to an information category. Annex F provides additional information for optional level 5 categories.

Annex D
(informative)

Determination of potential production for a WPS – examples

D.1 Overview

Annex D does not specify or recommend any particular method of determining Potential service, but identifies possibilities and lists issues to be considered for the methods. It is up to the user to define the method to be used, depending on the number of elements at a WPS, data availability and quality, and other factors.

In IEC TS 61400-26-3 two new terms have been introduced, Constrained potential production and Physical potential production together with the Service terminology.

With the introduction of Services, the range of products provided by the WPS is extended. In order to relate the Lost Production to proper terms, more definitions of Potential production are needed. In some operational conditions, it's more relevant to relate to the term Constrained potential production rather than Physical potential production as Services will seldom be performing at their potential physical level.

Examples on how to use the two variants of potential production are illustrated in Table D.1.

D.2 Primary service

As the active energy production normally is the primary Service delivered from a WPS this will be limited by the physical limits from the plant. In some cases, typically in curtailed situations, it might also be interesting to know the Constrained potential production or maybe even both types of potential production. This can be due to different stakeholders having individual reporting requirements.

D.3 Secondary services

As the reactive energy production and high and low frequency compensation normally are secondary Services delivered from a WPS, these will be limited by a set point. In most cases this Service operates in a curtailed situation. Thus, the Constrained potential production is of interest to most stakeholders.

Table D.1 – Examples on how to determine Potential production

	Physical potential production	Constrained potential production
Service: Active power	WPS potential production is the sum of each WTGS potential production (See IEC TS 61400-26-2:2014 Annex A) compensated for losses in BOP.	Set point given by external source.
Service: Reactive power	A sum of the installed reactive power capacity in the WPS compensated for losses in BOP.	Set point given by external source.
Service: High frequency compensation	Physical potential production of WPS Active power Service plus active power consumption capacity (e.g. an energy storage unit)	Set point given by external source.
Service: Low frequency compensation	WPS potential production is the sum of each WTGS potential production (See IEC TS 61400-26-2:2014 Annex A) compensated for losses in BOP. (This however would require the WPS operating at no active power output.)	Set point given by external source. **or** The difference between Actual production and Physical potential production of WPS Active power Service.

Annex E
(informative)

Service availability indicators – examples

E.1 Overview

Annex E is divided into two clauses. Clause E.2 deals with time-based WPS availabilities, whereas Clause E.3 describes production based availability.

E.2 Time based WPS availability

E.2.1 General

Clause E.2 describes examples of how to calculate various measures of service availability of a WPS, based on the information categories defined in this document. Each example of service availability is defined in terms of three types of information categories:

a) information categories considered as available time;

b) information categories considered as unavailable time; and

c) information categories not to be considered in the availability calculation.

The constituents of each of the three types of information categories specified above are defined for each measure of availability in its respective clause. Below are three examples using mandatory and optional information categories. Users may find other arrangements of the categories to calculate availability specific for their need.

When calculating the measure of availability, the following equation can be applied:

$$\text{Availability} = 1 - \frac{\text{Unavailable time}}{\text{Available time} + \text{Unavailable time}} \quad \text{(E.1)}$$

E.2.2 Operational service availability (“TSO’s view”)

E.2.2.1 General

Definition – Operational service availability is the fraction of a given period of time in which a WPS is actually providing a specific service or is ready to provide a specific service. Lost operating hours due to any reason are included as service unavailable.

E.2.2.2 Operational service availability algorithm based on mandatory information categories only

In this definition, time considered as available includes:

- FULL PERFORMANCE, **IAOSFP**
- PARTIAL PERFORMANCE, **IAOSPP**
- READY STANDBY, **IAOSRS**

Time considered unavailable includes:

- TECHNICAL STANDBY **IAOOSTS**
- OUT OF ENVIRONMENTAL SPECIFICATION, **IAOOSEN**
- REQUESTED SHUTDOWN, **IAOOSRS**

- OUT OF ELECTRICAL SPECIFICATION, **IAOOSEL**
- SCHEDULED MAINTENANCE, **IANOSM**
- PLANNED CORRECTIVE ACTION, **IANOPCA**
- FORCED OUTAGE, **IANOFO**
- SUSPENDED, **IANOS**
- FORCE MAJEURE, **IAFM**

Time not included in the calculation includes:

- INFORMATION NOT AVAILABLE, **IU**

$$\text{System operational availability} = 1 - \frac{\begin{array}{l}\text{IAOOSTS} + \text{IAOOSEN} + \text{IAOOSRS} + \text{IAOOSEL} \\ + \text{IANOSM} + \text{IANOPCA} + \text{IANOFO} + \text{IANOS} + \text{IAFM}\end{array}}{\begin{array}{l}(\text{IAOSFP} + \text{IAOSPP} + \text{IAOSRS}) + (\text{IAOOSTS} + \text{IAOOSEN} + \text{IAOOSRS} \\ + \text{IAOOSEL} + \text{IANOSM} + \text{IANOPCA} + \text{IANOFO} + \text{IANOS} + \text{IAFM})\end{array}} \quad \text{(E.2)}$$

Note that since no information about the WPS is known in the "Information not available information categories", these periods are not included as available or unavailable, and are excluded entirely from the calculation.

E.2.3 Operational service availability ("WPS operator's view")

E.2.3.1 General

Definition – Operational service availability is the fraction of a given period of time in which a WPS is actually providing a specific service or is ready to provide a specific service. Lost operating hours due to any reason are included as service unavailable.

E.2.3.2 Operational availability algorithm based on mandatory information categories only

In this definition, time considered as available includes:

- FULL PERFORMANCE, **IAOSFP**
- PARTIAL PERFORMANCE, **IAOSPP**
- READY STANDBY, **IAOSRS**
- OUT OF ELECTRICAL SPECIFICATION, **IAOOSEL**

Time considered unavailable includes:

- TECHNICAL STANDBY, **IAOOSTS**
- OUT OF ENVIRONMENTAL SPECIFICATION, **IAOOSEN**
- REQUESTED SHUTDOWN, **IAOOSRS**
- PLANNED CORRECTIVE ACTION, **IANOPCA**
- FORCED OUTAGE, **IANOFO**
- SUSPENDED, **IANOS**
- FORCE MAJEURE, **IAFM**

Time not included in the calculation includes:

- INFORMATION NOT AVAILABLE, **IU**
- SCHEDULED MAINTENANCE, **IANOSM**

$$\text{System operational availability} = 1 - \frac{\begin{array}{c}\text{IAOOSTS} + \text{IAOOSEN} + \text{IAOOSRS} \\ + \text{IANOPCA} + \text{IANOFO} + \text{IANOS} + \text{IAFM}\end{array}}{\begin{array}{c}(\text{IAOSFP} + \text{IAOSPP} + \text{IAOOSEL}) + (\text{IAOOSTS} + \text{IAOOSEN} \\ + \text{IAOOSRS} + \text{IANOPCA} + \text{IANOFO} + \text{IANOS} + \text{IAFM})\end{array}} \quad \text{(E.3)}$$

Note that since no information about the WPS is known in the "Information not available information categories", these periods are not included as available or unavailable, and are excluded entirely from the calculation.

E.2.4 Technical service availability ("WPS maintenance provider's view")

E.2.4.1 General

Definition – Operational service availability is the fraction of a given period of time in which a WPS is actually providing a specific service or is ready to provide a specific service. Lost operating hours due to any reason are included as service unavailable.

E.2.4.2 Operational service availability algorithm based on mandatory information categories only

In this definition, time considered as available includes:

- FULL PERFORMANCE, **IAOSFP**
- PARTIAL PERFORMANCE, **IAOSPP**
- READY STANDBY, **IAOSRS**
- TECHNICAL STANDBY, **IAOOSTS**
- OUT OF ENVIRONMENTAL SPECIFICATION, **IAOOSEN**
- REQUESTED SHUTDOWN, **IAOOSRS**
- OUT OF ELECTRICAL SPECIFICATION, **IAOOSEL**
- SUSPENDED, **IANOS**

Time considered unavailable includes:

- SCHEDULED MAINTENANCE, **IANOSM**
- PLANNED CORRECTIVE ACTION, **IANOPCA**
- FORCED OUTAGE, **IANOFO**

Time not included in the calculation includes:

- INFORMATION NOT AVAILABLE, **IU**
- FORCE MAJEURE, **IAFM**

$$\text{System operational availability} = 1 - \frac{\text{IANOSM} + \text{IANOPCA} + \text{IANOFO}}{\begin{array}{c}(\text{IAOSFP} + \text{IAOSPP} + \text{IAOSRS} + \text{IAOOSTS} + \text{IAOOSEN} + \text{IAOOSRS} \\ + \text{IAOOSEL} + \text{IANOS}) + (\text{IANOSM} + \text{IANOPCA} + \text{IANOFO})\end{array}} \quad \text{(E.4)}$$

Note that since no information about the WPS is known in the "Information not available information categories", these periods are not included as available or unavailable, and are excluded entirely from the calculation.

E.3 Production-based service availability indicators – examples

E.3.1 Overview

Clause E.3 describes examples of how to calculate various measures of production-based service availability of a WPS, based on the information categories defined in this document and in IEC TS 61400-26-2. Examples are given using mandatory and optional categories. Users may find other optional categories or definitions of production-based availability more specific to their needs.

In the time period for which production-based service availability is to be calculated, the operation of the WPS shall first be categorized according to the information categories defined in IEC TS 61400-26-3.

Each example of production-based availability is defined in terms of:

- actual service;
- lost service;
- information categories not to be considered in the availability calculation.

Lost service = Potential service – Actual service (Except in FULL PERFORMANCE as lost service is defined to be 0 here.)

When calculating the measure of availability, the following equation is applied:

$$\text{Production based service availability} = 1 - \frac{\text{Lost service}}{\text{Actual service} + \text{Lost service}} \quad \text{(E.5)}$$

E.3.2 System operational production-based availability (“WPS operator’s view”)

E.3.2.1 General

System operational production-based service availability is the ratio of actual service production in a given period of time compared to what the service production would have been if the unit has been generating in full performance the entire time. All causes of lost production are included. This may be considered as representative of the WPS user’s view of availability and production.

E.3.2.2 System operational production-based availability algorithm based on mandatory information categories only

In this example, information categories with an Actual service are:

- FULL PERFORMANCE, **IAOSFPP$_A$**
- PARTIAL PERFORMANCE, **IAOSPPP$_A$**

Information categories with lost production are:

- PARTIAL PERFORMANCE, **IAOSPPP$_P$** – **IAOSPPP$_A$**
- TECHNICAL STANDBY, **IAOOSTSP$_P$**
- OUT OF ENVIRONMENTAL SPECIFICATION, **IAOOSENP$_P$**
- REQUESTED SHUTDOWN, **IAOOSRSP$_P$**
- OUT OF ELECTRICAL SPECIFICATION, **IAOOSELP$_P$**
- SCHEDULED MAINTENANCE, **IANOSMP$_P$**

- PLANNED CORRECTIVE ACTION, **$IANOPCAP_P$**
- FORCED OUTAGE, **$IANOFOP_P$**
- SUSPENDED, **$IANOSP_P$**
- FORCE MAJEURE, **$IAFMP_P$**

Information categories not included in the calculation are:

- INFORMATION UNAVAILABLE, **IU**
- READY STANDBY, **$IAOSRSP_A$**

$$\text{System operational production based availability} = 1 - \frac{\begin{array}{l}(IAOSPPP_P - IAOSPPP_A) + IAOOSTSP_P + IAOOSENP_P + \\ IAOOSRSP_P + IAOOSELP_P + IANOSMP_P + IANOPCAP_P + \\ IANOFOP_P + IANOSP_P + IAFMP_P\end{array}}{\begin{array}{l}(IAOSFPP_A + IAOSPPP_A) + (IAOSPPP_P - IAOSPPP_A) + \\ IAOOSTSP_P + IAOOSENP_P + IAOOSRSP_P + IAOOSELP_P + \\ IANOSMP_P + IANOPCAP_P + IANOFOP_P + IANOSP_P + IAFMP_P\end{array}} \quad \text{(E.6)}$$

Note that since no information about the WPS is known in the INFORMATION UNAVAILABLE information category, these periods are not included as available or unavailable, and are excluded entirely from the calculation. This is the equivalent of assuming that production during those periods is the same as the average production during the period for which information is available.

E.3.3 System operational production-based availability ("TSO's view")

E.3.3.1 General

System operational production-based availability is the ratio of Actual service in a given period of time compared to what the production would have been if the unit has been generating in full performance the entire time. All causes of lost production are included. This may be considered as representative of the WPS user's view of availability and production.

E.3.3.2 System operational production-based service availability algorithm based on mandatory information categories only

In this example, information categories with an Actual service are:

- FULL PERFORMANCE, **$IAOSFPP_A$**
- PARTIAL PERFORMANCE, **$IAOSPPP_A$**
- OUT OF ELECTRICAL SPECIFICATION, **$IAOOSELP_P$**

Information categories with lost production are:

- PARTIAL PERFORMANCE, **$IAOSPPP_P$** – **$IAOSPPP_A$**
- TECHNICAL STANDBY, **$IAOOSTSP_P$**
- OUT OF ENVIRONMENTAL SPECIFICATION, **$IAOOSENP_P$**
- REQUESTED SHUTDOWN, **$IAOOSRSP_P$**
- PLANNED CORRECTIVE ACTION, **$IANOPCAP_P$**
- FORCED OUTAGE, **$IANOFOP_P$**
- SUSPENDED, **$IANOSP_P$**
- FORCE MAJEURE, **$IAFMP_P$**

Information categories not included in the calculation are:

- INFORMATION UNAVAILABLE, **IU**
- SCHEDULED MAINTENANCE, **$IANOSMP_P$**
- READY STANDBY, **$IAOSRSP_A$**

$$\text{System operational production based availability} = 1 - \frac{(IAOSPPP_P - IAOSPPP_A) + IAOOSTSP_P + IAOOSENP_P + IAOOSRSP_P + IANOPCAP_P + IANOFOP_P + IANOSP_P + IAFMP_P}{(IAOSFPP_A + IAOSPPP_A + IAOOSELP_P) + (IAOSPPP_P - IAOSPPP_A) + IAOOSTSP_P + IAOOSENP_P + IAOOSRSP_P + IANOPCAP_P + IANOFOP_P + IANOSP_P + IAFMP_P} \quad \text{(E.7)}$$

Note that since no information about the WPS is known in the INFORMATION UNAVAILABLE information category, these periods are not included as available or unavailable and are excluded entirely from the calculation. This is the equivalent of assuming that production during those periods is the same as the average production during the period for which information is available.

E.3.4 System operational production-based availability ("WPS maintenance provider's view")

E.3.4.1 General

System operational production-based availability is the ratio of Actual service in a given period of time compared to what the production would have been if the unit has been generating in full performance the entire time. All causes of lost production are included. This may be considered as representative of the WPS user's view of availability and production.

E.3.4.2 System operational production-based service availability algorithm based on mandatory information categories only

In this example, information categories with an Actual service are:

- FULL PERFORMANCE, **$IAOSFPP_A$**
- PARTIAL PERFORMANCE, **$IAOSPPP_A$**
- OUT OF ELECTRICAL SPECIFICATION, **$IAOOSELP_P$**
- OUT OF ENVIRONMENTAL SPECIFICATION, **$IAOOSENP_P$**
- REQUESTED SHUTDOWN, **$IAOOSRSP_P$**
- TECHNICAL STANDBY, **$IAOOSTSP_P$**

Information categories with lost production are:

- PARTIAL PERFORMANCE, **$IAOSPPP_P$ – $IAOSPPP_A$**
- SCHEDULED MAINTENANCE, **$IANOSMP_P$**
- PLANNED CORRECTIVE ACTION, **$IANOPCAP_P$**
- FORCED OUTAGE, **$IANOFOP_P$**

Information categories not included in the calculation are:

- INFORMATION UNAVAILABLE, **IU**
- READY STANDBY, **$IAOSRSP_A$**
- SUSPENDED, **$IANOSP_P$**
- FORCE MAJEURE, **$IAFMP_P$**

$$\text{System operational production based availability} = 1 - \frac{(IAOSPPP_P - IAOSPPP_A) + IANOSMP_P + IANOPCAP_P + IANOFOP_P}{\begin{array}{l}(IAOSFPP_A + IAOSPPP_A + IAOOSELP_P + IAOOSENP_P + \\ IAOOSRSP_P + IAOOSTSP_P) + (IAOSPPP_P - IAOSPPP_A) + \\ IANOSMP_P + IANOPCAP_P + IANOFOP_P\end{array}} \quad \text{(E.8)}$$

Note that since no information about the WPS is known in the INFORMATION UNAVAILABLE information category, these periods are not included as available or unavailable, and are excluded entirely from the calculation. This is the equivalent of assuming that production during those periods is the same as the average production during the period for which information is available.

Annex F
(informative)

Examples of optional level 5 categories

F.1 Overview

Annex F introduces an example definition of a level 5 to the IEC TS 61400-26 family of documents, applicable to WTGS and WPS. Possible application examples of level 5 categories are illustrated in Tables F.1 to F.71. Table F.1 presents a full overview of the categories added, whereas Tables F.2 to F.71 illustrate the individual level 5 categories and priority levels.

F.2 Example of level 5 definitions

F.2.1 General

Table F.1 – Example of level 5 definitions

Mandatory Level 1	Mandatory Level 2	Mandatory Level 3	Mandatory Level 4	Level 5	Priority
INFORMATION AVAILABLE (IA)	OPERATIVE (IAO)	IN SERVICE (IAOS)	FULL PERFORMANCE (IAOSFP)	NOT CURTAILED	1
				NOT CURTAILED – WARNING	2
				UP-RATED	3
			PARTIAL PERFORMANCE (IAOSPP)	DERATED – OTHER	4
				DERATED – GRID WPS OPERATOR	5
				DERATED – GRID TSO	6
				DERATED – GRID CONTROL	7
				DERATED – NOISE	8
				DERATED – TEMPERATURE	9
				DERATED – STRUCTURAL LOAD	10
				DERATED – WIND	11
				DEGRADED – OTHER	12
				DEGRADED – DIAGNOSTIC	13
				DEGRADED – NOISE	14
				DEGRADED – COMPONENT	15
				DEGRADED – TEMPERATURE	16
				DEGRADED – STRUCTURAL LOAD	17
			READY STANDBY (IAOSRS)	OTHER READY STANDBY	18

Mandatory Level 1	Mandatory Level 2	Mandatory Level 3	Mandatory Level 4	Level 5	Priority
		OUT OF SERVICE (IAOOS)	TECHNICAL STANDBY (IAOOSTS)	OTHER TECHNICAL STANDBY	19
				LUBRICATION	20
				DE-ICING	21
				DRY OUT	22
				CABLE UNTWIST	23
			OUT OF ENVIRONMEN-TAL SPECIFICATION (IAOOSEN)	OTHER ENVIRONMENTAL	24
				CALM WINDS	25
				HIGH WIND	26
				TEMPERATURE	27
			REQUESTED SHUTDOWN (IAOOSRS)	OTHER REQUESTED SHUTDOWN	28
				ENVIRONMENTAL	29
				GRID – WPS OPERATOR	30
				GRID – TSO	31
				NOISE	32
				FLICKER	33
				WILDLIFE	34
				STRUCTURAL LOAD	35
			OUT OF ELECTRICAL SPECIFICATION (IAOOSEL)	OTHER OUT OF ELECTRICAL SPECIFICATION	36
				FREQUENCY	37
				VOLTAGE LEVEL LOW	38
				VOLTAGE LEVEL HIGH	39
				ASYMMETRY	40
	NON-OPERATIVE (IANO)	SCHEDULED MAINTENANCE (IANOSM)		SCHEDULED MAINTENANCE	41
		PLANNED CORRECTIVE ACTION (IANOPCA)		OTHER CORRECTIVE ACTION	42
				UPGRADE	43
				INSPECTIONS	44
				RETROFIT	45
				REPAIR WORK	46
		FORCED OUTAGE (IANOFO)		OTHER FORCED OUTAGE	47
				FAILURE REPAIR	48
				DIAGNOSTIC	49
				LOGISTIC WPS MAINTENANCE PROVIDER	50
				LOGISTIC WPS OPERATOR	51
				RESPONSE WPS MAINTENANCE PROVIDER	52
				RESPONSE WPS OPERATOR	53

Mandatory Level 1	Mandatory Level 2	Mandatory Level 3	Mandatory Level 4	Level 5	Priority
		SUSPENDED (IANOS)		OTHER SUSPENDED – SCHEDULED MAINTENANCE	54
				PERSONNEL SAFETY – SCHEDULED MAINTENANCE	55
				ENVIRONMENT – SCHEDULED MAINTENANCE	56
				IT ACCESS – SCHEDULED MAINTENANCE	57
				OTHER SUSPENDED – PLANNED CORRECTIVE ACTION	58
				PERSONNEL SAFETY – PLANNED CORRECTIVE ACTION	59
				ENVIRONMENT – PLANNED CORRECTIVE ACTION	60
				IT ACCESS – PLANNED CORRECTIVE ACTION	61
				OTHER SUSPENDED – FORCED OUTAGE	62
				PERSONNEL SAFETY – FORCED OUTAGE	63
				ENVIRONMENT – FORCED OUTAGE	64
				IT ACCESS – FORCED OUTAGE	65
				INACTIVE RESERVE	66
				MOTHBALLED	67
				RETIRED	68
	FORCE MAJEURE (IAFM)			FORCE MAJEURE	69
INFORMATION UNAVAILABLE (IU)				INFORMATION UNAVAILABLE	70

F.2.2 NOT CURTAILED

Definition – The WPS/WTGS is operative and functioning according to design specifications with no technical restrictions, limitations or warnings.

This may include, but is not limited to, the following examples:

- All WTGSs performing according to design specification.
- All WTGSs delivering active power according to design power curve.
- All BOP equipment performing its designed function at rated capacity.
- WTGS(s) has no constrains.

The NOT CURTAILED category is an underlying category of FULL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The NOT CURTAILED category is optional.

Table F.2 – NOT CURTAILED category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	FULL PERFORMANCE **(IAOSFP)**	1	**NOT CURTAILED**	**1**
					NOT CURTAILED – WARNING	2
					UP-RATED	3

Entry point – The WPS/WTGS is performing the intended function with the full capacity at the given conditions with no know issues including issues not affecting intended function.

Exit point – The WPS/ WTGS is not delivering the intended function with the full capacity at the given conditions or an issue occurs also ones not affecting the intended function.

F.2.3 NOT CURTAILED – WARNING

Definition – The WPS/WTGS is operative and functioning according to design specifications with no technical restrictions, limitations, but with warning.

This may include, but is not limited to, the following examples:

- All WTGSs performing according to design specification.
- All WTGSs delivering active power according to design power curve.
- All BOP equipment performing its designed function at rated capacity
- WTGS(s) has no constrains.

The NOT CURTAILED – WARNING category is an underlying category of FULL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The NOT CURTAILED – WARNING category is optional.

Table F.3 – NOT CURTAILED – WARNING category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	FULL PERFORMANCE **(IAOSFP)**	1	NOT CURTAILED	1
					NOT CURTAILED – WARNING	**2**
					UP-RATED	3

Entry point – The WPS/WTGS is performing the intended function with the full capacity at the given conditions but with a known issue not affecting intended function.

Exit point – The conditions for being in NOT CURTAILED – WARNING no longer exist.

F.2.4 UP-RATED

Definition – The WPS/WTGS is operative and functioning according to design specifications but at performance level higher than nominal.

The UP-RATED category is an underlying category of FULL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The UP-RATED category is optional.

Table F.4 – UP-RATED category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	IN SERVICE (**IAOS**)	FULL PERFORMANCE (**IAOSFP**)	1	NOT CURTAILED	1
					NOT CURTAILED – WARNING	2
					UP-RATED	**3**

Entry point – The WPS/WTGS is performing the intended function at a level higher than nominal.

Exit point – The WPS/WTGS is no longer performing the intended function at a level higher than nominal.

F.2.5 DERATED – OTHER

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to external conditions and it cannot be categorised by any of the other sub categories under PARTIAL PERFORMANCE.

The DERATED – OTHER category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DERATED – OTHER category is optional.

Table F.5 – DERATED – OTHER category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	**DERATED – OTHER**	**4**
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to an unclassified external constrain.

Exit point – The conditions for being in DERATED – OTHER no longer exist.

F.2.6 DERATED – GRID WPS OPERATOR

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to external conditions originating from the grid and applied by the wind farm operator.

The DERATED – GRID WPS OPERATOR category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DERATED – GRID WPS OPERATOR category is optional.

Table F.6 – DERATED – GRID WPS OPERATOR category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	**5**
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to a grid issue and constrain is applied by the wind farm operator.

Exit point – The conditions for being in DERATED – GRID WPS OPERATOR no longer exist.

F.2.7 DERATED – GRID TSO

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to external conditions originating from the grid and applied by the TSO.

The DERATED – GRID TSO category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories.

The DERATED – GRID TSO category is optional.

Table F.7 – DERATED – GRID TSO category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	**6**
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to a grid issue and constrain is applied by the TSO.

Exit point – The conditions for being in DERATED – GRID TSO no longer exist.

F.2.8 DERATED – GRID CONTROL

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to external conditions originating from the grid control systems (Automatic, e.g. to comply with grid codes).

The DERATED – GRID CONTROL category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DERATED – GRID CONTROL category is optional.

Table F.8 – DERATED – GRID CONTROL category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	**7**
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to a grid issue and constrain is applied by an automated grid control system internal or external.

Exit point – The conditions for being in DERATED – GRID CONTROL no longer exist.

F.2.9 DERATED – NOISE

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to expected curtailments due to noise compliance.

The DERATED – NOISE category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information. The DERATED – NOISE category is optional.

Table F.9 – DERATED – NOISE category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	**8**
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at reduced capacity due expected noise curtailments.

Exit point – The conditions for being in DERATED – NOISE no longer exist.

F.2.10 DERATED – TEMPERATURE

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to external temperature conditions outside specifications or according to external temperature curtailment specifications.

The DERATED – TEMPERATURE category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DERATED – TEMPERATURE category is optional.

Table F.10 – DERATED – TEMPERATURE category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	**9**
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to an external temperature constrain.

Exit point – The conditions for being in DERATED – TEMPERATURE no longer exist.

F.2.11 DERATED – STRUCTURAL LOAD

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to external conditions jeopardizing the structural integrity if performance was not reduced e.g. wake sector management.

The DERATED – STRUCTURAL LOAD category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DERATED – STRUCTURAL LOAD category is optional.

Table F.11 – DERATED – STRUCTURAL LOAD category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	**10**
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to an external structural load constrain.

Exit point – The conditions for being in DERATED – STRUCTURAL LOAD no longer exist.

F.2.12 DERATED – WIND

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to wind conditions but not related to missing energy in the wind resources.

The DERATED – WIND category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DERATED – WIND category is optional.

Table F.12 – DERATED – WIND category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	**11**
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to wind conditions but not related to missing energy in the wind resources.

Exit point – The conditions for being in DERATED – WIND no longer exist.

F.2.13 DEGRADED – OTHER

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to internal conditions and it cannot be categorised by any of the other sub categories under PARTIAL PERFORMANCE.

The DEGRADED – OTHER category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information. The DEGRADED – OTHER category is optional.

Table F.13 – DEGRADED – OTHER category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	**12**
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to an unclassified internal constrain.

Exit point – The conditions for being in DEGRADED – OTHER no longer exist.

F.2.14 DEGRADED – DIAGNOSTIC

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to internal conditions related to diagnosing a problem with the WPS/WTGS.

The DEGRADED – DIAGNOSTIC category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DEGRADED – DIAGNOSTIC category is optional.

Table F.14 – DEGRADED – DIAGNOSTIC category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	**13**
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to internal conditions related to diagnosing a problem with the WPS/WTGS.

Exit point – The conditions for being in DEGRADED – DIAGNOSTIC no longer exist.

F.2.15 DEGRADED – NOISE

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to unexpected curtailments due to noise compliance.

The DEGRADED – NOISE category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information. The DEGRADED – NOISE category is optional.

Table F.15 – DEGRADED – NOISE category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	**14**
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at reduced capacity due unexpected noise curtailments.

Exit point – The conditions for being in DEGRADED – NOISE no longer exist.

F.2.16 DEGRADED – COMPONENT

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to internal conditions related to one or more components.

The DEGRADED – COMPONENT category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DEGRADED – COMPONENT category is optional.

Table F.16 – DEGRADED – COMPONENT category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	**15**
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to curtailment related to one or more internal components.

Exit point – The conditions for being in DEGRADED – COMPONENT no longer exist.

F.2.17 DEGRADED – TEMPERATURE

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to internal temperature conditions outside specifications.

The DEGRADED – TEMPERATURE category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DEGRADED – TEMPERATURE category is optional.

Table F.17 – DEGRADED – TEMPERATURE category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	IN SERVICE **(IAOS)**	PARTIAL PERFORMANCE **(IAOSPP)**	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	**16**
					DEGRADED – STRUCTURAL LOAD	17

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to an internal temperature constrain.

Exit point – The conditions for being in DEGRADED – TEMPERATURE no longer exist.

F.2.18 DEGRADED – STRUCTURAL LOAD

Definition – Some of the intended functions of the WPS/WTGS are operating at reduced performance due to internal conditions jeopardizing the structural integrity if performance was not reduced.

The DEGRADED – STRUCTURAL LOAD category is an underlying category of PARTIAL PERFORMANCE and has no predefined underlying mandatory or optional information categories. The DEGRADED – STRUCTURAL LOAD category is optional.

Table F.18 – DEGRADED – STRUCTURAL LOAD category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	IN SERVICE (**IAOS**)	PARTIAL PERFORMANCE (**IAOSPP**)	2	DERATED – OTHER	4
					DERATED – GRID WPS OPERATOR	5
					DERATED – GRID TSO	6
					DERATED – GRID CONTROL	7
					DERATED – NOISE	8
					DERATED – TEMPERATURE	9
					DERATED – STRUCTURAL LOAD	10
					DERATED – WIND	11
					DEGRADED – OTHER	12
					DEGRADED – DIAGNOSTIC	13
					DEGRADED – NOISE	14
					DEGRADED – COMPONENT	15
					DEGRADED – TEMPERATURE	16
					DEGRADED – STRUCTURAL LOAD	**17**

Entry point – The WPS/WTGS is not performing the intended function at full capacity due to an internal structural load constrain.

Exit point – The conditions for being in DEGRADED – STRUCTURAL LOAD no longer exist.

F.2.19 OTHER READY STANDBY

Definition – The category OTHER READY STANDBY is when ready to respond to a predefined event.

This may include, but is not limited to, the following examples:

- A low frequency compensation service is activated and awaiting a frequency drop.
- Aviation warning light service awaiting an indication of nearby aeroplanes.
- Radar for bird migration awaiting a reading.
- VAr compensation system having elements disconnected but ready to engage.

The OTHER READY STANDBY category is an underlying category of READY STANDBY and has no predefined underlying mandatory or optional information. The OTHER READY STANDBY category is optional.

Table F.19 – OTHER READY STANDBY category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	READY STANDBY **(IAOOSRS)**	3	**OTHER READY STANDBY**	**18**

Entry point – The Service is ready and able to respond to a pre-defined event.

Exit point – The Service is no longer able to respond to a pre-defined event or is now responding.

F.2.20 OTHER TECHNICAL STANDBY

Definition – The category OTHER TECHNICAL STANDBY is when one of the other categories underlying TECHNICAL STANDBY can't be used.

The OTHER TECHNICAL STANDBY category is an underlying category of TECHNICAL STANDBY and has no predefined underlying mandatory or optional information categories. The OTHER TECHNICAL STANDBY category is optional.

Table F.20 – OTHER TECHNICAL STANDBY category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	TECHNICAL STANDBY **(IAOOSTS)**	4	**OTHER TECHNICAL STANDBY**	**19**
					LUBRICATION	20
					DE-ICING	21
					DRY OUT	22
					CABLE UNTWIST	23

Entry point – None of the other underlying categories of TECHNICAL STANDBY can be used.

Exit point – The conditions for being in OTHER TECHNICAL STANDBY no longer exist.

F.2.21 LUBRICATION

Definition – The category LUBRICATION is defined as periods where the WPS/WTGS is temporarily not functioning due to performance of controlled and predefined lubrication tasks required for maintaining the intended functions.

The LUBRICATION category is an underlying category of TECHNICAL STANDBY and has no predefined underlying mandatory or optional information categories. The LUBRICATION category is optional.

Table F.21 – LUBRICATION category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	TECHNICAL STANDBY **(IAOOSTS)**	4	OTHER TECHNICAL STANDBY	19
					LUBRICATION	**20**
					DE-ICING	21
					DRY OUT	22
					CABLE UNTWIST	23

Entry point – The WPS/WPGS determines or receives information that lubrication standby tasks have to be executed requiring shutdown of the WPS/WTGS.

Exit point – The conditions for being in LUBRICATION no longer exist.

F.2.22 DE-ICING

Definition – The category DE-ICING is defined as periods where the WPS/WTGS is temporarily not functioning due to performance of controlled and predefined de-icing tasks required for maintaining the intended functions.

The DE-ICING category is an underlying category of TECHNICAL STANDBY and has no predefined underlying mandatory or optional information categories. The DE-ICING category is optional.

Table F.22 – DE-ICING category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	TECHNICAL STANDBY **(IAOOSTS)**	4	OTHER TECHNICAL STANDBY	19
					LUBRICATION	20
					DE-ICING	**21**
					DRY OUT	22
					CABLE UNTWIST	23

Entry point – The WPS/WPGS determines or receives information that de-icing standby tasks have to be executed requiring shutdown of the WPS/WTGS.

Exit point – The conditions for being in DE-ICING no longer exist.

F.2.23 DRY OUT

Definition – The category DRY OUT is defined as periods where the WPS/WTGS is temporarily not functioning due to performance of controlled and predefined component dry

out tasks required for maintaining the intended functions. This is typically after long standstill periods.

The DRY OUT category is an underlying category of TECHNICAL STANDBY and has no predefined underlying mandatory or optional information categories. The DRY OUT category is optional.

Table F.23 – DRY OUT category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	TECHNICAL STANDBY **(IAOOSTS)**	4	OTHER TECHNICAL STANDBY	19
					LUBRICATION	20
					DE-ICING	21
					DRY OUT	**22**
					CABLE UNTWIST	23

Entry point – The WPS/WPGS determines or receives information that dry out standby tasks have to be executed requiring shutdown of the WPS/WTGS.

Exit point – The conditions for being in DRY OUT no longer exist.

F.2.24 CABLE UNTWIST

Definition – The category CABLE UNTWIST is defined as periods where the WPS/WTGS is temporarily not functioning due to performance of controlled and predefined cable untwist tasks required for maintaining the intended functions.

The CABLE UNTWIST category is an underlying category of TECHNICAL STANDBY and has no predefined underlying mandatory or optional information categories. The CABLE UNTWIST category is optional.

Table F.24 – CABLE UNTWIST category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	TECHNICAL STANDBY **(IAOOSTS)**	4	OTHER TECHNICAL STANDBY	19
					LUBRICATION	20
					DE-ICING	21
					DRY OUT	22
					CABLE UNTWIST	**23**

Entry point – The WPS/WPGS determines or receives information that cable untwist standby tasks have to be executed requiring shutdown of the WPS/WTGS.

Exit point – The conditions for being in CABLE UNTWIST no longer exist.

F.2.25 OTHER ENVIRONMENTAL

Definition – The category OTHER OUT OF ENVIRONMENTAL SPECIFICATION is when one of the other categories underlying OUT OF ENVIRONMENTAL SPECIFICATION can't be used.

The OTHER ENVIRONMENTAL category is an underlying category of OUT OF ENVIRONMENTAL SPECIFICATION and has no predefined underlying mandatory or optional information categories. The OTHER ENVIRONMENTAL category is optional.

Table F.25 – OTHER ENVIRONMENTAL category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	OUT OF ENVIRONMENTAL SPECIFICATION **(IAOOSEN)**	5	**Other environmental**	24
					Calm winds	25
					High wind	26
					Temperature	27

Entry point – None of the other underlying categories of OUT OF ENVIRONMENTAL SPECIFICATION can be used.

Exit point – The conditions for being in OTHER ENVIRONMENTAL no longer exist.

F.2.26 CALM WINDS

Definition – The category CALM WINDS is obtained when the WPS/WTGS is operative but not functioning as the wind energy is below the minimum level to operate the WPS/WTGS.

The CALM WINDS category is an underlying category of OUT OF ENVIRONMENTAL SPECIFICATION and has no predefined underlying mandatory or optional information categories. The CALM WINDS category is optional.

Table F.26 – CALM WINDS category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	OUT OF ENVIRONMENTAL SPECIFICATION **(IAOOSEN)**	5	Other environmental	24
					Calm winds	**25**
					High wind	26
					Temperature	27

Entry point – The wind conditions change to be below the design specification of the WPS/WTGS, prohibiting the WPS/WTGS from operation.

Exit point – The conditions for being in CALM WINDS no longer exist.

F.2.27 HIGH WIND

Definition – The category HIGH WIND is obtained when the WPS/WTGS is operative but not functioning as the wind conditions are above the design specifications.

The HIGH WIND category is an underlying category of OUT OF ENVIRONMENTAL SPECIFICATION and has no predefined underlying mandatory or optional information categories. The HIGH WIND category is optional.

Table F.27 – HIGH WIND category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	OUT OF ENVIRONMENTAL SPECIFICATION **(IAOOSEN)**	5	Other environmental	24
					Calm winds	25
					High wind	**26**
					Temperature	27

Entry point – The wind conditions change to be above the design specification of the WPS/WTGS, prohibiting the WPS/WTGS from operation.

Exit point – The conditions for being in HIGH WIND no longer exist.

F.2.28 TEMPERATURE

Definition – The category TEMPERATURE is obtained when the WPS/WTGS is operative but not functioning as the temperature conditions are out of the design specifications.

The TEMPERATURE category is an underlying category of OUT OF ENVIRONMENTAL SPECIFICATION and has no predefined underlying mandatory or optional information categories. The TEMPERATURE category is optional.

Table F.28 – TEMPERATURE category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	OUT OF ENVIRONMENTAL SPECIFICATION **(IAOOSEN)**	5	Other environmental	24
					Calm winds	25
					High wind	26
					Temperature	**27**

Entry point – The temperature conditions change to be out of the design specification of the WPS/WTGS, prohibiting the WPS/WTGS from operation.

Exit point – The conditions for being in TEMPERATURE no longer exist.

F.2.29 OTHER REQUESTED SHUTDOWN

Definition – The category OTHER REQUESTED SHUTDOWN is when one of the other categories underlying REQUESTED SHUTDOWN can't be used.

The OTHER REQUESTED SHUTDOWN category is an underlying category of REQUESTED SHUTDOWN and has no predefined underlying mandatory or optional information categories. The OTHER REQUESTED SHUTDOWN category is optional.

Table F.29 – OTHER REQUESTED SHUTDOWN category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE (**IA**)	OPERATIVE (**IAO**)	OUT OF SERVICE (**IAOOS**)	REQUESTED SHUTDOWN (**IAOOSRS**)	6	**OTHER REQUESTED SHUTDOWN**	**28**
					ENVIRONMENTAL	29
					GRID – WPS OPERATOR	30
					GRID – TSO	31
					NOISE	32
					FLICKER	33
					WILDLIFE	34
					STRUCTURAL LOAD	35

Entry point – None of the other underlying categories of REQUESTED SHUTDOWN can be used.

Exit point – The conditions for being in OTHER REQUESTED SHUTDOWN no longer exist.

F.2.30 ENVIRONMENTAL

Definition – The category ENVIRONMENTAL is obtained when the WPS/WTGS is operative but not functioning as it has been stopped by an external request due to environmental conditions, hence the "OUT OF ENVIRONMENTAL" condition is not present but extreme environmental conditions is expected to occur in the near future.

Examples:

Tornado is forecasted and to protect the WPS the WPS is shutdown.

Hurricane is forecasted and to protect the WPS the WPS is shutdown.

The ENVIRONMENTAL category is an underlying category of REQUESTED SHUTDOWN and has no predefined underlying mandatory or optional information categories. The ENVIRONMENTAL category is optional.

Table F.30 – ENVIRONMENTAL category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	REQUESTED SHUTDOWN **(IAOOSRS)**	6	OTHER REQUESTED SHUTDOWN	28
					ENVIRONMENTAL	**29**
					GRID – WPS OPERATOR	30
					GRID – TSO	31
					NOISE	32
					FLICKER	33
					WILDLIFE	34
					STRUCTURAL LOAD	35

Entry point – The WPS/WTGS is ordered to shut down by an external request due to expected extreme environmental conditions in nearby future.

Exit point – The conditions for being in ENVIRONMENTAL no longer exist.

F.2.31 GRID – WPS OPERATOR

Definition – The category GRID – WPS OPERATOR is obtained when the WPS/WTGS is operative but not functioning as it has been stopped by an external request by the WPS operator due to grid issues.

The GRID – WPS OPERATOR category is an underlying category of REQUESTED SHUTDOWN and has no predefined underlying mandatory or optional information categories.

The GRID – WPS OPERATOR category is optional.

Table F.31 – GRID – WPS OPERATOR category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	REQUESTED SHUTDOWN **(IAOOSRS)**	6	OTHER REQUESTED SHUTDOWN	28
					ENVIRONMENTAL	29
					GRID – WPS OPERATOR	**30**
					GRID – TSO	31
					NOISE	32
					FLICKER	33
					WILDLIFE	34
					STRUCTURAL LOAD	35

Entry point – The WPS/WTGS is ordered to shut down by an external request by the WPS operator due to grid issues.

Exit point – The conditions for being in GRID – WPS OPERATOR no longer exist.

F.2.32 GRID – TSO

Definition – The category GRID – TSO is obtained when the WPS/WTGS is operative but not functioning as it has been stopped by an external request by the TSO due to grid issues.

The GRID – TSO category is an underlying category of REQUESTED SHUTDOWN and has no predefined underlying mandatory or optional information categories. The GRID – TSO category is optional.

Table F.32 – GRID – TSO category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	REQUESTED SHUTDOWN **(IAOOSRS)**	6	OTHER REQUESTED SHUTDOWN	28
					ENVIRONMENTAL	29
					GRID – WPS OPERATOR	30
					GRID – TSO	**31**
					NOISE	32
					FLICKER	33
					WILDLIFE	34
					STRUCTURAL LOAD	35

Entry point – The WPS/WTGS is ordered to shut down by an external request by the TSO due to grid issues.

Exit point – The conditions for being in GRID – TSO no longer exist.

F.2.33 NOISE

Definition – The category NOISE is obtained when the WPS/WTGS is operative but not functioning as it has been stopped by an external request due to acoustic noise compliance.

The NOISE category is an underlying category of REQUESTED SHUTDOWN and has no predefined underlying mandatory or optional information categories. The NOISE category is optional.

Table F.33 – NOISE category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	REQUESTED SHUTDOWN **(IAOOSRS)**	6	OTHER REQUESTED SHUTDOWN	28
					ENVIRONMENTAL	29
					GRID – WPS OPERATOR	30
					GRID – TSO	31
					NOISE	**32**
					FLICKER	33
					WILDLIFE	34
					STRUCTURAL LOAD	35

Entry point – The WPS/WTGS is ordered to shut down by an external request due to acoustic noise compliance.

Exit point – The conditions for being in NOISE no longer exist.

F.2.34 FLICKER

Definition – The category FLICKER is obtained when the WPS/WTGS is operative but not functioning as it has been stopped by an external request due to visual flicker compliance.

The FLICKER category is an underlying category of REQUESTED SHUTDOWN and has no predefined underlying mandatory or optional information categories. The FLICKER category is optional.

Table F.34 – FLICKER category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	REQUESTED SHUTDOWN **(IAOOSRS)**	6	OTHER REQUESTED SHUTDOWN	28
					ENVIRONMENTAL	29
					GRID – WPS OPERATOR	30
					GRID – TSO	31
					NOISE	32
					FLICKER	**33**
					WILDLIFE	34
					STRUCTURAL LOAD	35

Entry point – The WPS/WTGS is ordered to shut down by an external request due to visual flicker compliance.

Exit point – The conditions for being in FLICKER no longer exist.

F.2.35 WILDLIFE

Definition – The category WILDLIFE is obtained when the WPS/WTGS is operative but not functioning as it has been stopped by an external request due to protection of the local wildlife.

The WILDLIFE category is an underlying category of REQUESTED SHUTDOWN and has no predefined underlying mandatory or optional information. The WILDLIFE category is optional.

Table F.35 – WILDLIFE category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	REQUESTED SHUTDOWN **(IAOOSRS)**	6	OTHER REQUESTED SHUTDOWN	28
					ENVIRONMENTAL	29
					GRID – WPS OPERATOR	30
					GRID – TSO	31
					NOISE	32
					FLICKER	33
					WILDLIFE	**34**
					STRUCTURAL LOAD	35

Entry point – The WPS/WTGS is ordered to shut down by an external request due to protection of the local wildlife.

Exit point – The conditions for being in WILDLIFE no longer exist.

F.2.36 STRUCTURAL LOAD

Definition – The category STRUCTRUAL LOAD is obtained when the WPS/WTGS is operative but not functioning as it has been stopped by an external request due to protection of the structural integrity of the construction.

The STRUCTURAL LOAD category is an underlying category of REQUESTED SHUTDOWN and has no predefined underlying mandatory or optional information. The STRUCTURAL LOAD category is optional.

Table F.36 – STRUCTURAL LOAD category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	REQUESTED SHUTDOWN **(IAOOSRS)**	6	OTHER REQUESTED SHUTDOWN	28
					ENVIRONMENTAL	29
					GRID – WPS OPERATOR	30
					GRID – TSO	31
					NOISE	32
					FLICKER	33
					WILDLIFE	34
					STRUCTURAL LOAD	**35**

Entry point – The WPS/WTGS is ordered to shut down by an external request due to protection of the structural integrity of the construction.

Exit point – The conditions for being in STRUCTURAL LOAD no longer exist.

F.2.37 OTHER OUT OF ELECTRICAL SPECIFICATION

Definition – The category OTHER OUT OF ELECTRICAL SPECIFICATION is when one of the other categories underlying OUT OF ELECTRICAL SPECIFICATION can not be used.

The OTHER OUT OF ELECTRICAL SPECIFICATION category is an underlying category of OUT OF ELECTRICAL SPECIFICATION and has no predefined underlying mandatory or optional information categories. The OTHER OUT OF ELECTRICAL SPECIFICATION category is optional.

Table F.37 – OTHER OUT OF ELECTRICAL SPECIFICATION category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	OUT OF ELECTRICAL SPECIFICATION **(IAOOSEL)**	7	**OTHER OUT OF ELECTRICAL SPECIFICATION**	**36**
					FREQUENCY	37
					VOLTAGE LEVEL LOW	38
					VOLTAGE LEVEL HIGH	39
					ASYMMETRY	40

Entry point – None of the other underlying categories of OUT OF ELECTRICAL SPECIFICATION can be used.

Exit point – The conditions for being in OTHER OUT OF ELECTRICAL SPECIFICATION no longer exist.

F.2.38 FREQUENCY

Definition – The category FREQUENCY is active when the WPS/WTGS is operative but not functioning as the frequency parameters of the WPS/WTGS are out of design specifications.

The FREQUENCY category is an underlying category of OUT OF ELECTRICAL SPECIFICATION and has no predefined underlying mandatory or optional information categories. The FREQUENCY category is optional.

Table F.38 – FREQUENCY category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	OUT OF ELECTRICAL SPECIFICATION **(IAOOSEL)**	7	OTHER OUT OF ELECTRICAL SPECIFICATION	36
					FREQUENCY	**37**
					VOLTAGE LEVEL LOW	38
					VOLTAGE LEVEL HIGH	39
					ASYMMETRY	40

Entry point – One or more of the frequency parameters of the WPS/WTGS change to be out of the operational and/or design specifications, prohibiting the WPS/WTGS from functioning.

Exit point – The conditions for being in FREQUENCY no longer exist.

F.2.39 VOLTAGE LEVEL LOW

Definition – The category VOLTAGE LEVEL LOW is active when the WPS/WTGS is operative but not functioning as the voltage level is below the WPS/WTGS design specifications.

The VOLTAGE LEVEL LOW category is an underlying category of OUT OF ELECTRICAL SPECIFICATION and has no predefined underlying mandatory or optional information categories. The VOLTAGE LEVEL LOW category is optional.

Table F.39 – VOLTAGE LEVEL LOW category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	OUT OF ELECTRICAL SPECIFICATION **(IAOOSEL)**	7	OTHER OUT OF ELECTRICAL SPECIFICATION	36
					FREQUENCY	37
					VOLTAGE LEVEL LOW	**38**
					VOLTAGE LEVEL HIGH	39
					ASYMMETRY	40

Entry point – The voltage parameters of the WPS/WTGS change to be below the operational and/or design specifications, prohibiting the WPS/WTGS from functioning.

Exit point – The conditions for being in VOLTAGE LEVEL LOW no longer exist.

F.2.40 VOLTAGE LEVEL HIGH

Definition – The category VOLTAGE LEVEL HIGH is active when the WPS/WTGS is operative but not functioning as the voltage level is above the WPS/WTGS design specifications.

The VOLTAGE LEVEL HIGH category is an underlying category of OUT OF ELECTRICAL SPECIFICATION and has no predefined underlying mandatory or optional information categories. The VOLTAGE LEVEL HIGH category is optional.

Table F.40 – VOLTAGE LEVEL HIGH category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	OUT OF ELECTRICAL SPECIFICATION **(IAOOSEL)**	7	OTHER OUT OF ELECTRICAL SPECIFICATION	36
					FREQUENCY	37
					VOLTAGE LEVEL LOW	38
					VOLTAGE LEVEL HIGH	**39**
					ASYMMETRY	40

Entry point – The voltage parameters of the WPS/WTGS change to be above the operational and/or design specifications, prohibiting the WPS/WTGS from functioning.

Exit point – The conditions for being in VOLTAGE LEVEL HIGH no longer exist.

F.2.41 ASYMMETRY

Definition – The category ASYMMETRY is active when the WPS/WTGS is operative but not functioning due to a grid voltage asymmetry outside the WPS/WTGS design specifications.

The ASYMMETRY category is an underlying category of OUT OF ELECTRICAL SPECIFICATION and has no predefined underlying mandatory or optional information categories. The ASYMMETRY category is optional.

Table F.41 – ASYMMETRY category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	OPERATIVE **(IAO)**	OUT OF SERVICE **(IAOOS)**	OUT OF ELECTRICAL SPECIFICATION **(IAOOSEL)**	7	OTHER OUT OF ELECTRICAL SPECIFICATION	36
					FREQUENCY	37
					VOLTAGE LEVEL LOW	38
					VOLTAGE LEVEL HIGH	39
					ASYMMETRY	**40**

Entry point – The voltage parameters of the WPS/WTGS change to be in asymmetry outside the operational and/or design specifications, prohibiting the WPS/WTGS from functioning.

Exit point – The conditions for being in ASYMMETRY no longer exist.

F.2.42 SCHEDULED MAINTENANCE

Definition – The category SCHEDULED MAINTENANCE is entered during scheduled maintenance of elements of the WPS/WTGS preventing the WPS/WTGS from performing the intended functions.

The SCHEDULED MAINTENANCE category is an underlying category of SCHEDULED MAINTENANCE and has no predefined underlying mandatory or optional information categories. The SCHEDULED MAINTENANCE category is optional.

Table F.42 – SCHEDULED MAINTENANCE category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	NON-OPERATIVE **(IANO)**	SCHEDULED MAINTENANCE **(IANOSM)**		8	**SCHEDULED MAINTENANCE**	41

Entry point – The WPS/WTGS functioning is stopped or prohibited with the intention of performing scheduled maintenance.

Exit point – The conditions for being in SCHEDULED MAINTENANCE no longer exist.

F.2.43 OTHER CORRECTIVE ACTION

Definition – The category OTHER PLANNED CORRECTIVE ACTION is when one of the other categories underlying PLANNED CORRECTIVE ACTION can not be used.

The OTHER CORRECTIVE ACTION category is an underlying category of PLANNED CORRECTIVE ACTION and has no predefined underlying mandatory or optional information categories. The OTHER CORRECTIVE ACTION category is optional.

Table F.43 – OTHER CORRECTIVE ACTION category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	NON-OPERATIVE **(IANO)**	PLANNED CORRECTIVE ACTION **(IANOPCA)**		9	**OTHER CORRECTIVE ACTION**	**42**
					UPGRADE	43
					INSPECTIONS	44
					RETROFIT	45
					REPAIR WORK	46

Entry point – None of the other underlying categories of PLANNED CORRECTIVE ACTION can be used.

Exit point – The conditions for being in OTHER CORRECTIVE ACTION no longer exist.

F.2.44 UPGRADE

Definition – The category UPGRADE is entered during actions required to upgrade or improve the intended functions of the WPS/WTGS when these actions are not part of normal scheduled maintenance.

The UPGRADE category is an underlying category of PLANNED CORRECTIVE ACTION and has no predefined underlying mandatory or optional information categories. The UPGRADE category is optional.

Table F.44 – UPGRADE category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	NON-OPERATIVE **(IANO)**	PLANNED CORRECTIVE ACTION **(IANOPCA)**		9	OTHER CORRECTIVE ACTION	42
					UPGRADE	**43**
					INSPECTIONS	44
					RETROFIT	45
					REPAIR WORK	46

Entry point – The WPS/WTGS is being upgraded.

Exit point – The conditions for being in UPGRADE no longer exist.

F.2.45 INSPECTIONS

Definition – The category INSPECTIONS is entered during WPS/WTGS inspection actions when these actions are not part of normal scheduled maintenance.

The INSPECTIONS category is an underlying category of PLANNED CORRECTIVE ACTION and has no predefined underlying mandatory or optional information. The INSPECTIONS category is optional.

Table F.45 – INSPECTIONS category

Information categories						
Mandatory Level 1	**Mandatory Level 2**	**Mandatory Level 3**	**Mandatory Level 4**	**Mandatory Priority**	**Optional Level 5**	**Optional Level Priority**
INFORMATION AVAILABLE **(IA)**	NON-OPERATIVE **(IANO)**	PLANNED CORRECTIVE ACTION **(IANOPCA)**		9	OTHER CORRECTIVE ACTION	42
					UPGRADE	43
					INSPECTIONS	**44**
					RETROFIT	45
					REPAIR WORK	46

Entry point – The WPS/WTGS is being inspected.