

Availability Signal for Wind Farms

9th August 2012
Operations



Agenda

Time	Item	Presenter
13:30	Introduction	Sonya Twohig (Chair)
13:40	Wind Farm Performance Reports	Dave Carroll
14:00	New Available Active Power signal quality standard	Dave Carroll
14:15	Q & A	-
14:45	Tea/Coffee	-
15:00	Changing Controllability Category	Karl O'Keeffe
15:45	Substitution of Availability Data	Marie Hayden
16:00	Q & A	-
16:25	Closing Remarks	Sonya Twohig



Wind Farm Performance Reports

Dave Carroll
Operational Services & Performance



Introduction

- Under OC10 of Grid Code, the TSO has an obligation to monitor, test and investigate the performance of all connected plant;
- Report looks at:
 - Available Active Power signal quality
 - Compliance with Dispatch Instructions
- Issued within Month End (ME) + 10 Business Days;
- December 2011 - June 2012 already issued.



Available Active Power (AAP)

Available Active Power Definition: *The amount of Active Power that the Controllable WFPS could produce based on current wind conditions. The Available Active Power shall only differ from the actual Active Power if the Controllable WFPS has been curtailed, constrained or is operating in a restrictive Frequency Response mode;*

WFPS1.7.6: *Controllable WFPSs shall submit Controllable WFPS MW Availability Declarations whenever changes in Controllable WFPS Availability occur or are predicted to occur. These declarations shall be submitted by means of an Electronic Interface in accordance with the reasonable requirements of the TSO's data system;*

WFPS1.7.4.5: *Where signals or indications required to be provided by the Controllable WFPS...become unavailable or do not comply with applicable standards...the Controllable WFPS shall, acting in accordance with Good Industry Practice, restore or correct the signals and/or indications as soon as possible*



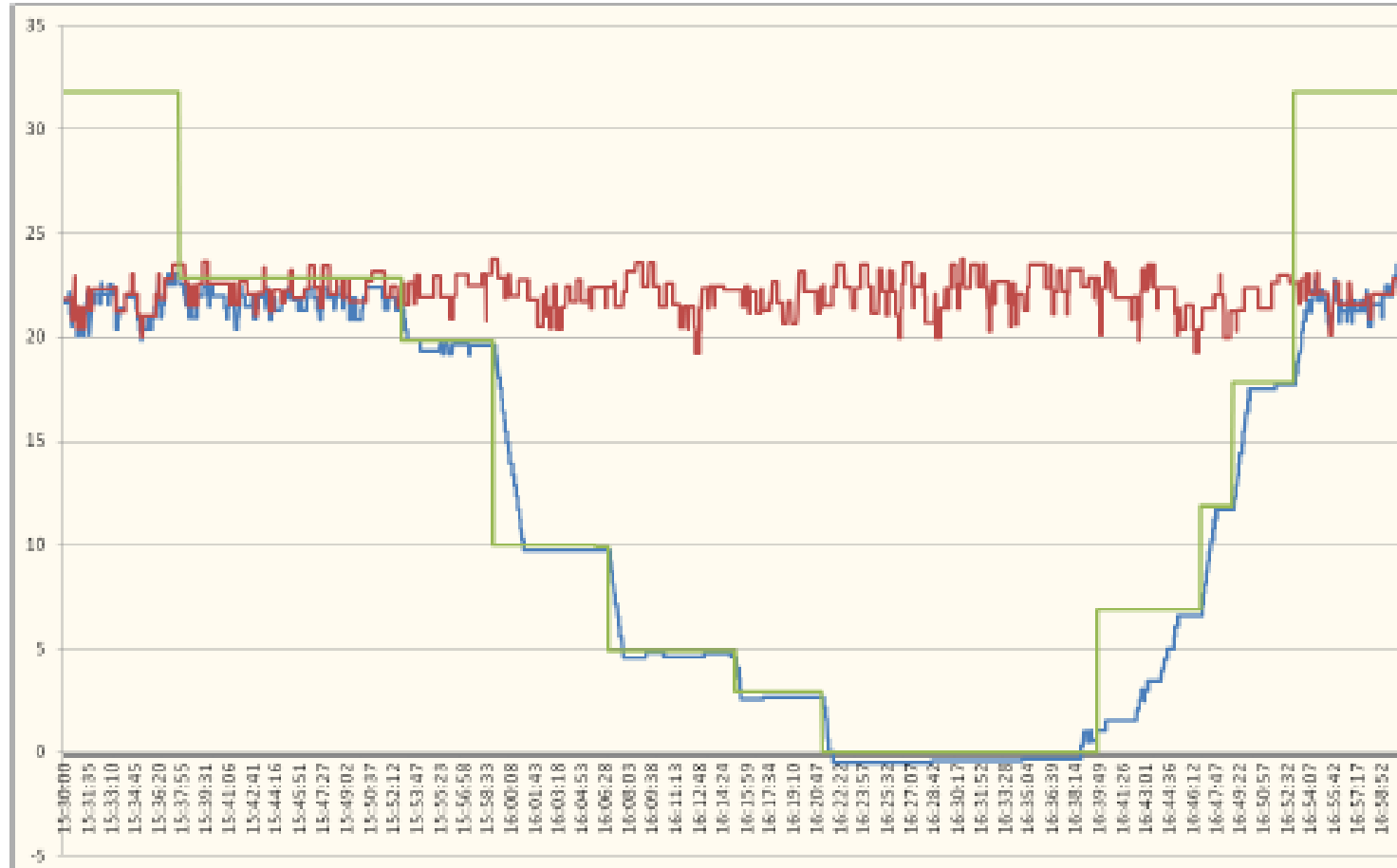
Active Power Control

WFPS1.7.2.2: *An Active Power Control set-point signal shall be sent by the TSO to the Wind Farm Control System. This set-point shall define the maximum Active Power output permitted from the Controllable WFPS. The Wind Farm Control System shall be capable of receiving this signal and acting accordingly to achieve the desired change in Active Power output*

WFPS1.7.4.4: *If Active Power Control, Frequency Response or Voltage Regulation facilities for the Controllable WFPS become unavailable, the Controllable WFPS shall contact the TSO without undue delay*



AAP and Active Power Control



	Available Active Power [MW]
	Active Power Output [MW]
	Active Power Control Setpoint [MW]



AAP – Why Important?

- System Operation & Dispatch
- Reporting
- To provide SEM-O with outturn availability data for Settlement Purposes



Active Power Control – Why Important?

- Allows the TSO control system frequency
- Allows the TSO to control power flows / contingencies on system



Available Active Power Standard

- Based on Normalised Root Mean Squared Deviation¹:

$$RMSD_{ud} = \sqrt{\frac{\sum_{h=1}^{h=p} (AP_{Uh} - MG_{Uh})^2}{p}}$$

$$NRMSD_{up} = \frac{RMSD_{up}}{\max(\text{Installed Capacity}, MEC)}$$

where:

AP_{Uh} is the Availability profile over the period h

MG_{Uh} is the Active Power output over the period h

- Method discussed with Industry (Grid Code & IWEA)



¹[Quality Standard for Windfarm Active Power Availability Signal](#); 02/12/2010

Available Active Power Standard

- Rolling 14-day NRMSD currently $\leq 10\%$;
- Rolling 14-day Count ≤ 2 days;
- Standard does not take curtailments or constraints into account;



Monthly Reports

- AAP analysis excludes periods where WFPS curtailed/constrained;
- Active Power Control based on NRMSD approach and MW Setpoint Feedback signal;
- Issued to IPPs/DSOs within month end + 10 working days; and
- Accompanying explanation document developed¹.



¹Wind Farm Performance Monitoring Report; 13/06/2012

Monthly Reports

- Note that this is not a curtailment/constraint report:
 - Compliance with Dispatch Instructions uses Setpoint Feedback from wind farm controller;
 - New active power setpoints issued by TSO may not have been correctly processed by wind farm controller;
 - The values do not differentiate between curtailments or constraints



Monthly Reports (sample 99 MW WFPS)

Time	Available Active Power [MW]	Output [MW]	Windfarm Setpoint Feedback [MW]	Dispatched?	AAP $(X_1 - X_2)^2$	DI $(X_1 - X_2)^2$
00:00:00	22.41	22.23	99.00		0.03	
00:15:00	26.26	26.29	99.00		0.00	
00:30:00	30.91	25.29	99.00			
00:45:00	34.70	24.43	24.17	Dispatched		
01:00:00			24.17	Dispatched		0.05
01:15:00				Dispatched		0.06
01:30:00				Dispatched		
01:45:00	35.94	19.75		Dispatched		0.33
02:00:00	35.95	32.07		Dispatched		
02:15:00	35.92	35.74				
02:30:00	35.88	35.75	99.00		0.02	
02:45:00	35.89	35.77	99.00		0.01	

AAP aligns closely with output

Setpoint feedback \approx size of wind farm => not dispatched

RMSD is small

Monthly Reports (sample 99 MW WFPS)

Time	Available Active Power [MW]	Output [MW]	Windfarm Setpoint Feedback [MW]	Dispatched?	AAP $(X_1 - X_2)^2$	DI $(X_1 - X_2)^2$
00:00:00	22.41	22.23	99.00			
00:15:00	26.26	26.29	99.00		0.00	
00:30:00	30.91	25.29	99.00			
00:45:00	34.70	24.43	24.17	Dispatched		
01:00:00	34.79	24.39	24.17	Dispatched		0.05
01:15:00	34.78	24.41	24.17	Dispatched		0.06
01:30:00	35.97	19.42	19.17	Dispatched		0.06
01:45:00	35.94	19.75	19.17	Dispatched		0.33
02:00:00	35.95	32.07	21.23	Dispatched		
02:15:00	35.92	35.74	99.00			

RMSD is small

Output closely matches setpoint. AAP is much higher than output

Setpoint feedback < size of wind farm => dispatched

Ignored to allow for profiling

DI Compliance Method

- Changing from trial use of NRMSD to using Grid Code definition *“set-point shall define the maximum Active Power output”*
- Due to use of SCADA a tolerance to the nearest whole MW will also be applied
- Change will be effective 01/10/2012



New Available Active Power signal quality standard

Dave Carroll
Operational Services & Performance

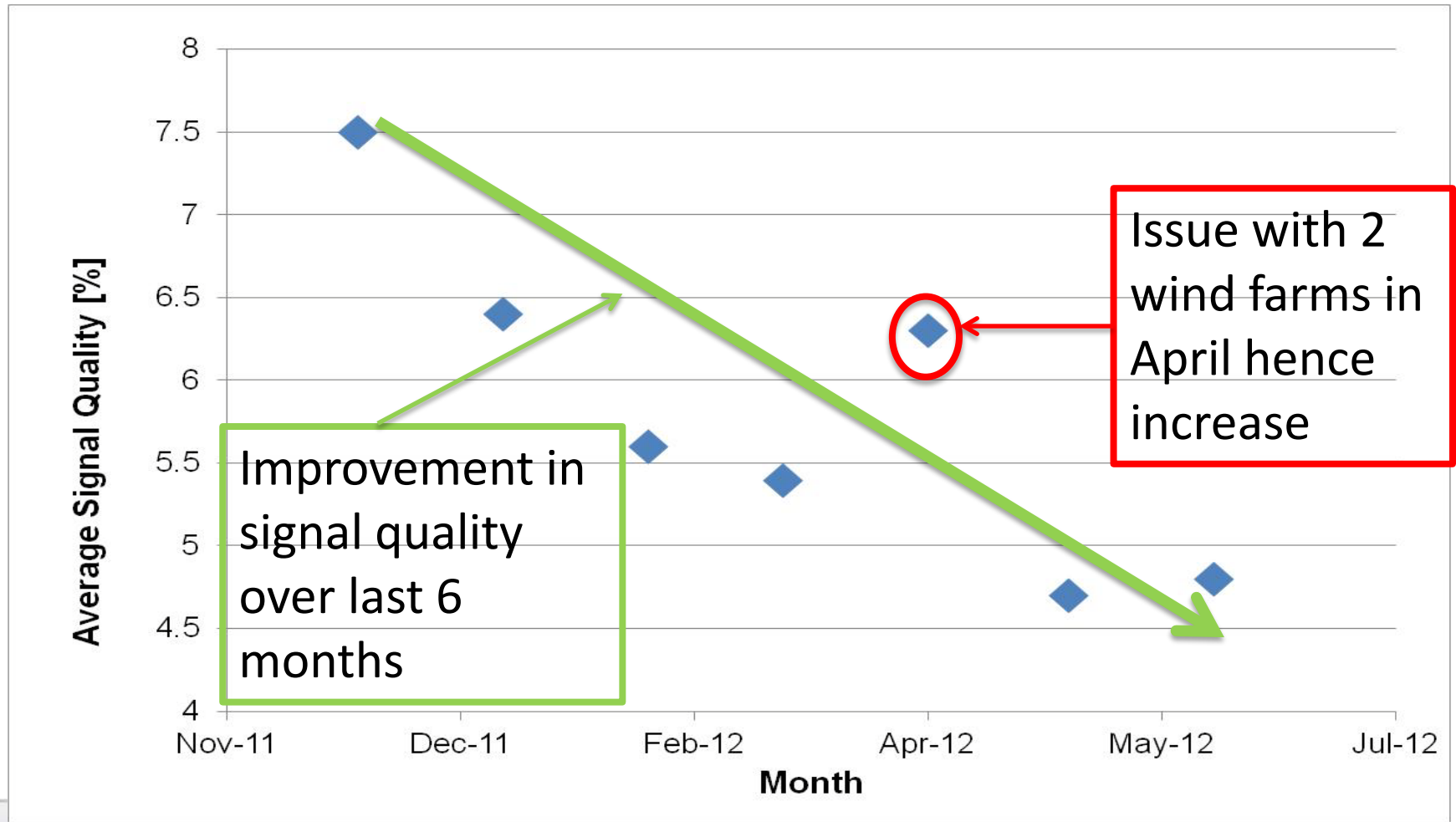


New AAP Standard

- Average Monthly AAP signal quality since Dec 11:
- Improvement over previous 6 months;
- AAP Performance Analysis [here](#)



New AAP Standard



New AAP Standard

- Changing from 10% to 6% effective 01/10/2012:
 - Analysed performance for the months Dec 11 to Jun 12;
 - Average NRMSD is 5.8%;
 - When non-performing WFPS excluded average NRMSD is 2.9%;
- Aligns with accuracy standard used by SONI;
- Analysis now excludes periods of curtailment/constraints



July Reports

- Currently being developed and will be issued next week



Q & A

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Changing Controllability Category

Karl O'Keeffe

Operational Services and Performance



Background

26th August 2011 SEM-11-062 was published stating TSOs should continue to “*adhere to an absolute interpretation of priority dispatch whereby economic factors are only taken account of in exceptional situations*”.

18th November 2011 TSOs published the order in which Priority Dispatch WFPS units would be dispatched down. Three categories were described in this list.

December 2011 TSOs wrote to all legacy non-controllable WFPS informing them of the 1st December 2012 deadline for achieving controllability status.

5th March 2012 TSOs published Controllability Policy paper explaining the Controllability categories and the process of moving category.



Priority Dispatch Order

1. Re-dispatch of Price Making generation and SO counter trading on the interconnector(s) after Gate Closure

2. Re-dispatch of Price Taking generation:
 - a. **Peat**
 - b. **Hybrid Plant**
 - c. **High Efficiency CHP/Biomass/Hydro**
 - d. **Wind farms**
 - e. **Interconnector(s) re-dispatch;**
 - f. **Generation the dispatch down of which results in a safety issue to people arising from the operation of hydro generation stations in flooding situations**



Wind Farms Priority Dispatch Order

In re-dispatching Wind Farms, the following hierarchy is used:

Category (i) - Not Controllable

Units which have failed controllability and are dispatched via Active power control system or by TSO/DSO via circuit breaker.

Category (ii) - Controllable

Units which have successfully proven controllability and Wind Dispatch Tool controls down all WFPS on a pro-rata basis using Availability.

Category (iii) – Still Commissioning

Recently energised with a testing programme agreed by the TSO.
Legacy units which have outstanding Controllability Issues.



Controllability Requirements

Two key tests

1. The WFPS **Active Power Control System** is **performing during real time operation and/or** during ongoing performance monitoring and testing of the WFPS.
 2. The **Availability Signal of the WFPS is correct and within the specified quality standard.**
- » Successful completion of both tests results in ***Operational Readiness Confirmation*** issued by the TSO
- Units that are 10MW or more are required to register as a Variable Price Taker in the SEM.



Test 1- Successful completion of a dispatch test with the TSO

A dispatch test is a remote test carried out by the TSO from the control centre. This test is dependent on system/wind conditions (typically an hour duration).

- Turn the active power control on or off through SCADA with acknowledgement from the WFPS;
- Dispatch instruction or series of dispatch instructions issued to the WFPS (active power set point(s));
- Acknowledgement of the received active power control set point(s) through set point feedback from the WFPS for all issued dispatch instruction(s);
- WFPS active power control responds within 10 seconds with the required ramp rates to the required dispatch instruction(s);
- Required dispatch instruction set point should be maintained as a maximum until a new set point is issued from the TSO or the active power control is switched off by the TSO.

Note that the WFPS active power control system must perform during real time operation and/or during ongoing performance monitoring/testing.

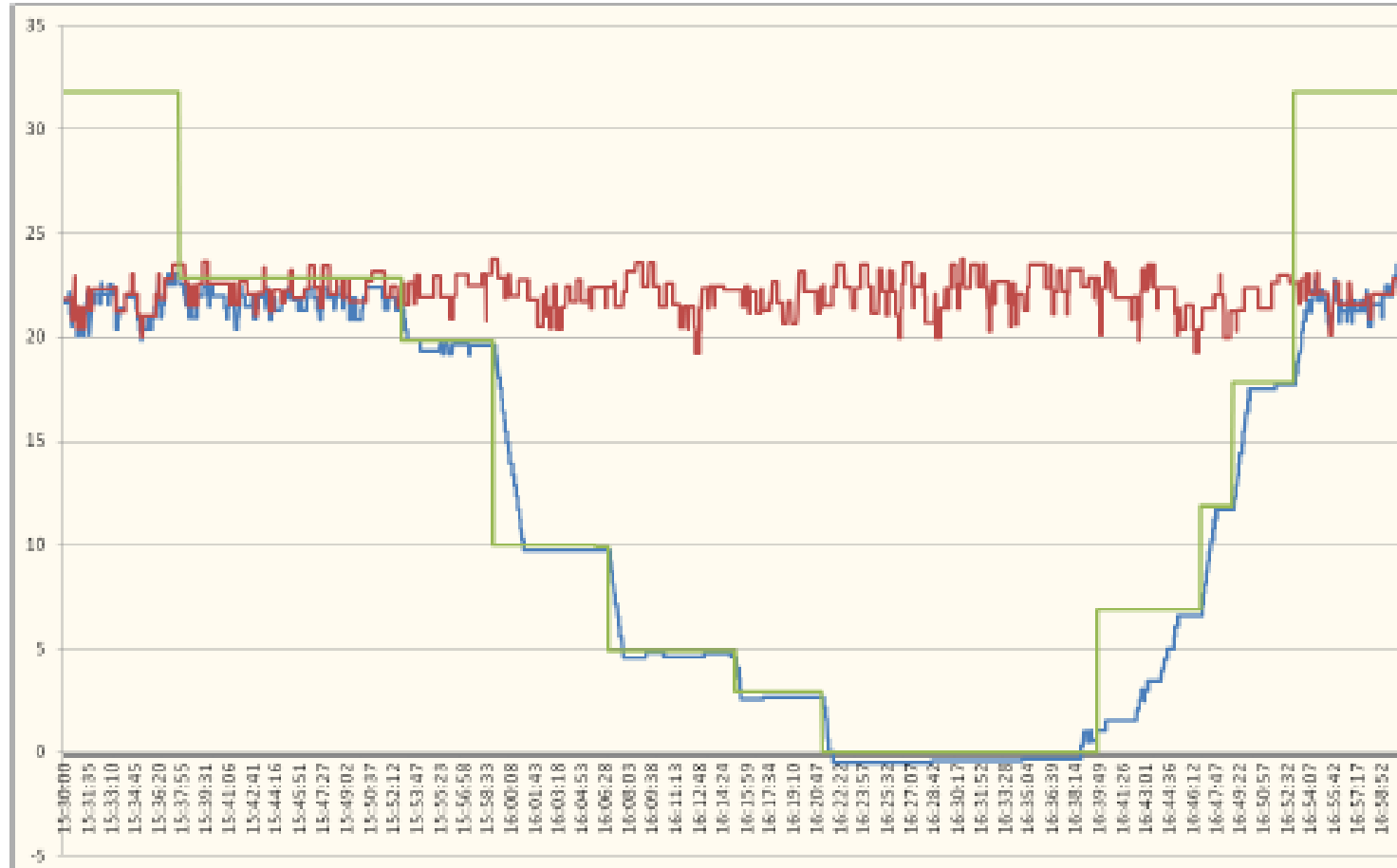





Test 2 - Availability signal is within the TSOs specified quality standard

- This signal at a given time is the measure of the active power a WFPS is capable of delivering to the connection point.
- This signal should account for unavailability of any of the turbines i.e. high and low wind speed shutdown scenarios, outages of a wind turbine generator etc.
- The availability signal of the WFPS is correct and within the specified quality standard.



Successful Dispatch Test

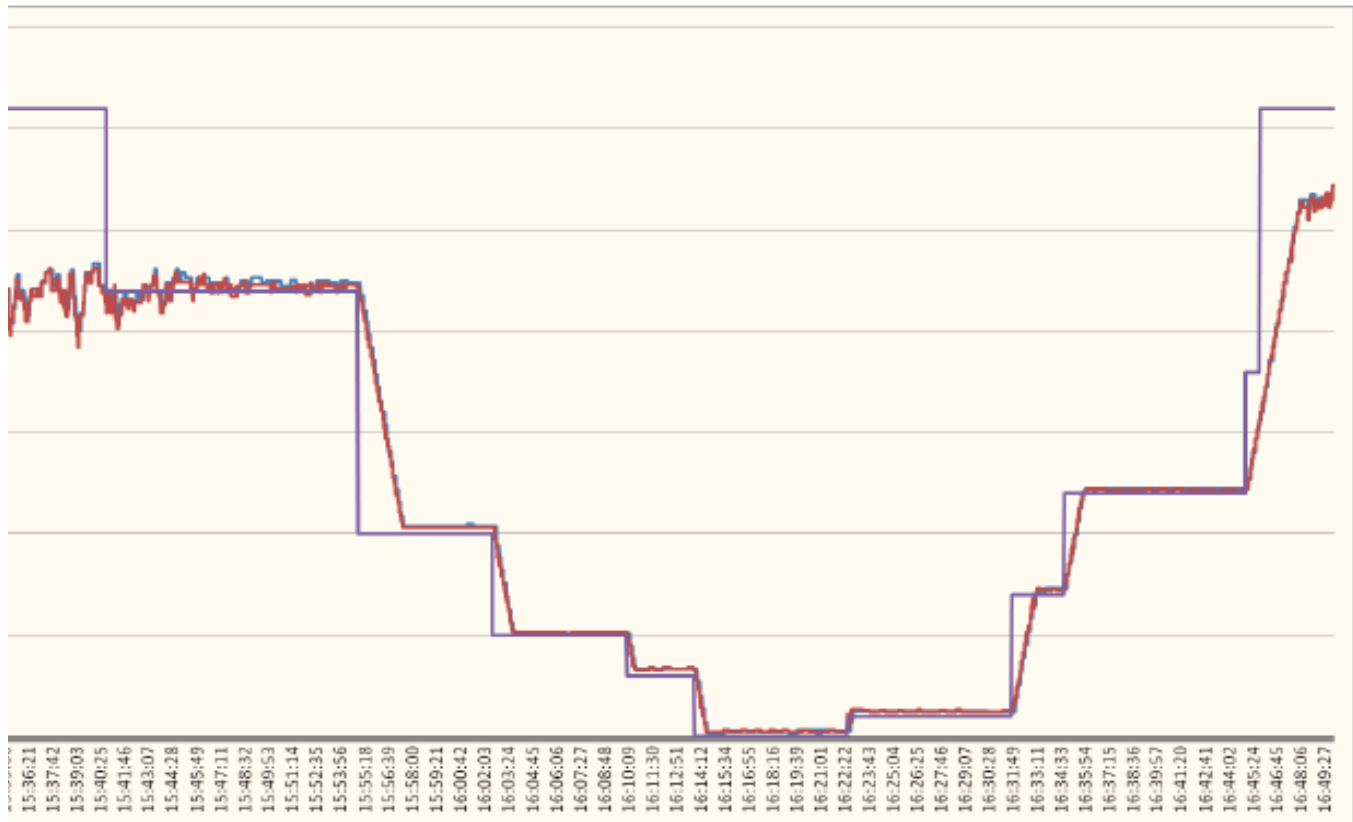





	Available Active Power [MW]
	Active Power Output [MW]
	Active Power Control Setpoint [MW]



Failed Dispatch Test

Availability Signal is not independent of Active Power Output



	Available Active Power [MW]
	Active Power Output [MW]
	Active Power Control Setpoint [MW]



Category (i) – Not Controllable

- This will be the first group of wind farms dispatched down in a re-dispatch event
 - **Depending on the MWs to be re-dispatched this group is selected first**
- No units currently in this category
 - **Deadline of 1st December 2012 will be strictly adhered to**
 - **TSOs and DSOs working on ensuring all legacy and commissioning wind farms have sufficient test dates in advance of deadline**



Category (ii) - Controllable

- This group of WFPS will be selected in the event that re-dispatch of Category (i) WFPS is not sufficient.
- There are 32 WFPS in this Category
 - All have received Operational Readiness Confirmation
- **WFPS in this category have 12 months from date of *Operational Readiness Confirmation* to complete full Grid Code Testing and achieve an Operations Certificate otherwise move to Category (i)**



Wind Farms Connected in Ireland

Wind Farm Name	Associated 110kV Station	Installed Capacity MW	Category
Ballywater	Crane	42	(ii)
Bindoo	Ratrussan	48	(ii)
Booltiagh	Booltiagh	19.5	(ii)
Clahane	Clahane	40	(ii)
Derrybrien	Agannygal	59.5	(ii)
Glanlee (Midas Gen unit)	Galilee	32.45	(ii)
Gortahile	Carlow	20	(ii)
Lisheen	Lisheen	36	(ii)
Richfield	Wexford	27	(ii)
Sorne Hill 1 & 2	Sorne Hill	38.9	(ii)
BEAM HILL	Trillick	14	(ii)
Coomagearlahy 1 (Kilgarvan)	Coomagearlahy	45	(ii)
Coomagearlahy 2 (Sillahertane)	Coomagearlahy	8.5	(ii)
Meentycat	Drumkeen	86.4	(ii)
Ballybane 1 & 2	Ballylickey	29.9	(ii)
Muingnaminne	Tralee	14.8	(ii)
Coomagearlahy 3 (Inchincoosh)	Coomagearlahy	32.5	(ii)
Flughland	Sorne Hill	9.2	(ii)
Knockawarriga	Trien	22.5	(ii)
Castledockrell	Castledockrell	41.4	(ii)
Garvagh 1 (Glebe)	Garvagh	26	(ii)
Garvagh 2 (Tullynahaw)	Garvagh	22	(ii)
Ballincollig Hill	Tralee	13.3	(ii)
Grouse Lodge	Rathkeale	15	(ii)
Rathcahill	Rathkeale	12.5	(ii)
Dromdeeven	Glenlara	28	(ii)
Tullynamoyle	Corderry	9.2	(ii)
Glenough	Cauteen	32.5	(ii)
Ballymartin	Waterford	6	(ii)
Kingsmountain 2 (Dunneil)	Cunghill	11.05	(ii)
Bawnmore	Macroom	25.3	(ii)
Caherdowney	Garrow	9.2	(ii)
Total Hierarchy (ii)		877.6	

Category (iii) Still Commissioning/Controllability Works Outstanding

- This group of WFPS will be selected in the event that re-dispatch of Category (i) and Category (ii) WFPS is not sufficient.
- There are 23 units in this Category:
 - 1 WFPS is still commissioning
 - 22 WFPS have outstanding controllability issues



Wind Farms Connected in Ireland

Wind Farm Name	Associated 110kV Station	Installed Capacity MW	Category
Carrowleagh	Glenree	36.8	(iii) Commissioning
Coomacheo	Garrow	59.8	(iii) Controllability Works Outstanding
Dromada	Dromada	28.5	(iii) Controllability Works Outstanding
Mountain Lodge	Ratrussan	31.5	(iii) Controllability Works Outstanding
Boggeragh	Boggeragh	57	(iii) Controllability Works Outstanding
Drumlough Hill 2	Trillick	10.2	(iii) Controllability Works Outstanding
Corkermore	Binbane	10	(iii) Controllability Works Outstanding
Black Banks 2	Corderry	6.8	(iii) Controllability Works Outstanding
Lackan	Moy	6.9	(iii) Controllability Works Outstanding
Loughderryduff	Binbane	7.65	(iii) Controllability Works Outstanding
Meenachullalan	Binbane	13.8	(iii) Controllability Works Outstanding
Raheen Bar 2 (Derrynadivva)	Castlebar	8	(iii) Controllability Works Outstanding
Taurbeg	Glenlara	25.3	(iii) Controllability Works Outstanding
Carraigcannon	Boggeragh	23	(iii) Controllability Works Outstanding
Cronelea 1	Carlow	6.9	(iii) Controllability Works Outstanding
Kealkil	Ballylickey	8.5	(iii) Controllability Works Outstanding
Knockastanna	Ardnacrusha	6	(iii) Controllability Works Outstanding
Mullananalt	Meath Hill	7.5	(iii) Controllability Works Outstanding
Tournafulla 1	Trien	7.5	(iii) Controllability Works Outstanding
Tournafulla 2	Trien	18	(iii) Controllability Works Outstanding
Coomatallin	Dunmanway	6	(iii) Controllability Works Outstanding
Gneeves	Knockeragh	9.35	(iii) Controllability Works Outstanding
Altagowlan	Corderry	7.65	(iii) Controllability Works Outstanding
Total Hierarchy (iii)		402.65 MW	

NB This does not include Pre Grid Code, exempt WFPS or Units <5MW

Process for Moving Categories

- Moving from Category (iii) to Category (ii)
- Moving from Category (iii) to Category (i)
- Moving from Category (ii) to Category (i)

Note: Issues arising from RTU and/or telemetry will be first analysed before a WFPS is requested to address non-performance that is not telemetry related. Any issue arising from TSO communications will not result in a WFPS moving categories



Moving from Category (iii) to Category (ii)

- Existing Category (iii) WFPS must complete controllability testing by December 1st 2012.
- Commissioning Units must prior to energisation agree a commissioning programme with the TSO. This includes:
 - An export capacity limit of 5MW will be applied locally by the WFPS at energisation. WFPS undergoes dispatch test(s) so to demonstrate controllability and increase export capacity access to the system.
 - The maximum allowable generation limit (dispatch test + 10MW).
 - When the last turbine is installed as per the agreed commissioning programme, the WFPS has **6 weeks** to complete Operational Readiness Confirmation.



Moving from Category (iii) to Category (i)

- The scenario applies to existing WFPS which have not successfully completed the Controllability Requirements by 1st December 2012.
- This scenario is where a unit which is in Commissioning Phase but has been unable to satisfy Controllability Requirements in the 6 weeks period following the installation of all turbines.



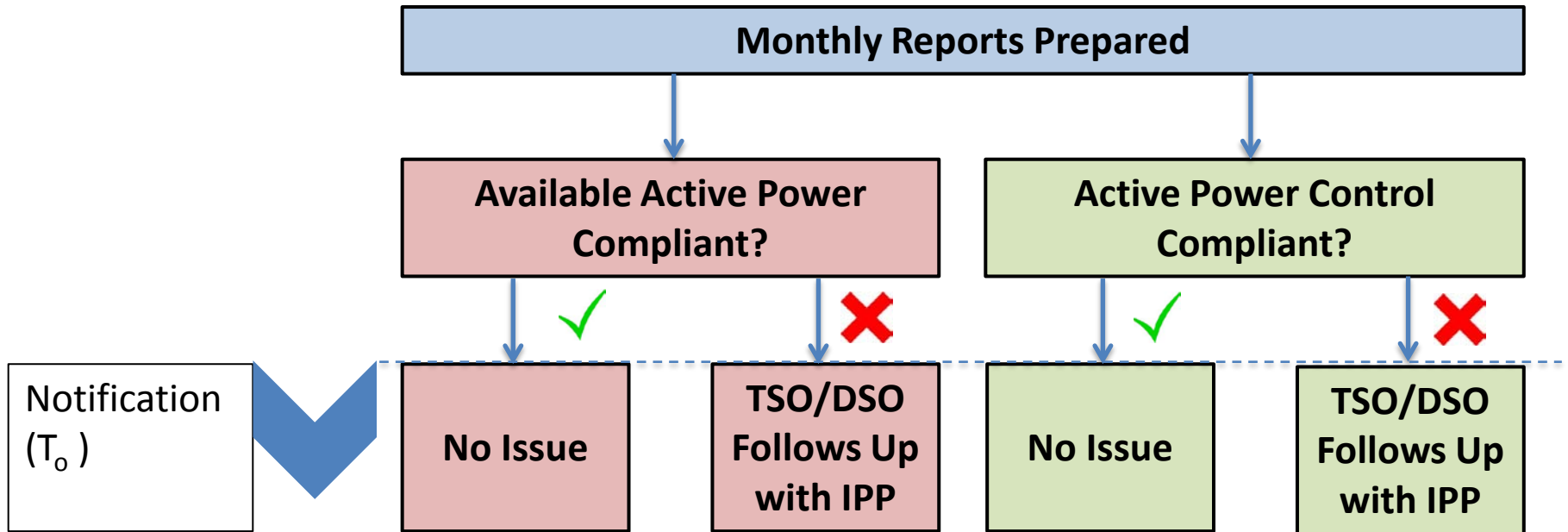
Moving from Category (ii) to Category (i)

Previously Controllable WFPS which is non-performing identified by:

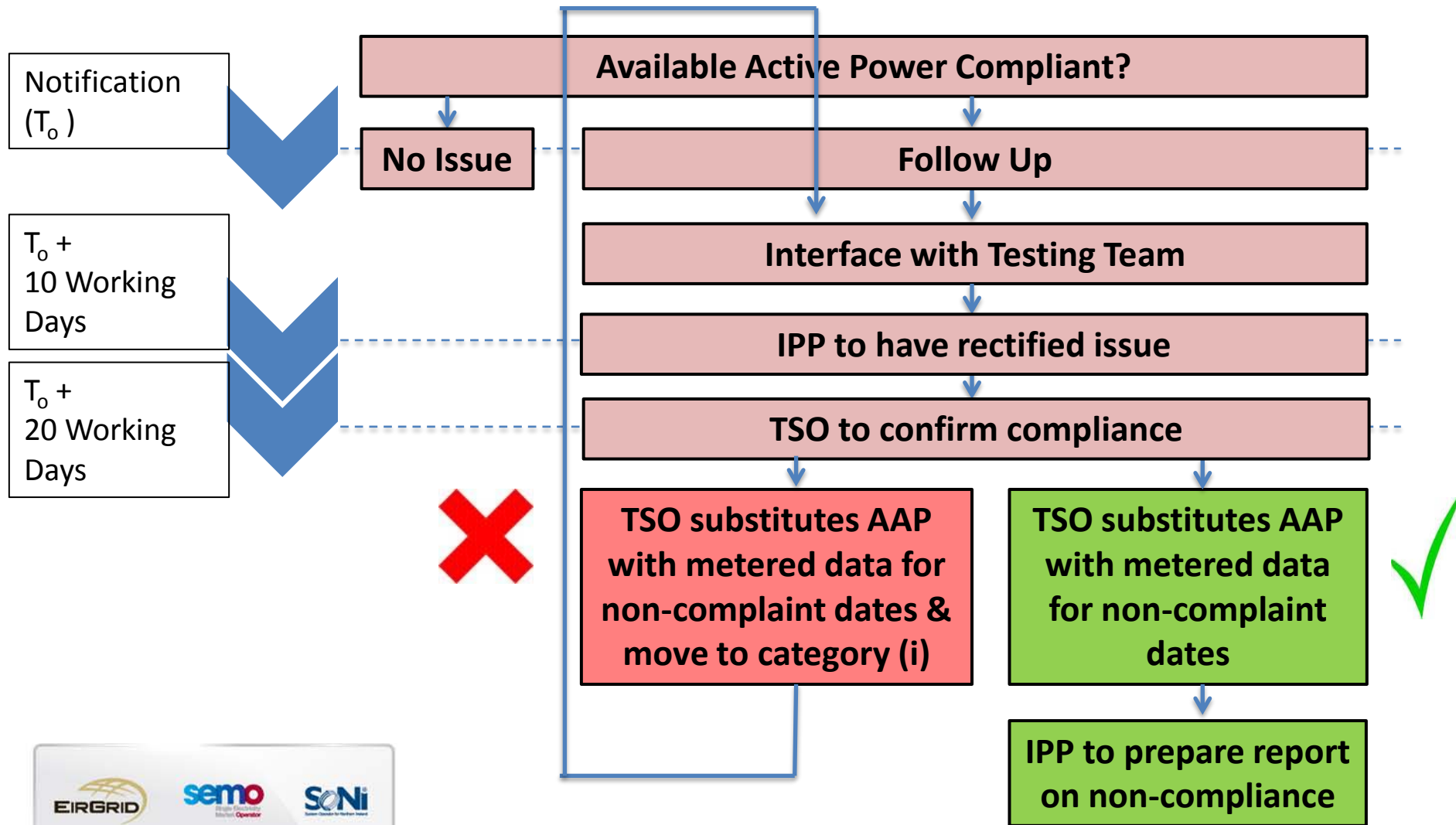
- Performance Monitoring
 - Testing
-
- For such cases identified as non-performing, the WFPS will be allowed **10 Business Days** to rectify the problem and confirm with the controllability requirements with the TSO.
 - At the end of the **10 Business days**, unless confirmed controllable through testing the WFPS will be categorised as category (i) and will remain in category (i) until such time as the controllability status has been restored, completes testing and is confirmed by the TSO.



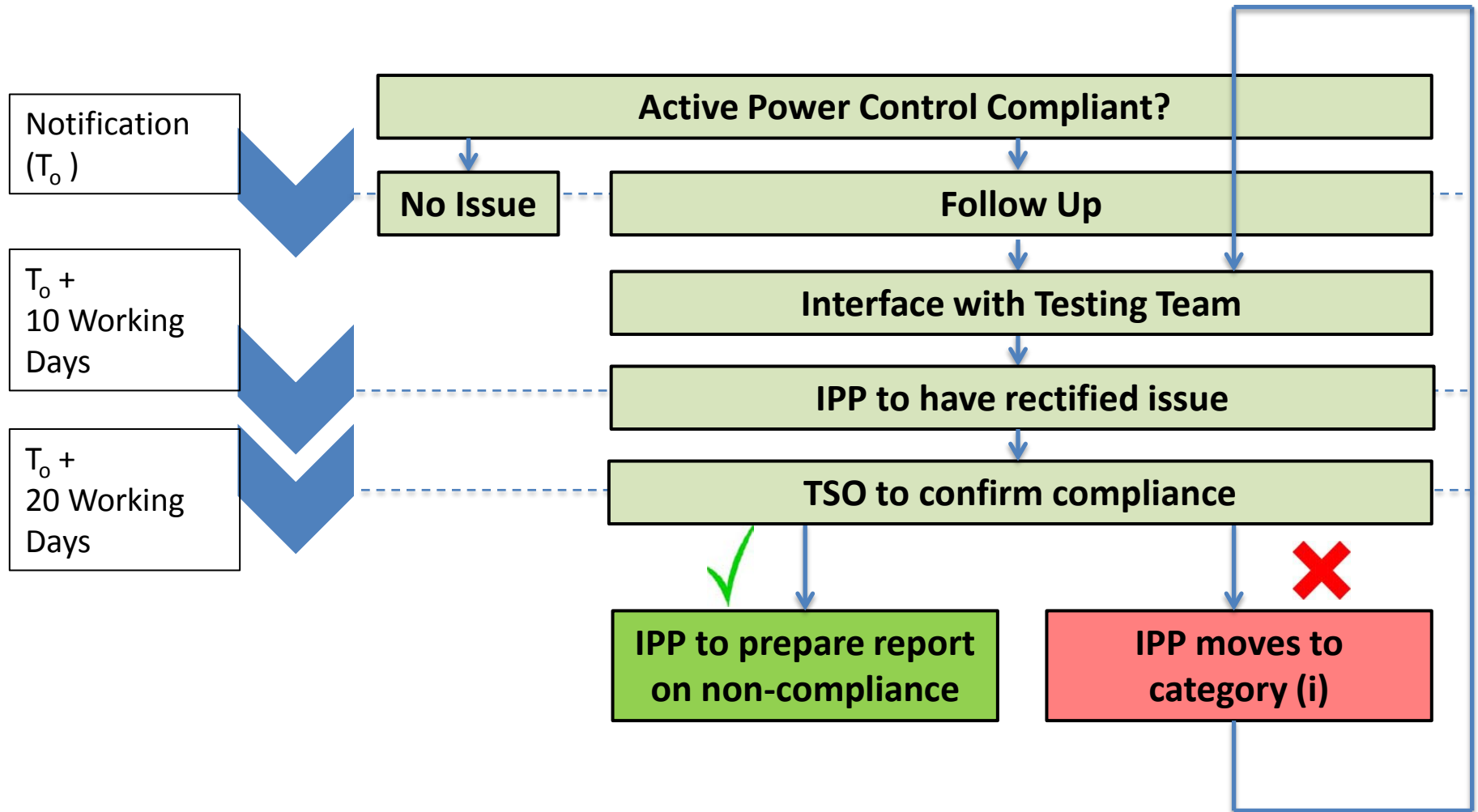
Performance Monitoring Process



Performance Monitoring Process



Performance Monitoring Process



Derogations

- Where a WFPS is considering applying for a derogation in respect of controllability
 - Must ensure that the derogation is raised with the appropriate System Operator (DSO or TSO) and Regulator (CER / UREGNI) at least 3 months before 1st December 2012.
 - This process must have concluded by 1st December otherwise the Wind Farm Power station in question will be moved to Category (i).
 - This applies to all legacy wind farms that were contacted in December 2011 by the TSOs and were informed of the 1st December 2012 deadline for proven controllability.



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Availability of Availability

Marie Hayden
9th August 2012



When “Availability” is not Available

- On occasions Availability Signals cannot be provided to the TSO in the normal approved manner
 - When the grid transformer or connection assets are out of service
 - When communications to NCC do not work – SCADA is not available
- Under specific circumstances a process is required to provide the TSO with this data

The purpose of this presentation is to outline a proposal for these situations and invite feedback



Presentation Overview

- Requirement to Provide Availability Information
- When and to Whom does this process apply
- Outline of the proposed process
- Feedback



Requirement to Provide Availability Information

- WFPS are required to provide the TSO with Availability data
- This data is used by the TSO for:
 - System Operation & Dispatch
 - Reporting
 - To provide SEM-O with outturn availability data for Settlement Purposes



Use of Availability in SEM

- SEM-O uses Availability data to calculate constraint payments when:
 - The unit is registered as a Variable Price Taking Generator (VPTG) *and*
 - The unit has a non-zero Firm Access Quantity *and*
 - There is a TSO dispatch instruction applied to the windfarm
- If the availability signal is not available then a 0MW value is issued to SEM-O and no constraint payments are made



When does this process apply

- It applies when the availability signal is lost as a result of outages of the Connection Assets scheduled by the TSO for the following reasons
 - To carry out transmission system development works
 - To carry out transmission system tests not related to the Windfarm in question
 - It also applies during unplanned (forced) outages of the Transmission System Connection Assets
- It only applies to WFPS who are eligible to receive constraint payments in SEM
 - Must be registered as Variable Price Taker Generation Unit and have a non-zero Firm Access Quantity



Requirements of the process

- The process must:
 - Result in the provision of accurate availability information to the TSO
 - Be implementable
 - Be non-discriminatory
 - Be timely
 - WFPS must have prior notification of outages
 - Data must be provided in accordance with SEM deadlines
 - Be auditable
 - TSOs must be able to derive conclusions about the accuracy of the data
 - TSOs must have the right to witness the process in action
 - TSOs and WFPS must maintain records



Summary of Process

- Planned outages - 4 Phases outlined on the following slides
 - Notification
 - Data Collection – *with and without met masts*
 - Data Submission
 - Completion
- Unplanned Outages
 - Difference in notification and data collection from planned outages



Notification Phase

- TSOs notify WFPS of forthcoming outages
 - Notification takes place annually in March
 - Confirmation of start and end dates takes place 2-3 weeks before outage
- WFPS confirms readiness to provide Availability data in accordance with agreed procedures
- TSO Issues Dispatch Instruction (Constraint) to 0MW when outage commences



Planned Outages Data Collection Phase:

Using Operational Met mast or anemometer data

- WFPS utilises on-site met masts/anemometer to collect wind speed and direction data
- WFPS converts this data into half hourly MW Availability data utilising
 - OEM Power Curves **and / or**
 - Historical Correlation data
- WFPS adjusts data for mechanical availability of its own turbines



Planned Outages Data Collection Phase:

No Operational met mast or anemometer available

- If met masts do not exist or are unavoidably unavailable then the following option is proposed
 - WFPS uses neighbouring wind farm data as a basis for calculating availability
- It will be the WFPS obligation to gather this information from the neighbouring windfarm
- It will be the WFPS obligation to derive reasonable estimates for availability at its site using this data



Submission Phase

- WFPS submits data via e-mail on the first day after the outage and for each day until the outage ends (by 10am on D+1)
- TSO reviews and submits acceptable data to SEM-O
- If TSO does not accept the data no data is submitted to SEM-O until the query is resolved between TSO and WFPS



Completion Phase

- TSO removes Dispatch Instruction to 0MW when outage concludes
- WFPS submits data by 10am on D+1 for the hours up until the time the grid connection was restored
- Any data queries or settlement queries are raised by the participant directly with SEM-O
- Where appropriate re-settlement occurs in accordance with the provisions of the Trading and Settlement Code.



Unplanned Outages

- As soon as is reasonably practicable the TSO notifies the WFPS of an unplanned outage and the expected duration of the outage
- Outage is expected < 2 days
 - WFPS may propose utilising neighbouring windfarm data in deriving availability data for the windfarm forced off the system.
- Outage is expected > 2 days
 - WFPS shall make the necessary arrangements to utilise the met mast to provide availability data.
- Submission and completion phases are as for Planned outages



Thank you for Listening

- Draft Process is Posted on EirGrid Website Under General Publications - <http://www.eirgrid.com/aboutus/publications/>
- Feedback is welcome today or by e-mail to PSOP@eirgrid.com
- Any Comments



Q&A



Thank you for your Attention

This presentation will be available over the coming days at www.eirgrid.com

