

DS3 Programme Status Update

09/04/13



Background – DS3 Programme

Shaping the power system of the future

System Services
Performance Monitoring
Grid Code
Demand Side Management



Frequency Control
Voltage Control
Renewable data
Rate of Change of Frequency

Studies & Model Development
Control Centre Tools
Wind Security Assessment Tool



System Performance



DS3 System Services Review

3 public consultations completed

1. Initial Information Gathering [COMPLETE]
2. Detailed New System Services product proposals [COMPLETE]
3. Financial Arrangements - remuneration, contractual arrangements [COMPLETE]
4. Recommendations Paper to RAs [UNDERWAY – Early Q2 2013]
5. Draft Decision by RAs [Q2 2013]
6. Full High Level Decision [Q3 2013]



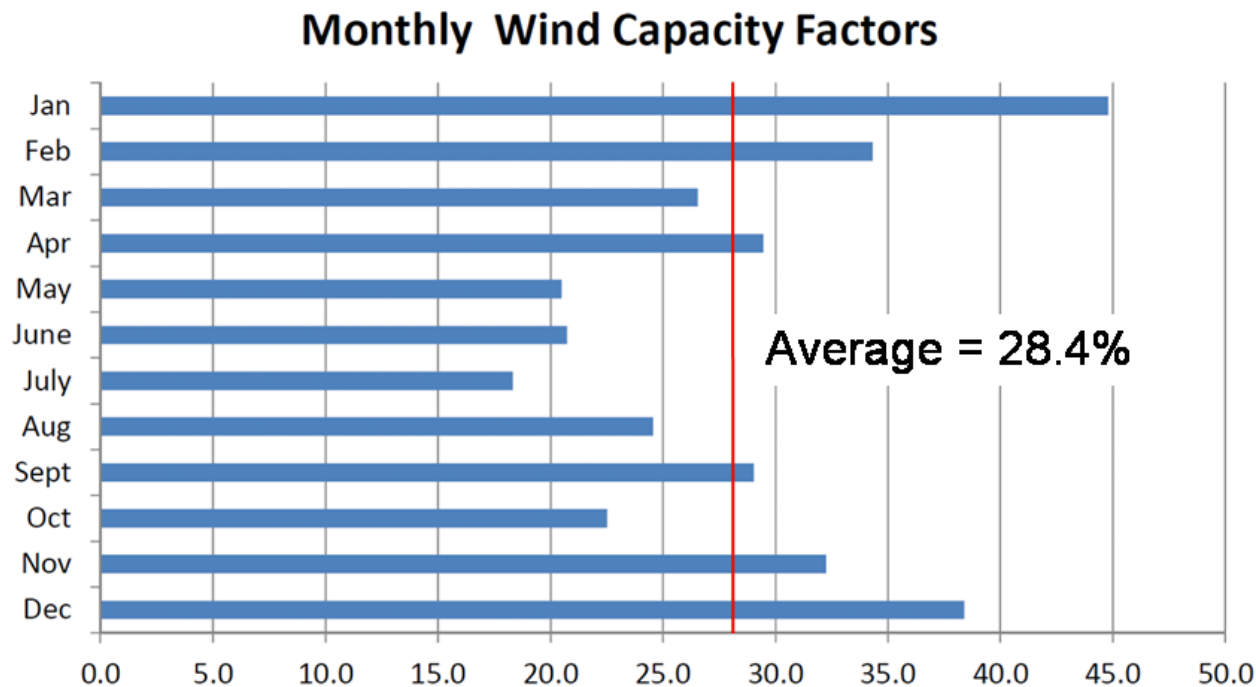
Demand Side Management

- Phase out of WPDRS complete
- 2 DSU operational (54 MW)
- Review of Grid Codes almost complete
 - Consultation planned for Northern Ireland in Q2 2013.
- Trialling of a new communications interface between Control Centres and DSU
- Issue with licensing for DSU in Northern Ireland
- Commenced DSM Demonstration project with Glen Dimplex



Renewable Data

- All-island Wind Record 18/12/12 – 1875 MW
- 2012 Curtailment Report
 - under development



System Tools



Control Centre Tools

- Wind Dispatch Tool Development
 - In line with SEM-13-010
 - Capability for Curtailment Reporting
- New plan published for workstream
- Managing Renewables in the Control Centres
 - Optimising control and visualisation
- WSAT operational in both Control Centres
 - Further developments to investigate frequency stability planned



Modelling and Studies

- Minimum Generator Study underway
 - Maintaining standards for transient stability, voltage stability, transient voltage stability, sufficient voltage control reserve, frequency stability, transient voltage stability
 - Ensuring ramping capability of the power system
 - snapshots of daily minimum load selected from three summer months 2012 at periods with highest wind
- Distributed Voltage Control study underway
 - Investigation of operating modes for wind farm clusters
- Generic wind farm model development
 - To include Grid Code modifications (frequency response and fault ride through)



Modelling and Studies

- Further Facilitation of Renewables studies
 - Developing methodology for automation
 - Dependent on output of System Services, Grid Code workstreams
 - Will use new models developed
- Assumptions
 - Assumptions will be developed in Q2 2013
- Model Validation
 - Actual Performance relative to model performance

In the Control Centres....

- Largest Single In-Feed & RoCoF Policy
 - if the MW's from the largest in-feed are too high, losing the Largest In-feed could mean that the RoCoF was rapid enough to trip off of DSO windfarms by ROCOF protection, causing the frequency to decrease even further.
 - The EMS will alert Control Centre operators when system inertia is below a threshold
 - Calculation of inertia by operators and reduction of size of largest in-feed if required
- SNSP Policy

$$SNSP (\%) = \frac{\text{Non-Synchronous Generation} + \text{Net Imports (Moyle + EWIC)}}{\text{Demand} + \text{Net Exports (Moyle + EWIC)}} \times 100$$



In the Control Centres....

On-line Wind Security Assessment Tool(WSAT)

- WSAT was installed in Dublin in 2010
- All Island WSAT was launched simultaneously in both Control Centres in Dublin and Belfast in November 2012
- Probably one of the first multi-jurisdictional tools in the world
- WSAT runs every 15 minutes 24/7 and assesses the Transient and Voltage Security of the power system in near real time for the **Real** case, **Wind increase** cases, and **Load increase** cases.



On-line WSAT Summary

WSAT provides a guidance how to operate a system with increasing wind generation by assessing the

Transient stability and

Voltage stability of the power system in ***Real case***

and by applying the stress tests on the system model in a form of ***Transfers*** for

- **Wind Increase** and/or
- **Load Increase**

to see at what levels of **wind** and/or **load** voltage security criteria are starting to become violated thus establishing

Secure levels of Wind and/or Load



WSAT Results

- With current levels of wind to date no wind-related issues with Transient and Voltage Stability were identified.
- If a problem is reported the Grid Controller will decide on an appropriate response
- WSAT as set at present is the last line of defence against Transient and Voltage instability.
 - How the system is broadly operated is determined in offline studies
- Note: WSAT as set at present does not account for insufficient plant flexibility: specifically for active and reactive power ramping requirements.

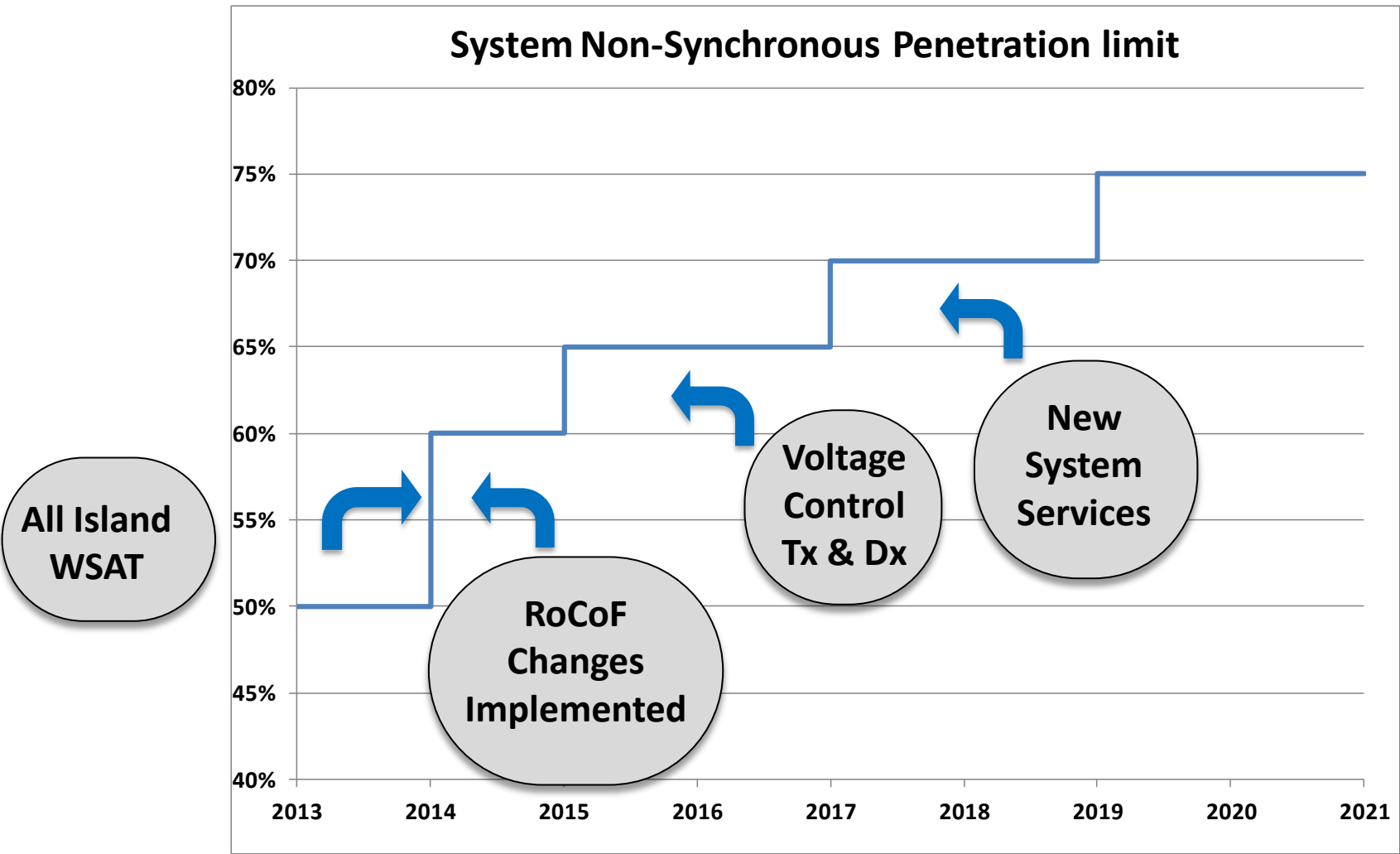


The past 18 months.....

- **Steady Progress on System Services**
 - Independent Consultant review period
 - Extended Consultations
 - Industry Engagement
- **RoCoF discussion and issues**
 - Lengthy discussions
 - Cost issue still outstanding
 - Difficult to work toward a solution for all parties
- **Grid Code Wind Farm Modifications**
 - Great progress made
- **Challenge of aligning all island position**
 - Different Grid Codes
 - 2 Regulatory Authorities



Operational Limits on Renewable Generation



DS3 Programme Outlook

- Project will evolve over the coming months
 - Enhanced role for the RAs
 - Progress for certain workstreams is dependent on output of DSOs work
 - Progress is dependent on decisions on System Services, RoCoF etc.
 - Move toward implementation of change in operational policies





DS3

Grid Code



Grid Code

- All RoCoF Modifications submitted to RAs - Dec 2012
 - All island standard of 1 Hz/s averaged over 500 ms is proposed
- Wind Farm Modifications

	Ireland Grid Code	Northern Ireland Grid Code / Settings Schedule	Ireland Distribution Code	Northern Ireland Distribution Code
Reactive Power Control Modes	Approved by CER – Feb 2013	TSO input complete – with UREGNI for approval	Mods being drafted	T&D Settings Schedule with UREGNI. D-Code Mods required
Steady State Q Capability	Approved by CER – Feb 2013	TSO input complete – with UREGNI for approval	Mods being drafted	T&D Settings Schedule with UREGNI. D-Code Mods required
Fault Ride Through	Approved by CER – Feb 2013	TSO input complete – with UREGNI for approval	Mods being drafted	T&D Settings Schedule with UREGNI. D-Code Mods required

GC Modifications

- Scope of WFPS Settings Schedule
- Glossary Terms
 - 3 different Ramp Rates added
 - “Fast Acting” term defined
- Modelling Requirements
- Voltage Control/Reactive Capability
- Fault Ride Through Capability
- Frequency Control
- Compliance Certification



Proposed RoCoF Modifications

All Island RoCoF Modification

- RoCoF Standard of 1 Hz/s measured over 500 ms.

Northern Ireland RoCoF Modification

- Initial requirement of 2Hz/s was requested.
- Considering concerns of generators and awaiting further studies a requirement of 1Hz/s has been proposed.

Grid code modifications in Ireland and N Ireland submitted to NIAUR and CER for approval on 21st December 2012.



Progress to date

Industry Interactions

- Significant discussions as part of the Joint Grid Code working group.
- Joint Grid Code Working Group paper developed - position of all parties.

TSOs

- Have developed and published a TSOs' Opinion paper.
- Grid code modifications proposed to the Regulatory authorities.
- DNV Kema report commissioned on impact of RoCoF on conventional generators.

DSOs

- Both DSOs have undertaken separate studies to assess the impact of increased RoCoF standards, the full findings have not been shared with the TSOs.

Regulatory Authorities

- Conventional generators have been asked to give an indication of the cost associated with the impact assessments they believe are required on their plant and equipment in order to meet the RoCoF requirements.
- Decision required on the TSO RoCoF Grid code modifications.



RoCoF Timeline

Q2 2013	Decision on RoCoF Modifications by Regulatory Authorities.
2013	Decision on conventional Generators' OEM studies.
2013/2014	DSOs' implementation plan
2013	Conventional generators either start OEM studies or seek derogations (dependent on regulatory decision).
2014	Testing and analysis of RoCoF capability.

Grid Code – Next Steps

- Distribution Code Modifications need to be progressed
 - IE Distribution Code meeting scheduled for 9th April
- DSU and Dynamic Model modifications in progress
- Review of Network Codes underway
- Testing Guidelines (Ireland) under development for wind farm modifications
- Further Joint Grid Code Working Group Meetings will be scheduled as required



Outstanding issues – Grid Code

- Date for finalisation of DSO reports.
 - Will require further discussions with the TSOs.
- Regulatory input on the cost recovery for generators.
- Regulatory decision required on Grid Code proposals.
- TSOs cannot move from present 50% SNSP level until resolution of the outstanding RoCoF issues.





RoCoF Assessment – DNV KEMA

- The following is a link to the DNV KEMA RoCoF report:
<http://www.eirgrid.com/media/DNVKEMARoCoFReport.pdf>
- Presentation is separate



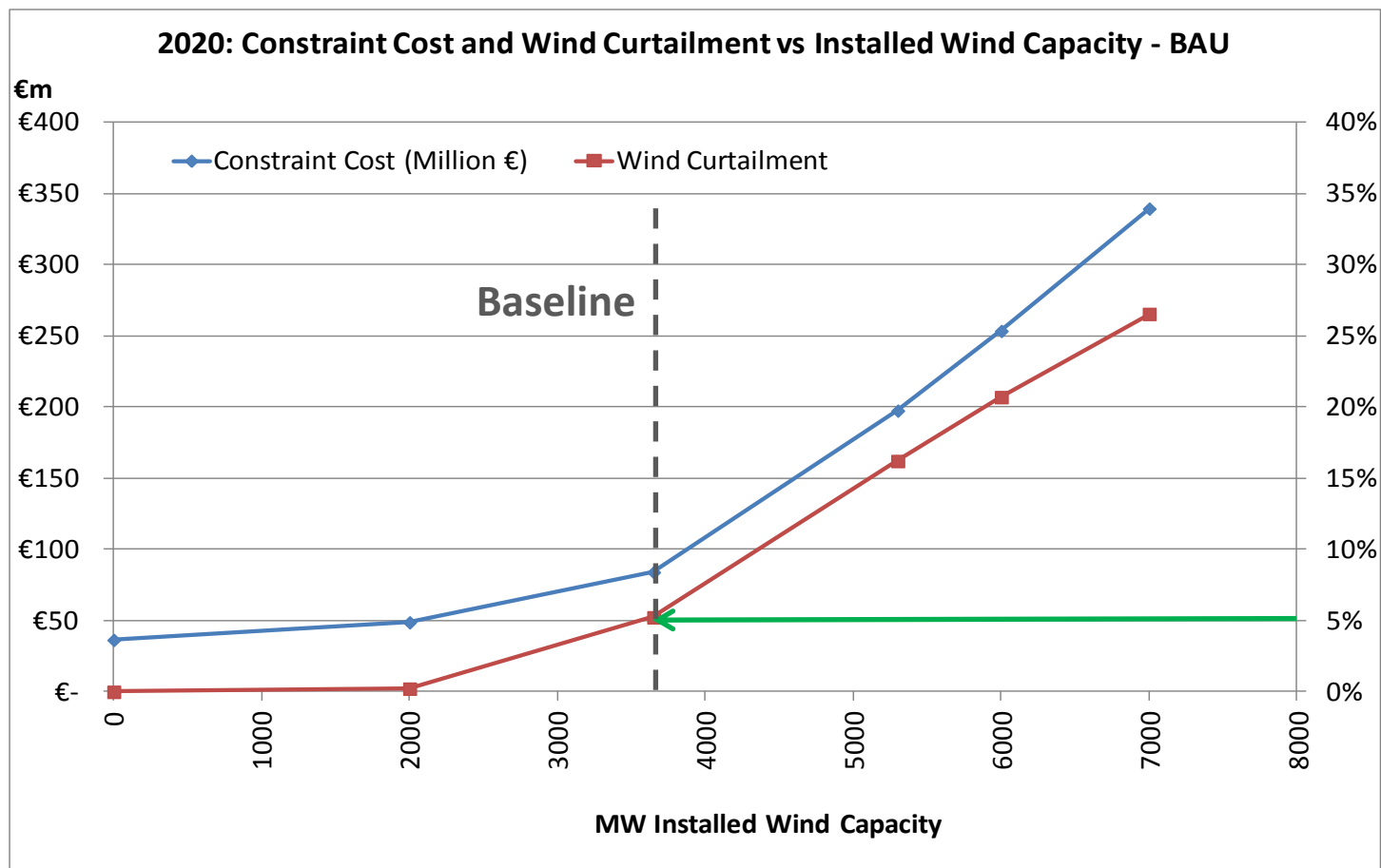
System Services



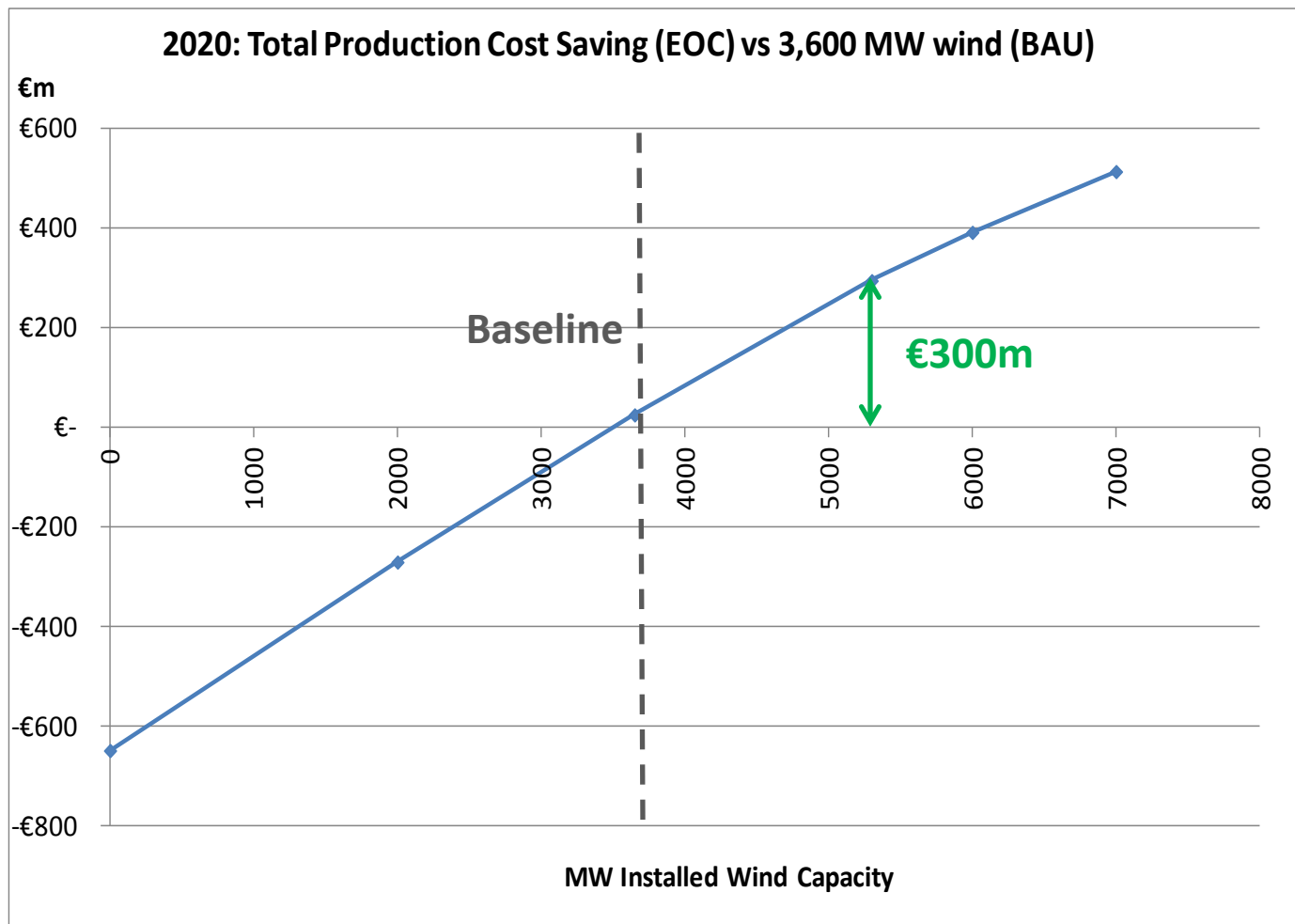
Third Consultation Paper: Finance

- Value-based approach
 - Valuation methodologies
 - Proposed valuation
- Allocation of money between consumers and products
- Remuneration Approach – dispatch-dependent
 - Illustration for typical generators
 - Impact on Capacity Mechanism
- Proposed contractual arrangements
- Link to Grid Code: modifications and compliance
- Final Product Designs
 - Including worked example

Valuation from production costs studies



Valuation from production costs studies



Allocation of System Services funds

- Benefit allocation between consumers and providers
 - SEMC decision
- Allocation between products
 - Four methods considered: pro rata → optimisation
- Propose that allocation mechanism fixed to provide degree of certainty
 - Long-term (8-12 years)

Significant Response

System Services Third Consultation

- 20 bilateral meetings held
- 26 responses received
- Broad consensus from respondents
 - Valuation approach
 - Allocation method
- Significant concerns
 - Revenue sufficiency
 - Impact on Capacity Payments
 - Length of Contract
 - Dispatch vs. Capability



Next Steps

- April - TSO Recommendations paper including response to consultation and detailed modelling results to the RAs
- June - SEMC proposed decision
- Sep - SEMC High level decision

Phase 2 Begins:

- Contract design
- System Build
- Performance monitoring
- Rate determination
- Operational Date 1st Oct 2015





System Services Capital Costs Assessment – DNV KEMA

- The following is a link to the DNV KEMA System Services Capital Cost report:
http://www.eirgrid.com/media/DNV_KEMA_Report_on_Costs_of_System_Services.pdf
- Presentation is separate



Performance Monitoring & Testing



System Services
Performance Monitoring
Grid Code
Demand Side Management



Frequency Control
Voltage Control
Renewable data
System inertia

Models Development
Control Centre Tools
AI Wind Security Assessment Tool



Performance Monitoring - Justification

- The TSOs have an obligation to carry it out under the Grid Codes
- The TSOs in both jurisdictions have always monitored the performance of the plant they dispatch
- The basis of secure and economic system operation relies on the expected plant performance to match actual performance
- The changing plant portfolio requires a greater degree of plant performance from conventional plant and introduces a large element of non synchronous generation (greater uncertainty)

Current Monitoring Process

- Ad hoc approach – as and when required
- Manual observation of plant
- Limited systematic monitoring e.g.
 - Generator loading / de loading automatically recorded and analysed for GPI purposes
 - Post event reserve analysis

Benefits of Current Approach

- Feeds into Operational Policy e.g. understanding of actual Operating Reserve (OR) performance so changes to OR policy
- Dispatch Balancing Costs (DBC) is closely aligned with Performance Monitoring e.g. minimum generation

	Improvement	Disimprovement	Net Change
Contracted POR (MW)	55	47	+8
Contracted SOR (MW)	38	104	-66
Contracted TOR1 (MW)	43	88	-45
Contracted TOR2 (MW)	33	85	-52
Contracted RRA (MW)	44	5	+39
Minimum Load (MW)	408	25	+383
Minimum Generation (MW)	358	0	+358
Reactive Power Lagging (MVar)	150	0	+150
Reactive Power Leading (MVar)	261	0	+261

Scope of Enhanced Monitoring Process

- Standardise and harmonise the performance monitoring and testing processes
- Systematic approach to monitoring
- Transparent for generators and improved communications
- Monitoring of new System Service products
- Investigate use of improved data
- Use data to validate dynamic models



Progress to date

- Internal project approval granted
- High level Requirements for Enhanced Performance Monitoring developed in Q4 2012
 - Data
 - Analysis
 - Reporting
 - Functional Spec



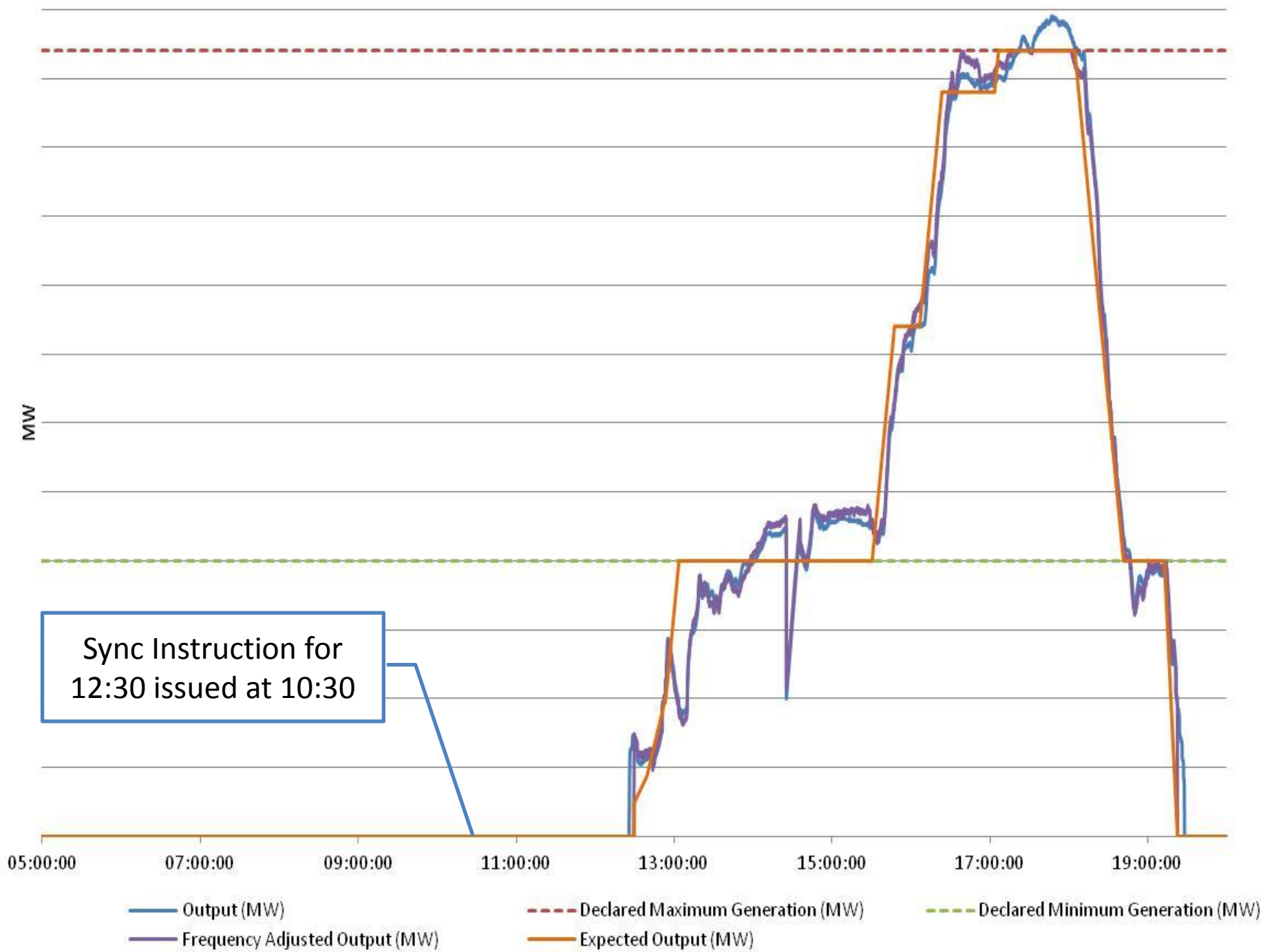
Proposed Data Requirements

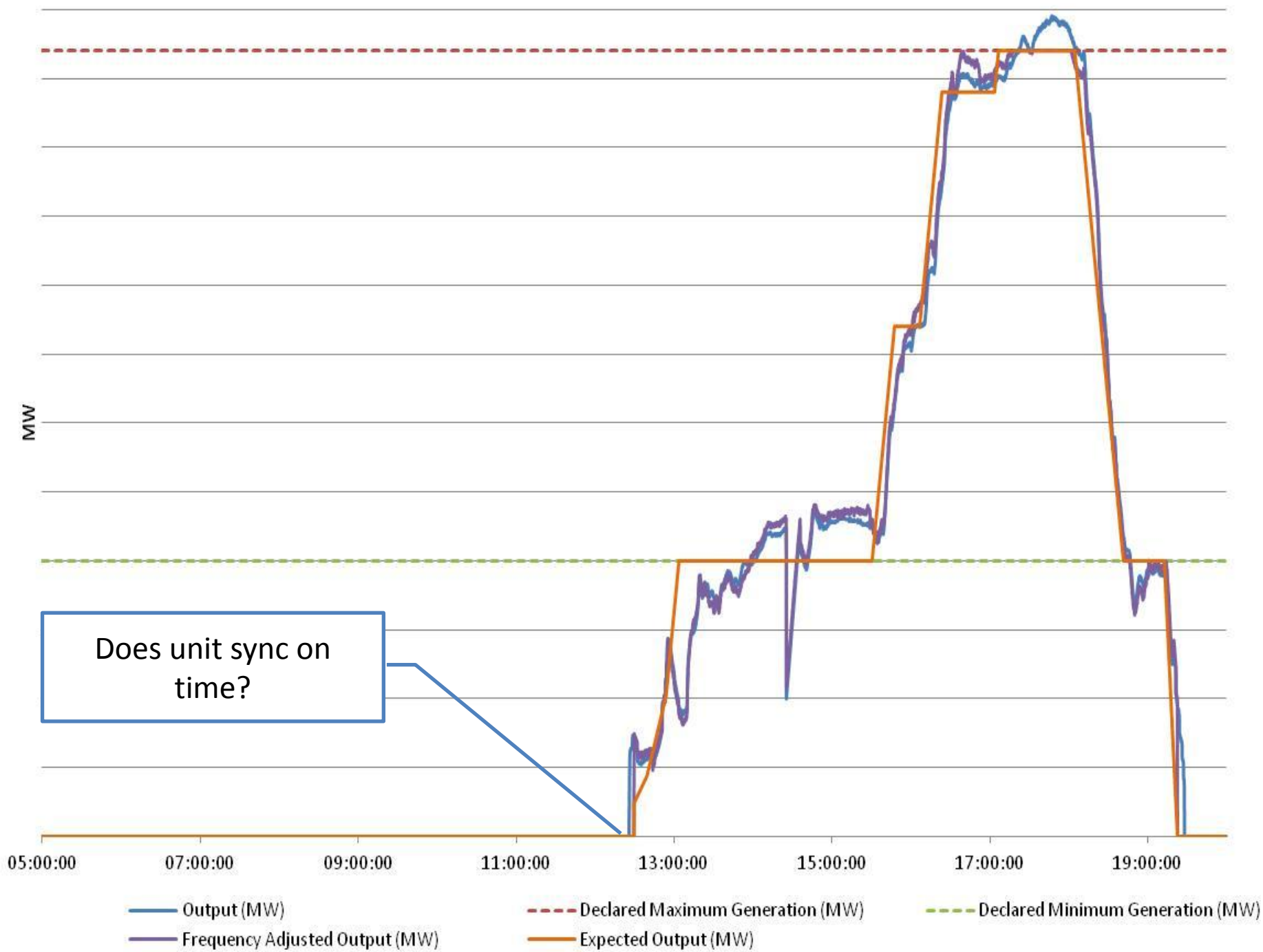
- Use existing Electronic Dispatch Instruction Logger (EDIL), Technical Offer Data (TOD), SCADA, metering
- Develop business case for use of high speed data recording (0 – 15 second monitoring)
 - Fast Frequency Response
 - Fast Post Fault Active Power Recovery
 - Dynamic Reactive Power Capability
- Will be shared with customers
- Will feed into System Services settlement for new products

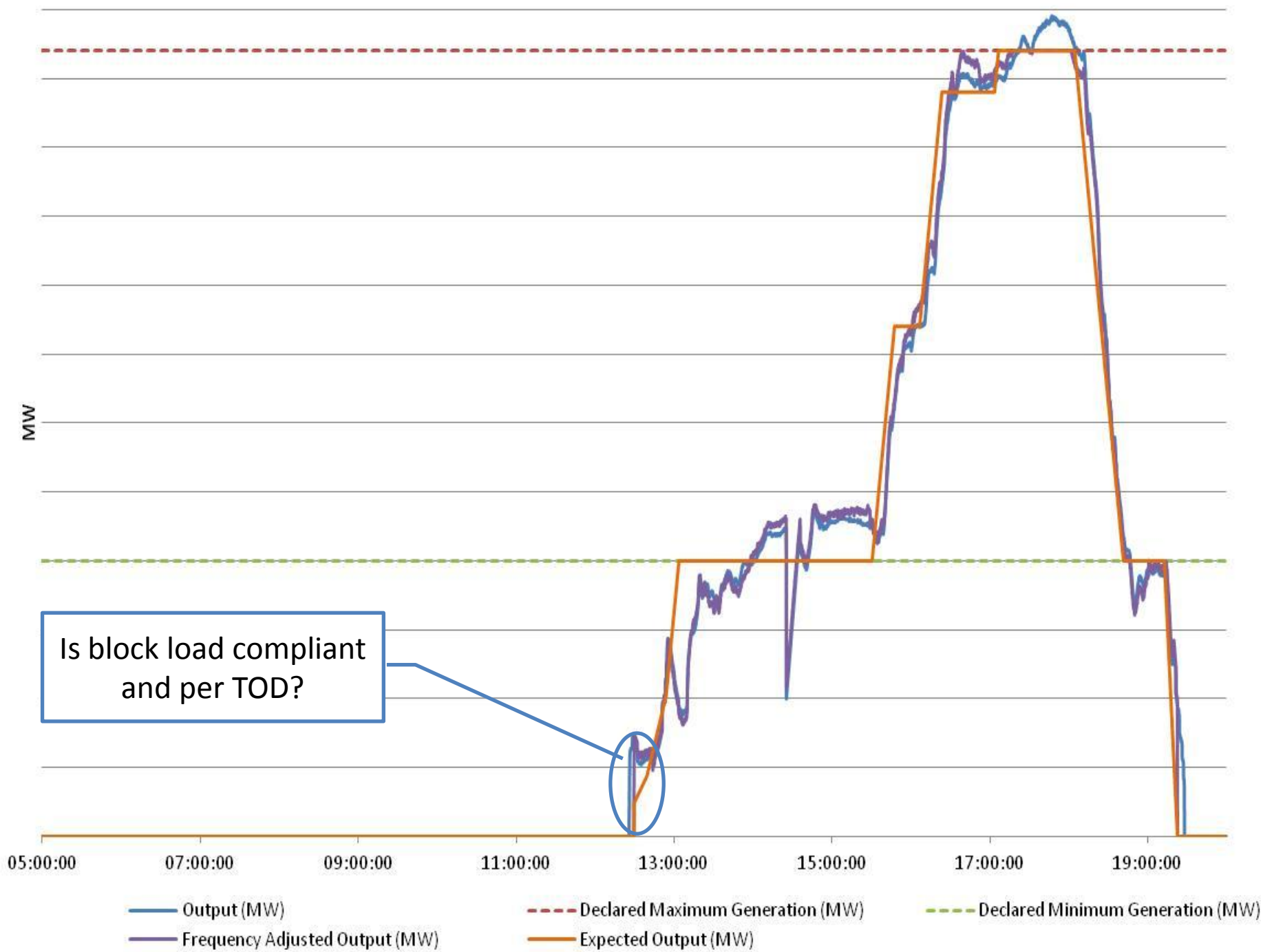


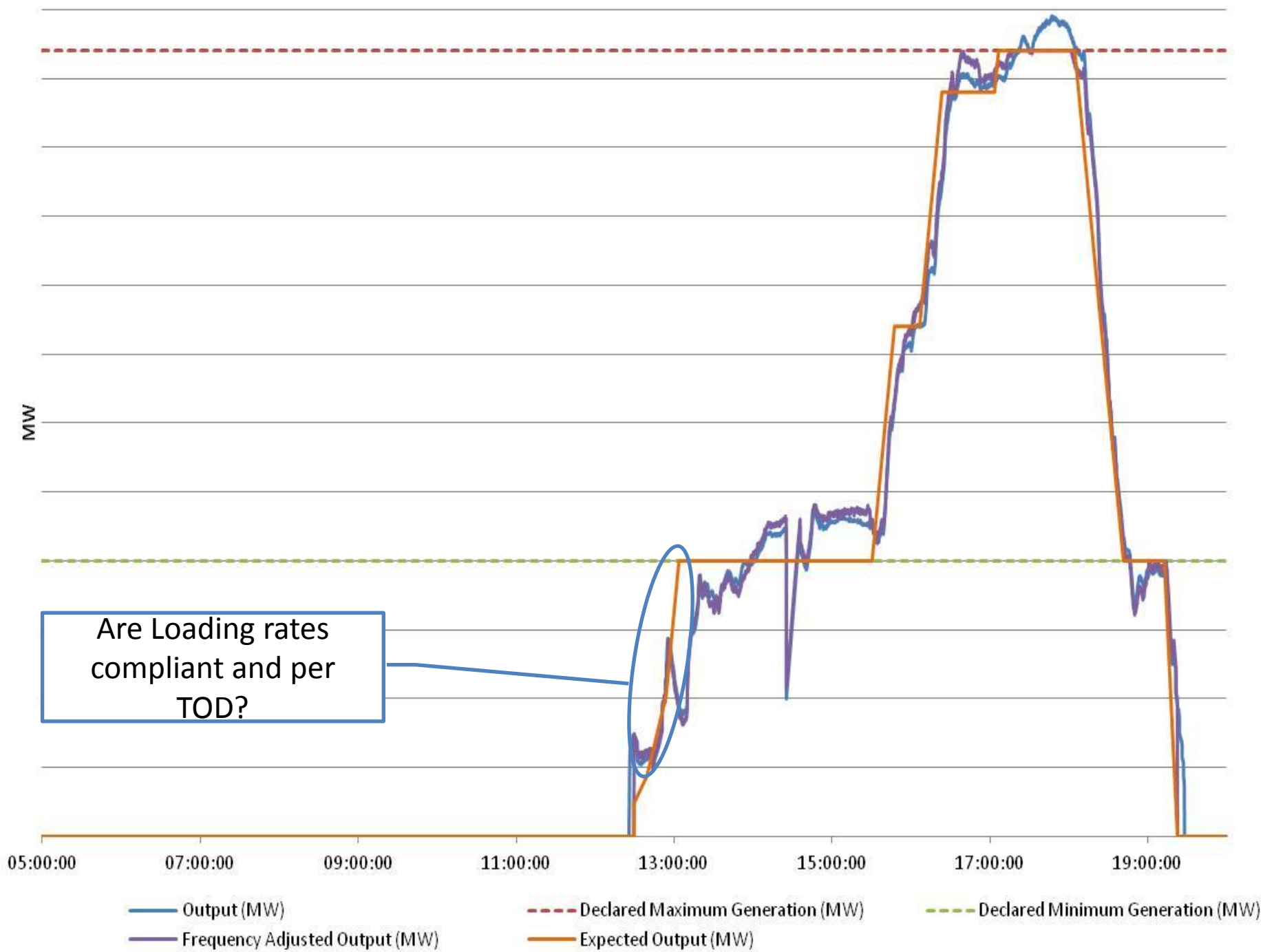
Proposed Analysis

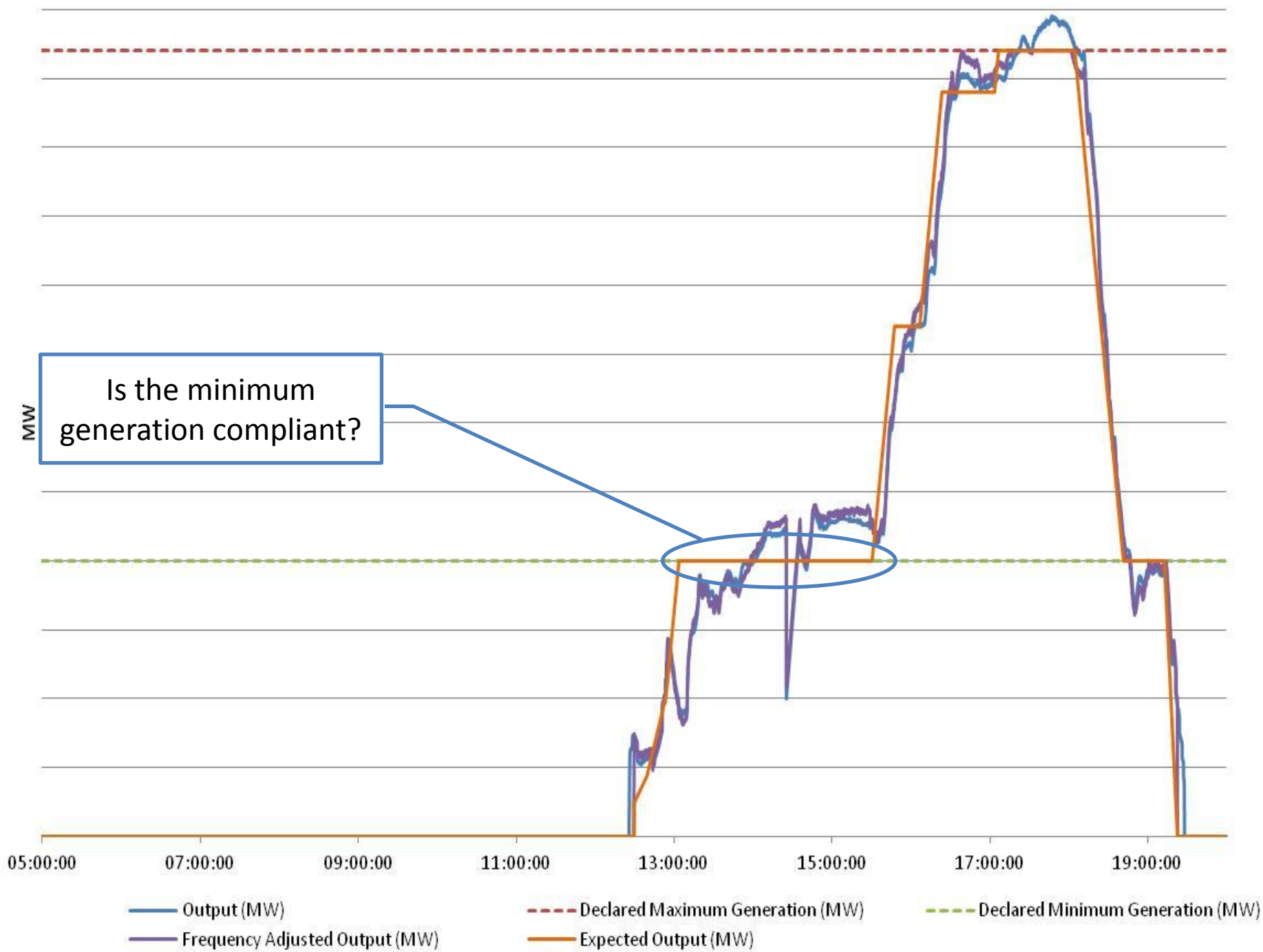
- For conventional, wind, interconnectors, DSUs, AGUs:
 - Active Power (Sync to Desync)
 - Availability (is unit declaring per capability curves, windfarm signal quality, etc)
 - Reactive Power Performance (is unit following dispatched value, etc)
 - Frequency response
- Sample Active Power....

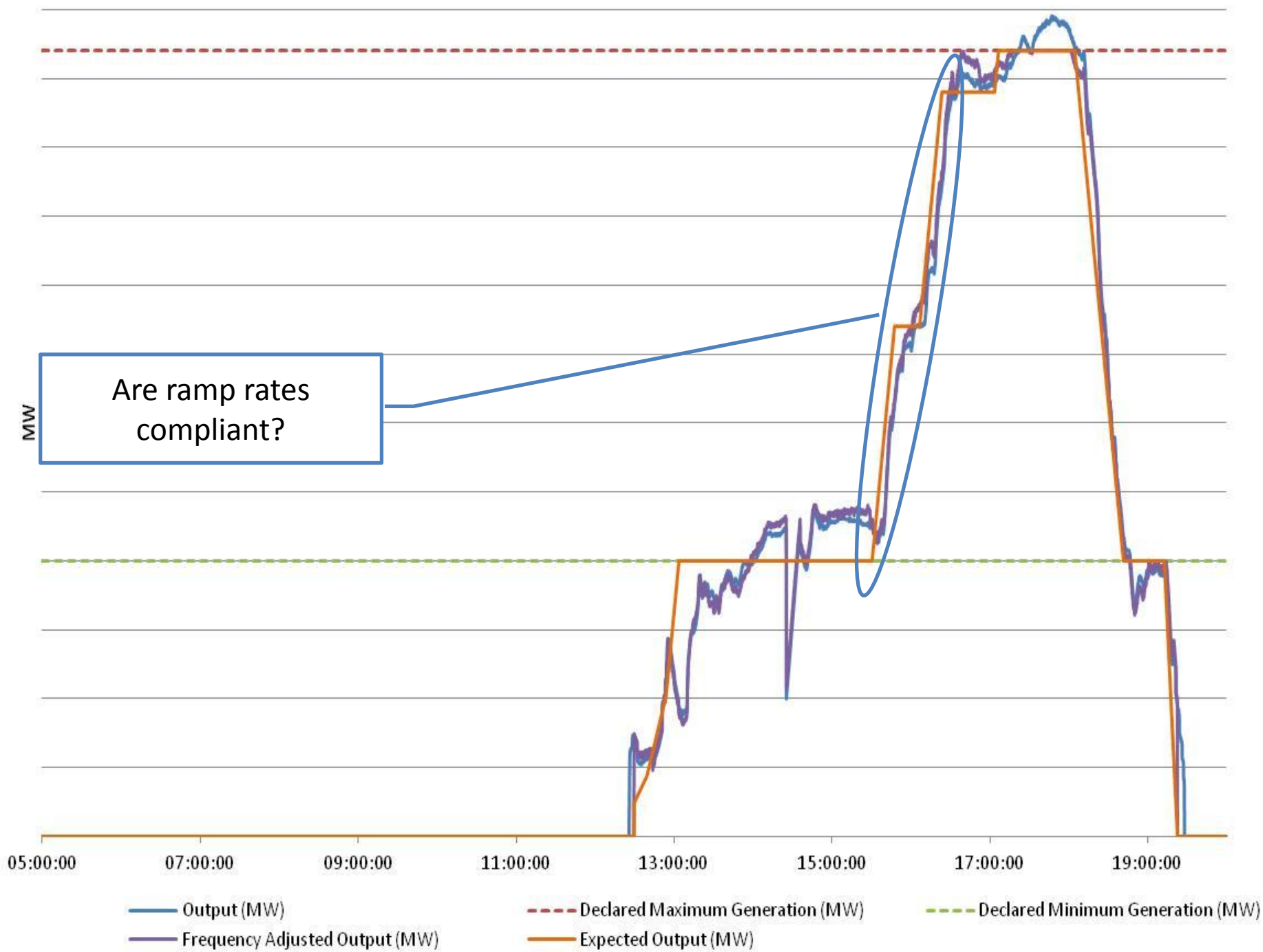


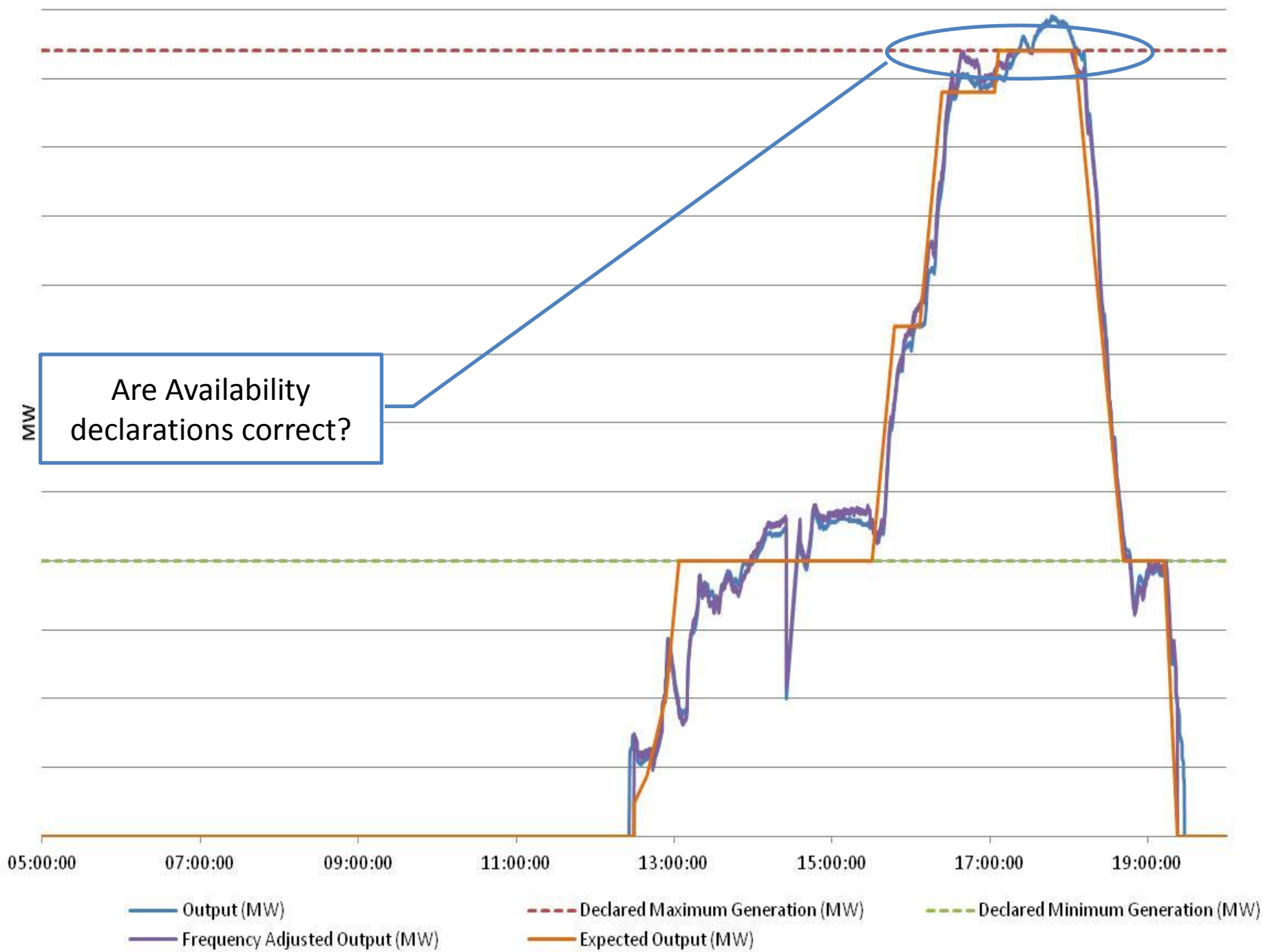












Proposed Reporting

- Web based Graphical User Interface
- Generators can download data and reports
- Removes need for emails
- Events and data as close to real-time as allowable
- Closes the loop



Next Steps

- Currently developing detailed business requirements specification
- Business case for high speed recorders (~300 recorders at 150 sites in 2020)
- Industry Briefings being arranged for beginning June:
 - Discuss proposed designs in detail
 - Feedback on these designs will be invited at the briefings
 - Looking for expressions of interest from generators to be involved in testing solution once developed
 - Invitations to follow shortly
- Tender and develop IT application



Testing & Commissioning

- Four all-Island workshops held with Industry
- Recommendations published on websites
- TSOs currently developing implementation plan for delivering recommendations
 - An update will be made on plan at the JGCRP on 1st May
 - A number of sample test procedures and reports for conventional units will be published in June for comment
 - The full implementation plan will be published in June

Testing Philosophy

- Testing will be either by physical demonstration or model verification through compliance monitoring
- Grid Code compliance will be assessed :
 - at application stage
 - commissioning of the unit
 - via performance monitoring
- Models need to be updated to reflect the unit performance
- All tests will be carried out at a wind farm level.



Fault Ride Through & Dynamic Reactive Power Capability

- No physical testing planned
- Any turbine Type Tests carried out should be submitted to the TSOs
- Requirement for dynamic models at time of application,
 - Studies carried out to verify Grid Code compliance
- Compliance monitoring will be carried out through ongoing performance monitoring
- Models will need to be updated if required (and re-submitted) post commissioning
- Enhanced performance monitoring systems will monitor compliance against the Grid Code requirements utilising high speed data

Reactive Power & Frequency Response

- Static Reactive Power tested by demonstration
- Frequency Response will be tested via a frequency injection signal
- Test Procedures will be developed



Update on Next Steps

Treatment of Curtailment in Tie-break situations



Market

- No changes to Market Payments until January 1st 2018
 - no changes necessary to SEM payments
 - changed policy to be incorporated into Target Model market
 - consideration may be necessary in Target Model rules for different arrangements for the period December 31st 2016 to December 31st 2017
- Changes to TSO constraint/curtailment rule-set should not impact SEM
 - unless some new combinations of dispatch instructions are proposed which would impact the Instruction Profiler



Curtailment Reporting

Curtailment Report 2011 and 2012 (due to be issued)

- Legislative requirement (and subsequent regulatory direction) on TSOs to report on significant levels of curtailment and to report on measures in place to minimise curtailment (DS3)

SEM – 13-012

- Action on TSOs to produce a reporting template by Q2 2013
- Having a first meeting of relevant stakeholders the end of April
- Will include representatives from wind, hydro, biomass, CHP sectors..



Control Centre Tools

SEM 13-010

- Design and Implementation of systems underway to support this
 - Implementation of new EMS wind dispatch tool to comply with requirements
 - Scoping in progress with Alstom
 - Developing a prototype to trial implementation of logic
 - Due to be delivered in Q2 2014





SO Interconnector Countertrading

8th April 2013

Simon Tweed



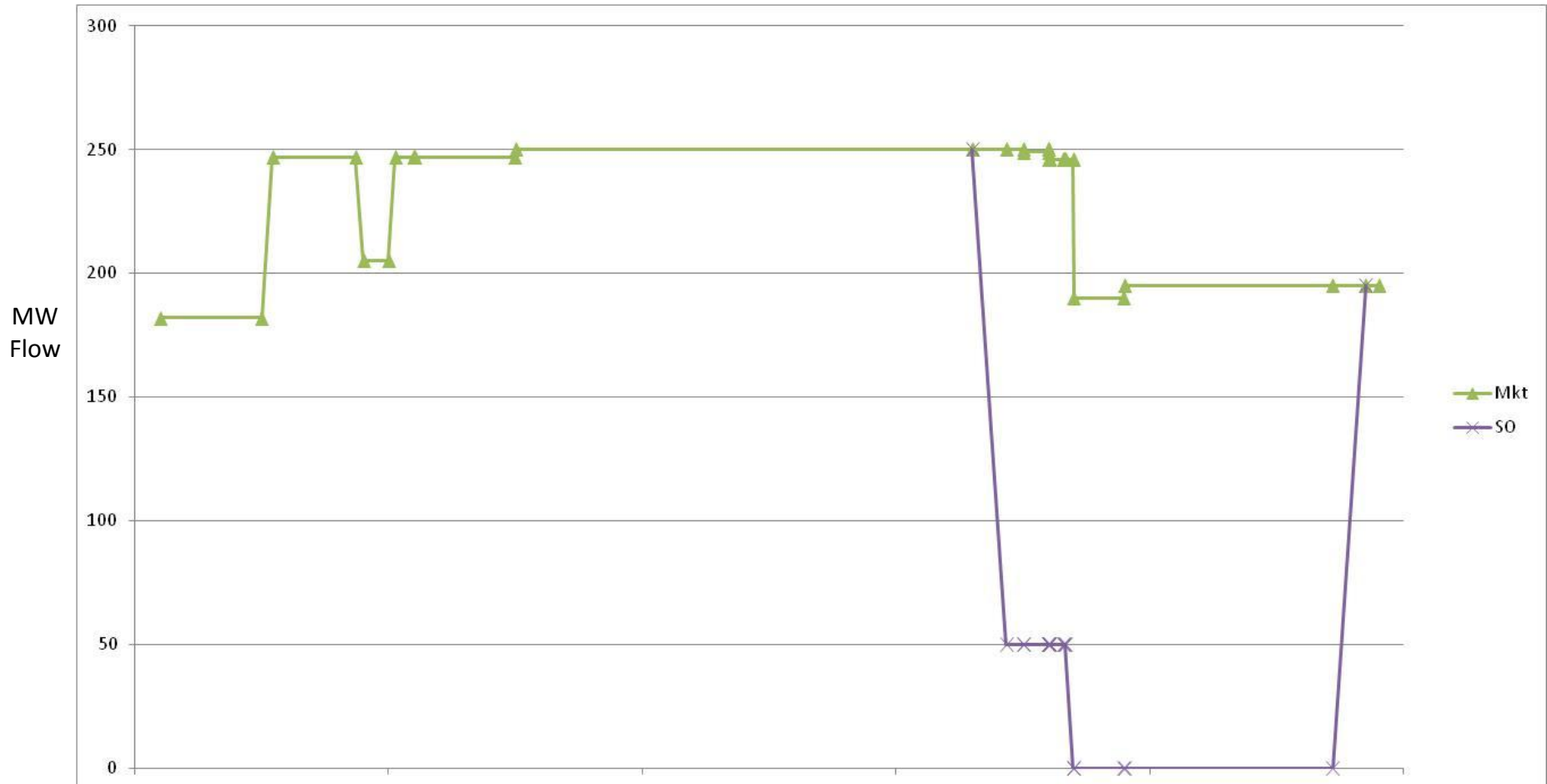


Current Arrangements

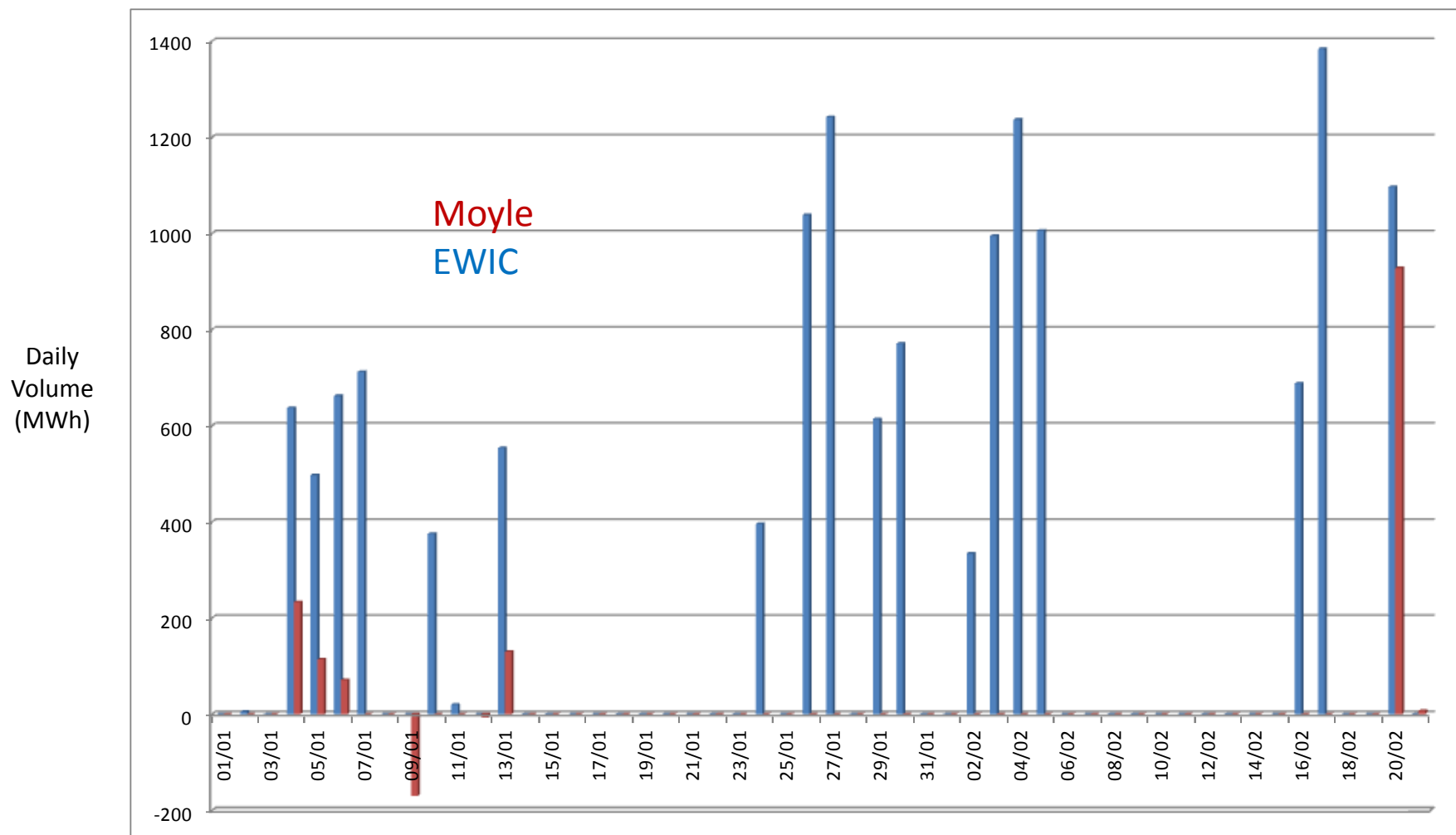
- Interconnector users buy capacity and bid into SEM.
- SEM produces the interconnector schedules – these have predominantly been full/high imports to SEM (GB→NI, GB→IE).
- High interconnector imports can lead to additional curtailment of priority dispatch generation.
- SONI and EirGrid have arrangements in place with National Grid to countertrade (post SEM gate closure) to alleviate curtailment.



EWIC schedule for TD 17th February



Usage of SO-SO services in 2013



SO Countertrading Updates

Available on website:

<http://www.eirgrid.com/media/TheOperationoftheEastWestInterconnector.pdf>

<http://www.eirgrid.com/media/InformationNoteOnSOInterconnectorCountertrading.pdf>





DS3 and the Broader European Policy

Jonathan O'Sullivan



Reliable Sustainable Connected

Communication on IEM



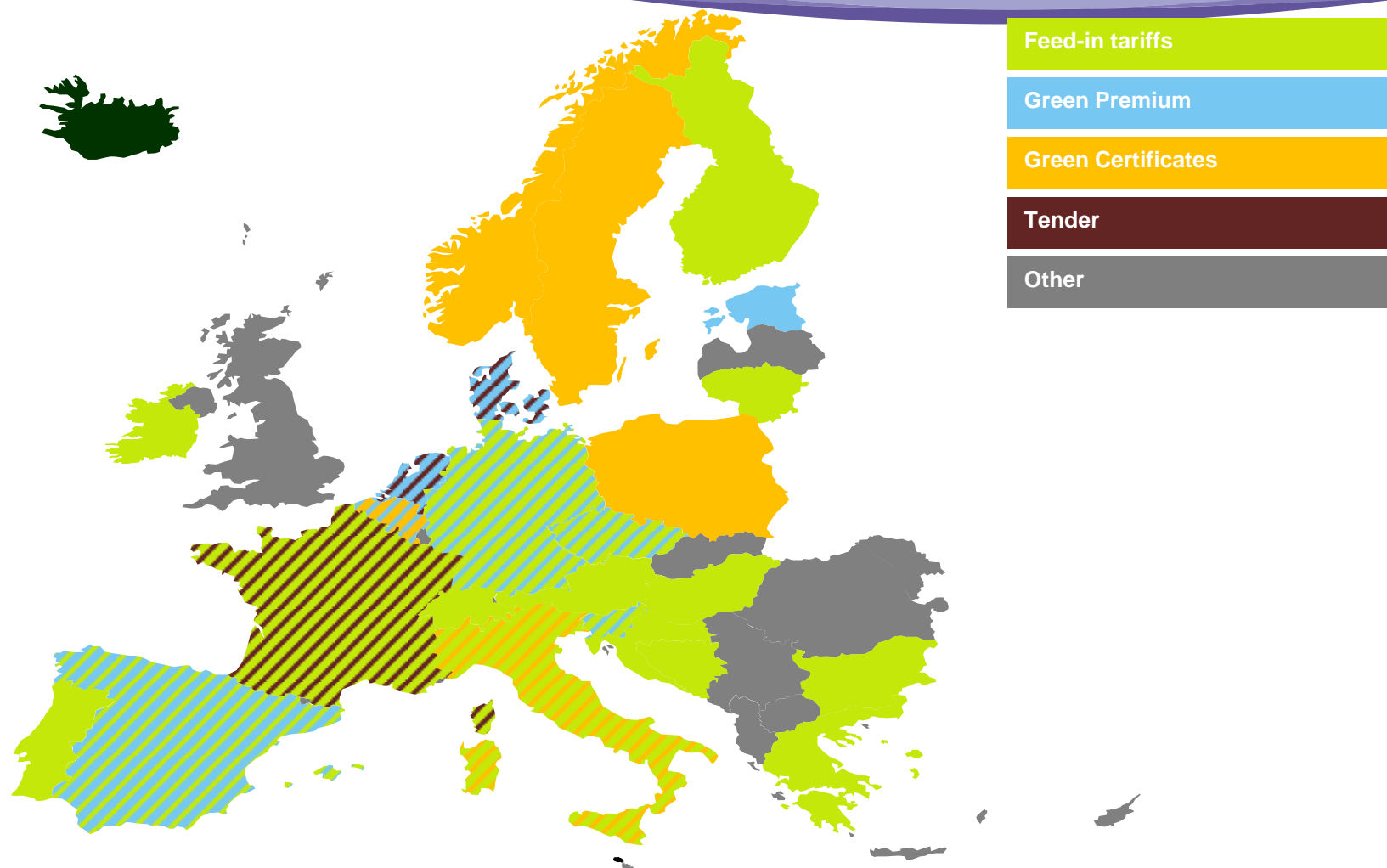
- **The Commission is pursuing infringement procedures against MS not yet fully transposed the Third energy package Directives**
- **Energy regulators to act decisively to ensure that all companies in the market are treated equally and that a level playing field is established.**
- **The Commission and ACER shall promote regional initiatives to play a prominent role in bridging the gap to reach the target of full market coupling in electricity as soon as possible.**
- **Member States must stimulate competition by developing infrastructure, in particular in support of cross-border activity, and eliminating market entry barriers.**

Communication on IEM



- **The Commission is formally setting up an Electricity Coordination Group with the mandate to facilitate cooperation on security of supply in electricity.**
- **Commission calls on Member States to adopt ambitious strategies for the roll-out of smart metering systems and to produce action plans which reflect how to modernise their grids**
- **The Commission will issue guidance on best practice and experience gained in renewable energy support schemes and on support scheme reform.**

Support Mechanisms: Financial

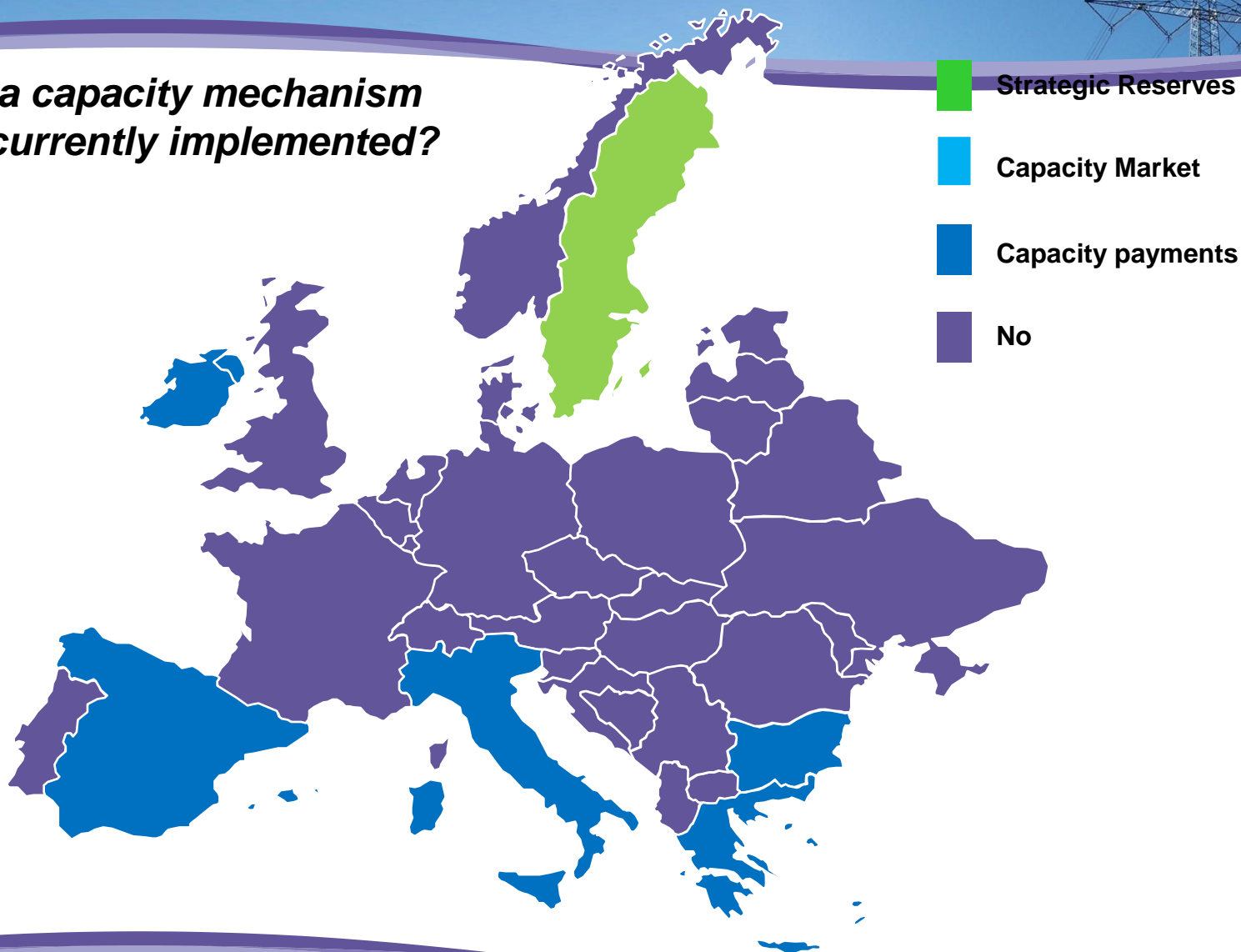


Communication on IEM

- **Member States to carry out a full analysis of lack of investment in generation, and why. Should seek cross-border solutions before planning to intervene. Fragmentation of the internal energy market must be avoided.**
- **The Commission is launching a public consultation on security of supply in electricity, generation adequacy and the internal energy market. Depending on the results of its consultation and further engagement with Member States and stakeholders, the Commission may propose follow-up measures**

Capacity Markets: Where are they today?

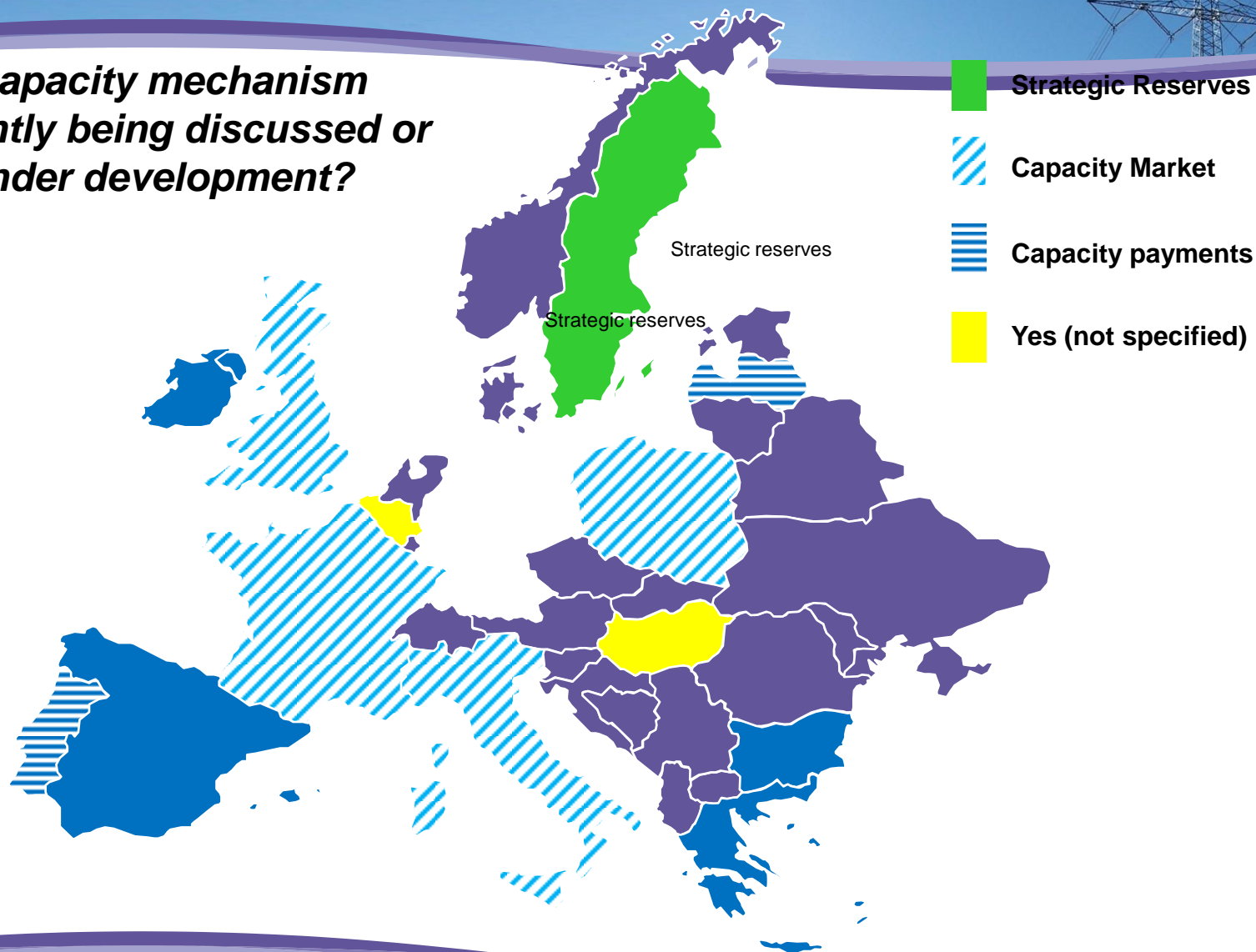
Is a capacity mechanism currently implemented?



Capacity Markets: Where might they be?



Is a capacity mechanism currently being discussed or under development?



EU Green Paper on 2030



- **A 2030 framework for climate and energy policies**
- **EU POLICY FRAMEWORK todate**
- **Key Issues**
 - Targets
 - Coherence of policy instruments
 - Fostering the competitiveness of the EU economy
 - Acknowledging the differing capacity of Member States