DS3 Advisory Council Meeting Dublin

18/05/2017

EIRGRID GROUP

Agenda

Topic	Time	Speaker
Introduction	10.30	Jon O' Sullivan - EirGrid (5 mins)
Industry Perspective	10:35	Presentation: Peter Thomas - Nordex UK Ltd (15 mins) Presentation: Colin D'Arcy - Tynagh Energy Ltd (15 mins) Discussion: All (10 mins)
Reprogramming DS3 Plan	11:15	Presentation: Doireann Barry - EirGrid (15 mins) Discussion: (5 minutes)
DS3 Programme Status Update	11:35	Presentation: Doireann Barry - EirGrid (20 mins) Discussion: All (10 mins)
Discussion on Winter Package	12:05	Presentation: Bernie Comey - DCCAE (15 mins) Discussion: (10 mins)
System Services (General Update)	12:30	Presentation: Robert O'Rourke - CER (15 mins) Presentation: Jason Hannon - QTP (5 mins) Discussion: All (10 mins)
Lunch & Networking (13:00 – 13:50)		
Topic	**Time**	**Speaker**
Rate of Change of Frequency (RoCoF)	13:50	Presentation: Jon O'Sullivan - EirGrid (10 mins) Presentation: James Kelly - ESB Networks (10 mins) Update: Rodney Ballentine - NIE Networks (10 mins) Discussion: All (5 mins)
Dublin Voltage Study	14:25	Presentation: Alan Rogers - EirGrid (15 mins) Discussion: (5 mins)
Closing Remarks and Actions	14:45	Jon O' Sullivan (EirGrid)
Session Closed / Networking	15:00	

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Industry Perspective

DS3 Advisory Council Meeting 18/05/2017

10.35-11.15 am

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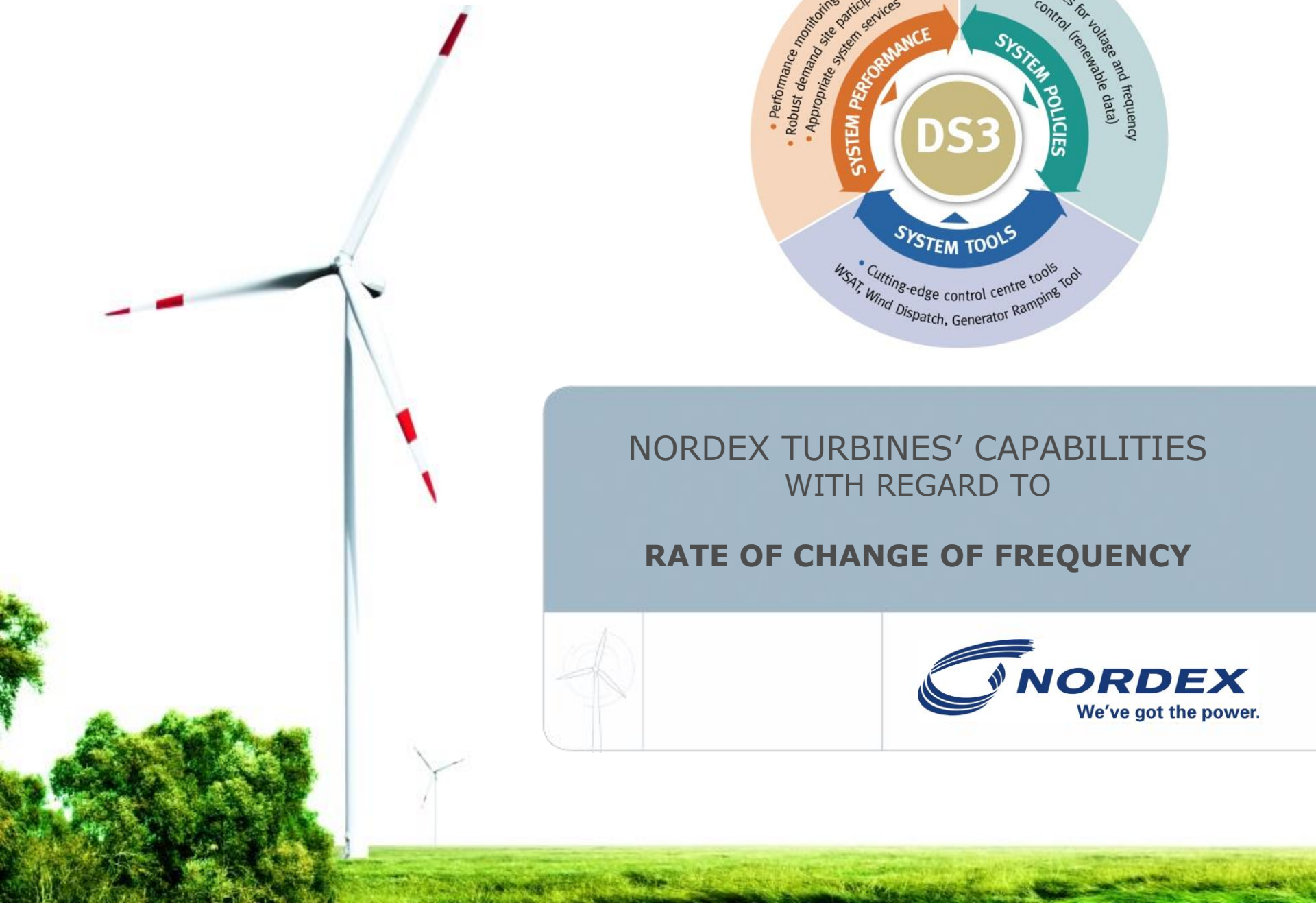


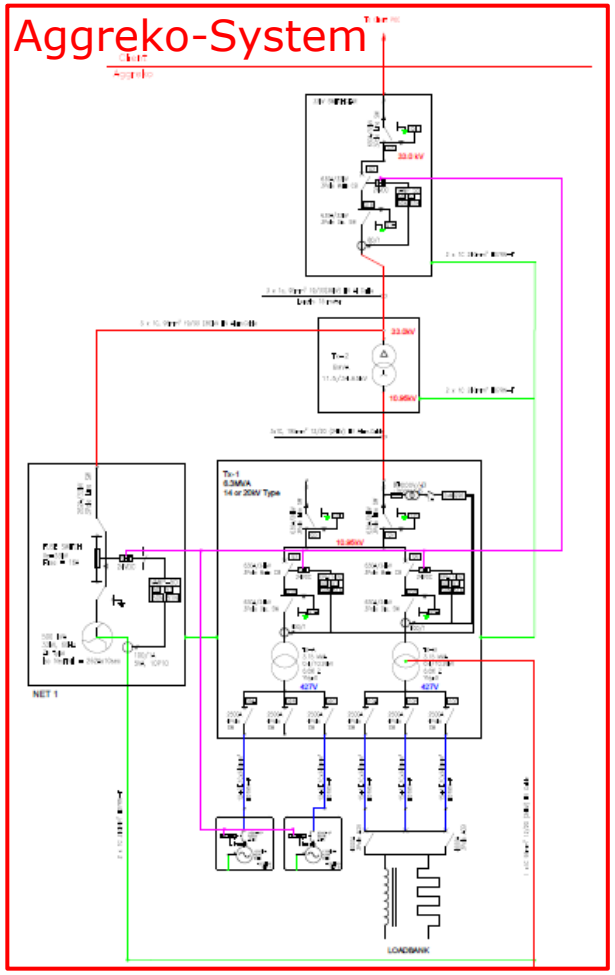
NORDEX TURBINES' CAPABILITIES
WITH REGARD TO

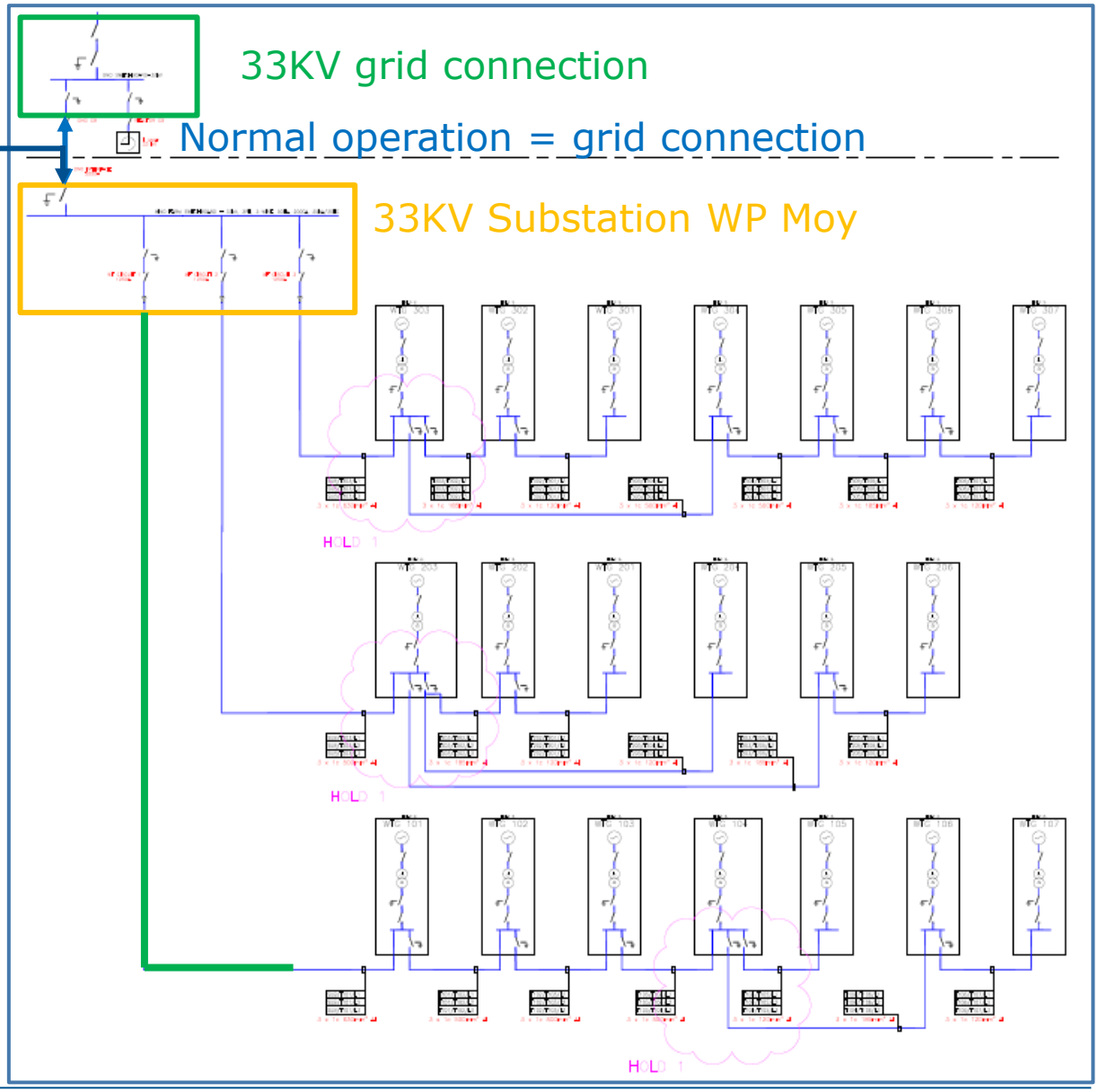
RATE OF CHANGE OF FREQUENCY

We've got the power.

Test set-up

Island operation
with few turbines





ROCOF MEASUREMENTS

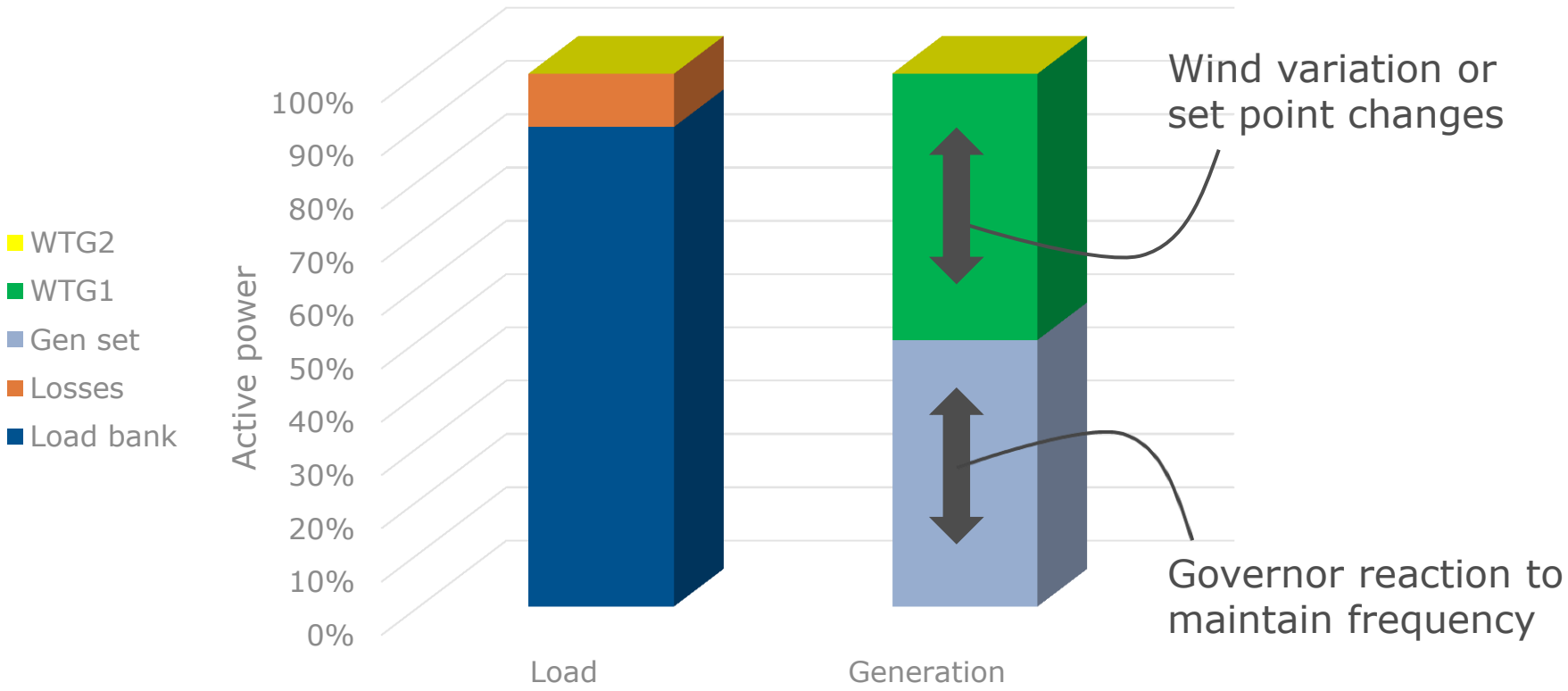
Danger
of death

Installed Measurement devices

- **@ WPP**
  - a) *Elspec Blackbox G4k*
  - b) *eMs Sub.net*
- **@ WTG 4**
  - a) *Elspec Blackbox G4k*
  - b) *MFR - Datalogger*
- **@ WTG 2**
  - a) *MFR - Datalogger*
- **@ Genset**
  - a) *Dranetz*

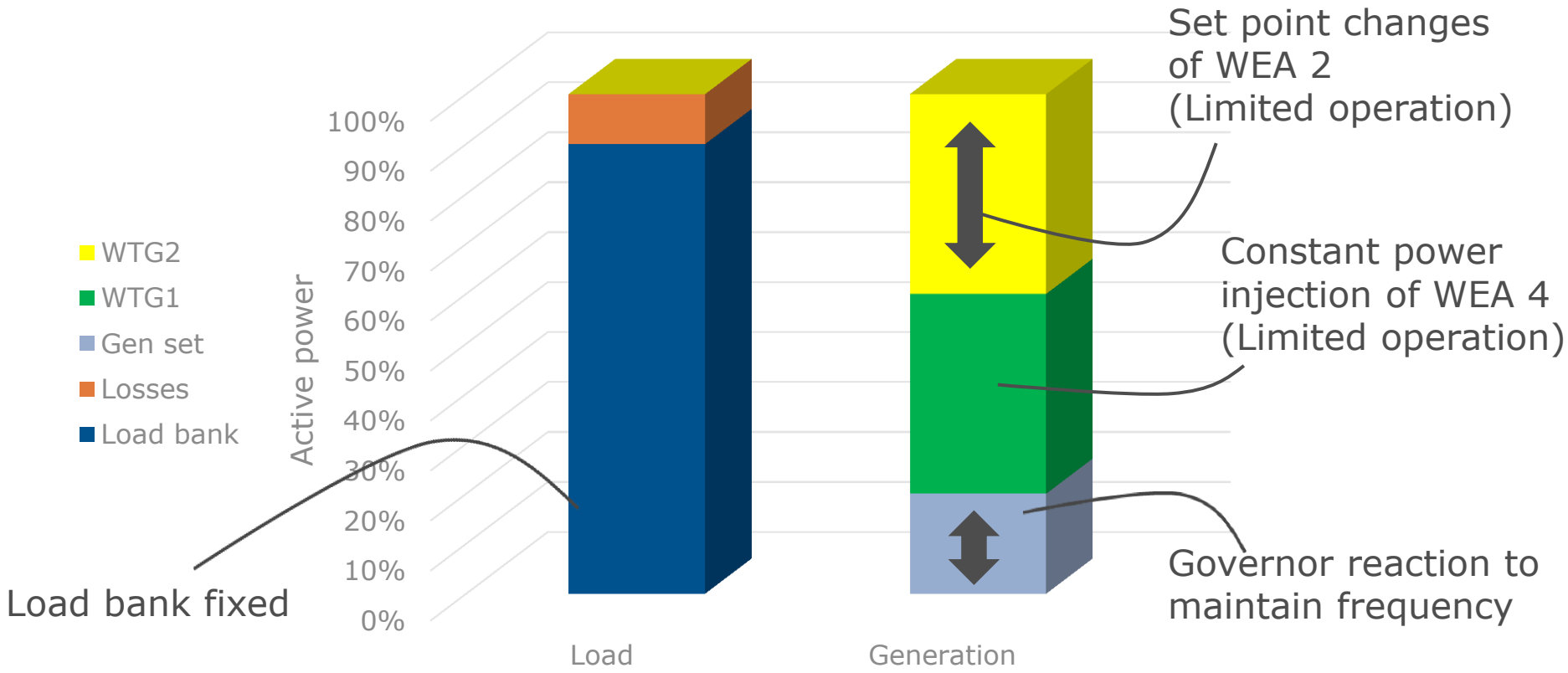
Basic principle

- Set load bank to a fixed impedance
- WTG units inject according to wind or limited
- Synchronous generators' governing system balances generation to load

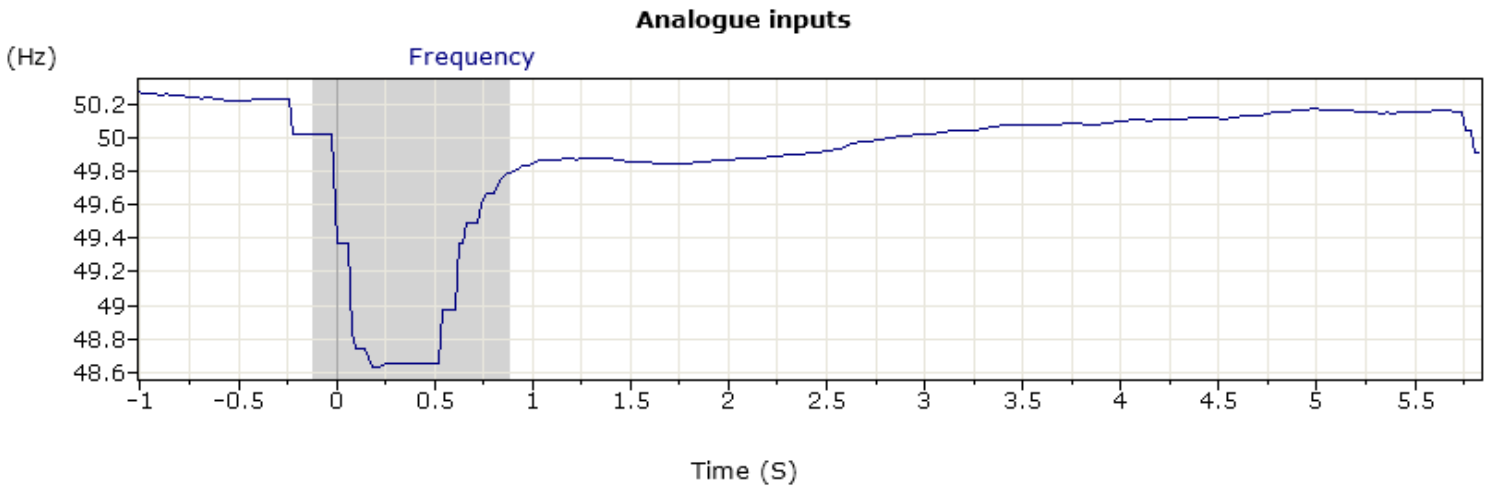


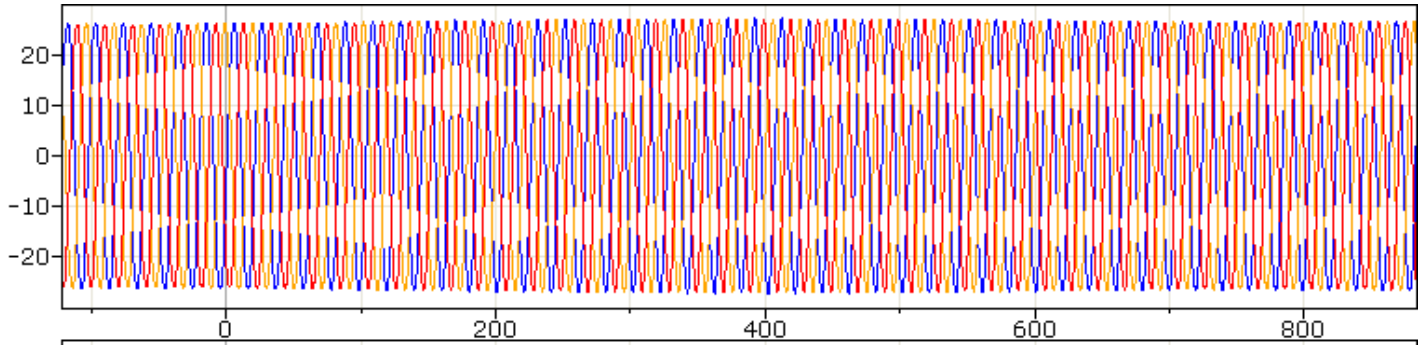
Test procedure

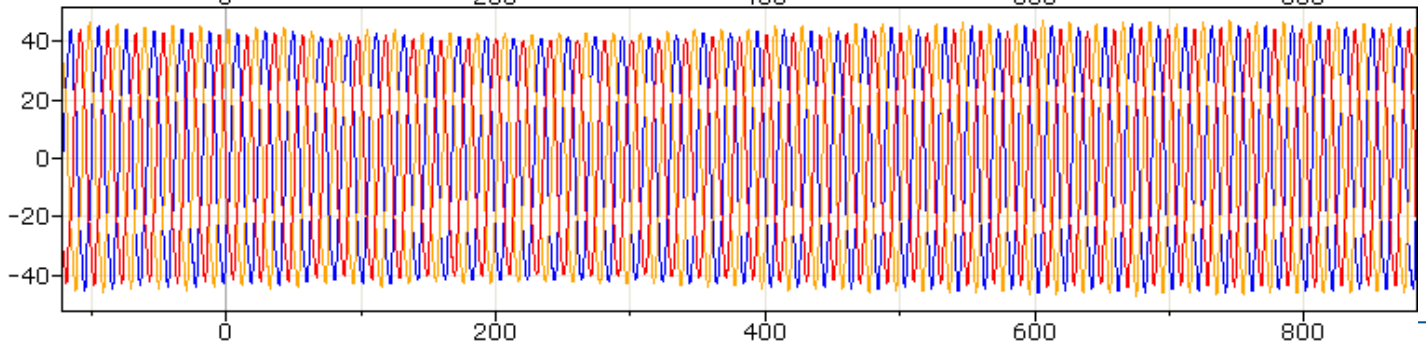
- Set load bank to a fixed impedance
- WTG units inject according to wind or limited
- Synchronous generators' governing system balances generation to load



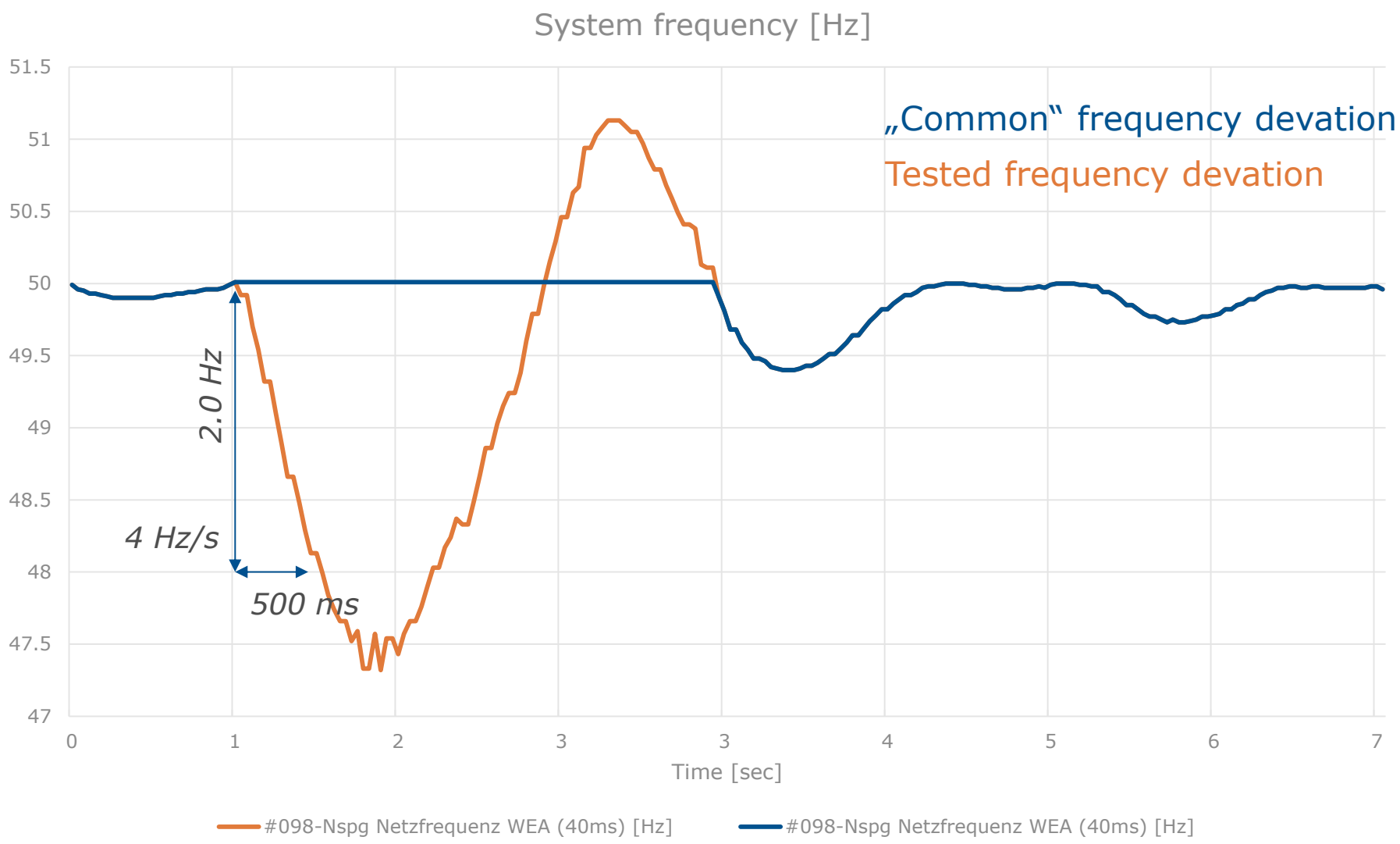
Severe UF event



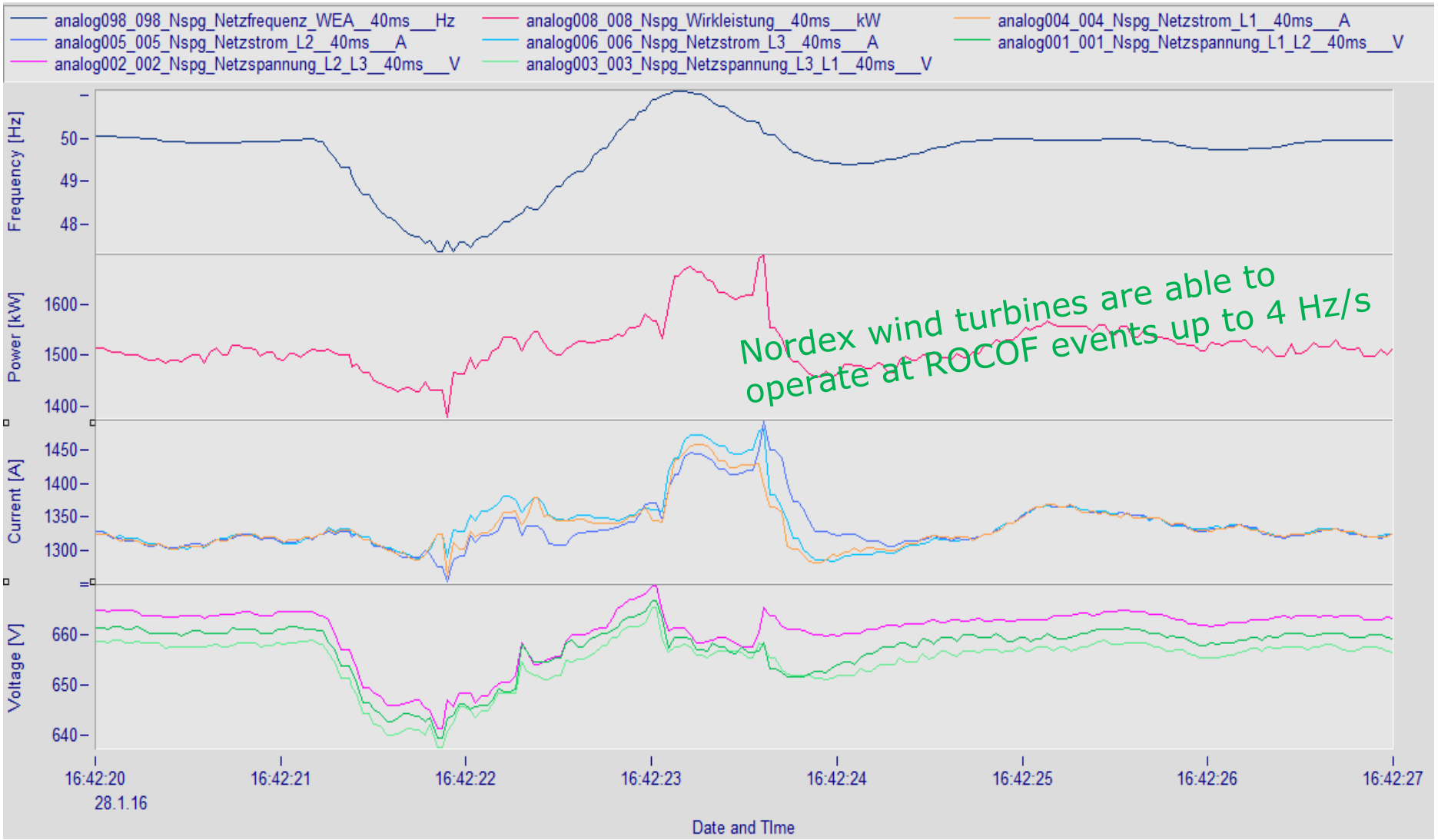




Results
Island grid > normal operating conditions

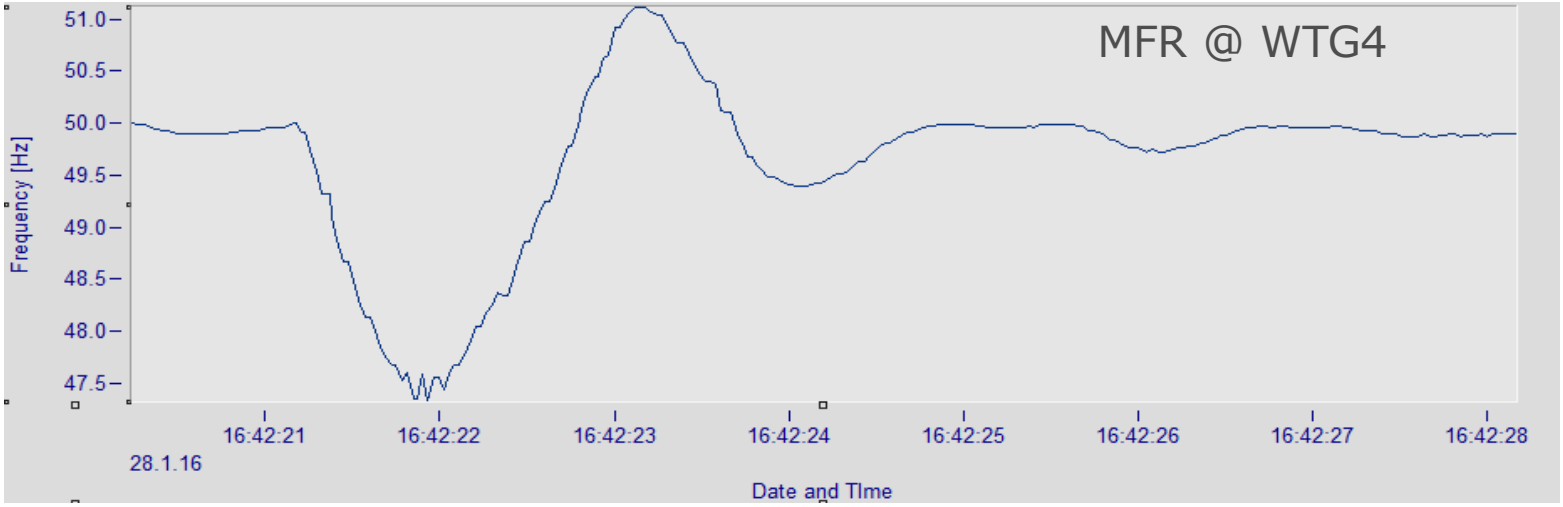


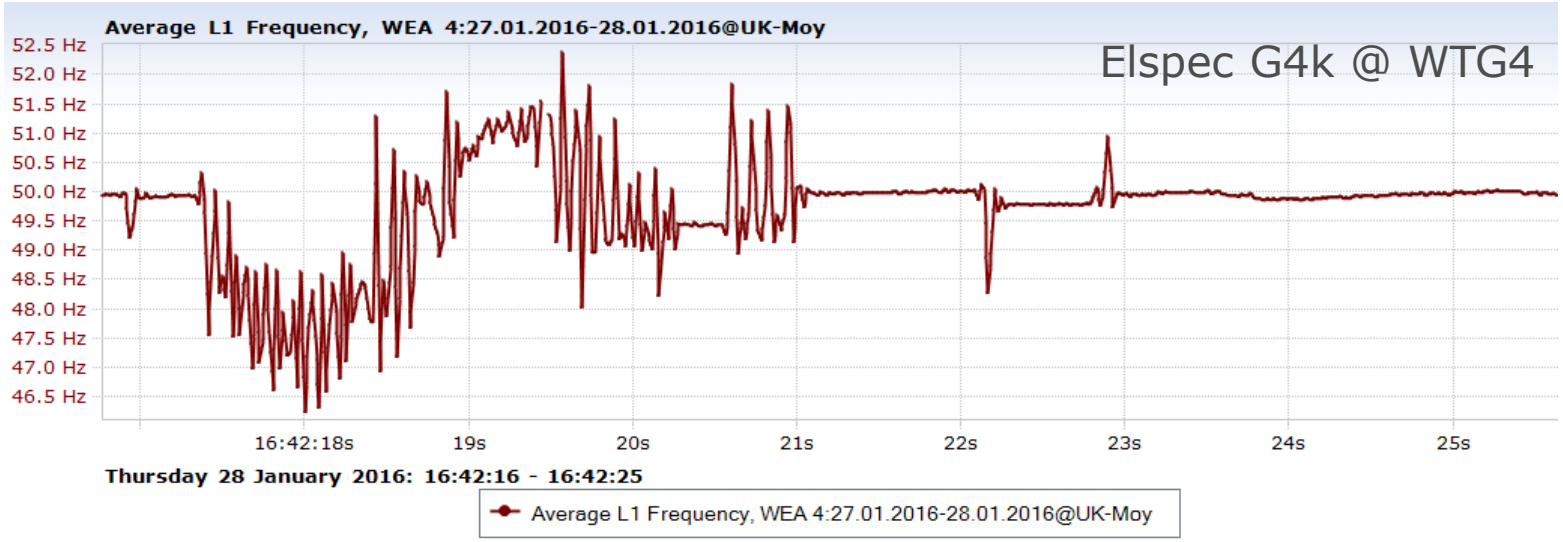
RESULTS - underfrequency
WEA 4 ≈ 1500 kW



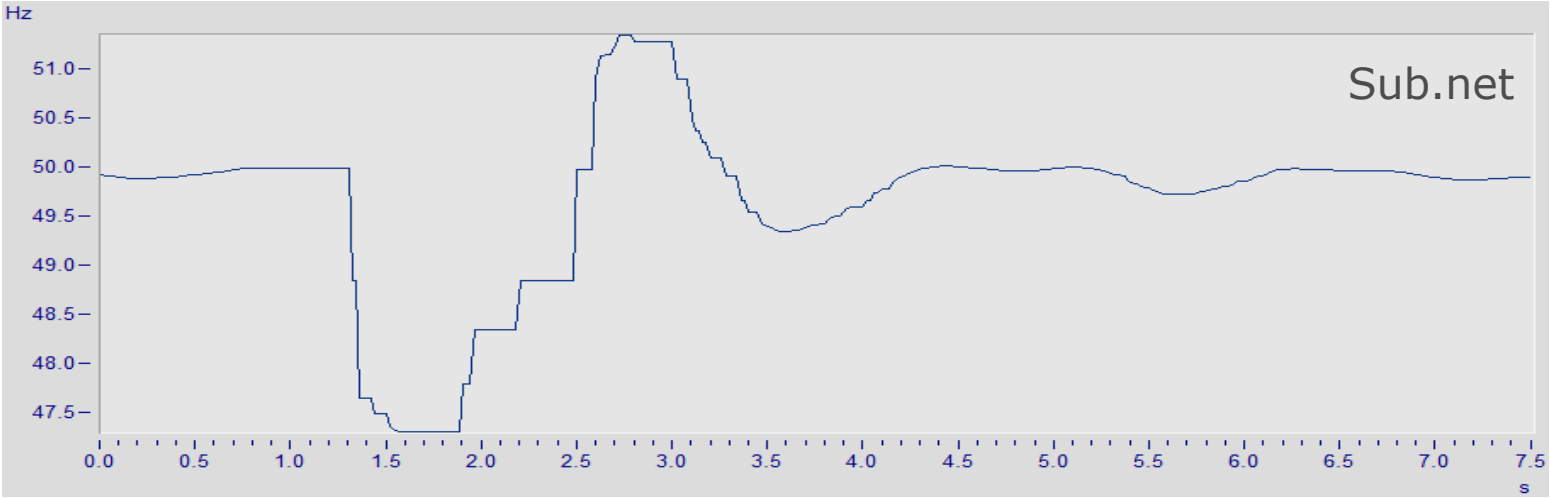
Nordex wind turbines are able to operate at ROCOF events up to 4 Hz/s

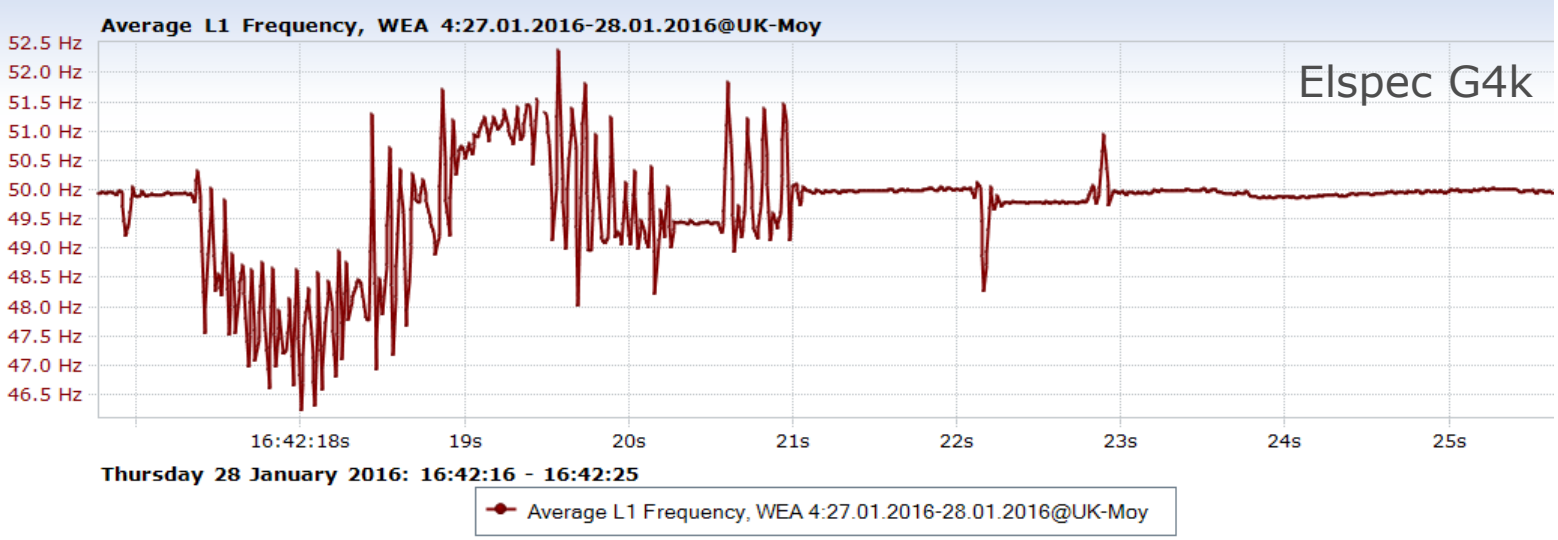
@WTG4: one location – two measurement devices



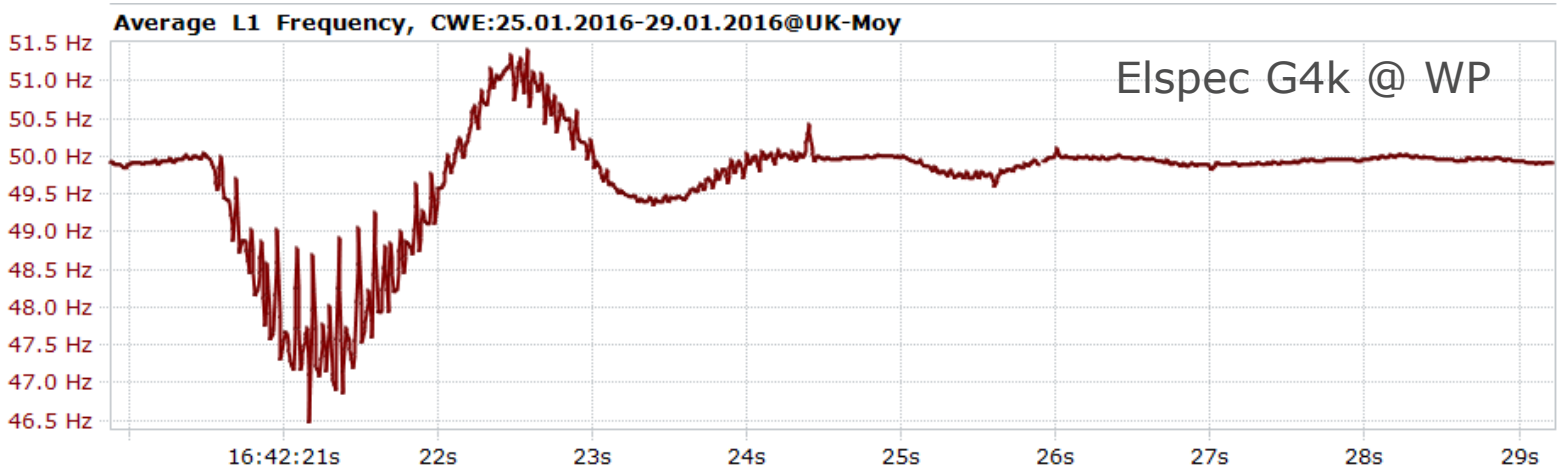


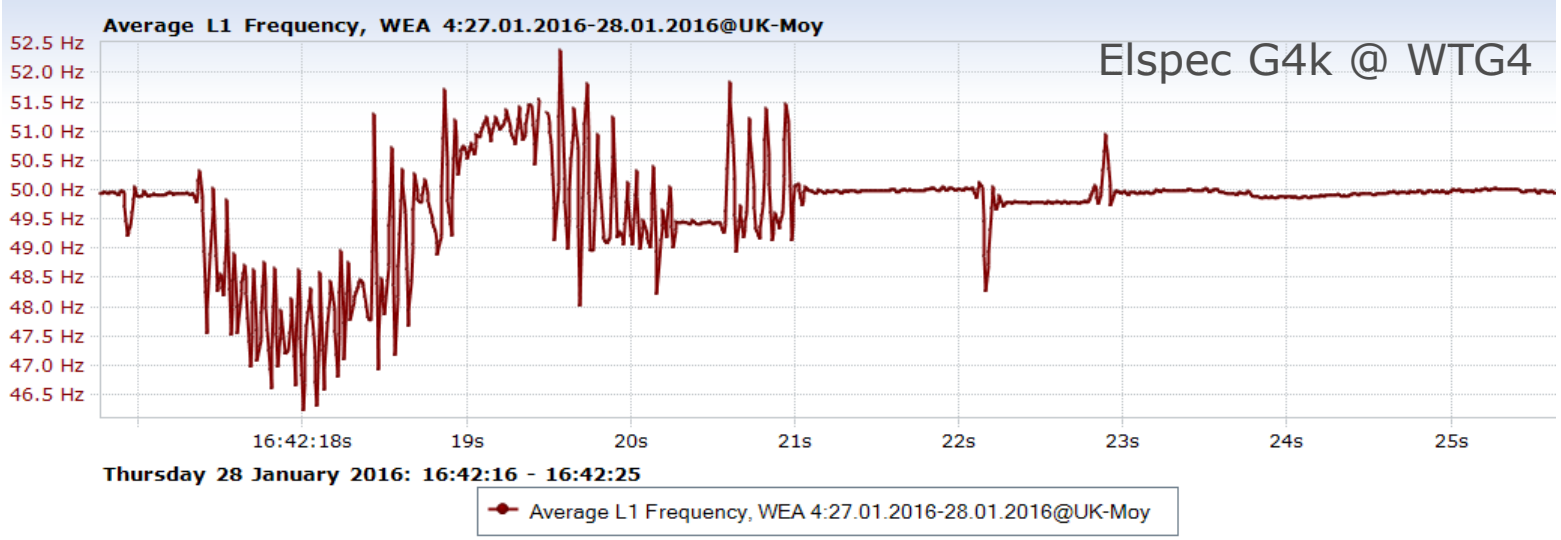
@WP: one location – two measurement devices





@WP: two locations – same measurement device





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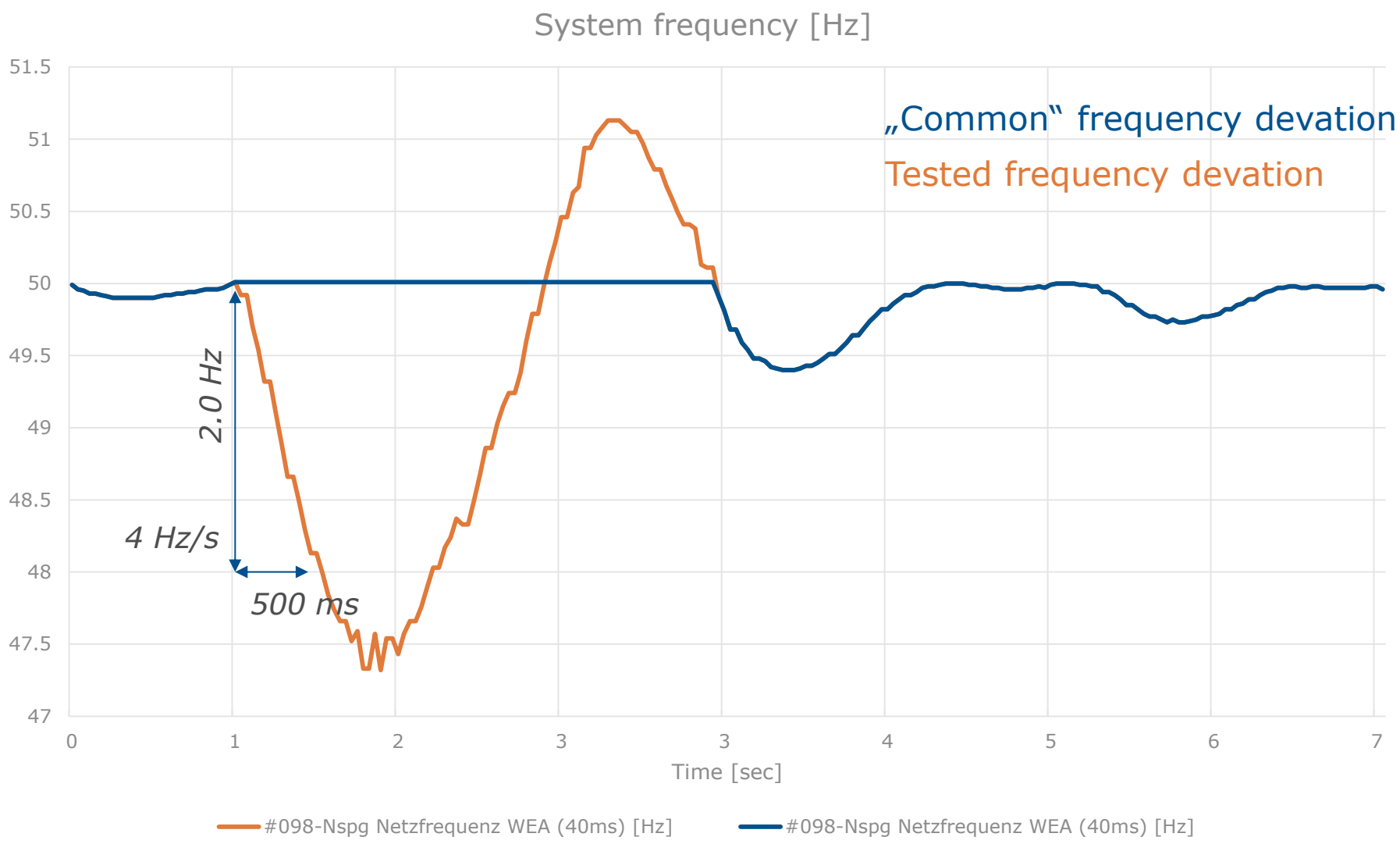


Thanks for your attention

TYNAGH ENERGY LIMITED

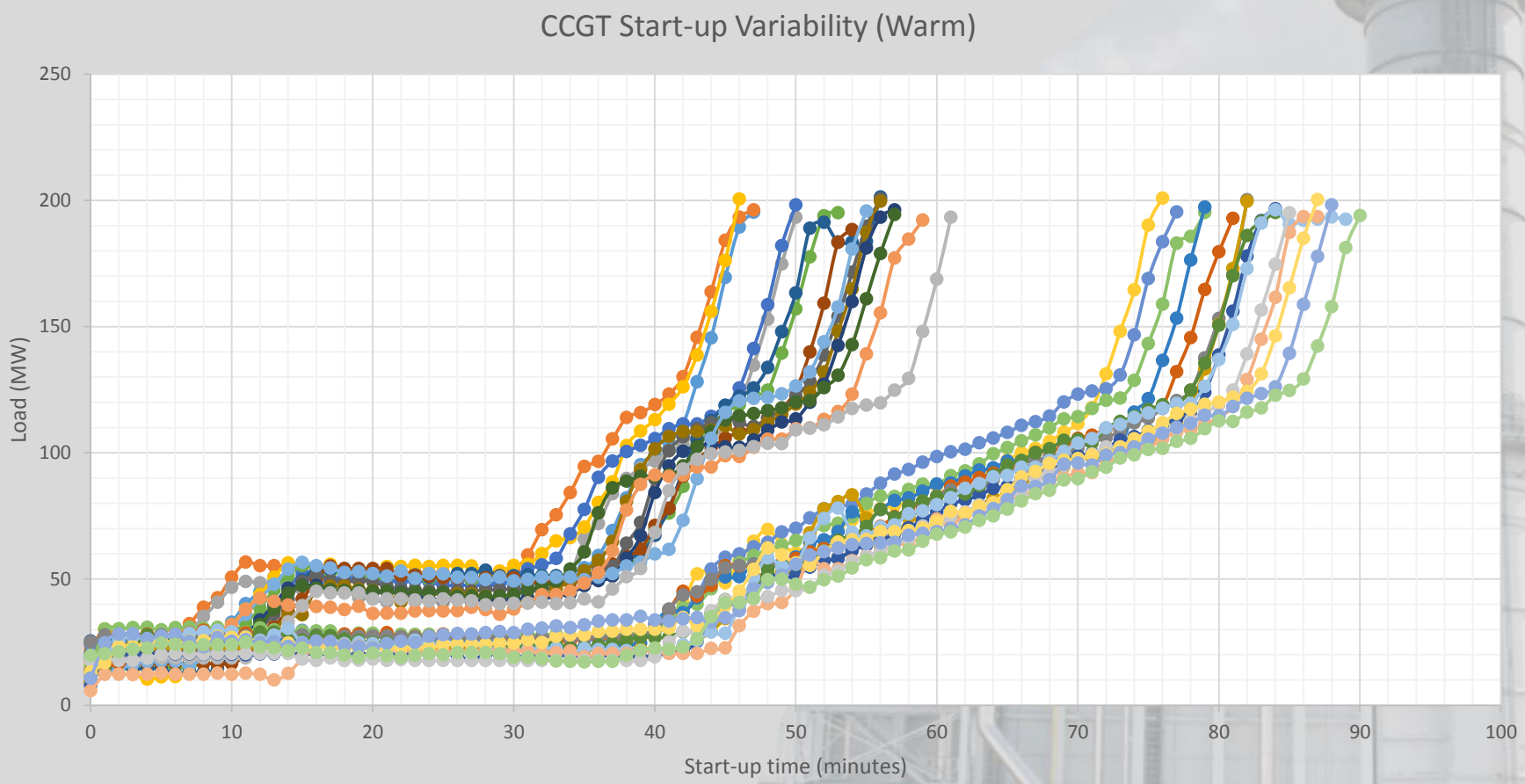
Realising full CCGT DS3 Capability

Ramping

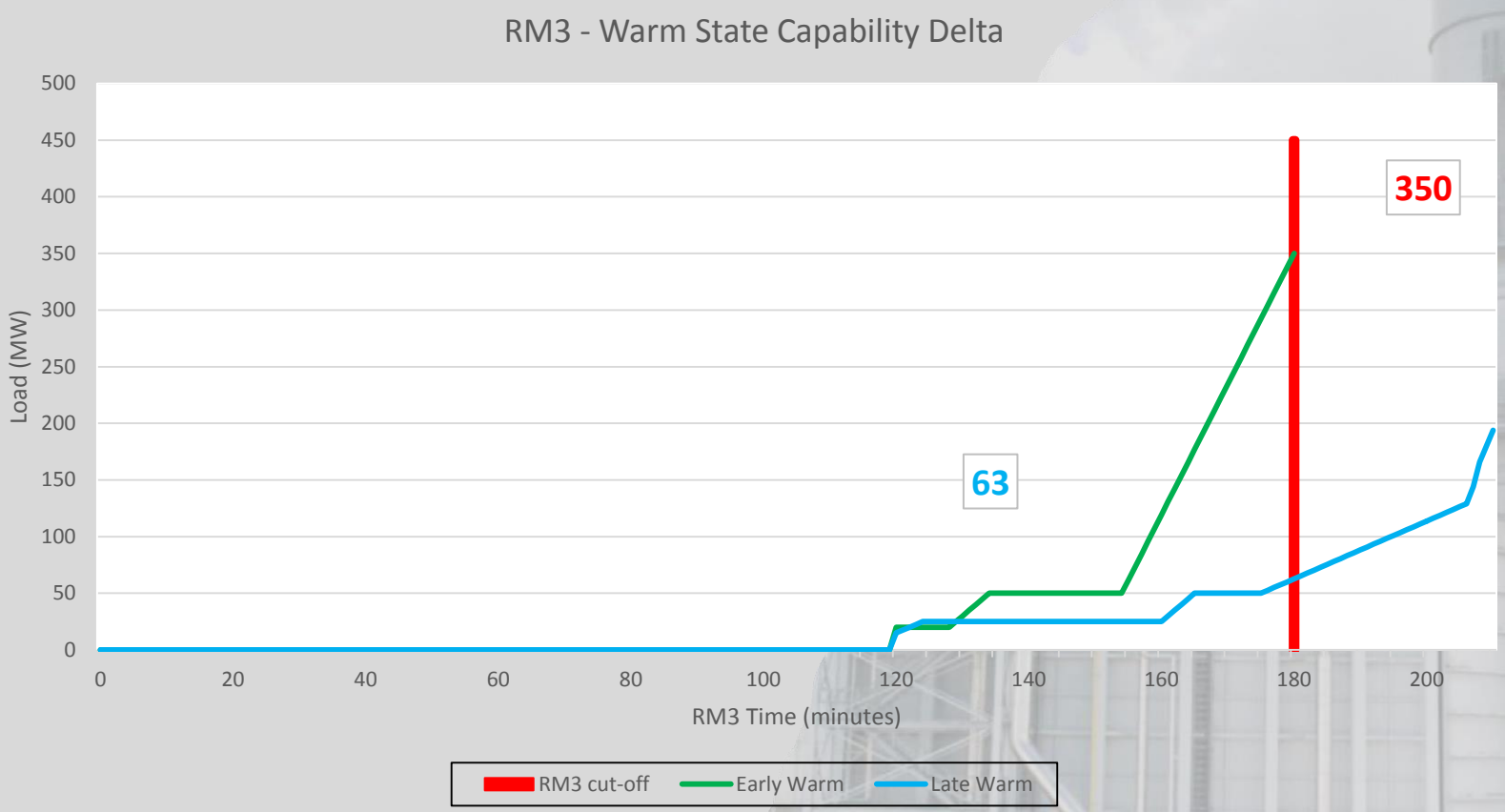
Colin D'Arcy

18/05/2017

CCGT start-up time variability



CCGT RM3 Capability Delta



Key Questions

Is this additional 287MW realisable by the TSO?

No

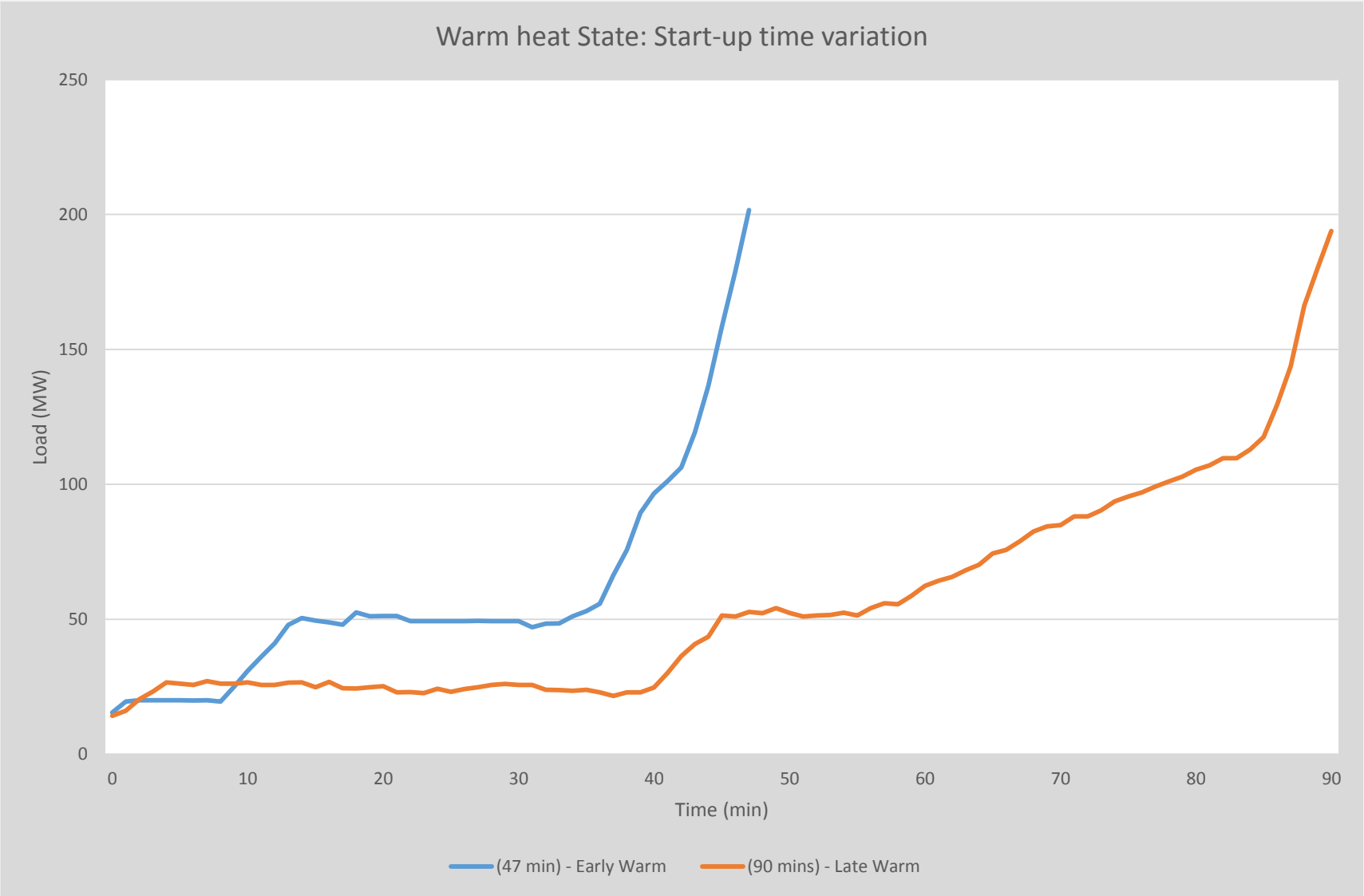
Can CCGT plants receive payment for this variable capability?

No

Are there restrictions preventing this capability being offered?

Yes

Technical Offer Data

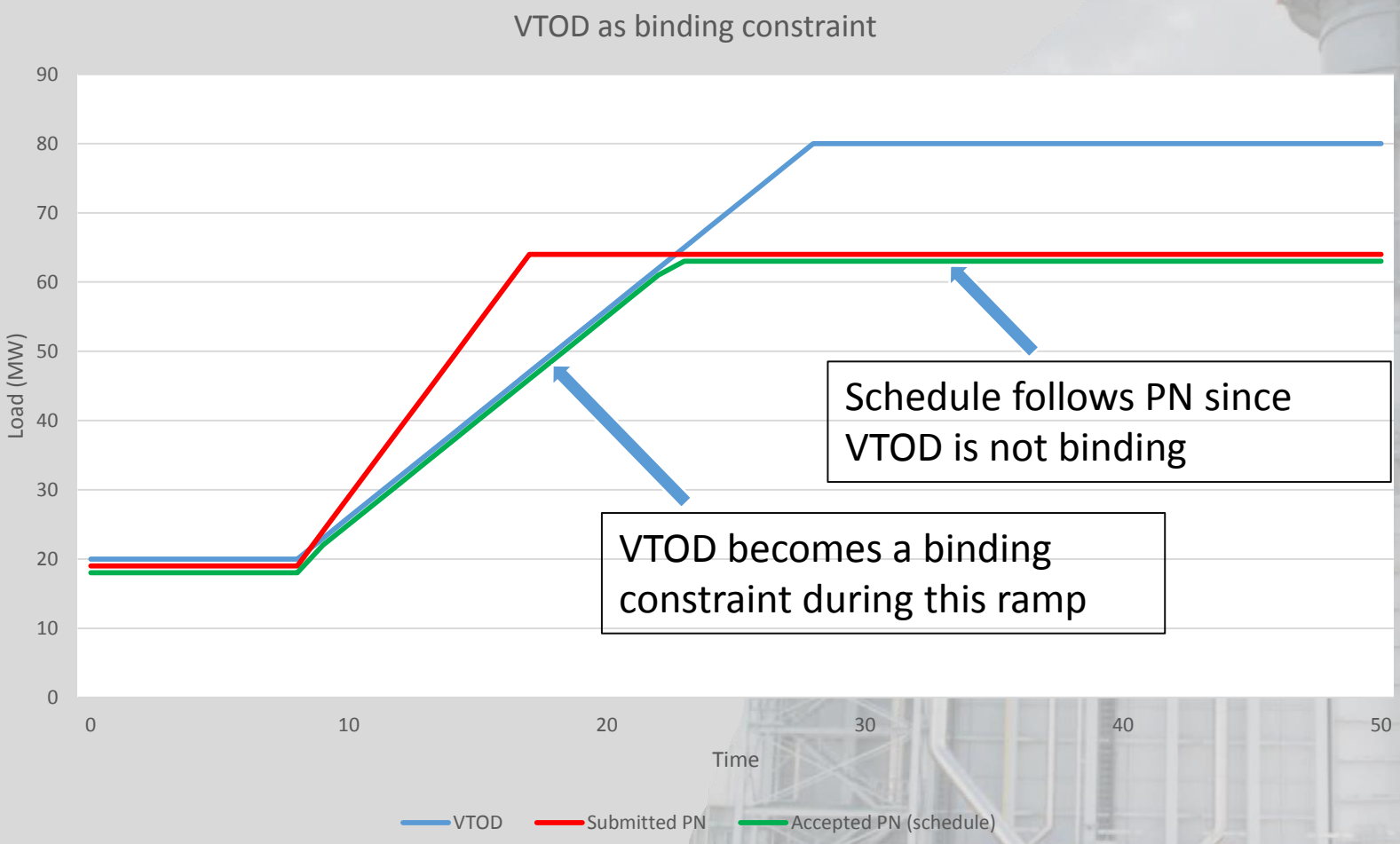


Technical Offer Data

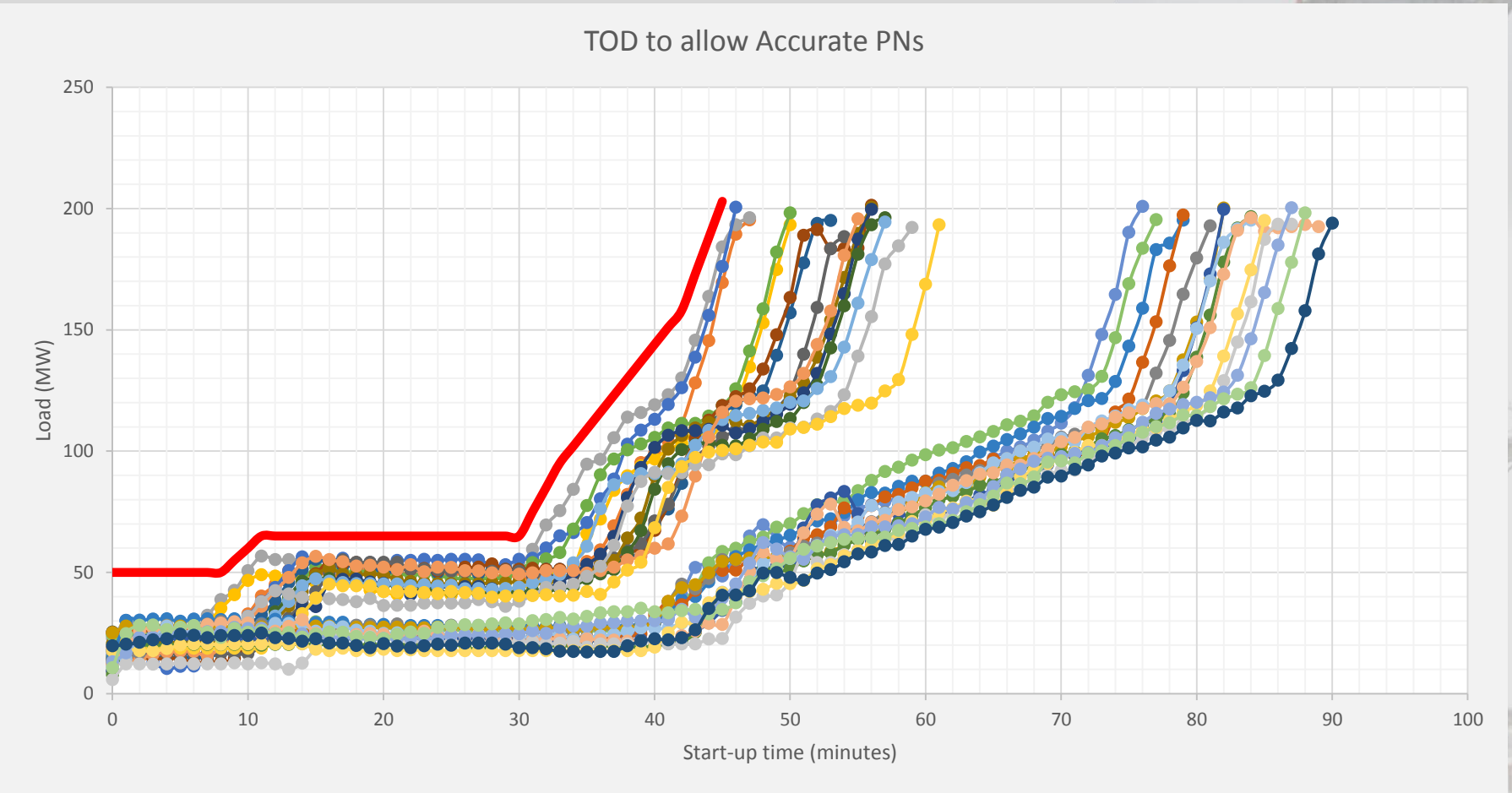
- A static TOD cannot accurately represent the start-up variability.
- Plants have historically tended towards late TOD so as to minimise exposure to GPI's and be long on imbalances.

Does this work in the I-SEM / DS3 environment?

TOD and Physical Notification interaction



TOD and Physical Notification interaction



Which TOD to submit – Fast or Slow?

Fast TOD

Accurate PN – Balance Responsible

Late starts – GPI Exposure

RM3 non-performance

DS3 Performance Monitoring - Failure

aid based on TOD but no “Certainty of Service Availability”

Slow TOD

Inaccurate PN – Not Balance Responsible

Early starts – No GPI Exposure

RM3 Underutilisation

DS3 Performance Monitoring - Pass

aid based on TOD with “Certainty of Service Availability”

Possible Solution

Fast TOD and accurate PNs

GPI calculated on more onerous (faster) of PN or GC

"Certainty of Service Availability"

Full utilisation

Units get paid for full capability

DS3 Performance Monitoring – against more granular capability curve

Paid based on realisable capability

Status Quo – Potential Outcome

Slow TOD

Align capability with this TOD - remove start-up variability

"Certainty of Service Availability"
…..but
TSO loses out on capability and CCGT fleet is underutilised

Accurate PN - No GF / imbalance exposure

Pass DS3 performance monitoring

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Reprogramming DS3 Plan

Doireann Barry

DS3 Advisory Council

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Overview

- Key operational changes to be delivered
- Programme Structure & Key Actors
- Risks to DS3

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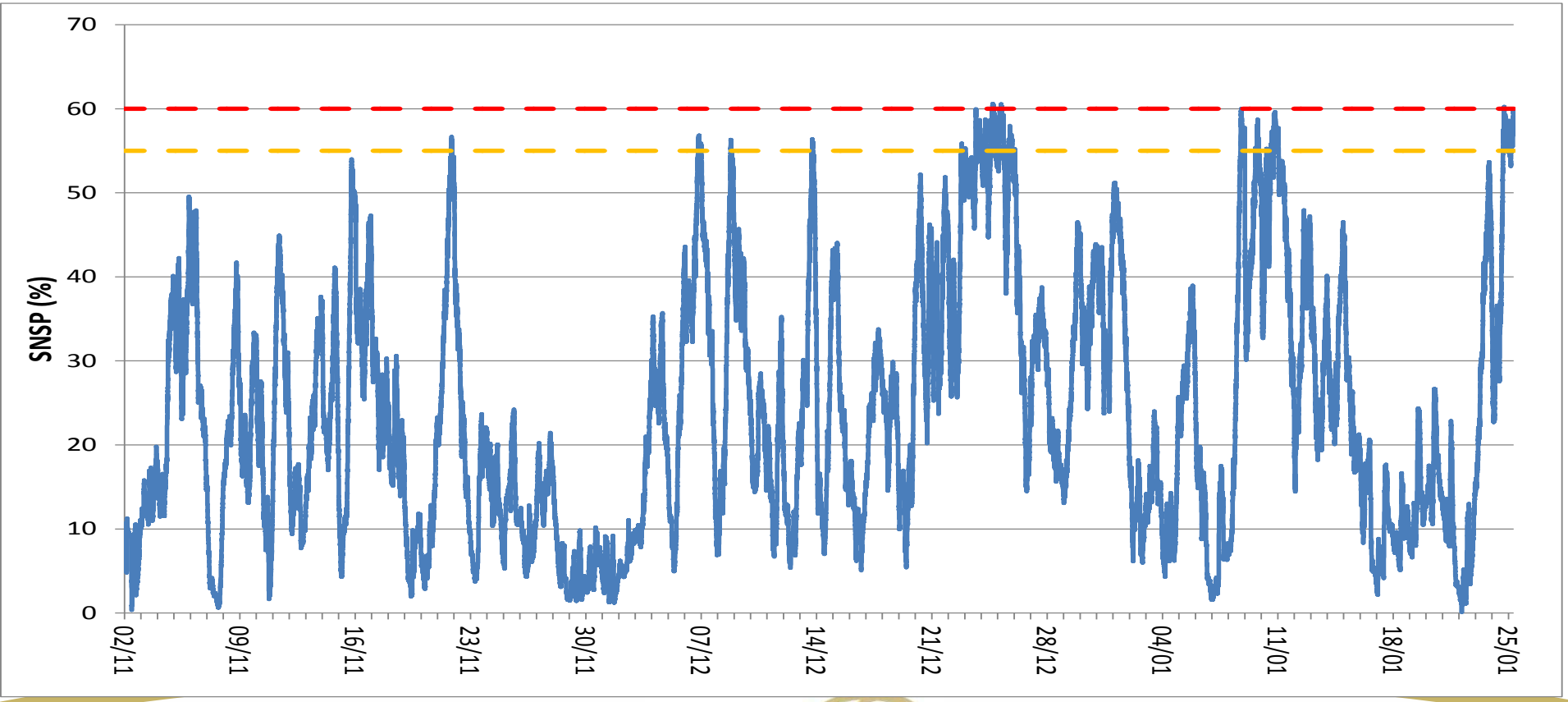
DS3 Programme

- Manages RES integration
- Requires significant changes to
  - Industry *(incentivised by System Services)*
  - Operational policies *(leading to increases in SNSP)*
  - Control centre capability *(enabling real operational change)*
- System Services Programme is a separate capitalised programme

What has DS3 delivered so far…

- SNSP @ 60%
- Wind Peak = 3,071 MW



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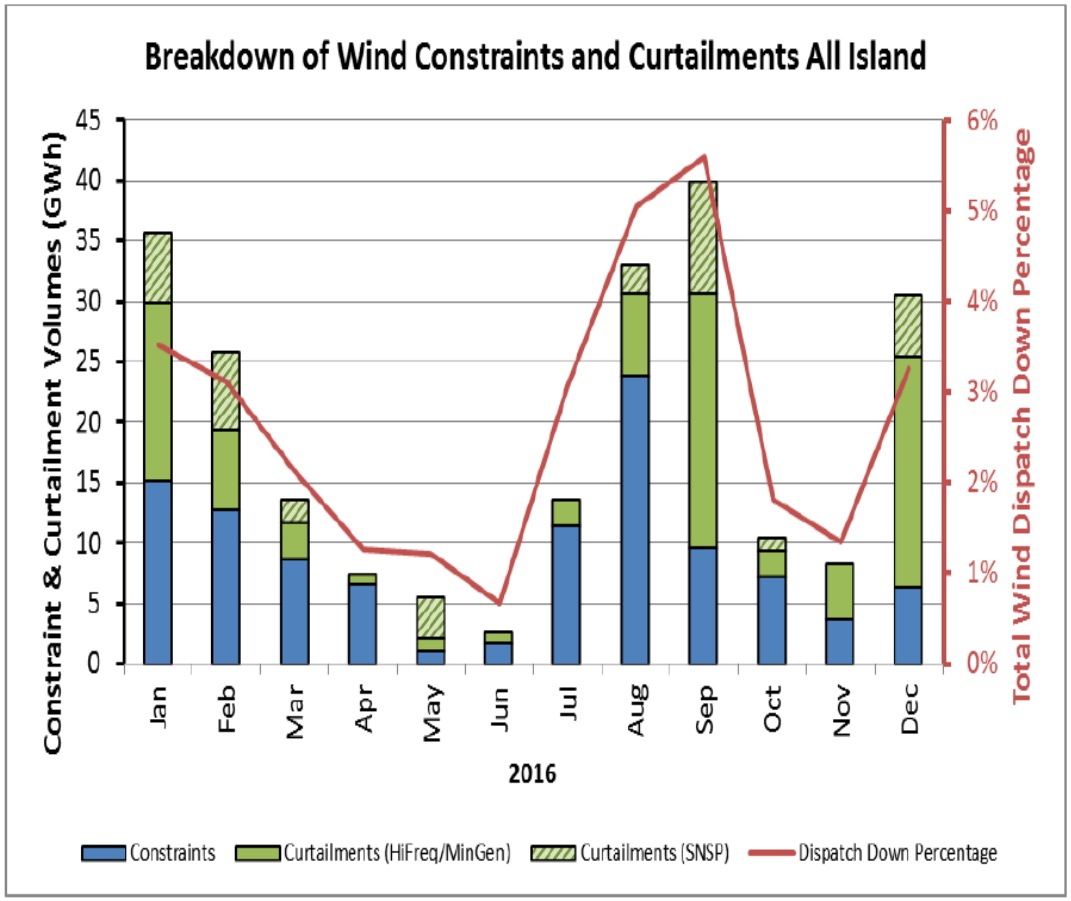
…it's not SNSP alone



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..and what needs to be done?

- *Transitioning to higher RoCoF*
- *Facilitating increased levels of exports*
- *Lowering inertia floor*
- *Lowering minimum sets requirement*

Facilitates increased RES penetration

Operational Changes enabled by Control Centre Tools

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Milestones to 2020

	2017	2018	2019	2020
SNSP	60% -> 65%	65% -> 70%	70% -> 75%	75%
RoCoF	0.5 Hz/s	0.5 -> 1 Hz/s	1 Hz/s	1 Hz/s
Inertia	23,000 MW.s	20,000 MW.s	17,500 MW.s	17,500 MW.s
Min Sets	8	8	7	7
Exports	300 -> 500 MW (interim)	500 MW (interim)	500 MW (interim -> enduring)	500 MW (enduring)
Reserve	POR: 75% FFR: 47%	POR: 75% FFR: 47%	POR: 75% FFR: 47%	POR: 75% FFR: 47%->55%
System Services	€75m			€235m

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Overview

- Key operational changes to be delivered
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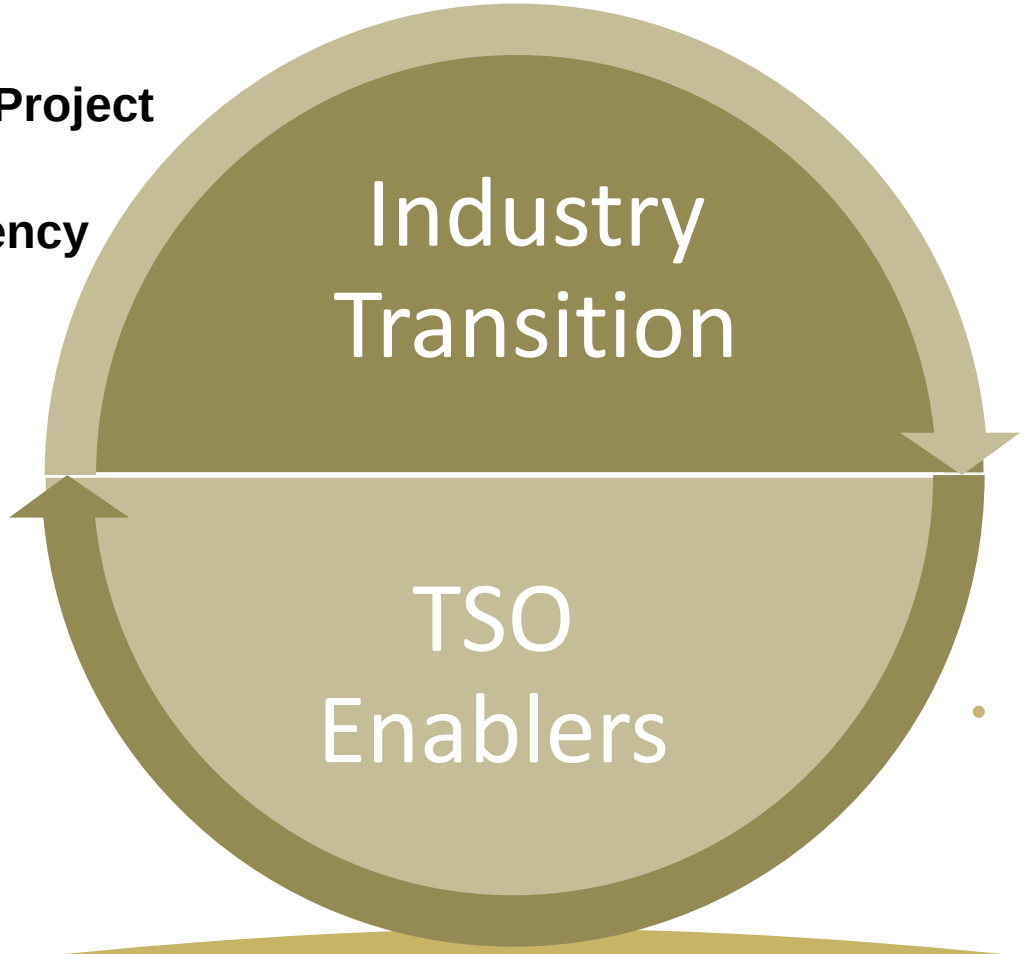
*NEW Programme Structure

- **TSO – DSO Project (RoCoF)**
- **Over-Frequency Project**



- **Control Centre Tools**

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Short-term changes to end 2018

		Q2 17	Q3 17	Q4 17	Q1 18	Q2 18	Q3 18	Q4 18
Operational Changes	Agreement with DSOs on RoCoF implementation	■						
	EWIC 500MW export trials		■					
	Complete RoCoF settings/ resolve Large Gens issues			■				
	RoCoF from 0.5 → 0.65Hz/s				■			
	RoCoF from 0.65 → 0.80Hz/s						■	
	RoCoF from 0.80 → 1Hz/s							■
Policy	RoCoF Policy			■				
	Ramping Policy							
Control Centre Tools	Robust WSAT		■					
	Look Ahead WSAT							■
	Voltage Trajectory Tool				■			
SNSP	SNSP trial at 65%			■				
	SNSP in operational policy				■			
	SNSP trial at 70%							■

ISEM Freeze in CHCC & NCC

Operational Studies: FOR2, Solar PV, SNSP increases, Inertia Floor, Ramping, Voltage Trajectory

..Key actors - what needs to be done?

Stakeholder/ External dependencies	Status	Comment	Stakeholder/ External dependencies	Status	Comment
ESB NETWORKS		• Continued delivery and closeout of TSO-DSO Project • Joint QTP for System Services	**Industry Participants – Conventional Generation**		• RoCoF & OFGS (interim & enduring) are critical unlocking the benefit of increasing SNSP • Careful management of resolution re: RoCoF for some generators is required
Northern Ireland Electricity Networks		• Support from UR to enable NIE N to implement RoCoF and OFGS settings is critical • Joint QTP for System Services	**Industry Participants – Wind**		• Need to be first adopters for new settings to drive implementation of OFGS project
SEM committee		• (SEMC) DS3 Joint Project Board have requested that broader DS3 activity is reported on in this forum.	**Wider industry/ Policy Makers/ General Public/ Others**		• Need to be kept informed of DS3 general progress

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Overview

- Key operational changes to be delivered
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- Risks to DS3

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Risks to DS3: RoCoF transition to 1Hz/s

- **Risk:** *Cannot operate to the 1Hz/s standard, due to either generator non-compliance or DSO failing to implement required changes*

- **Mitigating steps**
  - ✓ Resolution of large generators' issues with plant owners/OEMs
  - ✓ Completion of RoCoF settings on embedded wind/ non wind by NIEN/ ESB N
  - ✓ Phased transition to operating at 1Hz/s with periodic TSO-DSO review

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Key Risks to DS3 - Control Centre Changes

- **Risk:** *pace & scale of change required in the Control Centre associated with ISEM will impact the capability to deploy DS3-specifc tools*

- **Mitigating steps**
  - ✓ Co-ordination with I-SEM on operational changes required and timeline associated with such changes
  - ✓ Develop transition plan including training and engagement with Control Centre operators.
  - ✓ Management of “ISEM freeze” in Control Centres

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Key Risks to DS3: Lack of Investment

- **Risk**: *lack in investment in new System Service-providing technologies results in the volume of new System Services required to operate the system with high levels of RES penetration being unavailable*

- **Mitigating steps**
  - ✓ Joint TSO-DSO QTP for new Services/ Service Providers, including new technologies and novel technology applications, in 2018 & 2019
  - ✓ Work with CER on transitional connection policy

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Key Risks to DS3: System Event

- **Risk**: *a system issue, such as Oscillations, could halt progress of DS3 and prevent changes in operational policies and/or tool deployment*

- **Mitigating steps**
  - ✓ Engagement with Control Centre on operational policy changes and transition plan
  - ✓ Engagement with industry on operational changes – through Advisory Council
  - ✓ Engage consultants for further analysis on experience with oscillations to date

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Summary

- Entering critical phase of DS3
- Focus is on industry changes with operational policy & tool enabling increased RES penetration

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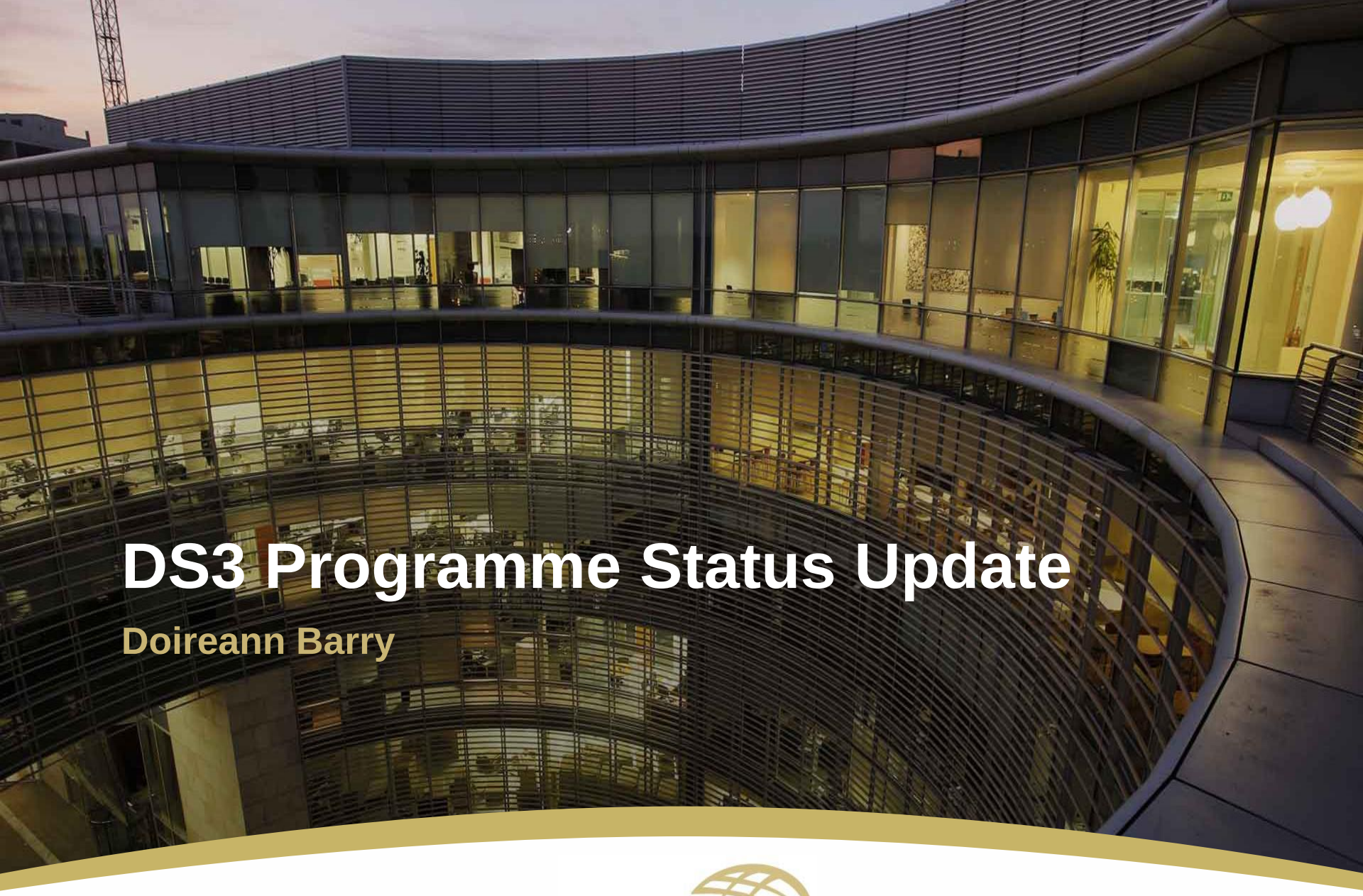

DS3 Programme Status Update

Doireann Barry

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Update on Progress

- Industry Transition
  - RoCoF
  - OFGS
- TSO Enablers
  - Control Centre Tools
- Other work ongoing
  - Voltage Control
  - DSM

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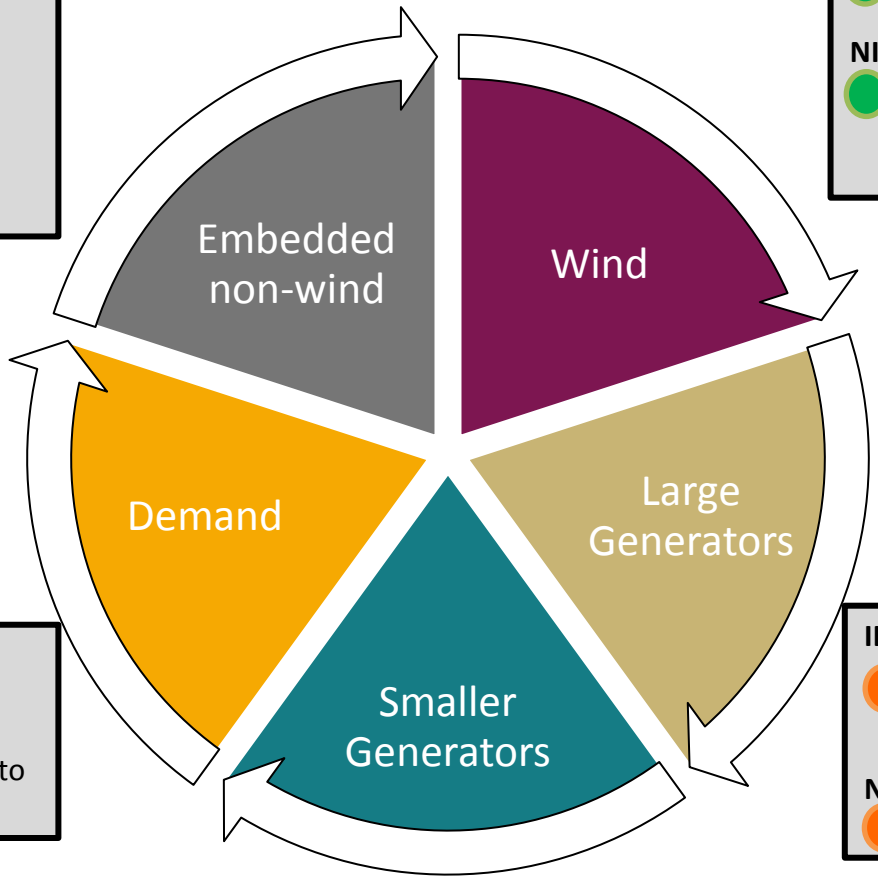
RoCoF overview

IE: EirGrid to confirm to ESB N the quantum of non-wind sites to apply the new settings

NI: Subject to direction from UR, need to determine how many sites need to apply new settings

IE: >80% of settings changed; plan to change other 20%

NI: Subject to direction on cost recovery from UR, NIE can witness changed settings be applied by end 2017



IE: ESB N have no concerns

NI: NIE & SONI have agreed overall prudent approach to risk to demand

IE: Testing progressing in line with agreed process (2 generators require further interaction)

NI: 2 generators require further interaction

IE: Studies underway; testing scheduled into 2018, as per plan

NI: n/a – NIE considering all SSG (<5MW) together

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Over-Frequency (IE)

- Interim OGFS (EWIC 500)
  - Impacted CCGTs have expressed some concern & may seek assurance from CER
  - Trial, scheduled to start in early June, to allow exports of 500MW at all levels of wind

- Wind forecasting errors have highlighted a need for a ramping policy
  - Study report on ramping scheduling has been completed → ramping policy being developed

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Control Centre Tools

- Wind Dispatch Tool
  - Unintended interaction between DS3 Frequency Control modifications and the WDT logic
  - Ongoing engagement with GE to progress solution (updated calculations to take account of frequency response)
  - Expected go-live date before 20th May

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Control Centre Tools

- Nodal Voltage Controller
  - EMS work complete
  - Telecoms carrying out work at present
  - Q3 2017

- Voltage Trajectory Tool
  - Engagement with Nexant ongoing for proof of concept study
  - Scope agreed – progress awaiting legal agreements being finalised

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Other Workstreams - Voltage Control

- ESB N is engaging with windfarms at Cauteen on the development of control schemes for the Nodal Controller.

- NIE N has secured approval from NIE board for nodal controller at Magherakeel.

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Other Workstreams - DSM

- Paper outlining the challenges of complex hybrid sites, including complex DSM, was brought by TSO to JGCRP on 25th April

- Setting up a cross-industry working group to examine
  - application process
  - metering and signaling
  - forecasting
  - performance monitoring
  - dispatch/ controllability
  - availability
  - compliance testing

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UVIG Award

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Roinn Cumarsáide, Gníomhaithe ar son na hAeráide & Comhshaoil
Department of Communications, Climate Action & Environment

Presentation to DS3 Advisory Council

Bernie Comey
Clean Energy Package
18 May 2017

Clean Energy for All Europeans

- As part of the Energy Union strategy, the EC published the 'Clean Energy for All Europeans' package on 30 November 2016.
- 8 legislative proposals covering the period 2021 to 2030.
- Interactions between the various proposals
- The regional aspect in the context of Brexit

The Legislative Package

- Energy Efficiency Directive
- Energy Performance in Buildings Directive (managed by D/HPCLG)
- Risk Preparedness in the Electricity Sector Regulation
- Electricity Internal Market Design Directive
- Electricity Internal Market Design Regulation
- ACER Regulation
- Renewable Energy Directive
- Governance of the Energy Union Regulation

Where are discussions at?

- Discussions at WG on Energy on the Energy Efficiency Directive and the Energy Performance in Buildings Directive.
- Aim - reach general agreement on these two proposals at the June Energy Council.
- Detailed discussions at EU level on others starts H2 2017.
- D/CCAE public consultation closed 8 May.
- Bilaterals with relevant stakeholders taken place/ underway.

Electricity Market design and regulation from wholesale to retail - Overview

- RECAST of existing 2009 Third Package legislation on electricity markets design (3 proposals) & and Electricity SOS Regulation
- Markets = from wholesale to networks to retail

Aim to

- improve markets efficiency
- adapt markets to transition /renewables and
- enhance electricity security of supply and crisis/emergency planning

Electricity Markets (1)

- **On regulation**

Change rules/approach on

wholesale and generation (conventional and renewables), networks (TSO & DSO), retail such as prices, smart meters, demand side, priority dispatch, participation and

EU regulatory governance and decision making

- **On security of supply**

Common rules on crisis prevention and tools to ensure cross-border cooperation

Managing electricity crisis situations

Key Features

Scale of impact is significant

- Many provisions: Local energy communities, aggregators, demand side management, prosumers
- Impact on industry / citizens? Retail ➢ wholesale, networks
- Views on cost? Depend on perspective.
- SOS - both regional cooperation and increased centralisation
- Targets and deadlines dates for implementation – different across the provisions/requirements

Potential Issues Concerns

- CRMs (dates, tests/conditions, emissions limits)
- Europe wide generation adequacy assessments
- ROCs (Regional Operation Centres) role/functions/task vs (national) generation adequacy and security of supply policies, measures
- Smart meters entitlement and rollout
- Roles/functions of DSO and TSO
- ACER enhanced roles and governance/decision making changes – small MS?
- IE in strong position on CRMs given SEM/ISEM

Likely alliances – different on each issue

RED Proposal - Overview

- Partially revises Renewables Directive 2009/28
- MS to contribute to a binding EU level target of at least 27% renewable energy by 2030
- MS contributions based on 2020 national targets
- IE 16% 2020 target to become baseline to 2030
- Proposals aimed at 3 end-use sectors: Electricity, Heating and Cooling and Transport
- Level of economic growth out to 2030, combined with energy efficiency savings will determine the level of renewable energy measures required

Support schemes - general principles

- Aim: Most cost effective deployment of RES
- Market oriented and Europeanised approach.
- Investor certainty
- **New Conditions:**
- Support not to be revised to negatively impact supported projects. Schemes to be reviewed every 4 years – value?
- Partial and gradual opening of SS to installations in other MS (10-15%) – mandatory requirement . Necessary?
- No support for new generation converting biomass to electricity only unless produced by CHP
- Existing biomass burning plant receives support

Permit Granting

- **Permit granting**
  - One-stop shop
  - Permitting process not > 3 years
  - Simple notification process to DSO for small plants and accelerated permit process for repowering (1 year)
  - Clarity needed re scope
  - Concern re benefits of putting systems in place ?

Consumers

- **Consumers**
  - Self consumers
    - Grid access without undue restrictions
    - Rights to remuneration based on market value
  - Renewable energy communities defined
  - Likely to require new obligations in law to be placed on TSO/DSO to provide access rights and for possible system changes

Heating & Cooling

- Aim: Increase share of renewables in H&C
- MS to “endeavour” to achieve an increase of 1% p.a. of the national share of final energy consumption up to 2030. A concern for IE ?
- District heating – waste heat excluded. MS concerns
- Access rights to RES-H and rights to customers to disconnect from existing system/switch
- Information and reporting re performance
- MS to designate a competent authority to enforce rules

Transport

- No binding EU national targets . However, EU level blending obligation on fuel suppliers
- Builds on ILUC. Target by 2030 – 6.8% advanced biofuels and decreasing levels of crop based biofuels
  - Crop based biofuels/ biomass fuels to decrease from 7% to 3.6% for road and rail transport
- National Data base – track eligible transport fuels / fraud
- MS concerns about ability of market to deliver 2nd generation biofuels.
- Significant investment to date in 1st generation biofuels across EU

Bioenergy

- **Sustainability Criteria**

  - Extended to biomass and biogas for H&C & electricity
  - Criteria for agricultural biomass streamlined
  - Challenging thresholds for GHG savings for biofuels in new plants and for biomass
  - Verification of sustainability criteria and GHG
  - Concern -potential to increase cost of biomass
  - Sustainability criteria to be set out by Cion

Governance Regulation

- Integrates energy and climate planning and reporting for the period 2021 to 2030.
- Existing plans and reporting structures such as the National Renewable Energy Action Plan, the National Energy Efficiency Action Plan and the Climate Monitoring Mechanism Regulation to be replaced by a single planning and reporting structure covering the 10 years.

Main Provisions (1)

- MS to develop draft National Energy and Climate Plan (NECP)(for the period 2021-2030) by 1 January 2018 and a final plan by 1 January 2019 - detailed.
- NECP will consolidate into one plan the existing national planning and reporting obligations across energy and climate policy areas.
- Linear trajectories for national emissions, renewable energy and energy efficiency and the measures to achieve.

Main Provisions (2)

- Member States to cooperate on **regional** basis in preparing the NECP.
- MS to take utmost account of EC recommendations on the draft plans.
- Biennial reporting is required on NECP progress starting in 2021.
- Also, reporting provisions of the Climate Monitoring Mechanism Regulation

Main Provisions (3)

- The EC may take action in 2023 if it assesses that the EU is at risk of not meeting its targets.
- Could require additional measures from Member States e.g. adjusting their share of renewable energy in heating/cooling and transport or make a financial contribution to an EU level fund.
- Failure to maintain the baseline share of RES (16% for Ireland) - gap to be covered by financial contribution to an EU level fund.

System Services (General Update)

Robert O' Rourke

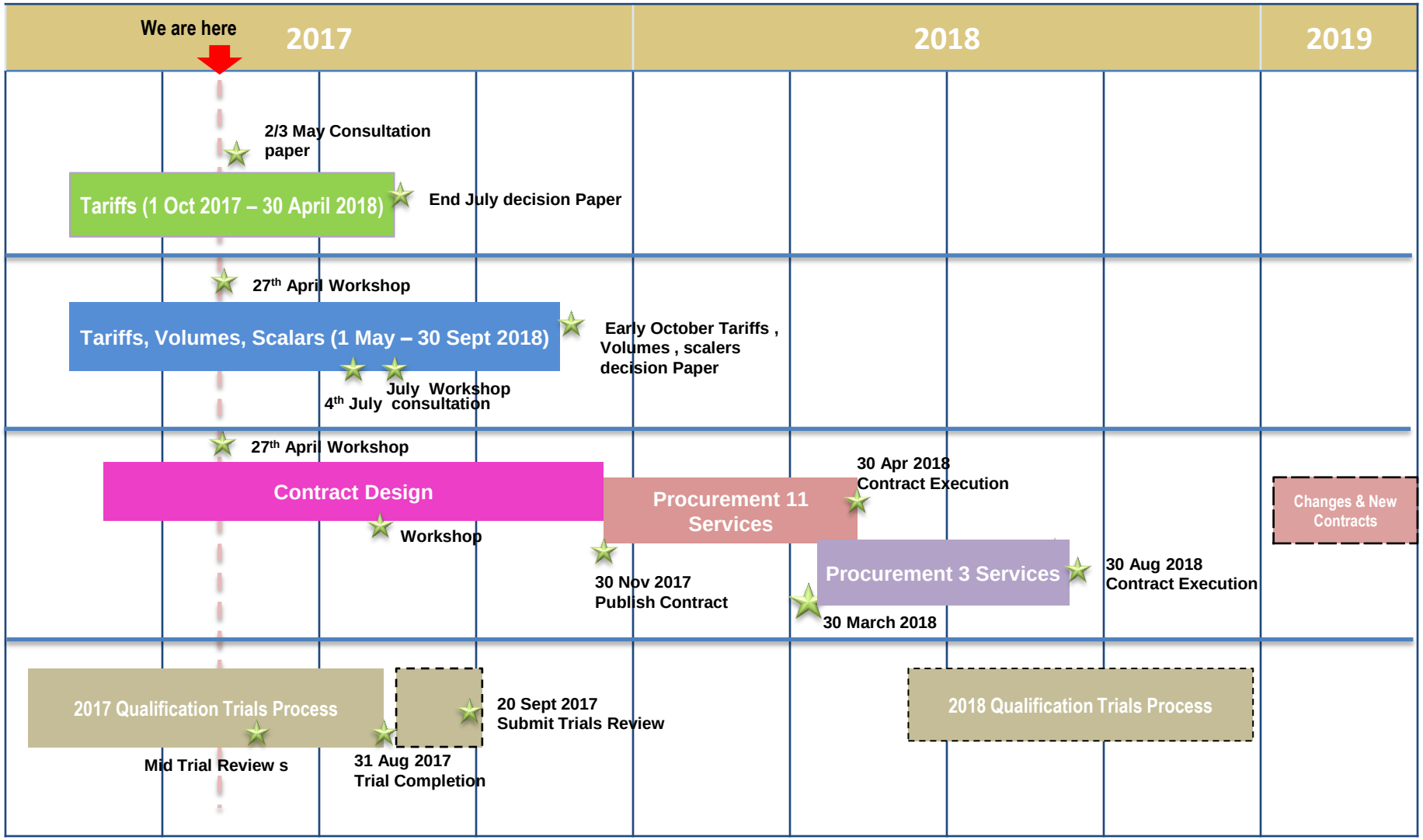
Commission for Energy Regulation
An Coimisiún um Rialáil Fuinnimh

System Services Update & Qualification Trials

Jason Hannon

EIRGRID GROUP

DS3 System Services 2017/18 - Milestone Plan



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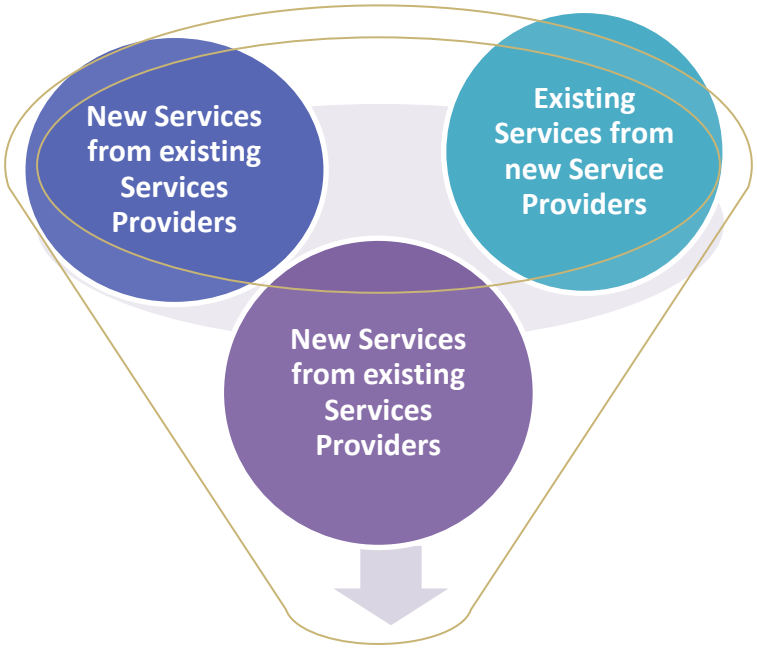
Qualification Trials – Final list of Providers

Trial	Service Provider	Lot
Provenability	Barranafaddock (Inertia Emulation)	1 – POR Wind
	Mount Lucas	
	Kill Hill (Inertia Emulation)	
	Athea	
	Electricity Exchange	3 – POR DSM
	Endeco / Electric Ireland Consortium	
	Acres (Inertia Emulation + Sync Comp)	4 – POR O.T.
Measurability	Kilroot K2	6.1 – FFR CDGU
	Indaver	
	Electricity Exchange	6.3 – FFR DSM
	Kill Hill (Inertia Emulation)	6.2 – FFR Wind
	EWIC	6.4 – FFR OT
	Moyle	
	Pallas	7.2 – FRT Wind
	Kilroot K2	7.1 – FRT CDGU

What's needed for prudent large scale deployment?



Standards & Operating Policies	Capabilities of new tech at scale	Performance Mechanisms	Payment Mechanisms	Comms. & Protocols	Schedule & Dispatch

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Key Updates

- Monthly Performance Report Templates created
- Availability Forecast Assessments of Wind / DSM ongoing
- 2 x Underfrequency Events to date / None for FRT
- Midpoint reviews – End of may / Start of June

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Lunch & Networking

13:00-13:50

EIRGRID GROUP

DS3 Advisory Council
Oscillations in Power Systems

Jon O'Sullivan

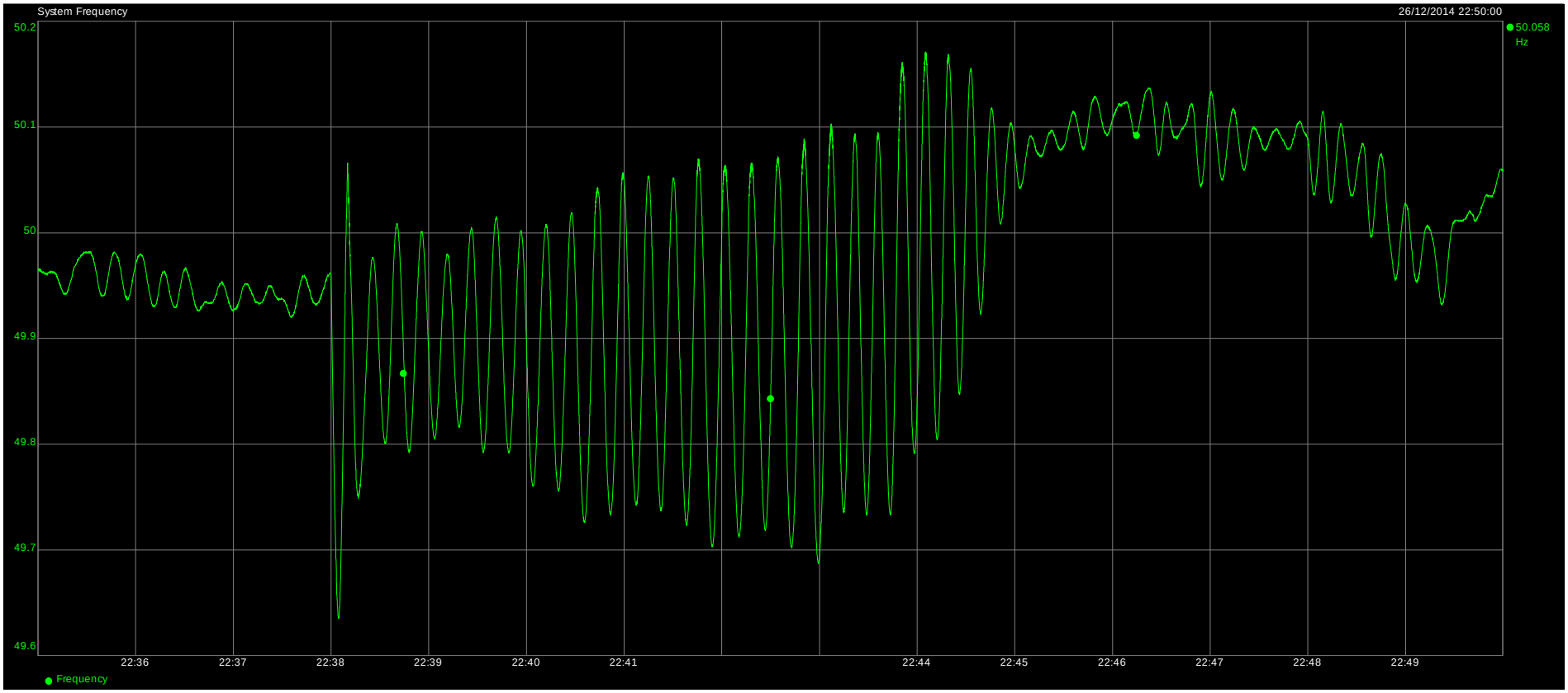
18 May 2017

EIRGRID GROUP

Date: 26/12/2014 22:38

Details:

Duration:	7mins approx.
Max Pk-Pk Amplitude:	484 mHz
Frequency/Mode:	0.06 Hz



EIRGRID GROUP

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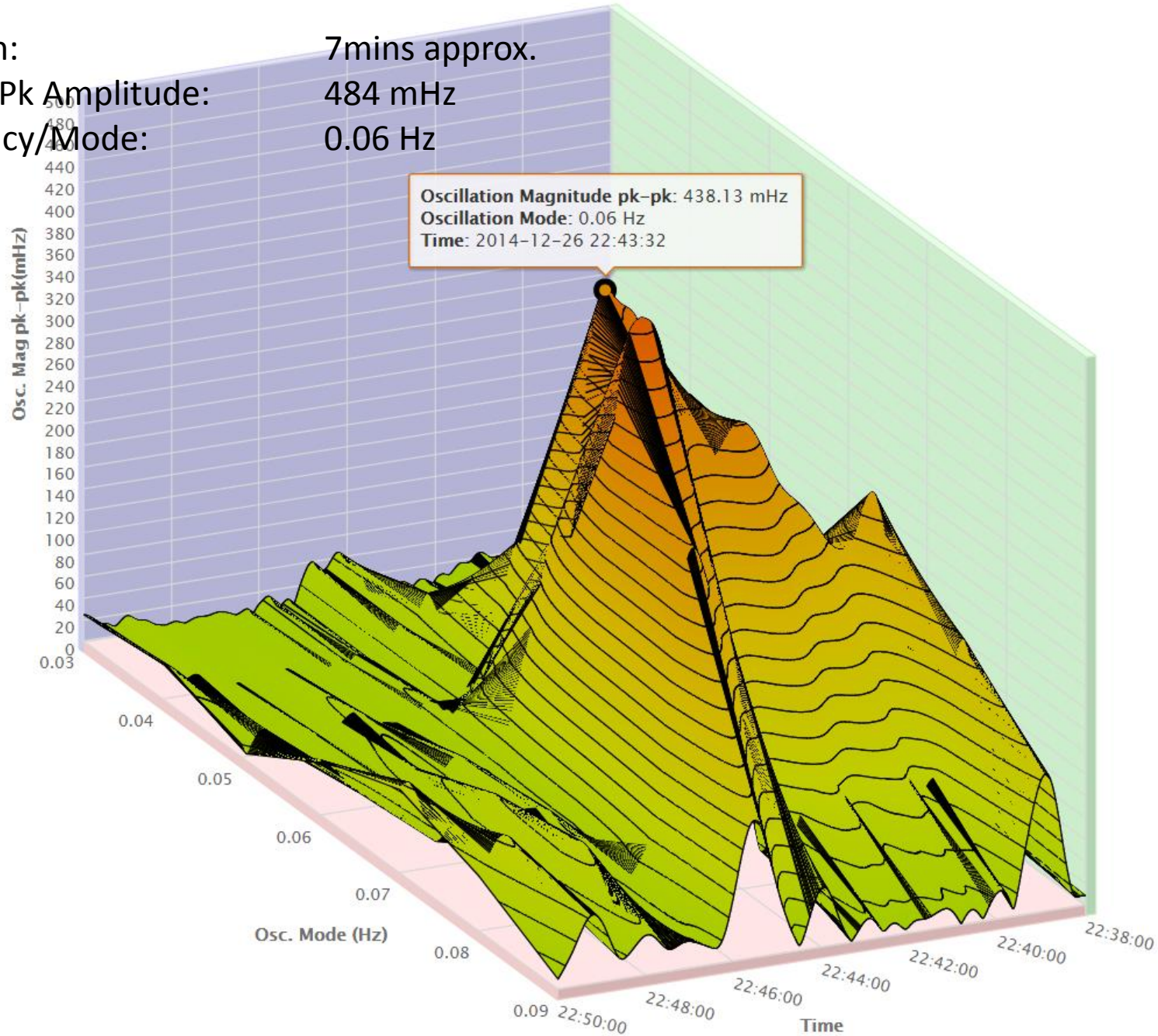
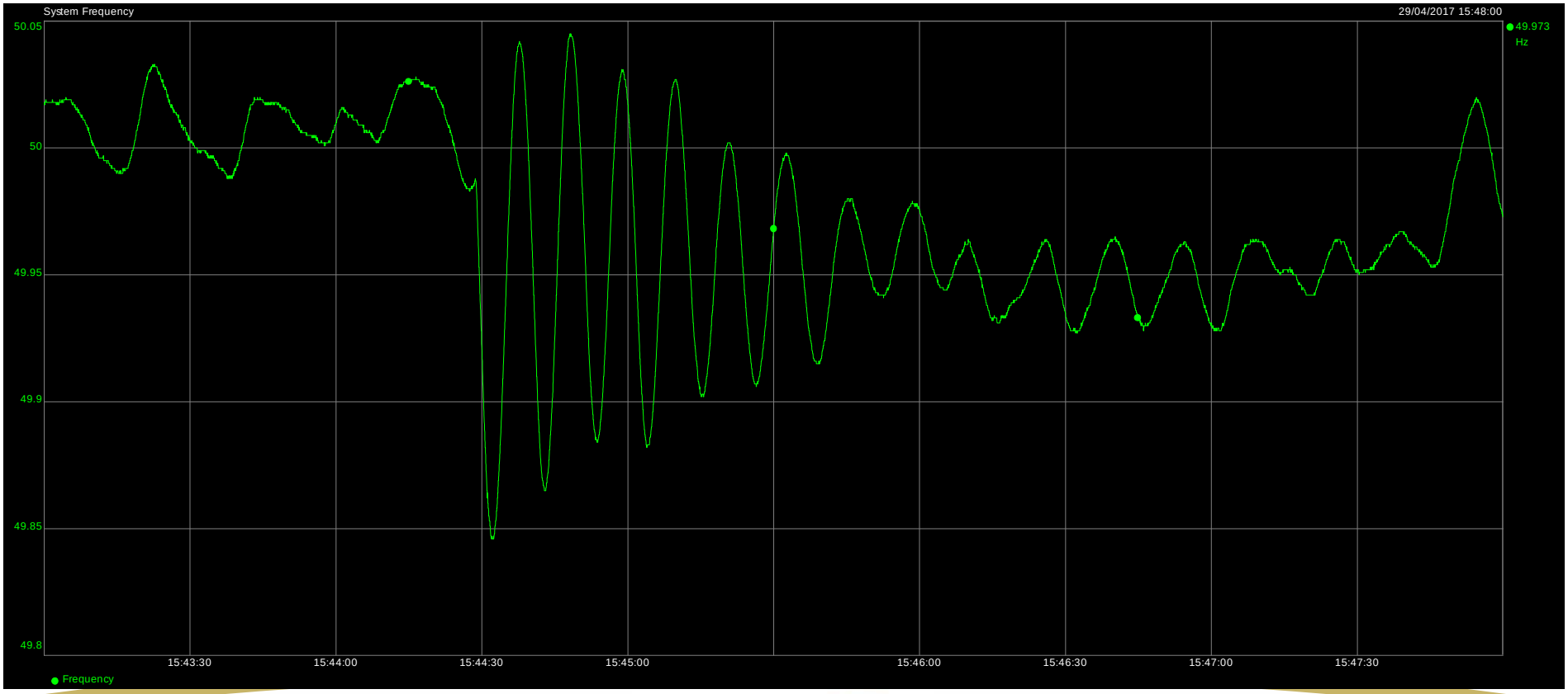


Date: 29/04/2017

Details:

Duration:	1.5 mins approx.
Max Pk-Pk Amplitude:	160 mHz
Frequency/Mode:	0.09 Hz



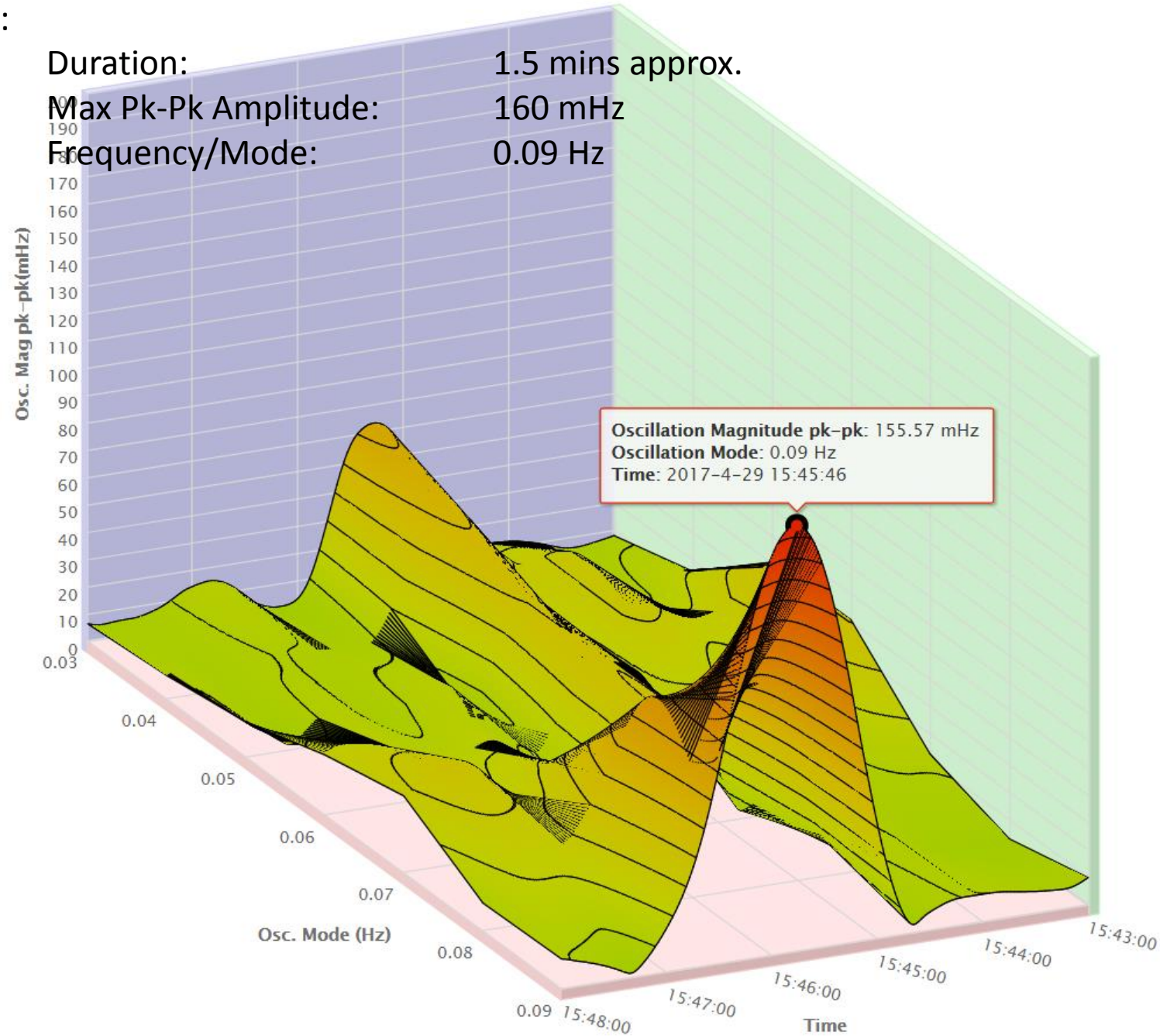
Date: 29/04/2017

Details:

Duration: 1.5 mins approx.

Max Pk-Pk Amplitude: 160 mHz

Frequency/Mode: 0.09 Hz



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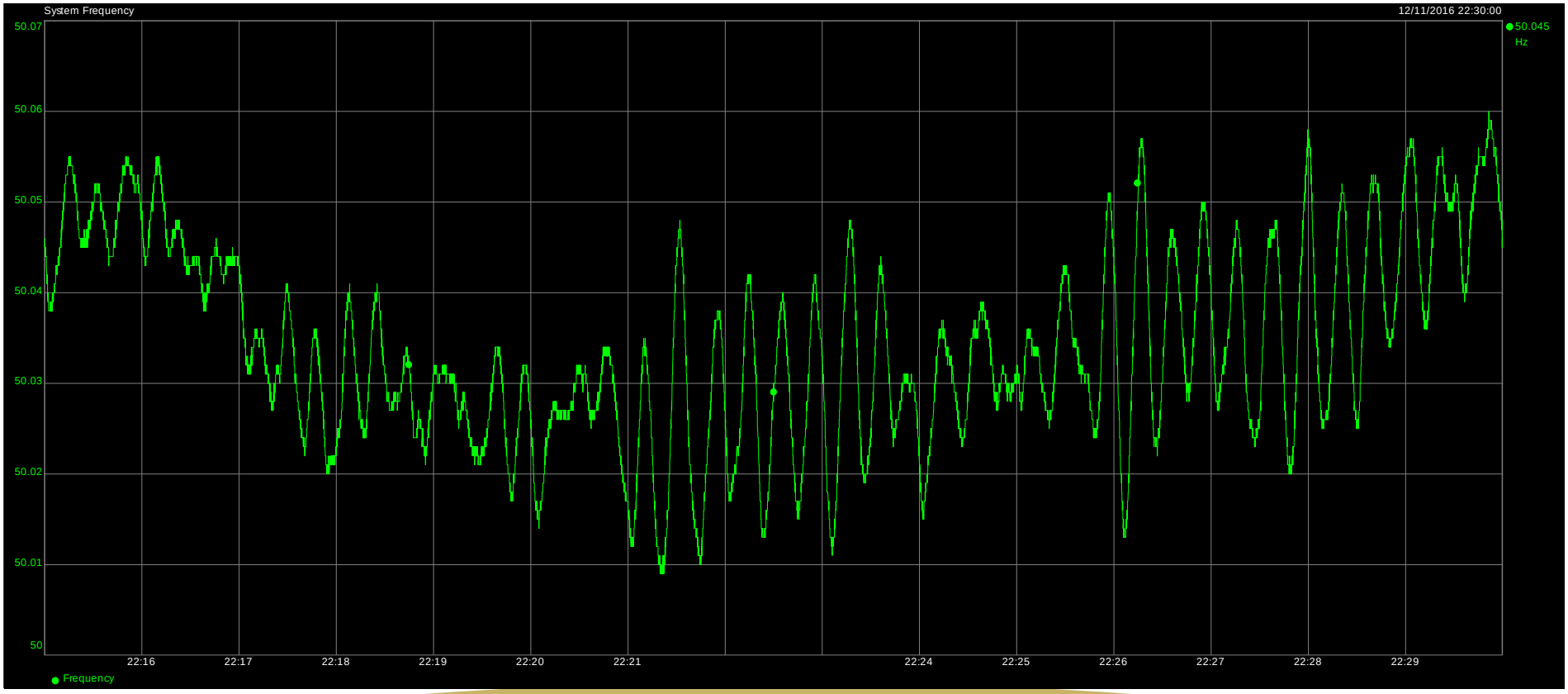

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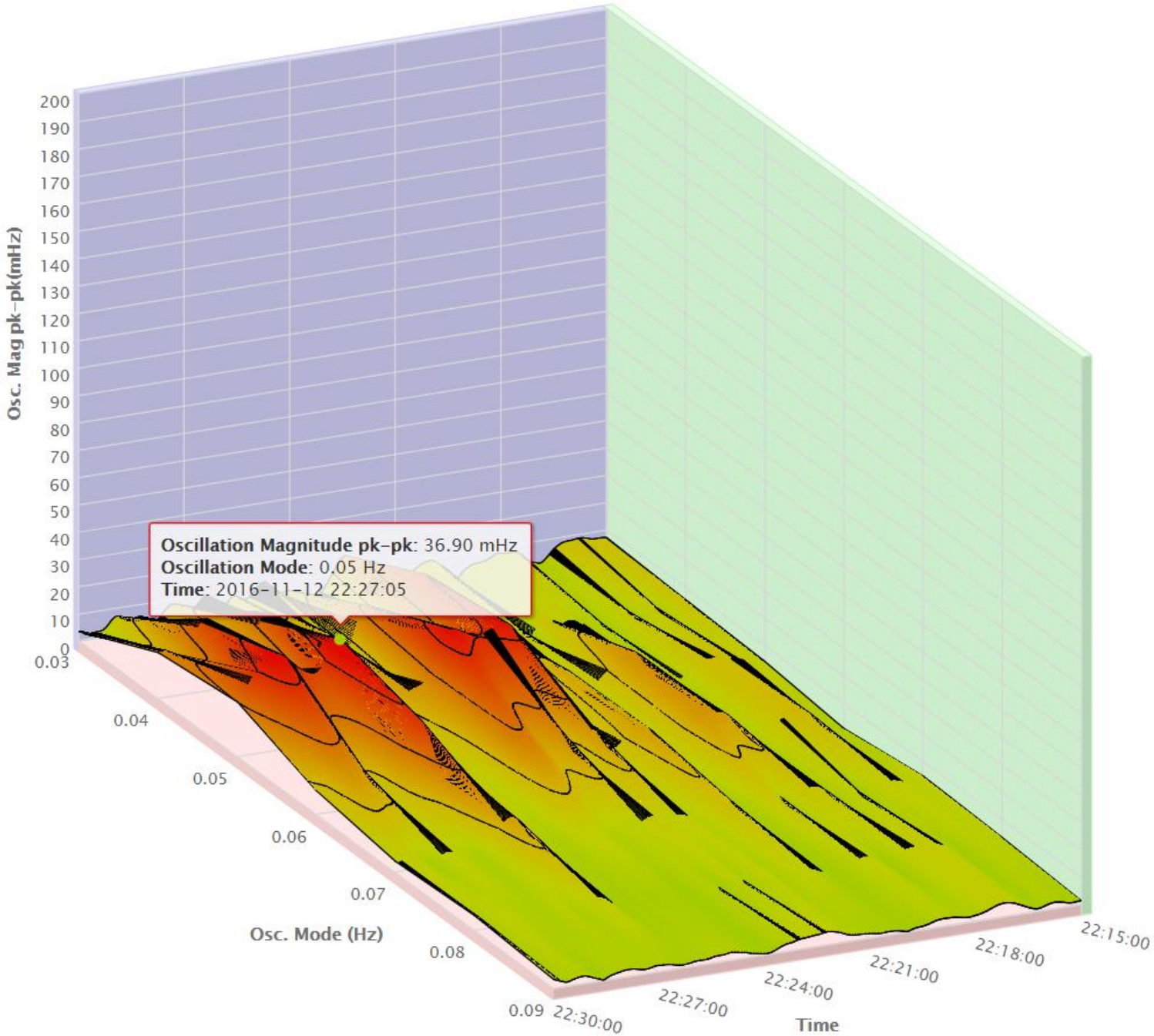

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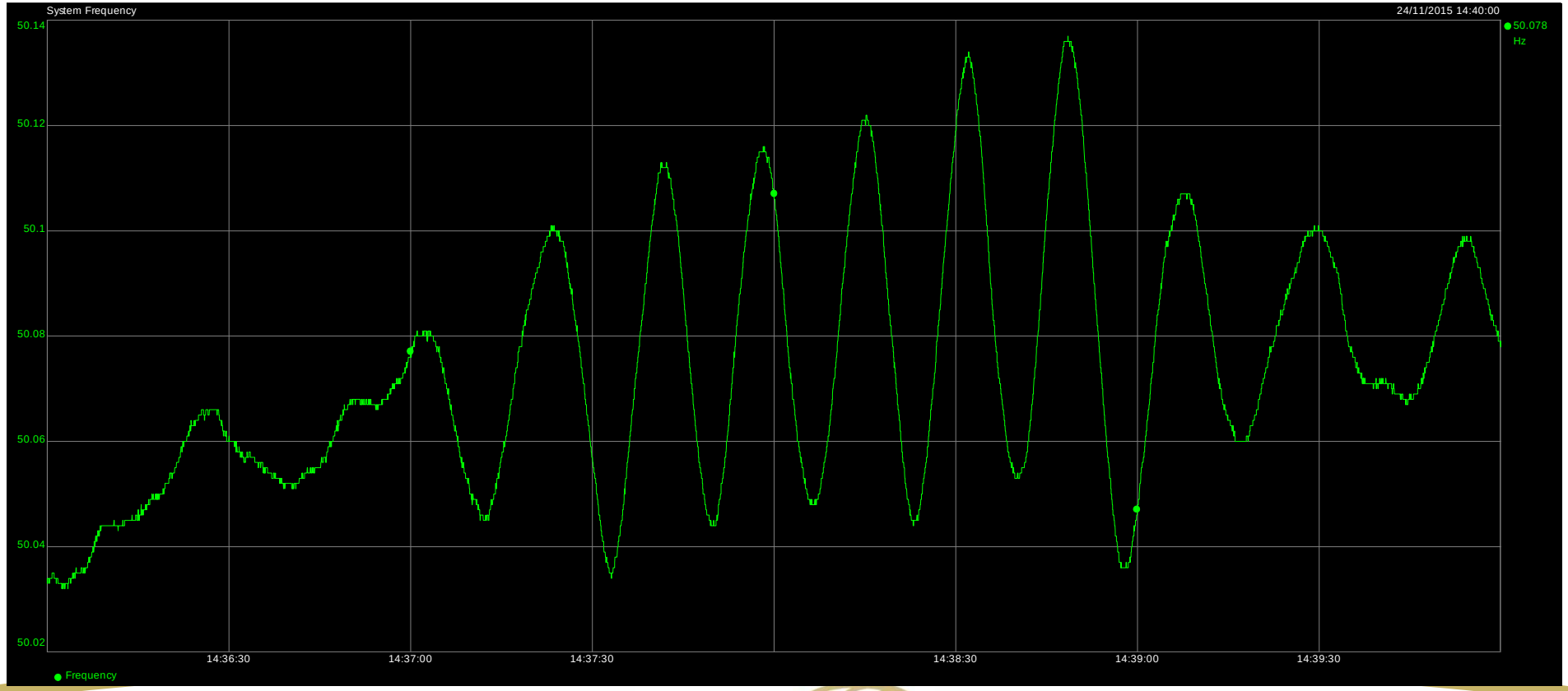
Details:

Duration:	2mins approx.
Max Pk-Pk Amplitude:	100 mHz
Frequency/Mode:	0.06 Hz



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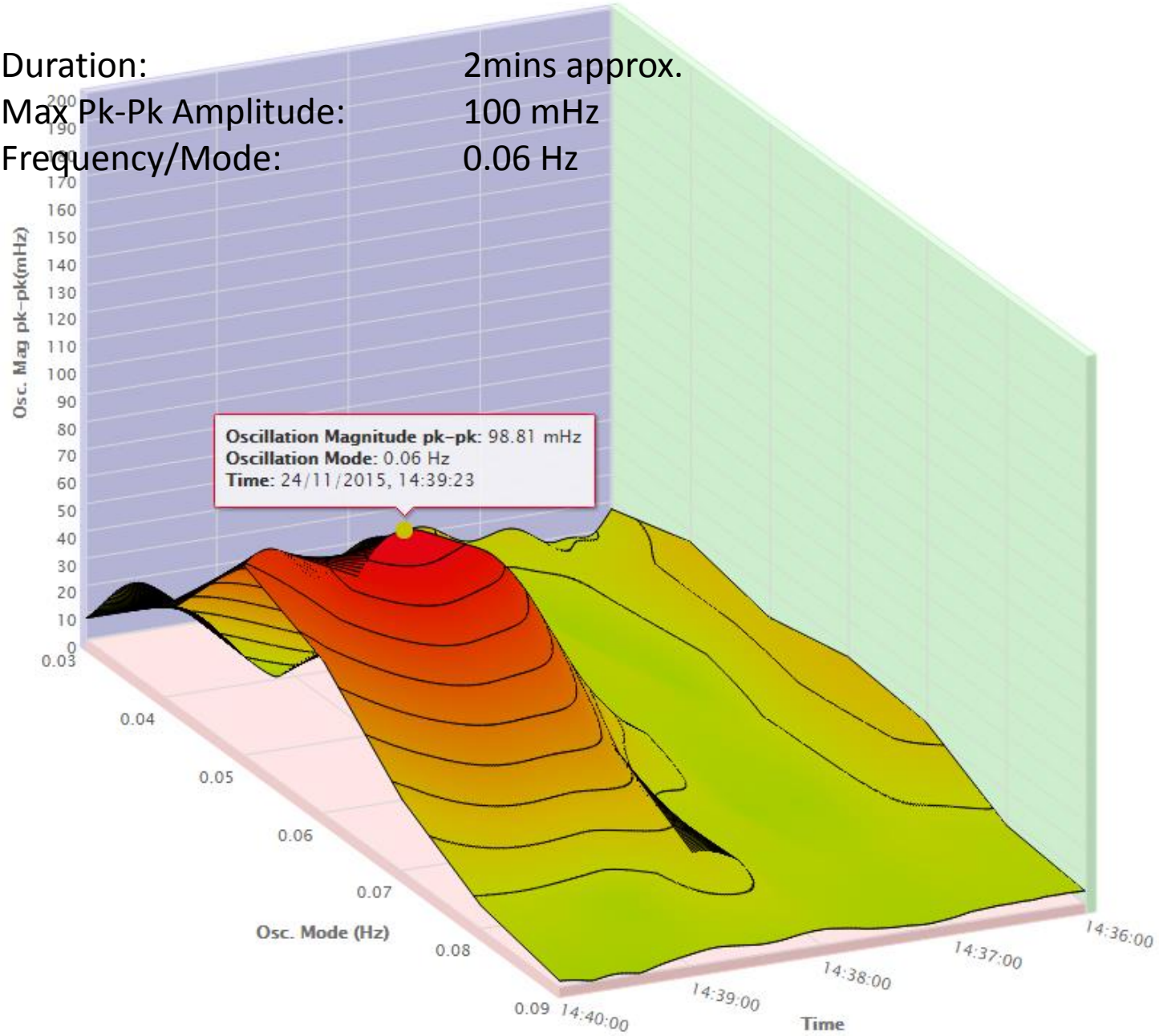
Date: 24/11/2015 14:36

Details:

Duration: 2mins approx.

Max Pk-Pk Amplitude: 100 mHz

Frequency/Mode: 0.06 Hz

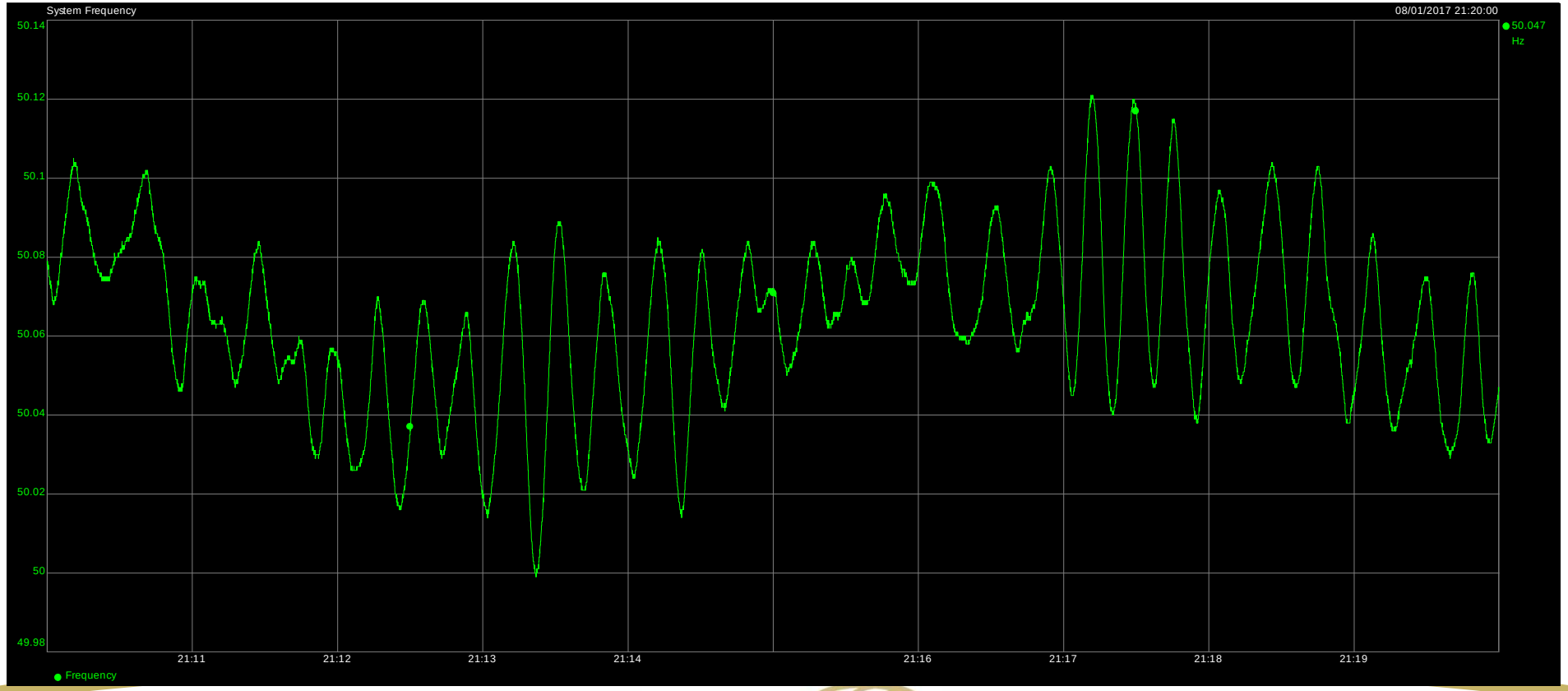


Date: 08/01/2017 21:10 – 21:20

Details:

Max Pk-Pk Amplitude: 85mHz

Frequency/Mode: 0.05 Hz

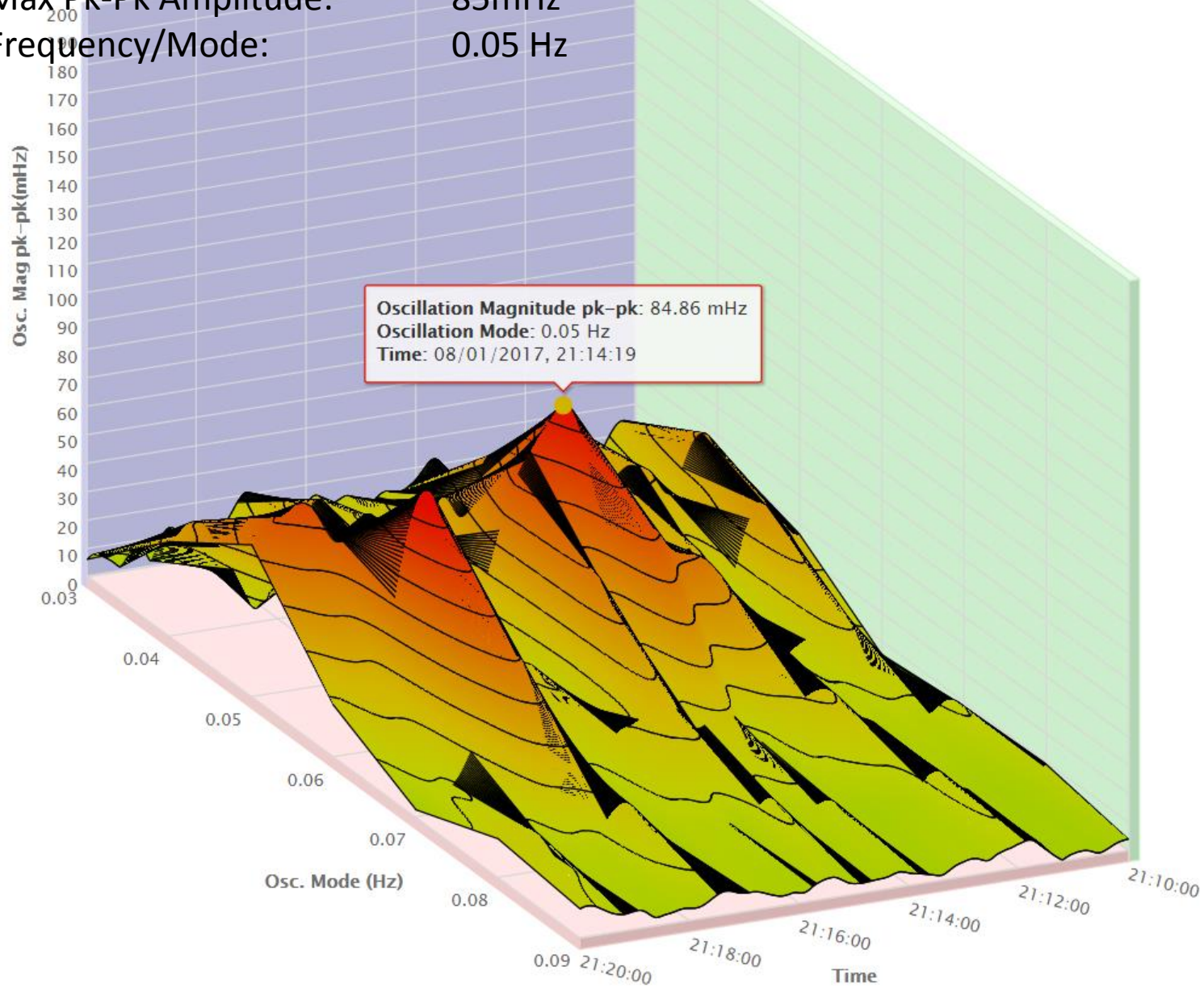


Date: 08/01/2017 21:10 – 21:20

Details:

Max Pk-Pk Amplitude: 85mHz

Frequency/Mode: 0.05 Hz



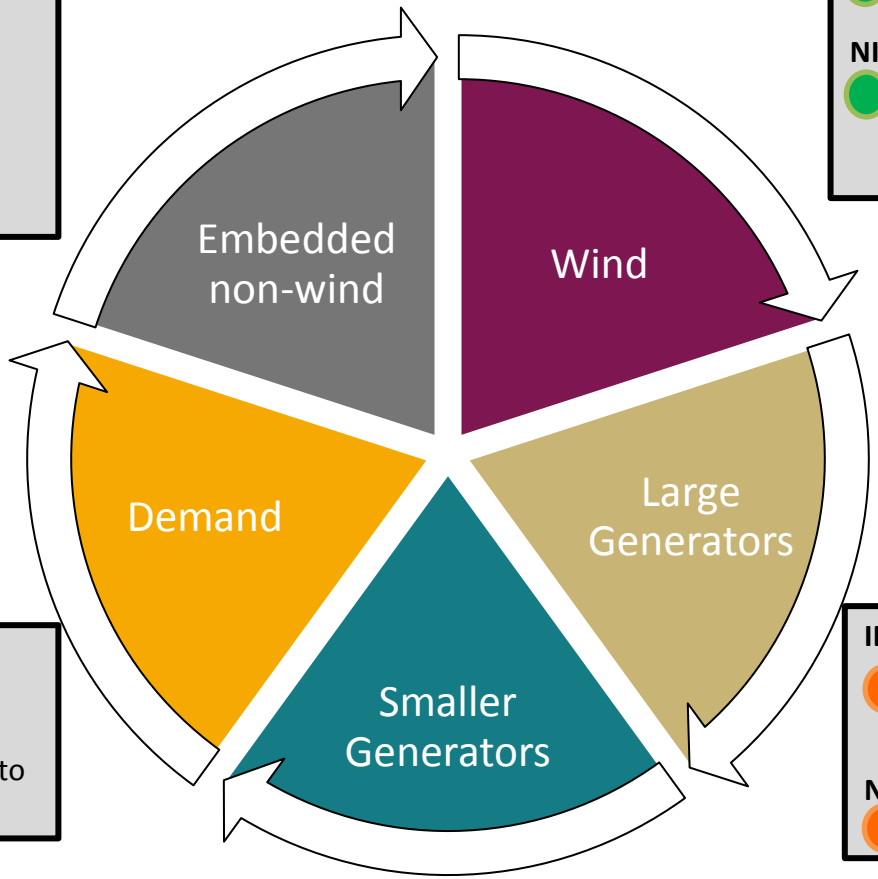
RoCoF overview

IE: EirGrid to confirm to ESB N the quantum of non-wind sites to apply the new settings

NI: Subject to direction from UR, need to determine how many sites need to apply new settings

IE: >80% of settings changed; plan to change other 20%

NI: Subject to direction on cost recovery from UR, NIE can witness changed settings be applied by end 2017



IE: ESB N have no concerns

NI: NIE & SONI have agreed overall prudent approach to risk to demand

IE: Testing progressing in line with agreed process (2 generators require further interaction)

NI: 2 generators require further interaction

IE: Studies underway; testing scheduled into 2018, as per plan

NI: n/a – NIE considering all SSG (<5MW) together

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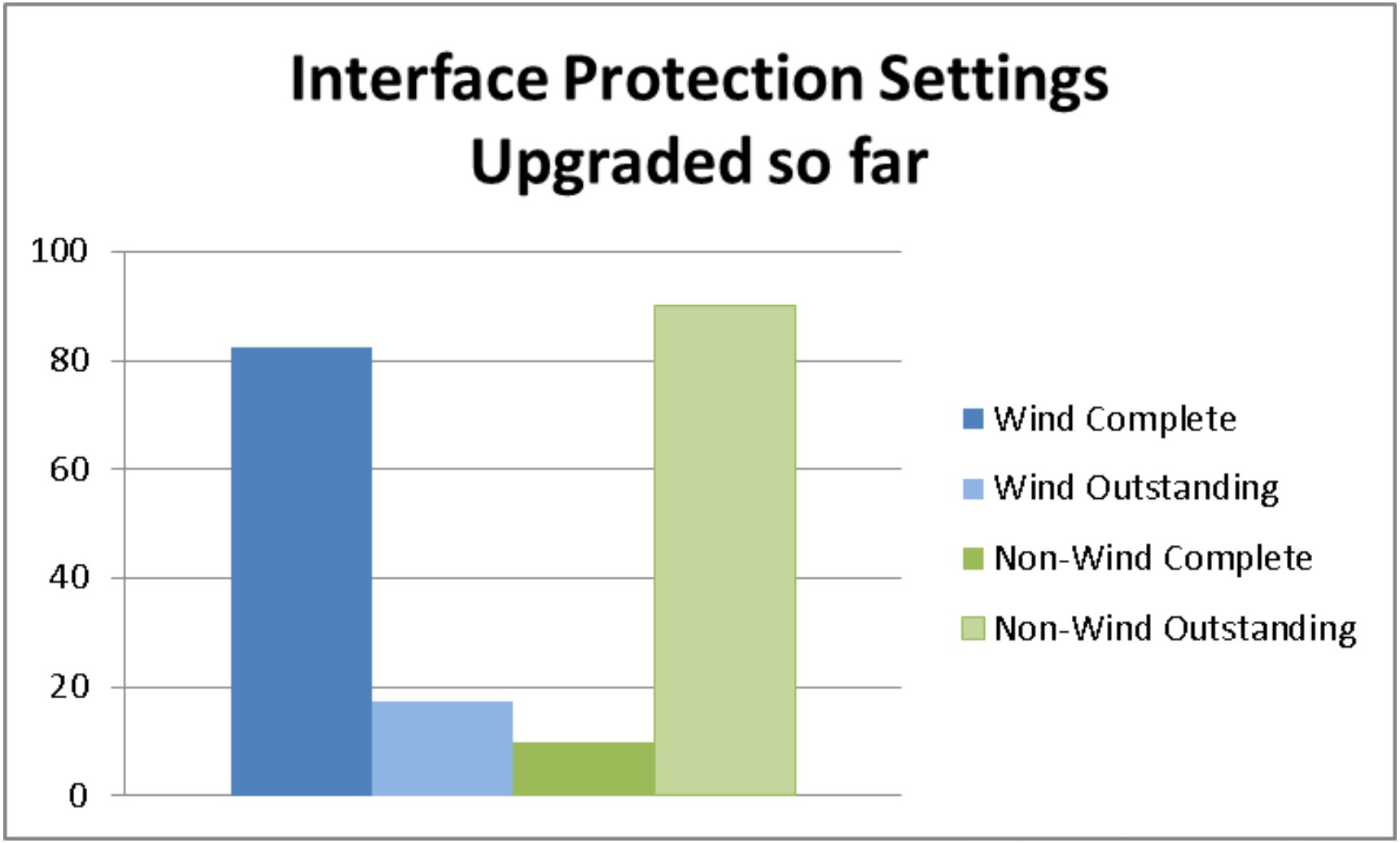
DSO RoCoF Update
DS3 Advisory Council
18/05/17

James Kelly

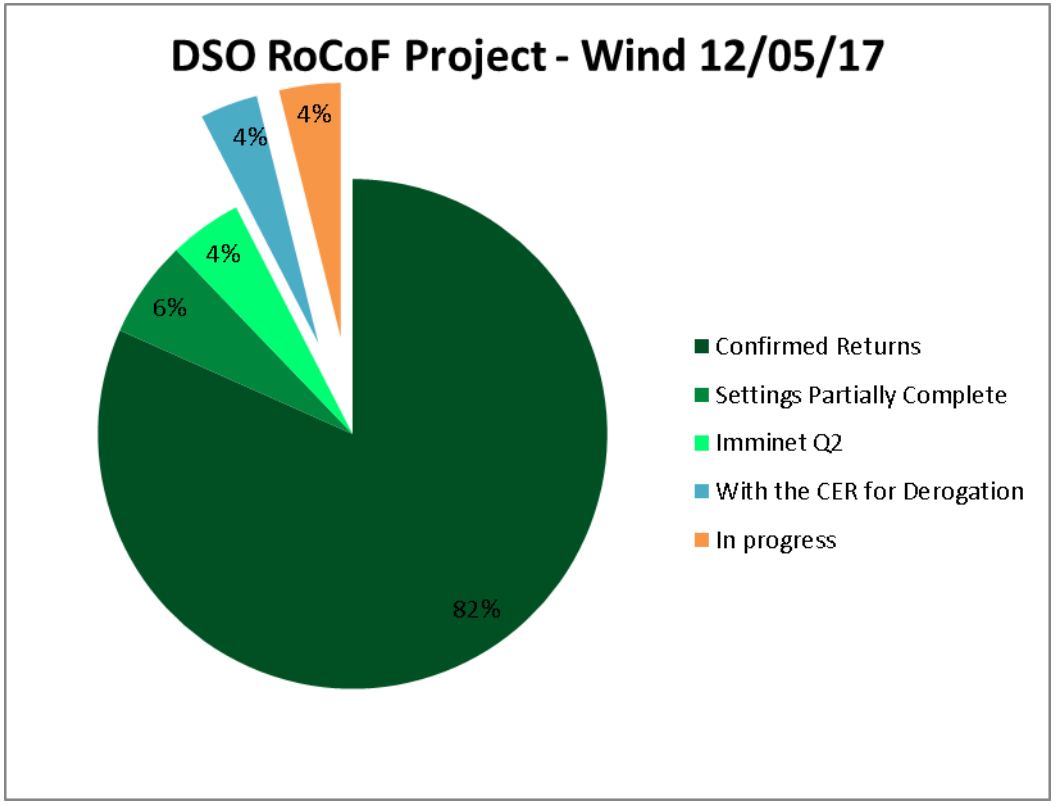
18th May 2017

Two streams: Wind and Non-Wind



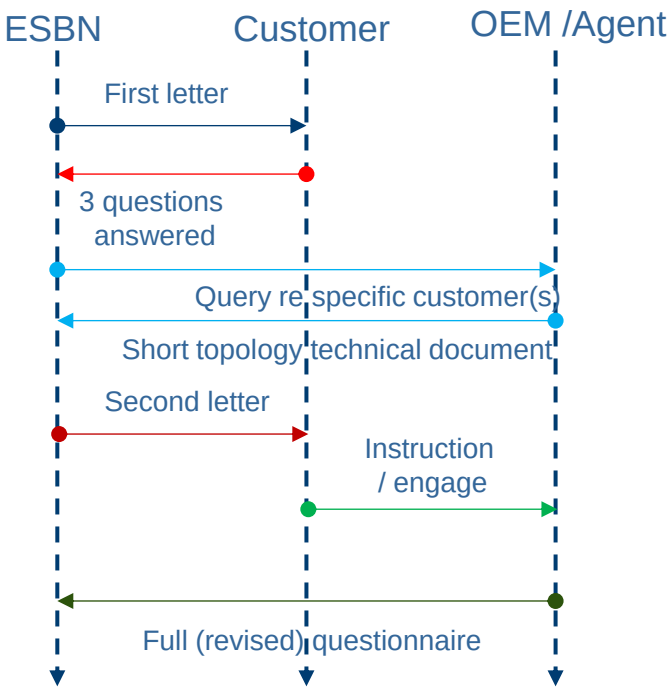
DSO RoCoF Project Wind Breakdown

Wind Figures Breakdown	%
Confirmed Returns	82.5%
Settings Partially Complete	6.23%
Imminent Q2	3.62%
With the CER for Derogation	3.71%
In progress	3.94%



Five step process to coordinate the upgrade of non-wind DSO connected generators

This 5 Step process has been devised by ESBN to coordinate the upgrade of interface protection settings predominantly at generation sites who operate in continuous mode or peak shaving.

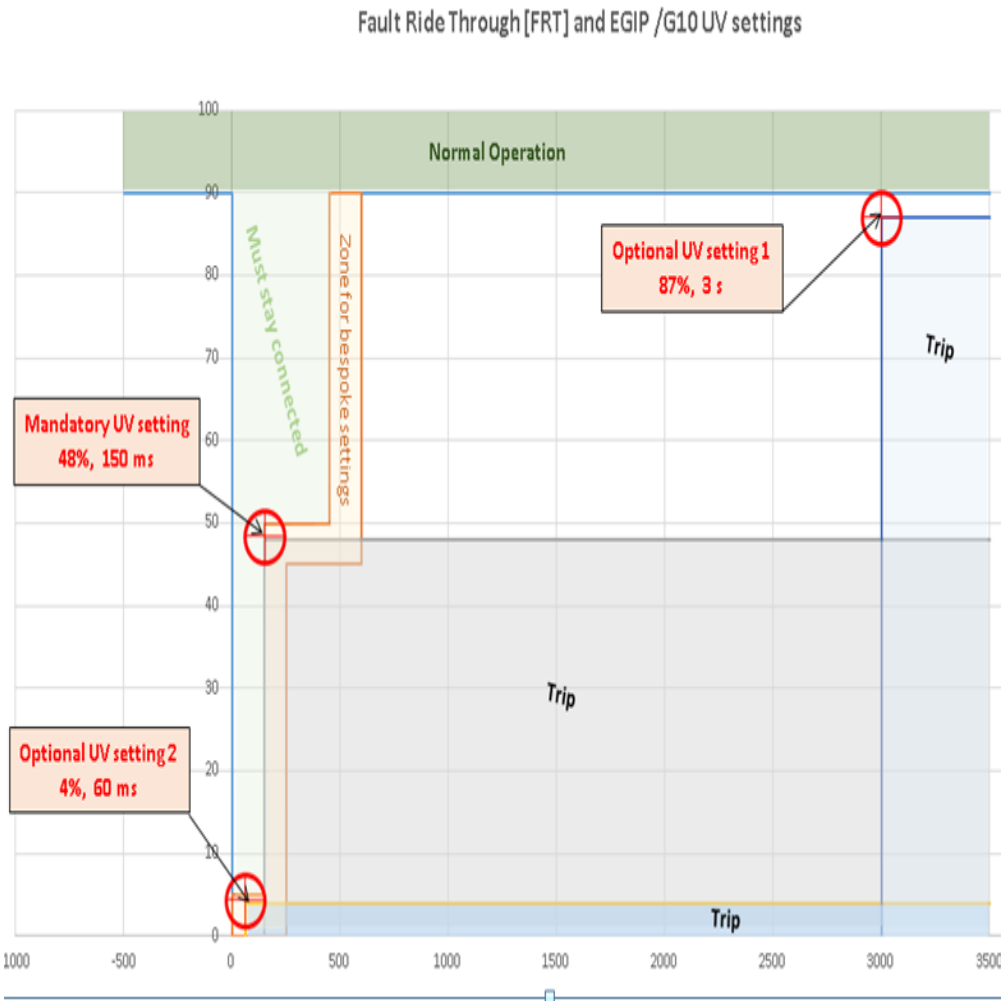


Clarification of Fault Ride Through requirements with Under Voltage settings

- **This two page document is being produced in response to industry feedback to ESBN.**

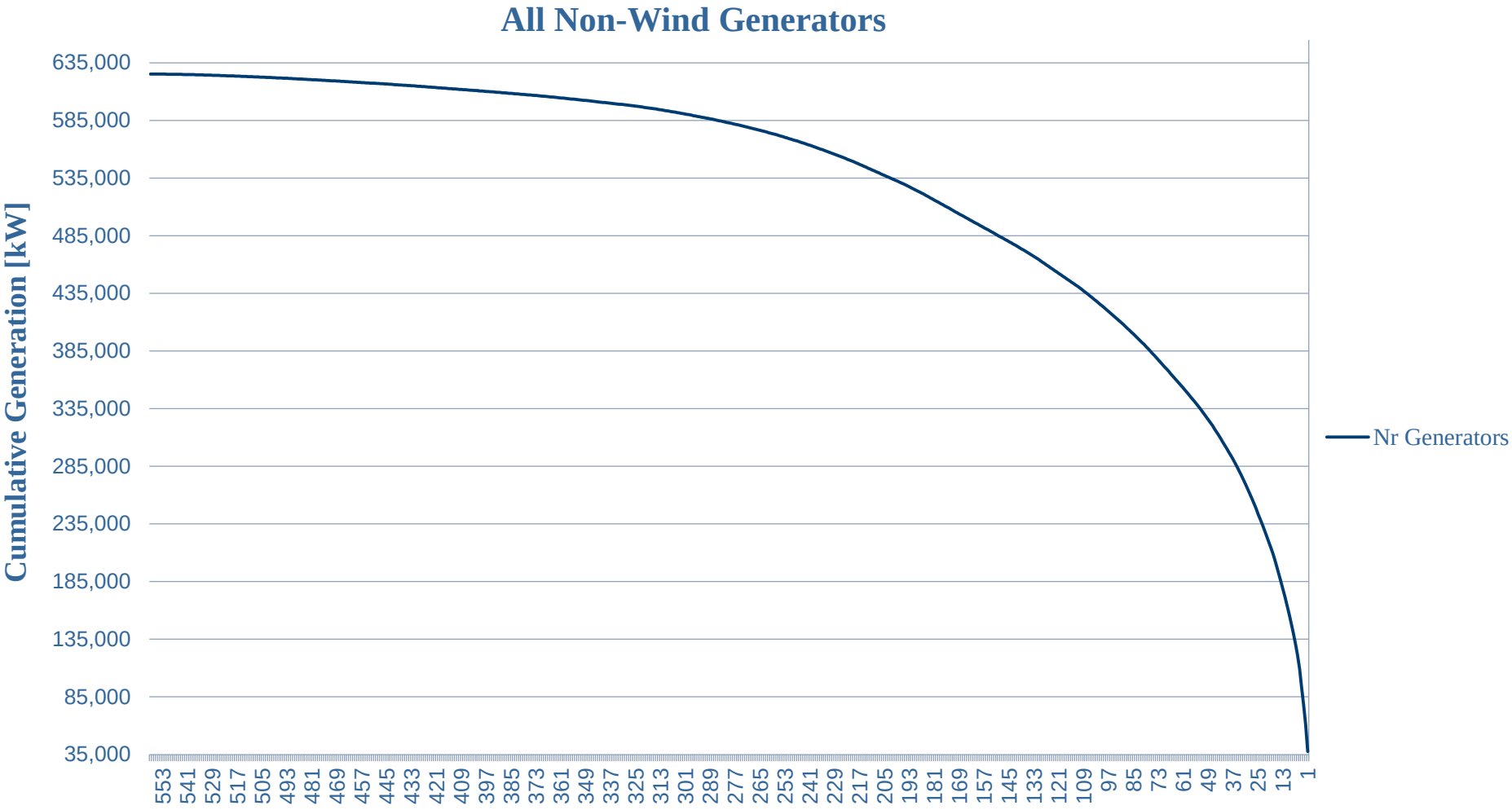
- **This two page document:**

1. *Clarifies FRT requirements.*
2. *Outlines the single mandatory UV setting.*
3. *Gives OEMs the flexibility to utilise additional settings that best serve their clients.*
4. *Can be used as a companion document to the G10 Synchronous Questionnaire.*

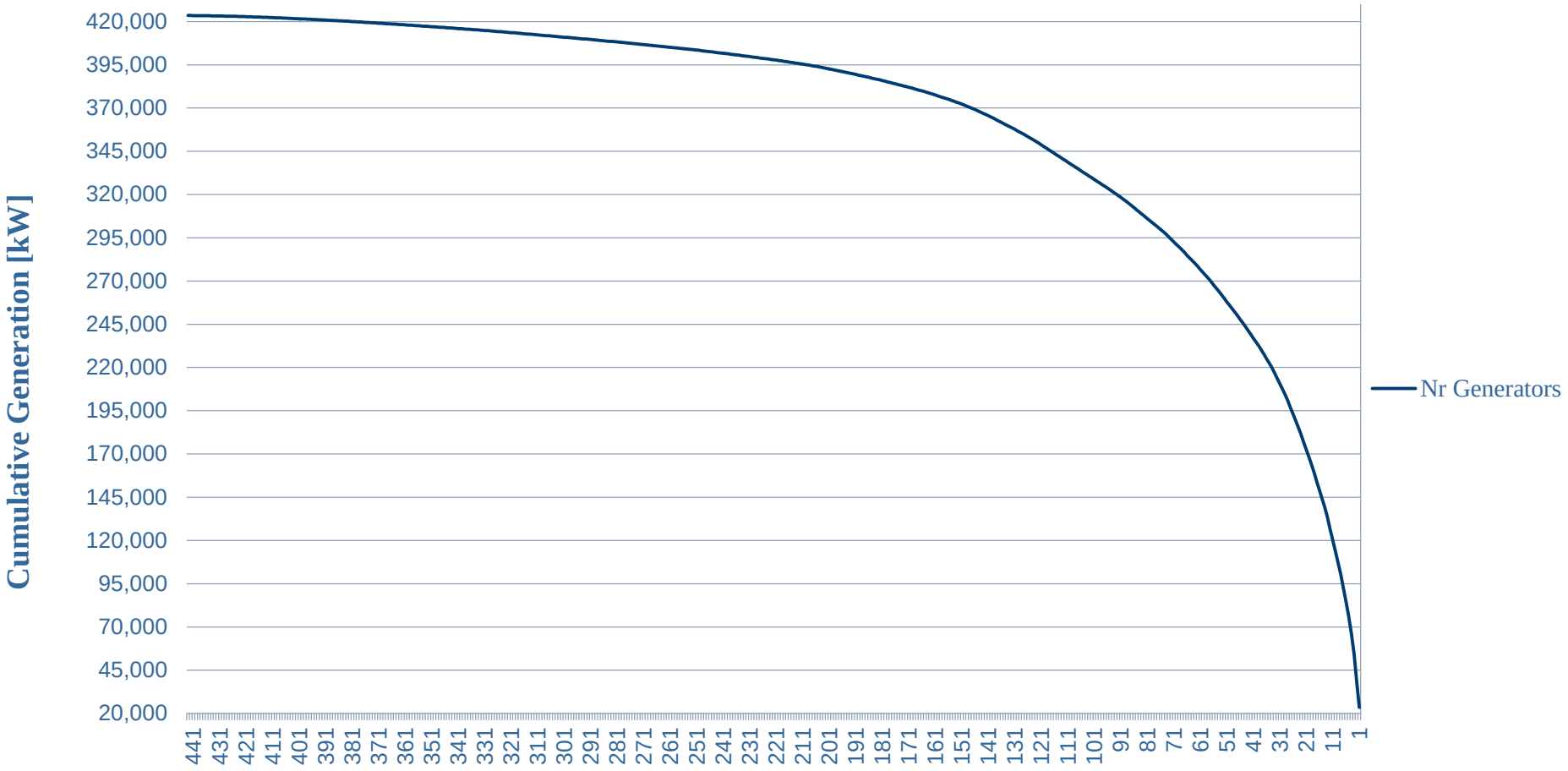


Spotlight on DSO DS3 RoCoF programme

- **The wind industry has reacted to this programme and with few exceptions have engaged with ESB Networks.**
- **First meeting of the Non-Wind Generator OEMs and Agents on DS3 Issues on 31/05/16, agreement made to engage with ESBN but this did not transpire.**
- **Second meeting took place on 13/10/16, presentations made to non-wind cohort by ESBN, CER and EirGrid, open discussion on all issues deterring non-wind generators from engaging in the programme.**
- **The non-wind generators up to Q4 2016 have for the most part not engaged with this programme, this has now changed with customer buy-in to the 5 Step Process.**
- **The CER has necessitated that significant progress is made on the DSO Non-Wind RoCoF stream by the end of Q4 2016.**


All Non-Wind Generators
Cumulative Generation [kW]
635,000
585,000
535,000
485,000
435,000
385,000
335,000
285,000
235,000
185,000
135,000
85,000
35,000
553 541 529 517 505 493 481 469 457 445 433 421 409 397 385 373 361 349 337 325 313 301 289 277 265 253 241 229 217 205 193 181 169 157 145 133 121 109 97 85 73 61 49 37 25 13 1
Nr Generators

All Non-Wind Generators: Continuous and Peak Shaving



Benefits of updating Interface Protection Settings

NETWORKS

DSO Benefits

- **ESB Networks will be provided the opportunity to develop a deeper knowledge of their customers topology, usage and needs.**
- **Allow ESB Networks as the Distribution System Operator to manage the distribution system in a manner that provides the highest level of operational security which will provide the maximum continuity of supply to all customers.**

Customer Benefits

- **More likely to stay connected to the distribution system during a global frequency event.**
- **The customer by updating their protection settings will comply with the Distribution Code.**

Conclusions

- **2016 D-Code Modifications specify Fault Ride Through & Frequency capabilities of all distribution connected Generators.**
- **Quota of non-wind interface protection upgrades to be agreed with EirGrid and completed before end Q4 2017. This is to maintain the security of operation of the Transmission and Distribution Systems.**
- **Strong engagement from Distribution connected Wind Farms, this programme will close in Q4 2017.**
- **Massive spotlight now on the DSO non-wind RoCoF programme, for several reasons ESBN and their customers must act together on this.**
- **Where it is proposed to use vector shift [LOM] an alternative form of LOM protection to ROCOF, any proposed VS settings will need to be approved by the ESBN Protection Manager.**

Questions?

DS3 - NIE NETWORKS' ROCOF IMPLEMENTATION PROJECT

DS3 ADVISORY COUNCIL 18/05/17

Summary

- To assess the increased risk, NIE Networks followed ‘industry best practice’ and commissioned Strathclyde University to undertake academic studies.
- These studies have been completed for LSG and SSG.
- NIE Networks has met with HSE NI and we are assessing the conclusions of these studies.
- It is our understanding, that UR expects that generators would make the necessary arrangements to amend their own protection settings.

Academic Research – Stability Analysis

	Current	New	
	Setting	Setting	Time Delay
RoCoF	0.125Hz/s – 0.4Hz/s	1.5Hz/s	300ms
Over Frequency	50.5Hz	Staged up to 52Hz as per Over Frequency Shedding Schedule. Specific setting for generator will be stated in letter.	1s
Under Frequency	48Hz	48Hz	500ms
Over Voltage	1.1pu	1.1pu	500ms
Under Voltage	0.9pu	Stage 1: 0.85pu Stage 2: 0.6pu	Stage 1: 3s Stage 2: 2s

Ongoing & Future Activities

- Distribution Code Modification on G59 protection settings to be proposed (late May 2017) – this will require a short public Consultation
- As part of this Consultation, information on the increased risks, and the Strathclyde University reports will be published
- Relevant generators, and the wider industry will be contacted directly to make them aware of the consultation.
- Responses considered, before a recommendation is made to UR.
- On UR approval of the proposed settings amendments, then;
- Letters will be circulated to the relevant generators requesting that they make the necessary protection setting amendments within the agreed timescales.
- As part of the outlined process, NIE Networks will request that generators perform their own risk assessment to satisfy themselves of any increased risks to their plant.
- NIE Networks will offer to provide SCADA data on circuit and S/S parameters

Future Activities

- **Based on these previous activities being completed:**
- **Start liaising directly with relevant generators in July regarding protection settings amendments**
- **Project Plan and regular reports produced showing progress of generators that have amended their settings.**
- **Changing LSG settings, will ultimately benefit those generators through reduced curtailments - our assumption is that they will respond positively and within the time scales required.**
- **However there is a risk that some may be slower to change settings than others.**

Timelines / Next Steps

Activity	Due Date	Status
Work Package 1	Q4 2015	Complete
Work Package 2	Q1 2016	Complete
Work Package 3	Q3 2016	Complete
Work Package 4	Q4 2016	Complete
Annex to WP3	Q1 2017	Complete
Annex to WP4	Q2 2017	On Schedule
Engagement with HSENI	Q4 2016	Complete
Consultation on “who pays”	Q1 2016	Complete
Consultation on D-Code Amendments (Protection Settings)	Q2 2017	On Schedule
LSG G59 amendments complete	Q3/Q4 2017	On Schedule
SSG G59 amendments – quantified risks outside ‘acceptable region’; still under review (dependant on WP4 annex outcome)	Q2 2017	On Schedule

Dublin Voltage Control

Alan Rogers

Eirgrid Operations, Planning, and Innovation

EIRGRID GROUP

Context

- There are a variety of Transmission Constraint Groups (TCGs) on the system
- TCGs can lead to significant constraint costs due to divergence from unconstrained market runs
- Minimising Constraints / Reviewing TCGs is a core Eirgrid policy in operating the system in a prudent economic fashion
- Removing constraints can help make more room for renewables

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Background – Dublin

- Dublin is Ireland's main load centre, with a peak demand of about 1600MW
- Eirgrid control the 220kV and ESBN control the Dublin 110kV radial network
- There is a transmission constraint group in Dublin for voltage control that requires three units (incl. EWIC)
- It is timely that the TCG be reviewed with the new reactor in Poolbeg, and in advance of ISEM

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Dublin Network

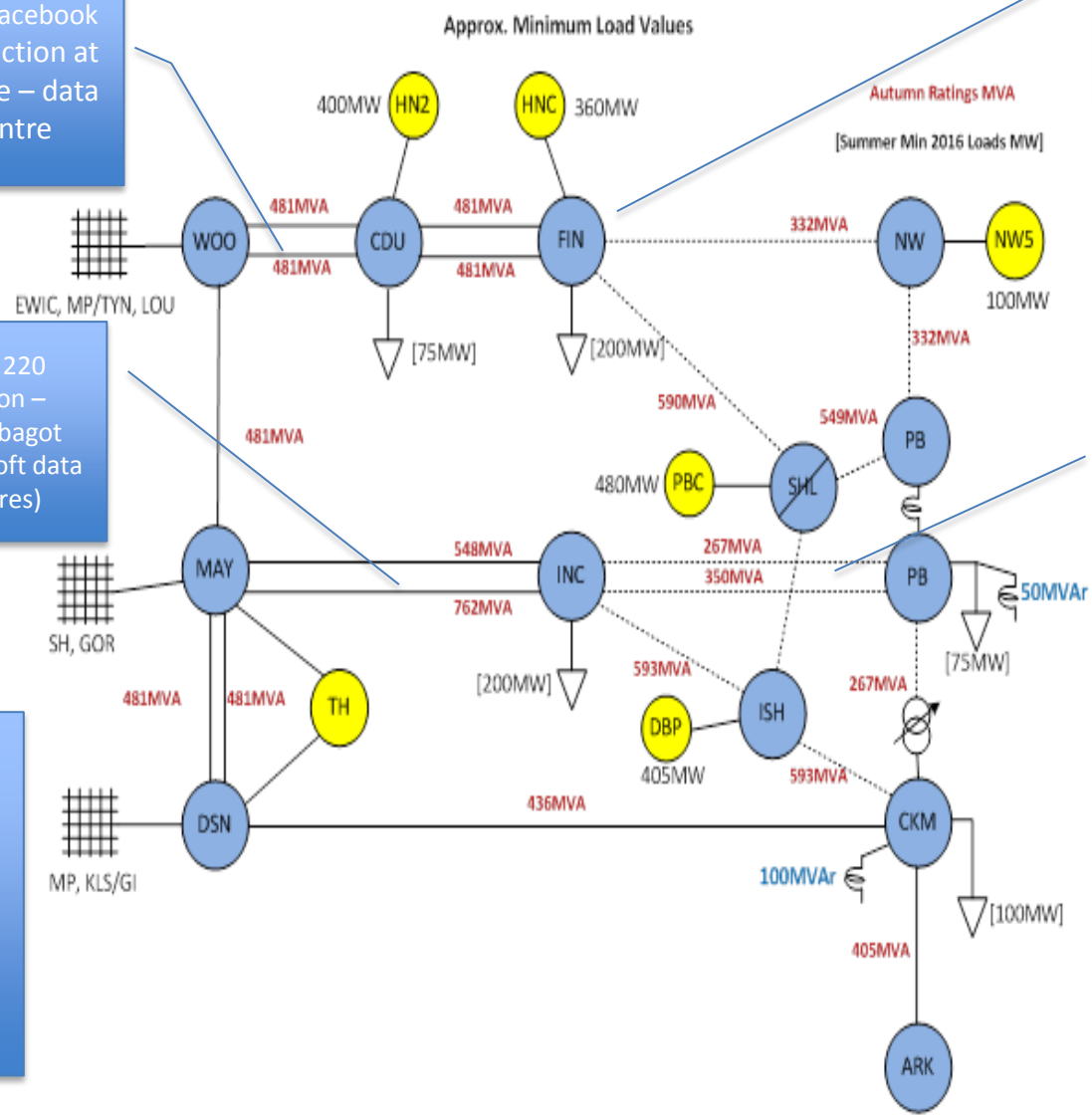
New Facebook connection at Clonee – data centre

New 220kV Station: Belcamp – data centres

New 220 Station – Castlebagot (Microsoft data centres)

Inchicore-Poolbeg-1 Forced Out

Each new connection requires long outages of 220kV lines into Dublin



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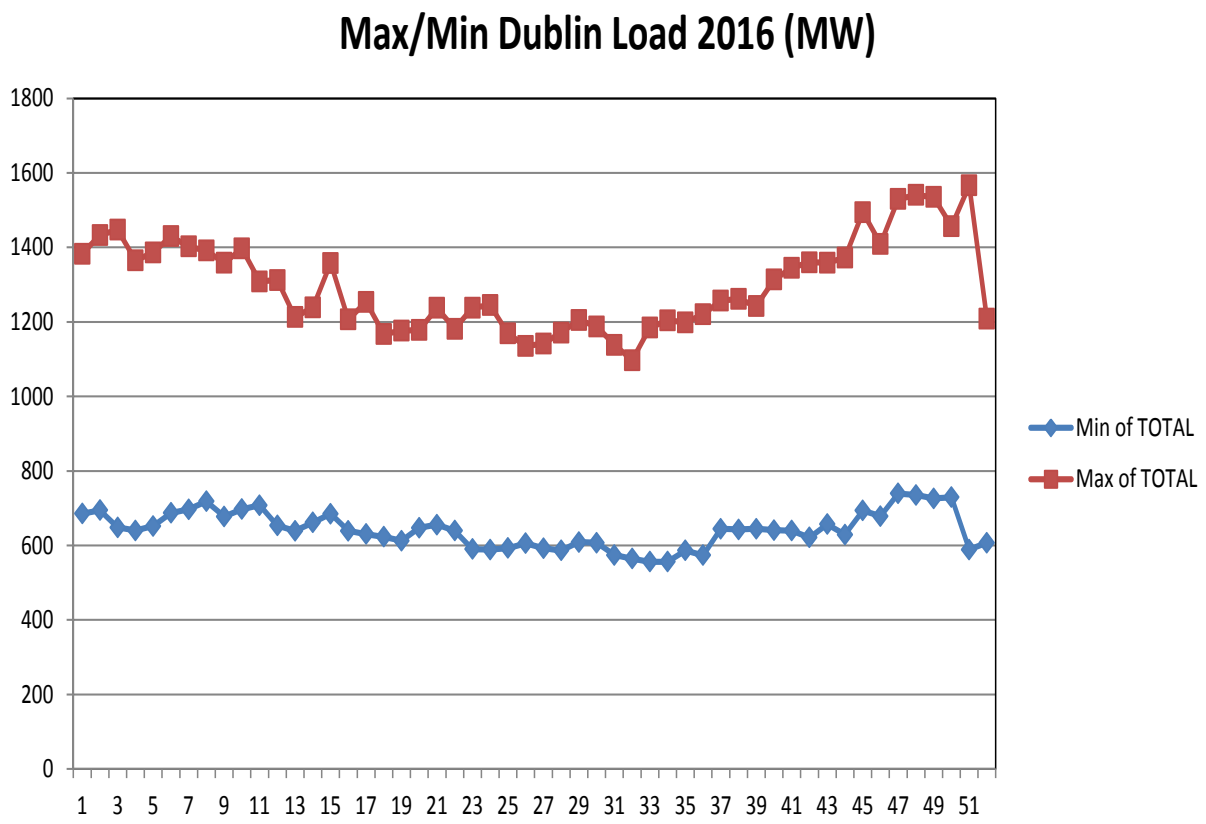
Dublin Load (2016)



Current TCG - Dublin Voltage

Dublin North Generation	NB	N:>=	1 Unit	HNC, HN2, PBA, PBB	Requirement for generation in North Dublin (for load flow and voltage control).
Dublin South Generation	NB	N:>=	1 Unit	DB1, PBA, PBB	Requirement for generation in South Dublin (for load flow and voltage control).

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Voltage Control Issues

- Need to maintain voltages within limits at all times (OSS)
- At low demand, voltages tend to increase, esp. at night
- Cable network produces MVArs which also tends to increase voltage
- Machines running in leading mode (absorbing MVArs) are less stable
- Can switch out cables at times, but this has impact on system security and loadflows / potential thermal issues
- Keeping units running has impact on constraint costs
- Need to avoid high voltage run-away / low frequency which could lead to overfluxing and system instability

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Next Steps

- Voltage control trial – Phase 1
  - Set one unit to unity power factor (zero MVArs) [Completed]
  - Analyse voltage and transient stability
- Voltage control trial – Phase 2
  - If Phase 1 successful, look to reduce units at night to 2 units (EWIC + 1 unit); monitor for 2-3 months
  - Analyse results (including VSA/TSA)
- Trial successful – roll out new TCG
- Trial unsuccessful – maintain TCG status quo and review following 2nd Poolbeg reactor installation

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Closing Remarks

DS3 Advisory Council 18/05/2017

14.45-15.00pm

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