

DS3 Industry Forum

Grand Canal Hotel, Dublin

29th of November 2016.



Agenda

DS3 Industry Forum		
Time	Agenda Item	Speaker
09:00-09:30	Registration (Tea & Coffee & Pastries)	
09:30-09:40	Introduction	David Cashman <i>DS3 Programme Manager Innovation Team EirGrid Group</i>
09:40-10:00	DS3 and beyond...	Jonathan O' Sullivan <i>Line Manager Innovation Team EirGrid Group</i>
10:00- 10:20	DS3 Programme Status Update <ul style="list-style-type: none">• 2016 focus areas• SNSP Studies / Trial	David Cashman <i>DS3 Programme Manager Innovation Team EirGrid Group</i>
10:20-10:40	Technical and economic analysis of the European System with 60% RES	Vera Paiva Da Silva <i>Program Director, Electricity Systems and Markets EDF Lab Paris -Saclay</i>
10:40-11:00	International Presentation	Charlie Smith, <i>Executive Director UVIG</i>
11:00-11:30	Tea/Coffee and Sandwiches	
11:30-12:00	Frequency Control – EWIC exports	Diarmaid Gillespie <i>Real-Time Operations EirGrid Group</i>
12:00-12:20	System Services <ul style="list-style-type: none">• QTP• CPP	Jason Hannon <i>Engineer Innovation Team EirGrid Group</i> Ian Connaughton <i>System Services Programme Manager Innovation Team EirGrid Group</i>
12:20-12:40	Rate of Change of Frequency	David Cashman <i>DS3 Programme Manager Innovation Team EirGrid Group</i>
12:40-13:00	Q&A discussion and closing remarks	

DS3 Project Plan to 2020

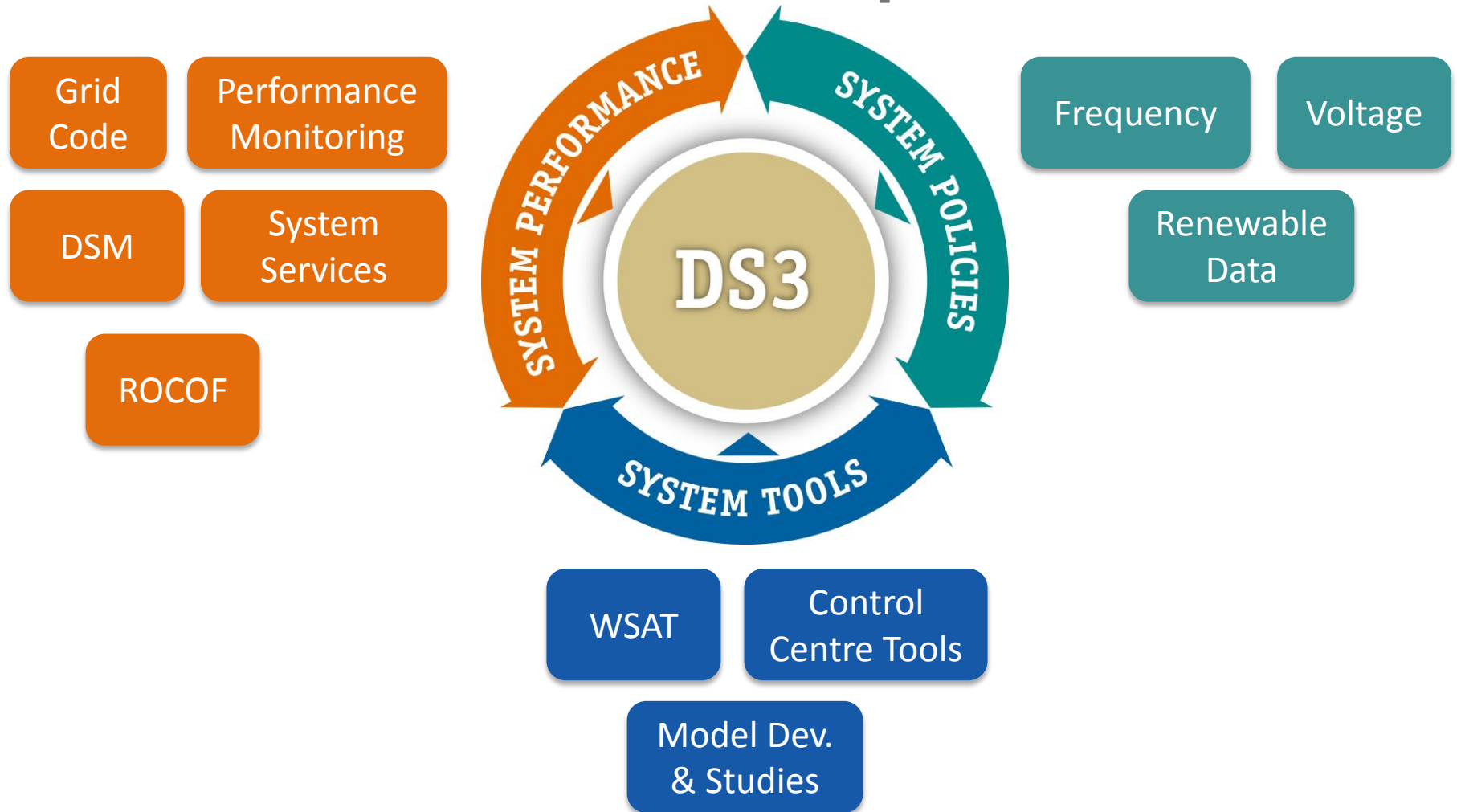
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Jon O' Sullivan



And we had a plan...



but what is DS3 really trying to do?



Installed Wind

3000 MW

5000 MW



Annual RES-E

22 %

40 %



Curtailement

5 %

5-7 %

But need to consider I-SEM...

Significant changes to system operations

- New unit commitment – SCUC, SCED
- New Market platform – Market Management System
- Intraday, forward and balancing markets
- Individual and Common Grid Models

...and other operational issues

Control Centre Tools

- New Tools within EMS
- Situational Awareness: EMS Alarm consolidation
- Forecasting

Studies

- Oscillations
- Review of TCGs

Policies

- AGC
- Priority Dispatch: de-committing of generation
- Network Codes/Guidelines

...what is still to come from Europe



which changes how system operated...

	2016	2017	2018	2019	2020
SNSP	55% -> 60%	60% -> 65%	65% -> 70%	70% -> 75%	75%
RoCoF	0.5 Hz/s	0.5 -> 1 Hz/s	1 Hz/s	1 Hz/s	1 Hz/s
Inertia	20,000 MW.s	20,000 MW.s	17,500 MW.s	17,500 MW.s	17,500 MW.s
Min Sets	8	8	7	7	6
EWIC	300 -> 500 MW (interim)	500 MW (interim)	500 MW (interim -> enduring)	500 MW (enduring)	500 MW
Reserve	POR: 75% FFR: 47%	POR: 75% FFR: 47%	POR: 75% FFR: 47%	POR: 75% FFR: 47%	POR: 75% FFR: 47%- >55%
Wind/Solar Policy	N/A	N/A	????	????	????

..change coming in domestic capabilities

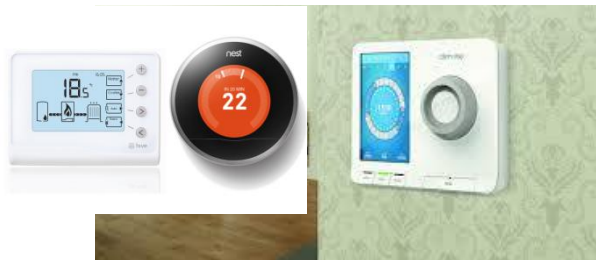
Energy management

HEMS – growing deployment

Large multinationals investing

- Non energy propositions
- Energy efficiency
- All suppliers in IRE installing

Industrial and SME using EMS



HomeKit

HomeKit is a framework for communicating with and controlling connected accessories in a user's home. You can enable users to discover HomeKit accessories in their home and configure them, or you can create actions to control those devices. Users can group actions together and trigger them using Siri.



and solar PV is around the corner?

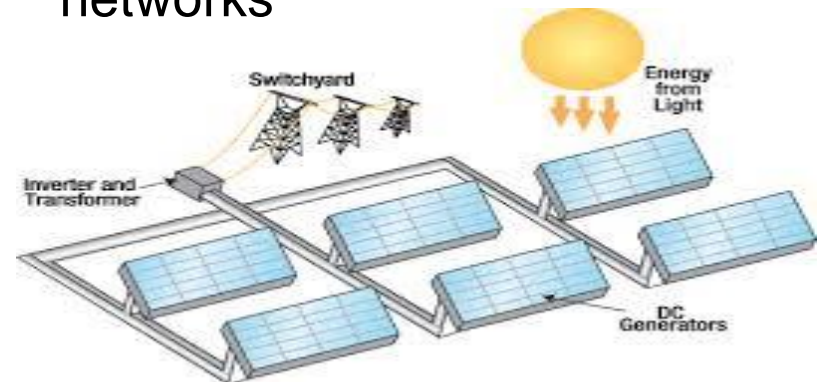
Context

- per unit cost falling
- supports likely soon
- Large scale deployment?
 - Embedded in homes and buildings
 - Dedicated Solar farms



Challenges

- system issues similar to DS3 but greater
- observability and controllability
- interactions with DNO
- bi-directional flows on radial networks



...which all leads to DS3 and beyond

lifestyle



Incentivise
and Influence



energy



centralised large units



distributed units

DS3 Project Update

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David Cashman



so what is DS3 doing this year?

Control Centre tools and studies

RESERVE MW	Req'd	Act
SOUTH POR	242	2
SOUTH SOR	386	5
SOUTH TOR	500	625

```
Max Infeed
ISLAND POR
ISLAND SOR
ISLAND TOR
```

Initial Form 990/1041-ES	Actual Current AMT	Available AMT	Available Current AMT	Complement Target AMT	Initial Form 990/1041-ES Complement Target AMT
Current level = 2.00%	40.0	40.0	1,075.0	1035.0	1035.7
Current level = 3.00%	5.4	5.0	16.0	16.0	34.1

Category 1: moderns currently excluded are included in target AMT, but Category 1 and 2 are not in target AMT (see next slide).

Target AMT is a gross-modifier amount = 2500% of the gross current AMT. Initial AMT is a net-gross-modifier amount. For net AMT, see next slide.

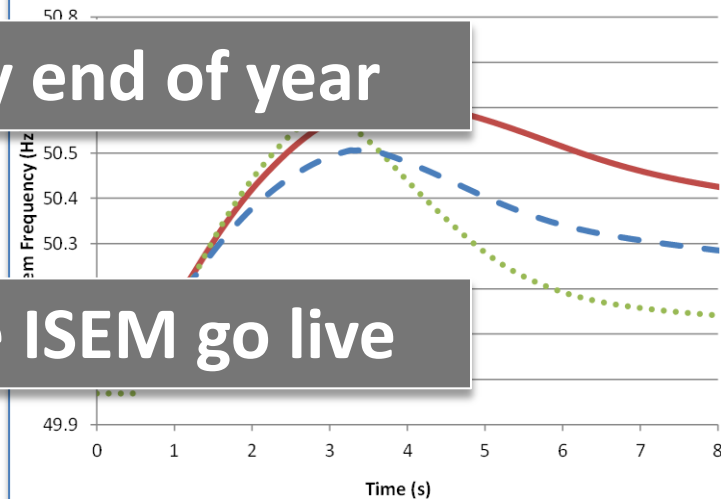
ALTONAR_P121	NOTEST	LEVEL 3	MAK	OK
BALCOG_P121	278-WAEST	LEVEL 3	MAK	OK
BAUYBAKE_P121	278-WAEST	LEVEL 3	MAK	OK
BEUTYORNE_P121	278-BARST	LEVEL 3	MAK	OK
BEUTYORNE_P121	278-BARST	LEVEL 3	MAK	OK
BEUTYORNE_P121	278-BARST	LEVEL 3	MAK	OK
BEUTYORNE_P121	278-WAEST	LEVEL 3	MAK	OK
BHARILL_P121	NOTEST	LEVEL 3	MAK	OK
BKCOG_P121	NOTEST	LEVEL 3	MAK	OK
BLISBAHR_P121	NOTEST	LEVEL 3	MAK	OK
BODDORNE_P121	278-WAEST	LEVEL 3	MAK	OK
CARDWYN_P121	278-WAEST	LEVEL 3	MAK	OK
CHARNWELL_P121	278-WAEST	LEVEL 3	MAK	OK
CLARKH_P121	278-WAEST	LEVEL 3	MAK	OK
COOMBS_P121	278-WAEST	LEVEL 3	MAK	OK
COOMBS_P121	278-WAEST	LEVEL 3	MAK	OK
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COOMBS_P121	278-WAEST	LEVEL 3	MAK	OK

65% SNSP b

60% SNSP by end of year

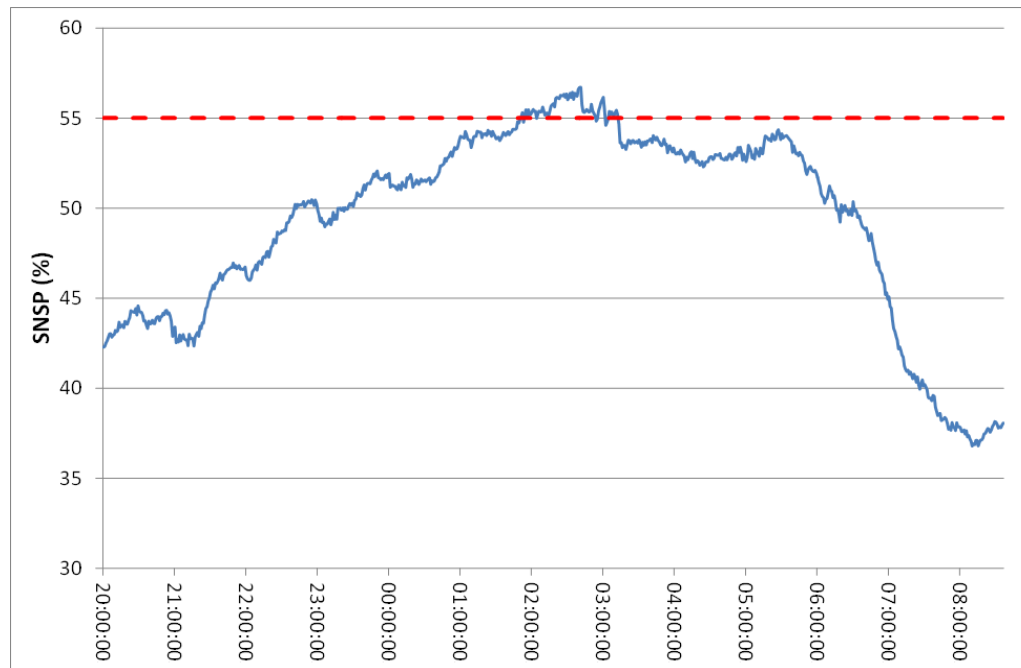
65% SNSP before ISEM go live

EWIC Increased Exports



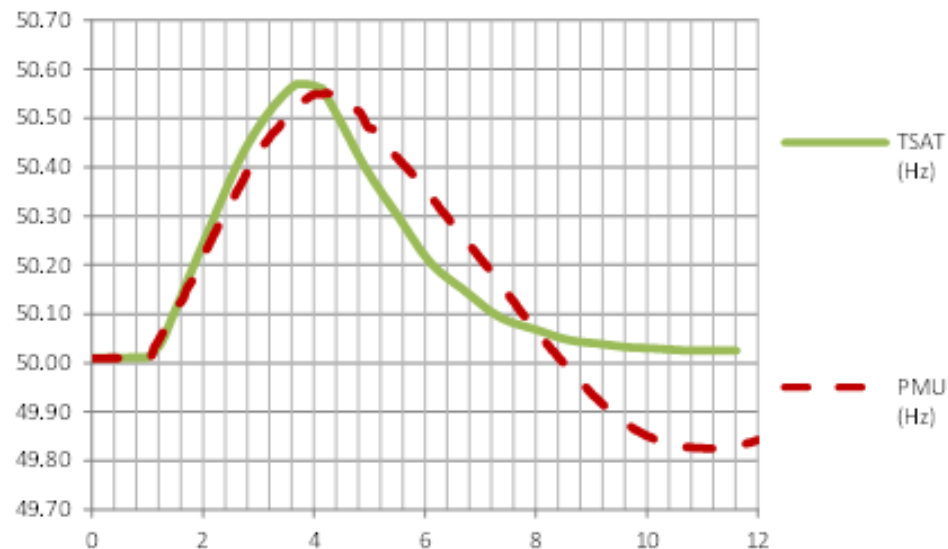
SNSP Trial

- In November a 3 month trial commenced of SNSP limit at 60%
- On November 22nd reached 56.7% SNSP



High-Frequency Mitigation Scheme

- Trip of IC could result in exceptional HF
- Studies and system testing carried out to develop an operational strategy
- EWIC System testing took place in August



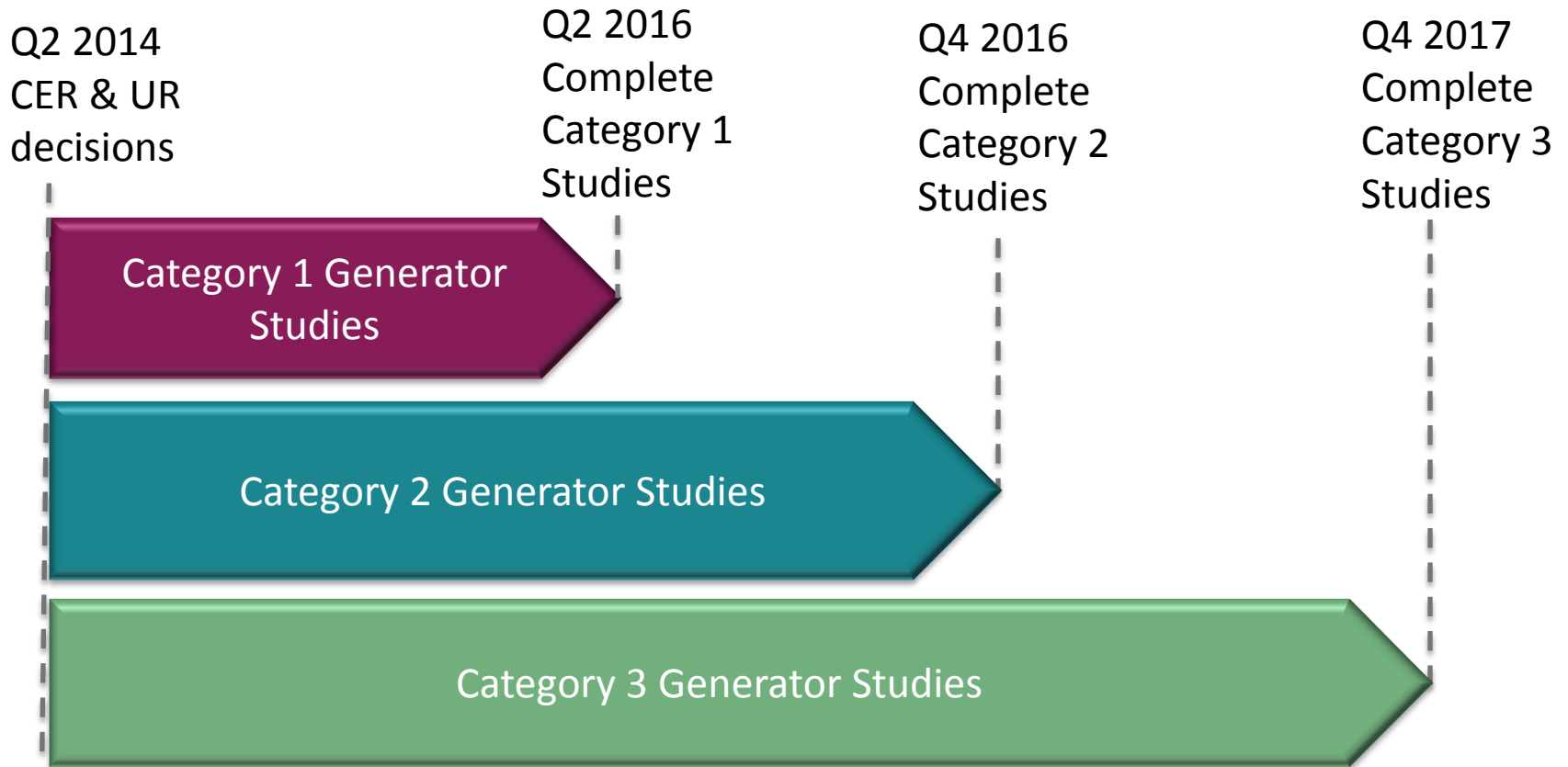
Next Steps for HF Mitigation

Interim mitigation plan is to be rolled out

- Extensive model validation
- Enhanced control centre tools
- Modify HF triggers on Moyle and EWIC
- Wind Farm Grid Interface Protection settings
- Runback schemes

Expect full export capability on EWIC
when it returns to service

RoCoF – Generator Studies Project



Power Off and Save project ongoing

EirGrid Pilot Project for Householders

What is Power Off & Save?



DS3 Task Plan

Task	2016	2017	2018	2019	2020
SNSP Limit	55% -> 60%	60% -> 65%	65% -> 70%	70% -> 75%	75%
Studies	Future Ops Policy/ Curl. 60% Study	Ramping V. Trajectory Inertia Floor Solar + DSM	Revised VDIFD Freq. Regulation	VDIFD? New Tech. Reserves	New Tech. Solar & DSM dispatch
Policies	Cat 1&2 Gen Studies	RoCoF -> 1 Hz/s	1 Hz/s Min sets: 7 17,500 MW.s	New Tech Dispatch Policy	Revised FFR, POR policies Min sets: 6?
Control Centre Tools	5 min WSAT SS Tools FFR monitor	Robust WSAT Ramping Nodal Controller	Look Ahead WSAT RES Dispatch	Voltage Trajectory	New Tech. Solar & DSM dispatch
Performance	Interim OFGS	New Tech. Trials LoM settings	Enduring OFGS	Renewables Variation	Reserves from New Tech

Technical and economic analysis of the European System with 60% RES

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Vera Paiva Da Silva

EDF Lab



International Presentation

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Charlie Smith,

UVIG



Intermission

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Managing Exceptional High Frequency Events

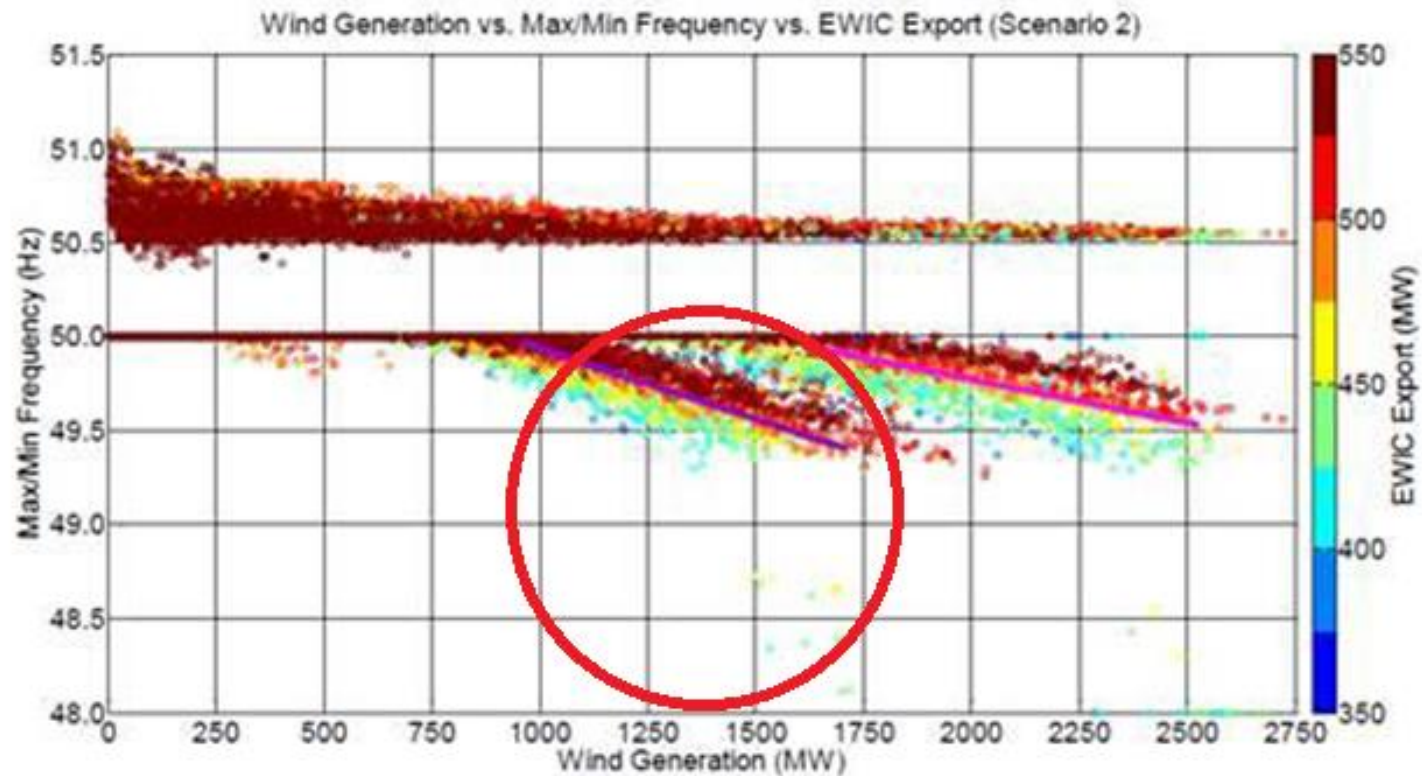
Diarmaid Gillespie – Real Time Operations

High Frequency Concerns

- **Exceptional High Frequency Events**
 - Trip of an IC during a high export causes exceptional system HF
 - >50.3 Hz – one event per year typically
 - EWIC primary concern (500 MW export NTC)
 - Concern exceptional HF event, causes exceptional LF event, as excess wind trips
- **Wind Farm Trip Settings**
 - DSO >1200 MW at 50.5 Hz; TSO >1300 MW at 50.8 Hz
- **Operational Constraints on EWIC**
 - 300 MW export cap (as measured in Ireland)
- **New Proposal**
 - New strategy to manage HF events until WF Trip settings are changed
 - New initiatives involving changes to Control Centre tools and grid interface protection
 - Trial of EWIC Exports to 500 MW for all system conditions to commence in November 2016
 - Increased EWIC Exports leads to reduced curtailment

Export Study Recap

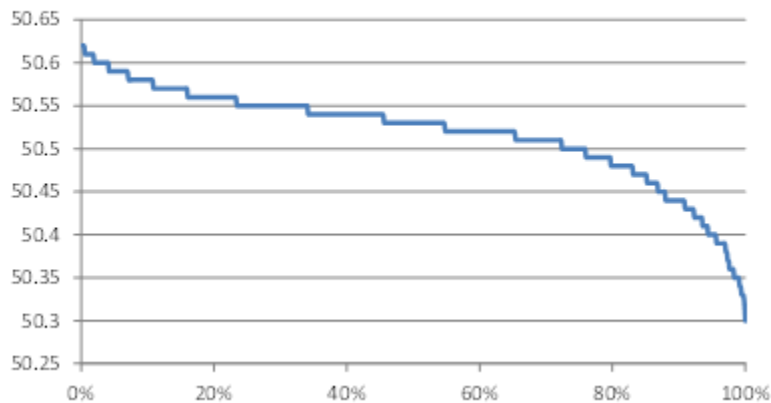
- EWIC Export Study (2015)
 - 300 MW limit could be relaxed for AI wind less than 1250 MW only



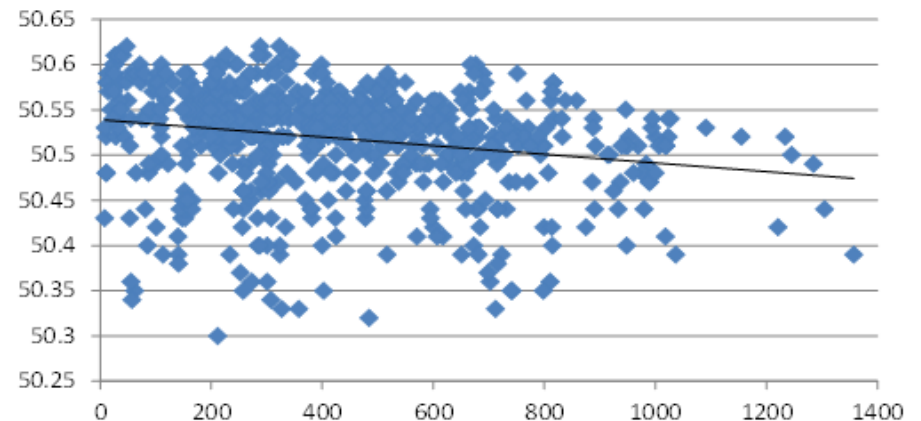
EWIC Export Trials: low/medium wind

- EWIC High Export Trials for AI wind < 1000 MW
 - 400 MW Trial commenced 6 July 2016
 - 500 MW Trial commenced 17 August 2016
- 400 MW Export Trial Analysis
 - 800 cases with EWIC > 300 MW

Zeniths (Hz)

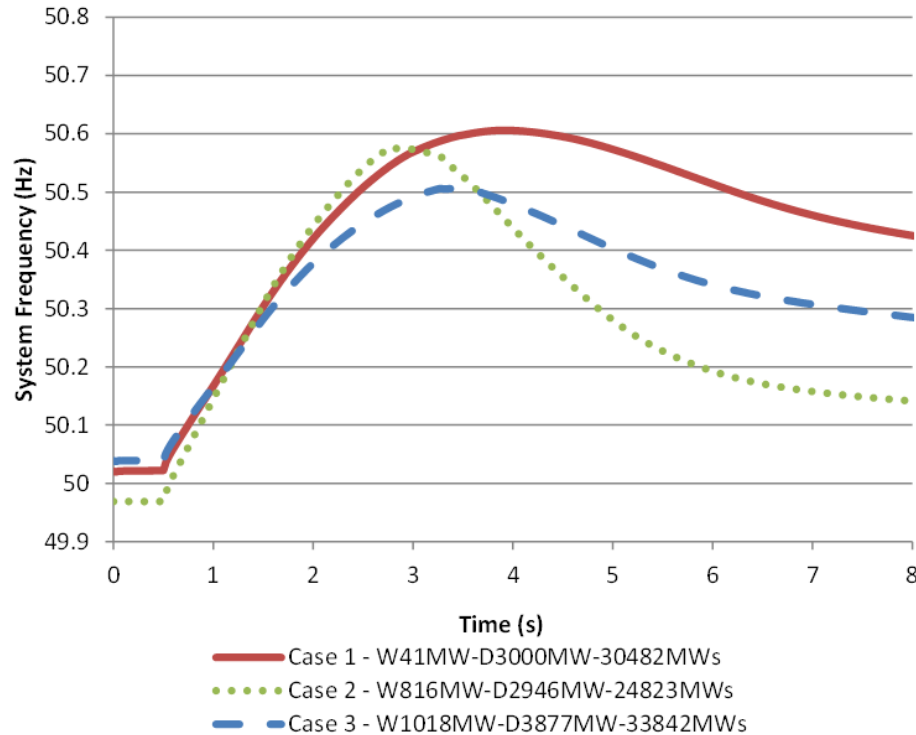


Wind (MW) vs Zenith (Hz)



EWIC Exports Trials: low/medium wind

- 400 MW Export Trial Analysis (continued)



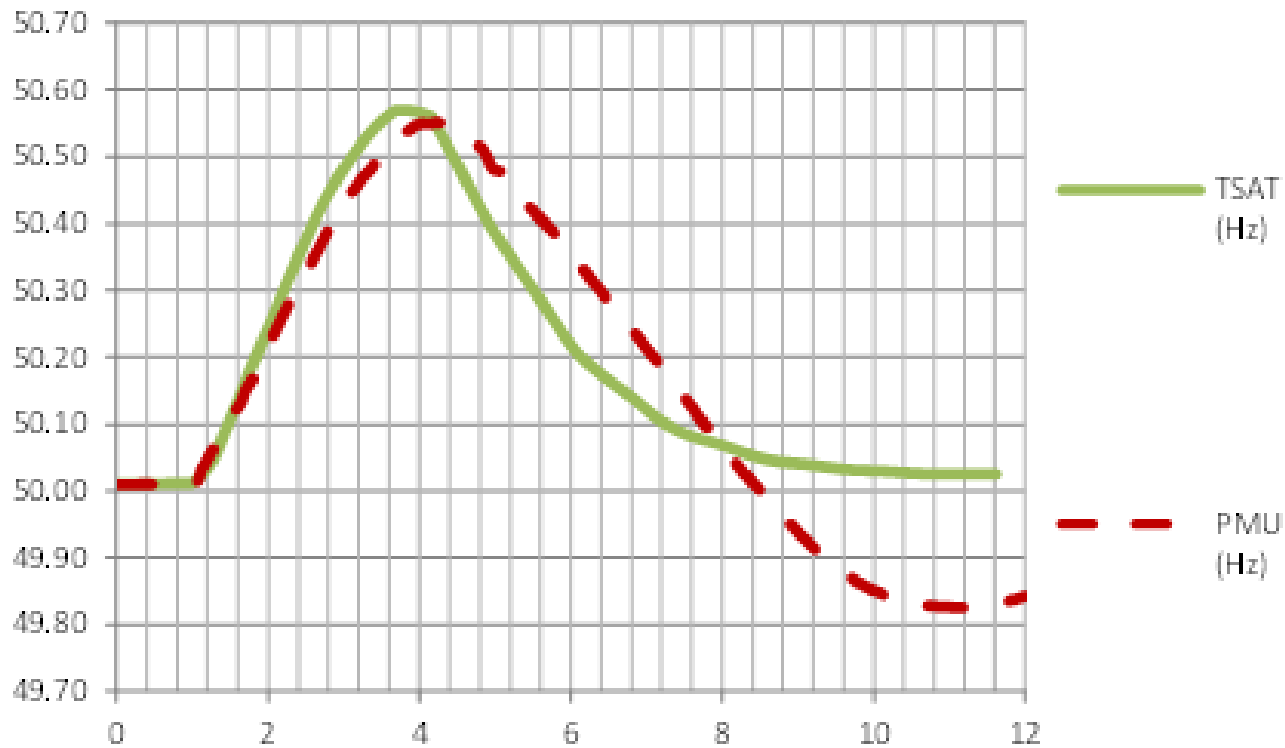
EWIC 500 MW Export Rejection Test

Summary:

- Test conducted 9 August 2016
- Test required for validation purposes prior to 500 MW Export Trial
- System conditions:
 - AI Demand: 4384 MW
 - AI Wind: 944 MW
 - System Inertia: 33,763 MWs
 - System Frequency pre-test: 50.01 Hz
- High level results
 - Frequency zenith: 50.55 Hz
 - Frequency nadir: 49.94 Hz (8s)
 - ROCOF: 0.24 Hz/s
 - Frequency above 50.5 Hz for 1.4 s

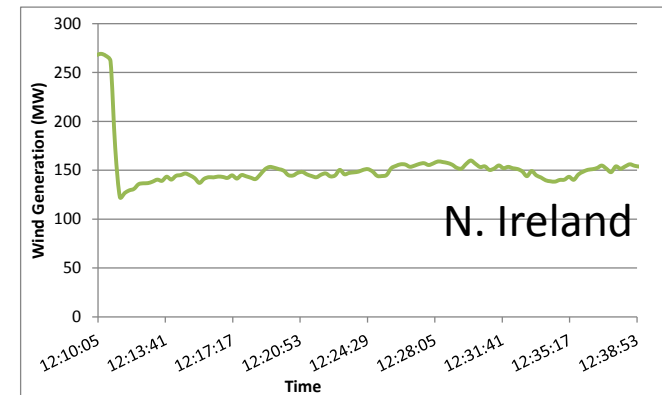
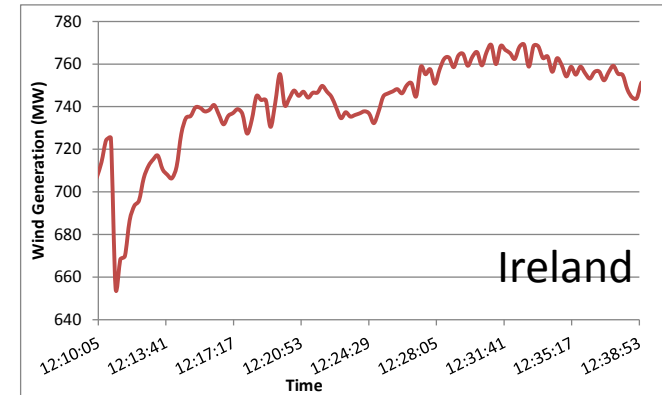
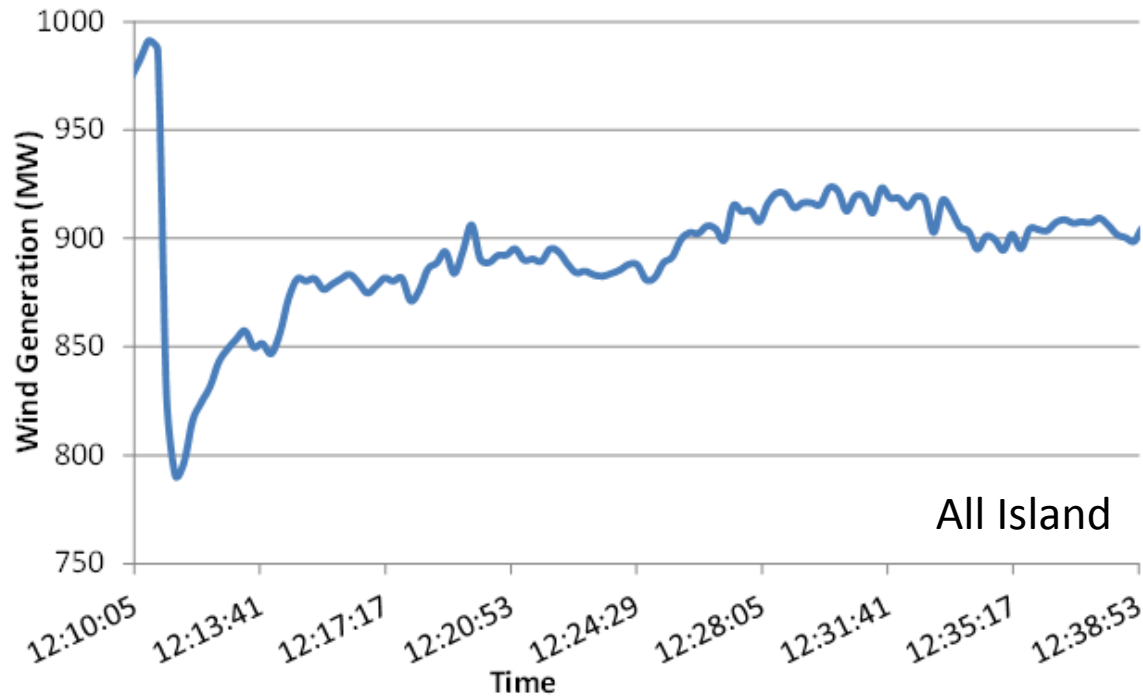
EWIC 500 MW Export Rejection

System Frequency: Actual versus Model



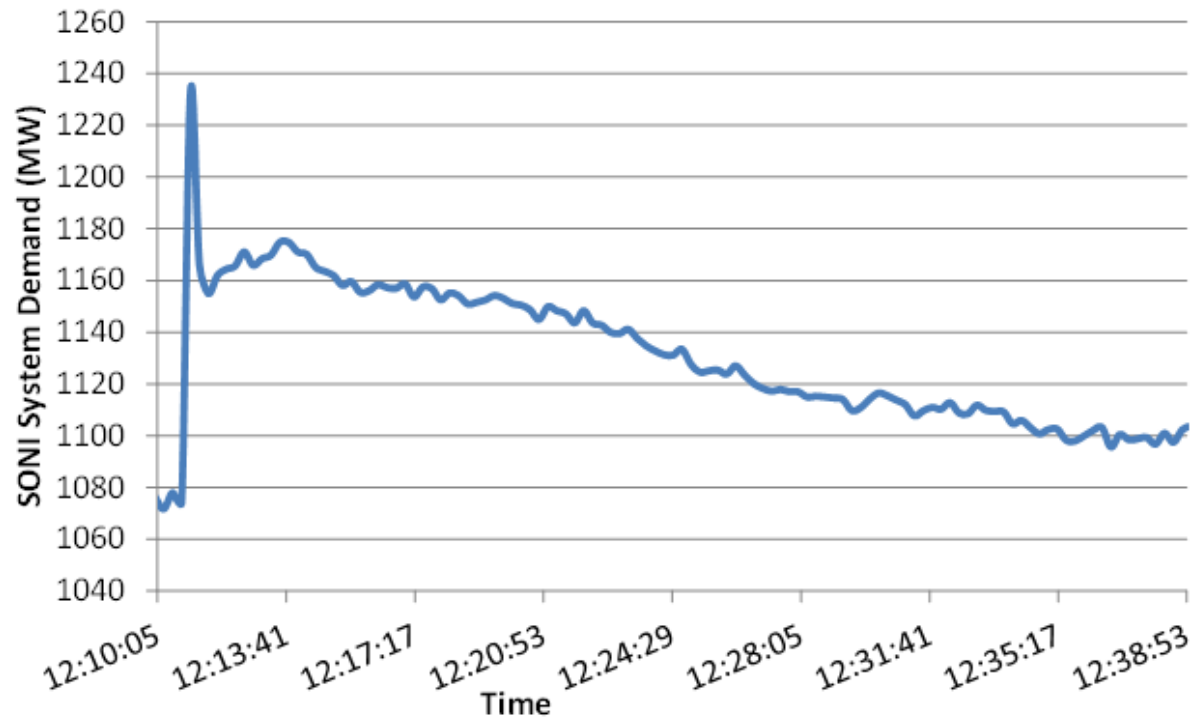
EWIC 500 MW Export Rejection

Wind Impact



EWIC 500 MW Export Rejection Test

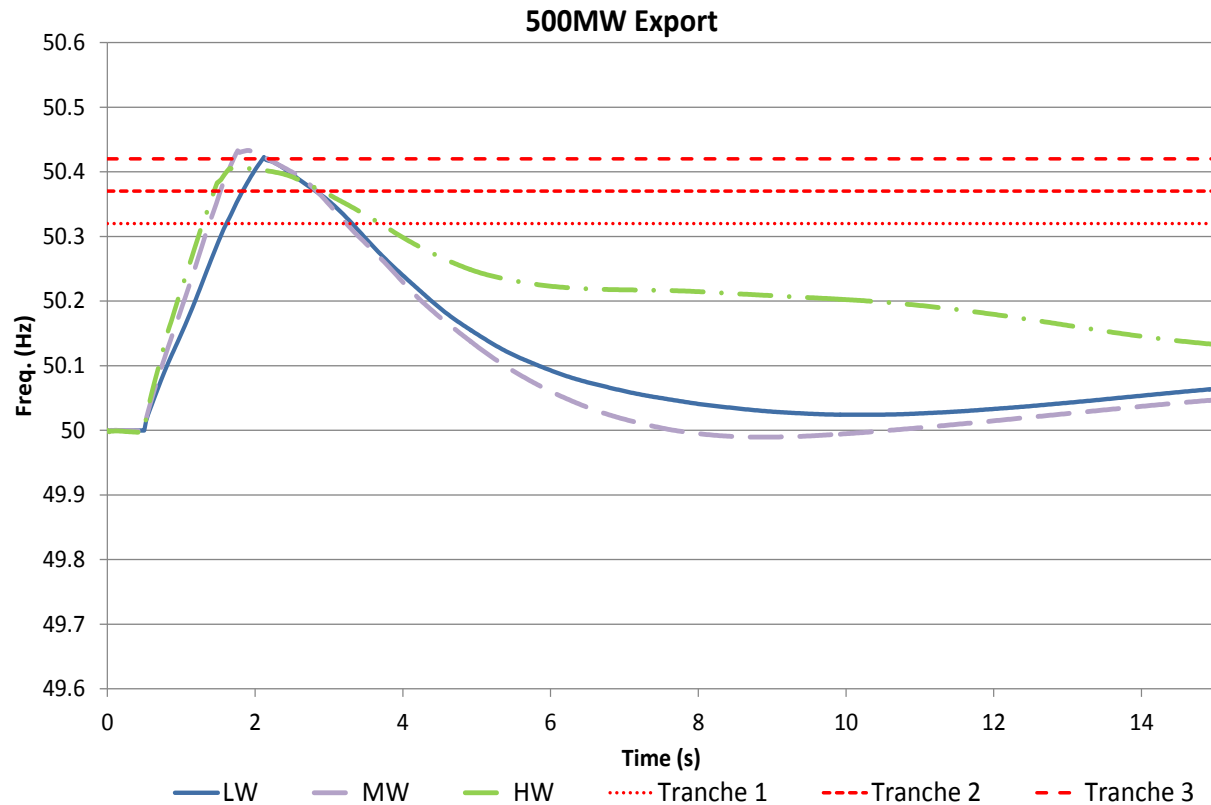
NI Demand Impact



Increasing Exports all conditions: Interim Plan

- Increase exports for all system conditions until WF settings change
- New Initiatives:
 - 1. Modify HF Triggers on EWIC & Moyle
 - 2. Revised HF settings on WF Grid Interface Protection
 - ~600 MW of wind across 14 WFs in Ireland set to trip at grid interface (110 kV)
 - Three tranche tripping schedule proposed: 50.32 Hz, 50.37 Hz, 50.42 Hz – all undelayed
 - 3. Wind Farm HF Response
 - WF high frequency response used more pro-actively during exports
 - 4. Conventional Units – machine runback and/or trip
 - Capability to runback a CCGT for less onerous HF event
 - Capability to trip a CCGT for more onerous HF event
 - 5. Enhancements to Control Centre Tools
 - EMS Changes – observability and control ability
 - WSAT Changes – improved models and data feeds
 - Greater awareness of HF impacts to System Controllers

Increasing Exports all conditions: Interim Plan



Summary and Next Steps

- EWIC Export Trials for low/medium wind up to 500 MW
- New Interim Plan proposed for managing exception HF events
 - Plan involves changes to system tools and grid interface protection
 - Plan backed up by studies and model validation
- Increased exports on EWIC will mean less curtailment
- Full exports on EWIC expected when back in service

System Services Update

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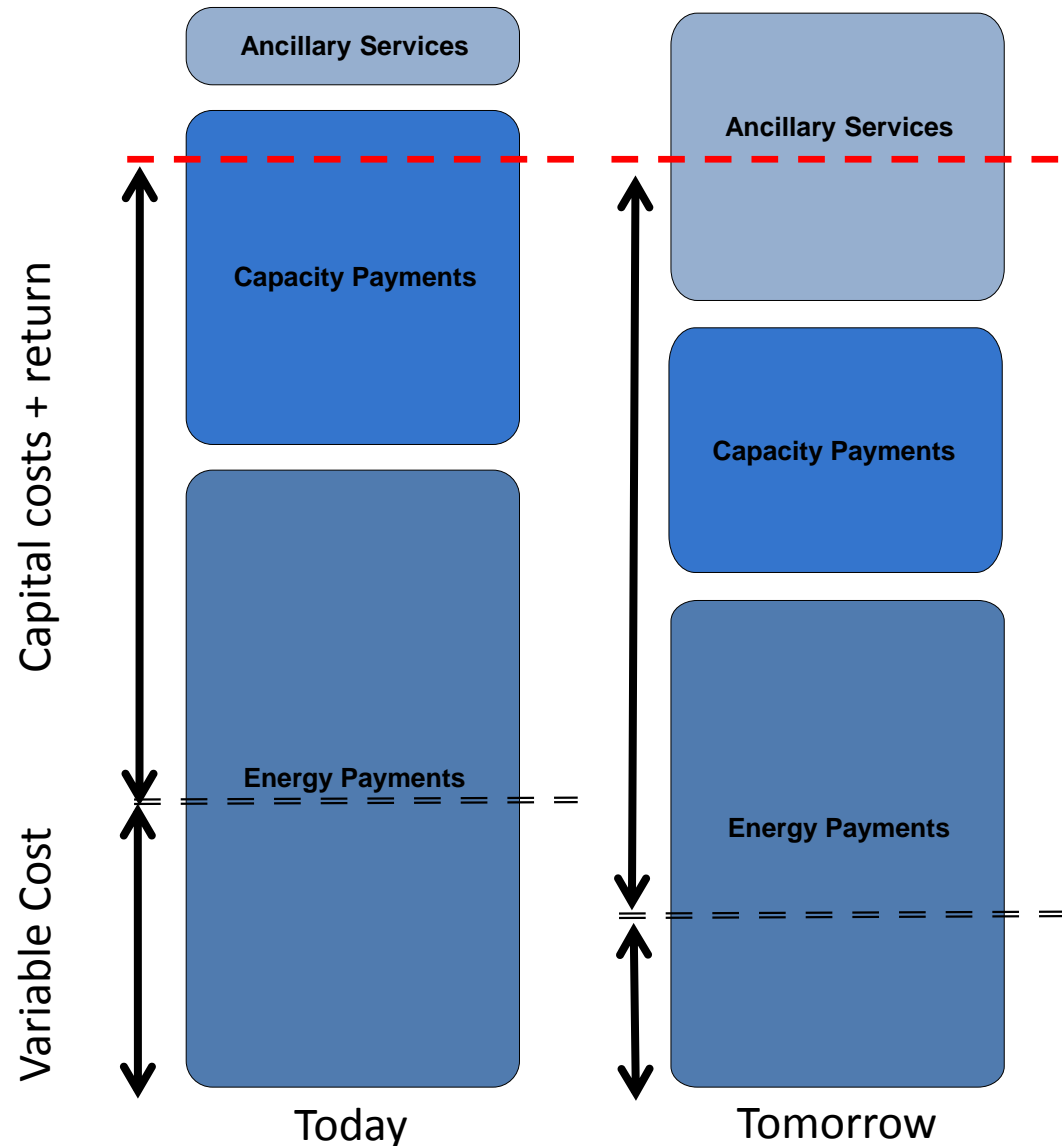
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Ian Connaughton

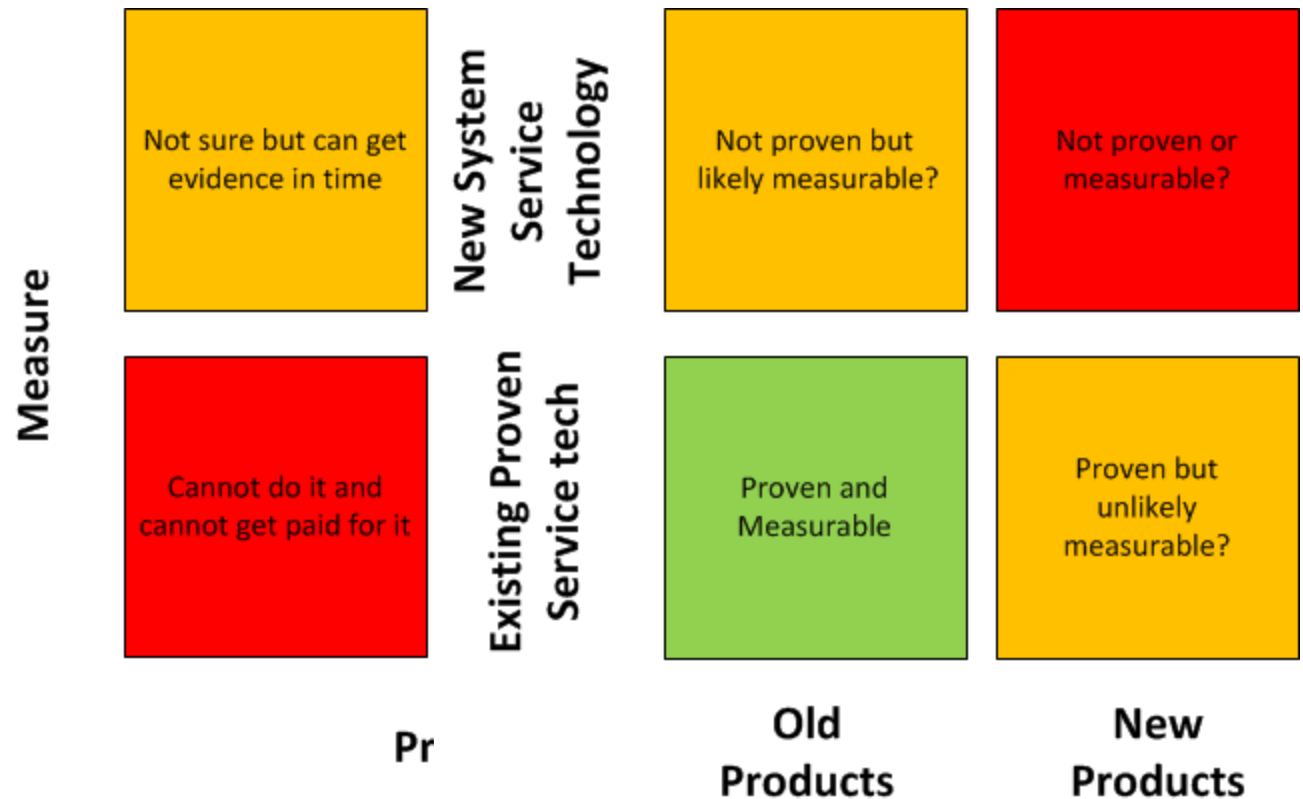


Incentivising the Portfolio: Market Signals

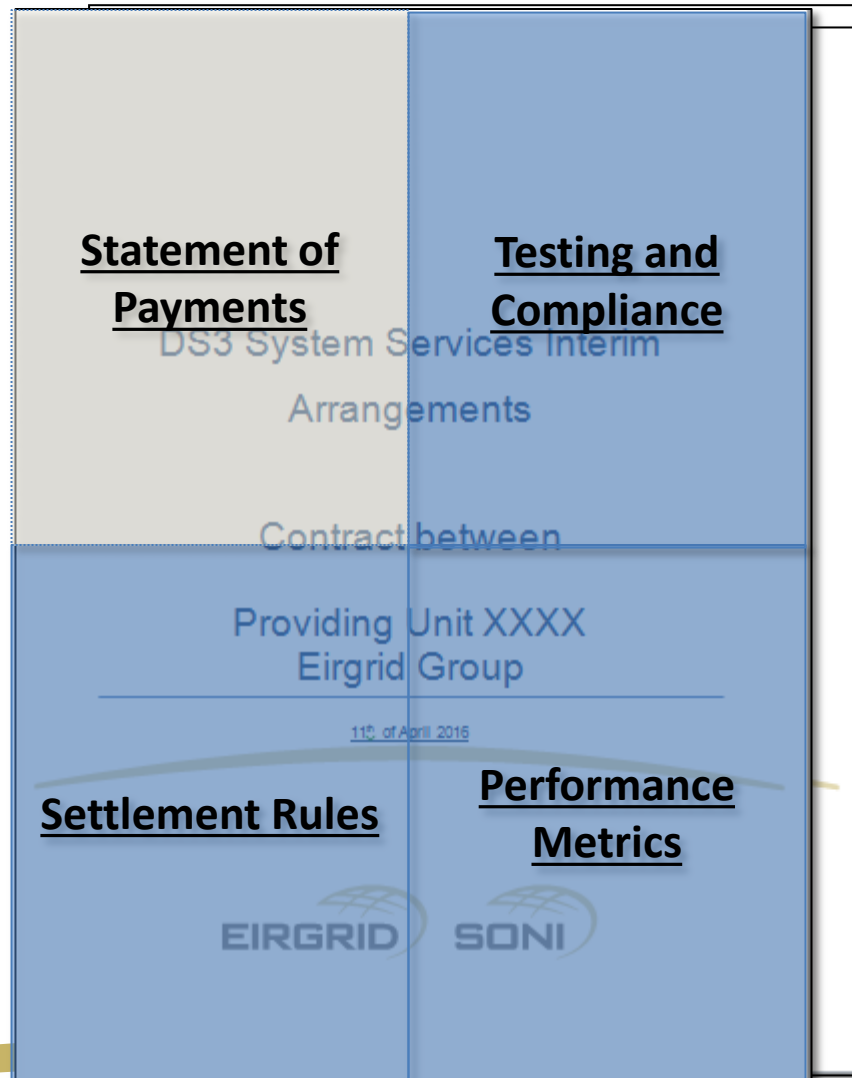
- Financial Mix will move to higher capital lower variable cost technologies
- Incentivise performance to obtain the plant mix that matches the system requirements and achieves the policy objectives



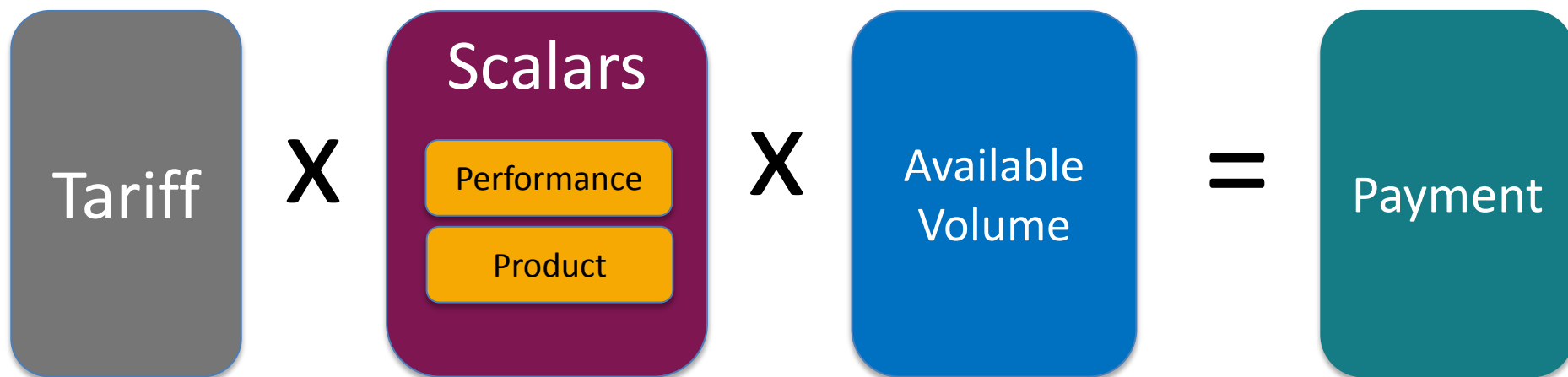
but there are some realities...!!



So what are we proposing?

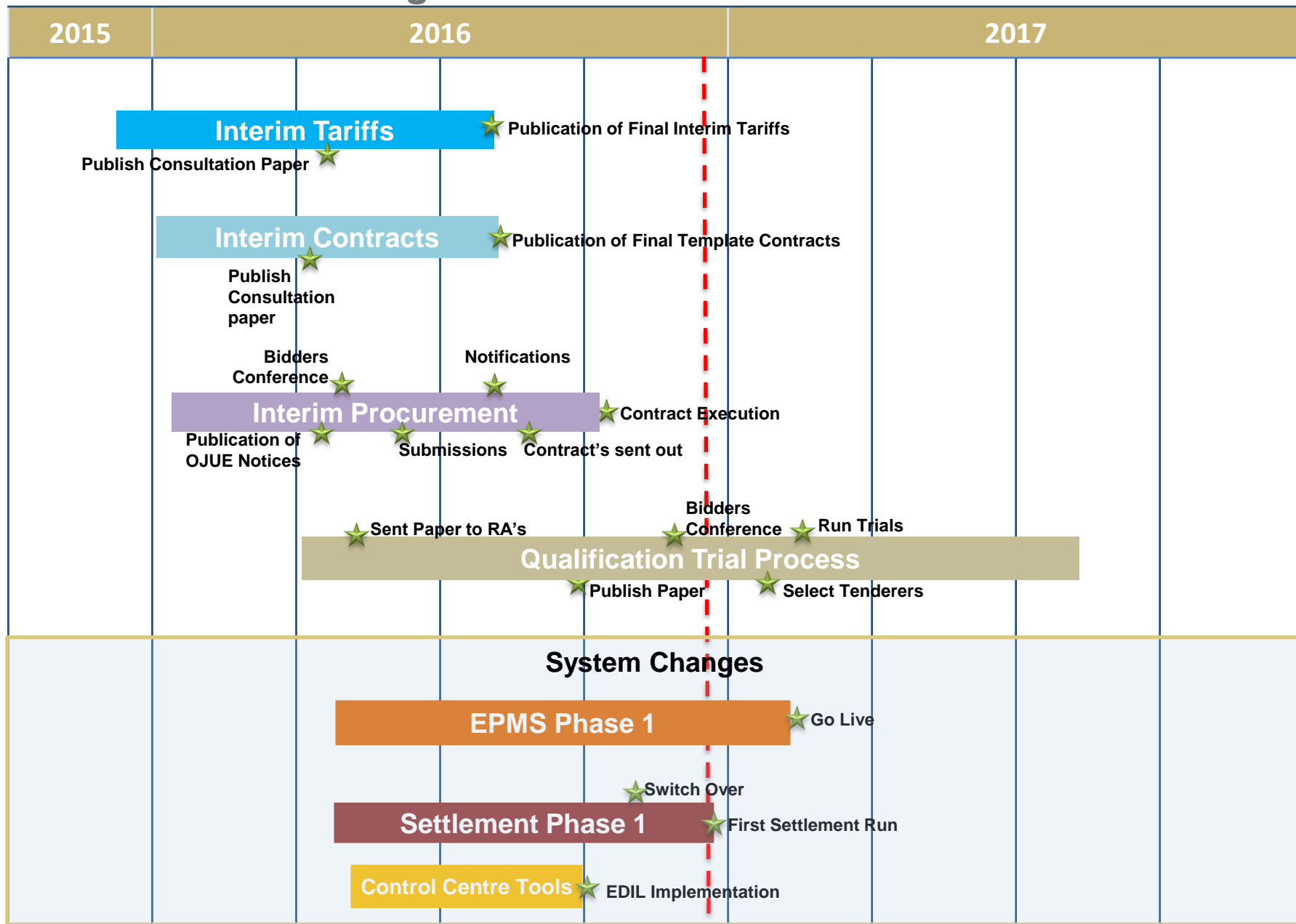


Payment under Interim Arrangements



Note: Scarcity and Volume Scalars will only apply for Enduring Arrangements

DS3 SS Interim Arrangement – Milestone Plan



DS3 System Services Qualification Trial Process

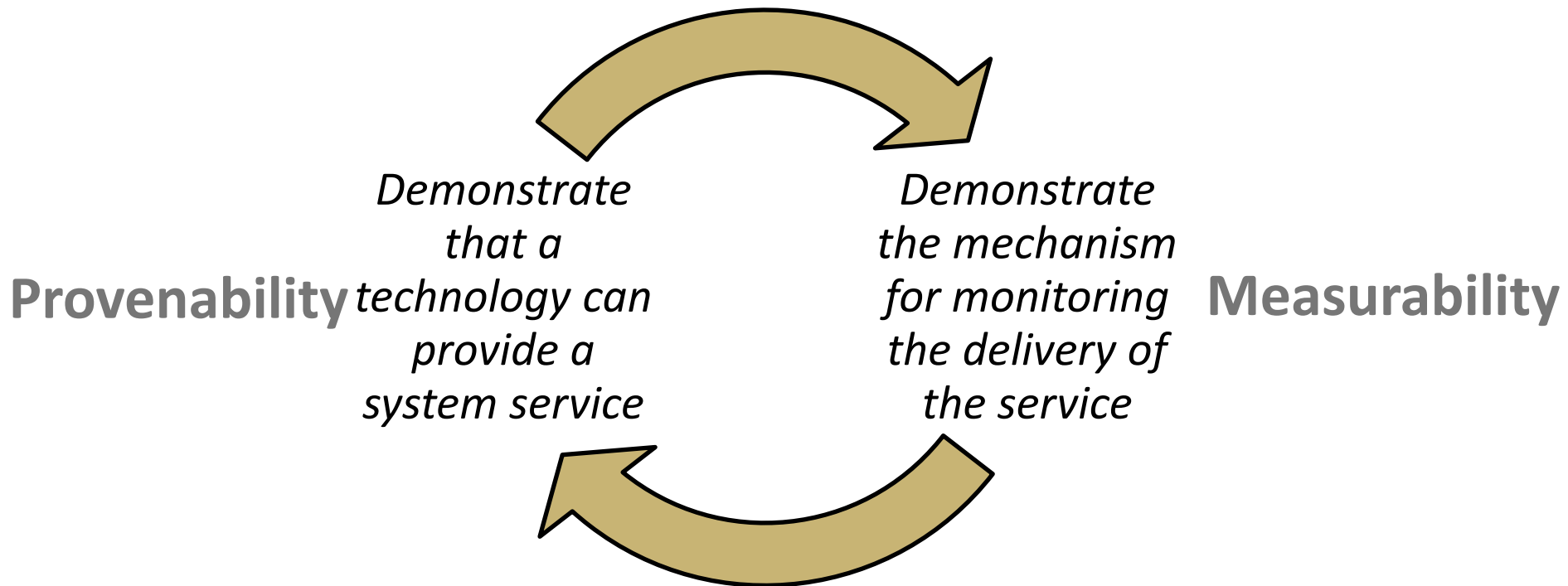
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Jason Hannon



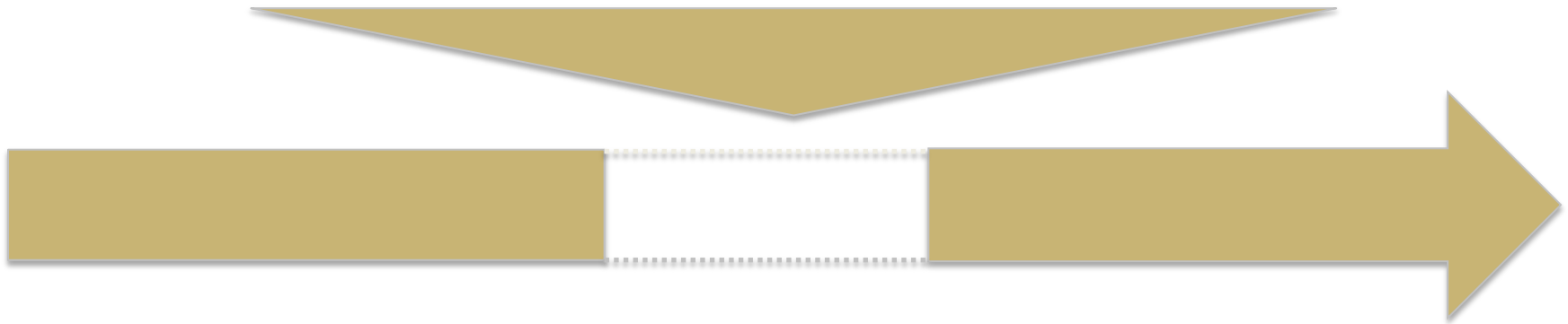
Qualification Trial Process Objectives



Where does QTP Year 1 fit?

Qualification Trial Process

- Q1- Q3 2017
- New & Existing Service Providers
- 5 Services
- Provenability & Measurability
- Focuses on potential to scale



Central Procurement Process 1

- Commenced 1st October 2016
- Existing Service Providers (mostly)
- 11 of 14 Services

Future Procurement Processes

- Full range of Service Providers including new technologies
- All 14 Services

QTP Year 1 Timeline

Phase 1:
Consultation
May 16 → Oct 16

Phase 3:
Trial Mar 17 – Aug
17

Phase 2:
Procurement
Nov 16 → Feb
17

Summary of Proposed Format

Provenability

<i>Services to be proven</i>	<i>Technology</i>	<i>Volume</i>
POR RM3	Wind	40MW
POR	DSM	20MW
POR RM3	Other Technologies	40MW

- Min/ Max Size: 1MW, 5MW per Providing Unit
- 'Other technologies minimum size: 100kW
- Payment in line with tariff

Measurability

<i>Services to be measured</i>	<i>Technology</i>
FFR	Conventional Generators Wind DSM Other Technologies
DRR FPFAPR	Conventional Generators Wind DSM Other Technologies

- No maximum/ minimum size
- Once-off payment per Providing Unit

Outcome of the QTP for Industry

Provenability

*Services to
be proven*

Technology

POR

RM3

Wind

Wind proven for POR and/or RM3

POR

DSM

DSM proven for POR

POR

RM3

Other
Technologies

Some other technologies proven for POR and /or RM3

Measurability

*Services to
be measured*

*Service
Providers*

FFR

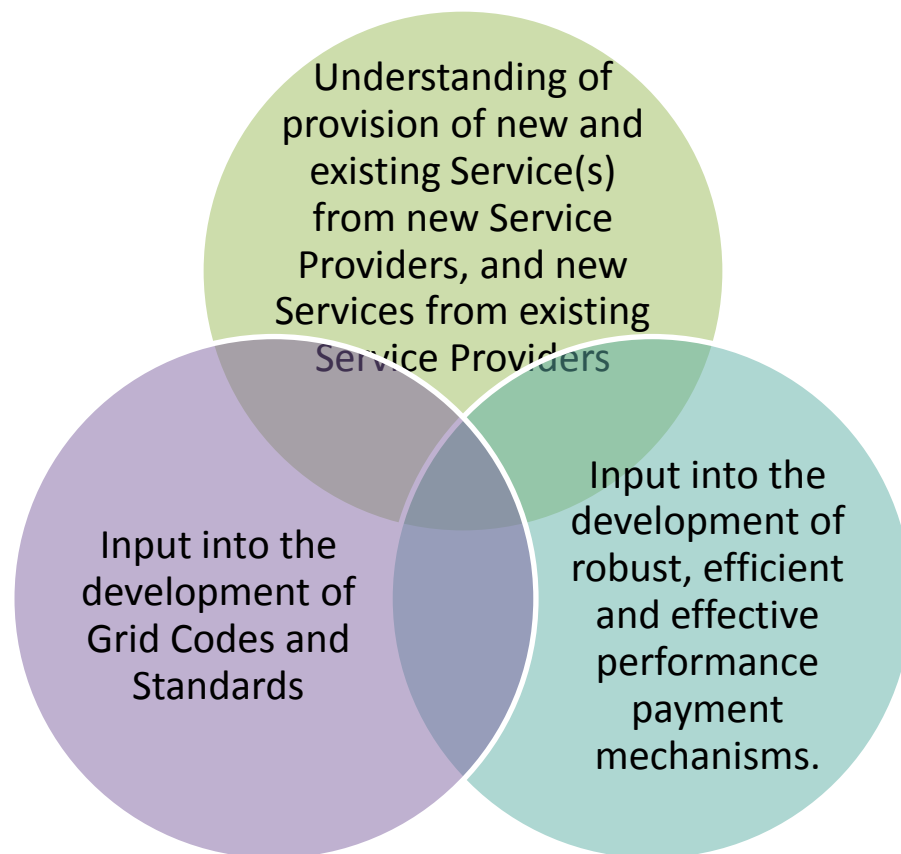
**6 measurement of the provision of FFR from 6 Service Providers: 2
Conventional, 1 DSM, 1 Wind and 1 other technologies**

DRR

FPFAPR

**3 measurement from 3 Service Providers of DRR and FPFAPR (Conventional,
Wind or other technologies**

Outcome of the QTP for EirGrid Group



Key Dates

Event	Date
Issue date for RFP	5 th November 2016
Bidders' conference	17 th November 2016
Latest date for receipt of queries	12:00 on 1 st December 2016
Latest date for receipt of tenders	12:00 on 8 th December 2016
Notification of Successful Tenderers - <i>anticipated</i>	Week commencing 30 th January 2017
Standstill Period	14 th February 2017
Signed Contracts returned to EirGrid	28 th February 2017
Trial Commencement – <i>subject to Contract sign-off</i>	1 st March 2017

RoCoF Update

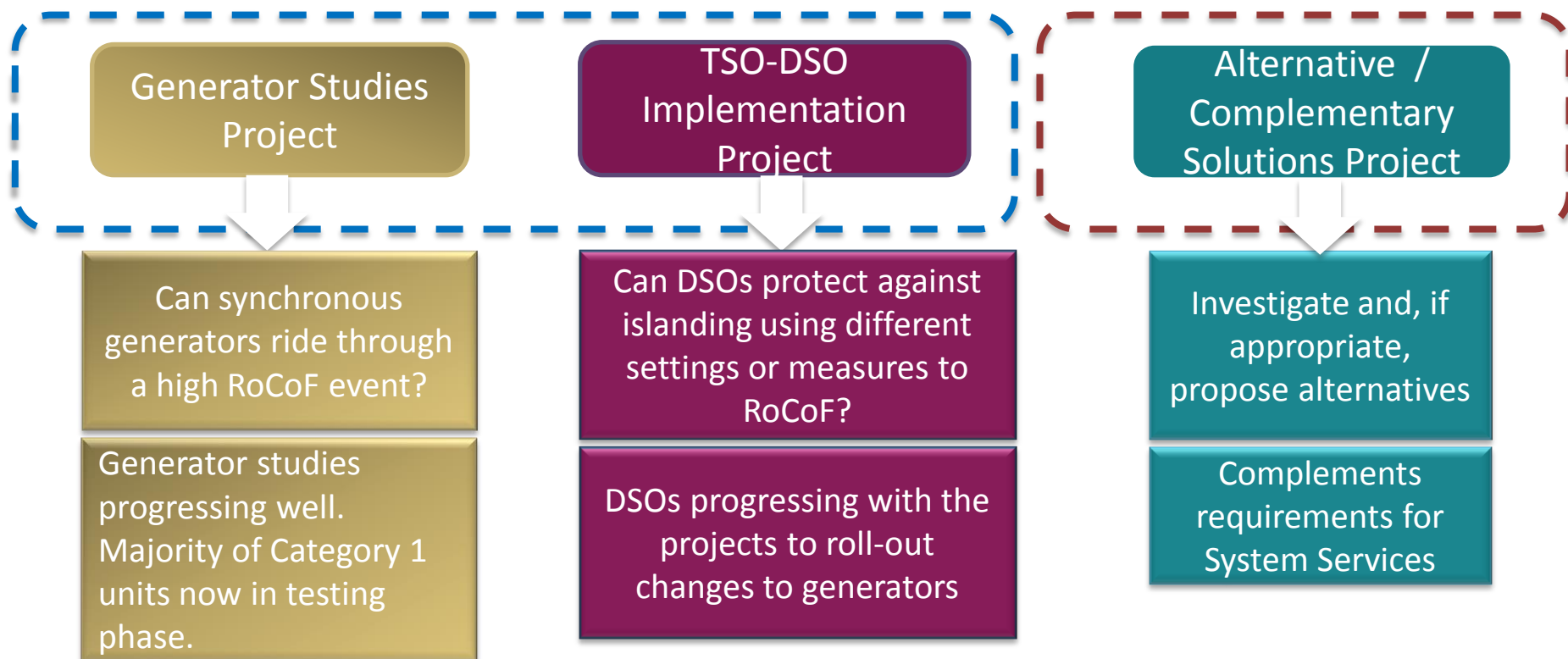
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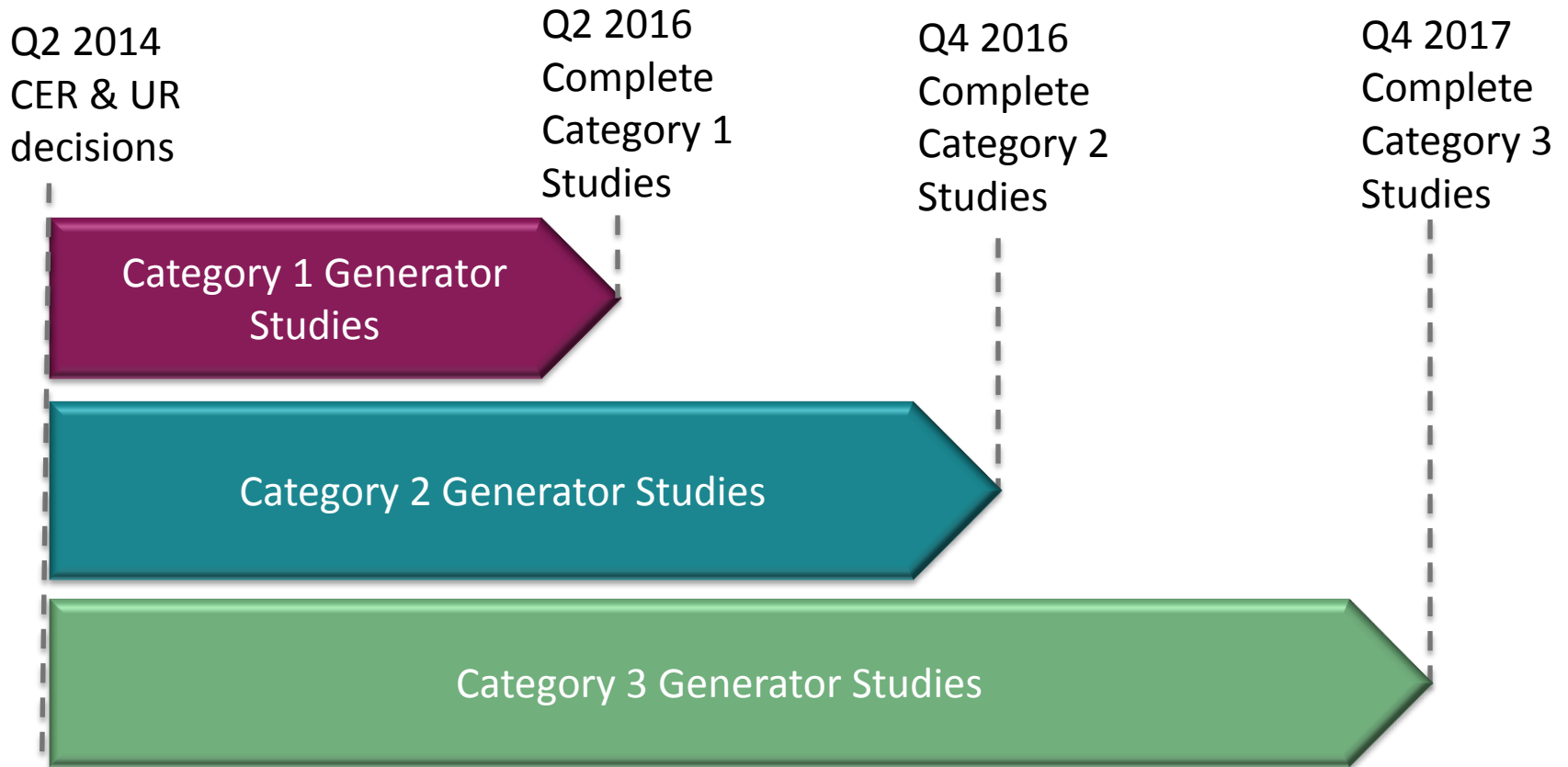
David Cashman



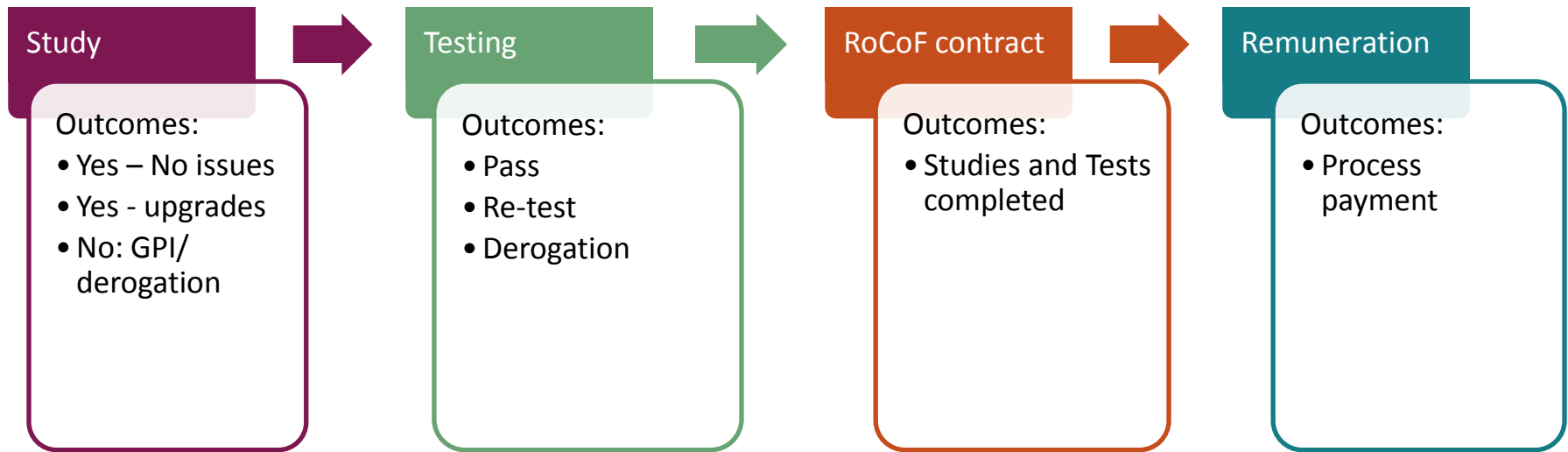
RoCoF Implementation Project



Generator Studies Timelines



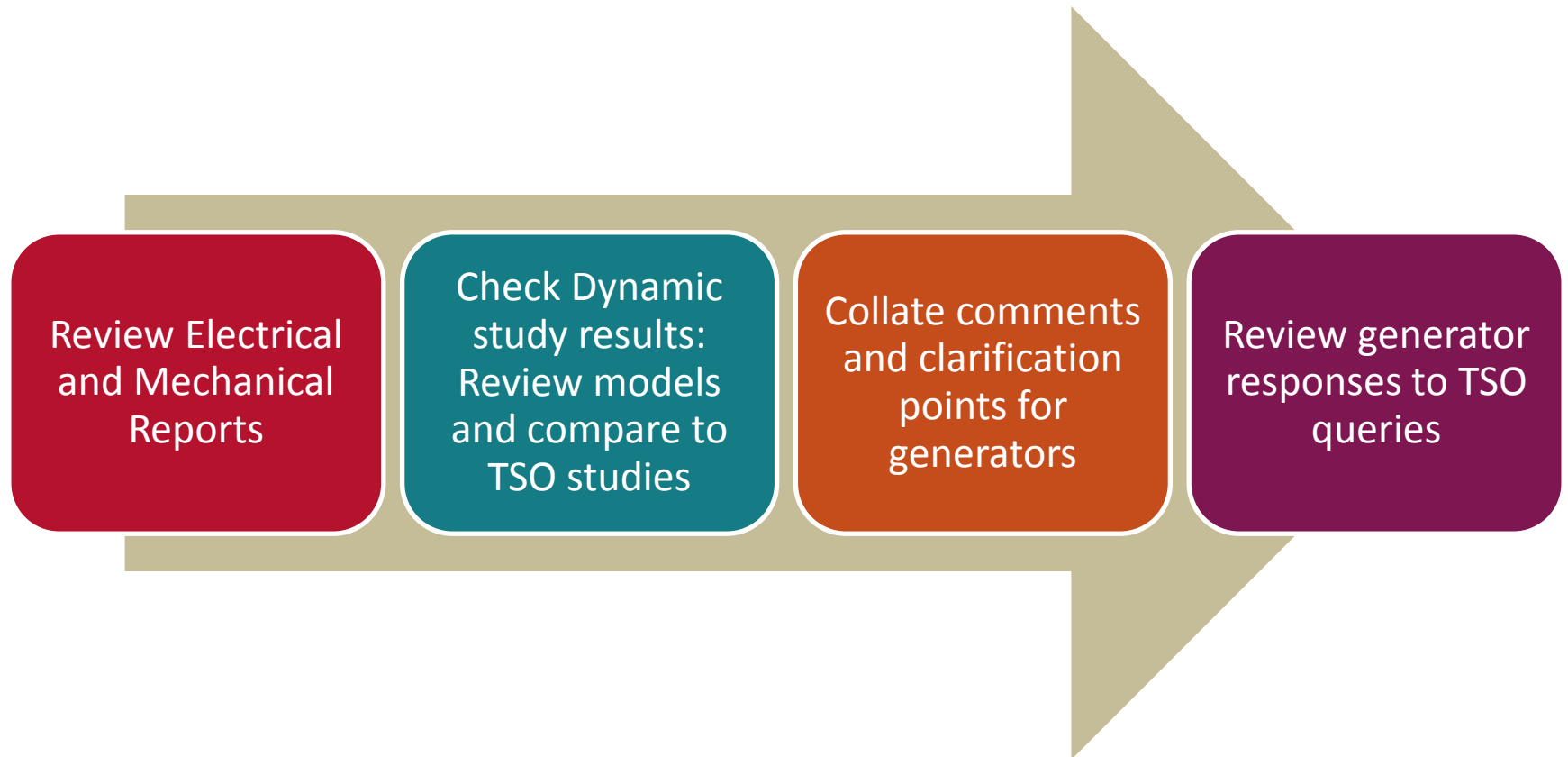
RoCoF Remuneration Method



Progress to Date

- All reports submitted by May 31st deadline have been reviewed. Cat. 2 deadline this week.
- 22 units are now in the 6 month testing phase
- Settlement systems for GPI and remuneration mechanism established
- 3 generators have fully completed the process and have been issued contracts

EirGrid Review Process



Generator Testing

- 22 generators due to be tested by March 2017
- EirGrid and SONI testing teams are engaging on scheduling and scoping testing
- Testing documents available on TSO websites
 - RoCoF Test Procedure Template
 - RoCoF Test Report Template
 - RoCoF Test Report Workbook

Next Steps

- Several study reports outstanding which need to be processed
- Generator testing team are engaging with units to prepare testing timelines
- Category 2 units due to submit studies this week

TSO-DSO Project

Ireland

- Requests for settings changes issued and roll-out is continuing
- Settings changes on >50% of wind farm sites completed
- Engagement with non-wind embedded generators ongoing

Northern Ireland

- University of Strathclyde WP1-3 studies for Large scale generation have been completed
- NIE N engagements with HSE NI and UR ongoing
- Roll-out of settings to commence subsequent to these meetings

