Introduction

DS3 Industry Forum
4th June 2015

Louis Fisher
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<th>Time</th>
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<td>10:00-10:05</td>
<td>Introduction</td>
<td>Chair: Louis Fisher</td>
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<td>10:05-11:05</td>
<td>DS3 Programme Status Update</td>
<td>Presentation: Robbie Aherne</td>
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<td>Presentation: Andrew McCorriston</td>
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<td>11:05-12:15</td>
<td>Rate of Change of Frequency (RoCoF)</td>
<td>Presentation: David Cashman</td>
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<td>System Services</td>
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DS3 Programme Status Update

DS3 Industry Forum
4th June 2015

Robbie Aherne
Recent Operational Experience
High Wind Levels in Early 2015

System Non-Synchronous Penetration (SNSP) was regularly hitting the 50% limit

... at times exports allow wind levels greater than 50% of demand
DS3 Programme
DS3 – Shaping the System of the Future

**System Performance**
- Grid Code
- Performance Monitoring
- DSM
- System Services
- ROCOF

**System Policies**
- Frequency
- Voltage
- Renewable Data

**System Tools**
- WSAT
- Control Centre Tools
- Model Dev. & Studies

*EirGrid* *semo* *SoNi*
System Non-Synchronous Penetration

SNSP = \frac{\text{Wind + Imports}}{\text{Demand + Exports}}
**DS3 System Services Products**

*NEW*
- Synchronous Inertial Response
- Fast Frequency Response
- Fast Post-Fault Active Power Recovery
- Ramping Margin 1,3,8 hrs

**Frequency Related Products**

**Transient Voltage Response**
- Dynamic Reactive Power

**Voltage Related Products**
- Steady-state Reactive Power
- Network Adequacy

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EIRGRID  
semo  
SoNi
System Services

- System Services Project Plan published on 20/05/2015 – published as a three-entity branded document

- TSO Procurement Strategy document published on 03/06/2015 – “living document”
Rate of Change of Frequency (RoCoF) Concept

Decreasing % of synchronous generation
RoCoF Implementation Project

Plan A: Move to 1 Hz/s over 500ms
- Generator Studies Project
- Can synchronous generators ride through a high RoCoF event? (Great Island GI4)

Plan B: Stay at 0.5 Hz/s
- TSO-DSO Implementation Project
- Can DSOs protect against islanding using different settings or measures to RoCoF?
- Alternative / Complementary Solutions Project
- Investigate and, if appropriate, propose alternatives
- Can embedded synchronous generators ride through a high RoCoF event?
- Complements requirements for System Services
Realising Potential of Embedded Generation

Established TSO-DSO Governance Arrangements for DS3

Key Issues:

- RoCoF protection setting for island detection – critical to moving standard
- Use of embedded generation for voltage and frequency control
- Impact of active generation / demand on DSO operations and network security
DSM Rapidly Evolving and Growing....
DSM Growth….A Balancing Challenge

**Consumer & DSM**
Trust, data privacy, cyber security, solid commercial foundation

**Power System**
Flexibility requirements, TSO and DSO secure operation, performance monitoring
Operational Policies & Related Studies

- Automated Dynamic Studies Tool (operational)
- Frequency regulation (complete)
- Voltage dip induced frequency dip (on-going)
- Quantitative frequency oscillation analysis (on-going)
- Provision of static frequency response (on-going)
- High frequency mitigation analysis (on-going)
- Cauteen Nodal Voltage Control Pilot Project (on-going)
- Northern Ireland Nodal Voltage Control Pilot Project (on hold)

Operational Policy Review Committee

Policy v1.0
Pilot
Widespread Implementation v2.0
EWIC Export Limit

- Largest single out-feed – mitigate potential for high frequency event
- Market flows are unaffected
- High frequency mitigation studies underway (summer)
- Long term: Over Frequency Generation Setting Schedule (studies underway to define)
1. TSOs frequency oscillation quantitative analysis
2. Alstom(a) frequency oscillation quantitative analysis and (b) “diagnosis and recommendation” report
Control Centre Tools

- WSAT voltage stability transfers (complete)
- Ramping tool and policy (trialling)
- Short circuit tool (trialling)
- EMS integration project (on-going)

Existing Control Centre Tools

2011

Tools Delivered

WSAT, Short Circuit, Wind Dispatch, Synchrophasor....

2012 - 2015

New Tools

Regulation, Ramping, Voltage Trajectory, WSAT Look ahead, System Services....

2015 - 2017
Summary
Operational Capability Outlook

Complements 2015 workstream plans
Complementary Progress Essential

Industry Response
- Investment
- Grid Code

- System Services
- RoCoF
- Operational Tools
- Operational Policies

75% SNSP
DS3 Programme Summary

• RoCoF workstreams progressing

• System Services underway but significant design and implementation issues need to be worked through

• Need to maximise contribution from embedded generation and demand side response – DSO/DNO collaboration key

• Operational policies and tools need to develop in parallel in a considered manner
Regulatory Authorities Update

DS3 Industry Forum
4th June 2015
DS3:

Delivering a Secure, Sustainable Electricity System

RA Update – DS3 Industry Forum

4th June 2015
New Arrangements - 2017

- Energy Trading Arrangements
- Ancillary Services (DS3)
- Capacity Remuneration Mechanism

Sustainability & Security of Supply

Price

Sustainability & Security of Supply
Our Focus: Consumer’s Interests

Reliable, secure electricity at sustainably low prices

- ETA structurally aligns energy trading with GB / EU
- CRM replaces CPM and focuses generator incentives
- System Services introduced to provide incentives for flexible performance

Pay-off: higher renewable utilisation, driving lower Energy Prices and lower total cost

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2014

Ancillary Services
  - Capacity Payments

2020

Ancillary Services/System Services
  - Capacity Payments

Energy Payments

Energy Payments
Ramping Renewable Utilisation

- **Current**
- **System Services (2016)**
- **RoCoF (2017)**
- **System Tools (2018)**
- **Operational Policies (2019)**

**Max SNSP (%)**
- 80
- 75
- 70
- 65
- 60
- 55
- 50
- 45
- 40

- **Initial Volumes**
- **Tariff-based**
- **Enduring Volumes**
- **Competitive**
Evolving Policy

• DETINI Consultation on CfD Implementation in Northern Ireland may remove 40% NI renewable target
  – Utility Regulator’s early view:
    • DS3 programme would likely remain a positive value proposition for NI consumers
    • SNSP is ‘clipping’ at 50% today; benefits of increasing it are measurable now, at only 20% penetration (Cal 2014)
    • Pragmatic, contextual management of procured System Service Volumes, particularly during ramp (2017 – 2019) can ensure value for money
Evolving Policy

• Workstream Interaction with ETA, CRM:

  – Consumer’s interests are promoted when market arrangements are clear and bolt together smoothly in both design and implementation

  – The SEM Committee have instructed all three projects to co-ordinate their activities: total consumer impact takes precedence over outcomes in any one area

  – Opportunities to leverage and combine project milestones are currently being explored

  – Some depth to this area; further liaison will be required with TSOs and stakeholders where specific combining of work or deliverables is identified
Rate of Change of Frequency Update

DS3 Industry Forum
4th June 2015

David Cashman
Presentation Overview

• Updates on status of three key workstreams
  
• Generator Studies Project
  
• TSO-DSO Implementation Project
  
• Alternative / Complementary Solutions Project
RoCoF Implementation Project

Timeline Update
• Project start date: 21st Nov 2014
• 6 months since beginning of project
Generation Studies Project

• All phase 1 Generators have commenced project

• CER and SONI quarterly updates published
  – Ireland: 24 Green status and 6 Amber
  – Northern Ireland: 4 Green status and 2 Amber

• Currently all phase 1 generators in IE and NI are on track to conclude by May 2016

• One generator (GI4) has declared compliance to the new standard

• Meetings with generators and OEMs scheduled for June
TSO-DSO Implementation Project

• Managed through existing TSO-DSO governance structure

• Ongoing bi-lateral TSO-DSO meetings taking place

• Loss of Mains (LoM) protection setting change process initiated by DSOs
TSO-DSO Implementation Project

• Ireland:
  – ESBN to finalise frequency injection bench testing of RoCoF relays imminently
  – Settings change requests issued to generators through User Questionnaire form
  – Engagement with embedded generators on RoCoF withstand capability through DCRP
  – Database of Distribution connected settings currently being compiled

• Northern Ireland
  – RoCoF project timelines for settings changes revised based on NIE projections
  – Current plan is to assess the impact of G59 rev 3 setting changes in advance of implementing 1 Hz/s settings
  – Database of settings for distribution connected wind generation has been compiled and work is ongoing to obtain embedded generation settings and volumes
  – Modification of Distribution Code for RoCoF requirements for embedded generators > 100 kW approved
Alternative / Complementary Solutions Project

• Joint project by TSOs
• Communication with industry via DS3 Advisory Council and website/email

Phase 1

• Range of theoretical options assessed at a high level
• Subset of viable options selected for Phase 2 analysis

Phase 2

• More detailed review of the selected options from Phase 1
• Analysis focused on technical and economic aspects of options
Phase 1 Assessment On-going

• DNV GL appointed end of March and due to conclude end June

• Analysis to date:
  – Assessment of non-synchronous device capability to provide RoCoF mitigation
  – Investigation of RoCoF detection methodologies and response times of devices

• Current analysis:
  – High level appraisals of technology types using ‘Faceplate’ templates
  – Comparison of technology types
Phase 1 Next Steps

• Finalize technology assessments

• Draft final report including technology appraisal and assessment of Non-synchronous device capability

• Publish for industry comment – End June 2015

• 2 Week response time for industry comment
Phase 2 Overview

• More detailed analysis likely including technical and economic studies of shortlisted options:
  – Dynamic simulations
  – Plexos studies

• Due to commence July 2015 with publication of draft results by December 2015

• Industry comment by Q1 2016
Summary

• Generator Studies project progressing and broadly on schedule

• Loss-of-Mains protection setting change process initiated with DSOs

• NI timelines for LoM changes revised based on NIE advice

• Alternative / Complementary Solutions project Phase 1 report due in June

• Alternative / Complementary Solutions project Phase 2 to commence in July
DS3 Industry Forum
ESBN Update

Tony Hearne
4th June 2015
Overview

Reactive Power / Voltage Control update

- Distribution Code DS3 (Reactive Power) Modifications
- Analogue Output capability integration with DCC SCADA
- WFPS Reactive Power Capability & Control Test Procedure – Type B ≥ 5MW
- Reactive Power / Voltage Control Nodal Controller Pilot – Cauteen Cluster

ROCOF update

- Interface Relay Tests
- Questionnaire and Settings Change
- Alternative LoM Protection

Conclusion
Reactive Power / Voltage Control Update
The following DS3 modifications were approved by the CER with an effective date of 08 October 2013:

MP 22 – DS3 Fault Ride Through

MP 23 – DS3 Reactive Power Voltage Control

More recently the following related clarification modifications were approved by the CER with an effective date of 23 February 2015:

MP 31 – Fault Ride Through

MP 32 – Voltage Regulation

MP 33 – Voltage Step Change
AO capability integration with DCC SCADA

Historically DCC SCADA did not require AO capability. However, the recently mandated new DS3 reactive power control modes have necessitated the integration of AO capability with DCC SCADA.

ESBN has recently successfully performed a FAT and a SAT (at Leopardstown Road).

ESBN is currently organising a site test at Cauteen after which this new capability will be rolled out to all Type B ≥ 5MW WFPSs.
ESBN is working with EirGrid on the above-mentioned test procedure which is now near completion and ready for trial.

It is planned to trail this new test procedure at the Cauteen Cluster.

In addition to the test procedure ESBN is also working with EirGrid on the associated business processes which will be required to coordinate the testing between the DSO, TSO and IPP.

Furthermore ESBN has developed the necessary in-house business processes and training material required for this testing.
A formal project has been initiated within ESBN.

The high-level functionality has been agreed between ESBN and EirGrid and we are currently working through the lower-level details.

A software simulator with load-flow has been developed which is being used to inform these design decisions.

The hardware design of the Nodal Controller has been concluded.

The pre-requisite communications infrastructure has progressed to the detailed design phase and will be installed at Cauteen imminently.

The participating IPPs have been engaged.
ROCOF Update
## Interface Relays Tests

### Legacy Voltage & Frequency Settings

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### RoCoF 0.6 Hz/s

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### RoCoF 0.4 Hz/s

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### New Voltage & Frequency Settings

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### RoCoF 1.0 Hz/s

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### RoCoF 0.4 Hz/s

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### RoCoF 1.0 Hz/s

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Interface Relays Tests

- Difficulty testing relay
- This relay represents a significant percentage of MW connections
- Issues a trip signal for all traces provided by EirGrid
- Working with manufactures to resolve problem

Relay 'X' MW connections

- Wind, 150.7MW
- Diesel, 8.12MW
- CHP, 5.623MW
Questionnaire and Settings Change

Wind Generators

• Instruction to change settings resent to all Wind Farm contacts

• Discussions held with larger developers

• Most will change setting over the coming months

Non-Wind 0 MEC Generators

• Meeting held with stakeholders of non-wind embedded generators

• Instruction to change interface settings sent

• Issues with new voltage settings and FRT capability
Alternative LoM Protection

- Where a RoCoF setting of 1Hz/s cannot be applied, alternative LoM protection maybe required

- Selection of Alternative LoM Solutions being explored are:

  1. **Supervised RoCoF**: G10 type relay monitors the Transmission system voltage, in the event of a disturbance a blocking signal is sent to a local network G10 relay inhibiting operation. **Trial Project due to begin in coming weeks**.

  2. **And RoCoF & Vector Shift**: The relay needs to see both a RoCoF and Vector Shift to initiate a trip signal. This may reduce the sensitivity of relays to grid disturbances. Studies required.

  3. **Exchange Relay**: This option will be informed by analysing of the installed fleet of G10 relays. Early indications show that some relays maybe not operate for the sample traces provided by EirGrid using a RoCoF setting of 0.6Hz/s.
Thanks for Listening

Questions?
DS3 System Services

DS3 Industry Forum
4th June 2015

Eoin Kennedy
Presentation Overview

• TSO Procurement Strategy
• Project Plan
• I-SEM Interaction
• Stakeholder Engagement
• Next Steps
• Key Messages
System Services Decision

Prepared for all 14 services and in place by Oct 2016
- “Cost-plus” based on a Best New Entrant (BNE) model or similar
- TSO consultations on tariff methodology and resulting tariffs

Allows for
- Early implementation of System Services
- Capability of current fleet to be revealed

Interim Regulated Tariff 2016/17
Regulated Tariff & Annual Auction

235 €M Cap in 2020/21
Timeline

Dec 2014
SEMC High Level Decision

March 2015
• Draft TSO Procurement Strategy and Draft Plan submitted to RAs
• Detailed design underway

Oct 2016
Interim Tariffs in place

Oct 2017
Go-live of first competitively procured services

Q1 2017
First Auction Run

7 Workstreams
12 + Consultations
90 + Deliverables
TSO Procurement Strategy
TSO Procurement Strategy

• “Living” document

• Draft version published on 3rd June provides a good indication of the likely structure and content of the enduring document

• Will be updated periodically during the course of the Implementation Project as decisions are made and key design aspects become clearer

Table of Contents

PART A: Introduction
PART B: TSOs’ Approach to Implementation of DS3 System Services Procurement Design
PART C: DS3 System Service Product Descriptions
PART D: Scenarios and Volumes for DS3 System Services
PART E: Long Term Contracts
PART F: Qualification Process
PART G: Assessment Principles for DS3 System Services Procurement
PART H: Auction and Tariff Implementation Principles
PART I: Information Provision
APPENDIX A: Product Description
Project Plan
Workstreams

- **WS1** Regulated Tariffs
- **WS2** System Services Volumes
- **WS3** Qualification Process Design
- **WS4** Auction Design
- **WS5** Contract Design
- **WS6** Product Design and I-SEM
- **WS7** TSO Operational Readiness

Workstreams proposed by SEMC

- Settlement
- Codes
- Control Centre Tools
- Financial
- System Services Performance Monitoring Infrastructure
- Training and Industry Communications
- Project Management
- Other Operational Readiness Activities
WS1 – Regulated Tariffs

- **SEMC Decision on Methodology for Calculation of Tariffs**
  - Q1 2016

- **SEMC Decision on BNE Model and Interim Tariffs**
  - Q3 2016

- **Go-live of Interim Regulated Tariff**
  - Oct 2016

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</table>
**WS2 – System Services Volumes**

**SEMC Decision on Volume Calculation Methodology and Scenarios**  
Q4 2015

**Publication of Indicative Volumes**  
Q2 2016

**SEMC Decision on Final Volumes**  
Q4 2016

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WS3 – Qualification Process Design

- SEMC Decision on Qualification Process Q4 2015
- SEMC Decision on “Competition Metrics” Q4 2015
- Qualification Opens to Industry Q2 2016
- Publication of Qualification Results Q4 2016
- SEMC Decision on Procurement Mechanism for each Service Q4 2016

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WS4 – Auction Design

- SEMC Decision on Detailed Auction Design Q4 2015
- Complete Procurement of IT Auction Platform Q2 2016
- Complete IT Design and Build of IT Auction Platform Q4 2016
- Run First Auction Q1 2017

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WS5 – Contract Design

**Contractual Principles Paper Issued**
- Q3 2015

**SEMC Decision on Final Contract**
- Q2 2016

**HAS Contracts Terminated and Interim Tariff Contracts Processed**
- Q3 2016

**New contracts from Auction / Regulated Tariff Processed**
- Q3 2017

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WS6 – Product Design and I-SEM

Scalar Methodology Developed Q3 2015

SEMC Decision on Scalar Methodology Q1 2016

Go-live of Volume, Product and Scarcity Scalars Q4 2016

Go-live of Performance Scalar Q1 2017

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WS7 – TSO Operational Readiness

- Codes
- Control Centre Tools
- Settlement
- System Services Performance Monitoring Infrastructure
- Training and Industry Communications
- Project Management
- Financial
- Other Operational Readiness Activities
## Summary of Consultations

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*Note: Further consultations will be required as part of TSOs’ operational readiness activities*
Design and Implementation

• Decision introduces complex design issues

• Key design challenges are the Auction and BNE tariff methodology

• Techno-economic consultancy support and expertise being engaged to assist with the principles and methodologies of these particular design aspects

• After that work, we will be in a better position to validate those aspects of the implementation plan
IS Aspects

- Significant level of IS development required to enable successful delivery and enduring operation of the DS3 System Services arrangements
- TSOs are working to develop greater certainty on the timelines and costs

- Settlement System
- Auction Platform
- Performance Monitoring and Testing
- Scarcity Scalar
- Operational Tools
Implementation

• Implementation work is underway with first consultations planned for summer 2015

Example: Volume Calculation

• Development of the following is progressing well:
  • Principles for creating service provider portfolios
  • Principles/methodology for how to calculate volumes
  • Assumptions used to calculate volumes
I-SEM Interaction
I-SEM Interaction

- Quarterly working level meetings between TSOs-RAs DS3 and I-SEM teams to ensure alignment

- E.g. Balancing arrangements

- Design

- E.g. Timing of consultations
  - E.g. Timing of DS3 and CRM auctions

- Delivery
Stakeholder Engagement
Approach to Consultations

- Aim is to engage and consult with stakeholders to greatest extent practicable

- Consultations will need to be overlapped – may be issued in batches

- Need to balance duration of consultation periods with overall delivery timelines

- 6 week periods allowed for in project plan but may decide to lengthen/shorten depending on importance/complexity of issues
TSO-led Consultations

1. Consultation paper published on the TSO and SEM Committee websites.

2. Stakeholders submit a response to the TSOs.

3. TSOs and RAs review the submissions and the TSOs prepare a recommendations paper that takes due consideration of the views expressed.

4. The TSOs submit the recommendations paper to the RAs’ Project Board for feedback or approval, depending on the context.

5. The SEM Committee will approve or provide feedback (where appropriate) on TSOs’ recommendations papers. All recommendation papers will be published on the EirGrid, SONI, and SEM Committee websites.

6. When making a formal decision, the SEM Committee considers the TSOs’ recommendations paper, as well as all responses received from stakeholders, and issues a decision paper.

Note: Where the TSOs have limited involvement in the development of the proposals being consulted on, the consultation will follow the established regulatory process.
Interaction with Stakeholders

- Transparent structured approach to engagement necessary

- Communication with stakeholders via consultations and industry forums/workshops (e.g. workshop shortly after opening a consultation)

- May provide opportunity for bilateral meetings during consultation (or batch of consultations) e.g. time set aside for meetings with slots allocated on a first come first basis

- Communication on implementation progress and other matters via the DS3 website and email
Next Steps
Next Steps

• Techno-economic consultancy support and expertise due to be appointed the week beginning 8th June

• Develop greater certainty on the timelines for IT systems

• Continue to undertake implementation work
Summary of Approach in 2015

March 2015
Draft Plan and Draft TSO Procurement Strategy submitted to RAs

End May 2015
• Consultants appointed to assist with development of principles and methodologies for auction and tariff

September 2015
“Firmed-up” Project Plan

Dec 2015

Planning

Implementation

Consultations 1-2
Consultations 3-8
Key Messages

- Draft TSO Procurement Strategy and Draft Project Plan published

- Techno-economic consultancy support and expertise being engaged to assist with principles and methodologies of challenging design aspects

- Project Plan will be “firmed up” in September 2015

- Implementation work is underway with first consultations planned for summer 2015
Voltage Dip-Induced Frequency Dip Analysis

DS3 Industry Forum
4th June 2015

Lisa McMullan
Presentation Overview

• Explanation of a VDIFD event
• Validation against real system records
• Simulation results
• Conclusions
• Next Steps
Explanation of a Voltage Dip Induced Frequency Dip Event
Voltage Dip-Induced Frequency Dip

1. Severe System Fault
2. Voltage Dip
3. Reduction in Active Power
4. Fault is Cleared
5. Slow Active Power Recovery
6. Temporary Energy Imbalance
7. Frequency Dip
Validation of Wind Farm Fault Ride Through Behaviour
Initial Assumptions for Wind Farm Fault Ride Through Behaviour

The WFPS shall provide at least 90% of its maximum AAP as quickly as the technology allows and in any event within 500 ms of the Transmission System Voltage recovering to 90% of nominal Voltage, for Fault Disturbances cleared within 140 ms.
Turbine 1: Fault Duration of 60ms

**Voltage**
- 55.6% Retained V

**Active Power**
- 5.9% Retained MW
- 680ms Recovery Time
Turbine 2: Fault Duration of 67ms

Voltage

Active Power

53% Retained V

56.4% Retained MW
10ms Recovery Time
Turbine 3: Fault Duration of 67ms

52.4% Retained V

48.3% Retained MW

10ms Recovery Time
Turbine 4: Fault Duration of 70ms

- Voltage: 79% Retained V
- Active Power: 46.4% Retained MW
- Recovery Time: 590ms
Revised Assumptions for Wind Farm Fault Ride Through Behaviour

Active Power recovery based on fault records for each turbine type.
Validation of Fault Induced Voltage Dip Propogation
Voltage Dip Propagation

- A severe transmission fault depresses voltage at the location of the fault.
- This depression propagates with varying degrees across the system.
Validation of Voltage Dip Propogation

Recorded System Data

Simulated Comparison in WSAT

Review of fault records

Voltages at various stations recorded

WSAT Snapshot case from event time

Fault emulated in the case

Voltages at selected stations recorded

Comparison of Voltage Propogation
Validation of Voltage Dip Propogation

Pre Fault Voltage

Fault Voltage

% Retained Voltage

Clear Correlation of Voltage Dip Propogation
Simulation Results & Next Steps
Points on the plot slightly below the 0.5 Hz/s line, are due to a transient frequency spike that is considered in the calculation of RoCoF in the relay models...

Load Shedding arrests frequency dip for this fault.
RoCoF Relay Operation

- Calculation of RoCoF during a transmission system fault.

![Graph showing bus frequency over time](image)
Conclusions

• System is secure at current wind levels for fault events analysed thus far

• System inertia as well as levels of wind generation have an impact on VDIFD events

• Wind turbines with slower active power recovery rates contribute to VDIFD events
Next Steps

• Follow up with relevant wind farms on Fault Ride Through performance

• Examination of more severe faults

• Further validation of protection relay modelling

• Studies to inform future operational policies
All-Island System Frequency Regulation Investigation

DS3 Industry Forum
4th June 2015

Norman Watson
Frequency Regulation

Confirmation of correlation between system parameters such as SNSP and frequency regulation
Freq. Regulation Analysis Scope

• Analysis of 2014 Data:
  – Percentage of time that frequency spent outside 49.9 – 50.1 Hz compared to SNSP, Wind and Inertia levels.
  – Analysis of average and maximum 5-second frequency deviations.
2014 Analysis: Average Freq. Deviations

• Increase in average deviations between 45% and 60% SNSP is approximately **0.003Hz** based on extrapolation of data.
2014 Analysis: Maximum Freq. Deviations

- Increase in maximum frequency deviations are marginal as SNSP increases.
Summary

• There is a correlation between frequency regulation and parameters such as SNSP

• Historical data indicates that the system could be securely operated at higher levels of SNSP – not an immediate barrier

• An incremental approach should be implemented when increasing SNSP – recognizes weakness of extrapolation

• Frequency regulation will require diligent management into the future
Control Centre Tools and Capability

DS3 Industry Forum
4th June 2015

Michael Burke
Workstream Overview

Where are we now?

Where are we going?
Tools and Capability
Control Centre Tool Types

- Forecast
- Schedule
- Control
- Monitor

NCC & CHCC Tools
Recent Developments

NCC & CHCC Tools

- Improved Graphical User Interface
- Regional Forecasts
- Accuracy incentives
- Wind Forecast Tender

Control

- Wind Dispatch Tool

Forecast

- Online Short Circuit Tool
- WSAT Frequency Security
- WSAT Regional Transfers
- Phasor Monitoring

Schedule

- RCUC: Inertia & ROCOF

Monitor

EMS Integration
Q4 2015
Real Time Short Circuit Tool

- G74 Methodology, 1ph & 3ph
- Runs automatically & alarms
- Offline Study functionality

More Proactive Network Management
Real Time use of Phasor Monitoring

- Higher sampling rate of system
- Oscillation Monitoring
- Post Event Analysis
**WSAT Development**

- **Frequency Security Assessment**
  - Predict nadir/zenith
  - Continuous Validation vs PMU data

- **Regional Transfers**
  - Identify amount of wind constraint necessary
  - Show margin to insecurity
  - Overloads & Voltage monitored
Energy Management System Integration

- Fully integrated all island EMS
- Facilitates more effective all island power system operation
- Improved powerflow analysis
- Q4 2015
EMS – Facilitating DS3

New EMS

- Busbar Monitoring
- Situational Awareness
- Dynamic Rating
- Wind in Studies
- Negative & Ramping Reserve
- WSAT Alarm Interface
- All Island Wind Dispatch

Situational Awareness

• More Information
• More Tools
• More Policies and Procedures

• Timely & Effective Decision Making
Future Tools: Key DS3 Inputs

- Ramping Studies & Policy
- Reserve from Wind
- Regulation Studies

- TSO/DSO Nodal Control
- Voltage Trajectory Study
- Voltage Control Policy

- Scheduling & Monitoring:
  - Ramping
  - SIR
  - FFR

Frequency Control
Voltage Control
System Services
Tools and Capability
Identification of further requirements

- International Conferences
- Regulatory Requirements
- Product Development Roadmaps
- Other TSOs
- DS3 Studies & Operational Policies
- Previous Project Experiences
- Operational Experience
- Control Centre Workshops
- Anticipated Tools
- Operational Experience
- Previous Project Experiences
- Other TSOs
- Product Development Roadmaps
- International Conferences
- Anticipated Tools
Other Tools?

- Look Ahead Analysis
- Demand Side Management
- Smart Grids
- Intelligent Alarm Processing
- Probabilistic tools
Questions?
Closing Remarks

DS3 Industry Forum
4th June 2015

Louis Fisher