RENEWABLE STATUS UPDATE

RGLG 3rd September 2019
Renewable Generation Status – Q2 2019

NI Connected Renewable Generation Technology Mix
- Total c. 1652MW
  - Hydro/Tidal 8 MW
  - Biogas 105 MW
  - PV 246 MW
  - Wind 1275 MW

NI Connected and Committed Renewable Generation Technology Mix
- Total c. 1903MW
  - Hydro/Tidal 8 MW
  - Biogas 112 MW
  - PV 307 MW
  - Wind 1,457 MW

+ 251MW to Connect
NIE Networks Capacity Map –demo

https://www.nienetworks.co.uk/connections/capacity-map
Transmission Application & Offers

RGLG
3rd September 2019
# Transmission Applications & Offers

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Developer</th>
<th>MEC/MIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP Kilroot GT5 and GT6 OCGT's</td>
<td>EP Kilroot Limited</td>
<td>2 x 205MW MEC</td>
</tr>
<tr>
<td>Aught Wind Farm</td>
<td>Aught Wind Farm Limited</td>
<td>37.2MW MEC</td>
</tr>
<tr>
<td>Pigeon Top Wind Farm</td>
<td>Energia Renewables Company 1 Limited</td>
<td>51.6MW MEC</td>
</tr>
<tr>
<td>Islandmagee Gas Storage</td>
<td>Costain Oil, Gas and Process Ltd.</td>
<td>34.75MW MIC</td>
</tr>
<tr>
<td><strong>Offers Issued</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BPS 100MW BESA</td>
<td>EP Ballylumford Limited</td>
<td>100MW MEC &amp; MIC</td>
</tr>
<tr>
<td>Atlantic Hub</td>
<td>Atlantic Hub Property Ltd.</td>
<td>100MW MIC</td>
</tr>
<tr>
<td>Curraghamulkin Wind Farm (also called Dooish)</td>
<td>DW Consultancy</td>
<td>42MW MEC</td>
</tr>
<tr>
<td>Belfast Power Limited</td>
<td>Evermore Energy</td>
<td>489.6MW</td>
</tr>
<tr>
<td>Drumkee Battery Storage</td>
<td>Drumkee Energy Limited</td>
<td>50MW MEC &amp; MIC</td>
</tr>
<tr>
<td>Mullavilly Battery Storage</td>
<td>Mullavilly Energy Limited</td>
<td>50MW MEC &amp; MIC</td>
</tr>
<tr>
<td>KPS 50MW BESA</td>
<td>EP Kilroot Limited</td>
<td>50MW MEC &amp; MIC</td>
</tr>
<tr>
<td>Castlereagh 50MW BESA</td>
<td>Energia Renewables Company 1 Limited</td>
<td>50MW MEC &amp; MIC</td>
</tr>
</tbody>
</table>
Demand Erosion and Uncontrollable Generation Limit

RGLG 3rd September 2019
Agenda

• Overview of System issues with Uncontrollable Export
• Operational considerations
• Implications of further uncontrollable export
• Mitigation considerations
• Next Steps
Key Principles

• SONI balances generation and demand on the system to maintain system stability.
• Min of 3 synchronous generators to be dispatched at all times.
• Excess generation results in system frequency > 50 Hz.
• Generation output must be reduced - dispatch down of controllable generation.
• Reduction may also be required for operating reserve requirements, including negative reserve, voltage control requirements and System Non-Synchronous Penetration limit.
Key Principles

- SONI Control room has seen continued year on year decline in min demand - multiple occurrences of min demand ≈ 450 MW
  - Uncontrollable generation (Micro/SSG) energy efficiency
- Uncontrollable generation cannot be curtailed - same effect as eroding system demand.
- Presents issues at low system demand even with minimal synchronous generation
  - Reliance on ability to export surplus via N-S or Moyle
- The total capacity of uncontrollable generation export is subject to an operational limit as a result.
## Operational Considerations

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System Stability Requirement</strong></td>
<td>At least 3 units on load at all times B10, B31, B32, C30, K1 &amp; K2</td>
</tr>
<tr>
<td></td>
<td>Min Gen Total: 249 – 486 MW</td>
</tr>
<tr>
<td><strong>Negative Reserve Requirement</strong></td>
<td>&gt;50 MW</td>
</tr>
<tr>
<td><strong>Uncontrollable LSG</strong></td>
<td>79 MW</td>
</tr>
<tr>
<td><strong>Min Demand</strong></td>
<td>450 MW</td>
</tr>
</tbody>
</table>

*Increasing reliance on export availability*

<table>
<thead>
<tr>
<th>Export Type</th>
<th>Capacity Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moyle Export</td>
<td>80 MW</td>
</tr>
<tr>
<td>North – South Export</td>
<td>110 – 270 MW (inertia dependent)</td>
</tr>
</tbody>
</table>

Above must also consider outages and availability of Gen units, Moyle and N-S.
<table>
<thead>
<tr>
<th>NI Min Demand (0000 – 0900)</th>
<th>456 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Conventional Generation (min gen + negative reserve)</td>
<td>295 MW</td>
</tr>
<tr>
<td>Moyle scheduled</td>
<td>440 MW import</td>
</tr>
<tr>
<td>North – South Flow</td>
<td>300 MW export</td>
</tr>
<tr>
<td>Wind forecasted</td>
<td>370 MW</td>
</tr>
<tr>
<td>Wind curtailed</td>
<td>Approx 300 MW remaining 70 MW uncontrollable</td>
</tr>
<tr>
<td>Request to Trade back on Moyle around 0430am</td>
<td>Refused (all trading on interconnectors is co-ordinated and only on firm market schedule)</td>
</tr>
<tr>
<td>Formal Emergency Assistance request issued to NG</td>
<td>Emergency Assistance trade back of 50 MW</td>
</tr>
</tbody>
</table>
August 11\textsuperscript{th} 2019

Northern Ireland - Actual and Forecast Wind

Actual Wind Generation

Forecast Wind Generation
<table>
<thead>
<tr>
<th>NI Min Demand (0000 – 0600)</th>
<th>456 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Conventional Generation (min gen + negative reserve)</td>
<td>459 MW</td>
</tr>
<tr>
<td>Moyle scheduled</td>
<td>83 MW export</td>
</tr>
<tr>
<td>North – South Flow</td>
<td>250 MW export</td>
</tr>
<tr>
<td>Wind forecasted</td>
<td>700 MW</td>
</tr>
<tr>
<td>Wind curtailed</td>
<td>Approx 376 MW</td>
</tr>
<tr>
<td>Wind post curtailment</td>
<td>324 MW remaining including approx 70 MW uncontrollable</td>
</tr>
</tbody>
</table>
22nd July 2019

Northern Ireland - Actual and Forecast Wind

![Graph showing actual and forecast wind power generation over time.](image-url)
Northern Ireland - Interconnection

22nd July 2019
Impact of Further SSG export

- Increased potential for system instability
- Increased likelihood of trade backs on Moyle – Cost to NI customer
- Deviation from priority dispatch rules
- Increased curtailment of LSG - may also undermine project commercials and future investment
What would help?

• SSG and LSG export becomes controllable
• Min demand growth
• Conventional plant min gens reduce
• Ability to reduce to 2 sets in NI achieved
• 2nd N-S
• Additional Interconnector in NI
What will make issue worse?

- Connection of further uncontrollable SSG export
- Continued reduction in min demand (including impact of self consumption)
- Replacement of ageing conventional generation fleet with high min gen plant
Next Steps

• SONI to complete impact assessment and decision on uncontrollable

• Rationale and any restrictions will be included in CIWG consultation paper
Contestability Update
Distribution and Transmission
Network Development/ ATR Update

RGLG – 3rd September 2019
Tomorrow’s Energy Scenarios 2019 Consultation

RGLG
3rd September 2019
TESNI Aim

• Under Condition 40 of the TSO Licence, SONI are required to produce a reasonable number of future scenarios which reflect uncertainties.

• TESNI aims to outline a range of credible pathways for Northern Ireland’s energy transition with a specific focus on what this means for the electricity system over the next thirty years and beyond.
SONI publications

- **Ten-year-horizon planning publications**
  - All Island Generation Capacity Statement
  - All Island Ten Year Transmission Forecast Statement
  - Transmission Development Plan

- **Twenty-year-plus-horizon planning publication**
  - Ten Year National Development Plan - Scenarios Report
  - Tomorrow’s Energy Scenarios
  - TES System Needs Assessment

Ten year electricity demand forecast.
Detailed information on demand and generation opportunities.
Ten year network and interconnection development plan.
Possible energy scenarios for Europe out to 2040.
Credible electricity scenarios for Ireland out to 2040.
Long-term needs of the electricity transmission grid out to 2040.
### Key Milestones:

- Consultation Period (7 weeks)
- Mid-consultation briefing session
Decarbonisation NI Context

NI scenarios

5th UK carbon budget & Amendment to Climate Change Act 2008

ENTSO-E’s scenario building working group
Future Energy Landscape Uncertain

- Changes in NI consumers’ future energy needs require understanding of:
  - What benefits exist through market integration by further interconnections
  - Impact on network and system operation with significantly higher levels of renewables and energy efficiency measures needed to achieve carbon neutrality
  - Interaction between the DSO and the TSO in the future planning and operation of the power system
  - Implications from energy storage both in battery technology and game changer technologies, such as Power to X
Scenario Quantification Process

AMBITION TOOL
Provides Outputs for Demand & Power Market Tool

DEMAND PROFILES

POWER MARKET SIMULATION

Stakeholder feedback

Final Scenario

Storyline consistency Check

Storyline GHG Ambition

GHG Ambition Storyline Check

Stakeholder feedback
TESNI 2019 Scenario Evolution

Today 2025 2030 2040

- Addressing Climate Change
- Modest Progress
- Least Effort
## Scenario Design Matrix

<table>
<thead>
<tr>
<th></th>
<th>Least Effort</th>
<th>Modest Progress</th>
<th>Addressing Climate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decarbonisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toward a zero-carbon electricity system by 2050</td>
<td>No</td>
<td>Progress made</td>
<td>Yes</td>
</tr>
<tr>
<td>Percentage RES-E in 2030</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
</tr>
<tr>
<td>Coal generation phase-out</td>
<td>Timely</td>
<td>Timely</td>
<td>Timely</td>
</tr>
<tr>
<td>Greenhouse Gas emissions reduction by 2030</td>
<td>35%</td>
<td>40%</td>
<td>45%</td>
</tr>
<tr>
<td>Carbon capture and storage</td>
<td>No</td>
<td>No</td>
<td>Yes [2040]</td>
</tr>
<tr>
<td>Energy efficiency gains</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Electrification of heat and transport</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td><strong>Decentralisation</strong></td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Distribution-connected generation growth</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Self-consumption</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td><strong>Enablers</strong></td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Demand-side flexibility</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Smart Meter uptake</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>
System Needs Assessment

Current Position

Develop scenarios
- We engage with a wide range of stakeholders during our consultations

Energy model
- We use optimisation software to simulate future energy production and consumption patterns

Grid model
- Generation dispatches
- Grid performance

Identify needs
- We apply our technical planning standards to thousands of simulations
- We use the concept of drivers and areas to group needs
### Driver(s)

- RES integration

### Need(s)

- Power transfer capacity
- Voltage support

For illustrative purposes only.
Prepare and launch consultation

Stakeholder engagement

Consultation open

Stakeholder info. briefing session

Design, approve and publish final report

System Needs Assessment

Key milestones:

- Consultation Period (7 weeks)
- Mid-consultation briefing session
G59 ROCOF IMPLEMENTATION PROGRAMME

RGLG Update 03/09/19
LSG RoCoF Progress

- All LSG sites >5MW have been changed to new RoCoF setting
- 1120 MW of 1Hz/s RoCoF compliant Large Scale Generation (including sites that have connected since the programme started)
- 68 LSG sites have been changed
SSG RoCoF Implementation

- Letters requesting G59 changes sent out 01 June 2018
- SSG owners to acknowledge receipt
  - Online or by return pre-paid envelope
- For assurance purposes SSG owners to use G59 approved contractors
  - List of approved contractors on NIE Networks website
- G59 approved contractor list established following procurement exercise
  - 23 contractors on list
- SSG owners to make the changes by 30 September 2019
- Costs associated with making the changes borne by SSG owners
SSG RoCoF – Current Status

- Currently engaged in programme
  - 1305 SSG’s (93%) – 394 MW (98%)

- Already changed
  - 967 SSG’s (69%) – 304 MW (76%)
SSG RoCoF – Current Status

MW of SSG completed against time

- % MW Complete
- Total MW SSG (400MW)
- MW Complete

Graph showing the progress of SSG RoCoF completion over time.
SSG RoCoF – Current Status

Changes Complete (MW)

- BioGas*: 68 MW
- Diesel: 92 MW
- PV: 22 MW
- Wind: 122 MW

Changes Not Complete (MW)

- BioGas*: 17 MW
- Diesel: 31 MW
- PV: 13 MW
- Wind: 35 MW

* BioGas includes LFG, CHP, AD & Hydro
SSG RoCoF – Customer Interactions

- Non-responders
  - Initial letter followed by October, February, April & July reminders
- Responders
  - Initial letter followed by February, April & July reminders
- March – May – Six Information Evenings
- May – G59 presence at Balmoral Show
- October – D Code breach notices to all SSG’s not changed
- Dedicated G59 email address >1600 contacts
- Dedicated phone number
SSG RoCoF – 30 September 2019

• NIE Networks expect there to be a significant number of SSG’s and MW changed by 30\textsuperscript{th} September 2019
  • Based on high level of engagement so far
  • Continued direct correspondence with SSG’s
  • Impact of information evenings
  • Impact of clear messaging on the implications of non-compliance
    • De-energisation, Ofgem, DfE and supplier contract implications
Total RoCoF (LSG & SSG) – Current Status

G59 Changes have been completed at 94% of Generation Capacity on the NIE Networks’ Distribution System

**Changes Complete (MW)**

- **BioGas***: 96
- **Diesel**: 107
- **PV**: 136
- **Wind**: 1085

**Changes Not Complete (MW)**

- **BioGas***: 17
- **Diesel**: 31
- **PV**: 13
- **Wind**: 35

* BioGas includes LFG, CHP, AD & Hydro