Weather-driven Energy System

Presentation to IEA
12 September 2022
INTRODUCTION TO EIRGRID

• We are owned by the Irish Government, and we are a regulated utility. This means we operate solely for the benefit of the electricity user.

• We do not generate electricity – we bring it from generators across the grid. We also operate some interconnectors with neighbouring electricity grids.

• We run the wholesale electricity market. This ensures electricity is always available at the most economic price possible.

• We do not own the electricity grid, and have no vested interest in adding to it.

• We only upgrade or add to the grid in response to government policy, or where it is an essential response to secure Ireland’s electricity supply.
ISLAND OF IRELAND POWER SYSTEM

**Facts & Features**
- Prevailing wind onto Western Atlantic Coast
- Main load centres on the East Coast
- Two 500 MW HVDC links to GB
- High level of operational constraints (e.g. 75% SNSP)
- Fuel mix dominated by gas and wind

**Statistics**
- 10 GW Dispatchable/Controllable Gen (incl wind & solar)
- 7 GW Winter Peak Demand
- 2.5 GW Summer Valley Demand
- Record Wind 4.5 GW on 5th Feb
- Record Wind 96% of all-island demand on 6th Feb
LET’S TALK ABOUT THE WEATHER

• Why is it important to forecast?
• What forecasts do we use?
• How do we use the forecasts?
• What does the future hold?
12/09/2022 5 Day Wind Forecast

- Wind Generation
- Primary Vendor
- Secondary Vendor

Options:
- Hide Tabular Data
- Download CSV Data

Select Date:
- 12/09/2022

Select Jurisdiction:
- England
- Wind

Select Graph:
- Latest
- Recent
- 5 Day
- Short Term
- Regions
- All Island
- Confidence Bands

TODAY
Energy Transition

Need to manage each type of day.

Need to manage the transition between the days.
EIRGRID’S CHANGE MANAGEMENT

DS3 & SOEF Programmes

System Policy
- Robust Operational Change Governance
- Systematic System Trials to push operational limits

System Performance
- Power System
- Generator and new technology

System Tools
- EMS including Wind Dispatch Tool
- Wind Forecasting Tool
- New: Ramping Margin Tool
- New: Look Ahead Stability Assessment Tool
- New: Voltage Trajectory Tool
CURRENT STATE OF EIRGRID’S SCHEDULING TOOLS

Wind Energy Forecasts

Ramping Margin Tool

Wind/Solar Energy Forecast

Ramping Requirement

Market Participant Data
Interconnector Flows
Load Forecast
Operational Constraints

Balancing Market Optimisation Scheduler

Indicative Operations Schedules

Look Ahead Stability Assessment Tool

Voltage Trajectory Tool
Each vendor generates an ensemble of forecasts based on different weather models.

- The average forecast is provided as the Variable Generation Forecast.
- The ramp forecast is generated by calculating the ramp for each forecast within the ensemble, for 1, 3 & 8 hours.
- The 80th percentile is the value provided in the ramp forecast.
- The Variable Generation Forecast and the Variable Generation Ramp Forecast are used to calculate the Variable Generation Uncertainty.
- The Variable Generation Uncertainty is combined with Load Forecast Uncertainty and Interconnector Uncertainty to produce the Ramping Requirement.
- The Ramping Requirement is an input to the Integrated Scheduling Process.
RAMPING MARGIN TOOL IN ACTION

Wind Forecast
Gen Unit Schedule with Ramp Req

Gen Unit Schedule without Ramp Req

Ramping Margin
Ramping Margin Requirement

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<tr>
<th>TCG Name</th>
<th>Scheduling Interval</th>
<th>Ramping Margin 1 Req. (MW)</th>
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RAMPING IN HIGH WIND

Exercise Judgement:
• Schedule “defensively”.
• Consider “using lower forecast” in long term schedule.
• Consider scaling down the forecast in long term schedule.
• Consider commitment of marginal ‘slow start’ units.
• Share less reserve capacity between North and South.
• Consider increasing regional stability/Target lower flows between regions.
• Preemptively constrain wind to reduce impact of gusts and improve frequency control and reduce risk of inadvertent protection trippings.
RAMPING IN-STORM CONDITIONS

Convene Storm Response Team
- Return circuits from maintenance outages.
- Put power system trials on hold.
- Audit protection settings.
- Identify risk areas.
- Anticipate tripping and impacts thereof (loss of load, loss of wind)
- Communicate internally and externally.
- Staff up the Control Centres.
- Again: Schedule defensively.
LOOK-AHEAD STABILITY ASSESSMENT TOOL

• Simulates tripping of 800+ scenarios
• Checks power system stability
  • Operates within secure frequency ranges
  • Stay within Rate of Change of Frequency (RoCoF) limit
• “What if” transfer analysis
• Does not consider ramp forecast
VOLTAGE TRAJECTORY TOOL

- Operate within secure voltage ranges
- Suggests corrective voltage actions
- Does not consider ramp forecast
THE FUTURE: SHAPING OUR ELECTRICITY FUTURE

- **2010**: > 10% RES-E
- **2020**: > 40% RES-E
- **2030**: 80% RES-E
- **2050**: Net Zero
THE FUTURE: SHAPING OUR ELECTRICITY FUTURE

Generation in 2020

Changes
- No Peat
- Little Coal
- More Solar
- More Onshore Wind
- More Offshore Wind
- 3rd GB Connection
- French Connection
# THE FUTURE: SHAPING OUR ELECTRICITY FUTURE

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<td>Power Flow Controllers</td>
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In Summary:
Operating our weather-driven power system is very complex. This complexity will increase so our ability to manage uncertainty will have to grow and grow.

Thank You

www.eirgridgroup.com
www.smartgriddashboard.com