Integration of Distributed Energy Resources:
Irish Case

Andrew Keane
University College Dublin
Irish DRES

- Utility Scale Distributed Resources
- Distributed Generation < 30 MW
TRANSMISSION SYSTEM
400, 275, 220 and 110 KV
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- 400kV Lines
- 275kV Lines
- 220kV Lines
- 132kV Lines
- 220kV Cables
- 110kV Cables
- HVDC Cables
- 400kV Stations
- 275kV Stations
- 220kV Stations
- 110kV Stations

Transmission Connected Generation
- Hydro Generation
- Thermal Generation
- Pumped Storage Generation
- Wind Generation
Utility Context

• Active facilitator of renewable energy
• Balancing act of obligations
  – Primarily to demand customers
  – Also now to generation customers

• 2020 RE Target is 40% of electricity to be renewable (~6,000 MW)
• Approximately half of which will be Distributed RES
Ireland Wind Connections (MW)

Projected System Demand 2020

Connected
Contracted
Gate 3
Connected Post Gate 3

- Distribution
- Transmission

1460 MW
1260 MW
3990 MW
6700 MW
Policy and Regulatory Challenges

• Financing of projects is challenging for developers due to high upfront capital costs
  – Certainty around revenue improves this situation
  – Drives governments to establish Feed in Tariff mechanisms

• Priority export for renewable energy

• Intersection between technical and policy requirements and objectives
Group Processing Approach

- Policies and regulations supporting DER need to (in some way) reflect technical reality of electrical network

- Areas of high density energy resource
- Multiple generators seeking to connect

- Consider network design for cluster as a whole
- Guarantees that wind power available is able to be utilised
- Largely eliminates issues related to variability
Challenges Faced

2003
System Operator placed a moratorium on all wind connections due to concerns over system security

December 2004
Moratorium lifted

January 2005
Group Processing Approach launched
Gate 1: 373 MW

January 2007
New Round of Connections processed and offered
Gate 2: 1300 MW

January 2011
New Round of Connections processed and offered
Gate 3: 4000 MW
Group Processing
Advantages and Disadvantages

• Rapid connection of large volume of renewable generators
• Provision of high quality connections to the grid

• Relatively large upfront capital network investment
  – Cost absorbed by electricity customer and wind farm developers
New Challenges

• Growing public opposition to wind turbines and overhead lines

• Growing public opposition to renewables incentives
  – Macroeconomic environment

• Connection of micro-generation (Solar PV)
  – Deeper into the grid generation is located, fewer existing technology options to integrate it

• Complex technical limitations
Innovation Options

• Real time management of resources
  – Centralised or distributed

• New connection arrangements for DER
  – Potential removal of right to export all power
  – Potential to provide lower cost connections
  – Requires greater ongoing monitoring and management

• Network automation and control
Summary

• Unique technical innovation coupled with appropriate policy and incentives

• High reliability of bulk system has limited drive towards microgrids (so far)

• Coordination of operation between utility operators, developers and regulators on island is central to achievements to date and further progress