Embedded Generation & National Grid - Challenges and Opportunities

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Agenda

- Role of National Grid
- What is meant by Embedded?
- Obligations on Generators
- Challenges to National Grid as SO
- Challenges to National Grid as TO
- Opportunities for Generators and Demand-Side
Role of National Grid

- System Operator in GB
  - Real time matching of generation and demand, achieved through accepting Bids and Offers in the BM
  - Safe and Secure transmission system
    - E&W – 400 kV and 275 kV
    - Scotland – 400 kV, 275 kV and 132 kV
    - Security standards covered by GB SQSS
- Transmission Owner in England and Wales

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<thead>
<tr>
<th></th>
<th>GB</th>
<th>E&amp;W</th>
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<tbody>
<tr>
<td>Installed capacity (GW)</td>
<td>77</td>
<td>67</td>
</tr>
<tr>
<td>Maximum demand (GW)</td>
<td>62</td>
<td>54</td>
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<tr>
<td>Energy supplied (TWh)</td>
<td>330</td>
<td>300</td>
</tr>
<tr>
<td>Circuit km</td>
<td>26500</td>
<td>15000</td>
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<tr>
<td>No of transformers</td>
<td>1000</td>
<td>676</td>
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Embedded Generation - headline figures

- England and Wales
  - Small and medium generators
  - ~6 GW currently
  - 2010 forecast of ~8 GW

- Scotland
  - All generation distribution connected
  - ~2.2 GW currently
  - 2010 forecast of ~4.5 GW
  - >80% expected to be large, and may chose to be BELLAs

- Demand in Scotland is around 6 GW at peak, and there is currently around 10 GW of transmission connected plant
What is meant by “Embedded” Generation

• In England and Wales
  • Embedded usually means a small or medium power station (<100 MW)
  • There are Large power stations which are distribution connected, but these generators are BMUs and so are “dispatchable”

• In SPT and SHET Transmission Areas
  • Embedded includes all distribution connected power stations
  • including those large stations which have chosen to have a BELLA
  • Large is >= 30 MW in SPT’s transmission area
  • Large is >=5 MW SHET’s transmission area

• Consultation on Regional Differences
Code Compliance

- Large Power Stations have to be compliant with Grid Code regardless of connection point; transmission or embedded

- Requirement to submit Bids and Offers in BM

- Requirement for Mandatory Services Capability
  - Response
  - Reactive

- Contractual arrangements to use Mandatory Services are being developed for BELLA Generation
Impact on Transmission Owner

- GB Queue
  - insufficient transmission capacity for the levels of generation wanting to connect

- Embedded Power Stations with a capacity <100MW do not currently pay for the use they make of the GB Transmission System
  - Treated as -ve demand for calculating TNUoS charges

- National Grid working with the industry to develop solutions to these issues
Impact on System Operations

- Exporting GSPs
  - No contractual mechanisms with embedded generators to commercially manage GSP flows onto the GB Transmission system (exporting GSPs)
  - Effect of changing a particular generator output on flows will depend on configuration of distribution system
  - The combination of these factors limits SO ability to manage flows through the GB transmission system

- Reactive
  - No significant increase in requirements expected

- Technology issues
  - Sensitivity of wind turbine generator technology to voltage disturbances
  - Shut downs during high wind speeds
SO - Energy Balancing

- **Response**
  - Requirement a function of largest loss
  - Frequency performance may marginally worsen with increased levels of small scale generation, but still manageable

- **Reserve**
  - Reserve Requirement likely to increase as levels of wind generation increases
  - Not directly related to their location – embedded or transmission connected
Customer Demand Management

- Around 1 GW of “triad” avoidance by > 1 MW customers are they reduce demand at peak ½ hours during winter

- Reduces the requirement for transmission infrastructure

- Evidence of demand management at other times, as customers respond to high energy prices

- Obligation to notify National Grid of the level of Customer Demand Management
Opportunities for Generators and Demand

- Frequency Control & Fast Reserve
  - Demand side already provide a number of balancing services
  - Automatic LF trips or manual instructions
  - Continued interest in talking to providers

- Standing Reserve
  - Standing Reserve – reduce demand / increase output under instruction within 20 minutes
  - Currently about one third (840 MW) is procured from non-BM providers
  - Developments to service to increase flexibility including more frequent tenders and longer response times
Further Information

- **Balancing Services**
  - National Grid website
    - www.nationalgrid.com/uk/Electricity/Balancing/
  - Anne Bennett – 01926 65 3445 anne.bennett@uk.ngrid.com

- **Transmission Access**
  - Ofgem options development group, looking at Access issues
  - Ofgem consultation on transmission charging for distributed generation - awaiting conclusions
  - Hedd Roberts 01926 65 5385 hedd.roberts@uk.ngrid.com

- **Seven Year Statement**
  - www.nationalgrid.com/uk/Electricity/SYS/