Smart DG Connections: Next Steps

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Overview

- SSE
- Active Network Management
- Micro Generation
- Controllable Demand
  - Electrolysers
  - DSM
- Different Operator Models
- Other
- Lessons Learnt
SSE

- 30th largest company in the FTSE 100*
- £13.8 bn market capitalisation
- Around 19,500 employees
- Delivered a real dividend increase every year since 1999
- UK’s broadest-based energy company
  - Electricity generation, transmission, distribution, supply and services
  - Gas production, storage, distribution, supply and services
  - Telecoms networks and data storage
- Ireland’s fastest-growing energy company
  - Electricity generation
  - Electricity and gas supply
  - Street lighting maintenance

* As at 11 January 2013
We own
• one electricity transmission
• two electricity distribution networks
• 106,000 substations
• 130,000 km of overhead lines and underground cables
• 100+ submarine cable links
• Across one third of the UK landmass.
• Serving 3.5 Million Customers
What is ANM?
## Alternative to Reinforcement

<table>
<thead>
<tr>
<th>Reinforcement</th>
<th>Active Network Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Established methods</td>
<td>• Can be implemented quickly and cost effectively</td>
</tr>
<tr>
<td>• Compliant with all existing standards and agreements</td>
<td>• Flexible and extensible</td>
</tr>
<tr>
<td>• Expensive (if even allowed)</td>
<td>• A step toward future smart grids</td>
</tr>
<tr>
<td>• Long lead times</td>
<td>• Requires new methods and new agreements</td>
</tr>
<tr>
<td>• Risk of stranded assets</td>
<td></td>
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</tbody>
</table>
Orkney Smart Grid Development

1. 1998 non firm connections first offered
2. DTI funded study – 2004:
   - Established benefits of ANM, details of technical solution and estimated potential economic generation connection
3. RPZ application – 2005
   - Sets out the generators involved, connection barriers, traditional solutions, innovative solutions, costs, etc.
4. IFI funded development activities – 2006/07 onwards
5. ANM Scheme Trial – November 2006
6. Connection of first two ANM generators – Nov 2009
7. Improvements of the ANM scheme in service
## Benefits

<table>
<thead>
<tr>
<th>Network</th>
<th>Environmental</th>
<th>Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 22 MW installed</td>
<td>• Reduction 53400 t CO$_2$*</td>
<td>• £4.1M revenue generated</td>
</tr>
<tr>
<td>• Mar’13 – Feb’14 40% demand met by ANM</td>
<td></td>
<td>• Socio-economic</td>
</tr>
<tr>
<td>• &gt;100% demand met by renewable</td>
<td></td>
<td>• 1/30$^{th}$ cost</td>
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*compared against oil*
Bridge of Dun ANM
Micro Generation

- Eroding network capacity
- Looking to include within ANM system
- System must have similar principles
  - Not affect existing generators
  - Must failsafe
  - Must be commercially viable for generators

<table>
<thead>
<tr>
<th>Priority</th>
<th>Generator</th>
<th>Size (kW)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>NNFG</td>
<td>600</td>
</tr>
<tr>
<td>2</td>
<td>NNFG</td>
<td>1500</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>26</td>
<td>SSNFG Cluster 1</td>
<td>1000</td>
</tr>
<tr>
<td>27</td>
<td>NNFG</td>
<td>1000</td>
</tr>
<tr>
<td>28</td>
<td>NNFG</td>
<td>1600</td>
</tr>
<tr>
<td>29</td>
<td>SSNFG Cluster 2</td>
<td>1000</td>
</tr>
<tr>
<td>30</td>
<td>NNFG</td>
<td>400</td>
</tr>
<tr>
<td>31</td>
<td>NNFG</td>
<td>500</td>
</tr>
<tr>
<td>32</td>
<td>NNFG</td>
<td>500</td>
</tr>
</tbody>
</table>
Electrolysers on D Networks
Demand Side Management

- Scale of potential DSM on Shetland is 2.5MW or 25% of summer demand
- Scheduling demand and weather

**Default water temperature**
- Water Temperature = 60 °C
- Energy Stored = 9 kWh
- Available Energy storage = 4 kWh

**Maximum water temperature**
- Water temperature = 80 °C
- Energy Stored = 13 kWh
- Available Energy Storage = 0 kWh
Other Techniques

Local energy markets
Alternative Operator Models (3rd Party Storage)
Alternative Operator Models (3rd Party DSM)
Lessons Learnt

• Many possible ways to reduce timescale/cost of new connections

• Effects stretch beyond Distribution / Transmission network

• Learning about impacts of new technologies

• Different models of operation (DNO / 3rd party)

• No one solution will work everywhere, require toolbox of solutions
Summary

• ANM available as BaU

• Benefits

• Active management for active connections

• Roles changing must work together to get more renewable onto the network