UK Perspective on Smart Grids

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OFGEM Network Innovation Competition
Drivers of Smart Grid in EU/UK

European Union 20/20/20 Kyoto Target

By 2020, compared to 1990:
- 20% cut in greenhouse gas (GHG) emissions
- 20% of consumed energy from renewables
- 20% improvement in energy efficiency


- 15% energy from renewables
- 10% transport and 30% electricity

Smart grid an essential response to challenge
Promoting UK Smart Grid Innovation

OFGEM policy focuses on Smart Grids to achieve
- New network capabilities
- Lower cost investments
- Earlier implementation
- Better customer experience

Imperative to drive innovation
- Strong regulatory incentive and funding framework put in place.

SMART GRID PROJECTS € MILLION (source EUJRC)

- 2009
- 2010
- 2011
- 2012

UK  EU Average
UK Industry Structure and Regulation

Competitive Generation and Retail
Growing customer participation through DG and smart meters

Regulator – OFGEM
System Operator – NG
Network Industry Body - ENA

Revenue-regulated T&D Networks
3 Transmission, 6 Distribution, and several Off-shore Operators

DISTRIBUTION COMPANIES
- SSE Power Distribution
- SP Energy Networks
- Northern Power Grid
- Electricity North West
- Western Power Distribution
- UK Power Networks
Innovation Framework in Networks

Multi-year incentive-based price controls set by OFGEM, each containing substantial funding for Innovation

Transmission 2013-2021
- Network Innovation Competition (NIC) ($400m)
- Innovation Allowance (NIA) 0.5%-1% of revenue*

Distribution To 2015
- Competitive Low Carbon Networks Fund (LCNF) $510m
- Allowances LCNF/IFI ($290m)

Distribution 2015-2023
- Expanded NIC (estimate extra $200m prior to 2016 review)
- Innovation Allowance (NIA) 0.5%-1% of revenue*

* The percentage NIA is based on the quality and content of the company's innovation strategy
Innovation Goals

- Equalising incentive for investing in “non-copper” solutions
- Improving customer service and meeting new needs
- Evaluating and mainstreaming smart grids through controlled-risk trialling
- Mobilising customers as part of the solution

FOCUS OF FUNDING
Innovative commercial and technical network solutions

TO:
- Connect renewables
- Manage impact of non-firm, distributed sources and demand side response
- Develop active and smart network management
- Test new commercial arrangements

To maximise value to customers in transition to low carbon networks
Innovation Competition Frameworks

OFGEM’s LCNF and NIC designed to maximise value through..

Competition in Selection

Efficient projects
Avoiding duplication

Process* stimulates broad participation

Solution neutrality

Collaboration in Lessons Learned

Fair Long-term Access to IPR

Compulsory web* and conference sharing

NIC Annual Process & Criteria

April
UP TO 5 PROPOSALS PER COMPANY/GROUP
INITIAL SCREENING PROCESS
SIMPLE PASS/FAIL AGAINST NIC CRITERIA

Accelerates development of low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing customers.

Generates knowledge that can be shared amongst all relevant Network Licencees.
Provides value for money for electricity customers.
Demonstrates a robust methodology and project readiness to implement.

Relevance and timing.
Involvement of other partners and external funding.
Innovative and an unproven business case where innovation risk warrants a limited development and/or demonstration Project.

August To November
UP TO 2 PROPOSALS PER COMPANY/GROUP
EXPERT PANEL REVIEW HOW WELL CRITERIA ARE MET/EXCEEDED
EXPERT PANEL RECOMMEND AND OFGEM DECIDE WHICH PROJECTS TO FUND

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## Innovation Competitions To-Date

<table>
<thead>
<tr>
<th>LCNF</th>
<th>NIC (Transmission)</th>
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<tbody>
<tr>
<td>Years 1-4 of 5</td>
<td>Year 1 of 8</td>
</tr>
<tr>
<td>$410M AVAILABLE</td>
<td>$43M AVAILABLE</td>
</tr>
<tr>
<td>$305M AWARDED</td>
<td>$28M AWARDED</td>
</tr>
<tr>
<td>31 FINAL PROPOSALS</td>
<td>3 FINAL PROPOSALS</td>
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<tr>
<td>19 FUNDED</td>
<td>2 FUNDED</td>
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Transmission Innovation

MTTE (SHE Transmission)
A collaborative centre to simulate and test High Voltage Direct Current (HVDC) technology in multi-terminal multi-vendor configuration.

Duration: 7 years.

Award 2013: £11.3m (Total Cost £13.4m)

Business Drivers:
• Interconnection of growing number of off-shore standalone HVDC systems, and use of HVDC on-shore as alternative to AC.
• Management of risk in deployment.
• Catalyst for multi-vendor solutions.

VISOR (SP Transmission)
Using wide area monitoring of PMUs and state estimation techniques to increase dynamic transfer capacity and to help manage potential network instabilities.

Duration: 4 years.

Award 2013: £6.5m (Total Cost £7.4m)

Business Drivers:
• Increasing costs of transmission constraints through connection of renewable generators
• Need for early warning and diagnostic tools to support deployment of first-in-UK technologies.
Distribution Innovation

Solent Achieving Value from Efficiency (SAVE) (SSEPD)

Investigate the use of targeted energy efficiency measures to alleviate network constraints.

Duration: 4½ years.

Award 2013: £8.3m (Total Cost £10.3m)

Business Drivers:
- use targeted energy efficiency measures with domestic customers
- quantify customer responses to a range of approaches
- develop a network planning tool that incorporates the learning from this and other trials.

Vulnerable Customers and Energy Efficiency (UK Power Networks)

Seek to engage fuel poor and vulnerable customers so they can benefit from energy efficiency and demand side response.

Duration: 4 years.

Award 2013: £3.3m (Total Cost £5.5m)

Business Drivers:
- engage fuel poor and vulnerable customers to understand how they can benefit from energy efficiency and offer demand-side response
- quantify the network service that these customers could provide
- understand the challenges and best approach to engaging with vulnerable customers.
### Distribution Innovation

**Capacity to Customers (ENWL)**

Combining proven technology with new commercial contracts, enabling previously open-point networks to be interconnected, using smart network fault management and automated breakers, to return “latent” capacity for customer use. Identifying required changes to modernise engineering design standards.

**Duration:** 3 years.

**Award 2011:** £9.1m (Total Cost £9.6m)

**Business Drivers:**
- Accommodating increasing new “low carbon” demand eg EVs and distributed generation.
- Avoiding costly “copper-in-the-ground” investment, while still maintaining reliability.

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**Flexible Urban Networks – Low Voltage (UK Power Networks)**

Using power electronic devices to interconnect and manage loading on low voltage networks, releasing spare capacity.

**Duration:** 3 years.

**Award 2013:** £6.5m (Total Cost £8.9m)

**Business Drivers:**
- Accommodating growing distribution-system connected renewable generation.
- Meeting voltage levels requirements at lower cost than “copper-in-the-ground” investment.
NIC/LCNF – Strengths and the Future

OFGEMS’S FRAMEWORK - STRENGTHS

• Has clarity of purpose and rigour of process.
• Funds at scale and over multiple years.
• Reaches the competition/collaboration sweet-spot.
• Drives the necessary enablers
  • e.g modernising technical standards.

IN PROGRESS

• “Mainstreaming” with big tangible benefits to customers.
• Encouraging companies to further strengthen collaboration with non-utility players and to draw in international experience.
SMART GRID – UK-EU

KEY TO AN AFFORDABLE TRANSFORMATION TO LOW CARBON ENERGY

OFGEM

Innovation framework
• Demonstrate SG solutions
• Incentivise mainstream deployment.

Codes and Standards
• With UK Industry and EU, oversee development of coherent standards

EU COMMISSION

Smart Grids Task Force*
• Mandate 490
• CEN, CENELEC, ETSI

ENTSO-E**
• Network Code development

* ec.europa.eu/energy/gas_electricity.smartgrids/taskforce_en.htm
** entsoe.eu/major-projects/network-code-development