Economic, Commercial and Regulatory Aspects of the Integration of Distributed Generation: A UK perspective

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Overview

1. Why is Distributed Generation important now?
2. The need for a new regulatory approach
3. From passive to active distribution networks
4. Outline of some new incentives
UK Government's objectives for energy policy


• To put the UK on a path to cut CO₂ emissions by 60% by about 2050 with real progress by 2020
• to maintain the reliability of energy supplies
• to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve our productivity
• to ensure that every home is adequately and affordably heated
One expected impact: Large increase in DG

- Some 10GW of various forms of DG expected by 2010; More in subsequent years
- Result of government support for renewables and cogeneration
- DG to assume responsibilities for system support
- DG to be considered in network replacement and development

Key Challenge: Cost effective integration of DG in operation and development of the system
Limiting factors for connecting DG
- In urban areas: Fault levels
- In rural areas: Voltage rise effect

Connection cost is related to voltage level at which DG is connected

Conflicting objectives
- Distribution network operator - minimise the impact of DG on networks (connect to as high voltage level as possible)
- Distributed Generation - minimise connection cost (connect to as low voltage level as possible)

Effect is prohibitive connection costs for many DG projects
Long term goal: From Passive to active networks?

- **Passive**
  - Designed to accept bulk power from transmission system and distribute to customers
  - Generally with unidirectional flows - some interconnected
- **Ad hoc approach with existing practise (“fit and forget”)**
  - No control over DG
  - Worst case scenarios condition for connection (maximum generation minimum load)
  - Limits capacity of DG that can be absorbed by networks
- **Active distribution network**
  - Local, coordinated control of voltage, flows and fault levels
- **Dilemma: Invest in distribution network primary plant or make it more intelligent through active management**
## Potential benefits of active management

Incremental investment cost of upgrading the network (including cost of active management systems in £m):

<table>
<thead>
<tr>
<th>Capacity of DG</th>
<th>Low Density</th>
<th>High Density</th>
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<tbody>
<tr>
<td></td>
<td>P</td>
<td>A</td>
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<tr>
<td>2.5GW</td>
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<td>0</td>
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<tr>
<td>5GW</td>
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<tr>
<td>7.5GW</td>
<td>100</td>
<td>80</td>
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<tr>
<td>10GW</td>
<td>243</td>
<td>80</td>
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Levelling the Playing Field

- **Legislation**
  - Role of distribution networks to facilitate competition
  - Financial separation of distribution businesses (DNOs)

- **Regulatory reforms by Ofgem**
  - Performance based regulation
  - Design of incentive schemes for DNOs to connect DG

- **Commercial integration**
  - New approaches to network pricing
  - Security standards reviewed to recognise the ability of DG to displace network capacity

- **Technical integration**
  - Coordinated operation of network with DG as part of move to active management
Key regulatory changes

• A series of reforms are being implemented in 2005 as part of the next regulatory price control:
  – The objectives of the incentive scheme are to encourage DNOs to undertake the investment required to facilitate distributed generation connections and invest efficiently and economically in their system.
  – The proposals provide protection to companies, with 70-80 percent pass-through of costs, with an incentive rate of £2-3.5/kW/year.

• Other developments
  – A move away from ‘deep’ connection charges for DG
  – New incentives for R&D and demonstration projects
From deep to shallow charging

Current use 'Deep Charging'.

Wind farm pays: Cost of new line + Cost of system upgrades

Everyone pays: Cost of system upgrades
R&D Initiatives

- **Innovation Funding Incentive (IFI)**
  - designed to encourage DNOs to invest in appropriate R&D activities that focus on the technical aspects of network design, operation and maintenance. Cost pass through of 90%, falling year by year. Max spend 0.5% of turnover.

- **Registered Power Zones (RPZ)**
  - designed to encourage DNOs to develop and demonstrate new, more cost effective ways of connecting and operating generation. Two applications per DNO per year allowed. Incentive of £4.5/kW of DG (up to 3x normal DG rate).
Will this be enough?

- Ofgem’s new approach is radically different from the regulatory practice of the 1990s
- R&D incentives a unique experiment - but will they be enough to revive network R&D in the UK?
- Much depends on detailed implementation and interpretation of rules
- Additional steps will be required - e.g. to enable new markets for active management services
- To meet White Paper objectives, may need further integration of environmental goals in economic regulation