Actively Managed Distributed Generation and the BSC

Baringa Partners and Smarter Grid Solutions

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Duncan Sinclair
Nick Screen
Graham Ault
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Introduction

- ELEXON engaged Baringa and Smarter Grid Solutions (SGS) to consider how the trials of Active Network Management (ANM) and the potential evolution to the Distribution System Operator model may be realised and how this might affect the BSC systems, processes and parameters.

- These slides are a summary our main report *Actively Managed Distributed Generation and the BSC*

- We also provide a summary of Innovation Ideas, designed to trial elements of the Commercial Models in a real system
Potential for actively managed distribution networks

- Our analysis, informed by a review of active trials and discussions with stakeholders, suggests
  - the amount of DG controlled under local balancing schemes administered by DNOs will continue to increase steadily, and expand from current trial areas
  - The rate of growth is expected to be relatively modest initially, as we enter the RIIO-ED1 price control period (2015-2022)
  - The rate may accelerate thereafter as local balancing and ANM become integral to DNO’s business plans under future price controls

- The evidence suggests that volumes of balancing actions taken on DG are unlikely to exceed 1 TWh annually before 2023, less than 10% of the 15-17 TWh of total annual balancing volumes at the transmission level operated by the Transmission System Operator (TSO), but could grow significantly thereafter
### Dimensions used to define the commercial models

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
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<tbody>
<tr>
<td>Dispatch control</td>
<td>Whether the dispatch under ANM schemes is controlled by the DNO, the TSO or includes an element of self-dispatch (in response to market signals).</td>
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<tr>
<td>Principles of access</td>
<td>Whether parties connecting in constrained parts of distribution networks are curtailed according to pre-defined rules, e.g.s. Last In First Off (LIFO), pro-rata, or receive financial compensation for curtailment/balancing (or some combination of these).</td>
</tr>
<tr>
<td>Form of compensation</td>
<td>Where financial compensation is in place, whether this is static (agreed ex-ante) or whether it is dynamic (based on the active bids and offers of network users).</td>
</tr>
<tr>
<td>Who bears the cost and risk</td>
<td>Whether the cost of curtailment/balancing is borne by individual network users, socialised to certain classes of network user, passed through to consumers directly or borne by DNOs (or a combination of these).</td>
</tr>
<tr>
<td>Level of national co-ordination</td>
<td>Whether individual DNOs operate different schemes for managing curtailment/balancing on their grids, whether all DNOs operate separate instances of a common scheme (co-ordinated via national balancing) or whether system level balancing is extended to distribution networks.</td>
</tr>
<tr>
<td>Scope of participation</td>
<td>Which class of network user is included within the scheme out of generators, demand side and storage.</td>
</tr>
<tr>
<td>DNO Incentives</td>
<td>What incentives are placed on DNOs with respect to ANM, for example incentive schemes related to number of connections, incentive schemes relating to curtailment/balancing costs specifically, or totex incentives aimed at optimising combined network expansion and curtailment costs.</td>
</tr>
<tr>
<td>Basis for network expansion</td>
<td>Whether network expansion is based on security standards or relates to the cost benefit trade off of curtailment and network expansion costs.</td>
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# Potential commercial models

<table>
<thead>
<tr>
<th>Model</th>
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<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>Rules based</strong>&lt;br&gt;Model 1 (Rules based) represents a continuation of existing practices whereby generators are curtailed without compensation under discrete local schemes.</td>
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<td><strong>2</strong></td>
<td><strong>Static market</strong>&lt;br&gt;Model 2 (Static market) represents an extension of the Rules based approach but with generators compensated for curtailment thus creating economic signals surrounding the cost and value of curtailment in constrained parts of distribution networks.</td>
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<tr>
<td><strong>3</strong></td>
<td><strong>DSO/TSO balancing</strong>&lt;br&gt;Model 3 (DSO/TSO balancing) involves the expansion of local balancing arrangements under more dynamic pricing, and the emergence of the Distribution System Operation (DSO) role, but operating independently of central system operations and the Balancing Mechanism.</td>
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<tr>
<td><strong>4</strong></td>
<td><strong>Integrated local balancing</strong>&lt;br&gt;Model 4 (Integrated local balancing) involves local balancing arrangements being integrated into national balancing arrangements, with DSOs and the TSO able to access balancing actions offered into satellite local balancing mechanisms.</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td><strong>Expanded national balancing</strong>&lt;br&gt;Model 5 (Expanded national balancing) involves the TSO assuming greater responsibility for balancing on distribution networks, with the national level balancing and settlement arrangements extended to lower voltage levels.</td>
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</tbody>
</table>
We believe that Model 2 (Static Market) is preferable to Model 1 in the near term since it should lead to more efficient balancing decisions.

- Modelling demonstrates price-based curtailment could reduce the total cost of network constraints by between 5% and 45%.
- A price based approach would also effectively signal to DNOs the economic trade-off between curtailment (opex) and network reinforcement.
In the longer term, we believe that Model 4 (Integrated local balancing) may be the preferred option.

- Model 4 provides incentives on DNOs to more fully trade off the costs of operational solutions with capital investment.
- Promotes efficiency in balancing the system overall.
- Ensures consistency of balancing signals through integrated settlement arrangements.
Potential implications for settlement

2. Static market

- Represents a change in market arrangements that could be taken to manage low levels of DG, storage and demand side response.
- This model would require the determination of a baseline position for each generator, with any curtailment (and associated financial compensation) calculated on the basis of this.
- For the BSC, this model represents a relatively low level of change

4. Integrated local balancing

- There are strong similarities and extensive interaction that would be required between the (national level) BSC requirements and systems, and settlement arrangements for the new local BMs.
- We consider that the most likely solution would be to extend the existing BSC arrangements to cover local balancing settlement, and to reduce the threshold required for generators to participate in the BM.
Conclusions

- **Near term (<2020)**
  - Levels of DG relatively low – requirement for ANM schemes limited to certain pockets of the networks
  - Introduction of price signals and competition for curtailment would promote more efficient balancing
  - Required changes to BSC limited, but ELEXON can offer supporting services
  - Concept should be trialled as a matter of urgency

- **Longer term (>2020)**
  - Penetration of DG likely to expand requiring more fundamental market and settlement reform
  - An approach based on integrated national and local balancing would likely lead to the most efficient outcome for consumers
  - ELEXON would be instrumental in delivering this outcome
  - Given the lead times for implementing more fundamental reforms we believe that aspects of this model should be trialled within the next 2-3 years.
Options for innovation

- The following three trials which could build on each other would test the concepts and feasibility of the recommended commercial models

- **Improving existing ANM through data visibility/transparency.** A trial focusing on accurate measurement of curtailment volumes, additional information provision to generators, and the additional data flows required for the efficient management of constraints between the TSO and DSO.

- **Simple market model to incentivise efficiency by creating a price for curtailment.** A trial to introduce financial compensation for curtailment based on bilateral agreements between DNOs and generators or through a simple auction run by the DNO.

- **Testing the concept of a local balancing mechanism.** A trial to introduce a dynamic market based approach to managing ANM curtailment, with a Local Balancing Mechanism (LBM), operated by a proxy DSO, which interfaces with the National Balancing Mechanism.