SEM Review of Demand Side Management

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Demand Side Working Group
Ofgem, London.
7th September 2010
Agenda

1. Irish market context
2. Overview of Irish Regulatory Authorities’ 2020 DSM Vision project
3. Use of DSM to balance wind
Agenda

1. Irish market context

2. Overview of Irish Regulatory Authorities’ 2020 DSM Vision project

3. Use of DSM to balance wind
Single Electricity Market (SEM)

- All Island wholesale electricity market 1st November 2007;
- Efficient, competitive market;
- Market power & dominance structures;
- SEM Committee oversees the market.
Equivalence of Generation and Demand?

System Operator aims to maintain the generation-demand balance within frequency and voltage limits by matching generation to demand at every point in time.
Demand Side Participation in the SEM

In Market – Explicit

- Single large demand unit offers demand reduction/shifting (DSU). Barriers – no firm day ahead price in the SEM; DSU at present has to be a supplier unit
- Aggregation of demand reduction by smaller units (already have aggregation of distributed generation)
Demand Side Participation in the SEM

In Market – Implicit

- Voluntary demand reduction/shifting in response to tariff signals – users require information upon which to base their consumption decision
- Demand reduction/shifting dispatched by TSO or initiated by automatic frequency response – what is the upside for consumers?
Demand Side Participation in the SEM

Out of Market

• Ancillary Service type purchase of reserve e.g. STAR, WPDRS, Powersave
Agenda

1. Irish market context

2. Overview of Irish Regulatory Authorities’ 2020 DSM Vision project

3. Use of DSM to balance wind
Project Structure

What is DSR?

Why is it needed? (The Island in 2020)

How much is there?

What are the barriers to deployment?

What are the enablers to deployment?

Which options are worth pursuing?

Policy Recommendations

Next steps
Role & Benefits of DSR

- **Overall demand reduction**
  - refers to measures which reduce energy consumption, typically the target of efficiency programmes;

- **Static peak reduction**
  - encompasses measures which enable changes to be made to the profile of demand to alleviate system peaks
    Examples include; static ToU tariffs & interruption contracts;

- **Flexible measures**
  - allow demand, or load, to be shifted in response to system condition on the day, such as dynamic time-of-use tariffs and system operator interruption contracts.

- **Ancillary Services**
  - New technologies – frequency responsive fridges
  - Not covered in detail in this consultation
International Experience - Key Findings

• Energy Efficiency

• Enhanced Feedback

• Time of Use Tariffs

• Demand Side Flexibility and Home Automation

• Quantitative Benefits Realised
  • improving energy efficiency or modifying electricity users’ behaviour consistently reduces the relevant customers’ total energy demand.
    • Reported savings in the range 5%-15% of those customer total demand
  • automation in the home and in commercial and industrial settings significantly increases the potential for peak reduction compared to other measures
  • distributed generation and microgeneration can offer significant flexibility as a percentage of their capacity (depending on their energy source).
Potential for DSR

Pöyry have examined the potential for DSR measures and reviewed the policy options available for delivering the DSV for 2020.

- Energy Efficiency
- Behavioural Demand
- Smart Meters
- Home & Office Automation
- Industrial & Commercial demand response
- New Demand – Electric Vehicle & Renewable Heat
- Microgeneration
- Aggregation of Distributed Generation
- Storage

Estimated flexible demand in 2020:

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<th>Space heating</th>
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<th>Other flexible demand</th>
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What does the 2020 vision look like?

• Electricity consumers make informed choices about their use of electricity in the short & long term
  – Consumers recognise the consequences of their consumption and the level of consumer awareness will be high
  – Consumers make informed choices when purchasing appliances

• Prices reflect the cost of supply at those times
  – Providing appropriate rewards for reduced consumption & changes to profiles

• Consumers will face appropriate incentives to ‘invest’ in methods which will allow them to better manage their consumption.
  – Perhaps in terms of effort rather than financially
What does the 2020 vision look like?

- Demand plays an active part in the process of system balancing and market price formation
  - Autonomous response to expected market prices
  - Dynamic response to market prices over a range of timescales
  - Inclusion of some dispatchable demand (and distributed generation) in the centralised processes
  - Perhaps bulk electricity storage.
  - Flexibility of demand will play a key role

- Electrification of heat and transport plays a significant role in the decarbonisation of the entire energy system for the Island,
  - This facilitates high levels of production of electricity from renewable sources.
2020 Demand Side Vision

Pöyry Policy Recommendation Based On:

• Competitiveness
  – Furthering of competition and consumer choice in energy markets
  – Encourage/ maximise innovation, enterprise and job creation (green jobs)

• Security of Supply
  – Focus on ensuring that electricity supply can meet demand and
  – Consideration of the maintenance and upgrade of networks
  – Also includes increasing fuel diversity in electricity generation

• Sustainability
  – Acceleration of the growth of renewable energy resources
  – Enhancement the efficiency of electricity use and realise savings in electricity use.
2020 Demand Side Vision

Pöyry Policy Recommendation Based On:

• Benefits to Electricity Markets
  – effect on generation capacity costs (requirements for investment in new gen cap.)
  – impact on variable generation costs
  – effect on levels of CO2 emissions
  – provision of frequency response.

• Cost
  – Low cost: € 0 -10 million
    • T&SC modifications, enabling SM with smart display & allowing static ToU tariffs
  – Medium cost: € 10 - 50 million
    • Subsidies for adoption of smart devices, R&D funding for technology funding, such as distribution level storage, and the additional investment in back-up processes.
  – High cost: > €50 million.
    • Major Capital Investments - a new pumped storage site, roll out of SM and the associated communications infrastructure.
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## Policy Recommendations

### High Value Recommendations

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<td><strong>Energy Efficiency</strong></td>
<td>SM - Allow advanced displays &amp; dynamic ToU tariffs</td>
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<td><strong>Smart Meters</strong></td>
<td>SM - Allow advanced displays &amp; dynamic ToU tariffs</td>
<td>Education Prgrammes</td>
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<td><strong>I&amp;C Demand Side Response</strong></td>
<td>Create firm day ahead price &amp; schedule for SEM</td>
<td>Study of volume &amp; nature of flexible demand</td>
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<td>Review TSC &amp; Grid Code - ID barriers to participation of I&amp;C demand</td>
<td>Engage with sector - increase awareness of potential for I&amp;C DS participation</td>
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## Policy Recommendations

### Low Value Recommendations

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<td>Behavioural Change</td>
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<td>Labelling scheme &amp; education program for smart appliances</td>
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<td>Storage</td>
<td>Review of SEM payments to pumped storage</td>
<td>Review support for R&amp;D in Dist. Level storage</td>
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### Limited Value Recommendations

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<td>New Demand - Heat Pumps</td>
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<td>Incentivise storage technology for HP</td>
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<td>Microgen.</td>
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Project Next Steps

- Consultation Paper Published 17\textsuperscript{th} August 2010
  - Consultation includes workshops in Dublin and Belfast – 16th & 17th Sept (TBC)

- Responses due 18\textsuperscript{th} October

- Publish Decision Paper which will set out the next steps in developing a detailed Demand Side Vision for 2020 and the necessary actions to realise it. December 2010
Agenda

1. Irish market context
2. Overview of Irish Regulatory Authorities’ 2020 DSM Vision project
3. Use of DSM to balance wind
Intermittency will be a major challenge for the SEM in the future.

Chart shows January 2030 with 2000 wind patterns.
Intermittency will change the timing of peak periods

Timing of the peak demand period and the peak ‘demand net of wind’ period for each day across eight wind years in 2020

• Dark blue blocks show the timing of peak demand, which are clustered around the evening (18h – 21h) and midday (12h – 13h), and show a strong seasonal pattern
• Light blue blocks show the daily demand net of wind peak, which exhibits more within-day variance and less regular seasonal patterns

As wind intermittency grows, will static tariffs be good enough?

Will more automation and greater dynamism be required?
Peak thermal generation will no longer correspond to peak demand

*Effect of wind means thermal generation peaks at 10am*

*Annual demand peak occurs at 6pm*

Demand and wind generation in the SEM, 18 December 2000 projected to 2020
The unconstrained market is not the whole story

Binding constraints in the SEM

Redispatch in the SEM and GB
A range of options are available to address these challenges

- Solutions to meet increased reserve and response needs
  - Short term active demand management

- Lessen within-day wind volatility
  - Diversify wind location
  - Improve wind forecasting

- Increased interconnection

- Reshape demand
  - Increase off peak demand
  - Reduce peak demand

- Lower day to day volatility
  - Longer range interconnection
  - Other storage possibilities

- Network capacity

Demand-side response of different types can help deal with all these system issues

Real time ½ hr 4 hrs Within day 3 days New investment

CER Commission for Energy Regulation
Utility Regulator
Active DSR can have a significant impact on wholesale markets

- Lower prices
- Less price volatility
- Less generator ramping
- Lower peaks may avoid network investments
- Lower CO2 emissions
- Increased competition in ‘production’ as well as retail
DSR can offer network benefits in addition to market benefits

However, it may not be possible to address both network and market problems at the same time.