The road to net zero electricity markets
Net Zero Market Design

Fintan Slye
Kayte O’Neill
John Twomey
Cian McLeavey-Reville

Simon Virley (KPMG)
Gareth Miller (Cornwall Insight)
Agenda

1. Welcome
2. A snapshot of 2050
3. Why ESO?
4. The journey so far
5. Insights from our stakeholders
6. Lessons from other markets
7. The plan for the year ahead
8. Q&A
A snapshot of 2050

Net Zero ambitions will transform the power sector. Markets will require reshaping in order to enable efficient outcomes for the consumer of tomorrow.

- 100% of vehicles will be electric
- 84GW of offshore wind
- 71GW of solar PV capacity
- 27GW of interconnectivity capacity
Why ESO?
The journey so far

PHASE 1 - What are the "exam questions" we need to answer on market reform for Net Zero?

18th January
- ESO interviews

25th March
- External launch
- Stakeholder interviews

25th March
- GB landscape & international case study analysis

#R2NZ5 SLIDO code
Recurring feedback from key internal & industry stakeholders

Key challenges and opportunities

- Need to reward flexibility
- Getting a more active demand side
- Resolving the interfaces between different policy instruments
- A greater role for strategic planning of monopoly networks
- Visibility and transparency of data

Key considerations for ESO’s approach

- The need for whole systems thinking – you can’t consider the power system in isolation anymore!
- Starting with the consumer and working back from there
- ESO have a key role to play in this debate
- Opening this debate up to those not currently in the energy sector
- Greater transparency in the way ESO engage with industry
Perspectives from international case studies

**California (CAISO)**
- Ambitious, ideology-led renewables targets creating system issues with rapid buildout of renewables but also creating opportunities for long-duration storage
- Too much solar generation has created “duck’s back” operability issues in midday trough and in morning and evening ramping
- 2020 blackouts due in part to extreme weather, in part to low capacity availability in climatically similar interconnected systems

**Texas (ERCOT)**
- Almost universal smart metered has led to an active ToU and DSR retail market
- Feb 2021 winter storms and blackouts demonstrated potential insufficient whole-system thinking, especially relating to the gas networks
- System kept separate for political reasons – but would interconnection have prevented blackouts?

**Germany**
- Four TSOs came together to balance the network jointly, saving €200mn in balancing costs in first year
- Transmission constraints preventing good northern renewables resource reaching industrial south
- Carbon taxes changing the economics of heating and transport decisions

**Australia**
- State-level wholesale pricing in the energy-only market leads to high volatility, sending investor signals, particularly for batteries
- Peak capacity is guaranteed by suppliers and large consumers
- Settlement periods are being cut to 5 minutes to send more volatile pricing signals, again benefiting flexibility

**Chile**
- Firm Power Auctions being won by renewables at historic low prices
- Also delivering battery storage to the market and ensuring that peak demand is met
- Transmission charges moved off generation (to demand), reducing locational signals
We have used the market insights and stakeholder priorities to create 4 clusters that frame our analysis.

- **Net Zero Requirements**: Ensuring that the system takes account of the changing consumer, societal, market participant and physical needs on the pathway to Net Zero.

- **Open Markets**: Market design needs to enable fair access to all market participants – including consumers, generators, and offerings in between these.

- **Market Signals**: Market design, regulations and policies to provide clear and consistent signals to investors and market participants.

- **Industry Governance**: Industry governance that enables Net Zero market reform at pace, rather than acts as a barrier.
## Proposed approach for Phase 2

<table>
<thead>
<tr>
<th>Proposed approach for Phase 2</th>
<th>Net Zero Requirements</th>
<th>Market Signals</th>
<th>Open Markets</th>
<th>Industry Governance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the energy system needs for society, consumer, market participants and operability</td>
<td>Identify the right market signals to efficiently deliver Net Zero Requirements</td>
<td>Identify the design options that ensure markets are accessible and fair to all market participants</td>
<td>Identify how industry governance can be an enabler not a barrier</td>
<td></td>
</tr>
</tbody>
</table>

### 1. What does the future look like?
- How is supply and demand matched?
- What flexibility is needed (sub-second to seasonal)?
- What locational challenges are there?
- What level of reliability is needed?
- What business models must be enabled?
- What market signals are needed to send suitable investment and operational signals?
- What does the market landscape look like in future?
- What capabilities / limitations do future market participants have?
- What signals are sent today, how are they sent, and are they appropriate for the future?
- How do current market designs suppress competition?

### 2. Gap analysis
- How do requirements change from today to 2030 to 2050?
- What are some examples of best practice governance (look to other sectors)?
- How do current market designs suppress competition?
- Identify limitations of current governance wrt pace and fairness

### 3. Identify solutions (examples, not exhaustive)
- Consider what requirements may be needed from non-market solutions (data, systems etc)
- Locational (LMP, nodal)
- Capacity (energy only, firm power auctions)
- Flexibility (settlement periods)
- Fair access
- Appropriate risk
- Simple
- Interoperable
- Flexible
- Promotes innovation
- Works with other sectors

### 4. Assess solutions & Apply whole system lenses
- **Decarbonise the system**
  - Power market design is fit for rapid convergence of sectors (transport, heat, industry, power)
- **Maintain system security**
  - Design is flexible and takes account of what is happening in other sectors
- **Achieve value for money**
  - Design is doing the right things at the right time to enable the Net Zero targets and milestones of other sectors
- **Promote fairness**
  - 2050 Pathways
    - Proposed timings, milestones, owners, initial actions
- **Optimise across the whole system**

### 5. 2050 Pathways
- Proposed timings, milestones, owners, initial actions
Mobilisation

Work package 1
What does good look like in 2050?

Work package 2
Gap Analysis

Work package 3
Identify solutions

Work package 4
Assess solutions

Work package 5
Recommendations

Industry engagement

Indicative timeline

<table>
<thead>
<tr>
<th>2021/22</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilisation</td>
<td>Phase 2 launch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work package 1: What does good look like in 2050?</td>
<td></td>
<td>Analysis of system landscape 2030 - 2050</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work package 2: Gap Analysis</td>
<td></td>
<td>Gap analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work package 3: Identify solutions</td>
<td></td>
<td>Long list of credible market solutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work package 4: Assess solutions</td>
<td></td>
<td>Potential solutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work package 5: Recommendations</td>
<td></td>
<td></td>
<td>Recommendations &amp; Pathways</td>
<td></td>
</tr>
</tbody>
</table>

Key:
- Industry touchpoint
- Key deliverable
Reflections and Q&A with the team
Are you interested in finding out about how the electricity market is changing and progressing to a zero carbon grid?

The Markets team in the ESO are running a series of interactive, online events in March, where you will be able to take part in focused sessions with subject matter experts on different aspect of electricity market change.

Click here to find out more and register for the events or access the recordings if you can’t make the session.
Thank you
Your feedback is invaluable
We’d love to hear what you thought of the event.

Please contact us via email:

cian.mcleavey-reville@nationalgrideso.com