



# DS3 Demand Side Management Forum

25<sup>th</sup> October 2016

Crowne Plaza Hotel, Dundalk

# DS3 DSM Forum Agenda

Topic	Timing
Part I - Joint Session DSM Challenges and Opportunities	9.30 – 11:00
<i>Coffee Break</i>	<i>11:00 – 11:45</i>
Part II – Parallel Focus Group Discussions <ul style="list-style-type: none"><li>• Large Scale DSU</li><li>• Smaller-Scale DSM</li></ul>	11.45 – 12.50
<i>Event Close</i>	<i>13:00</i>

# Objective of Forum

- Overview of challenges and opportunities for Demand Side Management in Ireland and Northern Ireland
- Gain perspective from stakeholders such as Regulatory Authorities, System Operators, Network Operators, DSU and DSM operators
- Open discussion on large-scale DSU and smaller-scale DSM, and identification of focus areas

# Agenda – Part I –Joint Session

Topic	Timing	Speaker
Introduction and Overview: EirGrid Group	09:30 – 09:45	Doireann Barry
RA Input: CER/ UR	09:45 – 10:00	Mo Cloonan, Jody O’Boyle
Network Operator: NIEN	10:00 – 10:15	Ian Baillie
Network Operator: ESNB	10:15 – 10:30	Tony Hearne
DSM Perspective: Empower	10:30 – 10:45	Michael Bambrick
DSU Perspective: Endeco	10:45 – 11:00	Michael Phelan

# Agenda – Part II – Parallel Focus Groups

**Chair:** Karl O’Keeffe

DSU Focus Group – Large Scale	Time	Speaker
DSU – Introduction and objective of Focus Group	11:45 – 11:55	TSO
DSU Operator Discussion	11:55 – 12:25	DSU reps
Discussion - Focus areas	12:25 – 12:40	All
Next Steps	12:40 – 12:50	TSO

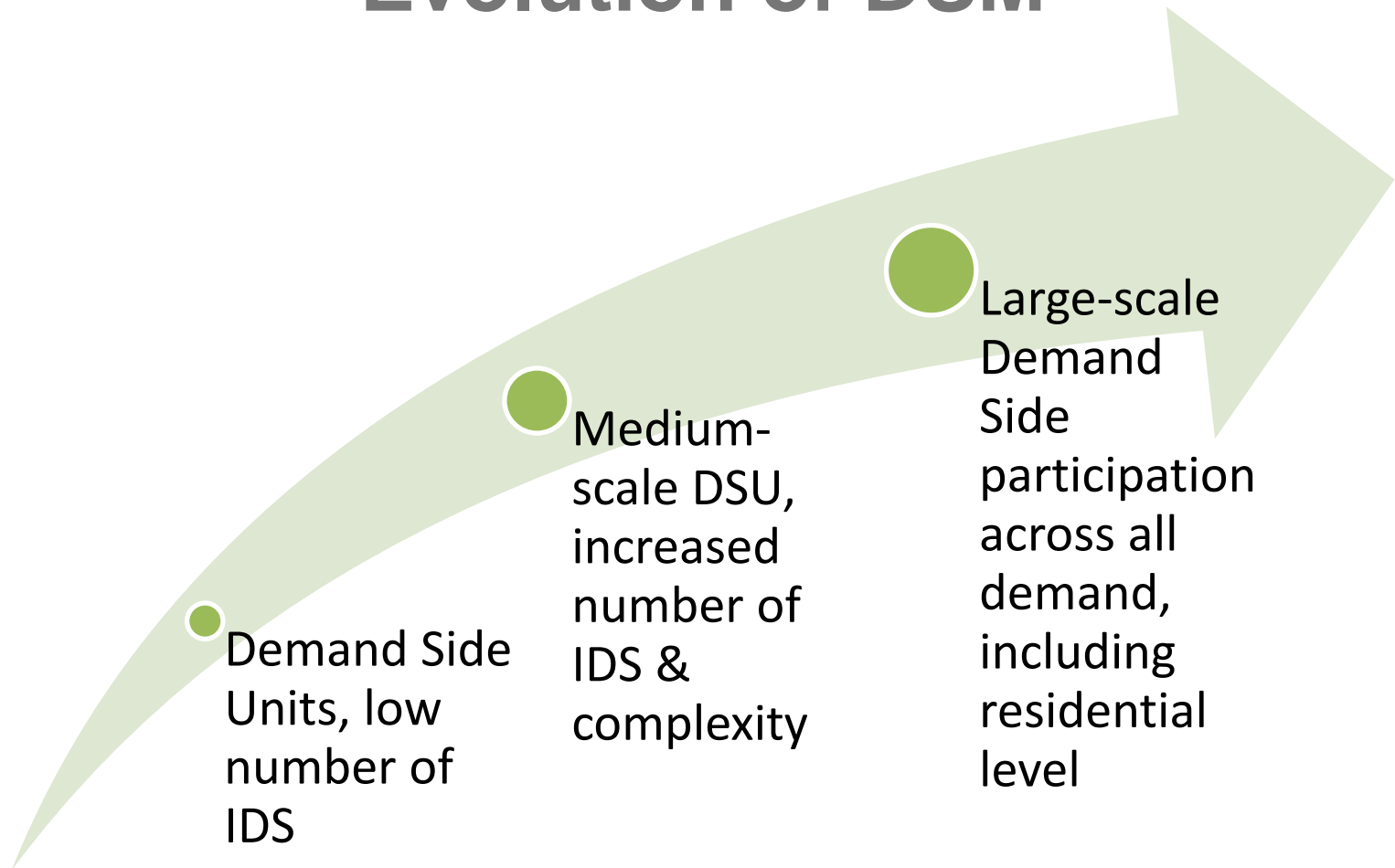
**Chair:** David Cashman

DSM Focus Group – Small Scale	Time	Speaker
DSM - Intro and objective of Focus Group	11:45 – 11:55	TSO
DSM Operator Discussion	11:55 – 12:25	DSM reps
Discussion - Focus areas	12:25 – 12:40	All
Next Steps	12:40 – 12:50	TSO

# DSM – Challenges & Opportunities

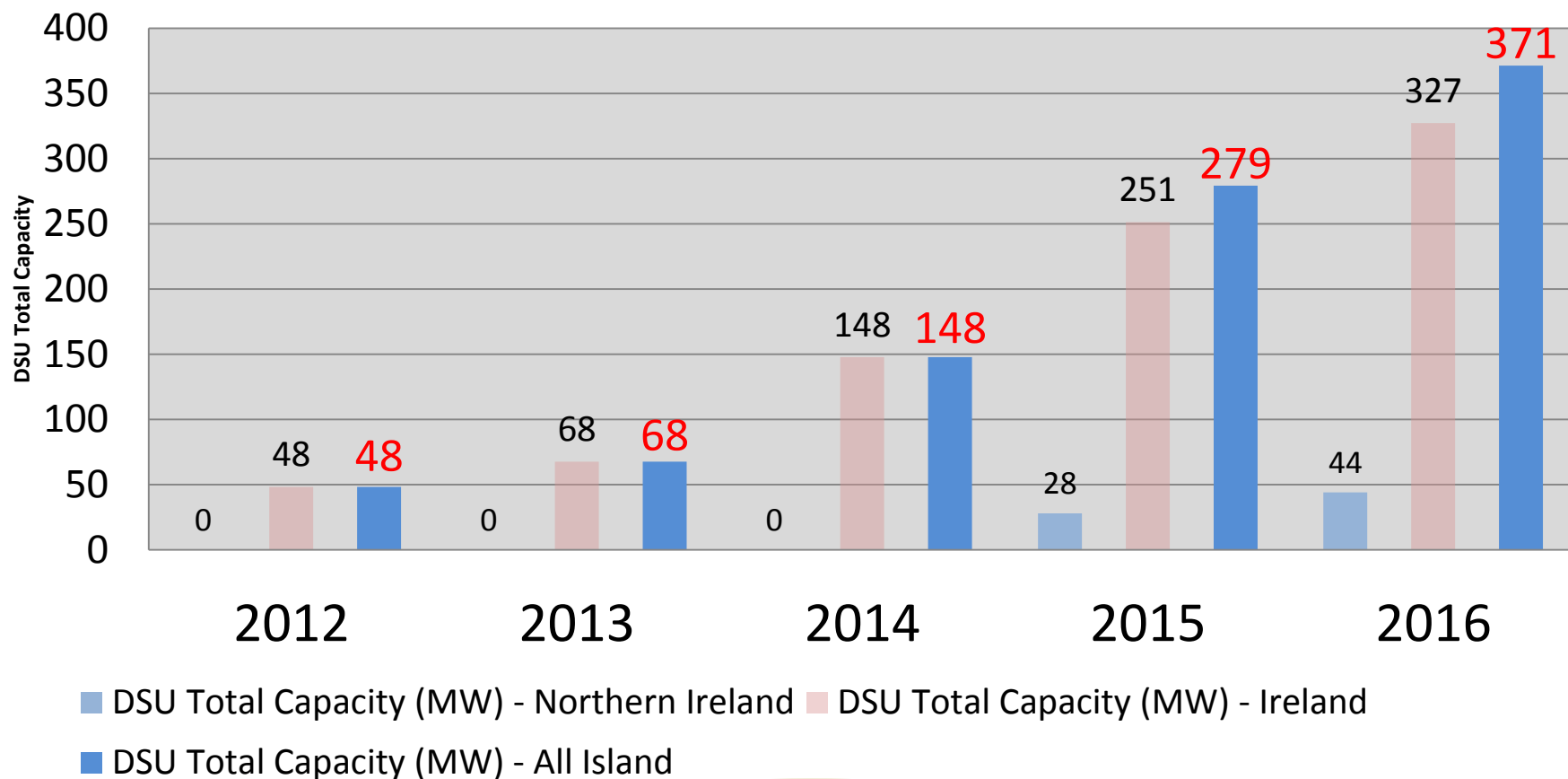
Doireann Barry, Innovation Programme Manager

# Evolution of DSM



# The story so far...

## DSU MW Capacity - All Island



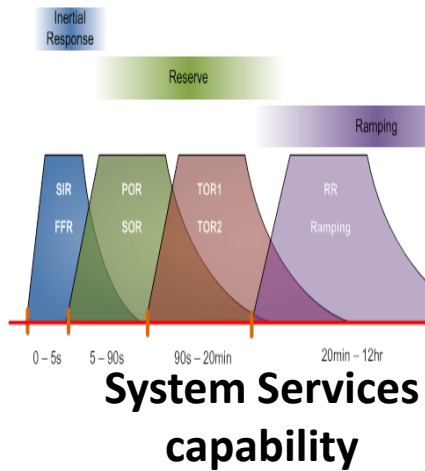


## .. and the opportunities

- System Services from new Providers
- Unlocking new Demand Side participation, right into the home
- Demand Growth through increased applications for Data Centres

# But what needs to be done across the energy sector?

## Performance



## DS3 System Services Qualification Trial Process DECISION PAPER

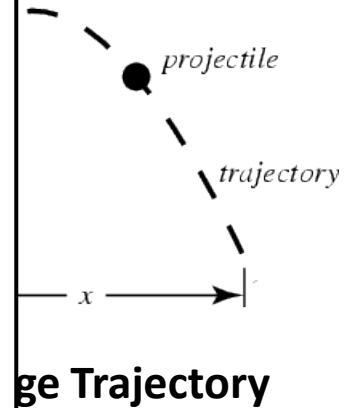
DS3 System Services Implementation Project

3 October 2016



**EIRGRID**  
GROUP

## Tools



# DS3 System Services Qualification Trial Process

## Provenability

<i>Services to be proven</i>	<i>Technology</i>	<i>Volume</i>
POR RM3	Wind	40MW
POR	DSM	20MW
POR RM3	Other Technologies	40MW

- Min/ Max Size: 1MW, 5MW per Providing Unit
- 'Other technologies min size: 100kW
- Payment for Service provided

## Measurability

<i>Services to be measured</i>	<i>Technology</i>
FFR	Conventional Generators Wind DSM Other Technologies
DRR FPFAPR	Conventional Generators Wind Other Technologies

- No maximum/ minimum size
- Once-off payment

# Challenges across Demand Side Sector

- Command & Control vs Incentivise & Influence
- ISEM
- TSO- DSO interaction

# Big changes are here in domestic capabilities

HEMS – growing deployment

Large multinationals investing

- Non energy propositions
- Energy efficiency
- All suppliers in IRE installing

Industrial and SME using EMS



HomeKit

HomeKit is a framework for communicating with and controlling connected accessories in a user's home. You can enable users to discover HomeKit accessories in their home and configure them, or you can create actions to control those devices. Users can group actions together and trigger them using Siri.



# ...so EirGrid are trialling residential services with Electric Ireland...

EirGrid Pilot Project for Householders

What is Power Off & Save?

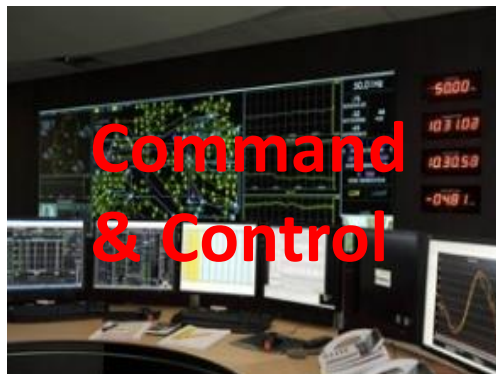


# ...which points to the future

lifestyle



energy



centralised large units



distributed units

# Regulatory Authority overview

DSU Forum  
25<sup>th</sup> Oct Dundalk



# DSM Forum

- RAs welcome the DSM Forum Initiative
- Importance of open discussion
- Key roles for TSO and DSO
- Regulatory involvement

# DSM Sector

- Current progress :
  - Active players in energy market, jointly developed application form
  - DS3 System services has been established to facilitate participation by DSUs
  - Summer restrictions (IE)– improved with Granular Instruction sets- 2016 restrictions apply to 13% of DSUs

# Future DSM activity

- Greater active provision of DS3 System services
- Greater scales of activity across sectors
- Network Code requirements

# Demand Side participation

- European focus on Demand side activity and increasing participation
- Further proposals likely to emerge on unlocking demand side potential

# Network Code Requirements

- **Requirements for Generators**, in force since May 2016 – emerging technology applications – by Nov 17<sup>th</sup> 2016
- **Demand Connection Code** – in force since Sept 2016 – applies to new Demand connections
- **System Operation** – voted, likely to be in force Q1 2017, existing and new demand connections
- **Balancing**- still in Comitology- applies to market participants, balancing services

Thank you

# DEMAND SIDE MANAGEMENT IN NORTHERN IRELAND

Presentation to Industry – 25 Oct 2016

## Overview

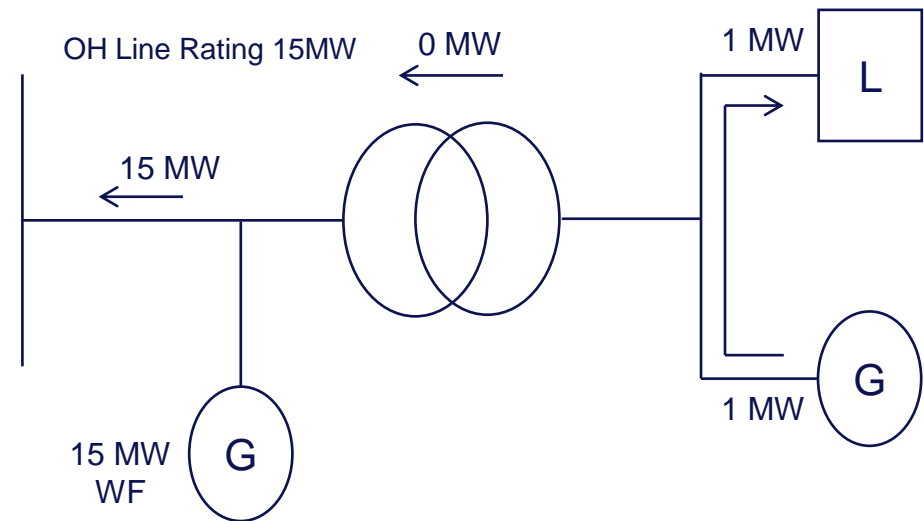
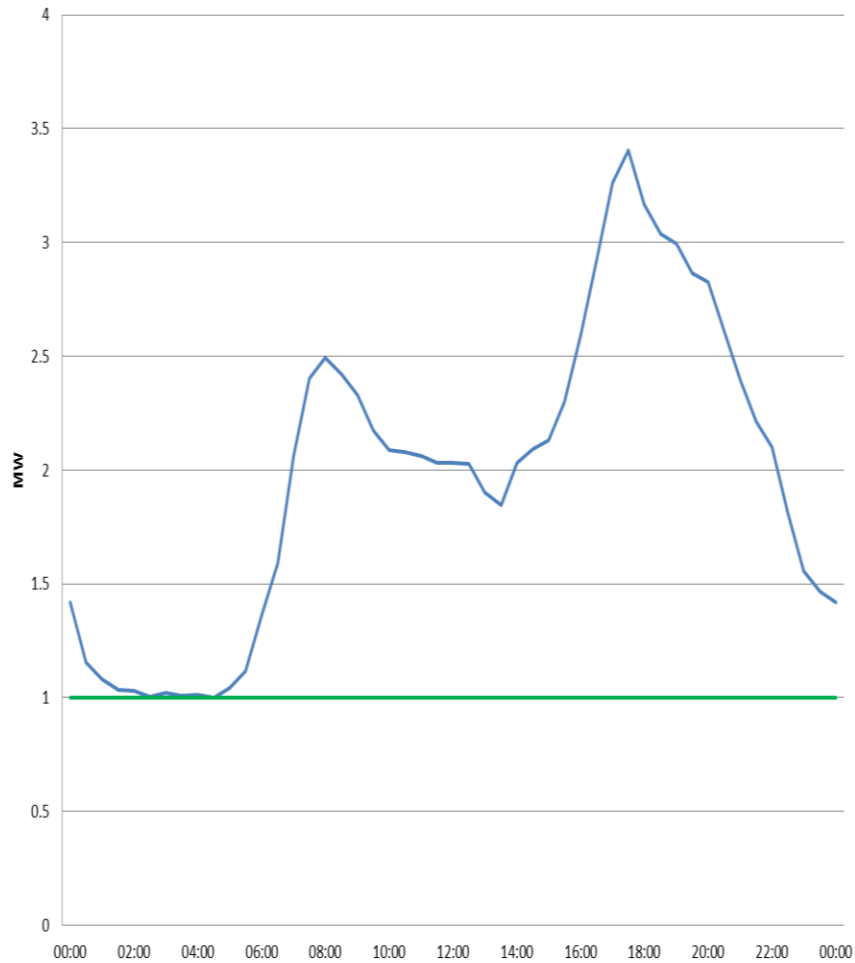
- There are 3 DSUs operators currently operating on the NIEN distribution network with approximately 38MW of tested and registered demand reduction available. (A further 9MW of non-dispatchable capacity has also been registered)
- This encompasses a total of 67 individual demand sites (IDS) which are a mix of commercial and industrial premises.
- A number of other DSU operators are currently in the application process to register more sites and with demand reduction capacity.

## The issue

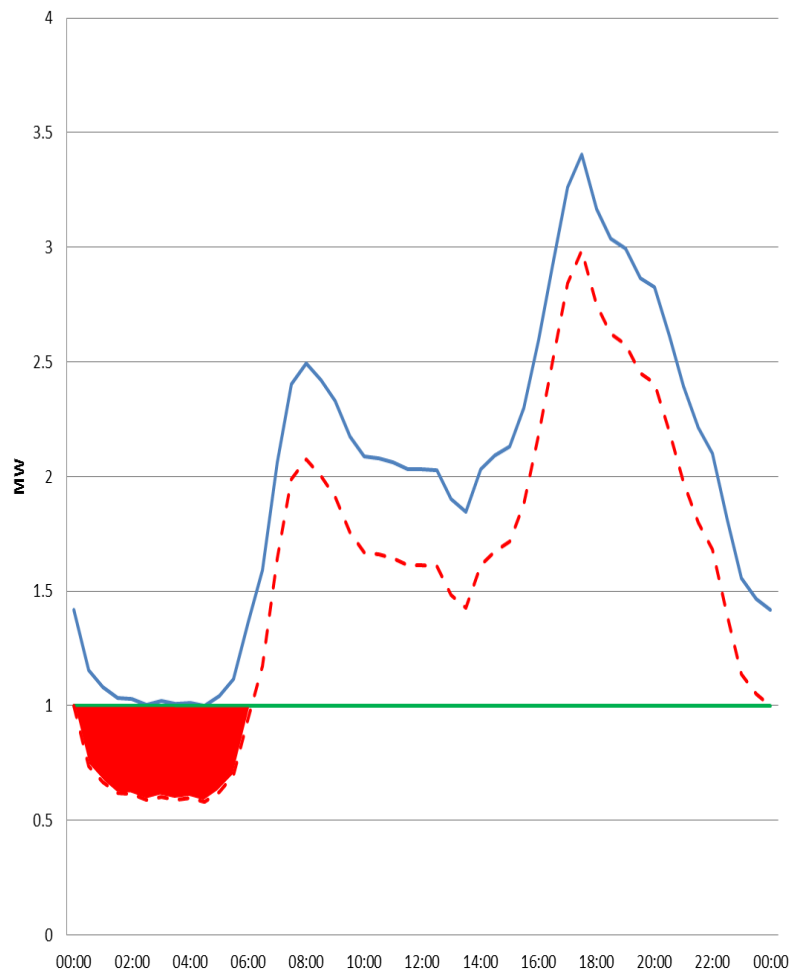
- The reduction in demand via the dispatching of DSUs has the potential to reduce total load at an individual substation level. This can cause issues for substation equipment and potential reverse power flow issues.



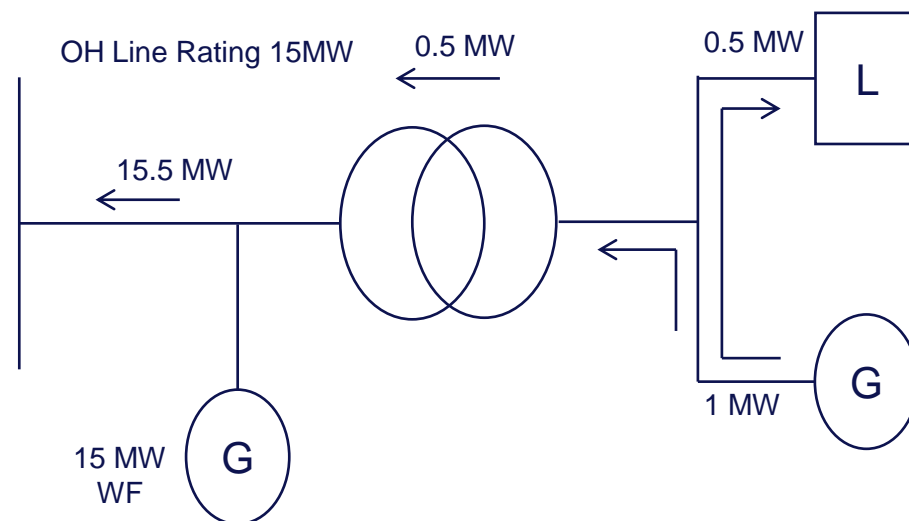
# DSUs – Load Erosion



# DSUs – Load Erosion



- Load Profile
- Minimum Load
- Load Erosion Reducing Minimum Load
- Potential Reverse Power Flow



- **NIE Networks instruction sets provide an individual demand site an operational window in which they can drop demand following a DSU dispatch notification.**
- **This keeps the load erosion due to DSU operation within a window where the distribution network is capable of supporting all connected generation and allow IDSs to participate in the DSU market.**
- **Although the instruction sets limit the operation/availability time of an IDS, it provides access for customers in congested areas of the network where otherwise a DSU application would be issued with a “Zero Dispatch” instruction set.**
- **NIE networks formally notify each IDS in writing detailing the applied instruction set and confirming their DSU Operator and the basis of the network assessment, i.e. the type and magnitude of the on site load reduction.**
- **Instructions sets will be reviewed annually to allow for any benefits resulting from system reinforcement which would allow a wider DSU access window for a particular customer.**

## RP6 – Network Investment

- **NIE Networks has identified reinforcement works which will be required on the distribution network over the RP6 period.**
- **The associated increase in network capacity will also provide greater access for DSU operation.**
- **All potential demand drop Ancillary Services will compete for the same network capacity as DSUs and hence must be subjected to the same instruction set restrictions to allow fair access to all markets.**

- The next regulatory period in NI (RP6) is scheduled to commence Oct 2017 and is planned to run for 6.5 years, i.e. April 2024.
- The Time Table for the assessment:
  - **Stage 1** – NIE Networks plan submission (including actual data for previous years) submitted to UR on 29 June 2016.
  - **Stage 2** – UR assessment of the plan and publication of draft determination for consultation on 20 January 2017.
  - **Stage 3** – UR publication of final determination on 2 June 2017.
- The total planned Capex for the distribution network is £342.1m for 6.5yrs of RP6.
- Of this £62.1m has been targeted at distribution network reinforcement.

# RP6 Plans for Demand Side Response

- **£6.6m has been requested for innovation integration projects;**
  - Demand Side Response (DSR)
  - Smart Asset Monitoring (SAM)
  - LV Active Network Management (LV ANM)
  - Voltage Management
  - Facilitation of Energy Storage Services (FESS)
- **To enable the roll out of smart solutions in RP7 £3.9m has also been requested to migrate Remote Terminal Units (RTUs) to Internet Protocol (IP) technology.**

# RP6 Plans for Demand Side Response

- **The key objectives of the proposed project are to:**
  - Improve utilisation of distribution networks through the application of DSR by contracting with generators and customers to reduce peak network power flows.
  - Evaluate the potential to use DSR to defer network reinforcement.
  - Evaluate the financial benefits to the Northern Ireland customer.
  - Identify any conflicts with existing contracted services.
  - Trial a technical/commercial solution.
  - Investigate possibility of ‘constrained’ connection offers for both Demand & Generation customers.
- **It is anticipated that this project will deliver:**
  - Customer benefits/savings.
  - Scalable innovative learning.
  - The learning to enable DSR to be applied as BaU.
  - A template for commercial DSR contracts.

# RP6 Plans for Demand Side Response

## Project Techniques

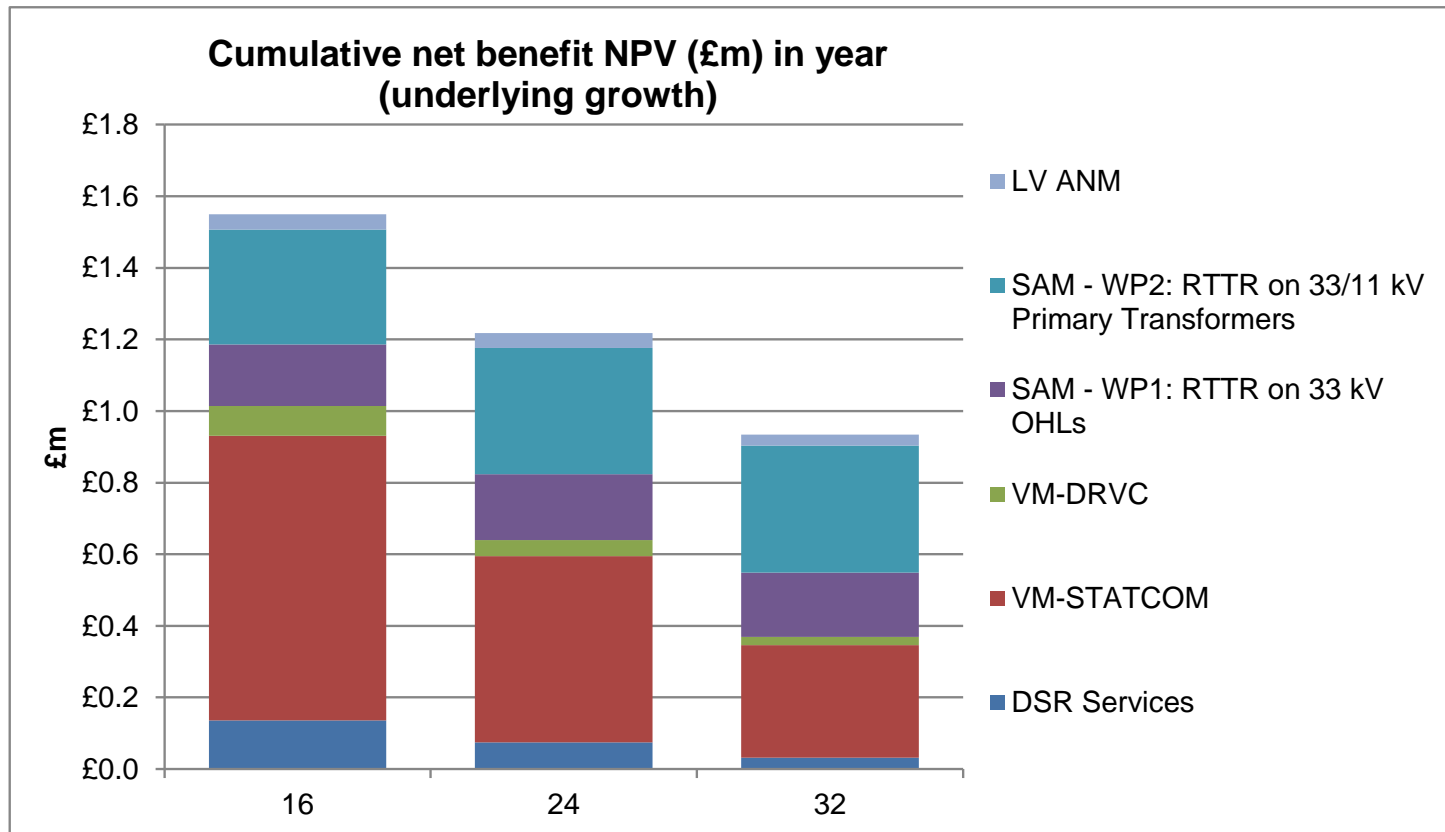
- Investigation of the capability of both demand and generation to defer CAPEX
- Pre-fault DSR vs Post-fault DSR

Pre-Fault DSR	Post-Fault DSR
Safe Assets	Latency between fault and response (network at risk?)
Customer dispatched more frequently	Customer dispatched less frequently
Increased cost to DNO and NI customer	Reduced cost to DNO and NI customer



# RP6 Plans for Demand Side Response

- It is estimated that over a 16 year period Demand Side Response has the potential to save the NI customer c£136k per substation



# Conclusion

- The reduction in load due to DSU operation has the potential to cause issues for substation equipment and potential reverse power flow issues on the D Network.
- To mitigate this risk NIE Networks has developed and issued a range of “instruction sets” to IDSs.
- Reinforcement plans in RP6 will create additional capacity which may enable instruction sets to be upgraded.
- NIE Networks have requested funding to run a Demand Side Response (DSR) project in RP6
- Project will examine to capability of both demand and generation response to defer network CAPEX
- It is estimated that over a 16 year period Demand Side Response has the potential to save the NI customer c£136k per substation
- DSR and the other integration trial projects are all part of developing active distribution network management solutions to improve access to the network and minimise cost to the NI customer.
- This inevitably requires the evolution of NIE Networks functioning as a ‘DNO’ into the ‘DSO’ for NI.

# Questions

# Placeholder for ESB N Update



# Small Scale DSM

- **Michael Bambrick**

Empower Generation (AGU)

Empower Energy Systems (HEMS)

# Dispatch-Down of Wind Market Failure?

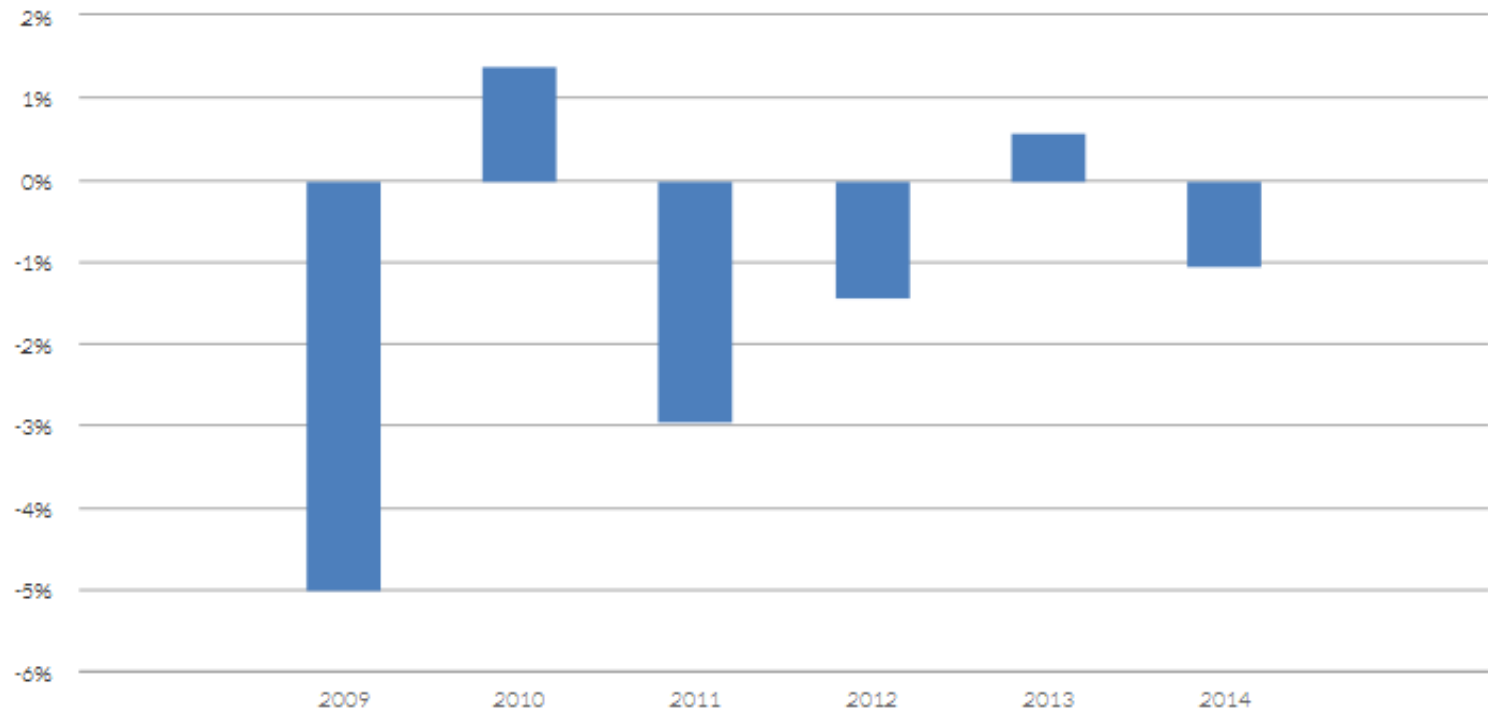
Year	Wind Dispatch-Down (%)		
	Northern Ireland	Ireland	All Island
2011	1.3%	2.4%	2.2%
2012	0.7%	2.5%	2.1%
2013	1.9%	3.5%	3.2%
2014	2.8%	4.4%	4.1%
2015	5.3%	5.1%	5.1%

Year	Wind Dispatch-Down Volume (GWh)		
	Northern Ireland	Ireland	All Island
2011	13	106	119
2012	7	103	110
2013	24	171	196
2014	41	236	277
2015	95	348	442

# Demand Growth Rates 2009 - 2014

## Energy Growth Rates

Energy growth rates are based on monthly energy generation plus net flows from interconnection.



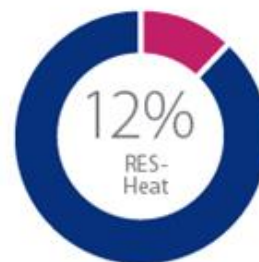
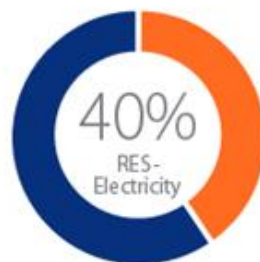
(EirGrid)

# Ireland's 2020 RES Targets

## Renewable Energy



Overall **16% RES** of national consumption



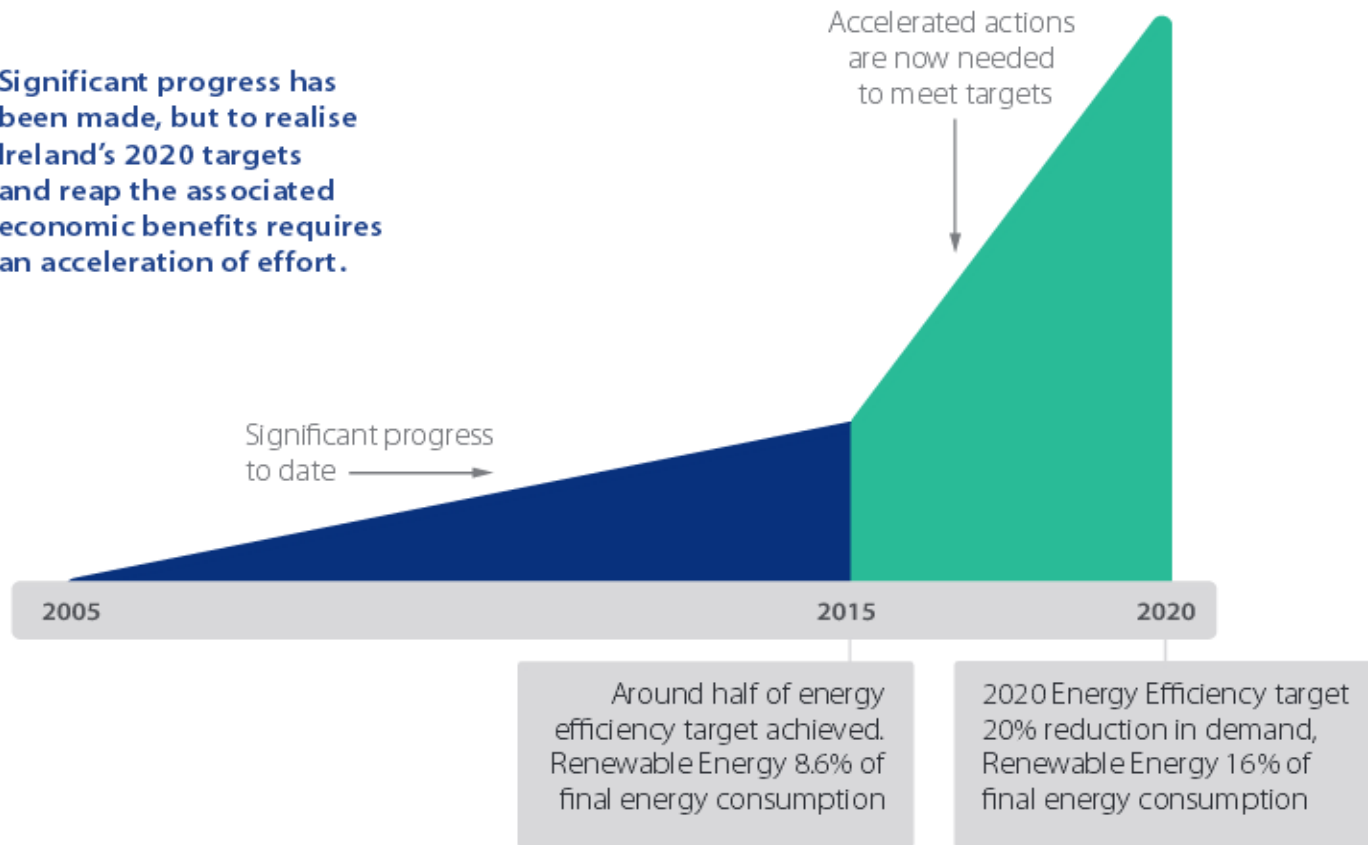
Three sub-targets

(SEAI Energy Modelling Group, April 2016)



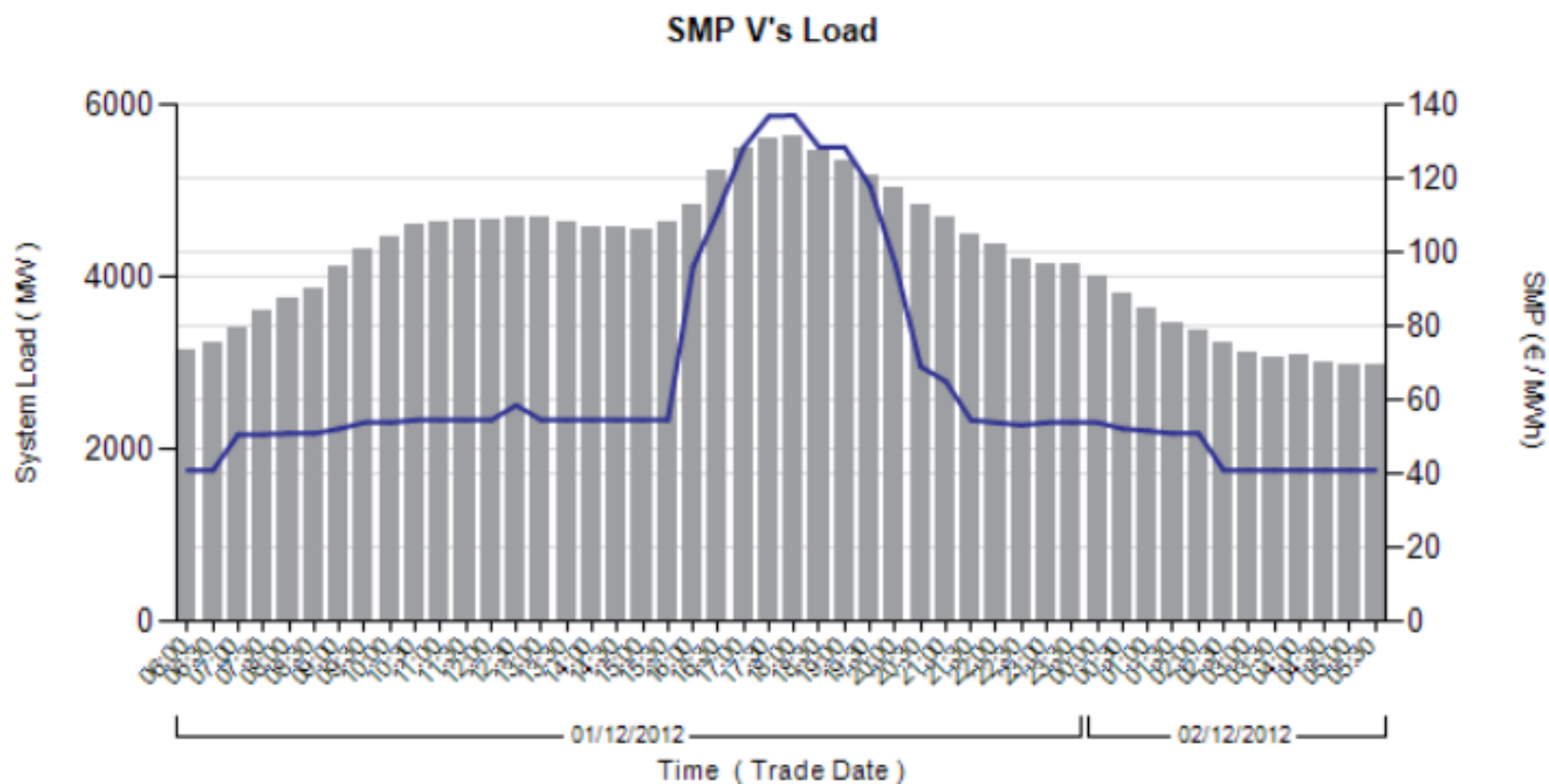
# Current Position

Significant progress has been made, but to realise Ireland's 2020 targets and reap the associated economic benefits requires an acceleration of effort.



(SEAI Energy Modelling Group, April 2016)

# Supply follows Demand



# Demand Side Management

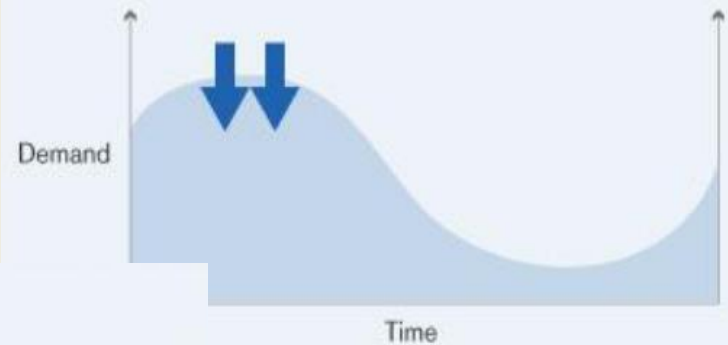
- Current focus on Demand Reduction
  - Relieve system stress when demand outstrips supply
  - No “Demand-Up” recognition (per GB)
- Ignores the other elephants in the room?
  - Static or falling consumption
  - Over capacity
  - Increase in embedded generation (Wind, PV, CHP)

# DSM Flexibility

Time-shift load to a different period



A 'net' load decrease



A 'net' load increase



Time-critical reduction



Other general load shape



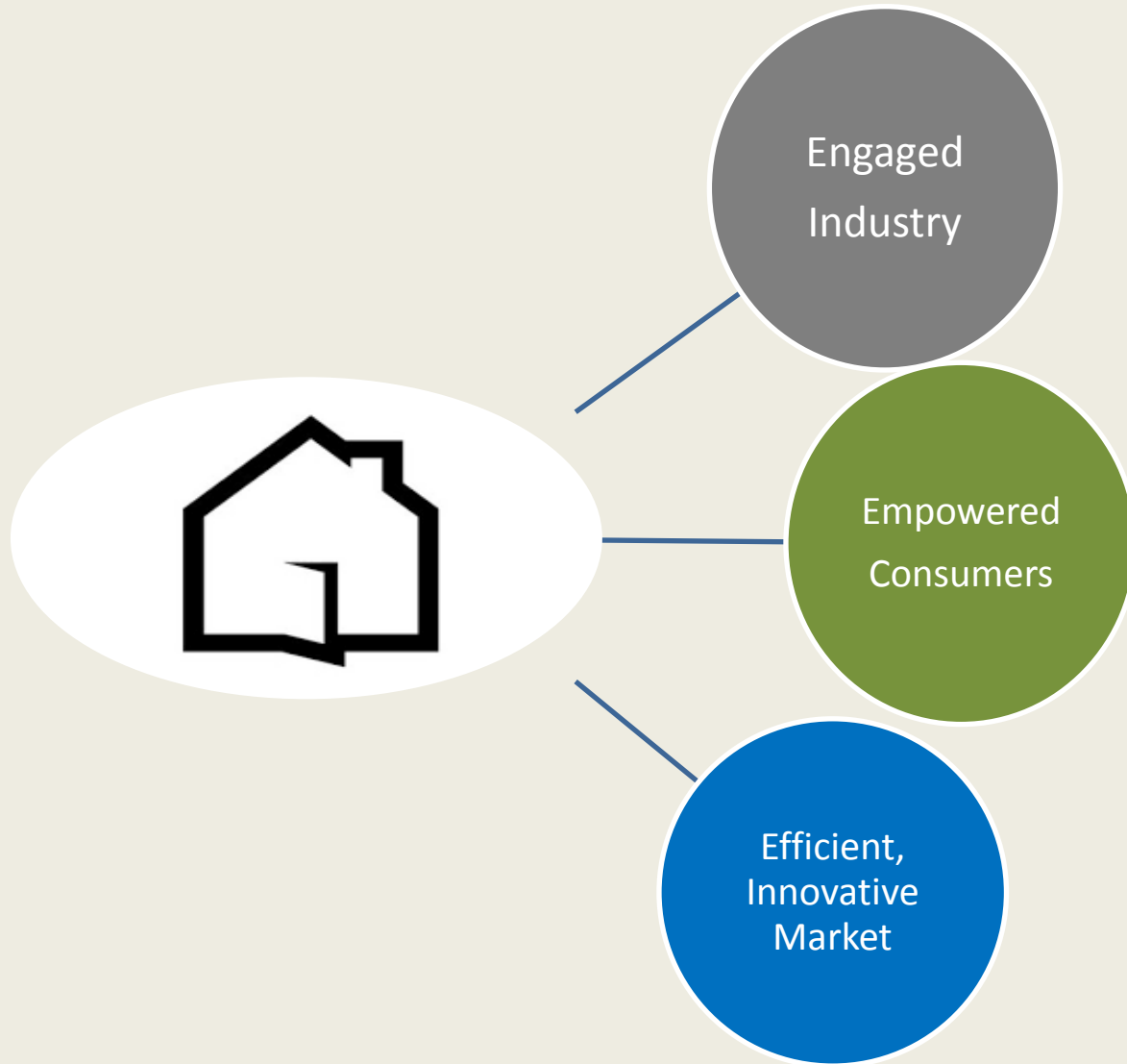
# DSM - Small is Beautiful

- Resilience
  - more secure
- Adaptable
  - zonal control
- Flexible
  - Parameterisable, automated
- Low unit cost
  - Existing infrastructure in home and network
- Simple
  - Predictable, manageable, marketable, scaleable & feasible
- Educational, engaging and democratic

# DHW Example

- >5% or 442 GWh dispatched-down annually
  - Average household use 5 KWh DHW per day
  - Equates to DHW for 250,000 homes
- SEM efficiency
  - Reduced dispatch-down
  - SNSP supported in both directions via automated FFR
  - Year round availability
- Zonal controls
  - Add load rather than network investment
- Lower carbon emissions
  - Increase RES-E %
  - Increase RES-H %

# How We'll Get There....



# Barriers

- Market complexity
- Distraction – ISEM, Brexit
- Inertia
- Inadequate incentives



# Overcoming Barriers

## Practical Steps

Areas of focus:

- Technology
- Cost of failure
- Market rules
- Consumer proposition
- Promote



Small Scale  
Big Potential

# Flexibility in Demand Side to Balance Renewables – Oct 25, 2016

**Michael Phelan - CEO**





We enable **intensive energy users** to actively participate and **earn lucrative recurring revenues** from demand side response schemes.



## Customers

- 280+ sites  
GB, ROI & NI



## Foundations

- On-going investment in Development



## Team

- Experienced development team



## Unique Platform

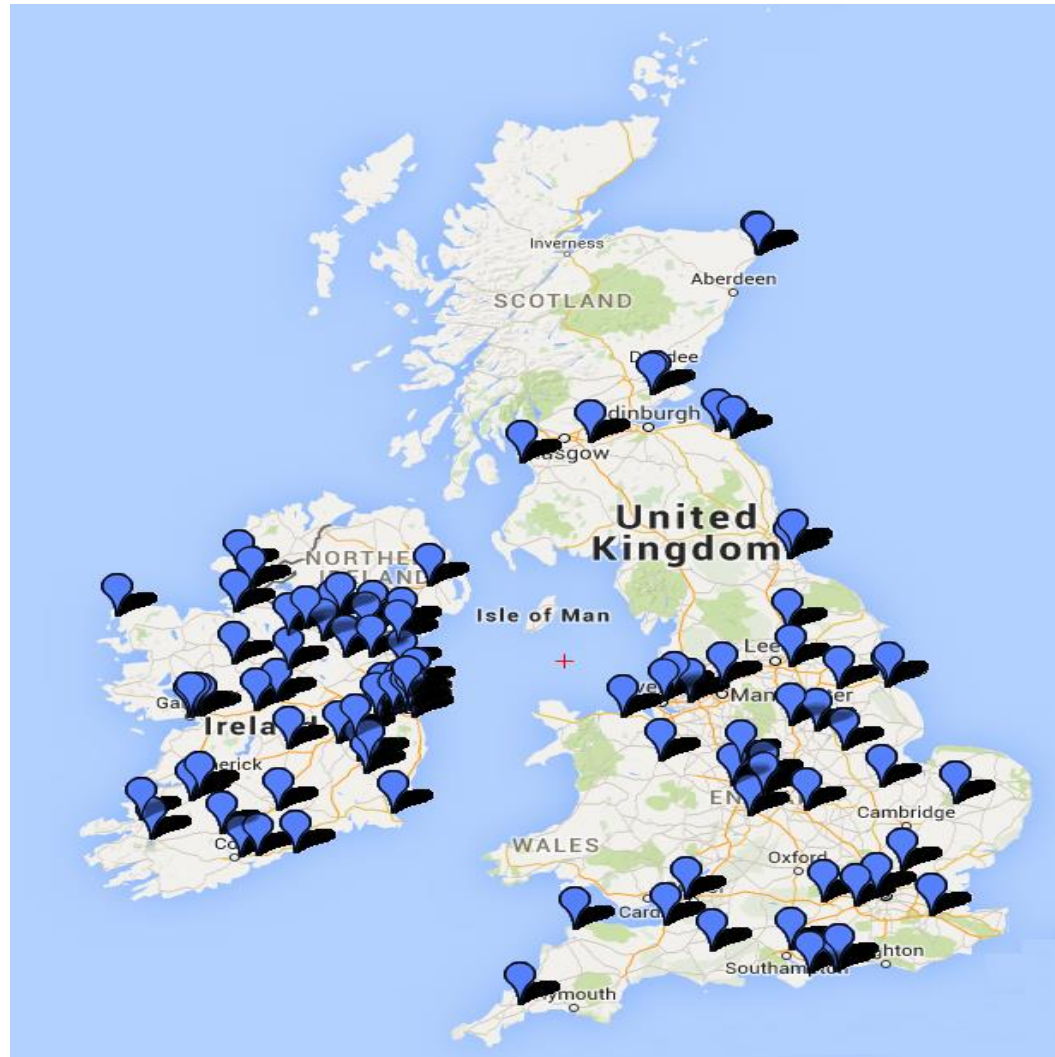
- 40 Man-years of development
- Innovation Awards



## Approved

- Aggregator for Grid Operators in GB, ROI and NI

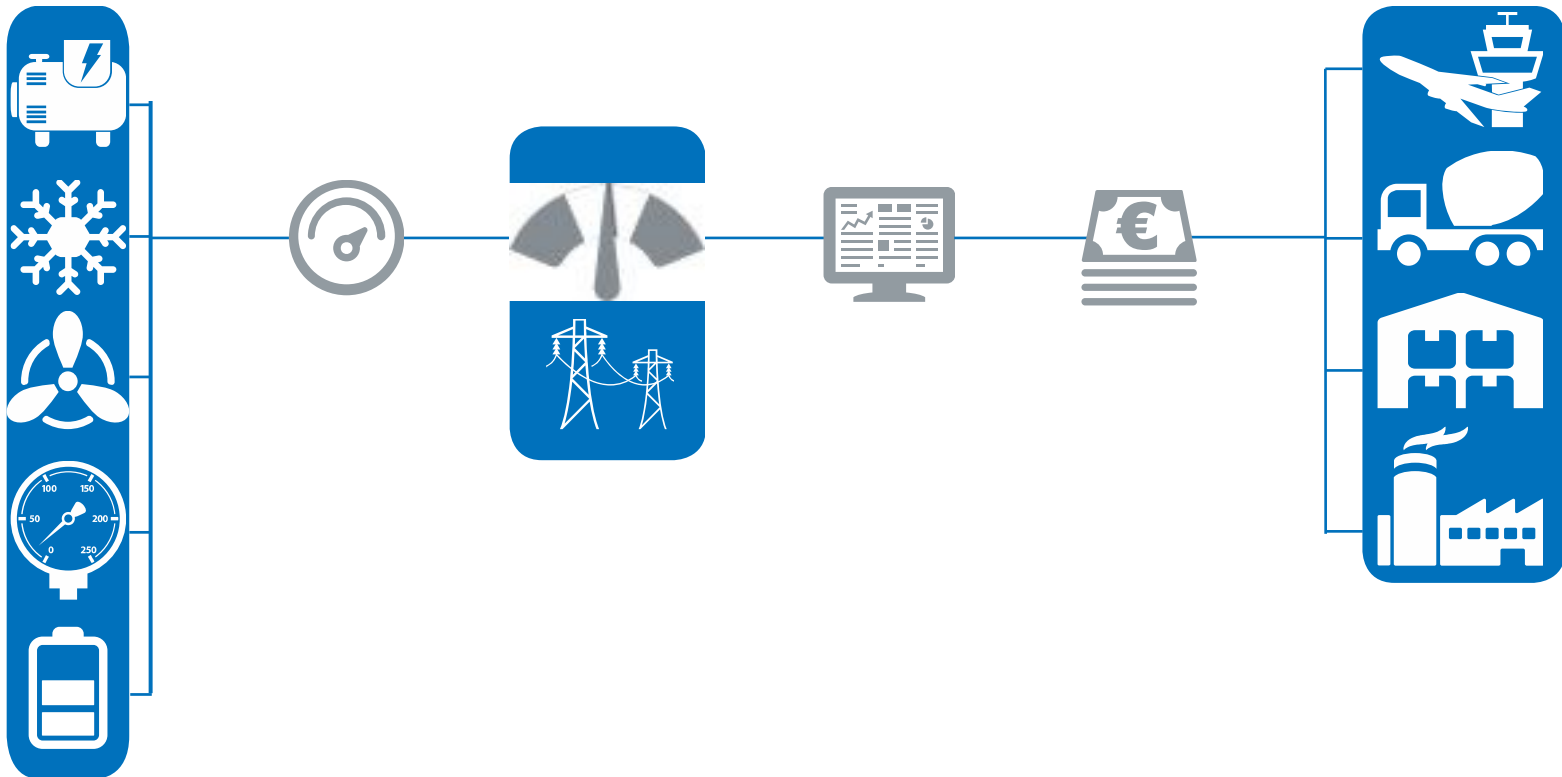
# Customer Site Locations



# Energy Platform

## We automate your assets

Your Assets ➤ Connected to our system ➤ Balancing the Grid ➤ Via our Platform ➤ Delivering Income Stream ➤ To Irish Businesses



# Balancing Services

## National Grid

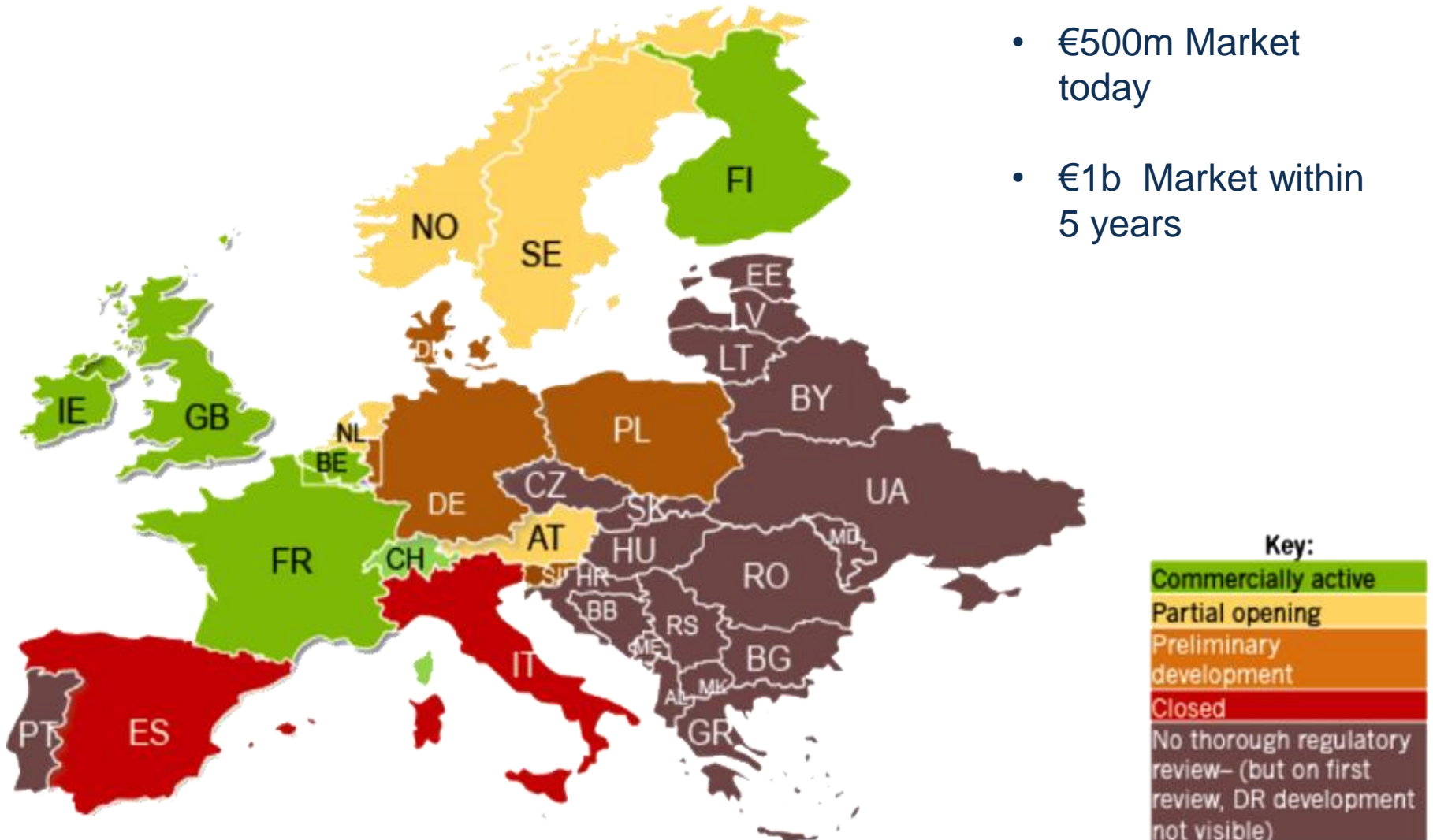


Under the new plans, National Grid will be **relying on demand-side schemes for “well over 50% of the time” by 2030**

**Duncan Burt**  
Head of Commercial Operations  
National Grid

# Smart Grid Energy Aggregation in Europe

- €500m Market today
- €1b Market within 5 years





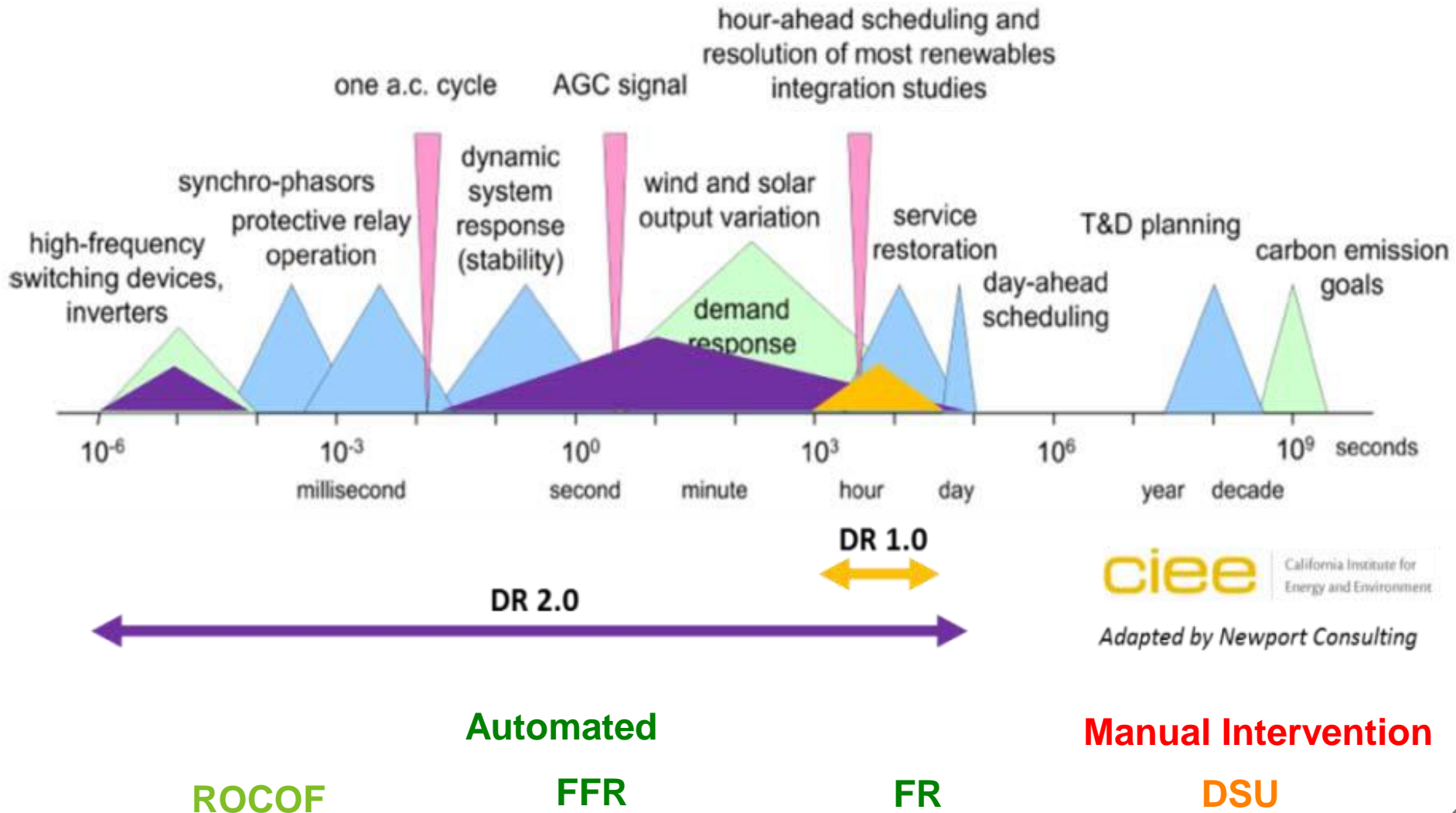
# Evolution of Grid Response Requirements - Globally

## Spectrum of Customer Response

Grid Operations	Predictable	Unpredictable
Timing	Day-Ahead	Seconds
Response Events	Discrete	Continuous
Decision & Control	Centralized	Distributed
Platform	Analog	Internet of Everything
Response Device	Specific Load	DER System

**No Automation** | **Automated**

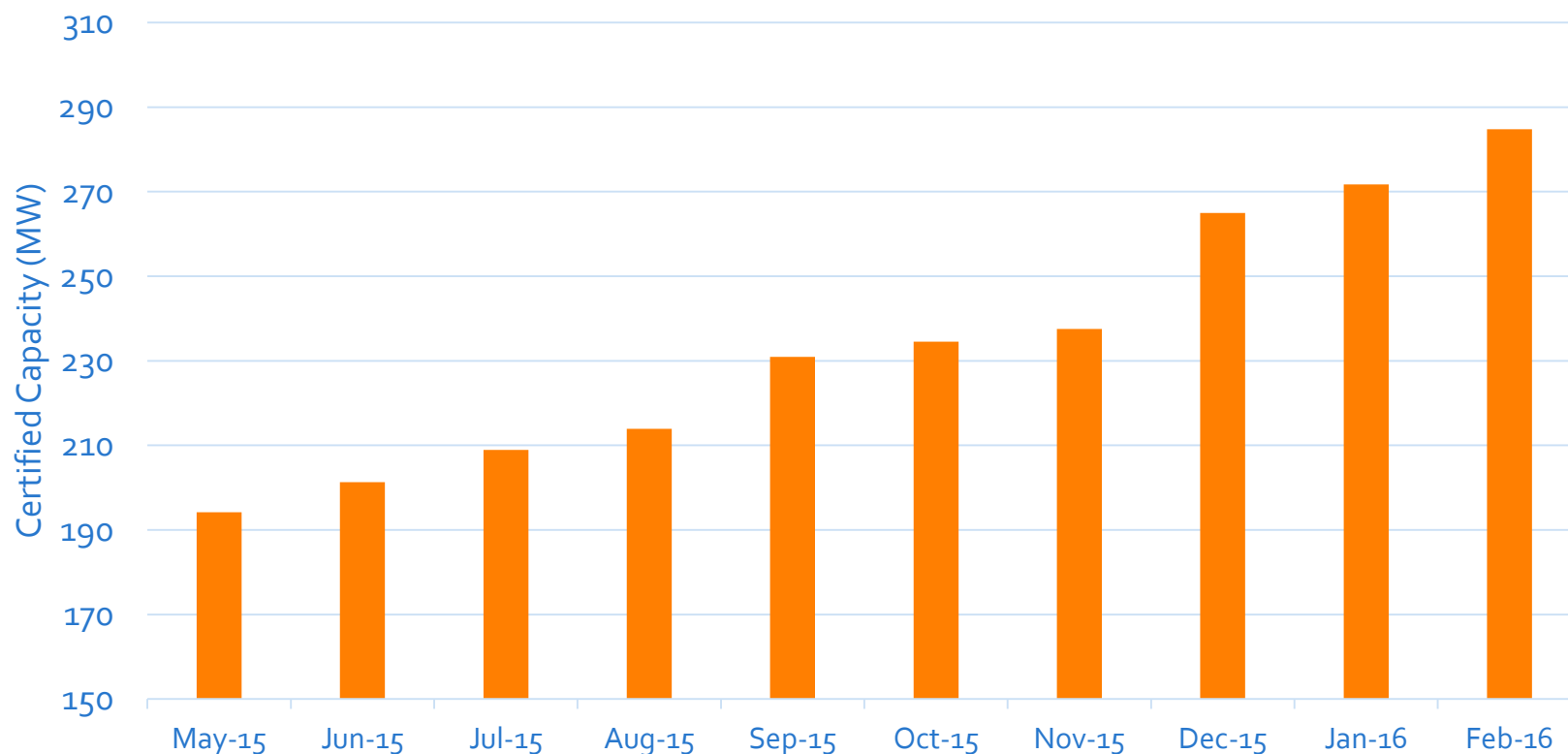
# Changes in Grid speed of response requirements – value follows speed



# Auction Flexibility Required

- + Auction flexibility is required to promote active Demand Side participation

Certified Market DSU Capacity (MW) - May 2015 to Feb 2016

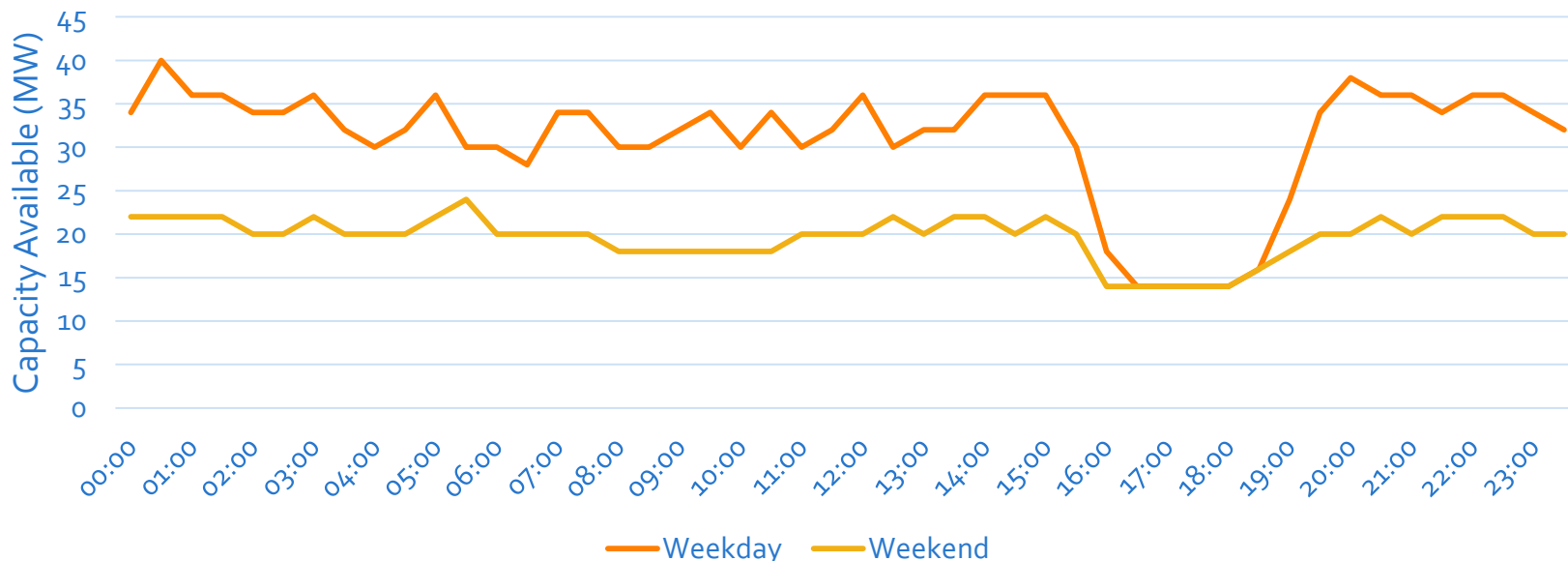


*SEM Demand Offers May-15 to Feb-16*

# Challenges in Predicting Load Availability

- + Challenges in predicting availability for DSU Annually:
  - + Changes in ambient conditions
  - + Production schedules of IDS
  - + Addition of IDS (individual demand sites) to unit
  - + Removal of IDS to unit (e.g. IDS change or provider or shutdown)
- + How does availability relate to a fixed tender value for demand side.

Example of Aggregated Unit Availability Profile (Weekday Vs Weekend)

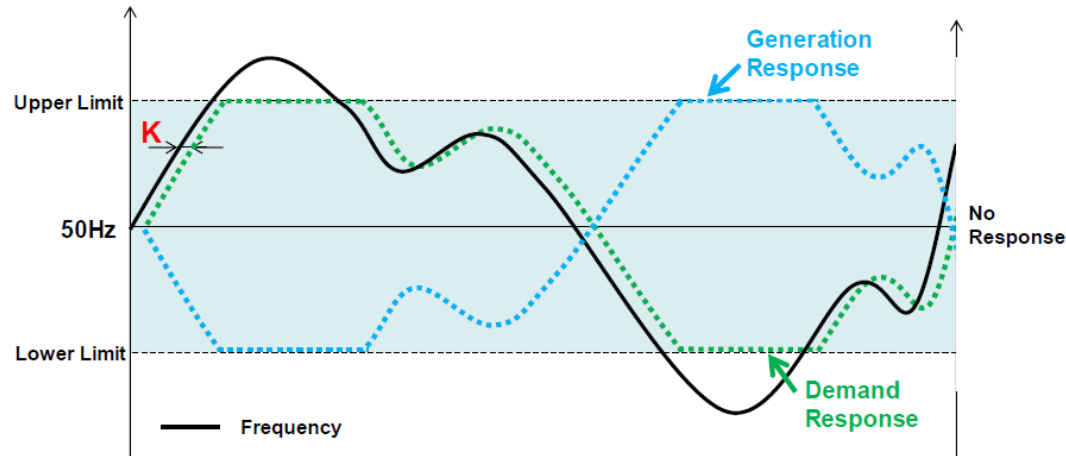


# DSO/DNO IDS Instruction Sets

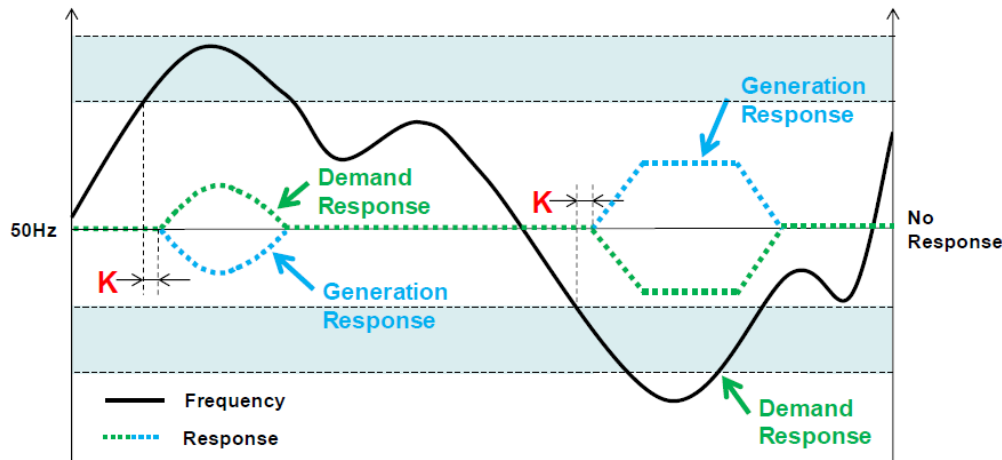
- + Introduced in June 2015 in ROI
  - + Blanket April to September dispatch constraint on selected IDS
  - + More extreme instruction sets in operation in NI, including 24/7/365 dispatch constraint
- + Little or no change of movement in IDS instruction sets since
- + How will IDS under instruction set as part of DSU interact with new market mechanisms?
  - + IDS with instruction sets could not be included in System Services Tender for 2016
  - + Will this be the same for 2017 System Services tender?
  - + How will this work for the Capacity Auction in 2017?
- + Require more engagement with DSO/DNO to refine and solve issues
- + DSU industry can be part of solution

# GB NG Dynamic Frequency Response – Up side as well as Down Side Response

## + Dynamic FFR: Fully Dynamic Frequency Response:



## + Dynamic FFR: Partial Dynamic Frequency Response:



High side response to reduce wind curtailment and facilitate renewable integration:

- Hour ahead notice to provide response
- 10 sec high side fast frequency response
- Load up of assets
- Back-off of embedded generation

Flexible in approach to load and storage.

# Flexible Contracts – Paramount Importance to Demand Side

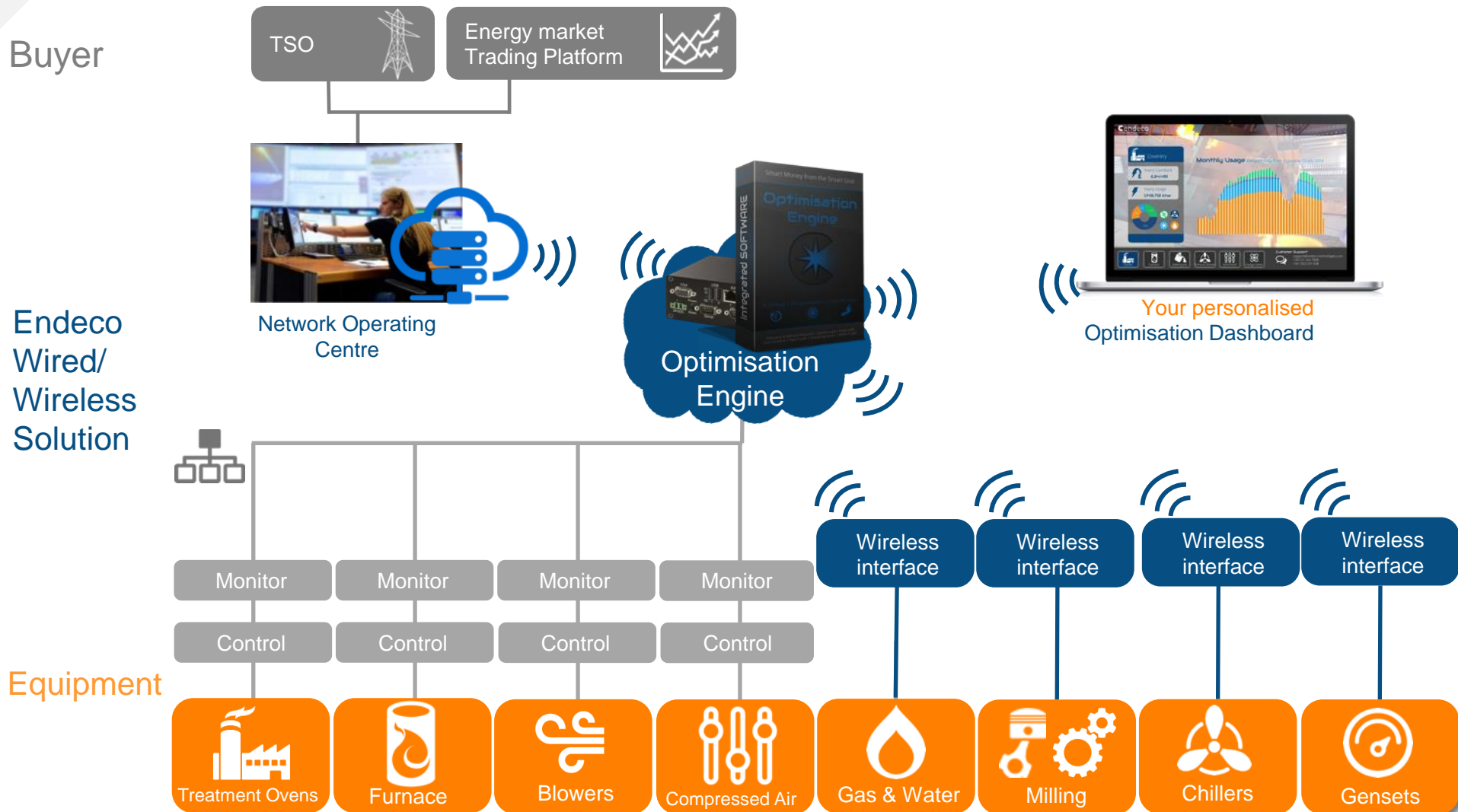
- + Demand Side Units Growing all the time
- + Irrespective of growth, availability is variable
- + Demand Side should not be disenfranchised on pricing because of flexible or shorter term contracts
- + Flexible FFR tendered market being developed in GB to enable monthly or weekly nomination as part of tenders

## Flexible Frequency Response – Active in GB for Demand Side

- + Providers tender pricing month ahead
- + Nominate availability week ahead currently (daily has been mooted)
- + Demand Side offers greatest accuracy – closer to real time

# One Solution Automates all energy incentives

**ENDECO**  
TECHNOLOGIES





# GB System Services Equivalent Schemes

Service	Response Time	Delivery Time
Frequency Control by Demand Management	2 Sec	30 mins
Static Firm Frequency Response	10 Sec	30 mins
Dynamic Firm Frequency Response	2 Sec	Length of excursion
Enhanced Frequency Response	< 1 Sec	Length of excursion

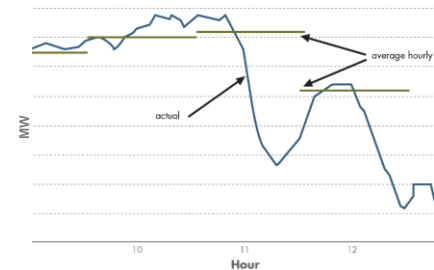
# Useful TSO and DNO Services

- + **Constraint Management Services:**
  - + Optimising flexible load usage, storage and embedded generation to minimise renewable constraints and reduce peak requirements;
  - + Target specific feeders, substations or individual service areas.
- + **Reinforcement Mitigation;**
  - + Renewable firming and ramp rate control using embedded generation, load and storage flexibility to take account of transmission or distribution line active reactive power import/export capacity limits;
  - + Defer feeder substation or difficult line or area upgrades.
- + **Voltage, Reactive Response and Fault Recovery;** Due to low inertia need to increase dynamic reactive response of embedded Generation and storage.
- + **Modular, real time location based forecasting, optimisation, event performance and outage analysis and circuit visibility on targeted lines.**



## DEMAND Side Market Development GB/IE

1. Recognize that DSM and storage solves curtailment as well as Grid stability.
  1. Store energy when wind blows
  2. Manage stability by fitting both sides of frequency balancing equation
- + Open and bilateral contracts to build up storage and demand side
- + Actively favor DSM and storage over other methods as they find them the best solutions for balancing grid while minimising wind and solar curtailment.
- + Little or no carbon impact (where provision through demand for low side and through embedded generation for high side is concerned)
- + A distributed service response across the market jurisdiction
- + No single point of unit delivery failure
- + Opportunity for the end consumer to benefit directly as well as the Grid System as a whole.



A nighttime photograph of the Manhattan skyline as seen from the water. The Manhattan Bridge is in the foreground, its steel structure and suspension cables illuminated. The city lights of Manhattan are visible in the background, with the Chrysler Building being a prominent feature. The water in the foreground is dark and reflects the lights from the bridge and the city.

# Thank you

 **cendeco**  
Technology Leader in Smart Grid Optimisation