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Driving Value from Demand Side Response

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What is Demand Side Response?

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- **“Demand Side Response**” is a way to earn revenue by reducing electricity consumption from the distribution network for short periods when the national electricity system is under stress

- National Gird is responsible for ensuring that we have a stable electricity grid. In order to achieve this National Grid must ensure that total instantaneous demand and total instantaneous supply are matched

Traditionally, National Grid procured this requirement from peaking power stations or older, less efficient and more expensive power stations

Many of these old, inefficient, polluted power stations are in process of decommissioned for environmental and economic reasons

Demand Side Response provides a more environmentally friendly and cost effective method of stabilising the National Grid

*Didcot Power Station closed March 2013 - **2000 MW***

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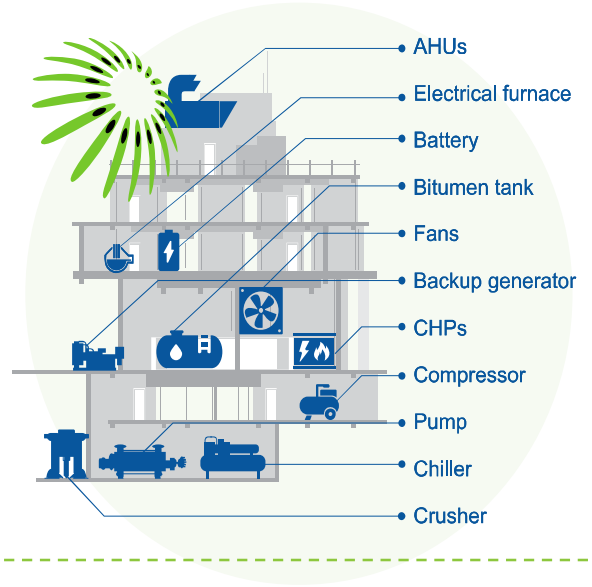
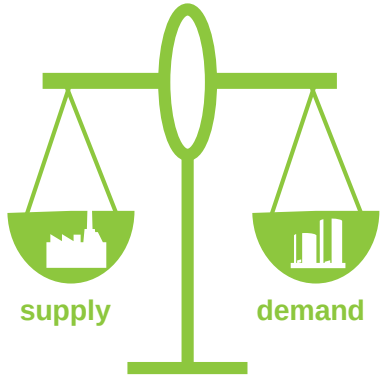
Balancing Service

When electricity demand exceeds supply on the grid

Clients' electrical asset consumption is adjusted using our technology



This shift returns power to the grid - restoring balance in a cost effective, green way



Our clients earn revenues simply for participating and being utilized and also for just being available

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The Energy Trilemma

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The Energy Trilemma

- The Energy Trilemma are the challenges the government faces with meeting security of supply, at a low cost to consumers while meeting sustainability targets

- The Energy Trilemma is the driving force behind the changes in the way electricity is consumed in the UK

- A result of this are policies which:
  - Incentivise Sustainably Generation
  - Increase uptake of Electric Heating
  - Lead to the electrification of Transport

- As a result peak electricity demand in the UK may increase by 50% before 2050

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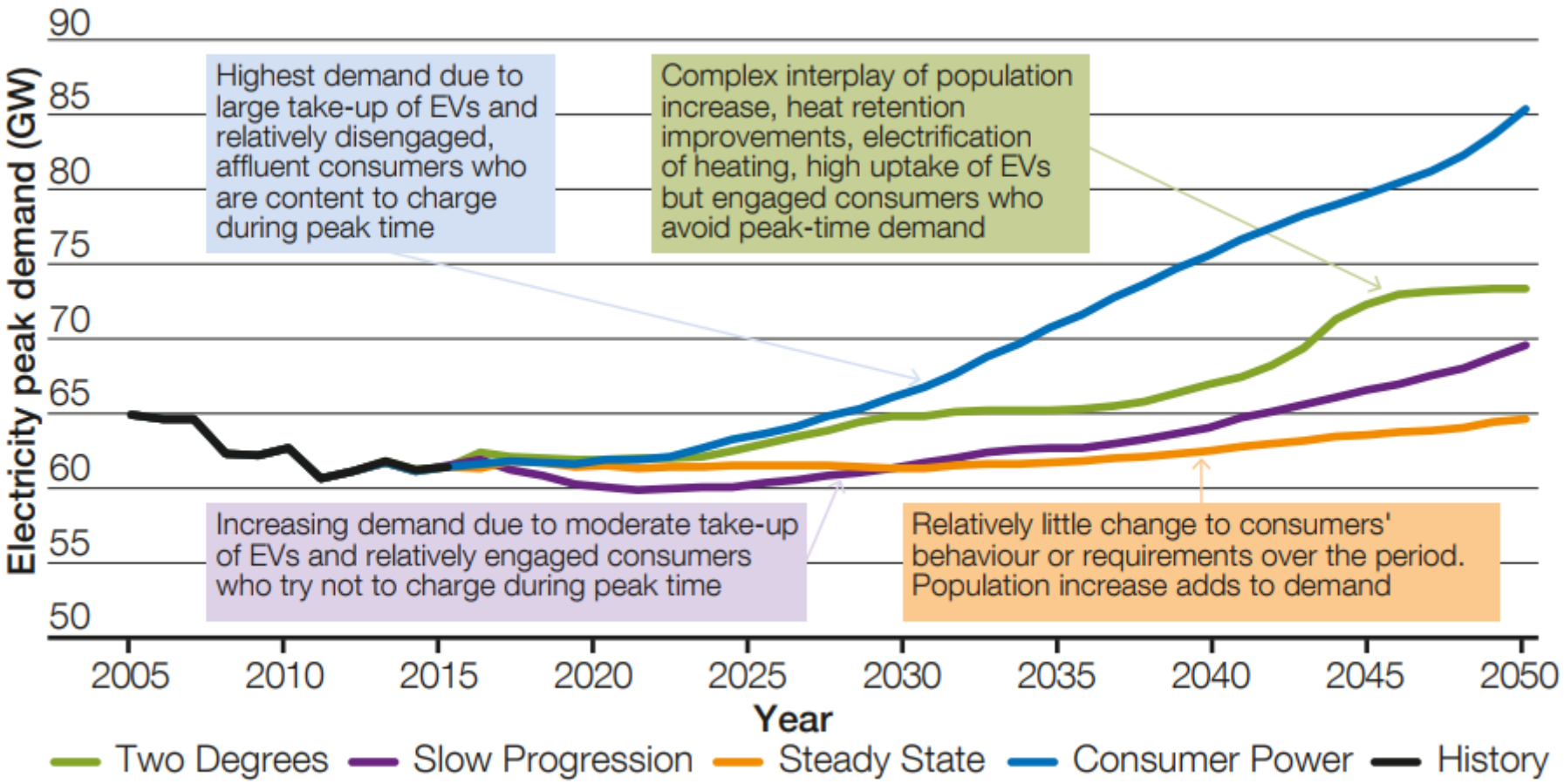
Peak Electricity Demand



National Grid's Future Energy Scenarios

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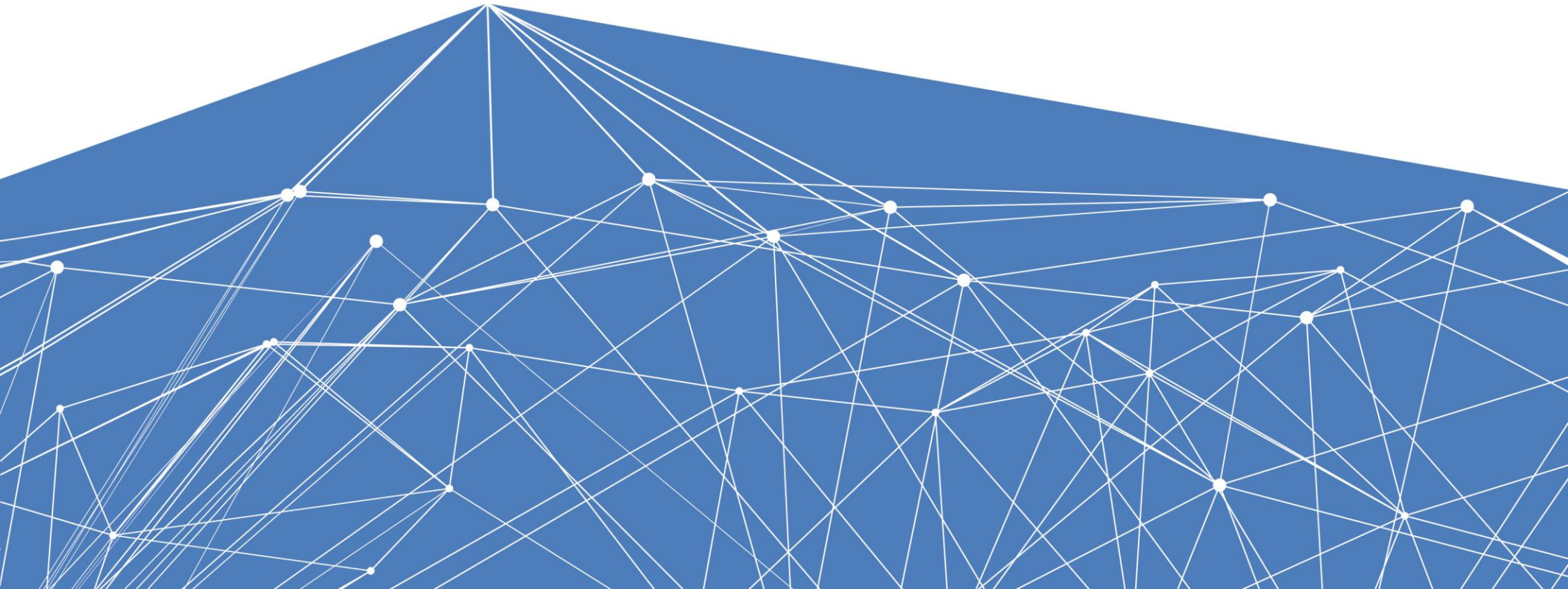
What does Demand side Response mean for you?



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Using Flexibility to decrease Energy Costs and Earn Revenues

Increased sustainable generation such as wind and solar lead to a higher requirement for flexibility, as a result National Grid pay higher revenues for balancing services

As wholesale prices of electricity become more variable, Demand Side Response allow you to optimise your energy consumption to reduce energy bills

Higher peak demand will increase the strain on existing transmission and distribution infrastructure driving up network costs. By participating in Demand Side Response it is possible to reduce these cost, and even generate revenue

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Assets Used in Demand Response

Mining & Quarries

- Bitumen tank heating
- Crushers
- Grinders
- Conveyer belts
- Variable speed drives
- Building management systems

Foundries & Metal processing

- Electric induction furnaces
- Ovens
- Pumps & melting pots
- Variable speed drives
- Building management systems

IT & Telecoms

- Computer air conditioning units
- Chillers
- DRUPS
- UPS
- Batteries

Commercial property

- Chillers
- AHU's
- Pumps
- Fans
- UPS
- Building management systems

Airport & Hospitals

- Onsite generation
- UPS
- Combined heat & power system

Manufacturing

- Electric hot water boilers
- Pumps
- Variable speed drives
- Fans
- Building management systems

Commercial refrigeration

- Supermarket refrigeration
- Cold storage
- Compressors
- Refrigerator packs
- UPS
- Variable speed drives

Universities

- Chillers
- Electric heating
- Standby diesel generation
- AHU's
- Laundry rooms

Water treatment & processing

- Variable speed drive pumps
- Blowers
- Aerators
- Motors & industrial plant
- Building Management System/ Pump Management System

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The Major Benefits of DSR

Creating Additional Revenue Stream by doing very little and non intrusive alterations to existing system in place:

NEW REVENUES

Significant new, annual recurring revenue streams.

COST SAVINGS

Participants save on consumption during demand response events and can take part in automated peak tariff avoidance schemes.

CONDITIONED EQUIPMENT

Continued monitoring and activation of controls and electrical equipment in demand response programs ensures operational readiness

ENERGY INSIGHTS

Real time metering of participating electrical assets and access to a wealth of consumption data for use in forecasting, reporting and CO_2 reduction schemes.

NO COST

There is no up front cost to participants for KiWi Power's proprietary enabling technology.

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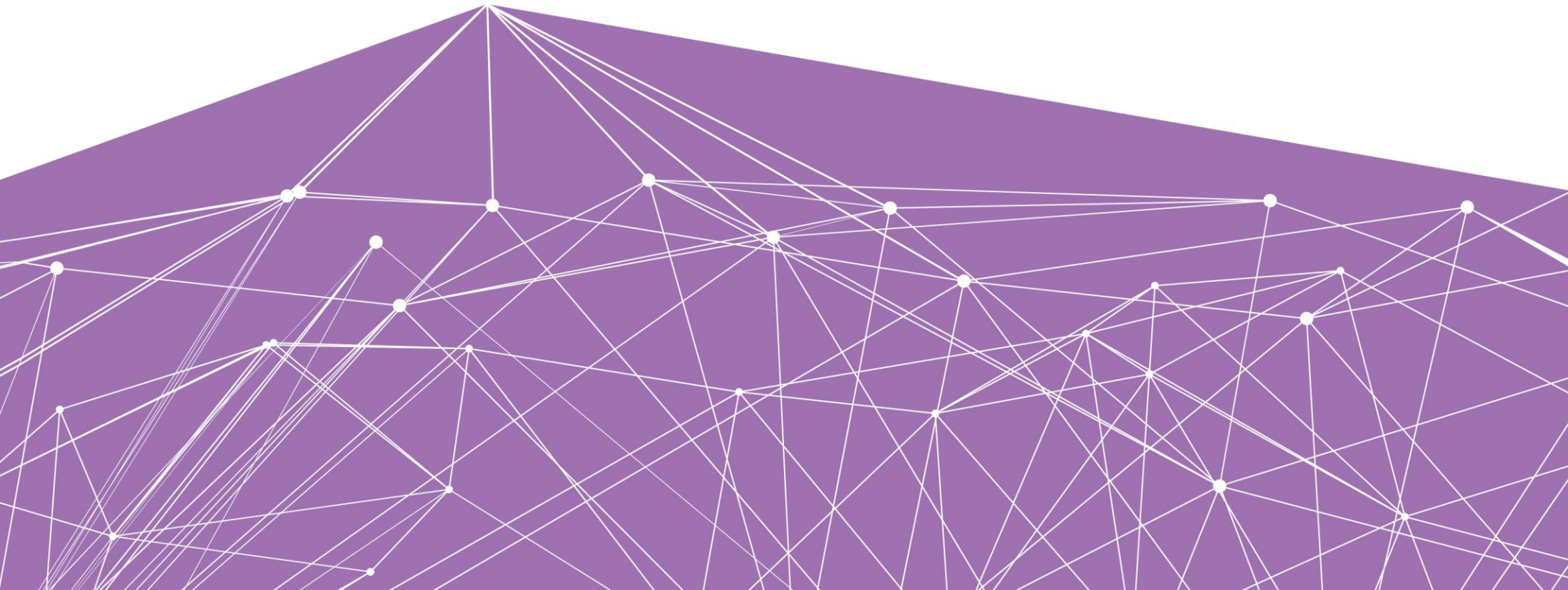
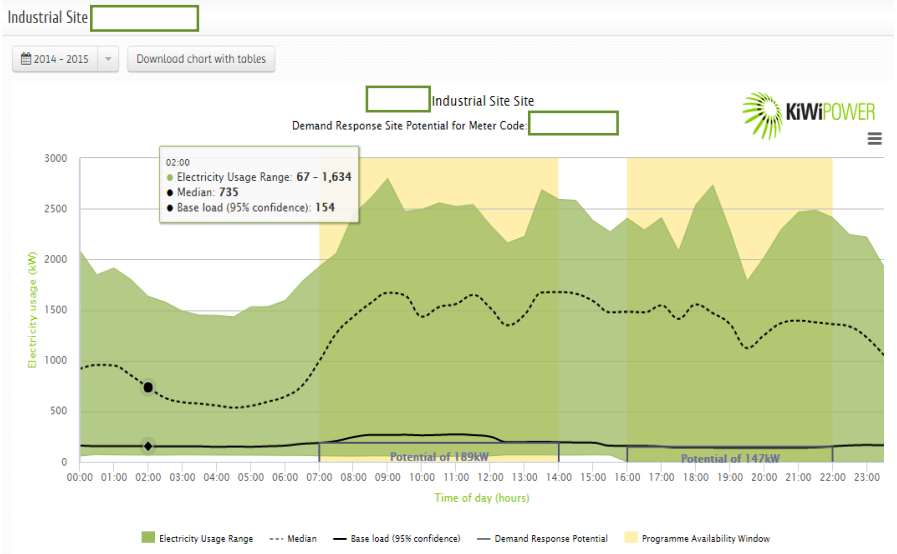
The Role of an Aggregator



- Analysing HH Data
- Assess the Energy consumption and asset suitability for participation in a programme
- ENA applications
- Minimise disruption to existing site operations
- Market analysis, tendering and contract management



KiWi Power – Technology/Operations

- Designed to maximise Demand Response revenues
- Flexible – we only deploy the functionality needed on each site
- Easy to install – pre-configured modules to reduce on-site works.
- In-house 24/7 Operations Team managing DSR events

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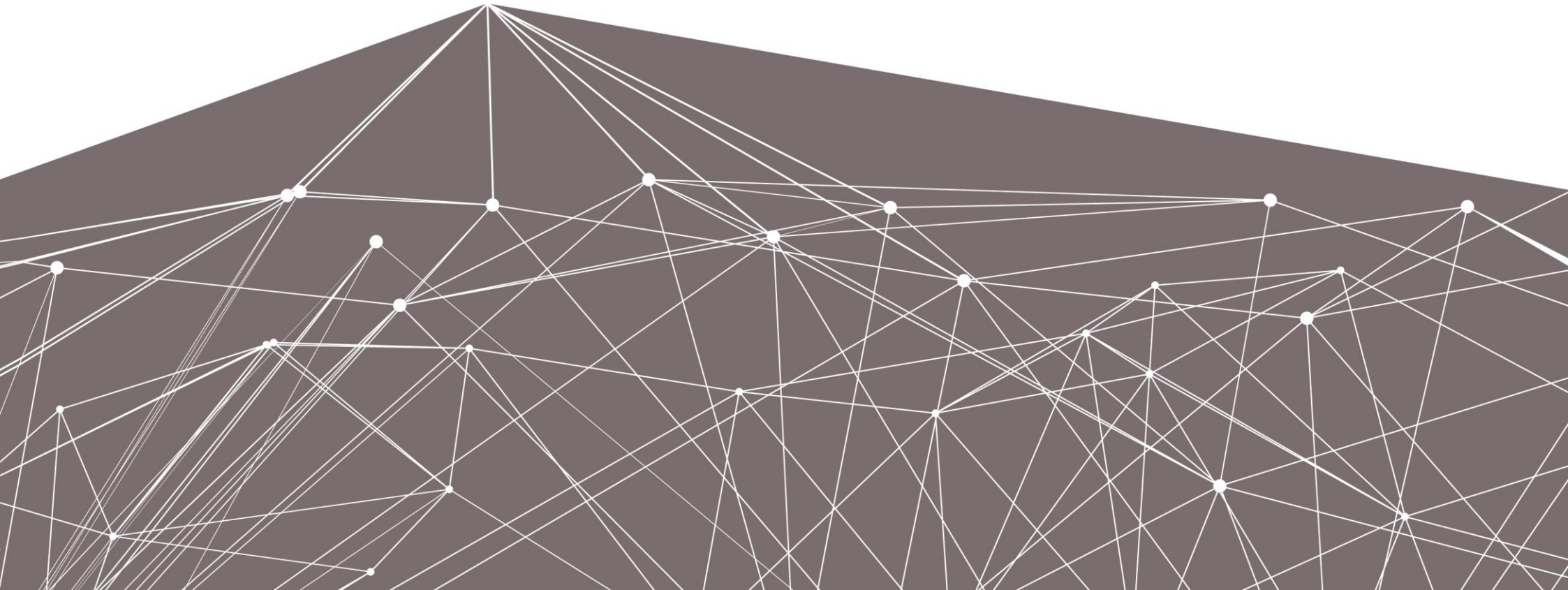
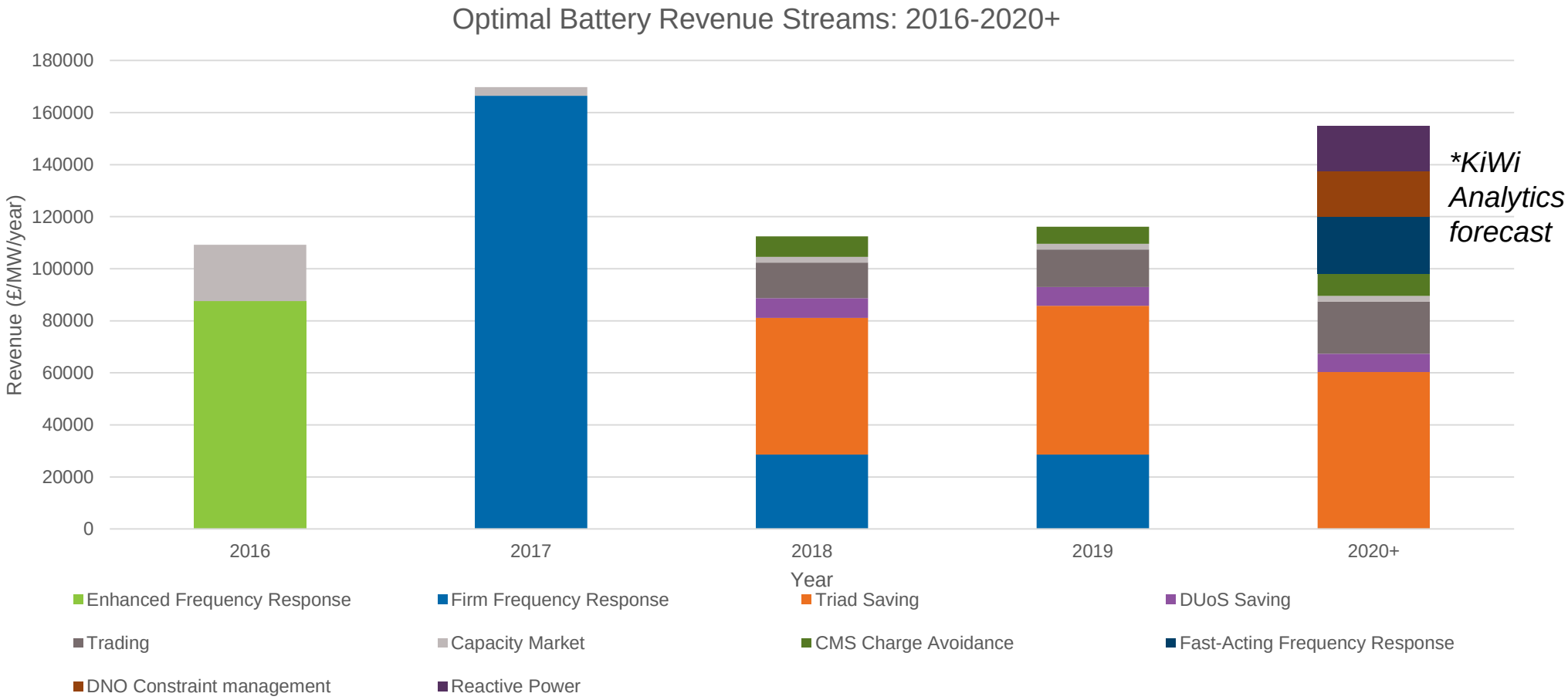
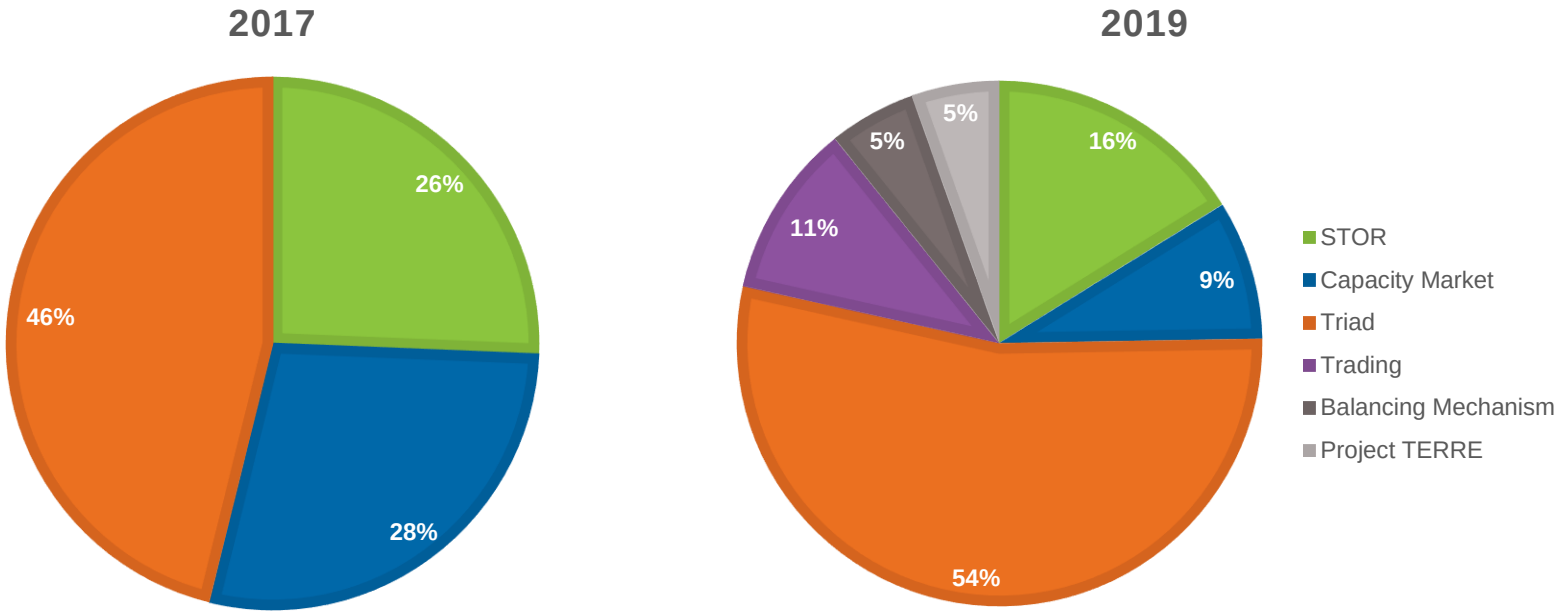
The Changing Landscape




Optimal Battery Revenue Streams: 2016-2020+
Revenue (£/MW/year)
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
2016
2017
2018
2019
2020+
Year
*KiWi Analytics forecast
Enhanced Frequency Response
Firm Frequency Response
Triad Saving
DUoS Saving
Trading
Capacity Market
CMS Charge Avoidance
Fast-Acting Frequency Response
DNO Constraint management
Reactive Power

Reserve Assets



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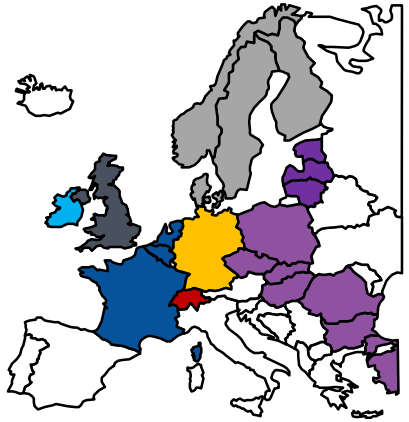
Participation in Demand Side Response Today

KiWi presence and experience – DR & Battery

- Leading provider of DR with **>500MW** under management (**STOR**, **FFR**, **Capacity Market**, **FCDM**)
- Live market participation, **110MW** in **FRRm** and more in **Effacement**
- Live in market for **Tertiary control** with local partner, expanding to Sweden/Finland
- Live in market for **Tertiary control** as of February 2017
- Live in market for **Primary control** (FCR) with four batteries, working on Battery + DR integration
- 7 large sites installed (>100MW capacity), **imbalance energy trading** from February 2017
- Several sites installed with large German partner, focus on **SPOT Energy Trading** and **Energy Efficieny**
- Working with Energy Management company to bring **Distributed Energy Resource (DER) management** to SME customers
- Test installations in place, go live in 2019
- Live in market with 20MW in **R3**

Successfully operated a **6MW/10MWh battery** over 2 years (FFR, STOR, CM)
Built and operating a **6MW/6MWh battery** at an industrial site (Enhanced Frequency Control)
Live with a **2.5MW/5MWh battery** at DNO substation (Dynamic FFR)
Built a **4MW/4.8MWh and a 2MW/2.4MWh battery** project with Tesla batteries
Operating four batteries in **Primary Frequency** in the Netherlands



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Our Clients & Partners

Retail

Commercial operations

Public sector

Hospitality

Utilities and more

Our partners

MARKS & SPENCER

BRITISH STEEL

NHS

Park Plaza Hotels & Resorts

United Utilities

sse

Westfield

TrinityMirror Printing

MILTON KEYNES COUNCIL

Marriott

Bournemouth Water

mitie

ocado

Time Inc.

STOCKPORT METROPOLITAN BOROUGH COUNCIL

Hilton

haven power

CLS ENERGY LTD

Case Study: KiWi Power lead the way with healthcare providers

Partnering with Colchester Hospital University NHS Foundation Trust for demand response

- Colchester Hospital University NHS Foundation Trust has two main sites, Colchester General Hospital and Essex County Hospital. The Trust provides healthcare services to around 370,000 people from Colchester and the surrounding area of north east Essex. Colchester General Hospital opened in 1984 and is one of Essex's largest facilities. Their care covers 596 inpatient beds, 44 maternity beds and 12 critical care beds (excluding A&E).

"We were impressed with KiWis work for the trust in maximising our generator operating revenue within a short period of time. KiWi commenced our programme with 1MW base load and within two months they installed and connected a further 0.4MW. At present we are earning over £100k per annum."

Vall Rasaratnam– Energy & Sustainability Manager – Colchester Hospital

Annual revenues: £100,000+

Zero setup costs

No disruption to site operations

Reduction of CO_2 emissions

Access to real time energy management dashboard with enhanced monitoring features

Case Study: Hotels have ambitious green objectives that cannot impact their guests experience

- Marriott selected KiWi Power as a demand response partner to help improve their energy efficiency, relieve stress on the National Grid and generate additional revenues for future sustainability projects. KiWi Power and Marriott selected the prestigious Grosvenor House location as a pilot site for demand response in the UK to assess viability.
- Upon successful completion of this pilot an additional 10 hotels have been rolled out and KiWi Power and Marriott are now moving towards implementing demand response programmes across a further 40 UK hotels.

"Marriott was the first international hotel chain to participate in demand response in the US. The UK hospitality industry has an exciting opportunity to generate new, risk-free revenue streams and greater insight into energy usage to actively contribute to sustainability goals."

John Conlon – Senior Director Facilities & Project Management, Marriott International Europe

- **Demand response**
- **Energy Management**
- **Triad management**
- **Improved CSR credentials**
- **Recuring revenue stream**

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Thank You