WESTERN POWER DISTRIBUTION

INNOVATION

NEXT GENERATION NETWORKS

Project Entire
Dissemination Webinar
Key Learning and transition to BaU

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WESTERN POWER DISTRIBUTION
INNOVATION

WESTERN POWER DISTRIBUTION EFFS

WESTERN POWER DISTRIBUTION NETWORK EQUILIBRIUM

WESTERN POWER DISTRIBUTION OPEN LV

WESTERN POWER DISTRIBUTION SMART ENERGY ISLES

WESTERN POWER DISTRIBUTION PLUGS AND SOCKETS

Future Networks Programme

Assets

- Management of distribution assets
- Exploitation of asset & network information
- Developing Smart Grid Technology

Customers

- Distributed Generation
- Connecting Electric Vehicles
- Adopting Battery Storage
- Facilitating Flexibility

Operations

- Maintaining Reliability
- Strategic Forecasting
- Transitioning to DSO
- Operational Efficiency

Network and Customer Data

Network Improvements and System Operability

- Improved Statistical Ratings for OHL
- DEDUCE
- Primary Networks Power Quality Analysis
- Stochastic Load Flow
- Visual Data Processing
- Network Islanding
- Common Information Model
- Harmonic Mitigation
- Virtual STATCOM

Transition to a Low Carbon Future

- Heat & Fleet
- Virtual Telemetry
- Solar Storage
- LV Connect & Manage
- FREEDOM
- Electric Nation
- Industrial & Commercial Storage
- Hydrogen Heat & Fleet

New technologies and commercial evolution

- MVDC
- Next Gen Telecoms
- OHL Power Pointer
- Entire
- LV Fault Location
- On-street EV Charging
- Smart Energy Isles
- Visibility Plugs & Socket
- DEDUCE
- MADE

Customer and Stakeholder Focus

- Power Electronic FLM
- Power Electronic FCL
- Self System Design
- New Build Standards
- LCT Response
- Carbon Portal

Safety, Health and Environment

- Simulated Training
- SF6 Alternatives
- Robot Trades
- LV Sensitive Earth Fault Protection
- Wildlife Protection
- Losses Investigation
- Advanced Vegetation Management

Background

- Project Entire is the culmination of a series of related Demand Side Response innovation projects:
  - Seasonal Generation;
  - FALCON;
  - SYNC.
- These gave the following learning:
  - The simpler the service the better;
  - Interactions with wider market services is key;
  - The more notice the better.

Objectives

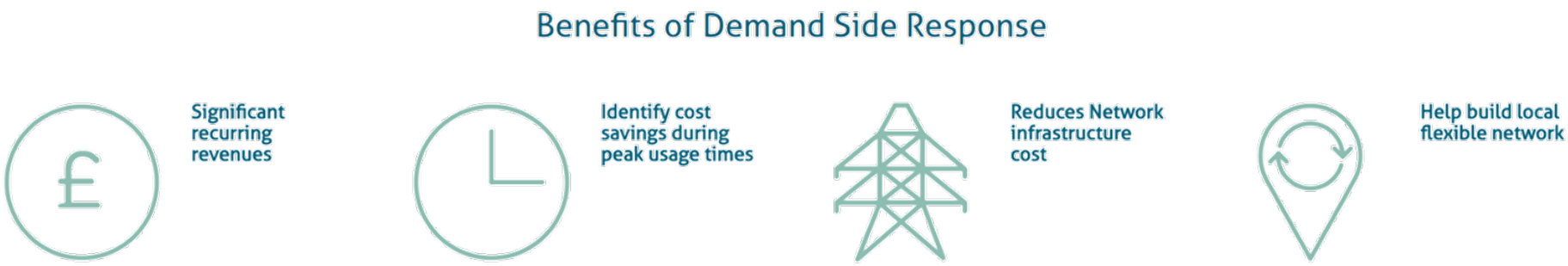
Pull learning from previous trials and develop a proposition that was viable for both the DNO and the participant.

This included:

- Internal systems design and build for the control room;
- External systems capabilities to connect to participants sites / assets;
- Back office systems to manage billing and payments;
- Skilled staff to support customers with enrolment to DSR Programme;
- Economic models for establishing DSR business case;
- DSR use cases / service models / products;
- Market sharing models;
- Identifiable brand for DSR services;
- Performance contracts for participants;
- Documentation support.

Original Scope

- Focus on simplicity for the end customer;
- Develop a managed service for direct participants;
- Provide access to other DSR programmes;
- Economic model that shared costs across multiple programmes;
- Regulatory approval for service sharing;
- Remote asset monitoring and management.

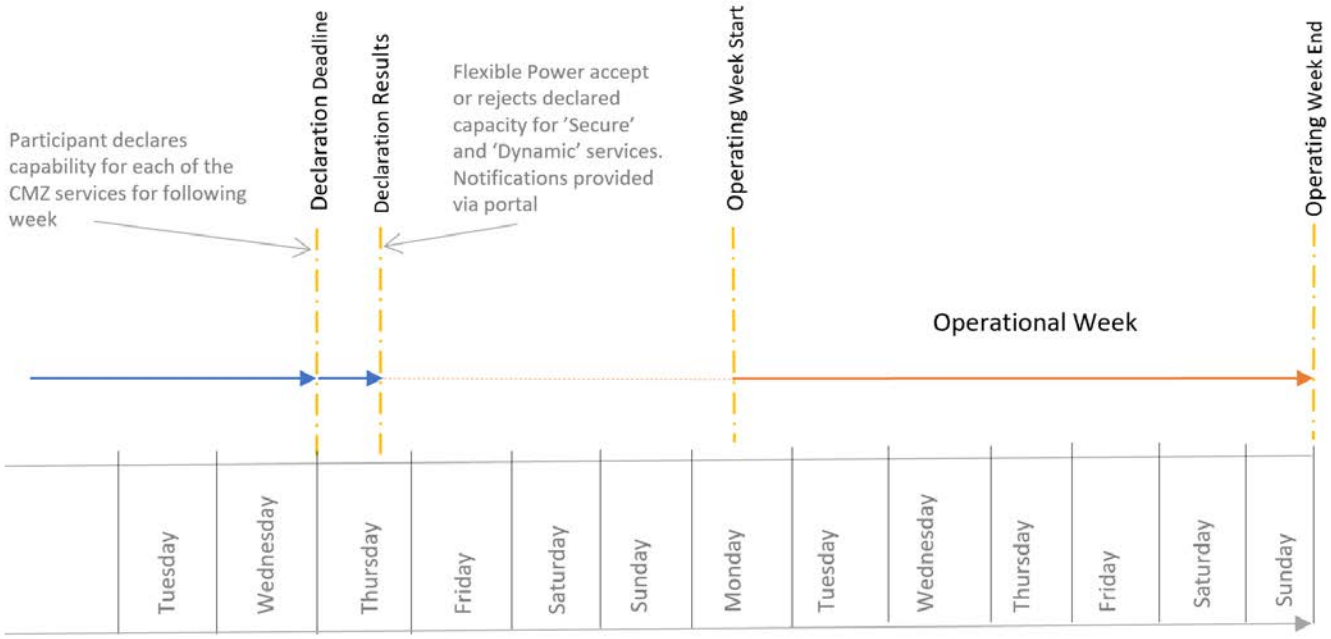


Revised Scope

- Following discussions with the Ofgem a project review was undertaken in Autumn 2017;
- Ofgem highlighted that they did not see models in which the DNO operates as a commercial operator as in the long term interests of customers;
- The key changes were:
  - Removal of the stacked service;
  - Removal of the managed service;
  - Products and processes adjusted based on learning generated;
  - Trial shortened.

Weekly Process

- Designed to fit alongside the Flexible STOR contract;
- Built on learning from FALCON on advanced notice.



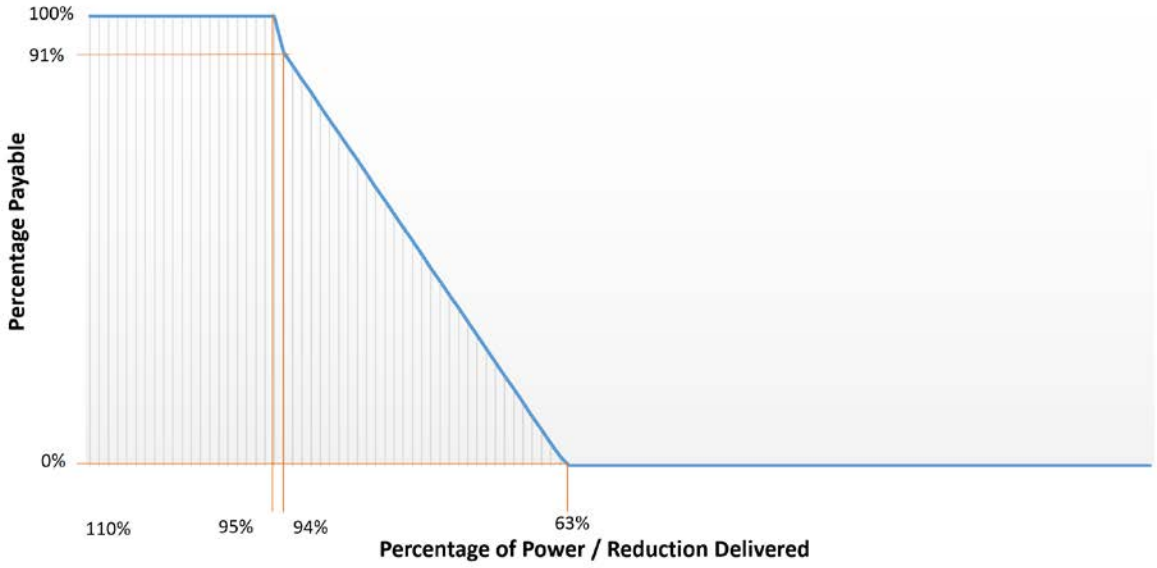
Three Services

- Based on fixed pricing;

	Secure	Dynamic	Restore
Original Use case	Pre-fault intervention	Post-fault intervention	Post-fault network restoration
Advanced payment	Yes, an arming payment for the declared run time £75-118/MW/h	Yes, an availability fee for the duration of potential requirement £5/MW/h	No
Utilisation payment	£150/MWh	£300/MWh	£600/MWh
Dispatch Notice	Week Ahead, on acceptance of availability	15 minutes ahead of requirement.	15 minutes ahead of requirement.

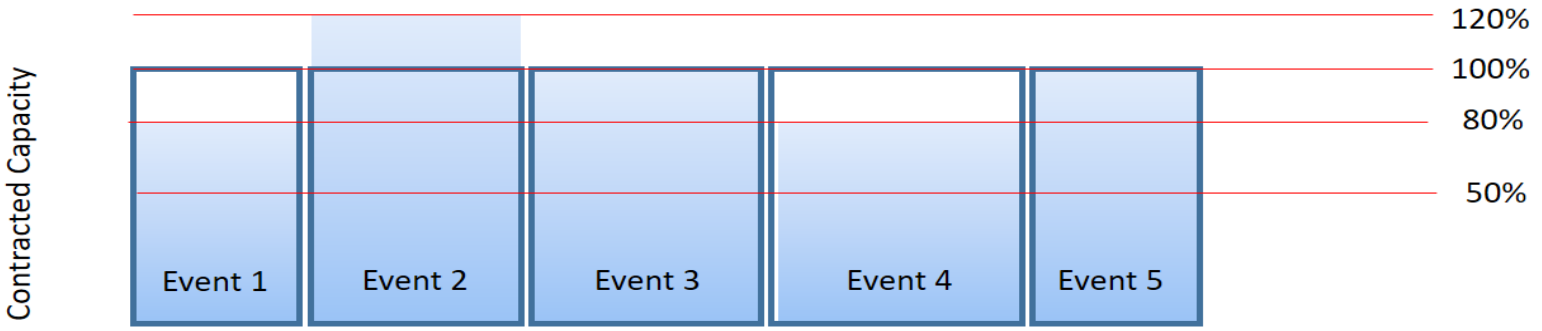
- Secure and Dynamic were main service. Restore was additional.

Payment Mechanics – Secure & Dynamic



- Each minute individually settled;
- Grace factor above 95%;
- Weighted penalty 3% reduction per 1% under delivery.

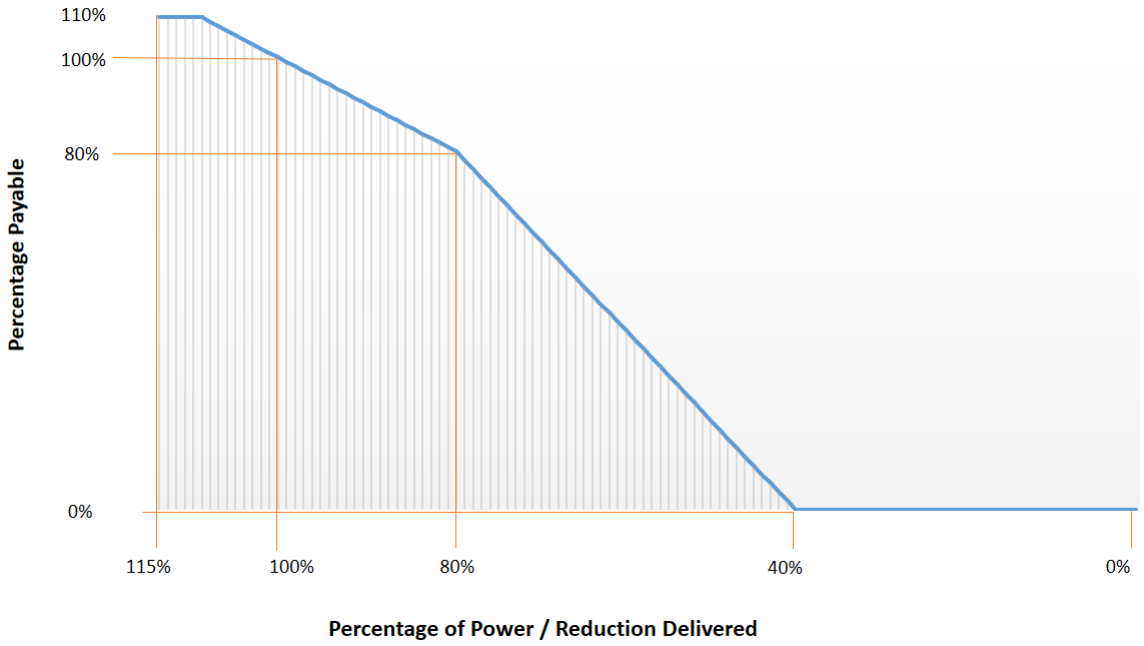
Payment Mechanics – Reconciliations



$$\frac{(80\%+100\%+100\%+80\%+100\%)}{5} = 92\%$$

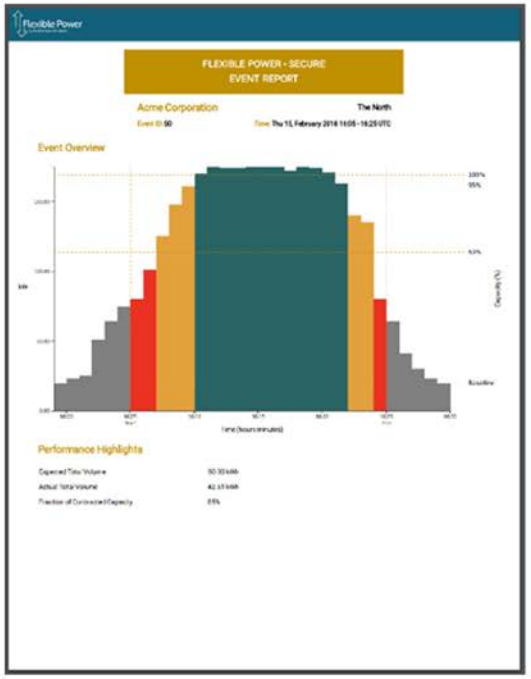
- Automatic calculation of volume in each event;
- Events capped at 100%;
- Automatic calculation of average volume over the month;
- % of total volume multiplied by accrued advance payment.

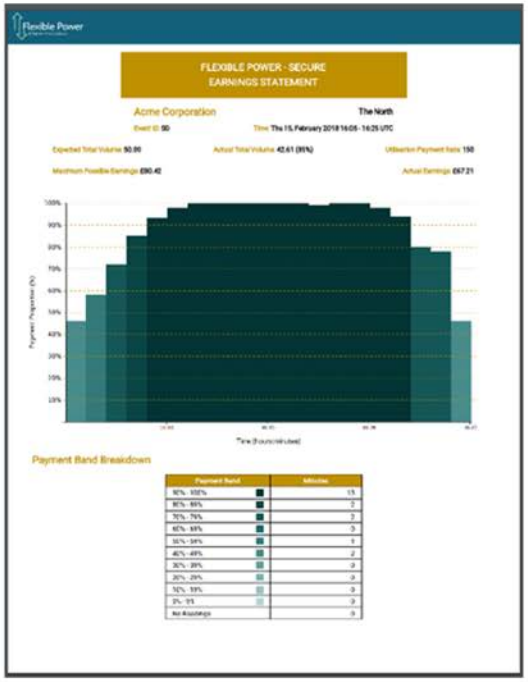
Payment Mechanics – Restore

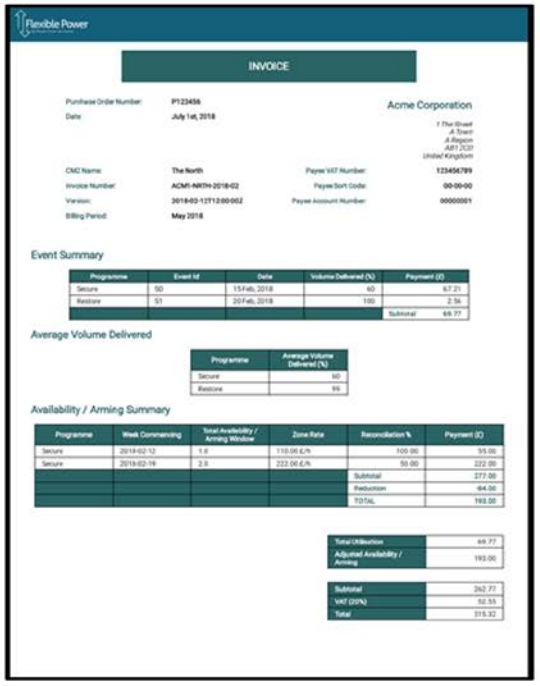


- No Grace Factor;
- Weighted penalty 2% reduction per 1% under delivery set at 80%;
- Paid over delivery up to 110%.

Reports

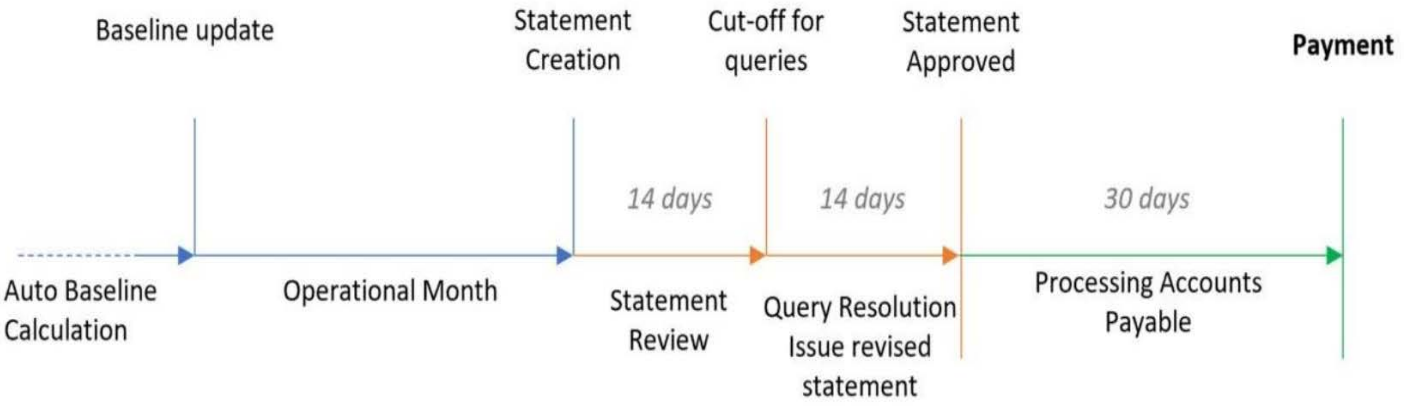






- Performance Report – post event;
- Earnings Statement – post event;
- Monthly Statement – end of month.

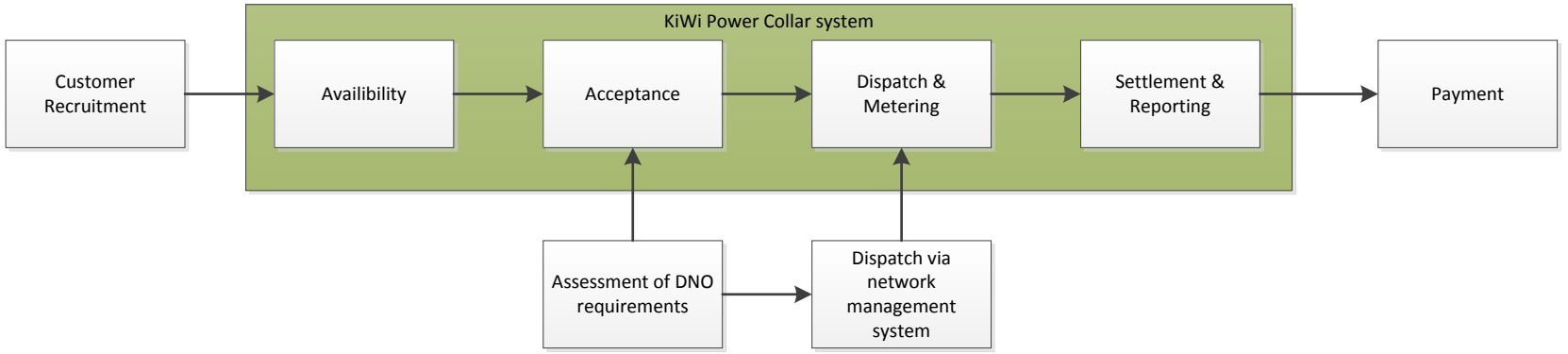
Billing



- Baseline calculated using previous months data and updated automatically;
- Statement available for review for 14 days;
- 14 days to resolve any queries;
- Statement agreed by end of month becomes invoice;
- Invoice transferred for payment.

Systems Overview

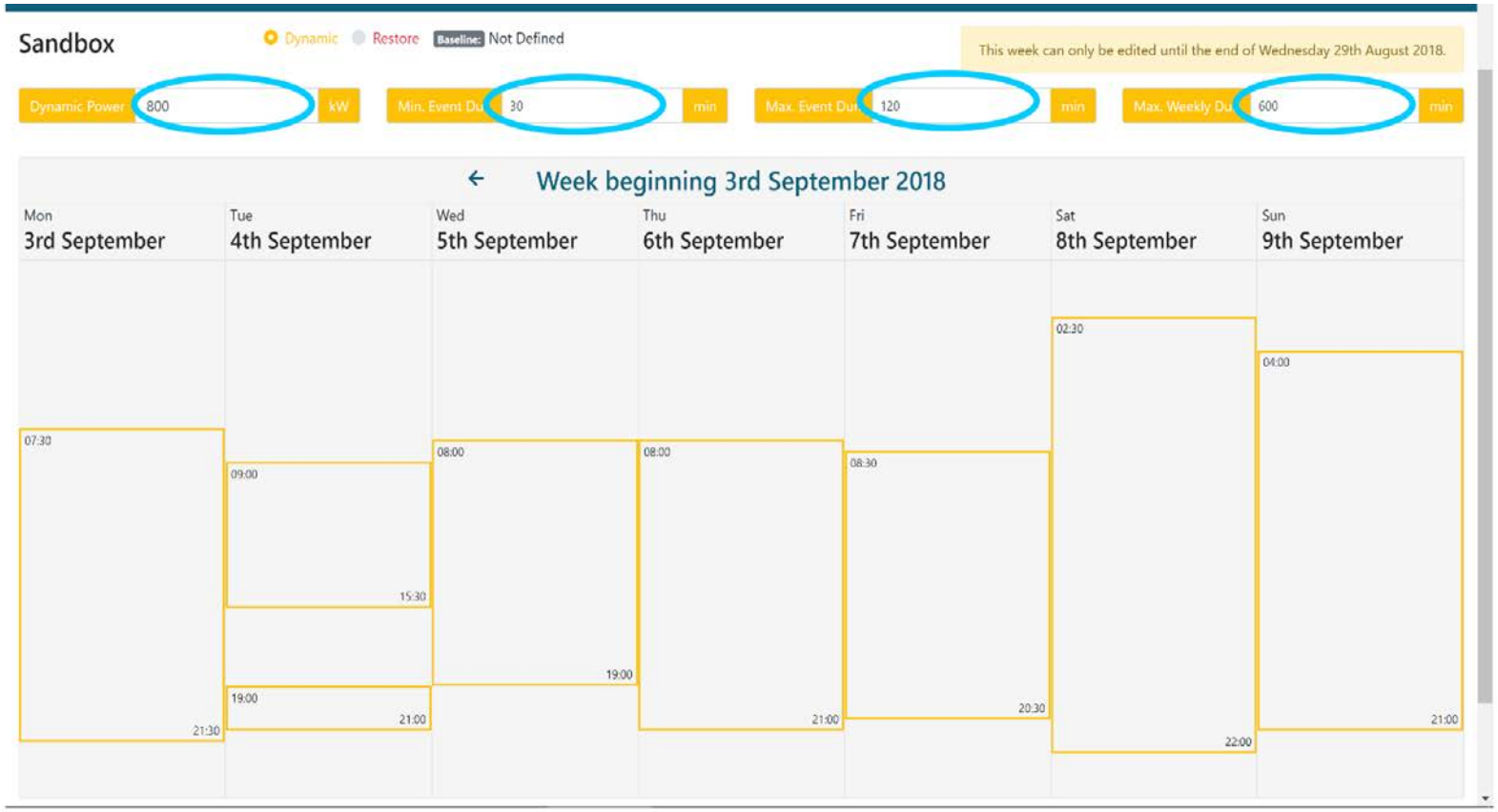
- Web Site;
- Customer Portal (Multiple Environments);
- API (Application Programme Interface);
- Operator Console.



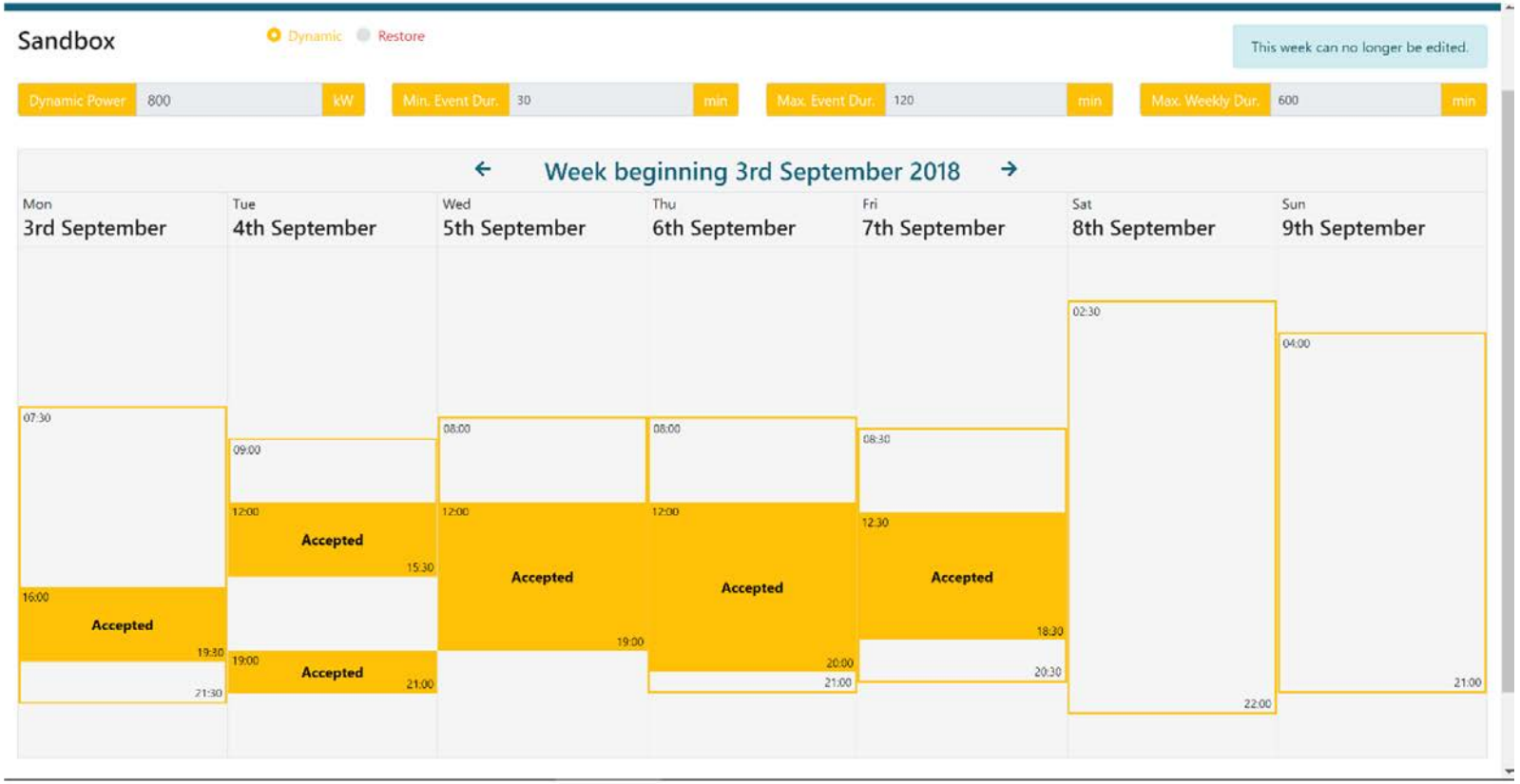
Systems – API

- Used for Metering as well as Dispatch and Cease instructions;
- Software connection negated need for any proprietary hardware;
- API can run on a wide range of devices and use a wide range of programming languages;
- Secure communications:
  - Signals originated from specific IP address range;
  - SSL Certificates;
  - Encrypted communications;
  - Dynamic API key generation;
  - Pre-defined signal list.
- Self Service setup.

Participant Portal - Declarations

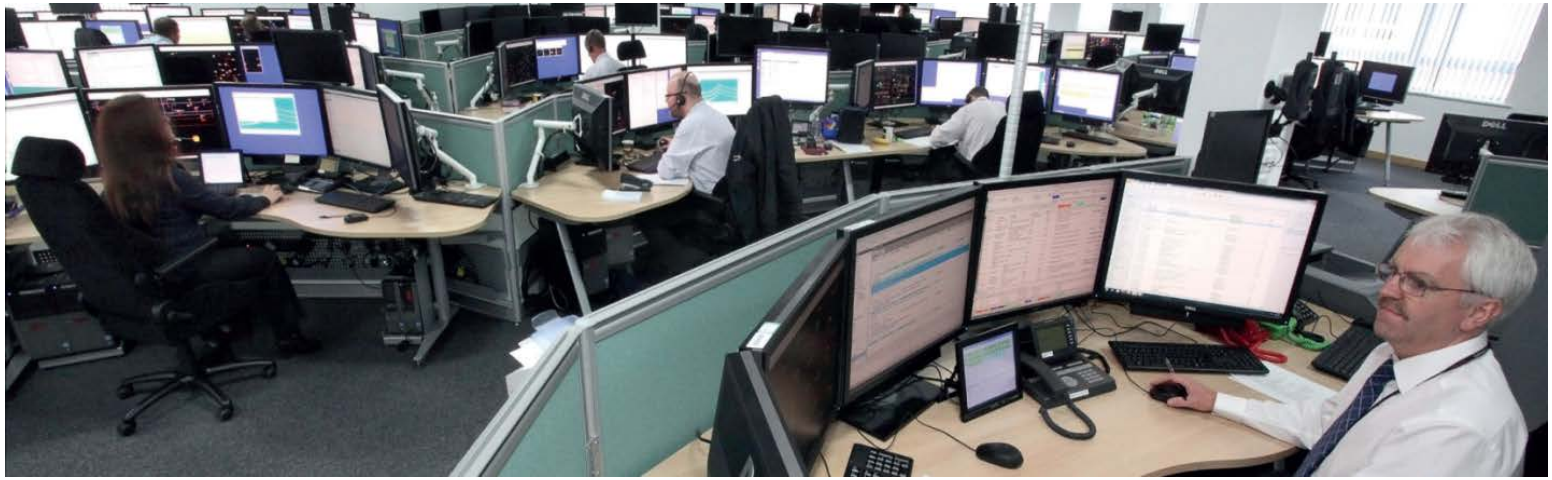


Participant Portal - Acceptance

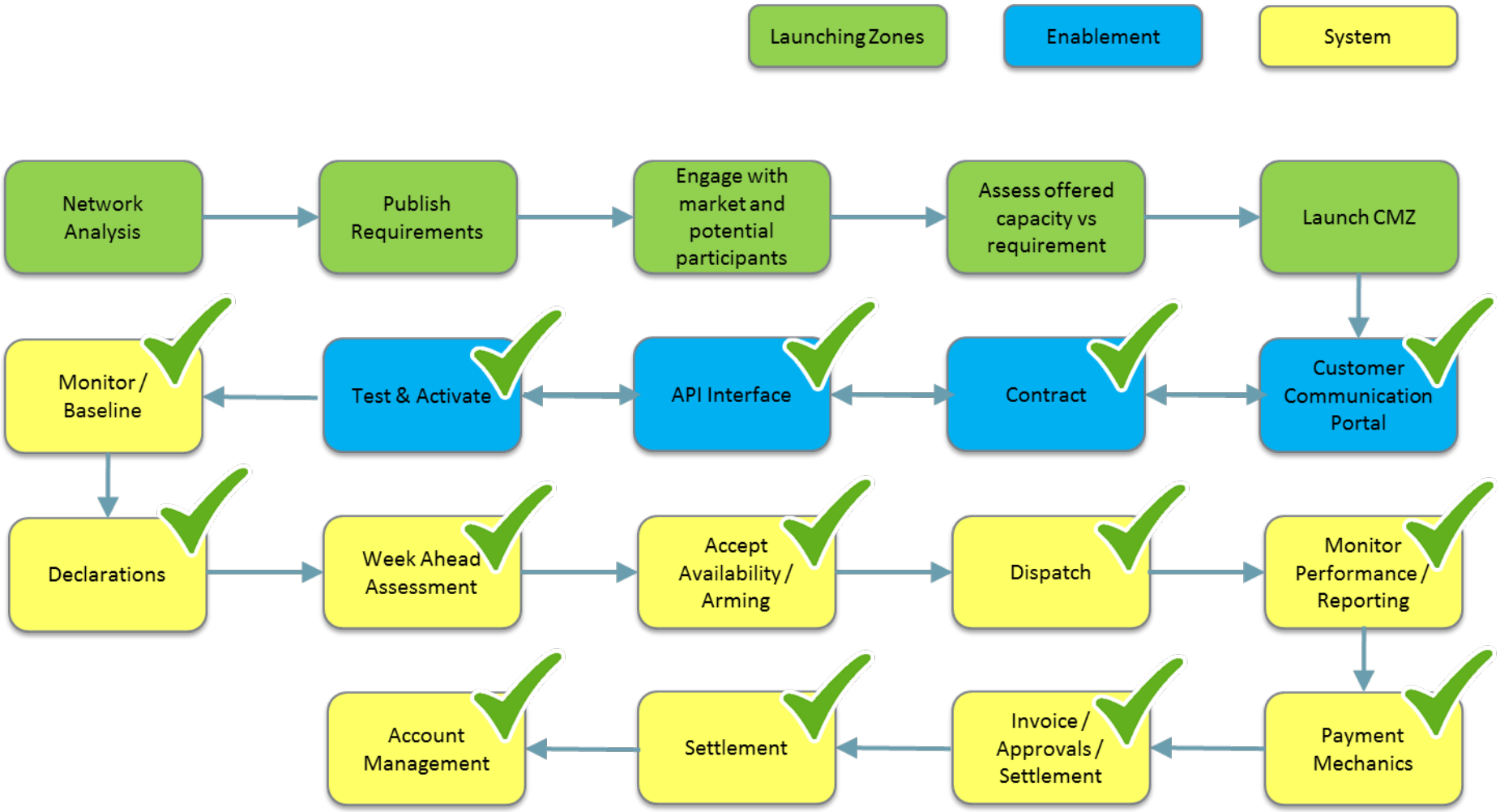


Central Control Console

- Cloud computing just needs a web connected PC and browser;
- Low cost from shared infrastructure;
- Rapid deployment to existing control room;
- Simple GUI;
- Integration to Network Management System for live dispatch.



Functionality & Process



Branding

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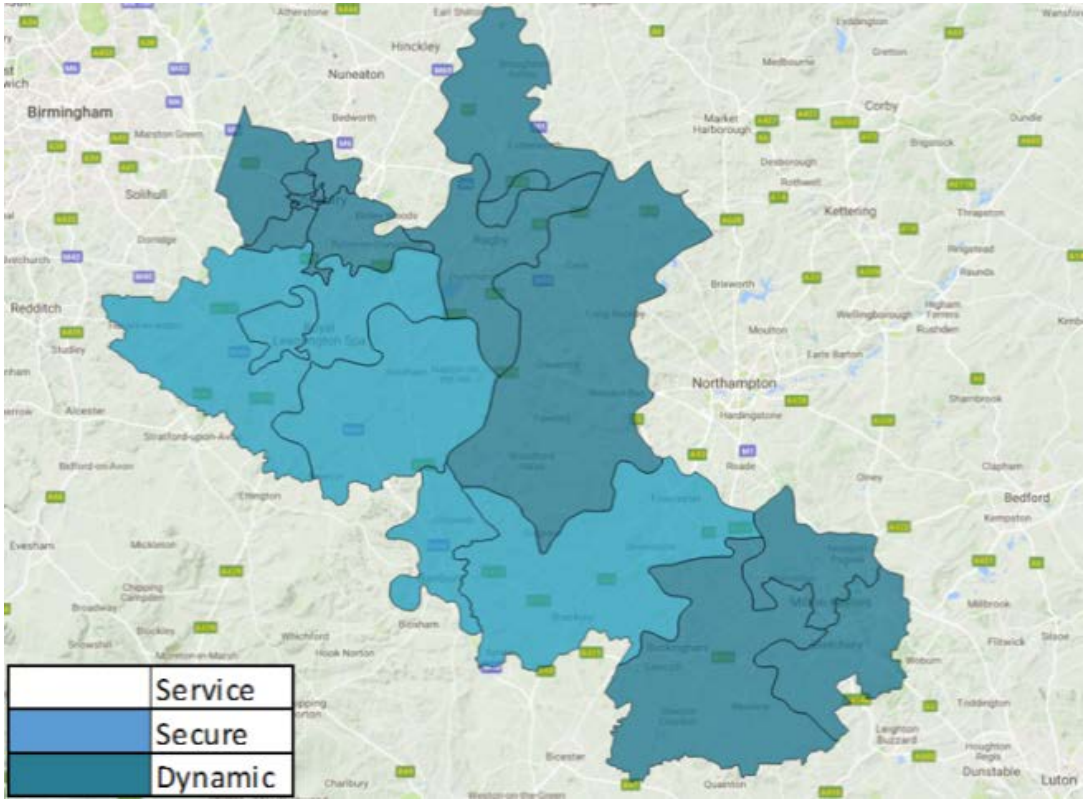
- Stand alone brand;
- Differentiate service procurement from main business enquiries and connections;
- Ease of sharing post trial .

Target Area

- Looked to recruit customers in 14 zones in the East Midlands;
- Along the M1-M40 corridor.



Recruitment Process & Customer Journey

- Focus on a simple process and ease of access;

Expression of Interest | **Preparation** | **Finalise and Test** | **Operate**

- EoI allowed for quick assessment of zone viability;
- Follow up processes aimed to get as much volume operational as possible;
- Testing and operation to verify the EOI.

Expression of Interest

- Initially ran EoI to asses viability of zones;
- Simple process aimed at understanding what was available in zones;
- Over 121MW of capacity responded across 69 sites;

	Total	Compliant	Potential	Non-Compliant	Out of Zone
Sites	69	34	23	4	8
MW	121.47	41.46	17.95	41.0	21.06

- 12 zones taken forward to full procurement.

Full Procurement

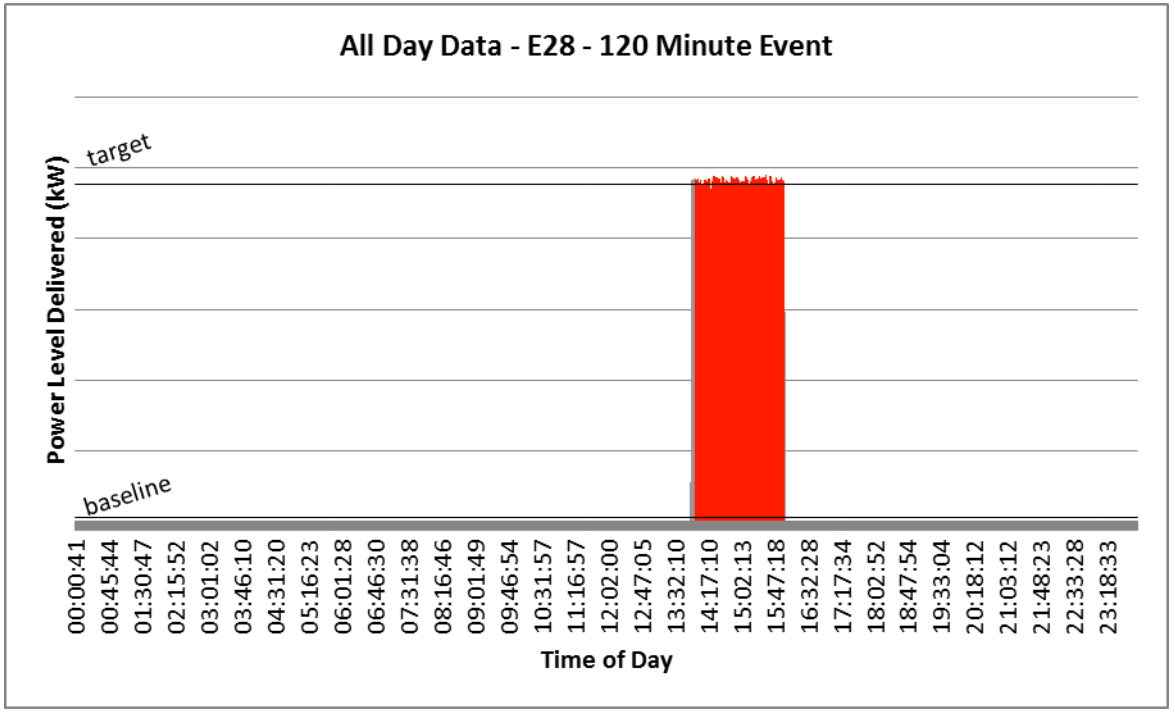
Required 3 simple tasks:

- Sign Contract;
- Provide more technical details;
- Build API.

- No fixed deadlines or maximum volumes to be as accessible as possible;
- 6 contracts signed;
- 3 sites live, 2.299MW;
- Significant challenge converting interest into operational MW.

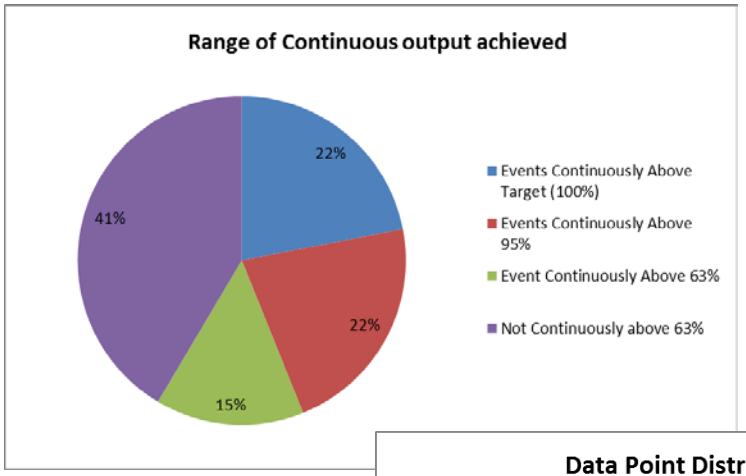
Trial Results

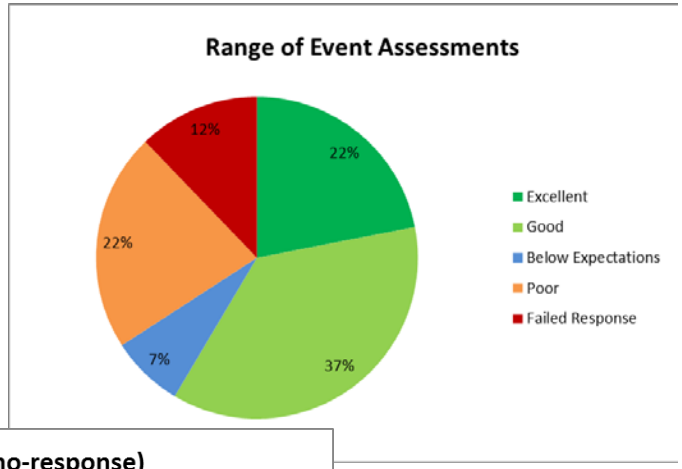
- Limited by recruitment;
- 44 events over the trial period;
- 97% data reliability, better during events;

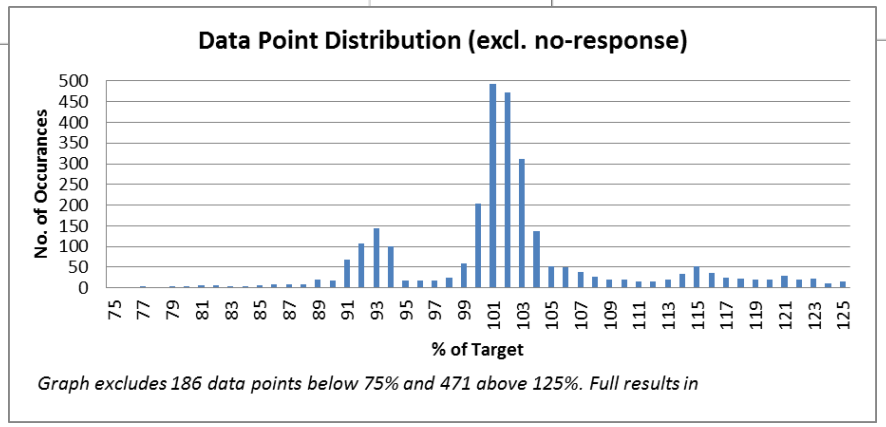


Trial Results

- General performance was good. Although it depends on how you quantify it;





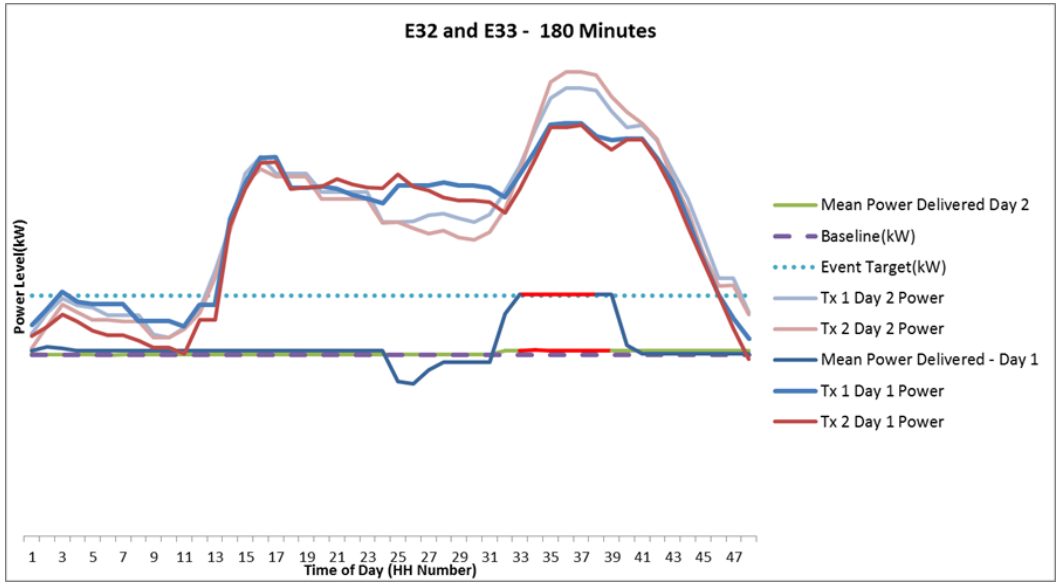


Trial Results

- Various types of events;

No response	Slow ramp /Early drop	Under Response	Mid-event dip(s)
5	7	4	5

- Some visibility on SCADA depended on location.

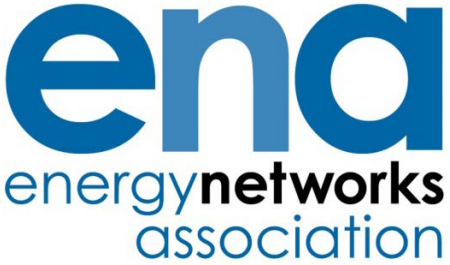


Project Learning

- Role of DNO in revenue stacking;
- Value of improved information;
- New network use cases;
- Significant interest in services, however sign ups have taken longer than expected;
- Positive feedback on service structures, however some issues with the freedom given;
- Trial fatigue amongst participants;
- Busy market place;
- API set up has been taken positively and is a simple way of interfacing;
- Internal processes and systems are simple to use;
- Impacts of multiple calls on baselining;

Project Outcomes

- Project took a waterfall approach to learning delivery;
- WPD have opened subsequent zones as part of BaU;
- Flexible Power continuing into the main business;
- Much of the learning has been built on and processes improved;
- Has also fed into the Open Networks project and wider industry processes;
- Learning has been shared with other DNOs bilaterally.



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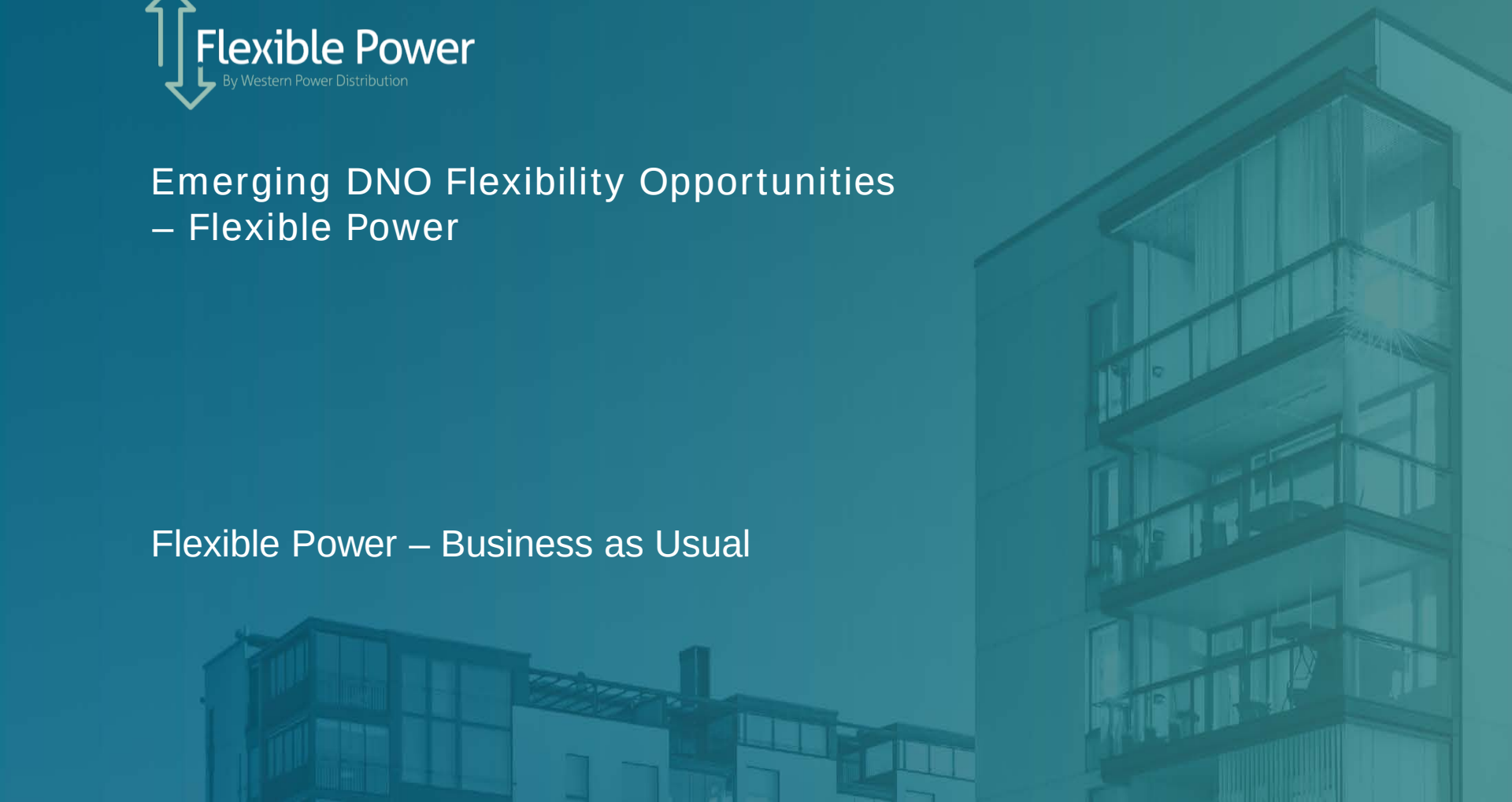
Emerging DNO Flexibility Opportunities – Flexible Power

Flexible Power – Business as Usual



Flexible Power – Business as Usual

- **Flexible Power 2018 Programme**
- **Flexible Power 2019 Programme**
  - New zones – Procurement cycle 1
  - Next steps – Procurement cycle 2

- **How to participate**
  - Signposting our flexibility locations
  - Useful tools
  - Registration of interest

- **Contractual summary**
- **Pricing strategy**

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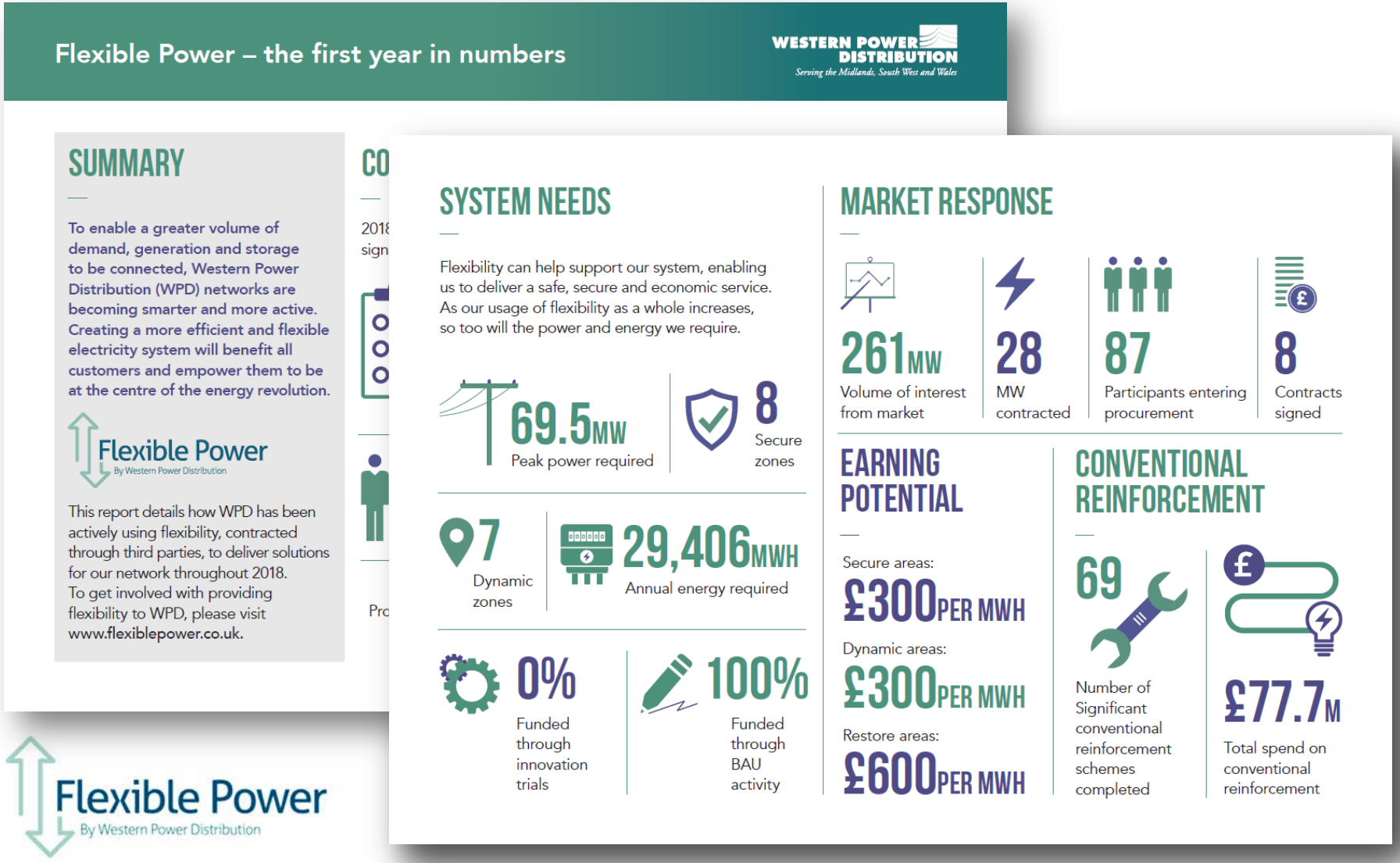
Flexible Power 2018 Programme



Flexible Power – the first year in numbers

WESTERN POWER DISTRIBUTION
Serving the Midlands, South West and Wales

SUMMARY

To enable a greater volume of demand, generation and storage to be connected, Western Power Distribution (WPD) networks are becoming smarter and more active. Creating a more efficient and flexible electricity system will benefit all customers and empower them to be at the centre of the energy revolution.

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This report details how WPD has been actively using flexibility, contracted through third parties, to deliver solutions for our network throughout 2018. To get involved with providing flexibility to WPD, please visit www.flexiblepower.co.uk.

CO

2018
sign

Pro

SYSTEM NEEDS

Flexibility can help support our system, enabling us to deliver a safe, secure and economic service. As our usage of flexibility as a whole increases, so too will the power and energy we require.

69.5MW Peak power required

8 Secure zones

7 Dynamic zones

29,406MWH Annual energy required

0% Funded through innovation trials

100% Funded through BAU activity

MARKET RESPONSE

261MW Volume of interest from market

28 MW contracted

87 Participants entering procurement

8 Contracts signed

EARNING POTENTIAL

Secure areas:
£300PER MWH

Dynamic areas:
£300PER MWH

Restore areas:
£600PER MWH

CONVENTIONAL REINFORCEMENT

69 Number of Significant conventional reinforcement schemes completed

£77.7M Total spend on conventional reinforcement

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https://www.westernpower.co.uk/news-and-events/latest-news/flexible-power-first-year-numbers

Flexible Power 2019 Programme

- **2019 will see procurement of 120+ MW of Flexibility resources**
- **Formal Tender process**
  - Alignment with best practice as identified through Open Networks
  - Compliance with procurement law
  - 2 procurement cycles
    - 4th Feb – 13th May
    - 1st July – 7th Oct

- **Visibility on Piclo and the Cornwall LEM.**
  - Providers with assets uploaded to these platforms will be able to identify which of their assets are within a Constraint Managed Zone (CMZ)
  - If these platforms identify a asset/CMZ match, the provider will then need to continue the process directly with Flexible Power.

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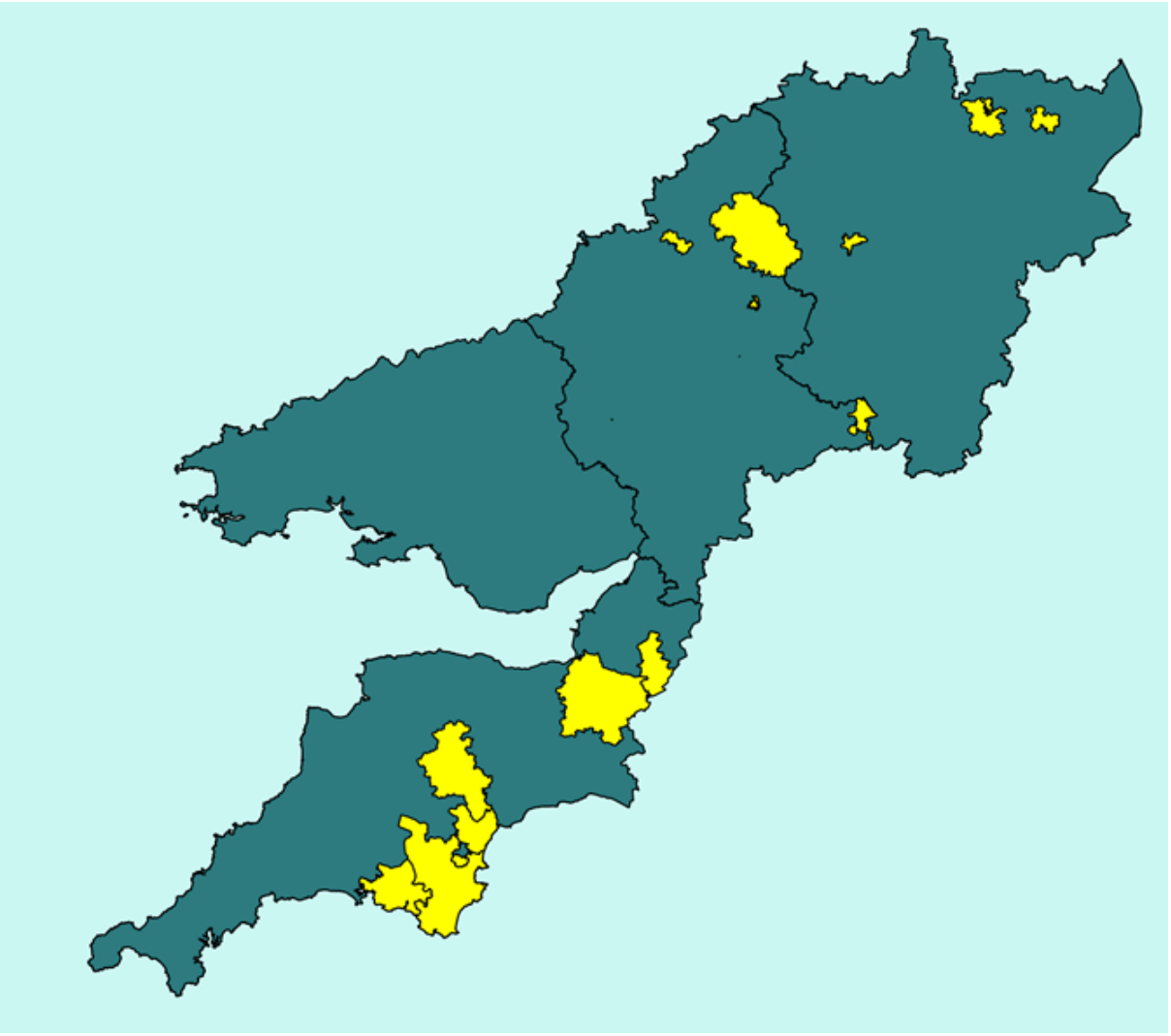
New zones – Procurement cycle 1

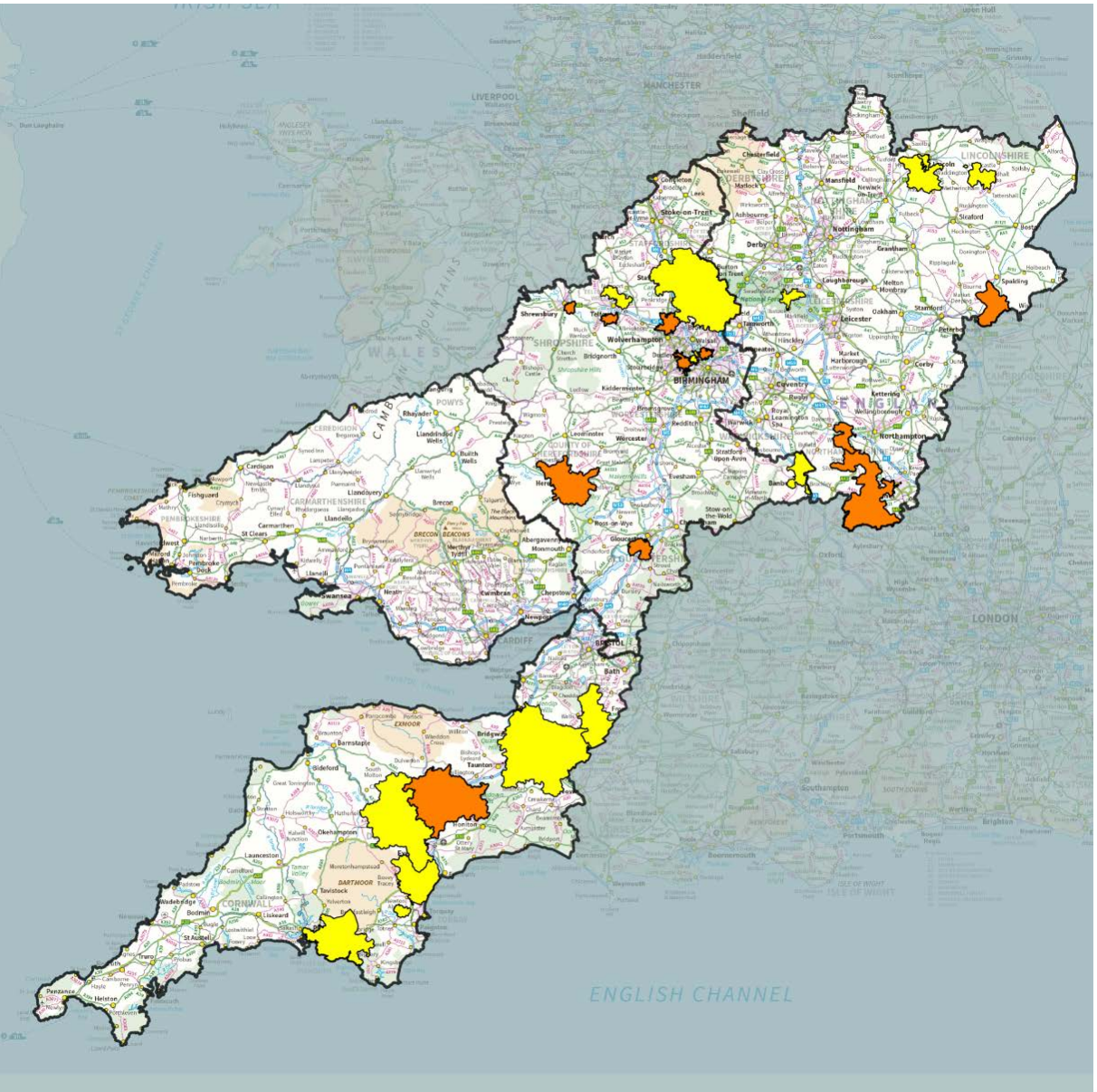
Zone Name	Zone Location	Applicable Products	MW Peak	Season
Banbury	Banbury, Oxfordshire	Dynamic & Restore	6.9	Summer
Bridgwater/Street	Bridgwater, Somerset	Secure & Restore	4.5	Summer
Donnington	Donnington, Ledbury	Dynamic & Restore	0.5	Winter
Lincoln/Beevor Street	Lincoln, Lincolnshire	Dynamic & Restore	2.6	Winter
Lincoln/North Hykeham	Lincoln, Lincolnshire	Dynamic & Restore	3.7	Winter
Mantle Lane	Coalville, Leicestershire	Dynamic & Restore	4.6	Winter
Plymouth/South Hams 1 & 2	Plymouth & South Hampton, Devon	Dynamic & Restore	35.8 (71.6)	Summer
Newton Abbot	Newton Abbot, Devon	Dynamic & Restore	16.4	Winter
Radstock	Radstock, Somerset	Dynamic & Restore	4	Winter
Woodhall Spa	Woodhall spa, Lincolnshire	Secure & Restore	0.5	Winter
Rugeley SGT	Rugeley, Staffordshire	Secure & Restore	12	Winter
Smethwick	Smethwick, Birmingham	Secure & Restore	1.9	Winter

New zones – Procurement cycle 1



- Twelve CMZs with peak requirements totalling 93.4MW.
- Five were existing CMZs with ongoing requirements.
- Seven were new CMZs.
- Procurement concluded on 13th May.
- Results will be published 20th May.

Next steps – Procurement cycle 2

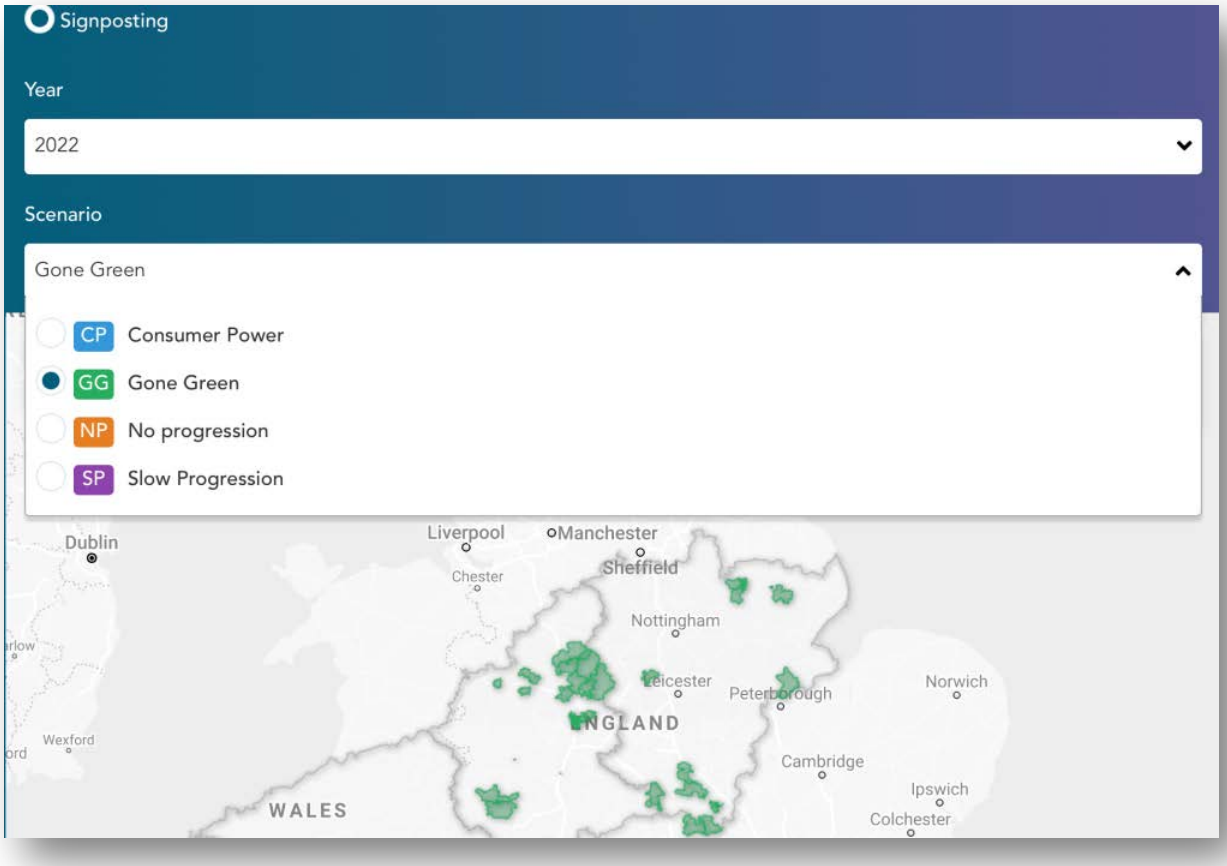


- Formal announcement of zones on 1st July.
- Will include any zones from cycle 1 that still have un-fulfilled requirements.
- Also to include 3 zones from our 2018 programme;
  - Exeter
  - Rugby
  - Bletchley
- Along with some additional new zones to be announced.
- Some are already being signposted, orange areas on map.

How to Participate - Signposting

We signpost our requirements up to five years out across our network on the WPD website:

www.westernpower.co.uk/network-flexibility-map



How to Participate - Signposting

2021

Scenario

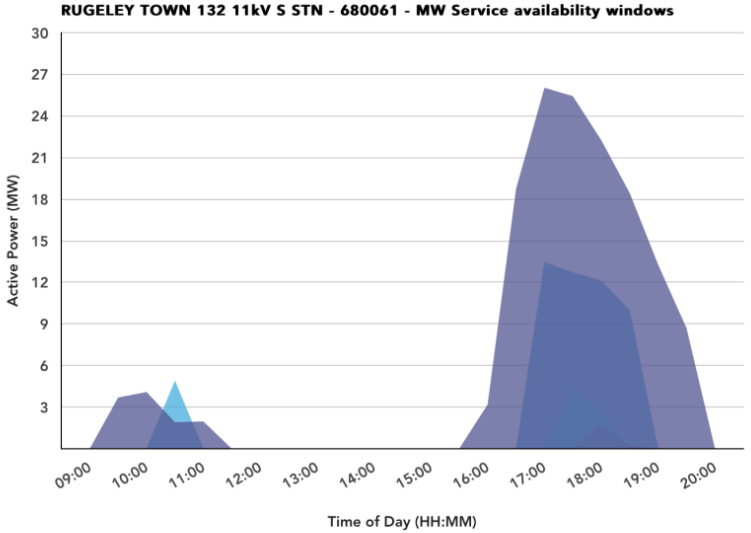
WPD BEST VIEW

Substation name	RUGELEY TOWN 132 11kV S STN
Substation number	680061
Status	Live Procurement
CMZ reference	CMZ_WM_0001
CMZ name	Rugeley SGT

CMZ_WM_0001 - Availability Windows.csv

CMZ_WM_0001 - 2021 - WPD BEST VIEW - Availability Windows.pdf

Expand View



Legend / MWh Utilisation

January		24.1 MWh
February		6.36 MWh
November		13.98 MWh
December		261.36 MWh

Services required

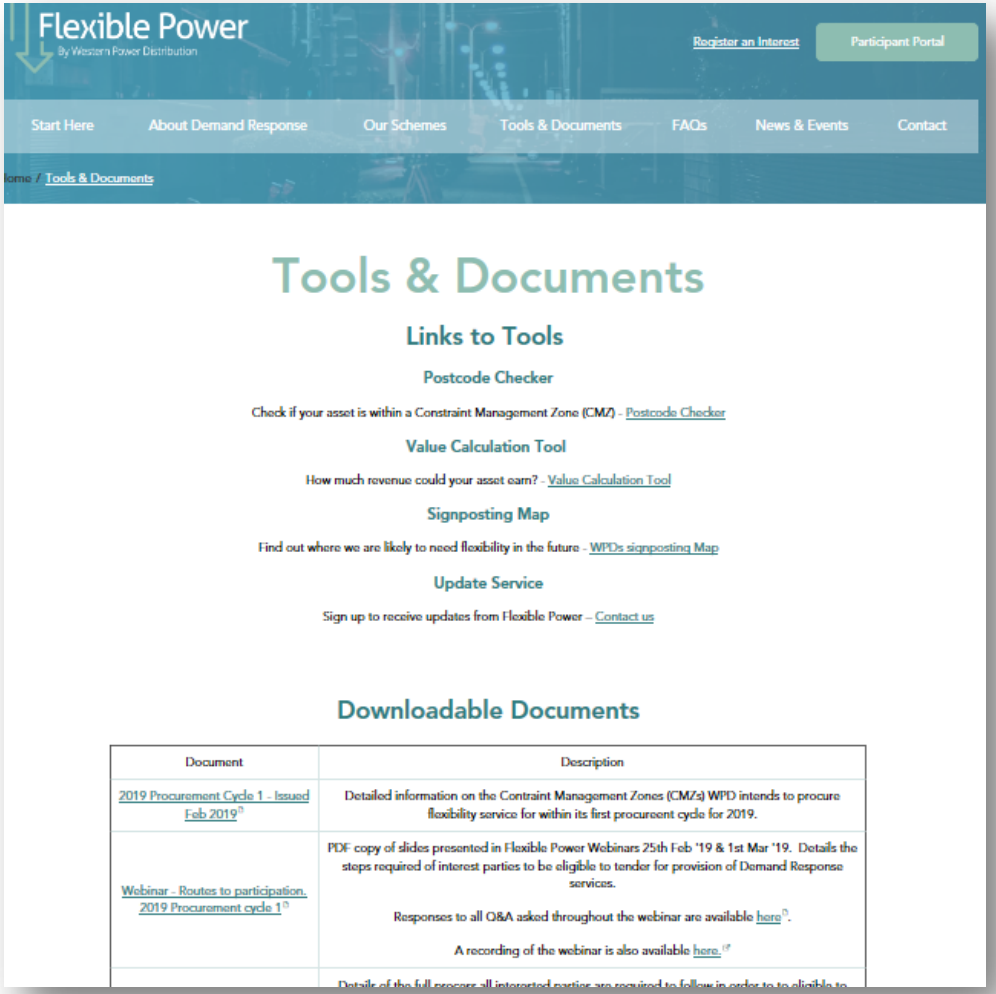
Mon, Tue

Service overview

Demand turn down and/or generation turn up would benefit this area. The Secure and Restore products are available in this zone through Flexible Power. For more information visit www.flexiblepower.co.uk

How to Participate – Useful tools

- View the location of our flexibility zones and download supporting information: www.flexiblepower.co.uk/our-schemes
- Check if your site is within a CMZ: www.flexiblepower.co.uk/postcode-checker
- Estimate your sites potential earnings: www.flexiblepower.co.uk/value-calculator
- Register to join our purchasing register: https://rfxxp.westernpower.co.uk/ECE



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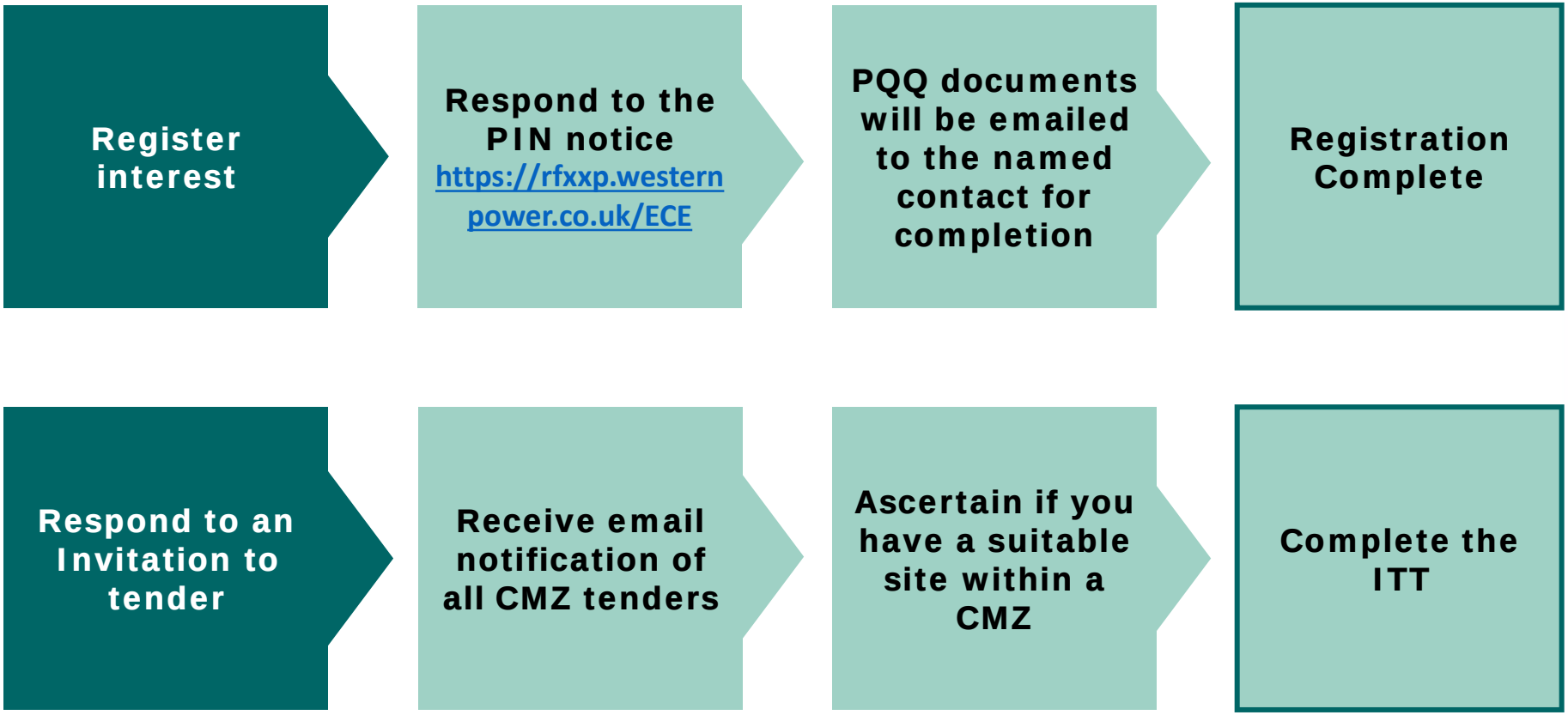
How to Participate – Register Interest



Contractual summary

- The CMZ contract is available to download from the tools and documents page: www.flexiblepower.co.uk/tools-and-documents

- Key features are:
    - Stackable with other revenue streams
        - No exclusivity clauses.
        - No obligation to provide availability.
    - No penalties for non-delivery, only loss of revenue through underperformance clawback.
    - Shared & Capped Liabilities

- The contract award duration is for 1 year.
- The option to extend the contract into further years will be offered if the CMZ continues to have ongoing requirements.
- After 1 year, participants within ongoing CMZs will not need to re-tender.

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Pricing Strategy

We have calculated a maximum fixed price for flexibility within our **Constraint Management Zones** (CMZs) based on cost efficiency.

Our fixed prices are currently operating at:

	Arming	Availability	Utilisation
Secure	£125/MWh	N/A	£175/MWh
Dynamic	N/A	£5/MWh	£300/MWh
Restore	N/A	N/A	£600/MWh

As the market grows and evolves we will move towards market led pricing, fixed prices will only be applicable to CMZs that do not have multiple flexibility providers with a total capacity that exceeds the CMZs needs.

Where capacity exceeds the CMZs needs, tendering parties will also be asked to provide their ‘best offer’ per MWh. The ‘best offer’ price will be used to determine a clearing price.

The clearing price will be deemed to be the CMZ s best market price, and this price will then be offered to all tendering parties.

Pricing strategy which provides stability in early markets but also allows for price discovery in mature markets

THANKS FOR LISTENING

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