WPD INNOVATION
Transforming the electricity network

WPD's Innovation Showcase

1st December 2020

westernpower.co.uk/innovation

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Feedback Question 1

What is your background?

- Consultancy
- Academia
- DNO
- Community Group
- Manufacturer
- Other

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Introduction to WPD Innovation

Yiango Mavrocostanti
Innovation Team Manager

Outline

- WPD – Who we are
- Why do we need to innovate?
- Our values and commitments
- Innovation Strategy Priority Areas
- How do we innovate?
- Our current portfolio of projects
- Call for ideas

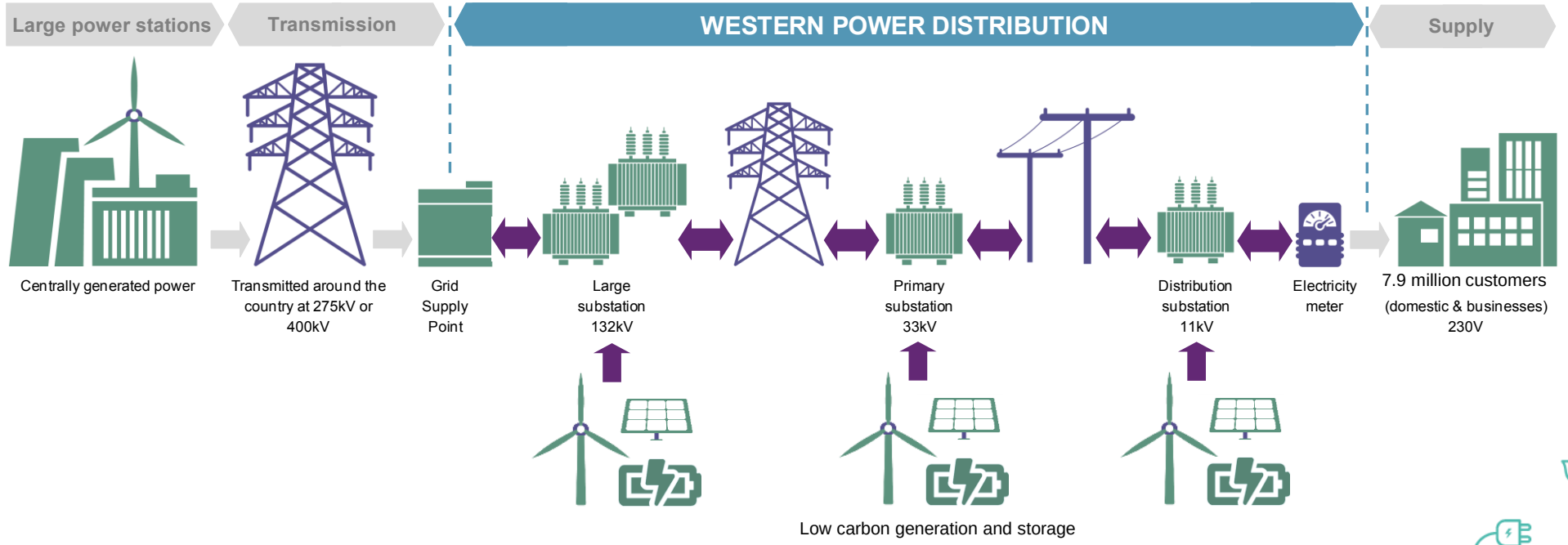
WPD - Who we are

- We operate the local electricity network, distributing power to 7.9 million homes & businesses
- Covering the East and West Midlands, South Wales and South West England

Network assets	
Cables and overhead lines	225,000 km
Poles and towers	1,389,000
Transformers	188,000

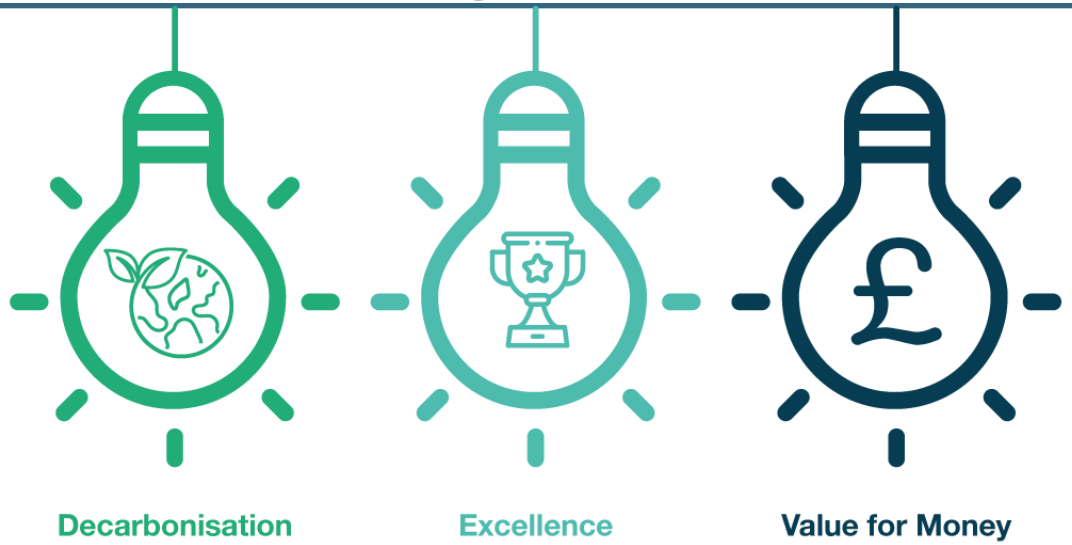
Why do we need to innovate?

- Transitioning from a Distribution *Network* Operator (DNO) to a Distribution *System* Operator (DSO)



Our Innovation Strategy & Values

We are a team of engineers dedicated to implementing our Innovation Strategy



We identify problems, find solutions and trial them through our projects

We aim to be a main contributor to decarbonisation

We are passionate about using our innovation funding the best way possible and providing value for money

We want to be working with the best people to achieve excellence together

Our Commitments

- ✓ We are committed to overcoming the barriers to the energy transition.
  - ✓ We will continue to focus on finding novel ways of efficiently and effectively transforming our network.
    - ✓ We will continue to develop new technologies, commercial solutions and standards to make the most out of our existing network.
      - ✓ We will work with our communities to understand how best we can support our vulnerable customers and ensure that no one is disadvantaged.

Our Priority Areas

- Decarbonisation and Net Zero
- Heat
- Transport
- Communities and Consumer Vulnerability
- Data

How we innovate

Generating ideas:

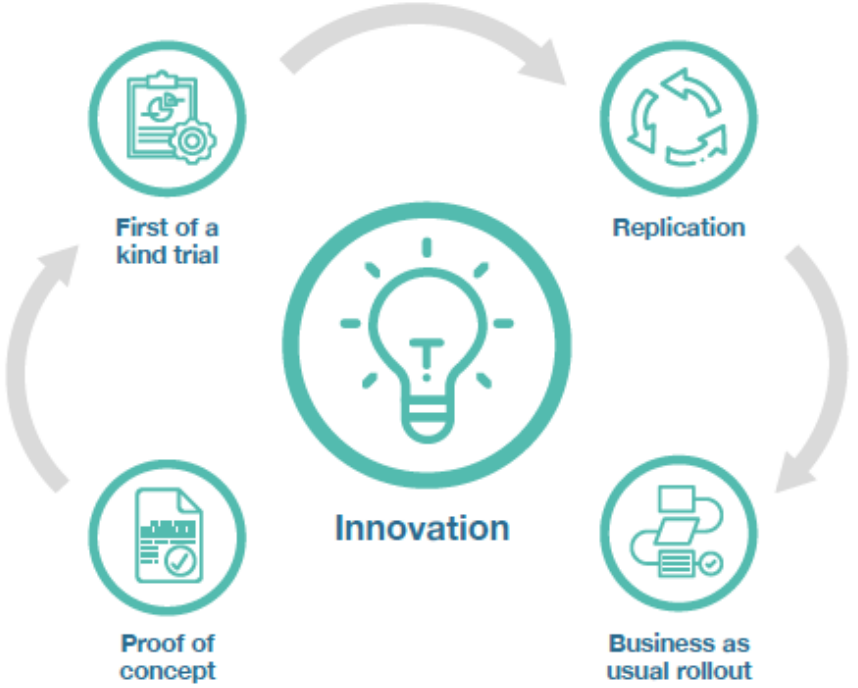
- We run **external calls** for ideas for projects.
- We **involve our experts** within the business.
- We **collaborate** with industry institutions.

Assessing ideas:

- We assess based on the level of **risk and benefits**.
- We determine whether projects align with **Ofgem's funding criteria**.

Funding projects:

- Network Innovation Allowance (NIA)
- Network Innovation Competition (NIC)



Our Innovation Programme

DC Share

SHEDD

Harmonic Mitigation

Presumed Open Data

OpenLV

EDGE-FCLi

SEAM

ALARM

PNPQA

Virtual Monitoring Data

MADE

OHL Power Pointer

Electric Nation - PoweredUp

Take Charge

EFFS

LTE| Connecting Futures

Future Flex

NEAT

IntraFlex

ARC Aid

Coordination of ANM & Markets

Our timelines and process

- Submit your ideas using our Google Form
- Submission Form will close at 11.59pm on 8 Dec 2020.
- If you have any questions, reach out to us at wpdinnovation@westernpower.co.uk.
- If you have already submitted your idea through the ENA call, please do not duplicate it in this call for ideas.

WPD INNOVATION

Transforming the electricity network

WPD Innovation Overview

Yiango Mavrocostanti

Innovation Team Manager

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Primary Networks Power Quality Analysis

Steve Pinkerton-Clark

Innovation & Low Carbon Networks Engineer

Outline

- Project Overview
- The problems the project is trying to solve
- Project progress
- Key Learning
- What happens next

Project Overview

Partners: Nortech Ltd

Budget: NIA – 1.35m

Duration: 3 years

March 2018 – March 2021

PNPQA aims to reduce uncertainties around the power quality (PQ) within Primary Networks and facilitate increased integration levels of low carbon technologies (LCTs).

This will be achieved through implementing a monitoring and analysis system for assessing the PQ and harmonic content of waveforms in Primary Networks, verifying the accuracy of the Primary Network equipment used for PQ monitoring, and using modelling to predict the future PQ impacts of increased integration of LCTs.

Problems

- The impact of power electronic devices on the harmonics and power quality of primary networks is currently uncertain. As more and more low carbon technologies (LCTs) are connected with power electronic inverters, the effects on the network, moving forwards, are increasingly unclear.

- The harmonic content of waveforms and power quality (such as flicker, voltage sags and swells, voltage unbalance) within the primary network is not routinely monitored at present. However, WPD is now required to publish harmonic data in order to facilitate LCT connections.

Progress

- The project is currently in the third phase (Trial)
- Power quality data is being received from 46 communicating power quality monitors installed on the West Midlands licence area.
- Software to automate retrieval and analysis of PQ data has been completed;
- Analysis of the first 6 months of monitoring data from all sites is underway;
- The power system models for future-looking power system studies of the potential PQ impacts of increased LCTs have been enhanced to increase modelling fidelity, and initial power system studies are underway; and
- Follow-up VT testing at NPL (National Physical Laboratory) has been kicked off, to validate and extend the earlier testing done by the UoM (University of Manchester).

Key Learning

National Grid has reported that demand fell by up to 20%.

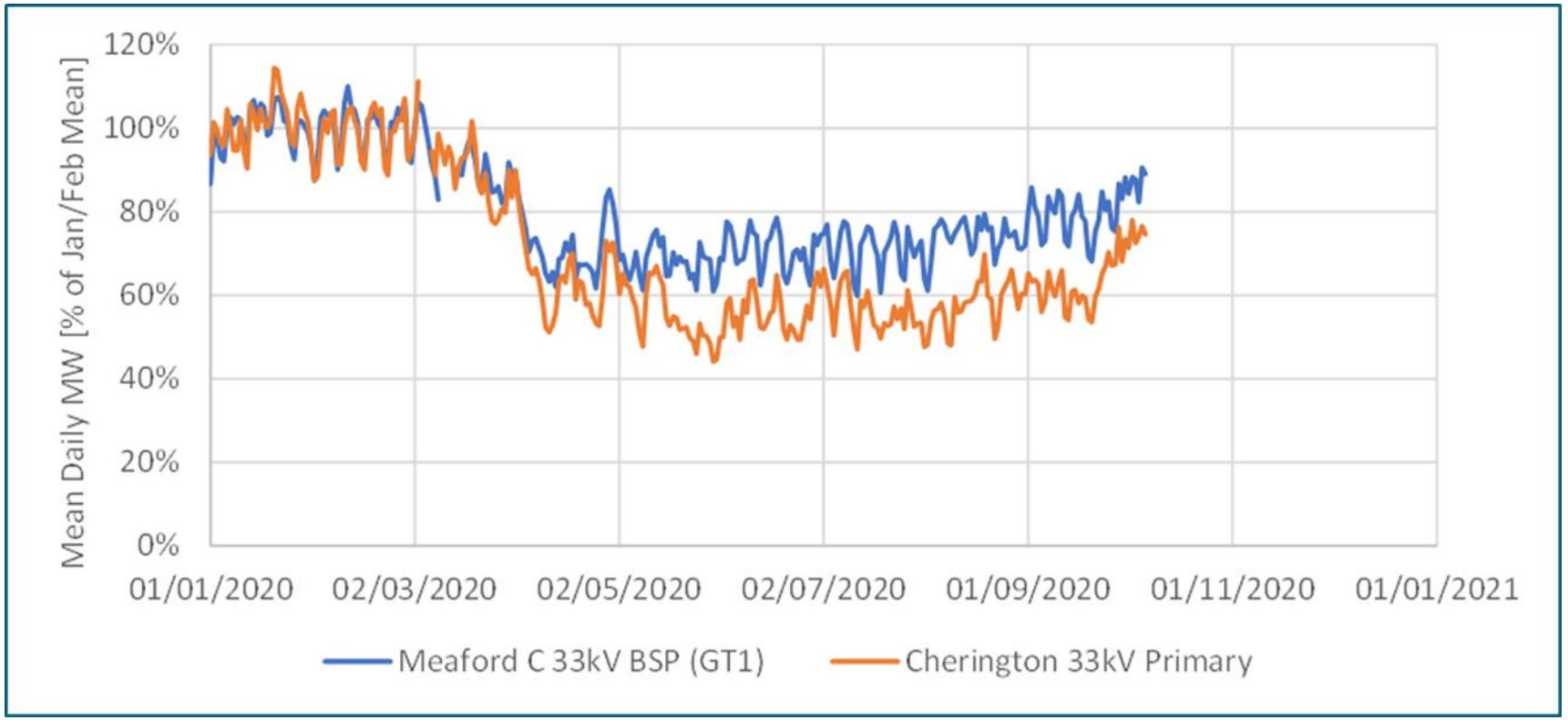
Changes in PQ due to the COVID-19 pandemic response.

It is clear to see that there is a significant (up to 40%) and sharp drop in power (demand) during March, followed by a slow rise, up to the September with an obvious lessening of the differentiation between weekday and weekend demand.

Coincident with the decrease in demand has been an increase in voltage THD (Total Harmonic Distortion).

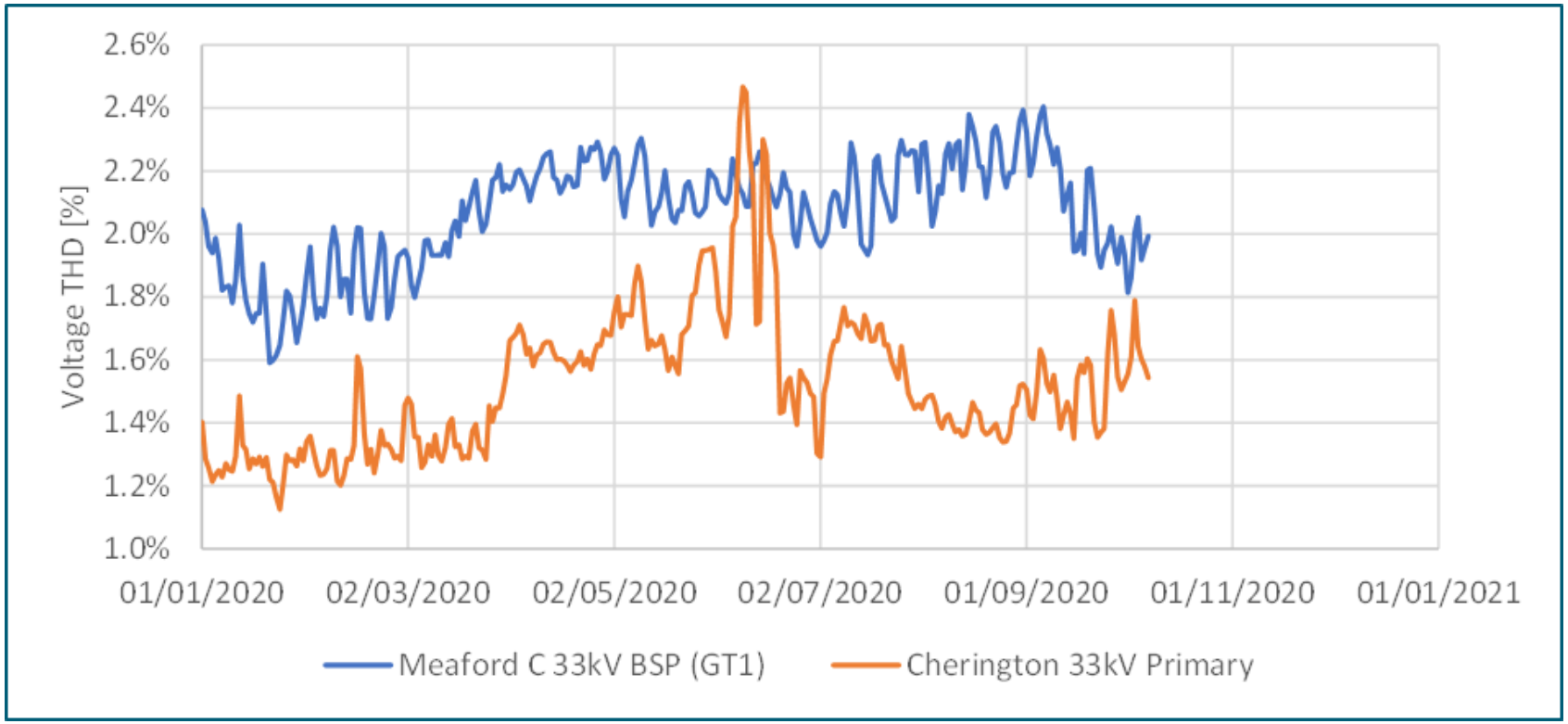
There is a sudden rise in THD at the start of lockdown, which is maintained until June.

Key Learning



Mean daily real power for 2020 to date at Meaford C BSP and Cherington 33kV Primary

Key Learning



Daily THD 95th percentile values for 2020 at Meaford C BSP and Cherington 33kV Primary

Next Steps

The PQ monitor trial will continue into the start of the next reporting period. Analysis tools will continue to be developed and will be applied to the first sixth months of data to produce an interim data analysis report, and then to a whole year of data to produce the final data analysis report.

The modelling and studies aspect of PNPQA will continue, with studies using existing PQ data and data from the PQ monitor trials taking place and being completed. A report analysing the findings from the studies will be produced.

The follow-up VT testing at NPL will continue and should be completed.

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Multi Asset Demand Execution (MADE)

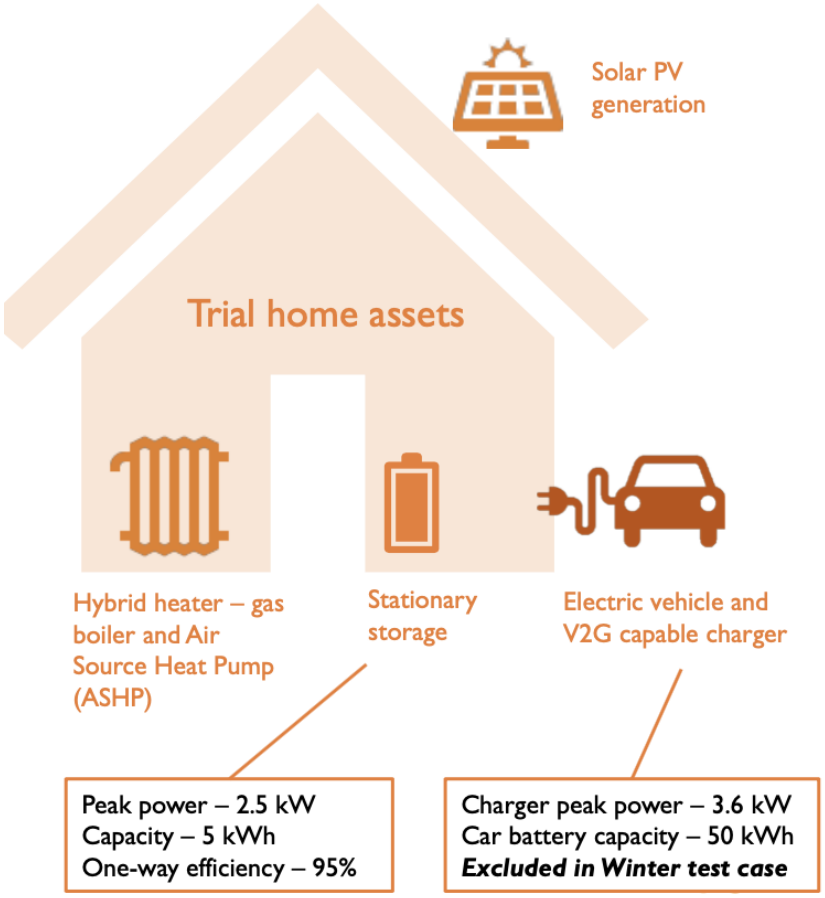
Matt Watson

Innovation & Low Carbon Networks Engineer

Outline

- Project overview
- Progress to date
- Key learning
- Next steps

Project Overview

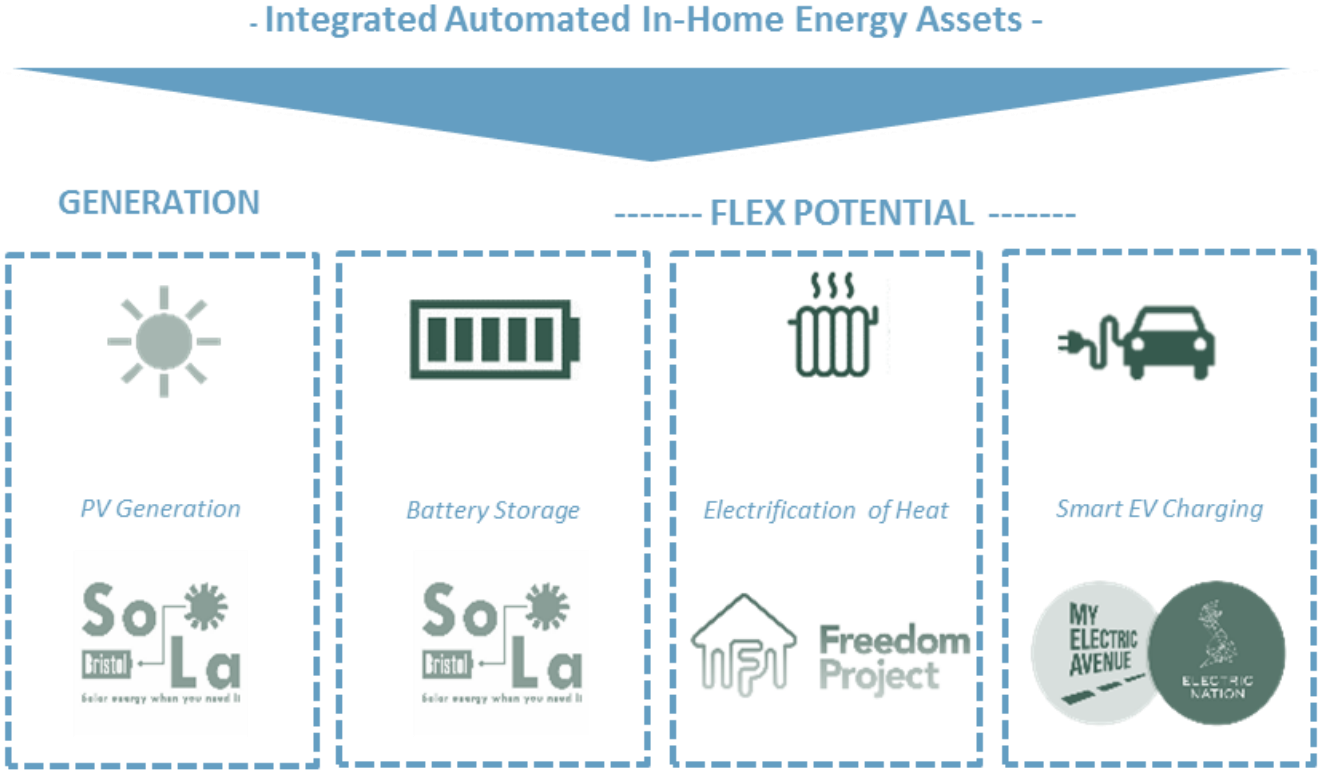


- MADE is a £1.6m Network Innovation Allowance project that was delivered by PassivSystems, supported by Everoze, Imperial College London and Delta EE;
- It runs between March 2019 and December 2020;
- The initial focus was on modelling work, building from learning in previous trial of single Low Carbon Technologies (LCTs);
- Then a 5 home technology trial was used to test the technology and validate the modelled learning.

The problem we are trying to solve

The MADE project investigates the implications of the deployment of the combination of:

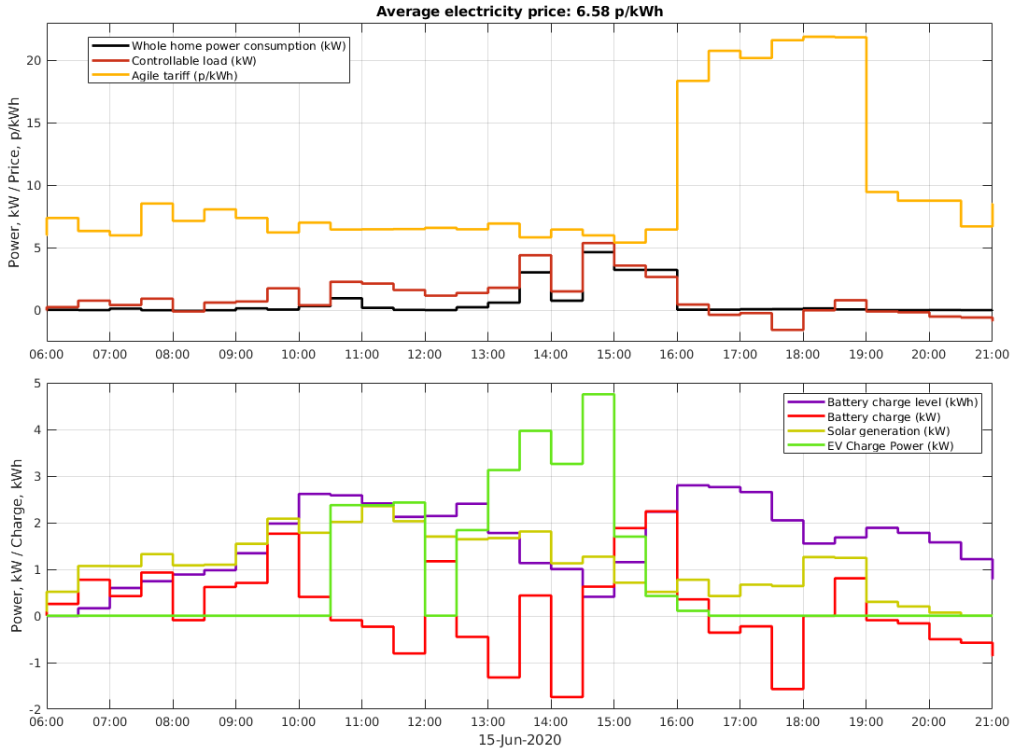
- Domestic Electric Vehicle (EV) charging;
- Hybrid heating systems (domestic gas boiler and air-source heat pump) or heat pump heating systems ; &
- Solar photovoltaic (PV) generation and storage.



These have previously been studied in isolation. The project aims to better understand the feasibility of managing and aggregating multiple LCT assets affordably within a home.

Progress to date

- The initial modelling was concluded and was complied into an interim report;
- The technology trial was successfully implemented. It was extended slightly (ending in early October) to mitigate the changes in behaviours seen due to COVID; &
- Partners have re-run analysis building in the trial learning. These have generally validated the initial modelling.
- This has all been compiled into a final report.



Key Learning

Key learning points are:

- Multiple LCTs can be managed effectively to maximise the value to the home owner and reduce the impact on the network;
- The controls respond well to variable time of use tariffs as well as direct Distribution Network Operator interventions. This can all be done whilst maintaining customer comfort;
- The potential benefits to individual customer are significant. The value could be up to £260 per annum; &
- There are significant wider system benefits to the enhanced levels of flexibility seen. These are in the order of billions per year and encompass a range of value streams (avoided generation build, avoided network reinforcement…). However some of these are difficult to monetise in the current system.

Next steps

The formal project is drawing to a close but there is scope for follow up work including:

- A large scale trial;
- Understanding how to leave no customer behind;
- Further developments of forecasting tools;
- Improving understanding of connected LCTs; &
- Review of the connection process for domestic LCTs.

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Feedback Question 2

Which platform would be your first choice to find information about our Innovation projects and activities?

- WPD Website
- LinkedIn
- Twitter
- Innovation Team Emails

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Harmonic Mitigation

Chris Harrap

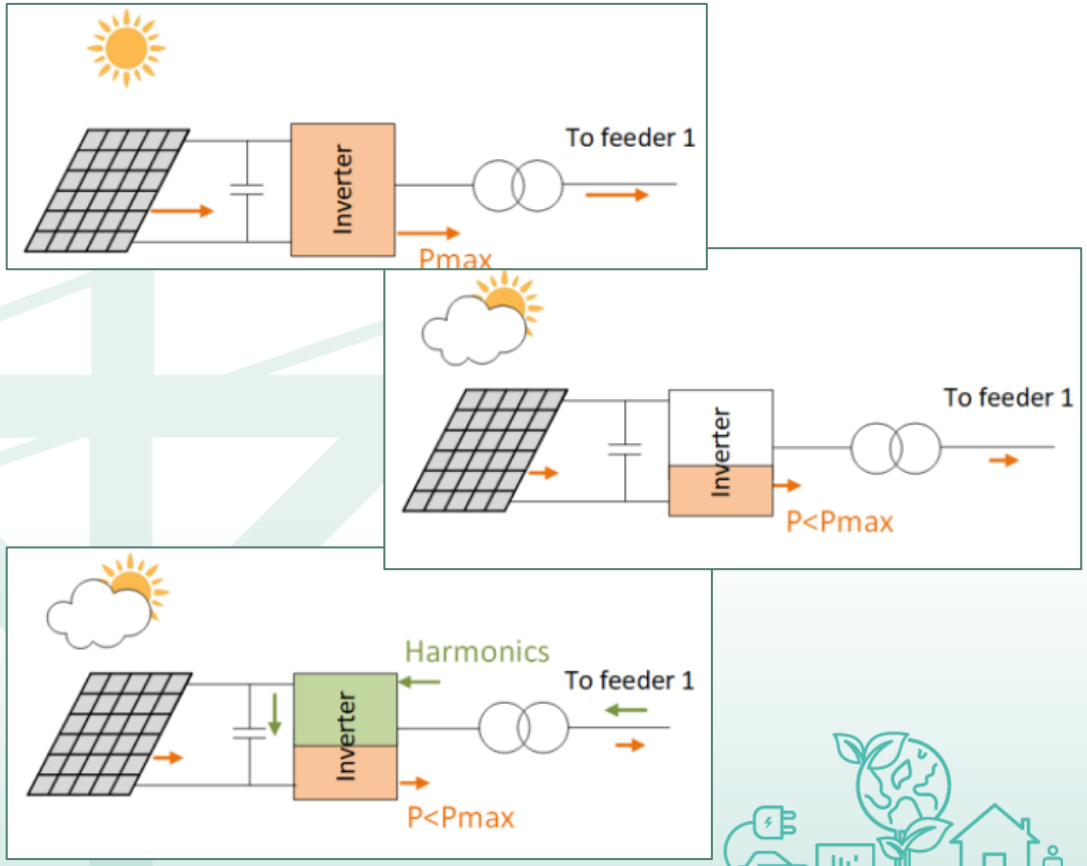
Innovation and Low Carbon Networks Engineer

Outline

- Introduction to Harmonics Mitigation Project
- Work Package 1 – Literature Review and System Modelling
- Work Package 2 – Algorithm Design (single inverter operation)
- Work Packages 3 and 4 – Future Work

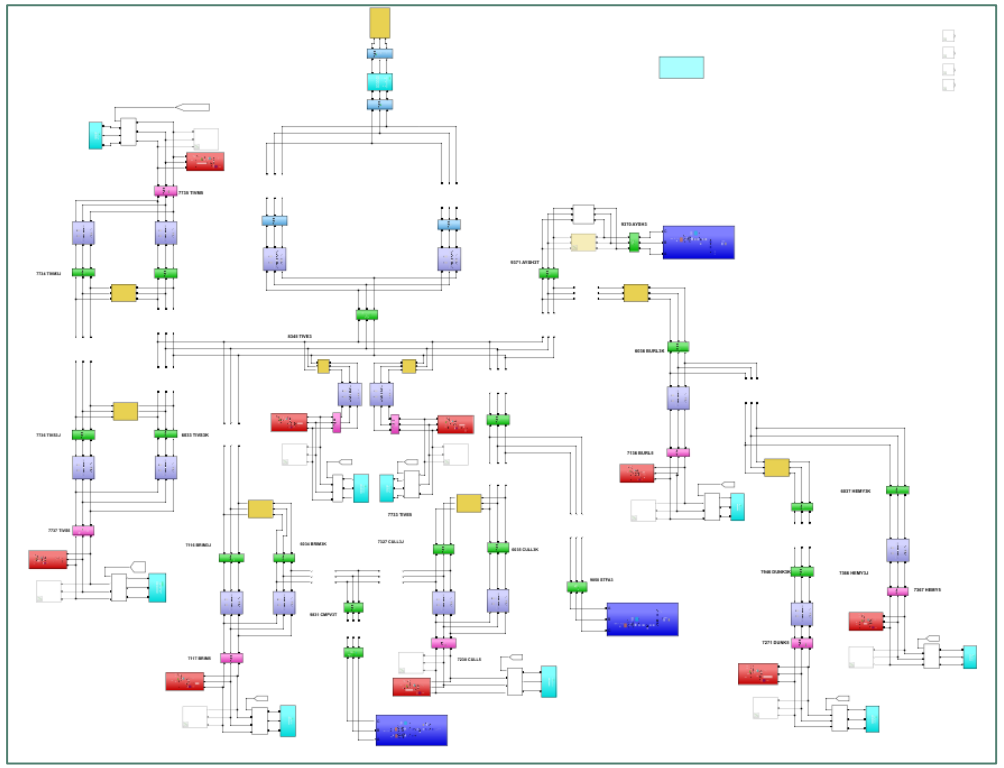
Intro to Harmonics Mitigation Project

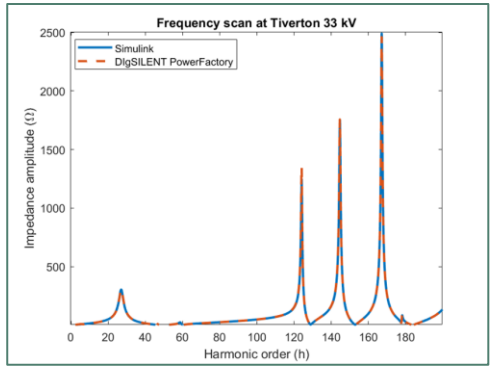
- Harmonics are a concern across UK electricity networks.
- Inverters, that are already connected, potentially have capability to assist.
- Project investigates how inverter capability and capacity could mitigate harmonics.
- Partnered with Swansea University & Power Systems Consulting, Oct 2019 – May 2022, £425k funded through Network Innovation Allowance.
- Delivered as 4 work packages

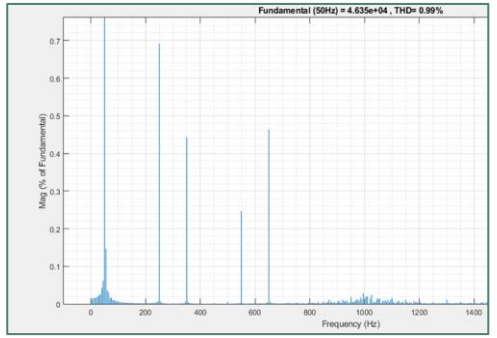


WP1 Key Outcomes and Learning

- Lit Review identified:
  - How converters can provide harmonic mitigation; and
  - Previous work in this field.
- Establishment of a modelling environment:
  - MATLAB/Simulink
  - Tiverton 33kV BSP network in SW England
  - Stage 1 – development of a validated network representation
  - Stage 2 - electromagnetic transient (EMT) simulation and analysis of the modelled network

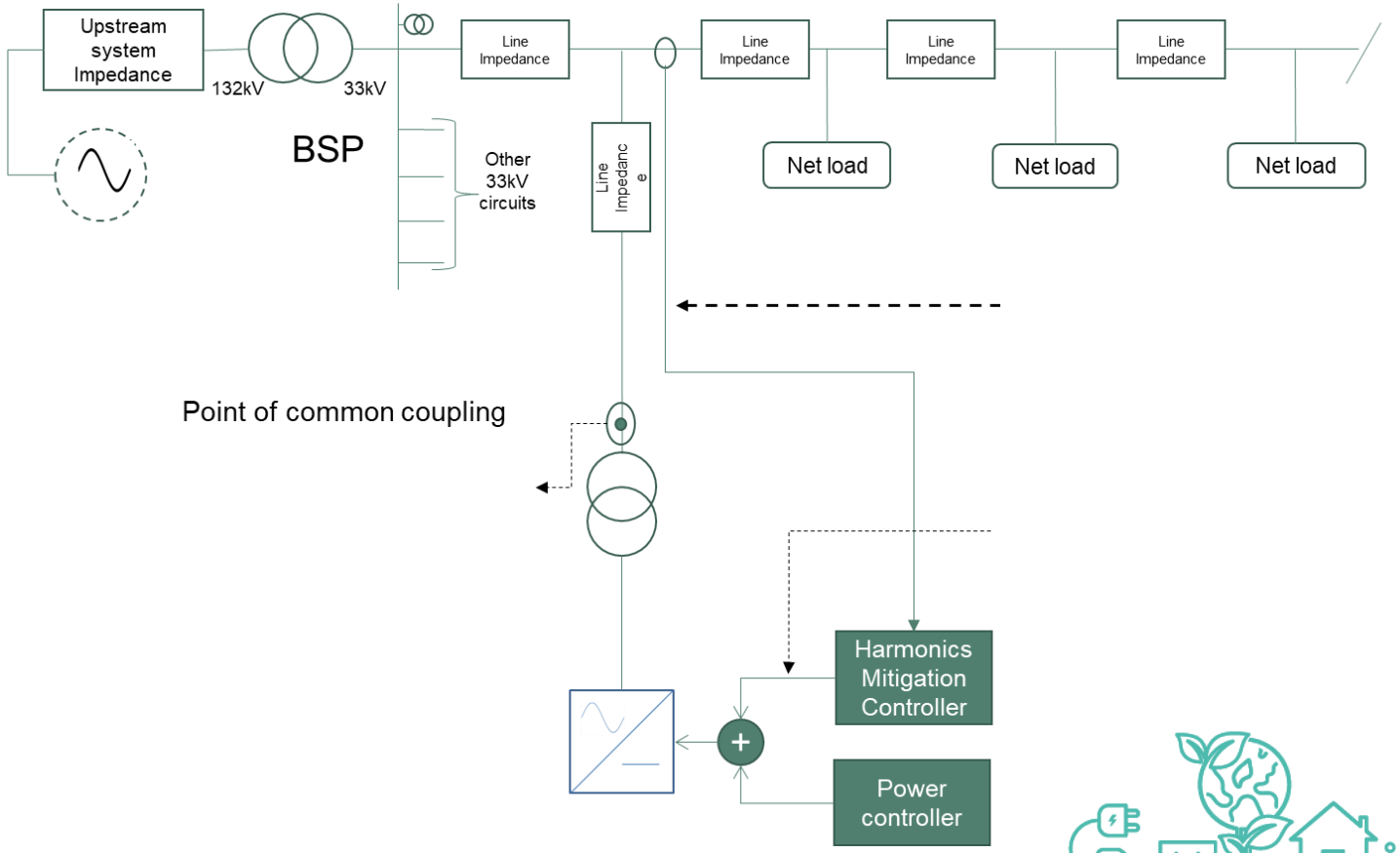






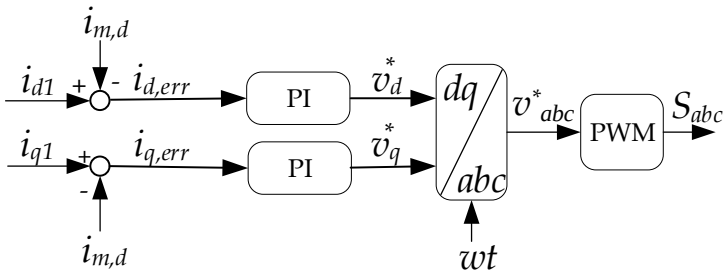
WP2 – Algorithm Outline

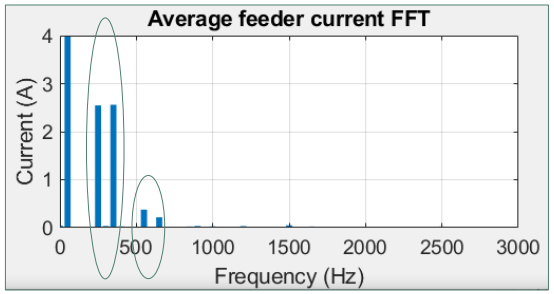
- System harmonic content derived from measurements
- A harmonics-related control signal is dynamically calculated
- The harmonic control signal is added to existing power control signal
- Resultant inverter output includes harmonic content in anti-phase to system harmonics

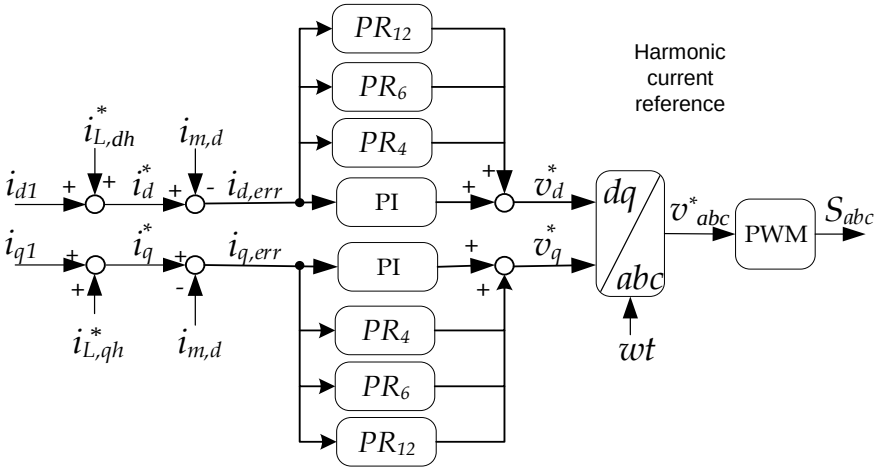


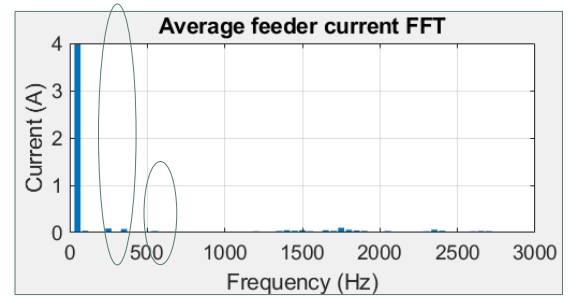
WP2 Key Outcomes and Learning

- WP2 was split into:
  - Development and testing of the control algorithm;
  - Evaluation of the impact of operating the algorithm.
- A control algorithm has been developed that:
  - Measures system harmonics & derives a harmonic control signal.
  - This signal influences the inverter output only when there is inverter capacity.
- During testing
  - This influence totally mitigates existing target harmonics when capacity exists.







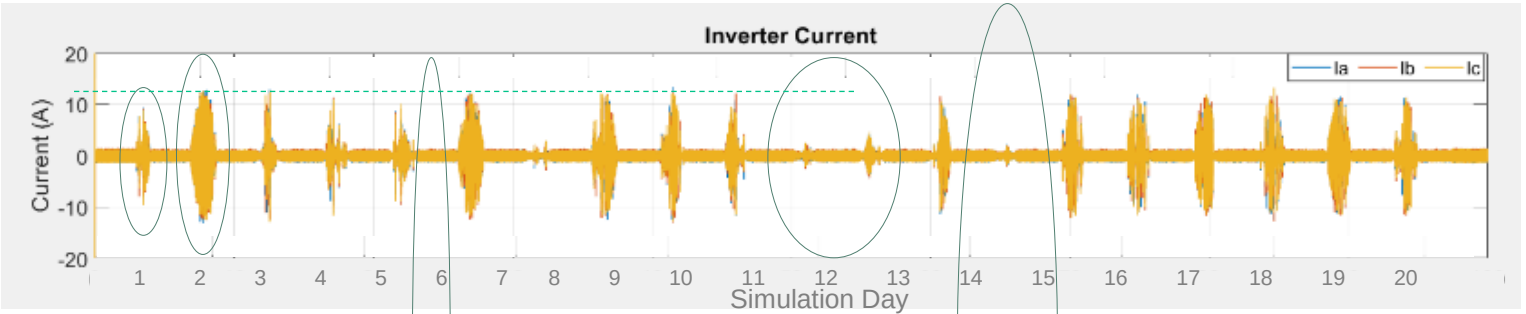


WP2 Key Outcomes and Learning

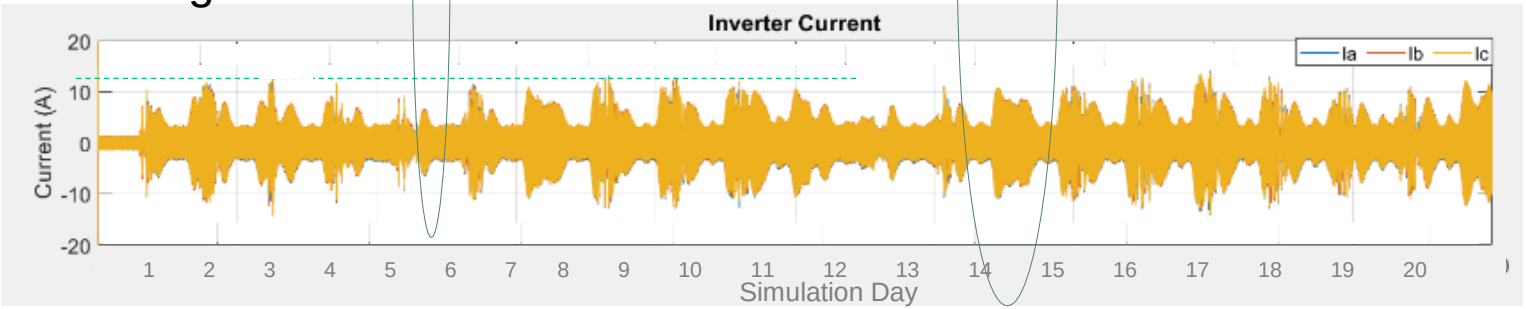
Traces of inverter current provide a good indication of harmonic mitigation activity:

- Without mitigation, variations are easily seen in intensity and duration of sunlight/inverter current
- With mitigation active the inverter is “busier”:

Without mitigation



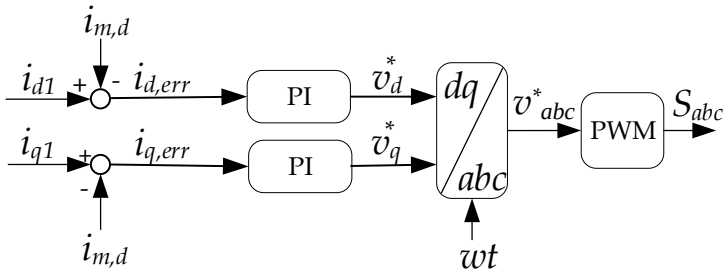
With mitigation

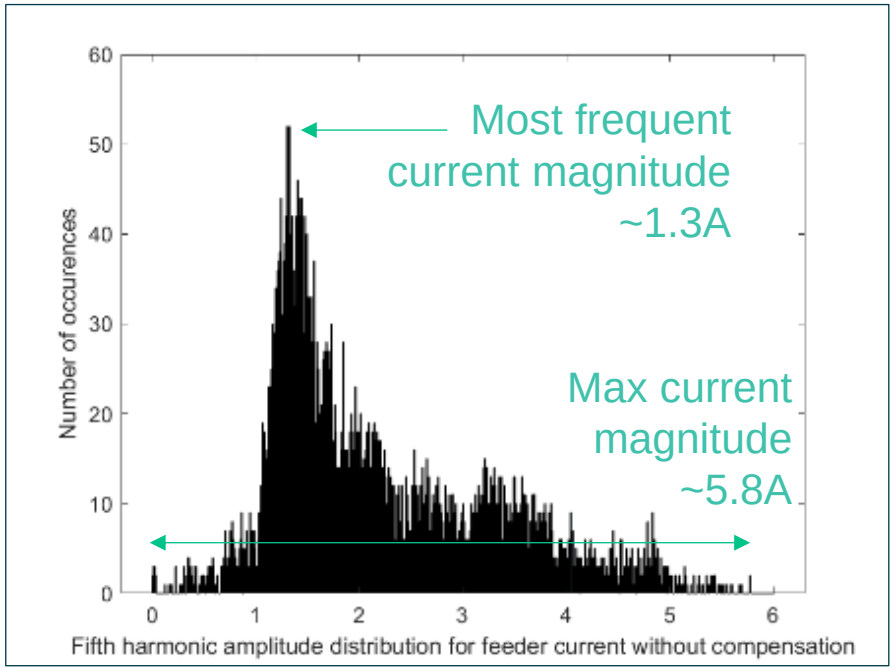


WP2 Key Outcomes and Learning

Analysis undertaken of feeder current during the 3-week operating period with no harmonic mitigation:

- the most frequent 5th harmonic current magnitude is ~1.3A
- currents of up to ~5.8A occur, though the number of instances diminishes as the current magnitude increases

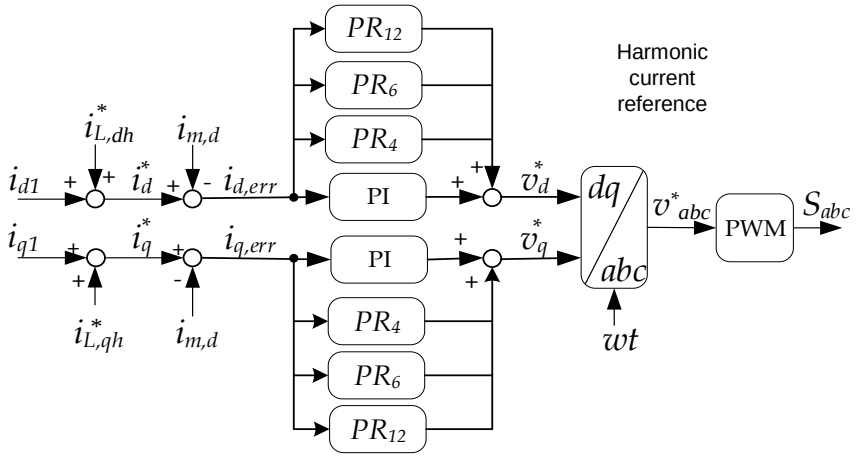


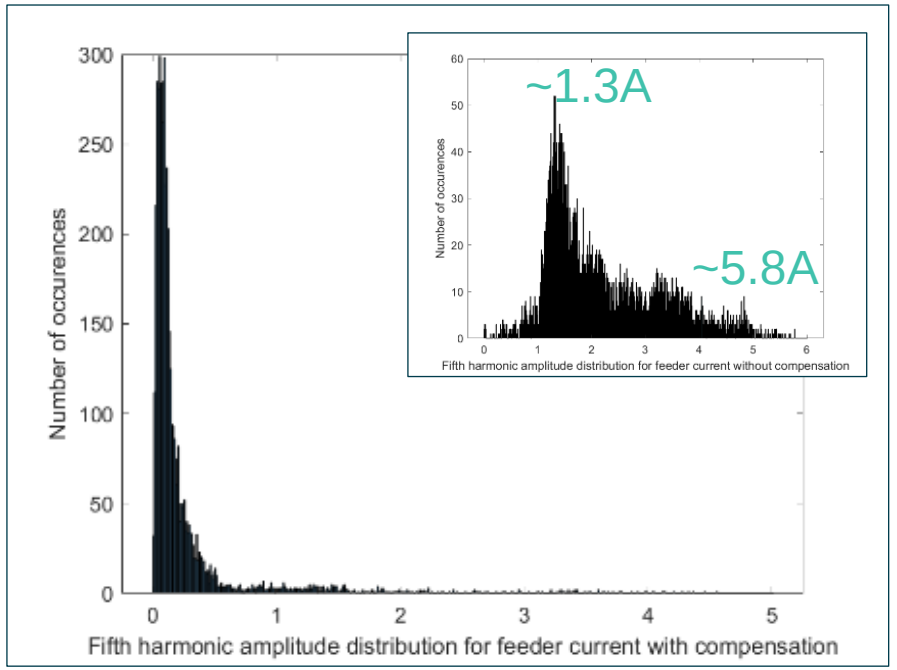


WP2 Key Outcomes and Learning

With harmonic action engaged:

- the most frequent 5th harmonic current magnitude becomes ~0.1A
- Only a very few instances of harmonic current above ~0.5A occur



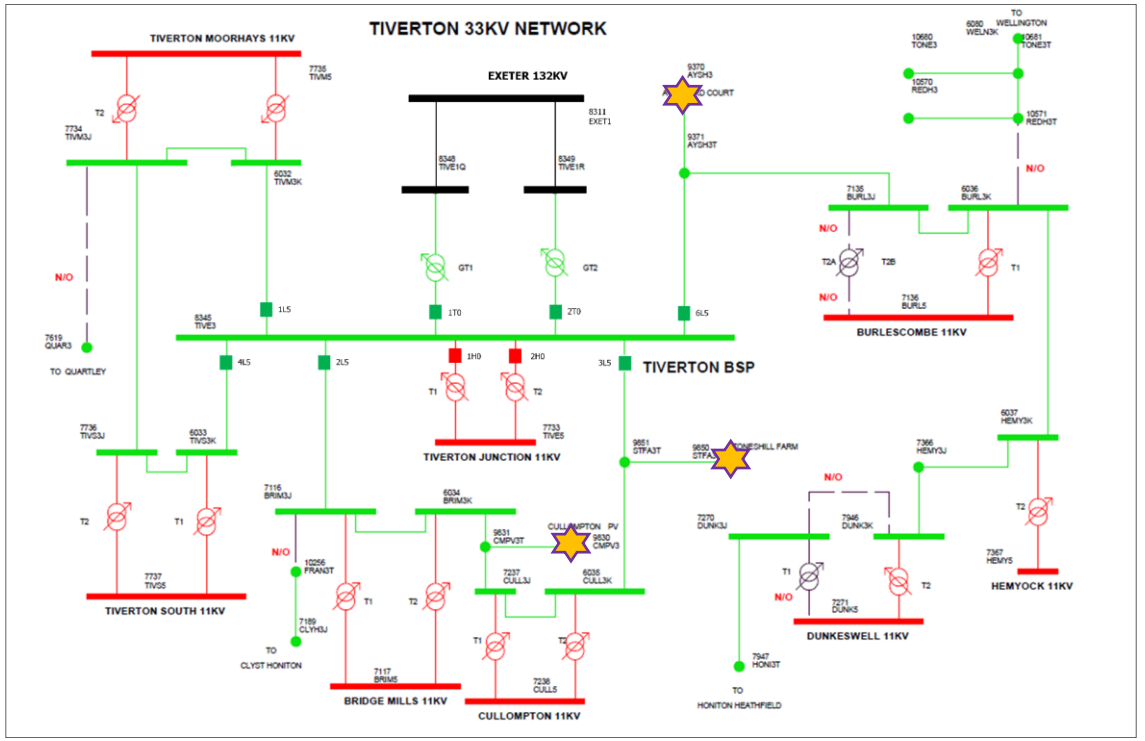


Over a three week autumn operating period:

- >80% reduction in upstream current harmonics is achieved
- a reductions of 16% in 33kV BSP voltage harmonics is also achieved

WP3 and WP4

- WP3 investigates the operation of harmonic mitigation at three locations simultaneously:
  - Part 1 sees independent operation of the three mitigation controllers
  - Part 2 then introduces coordination between the three mitigation controllers
- WP4 demonstrates operation of the algorithm with a physical inverter within a university laboratory setting, - hardware in the loop testing.



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Presumed Open Data (POD)

Sam Rossi Ashton

Innovation & Low Carbon Networks Engineer

Outline

- Project Overview
- Scope
- What is Presumed Open?
- Benefits of Open Data
- Openness Classifications
- Project Method
- Triage Process
- Learning So Far
- Next Steps
- Get Involved

Project Overview

Funding	Network Innovation Allowance
Duration	January 2020 to January 2021
Budget	£580k
Partners	Western Power Distribution Energy Systems Catapult Centre for Sustainable Energy

Scope

The scope of this project is to deliver on recommendations, made by the Energy Data Task Force in it's a Strategy for a Modern Digitalised Energy System Report.

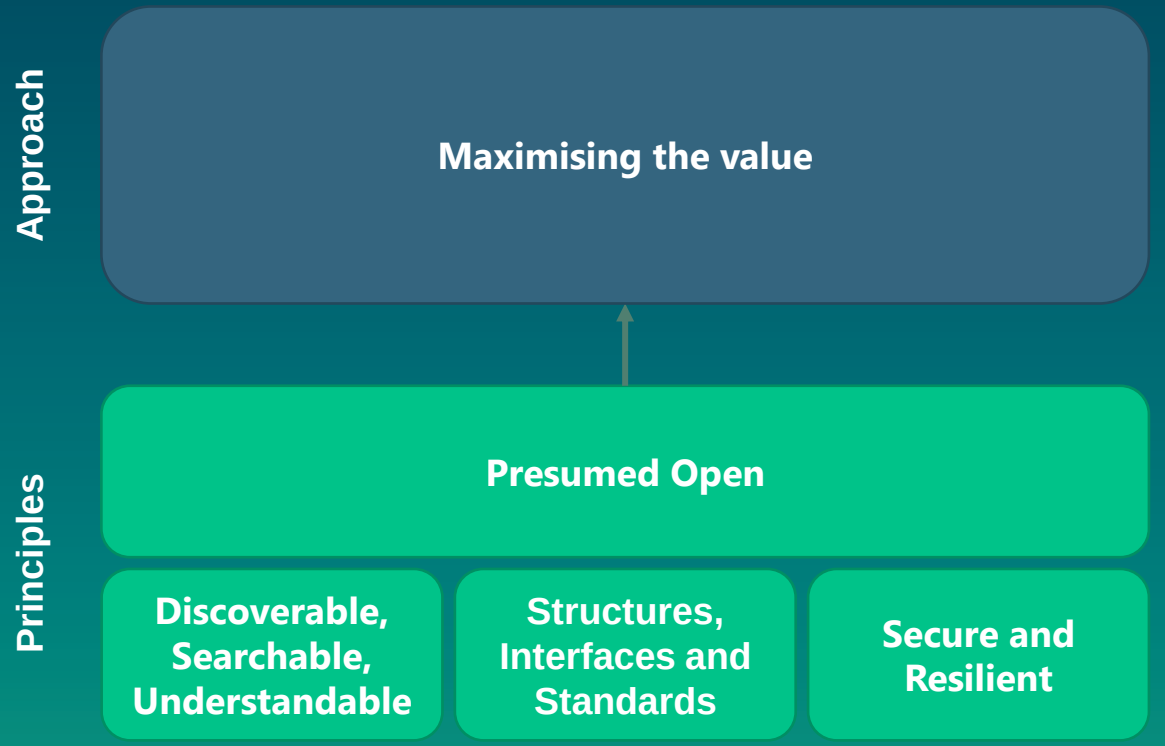
- Recommendation 2 - Maximising the value of data
- Recommendation 3 - Visibility of data

What is Presumed Open?

Presumed Open is the principle that data should be as open as possible. Where the most granular data cannot be entirely open, the data custodian should provide objective justification for this.

Presumed Open does not mean that all data is available to everyone – it is just a more impartial way of approaching data sharing

Data can only be openly shared if there are no Privacy, Security, Negative Consumer Impact or Commercial issues.



Benefits of Open Data

Maximising the visibility and value of data could:

- Faster decarbonise the energy system through easier identification of capacity for the connection of LCT assets.
- Reduce customer bills through a more strategic deployment of LCTs.
- Optimise procurement regarding asset location, size, or function.
- Enhance third-party interactions promoting better flexibility response behaviour and greater opportunities for flexibility revenue.
- Facilitate the realisation new commercial opportunities from the creation of new markets with new players.

Openness Classifications

To simplify data access the EDTF report proposed four data openness classifications:

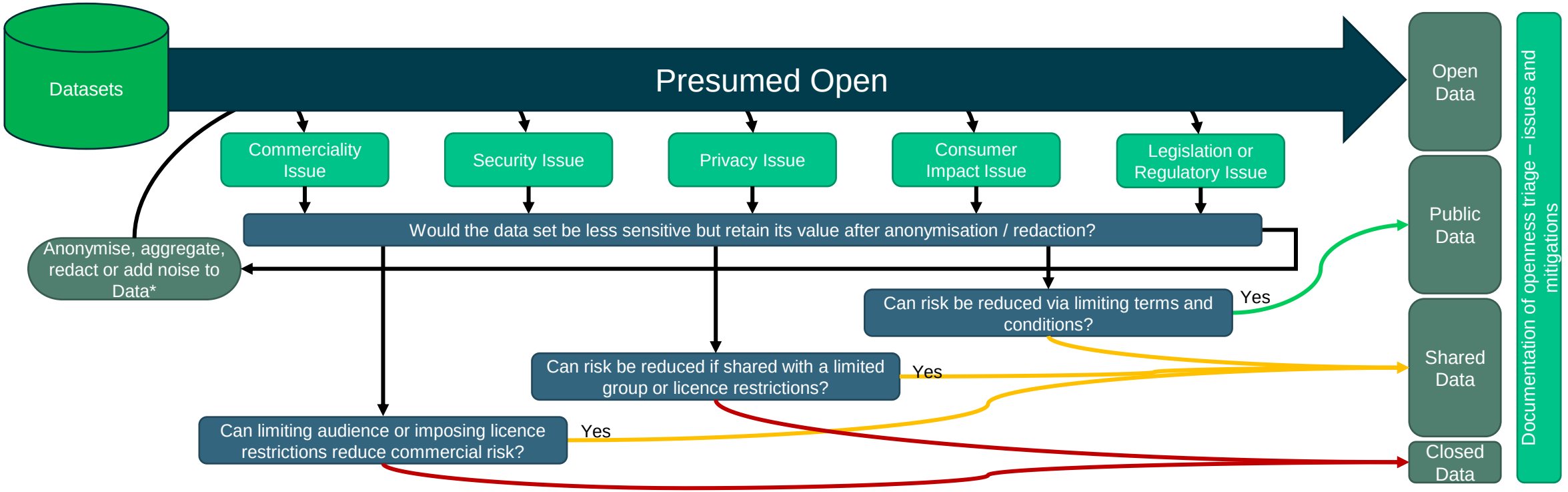
- **Open:** Data is made available for all to use, modify and distribute with no restrictions
- **Public:** Data is made publicly available but with some restrictions on usage
- **Shared:** Data is made available to a limited group of participants possibly with some restrictions on usage
- **Closed:** Data is only available within a single organisation

Project Method

The project is looking to:

1. Identify all relevant data currently collected and held by WPD.
2. Host workshops to identify and develop third-party requirements and use cases.
3. Triage data into ‘Openness Classifications’ and consider appropriate means of access for each tier.
4. Develop a public-facing data hub to be hosted online.
5. Host a data science challenge to introduce stakeholders to the hub.

Triage Process



*Multiple stages of anonymisation / redaction may be required to address different issues (e.g. privacy and security) but repeated application should be limited

Presumed Open Data

Learning So Far

WP1: Data Discovery

- Development of WPD data catalogue with over 100 datasets documented

WP2: Use Case Development

- Four workshops held with 140 use case ideas recorded.

WP3: Data Openness Assessment & Processing

- Data Sharing Assessment (DSA) Tool developed and validated.

	WPD Datasets		External Datasets
Requirements	*Core* • Crown asset location (LV) • Connected customers (MPANs aggregated) • Max demand (PowerOn)	*Additional* • Local network maps (EMU / INM / CIM) • Network demand/generation data (TSDS) • Network assets (SWRR)	• Geospatial data • 'Behind the meter' asset data • Granular smart meter data
	Benefits		**Actors**
Considerations	*WPD* • Ofgem are considering the wide spread roll out of LAEP and WPD could get ahead of the curve.	*Third Parties* • Better visibility of network constraints • Faster time to plan developments • Better impact modelling of solution to mitigate consumer issues with emerging smart local energy systems	*WPD* • Network Planning • Digital Systems Development *Third Parties* • Innovate UK and PFER Projects • Asset Investors • Community Energy Groups • Local Authorities

Example Developed Use Case: WPD could alleviate constraints and support decarbonisation through data driven Local Area Energy Planning

Next Steps

WP4: Open Data Hub Development

- Develop the Open Data Hub where data can be uploaded by WPD and downloaded by its stakeholders.
- Develop appropriate means of access (registration/verification of identity) for datasets that can't be considered fully open.

WP5: Data Science Challenge

- Launch of the Open Data Hub.
- Select a specific use case to be launched as a data science challenge to drive hub engagement to deliver immediate value.

Get Involved

The POD project is looking to engage with stakeholders about the design of the Open Data Hub and welcomes interest in the upcoming data science challenge.

Beyond that, WPD now has host of wider data activities that we wish to engage stakeholders with.

If you want to get involved, please contact:

dsodigitalisation@westernpower.co.uk

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Transforming the electricity network

Sam Rossi Ashton

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Feedback Question 3

Which of the following dissemination methods would be your first choice to find out about Innovation project learning?

- Larger face to face conferences
- Smaller face to face events/workshops
- Larger virtual events
- Individual project webinars

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Future Flex

Matt Watson

Innovation & Low Carbon Networks Engineer

Outline

- Project overview
- Progress to date
- Key learning
- Next steps

Problem & Project Overview

- First generation Distribution System Operator (DSO) flexibility services are currently being procured across GB, These tend to be provided by large distribution connected assets.
- The Future Flex project aims to develop second generation DSO flexibility service with a focus on the domestic scale. This looks to widen the pool of providers and enable the coordination of larger home loads to benefit the distribution network.
- We have used workshops to gain participant input into a commercial design and have developed these into 3 work streams.
- Future Flex is a £830k Network Innovation Allowance (NIA) project which runs from November 19 to December 21 the partners are Everoze and Smart Grid Consultancy.

Progress to date

DSO ready homes

Definition has been created.

Use cases have been identified.

Mitigations are being mapped.

Sustain H

Service and trial have been designed.

8 participants involved so far.

A number are operational in November.

Aggregated Data

Existing Datasets have been reviewed.

Initial de-rating factors have been developed.

Further data is being gathered from participants.

Pro Low Carbon

A Methodology has been established.

This is now being reviewed.

Key Learnings

- There is significant appetite to trial domestic flexibility, even though the value of services low.
- Translating interest into tangible assets has been difficult due to the limited maturity of the market.
- The utilisation of domestic assets brings up challenges around the management of personal data.
- The role of the DSO is to inform policy makers of the carbon impacts of services rather than actively prioritise certain participants.

Next Steps

The key next steps are to:

Continue with Sustain H trial. Add new participants in the summer season.

Continue to collate more data for the aggregated data work stream. This will then be re-run.

Finalise and Trial interventions for DSO ready homes.

Disseminate Learning to date.

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Break

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Electric Nation - PoweredUp

Ricky Duke

Innovation & Low Carbon Network Engineer

Outline

- Overview of Electric Nation PoweredUp
- Progress to date
- Recruitment
- Learning so far
- Next Steps

Electric Nation - PoweredUp

Project Overview

- **Project will take 2 years 6 months to complete**
- **Forecasted spend £2.6M**
- **Up to 110 Nissan Leaf drivers engaged in the trial with CrowdCharge**

PoweredUp aims to enable us to understand how future bi-directional charging of electric vehicles might affect the operation of Low Voltage (LV) networks. The technical characteristics of this process is relatively untested due to the low volume of devices to date.

PoweredUp will examine the effect of up to 110 mainly domestic installations not only for technical characteristics but also for the likely usage by users and the energy supply services they access. PoweredUp will be examining a “future world”. This is where a street of Electric Vehicle users may have these devices charging their cars orchestrated to varying strategies relating to the commercial goals of associated energy suppliers. This examination will result in recommendations for the parameters to be used in network planning.

Project Aims

- The aims of the project are as follows:

- Explore and report on the impact of Vehicle to Grid (V2G) charging on the LV network utilising end-user trial charging data and analysis.

- Demonstrate, via modelling, to what extent V2G can assist with management of LV network demand.

- Examine how sophisticated dynamic bi-directional energy services based on vehicle battery storage, from a variety of energy suppliers, may impact the LV infrastructure.

- Provide recommendations for policy and commercial frameworks on V2G services.

Progress to Date

PoweredUp has completed its design/set-up phase and has now moved into the initiation phase of the project.

During this phase we have undertaken recruitment launch, processing of customer applications and technical developments surrounding the project hardware of the Wallbox Quasar, CrowdCharge Controller and import/export meters in preparation for implementation of the end-user trial.

Furthermore, technical discussions with the three onboarded Energy Suppliers have begun, with one end-user proposition already presented to customers.

Since the recruitment launch, the project has received over 400 initial enquires via the Electric Nation Vehicle to Grid website this demonstrating an excellent Public Relations launch despite the difficulties faced by the Covid outbreak.

Recruitment

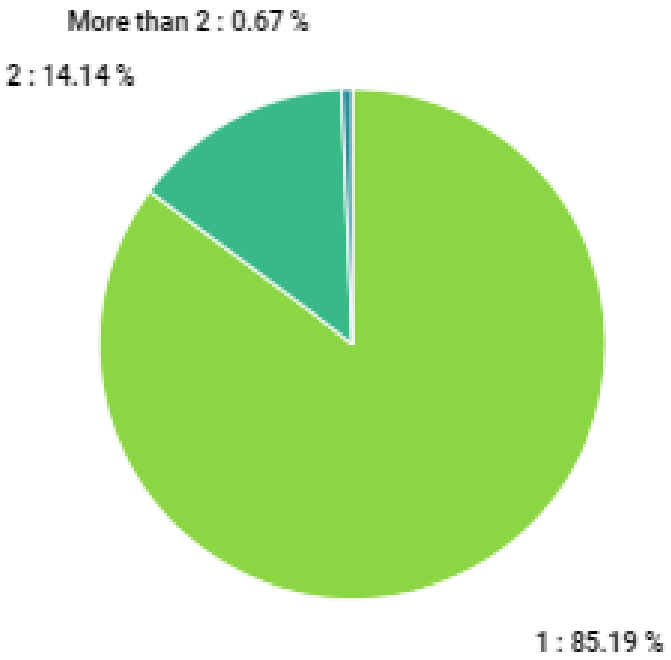


Figure 14: How many EVs do you keep at your property?

During the recruitment phase, we have seen that the number of applications from people who own or lease two or more Electric Vehicles has increased drastically over the past few years since the inception of Electric Nation one. On Electric Nation one, a handful of applications had two or more Electric Vehicles.

To date 15% of applications (40+) have multiple Electric Vehicles at their properties thus demonstrating the requirements for innovative investigations of smart charging services such as Smart Charging (Electric Nation one), V2G charging (Electric Nation Vehicle to Grid) and through infrastructure reinforcements.

Learning so far

Most of the learning generated so far relates to customer recruitment for the 12 month trial. Main points include:

- Upon launching customer recruitment, around 15% of enquires detailed they have more then 1 EV at their property, this drastically increased from the previous Electric Nation 1 trial with only a handful of multiple EV applications. A future trial should specifically investigate V2G services strategies to offer a V2G solution for households with multiple EVs.

- Out of our applicants, 43% already had solar PV installed. 12% of these applicants also already had a stationary battery storage device installed. Due to technical complications surrounding optimisation of the stationary batteries. unable to control their batteries in this project as this is out of scope.

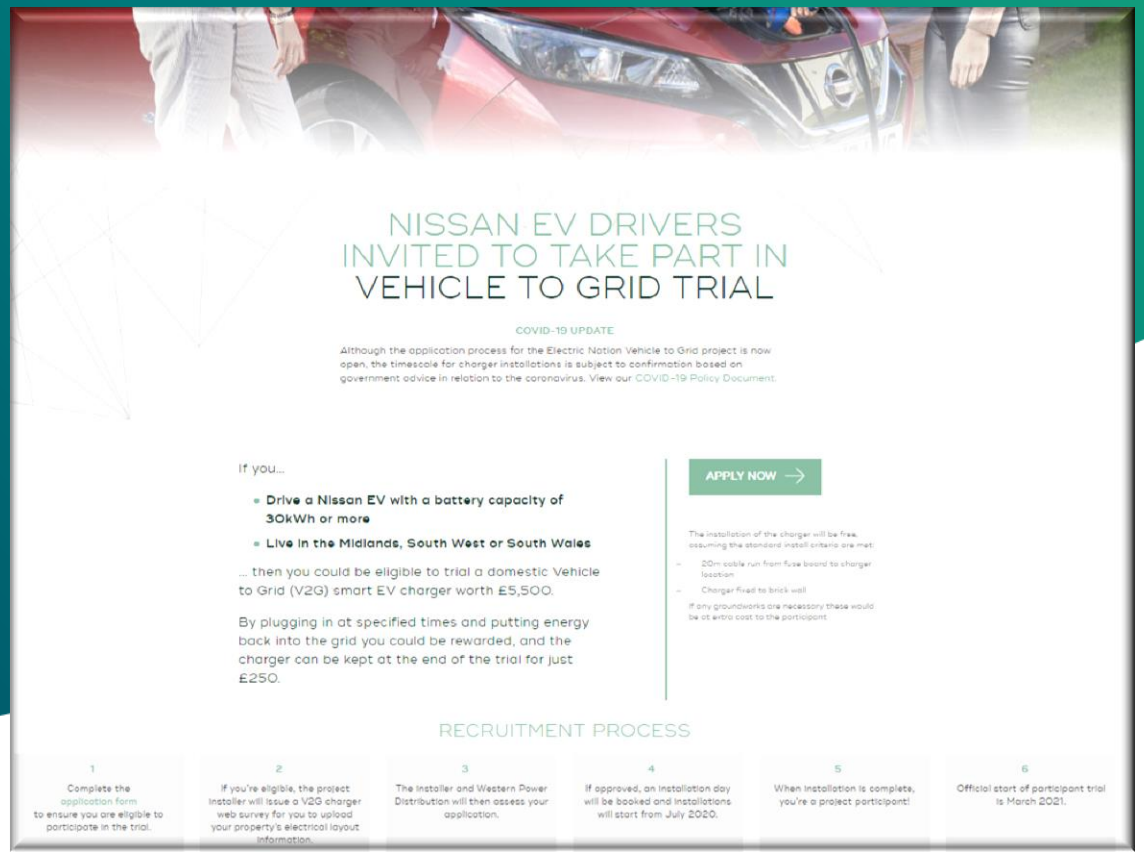
Electric Nation - PoweredUp

Get Involved

If you drive a Nissan Electric Vehicle and would like to be involved we would like to hear from you! To be eligible you must-

- **Live within one of the four WPD licence areas**
- **Drive a Nissan Electric Vehicle with a battery capacity of 30kWh or more**
- **Only have one Electric Vehicle in your household**

Visit www.electricnation.org.uk to start your application today!



Next Steps

Although Covid-19 is still prevalent throughout the UK, the risk to the general public has been reduced through Government controls such as local lockdowns. The effect of Covid-19 outbreak on the project has caused installations for customer to be paused until the risk has been significantly reduced.

Key areas of project work for the next six months are:

- Customer recruitment
- Pilot Site testing
- Installations
- Energy Suppliers
- End-user one year operational trial

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Feedback Question 4

Which of WPD's Innovation team key priority areas are you most interested in?

- Decarbonisation & Net Zero
- Heat
- Transport
- Data
- Communities & Consumer Vulnerability

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DC Share

Ricky Duke

Innovation & Low Carbon Network Engineer

DC SHARE

Outline

- Project Overview
- Project Aims
- Progress to date
- Learning so far
- Next Steps

Project Overview

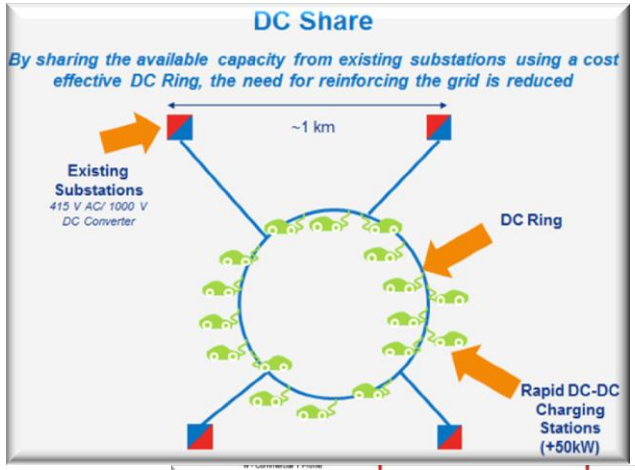
- **3 Year Project, January 2020 – March 2023**
- **£5.6 Million Pound NIC Project**
- **Deliver partners include, Ricardo, Turbo Power Systems, Electricity North West and Vectos**

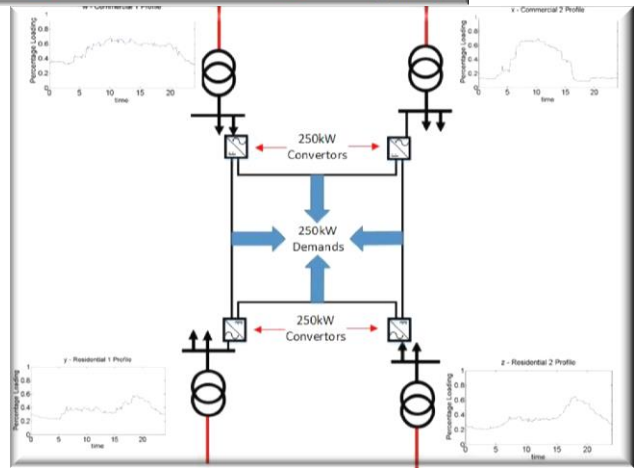
With the rise in the uptake of Electric Vehicles (EV) and their charging needs, this places additional demand on the Low Voltage network, in particularly at peak times as shown from Electric Nation.

DC Share aims to utilise and share spare capacity within a geographical area of the Low Voltage (LV) network through new Direct Current (DC) converter technologies and DC links between distribution substations. On these links, DC technology such as rapid car chargers and solar can be directly connected and managed.

The project aims to overlap industrial areas with residential areas and share the capacity based on real time loadings and load profiles.

Project Aims





Trial new power electronics and using DC meshed networks in a innovative way.

Link distribution substations with different load profiles that boarder industrial & residential areas with DC interconnectors, and sharing available capacity in real time.

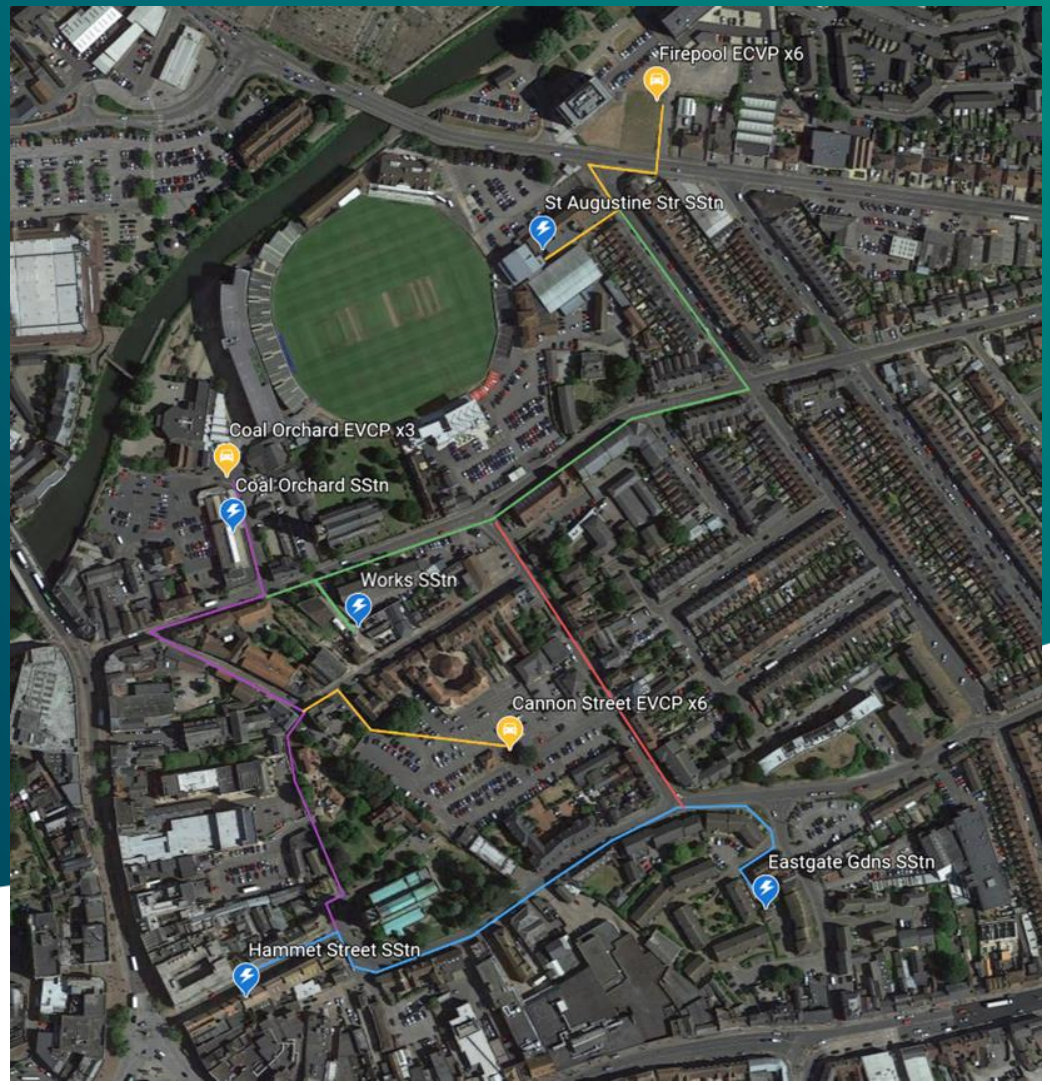
This enables latent capacity within the distribution sites to be combined and used to supply DC-DC rapid car chargers.

Progress to date

- Trial site location confirmed as Taunton
- Initial design of innovative elements, the DC-DC rapid chargers and Grid Tied Inverters completed
- Extensive modelling of the proposed DC network
- Planning permissions gained for placement of rapid charging infrastructure
- Communication and control system specified
- Use cases of the DC network have been specified
- Procurement of long lead items

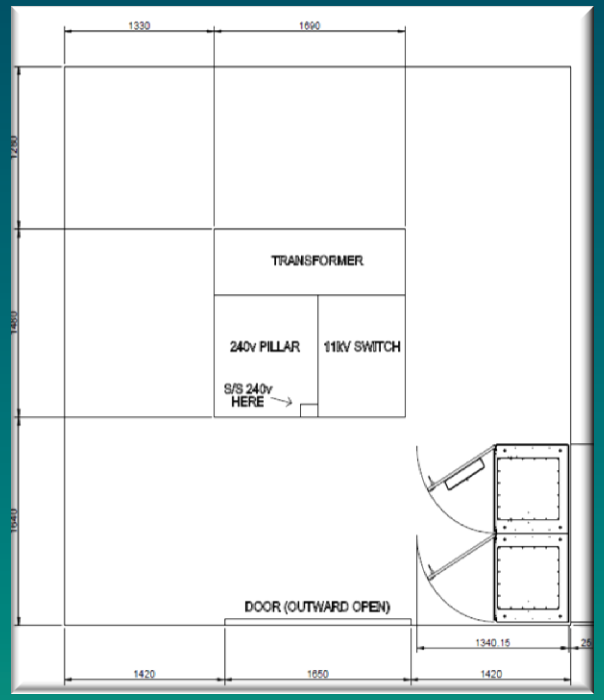
DC Share

Trial Layout



Learning So Far

Main learning generated so far in the site selection process.



Undertaking a detailed site selection process has involved significantly more work than initially anticipated. Many factors that were maybe not originally anticipated have required attention, such as liaison with other Government Agencies (eg EA, HA etc) plus issues of land ownership, planning permissions should new GRP structures be required, listed building consents etc.

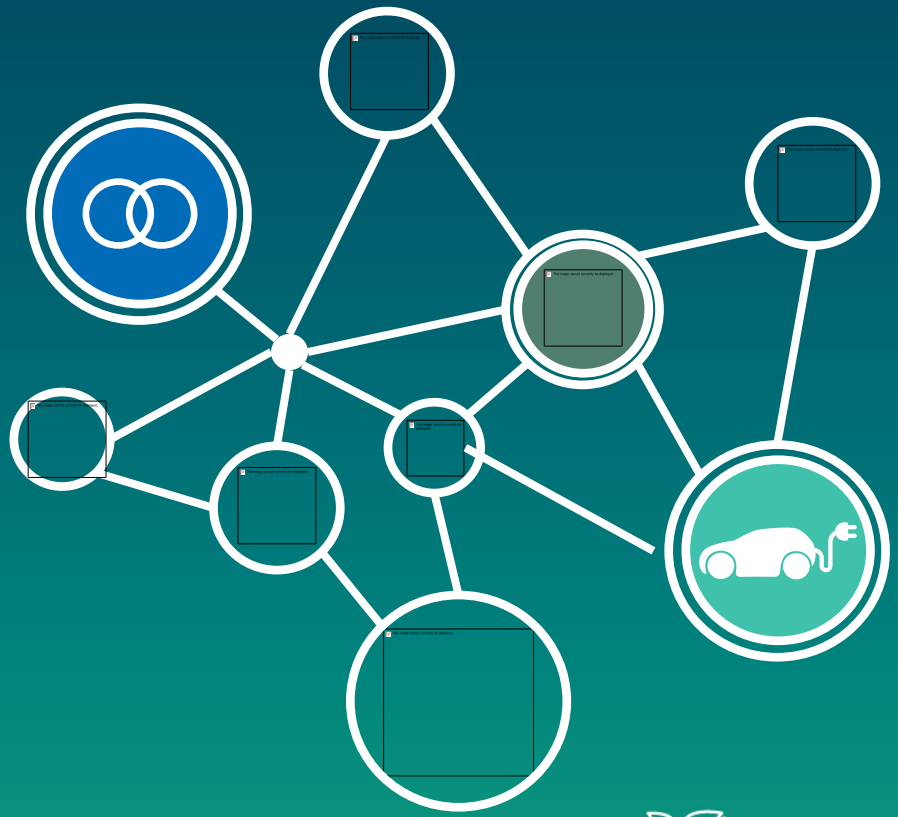
All these non-technical issues require careful and detailed analysis. The best scenario to conclude site selection quickly is to only consider Substations which are located entirely upon WPD owned land and which have sufficient space to house the new equipment.

Next Steps

Final System Design report – December 20

Start construction of GTI's and chargers Q1 21

- Complete and finalise the trial design to OFGEM by mid December.
- Procure components for manufacture and the control system.
- Factory acceptance testing by Q3 next year.
- Shovels in the ground and network installation to start Q3 next year.
- 12 month trial
- Analysis and reporting



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Take Charge

Neil Murdoch
Engineering Manager (GHD)

Outline

- Project overview
- The problem we are trying to solve
- Our solution
- What we have done so far
- Key learning
- What we will do next

Project Overview

Duration

April 2020 –

December 2021

Contract Value

£ 1,380,000

Network Innovation Allowance (NIA) Funded

Project Partners

GHD

BRUSH

moto

ecotricity

Status

WP2 in progress – Development & Design of the Connection Solution

The problem we are trying to solve

The development of rapid EV charging is becoming increasingly important to minimise the time and disruption associated with customers charging their vehicles.

- Motorway Service Areas (MSAs) were identified as a strategic location for large-scale deployment of rapid EV charging infrastructure
- Currently, MSAs have a low demand requirement and are typically supplied at Low Voltage (LV)
- The deployment of rapid EV charging at MSAs is likely to require a power supply of up to 20 MVA to ensure that customers can simultaneously charge their vehicles at peak times.

Our solution

Specify, design, test and trial a brand new standardised package solution for delivering large capacity to MSAs to enable rapid EV charging.

The Compact Connection Solution (CCS) will be:

- Designed and built in conjunction with Brush - a leading manufacturer in switchgear and transformers
- Installed at a Moto MSA within our licence area
- Connected to the existing 33kV network within the proximity of selected MSA
- Able to provide significant capacity to both existing and new charging infrastructure
- ‘Plug and play” - providing a more efficient and cost effective solution

Project Work Packages

WP1 System Capacity Optimisation	**Completed**	• Site Selection • Calculation of capacity
WP2 Develop and Design the Connection Solution	**In Progress**	• Functional specification • Detailed design
WP3 Build and Install the Connection Solution	**Scheduled for 2021**	• Manufacturing of components • Testing of CCS • Site works at trial site • Energise CCS and begin trials
WP4 Trial and Evaluation		

What we have done so far

WP1 System Capacity Optimisation

A Site Selection Methodology was produced to determine the most suitable MSA for the trials. The methodology considered a number of factors.

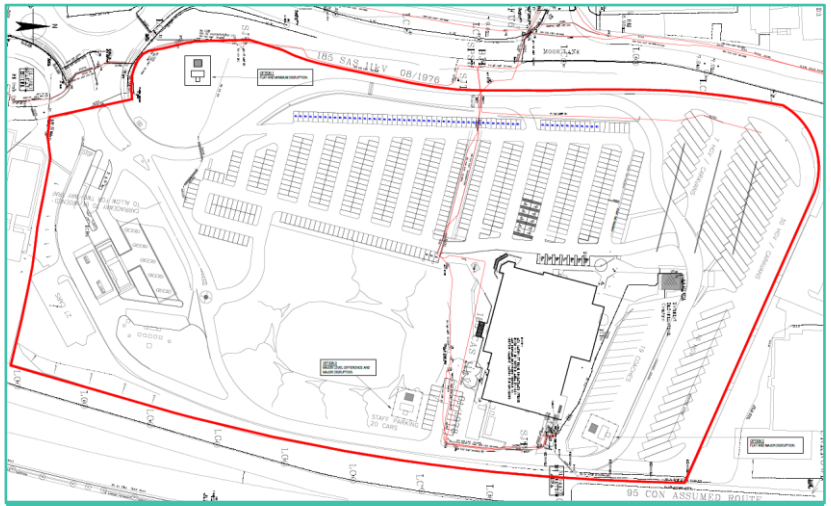
- Proximity to PoC
- Access
- Network configuration
- PoC configuration
- MSA space
- Visitor usage

What we have done so far

WP1 System Capacity Optimisation

After evaluating 13 short-listed sites, Exeter MSA was selected as it scored highly across the majority of the factors considered.

Exeter MSA area and existing Ecotricity chargers



Exeter MSA Site Overview

What we have done so far

WP1 System Capacity Optimisation

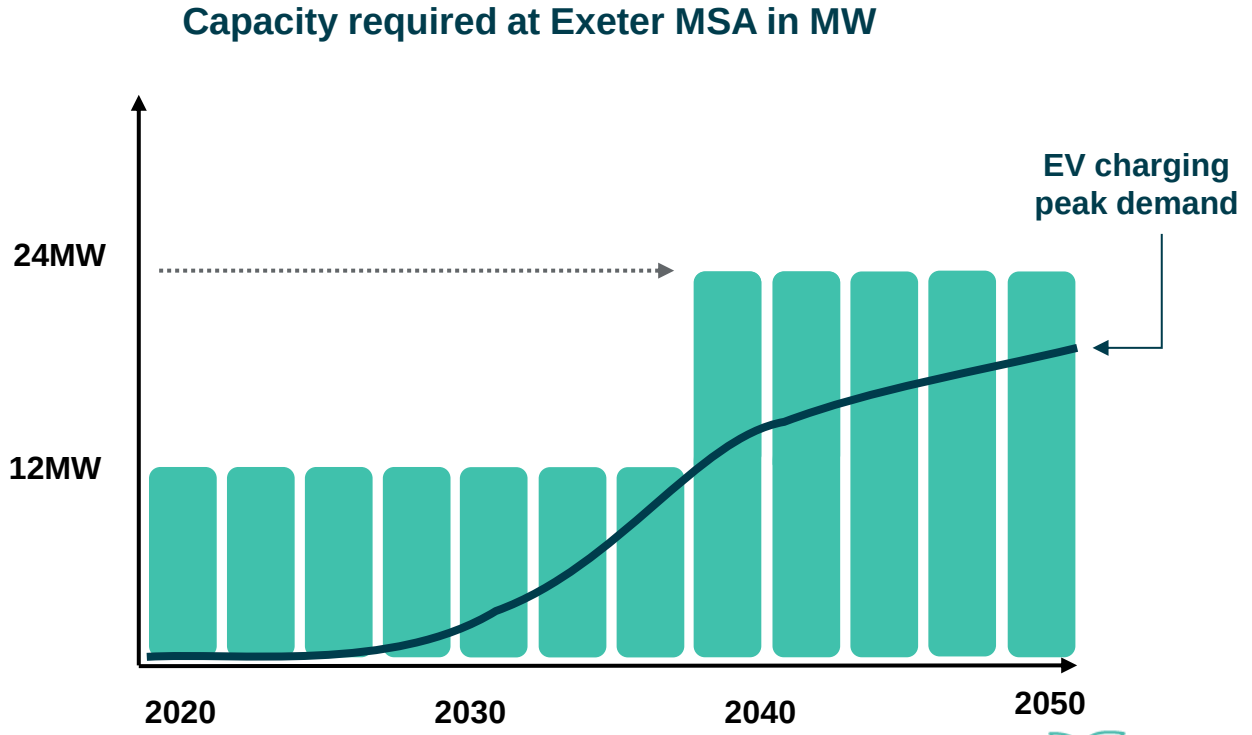
After selecting Exeter MSA as the trial site a report was produced to investigate EV charging patterns and evaluate the capacity required for rapid EV charging.

- EV Uptake
- Road Traffic
- Customer Behaviour
- Charging Demand
- Network Demand
- MSA infrastructure
- EV Hardware

What we have done so far

WP1 System Capacity Optimisation

The approach followed showed that the capacity required at Exeter MSA increases in line with EV uptake and reaches 18MW in 2050. This can be split into two distinct capacity groups



What we have done so far

WP2 Develop and Design the Solution

Work has been progressing with our Project Partner, Brush, to develop a Functional Specification for the CCS. This has now been finalised and provides the basis for the detailed design.

- Builds on learning from the SSE's MASC project that focused on compact substations for transmission connections.
- Design built around reducing footprint, interfaces, maintenance and commissioning.
- Modular design that would allow for future upgrades with minimal disruption and cost.

Key learning

A number of key learning points have been generated through work packages 1 and 2. These relate to items including determining EV capacity at MSAs to the design of the compact substation. Further details are available in our reports…

- Investigation into existing EV charging patterns at MSAs found that they were very similar standard “public” charging patterns.
- Configuration of rapid EV charging infrastructure will be dictated by ratings of standard DNO infrastructure (i.e. standard transformer and cable ratings)
- Projections for rapid EV charging have been based current customer behaviour. These behaviours could change in the future as EV technology progresses and more rapid EV charging is available.

What we will do next

WP1 System Capacity Optimisation	Q3 2020	Completed
WP2 Develop and Design the Connection Solution	End of 2020	Finalise the detailed design of the CCS in conjunction with Brush and WPD design and policy teams.
WP3 Build and Install the Connection Solution	Q2 2021	Begin the build stage, commence site works at Exeter MSA and install CCS.
WP4 Trial and Evaluation	Q4 2021	Energise the CCS, monitor performance and capture data for dissemination.

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Breakout Sessions

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Feedback Question 5

Are you satisfied with the amount of Q&A/discussion time within this event?

- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied
- Indifferent - Project learning was my priority

Feedback Question 6

Overall, how would you rate today's WPD Innovation Showcase?

- Excellent
- Very Good
- Good
- Fair
- Poor

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Thank you for attending our Innovation Showcase

Yiango Mavrocostanti
Innovation Team Manager

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