WESTERN POWER DISTRIBUTION

INNOVATION

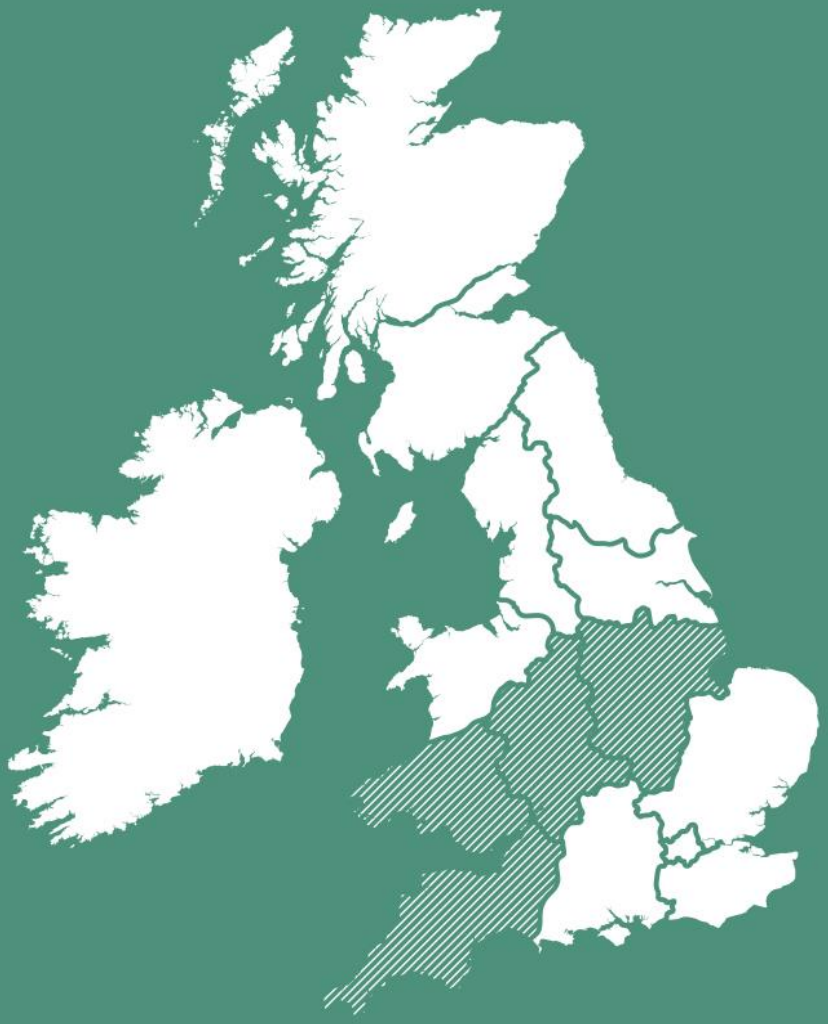
NEXT GENERATION NETWORKS

ENTIRE

WPD_NIA_017

NIA MAJOR PROJECT PROGRESS REPORT

REPORTING PERIOD: APR 2018 – SEP 2018



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	Name	Date
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Date	Issue	Status
10/10/2018	0.1	First draft
12/10/2018	0.2	Draft following review
31/10/2018	1.0	Final

Contents

1 Executive Summary

Entire is funded through Ofgem's Network Innovation Allowance (NIA). Entire was registered in June 2016 and will be complete by April 2019.

Entire aims to develop and test a comprehensive Demand Side Response (DSR) aggregation capability to manage generators and customer loads. Previous trials have shown that manually controlled DSR can provide a valuable tool to network management. Entire is seeking to develop our understanding of DSR both in terms of more advanced systems but also the operational framework that would allow Distribution Network Operators (DNOs) to participate more widely in DSR schemes operates by other parties. The project will also investigate the regulatory and policies requirements to operate and manage DSR as well as the skills required to develop the commercial DSR markets.

This report details progress of the project, focusing on the last reporting period, March 2018 to October 2018.

1.1 Business Case

By making DSR commercially viable for both the DNO and participants, Entire may allow for the utilization of DSR for the management of network constraints and the extension of non-network solutions.

DSR has multiple use cases and can help defer reinforcement, manage constraints during network build out as well as offering optionality for the DNO.

These benefits are only possible if DNOs can offer products that are commercially attractive to participants and that facilitate revenue stacking.

An example of the possible value to customers is shown for one of the constraints investigated in the project.

In Constraint Management Zone (CMZ) 1, the provision of a new Super-Grid transformer is being deferred. Based on previous similar installations the base cost for such and installation is approximately £12 million.

Taking a simple example of deferring the associated costs by one year reduces the total NPV to £11.41 million due to the discounting effect.
Running DSR for a year for this scheme was estimated to cost approximately £0.21 million.
As such:

Saving = Base cost-method costs
= 12 – (11.41 +0.21) = £0.38 million.

The cost of each year of deferral will depend on the loading of the network and the associated profile, however, DSR can provide significant savings for the deferral of high cost reinforcement.

Over the course of innovation trials, all DNOs have expressed a great deal of interest in DSR and most have carried out their own limited scope trials. The project seeks to accelerate the transition to BaU for all DNOs and address many of the issues that arise from the lack of overlap with their existing core competencies.

DSR services are highly scalable once the central systems and skills have been developed. Much of the attraction of DSR over engineering solutions is that it offers excellent economies of scale.

1.2 Project Progress

This is the fourth progress report. It covers progress from March 2018 to the beginning of October 2018. Full details can be found in section 2.2.

The build phase is almost closed. The control system (Collar) has been completed by Kiwi Power and delivered. This gives full functionality from the declaration of availability, the acceptance of offers, dispatch of requirements and monitoring of performance. The only remaining task is the final build of the PowerOn-Collar link. This was delayed following issues identified in the initial installation.

The testing phase is also nearing completion with the PowerOn-Collar link the only remaining task.

The operations phase has been underway since the first of April. Systems are live as are some sites, allowing full end to end system operation. However customer transition from interest to sign up has been limited. This has limited the level of reliability testing that can be carried out.

1.3 Project Delivery Structure

1.3.1 Project Review Group

The Entire Project Review Group meets on a bi-annual basis. The role of the Project Review Group is to:

- Ensure the project is aligned with organisational strategy;
- Ensure the project makes good use of assets;
- Assist with resolving strategic level issues and risks;
- Approve or reject changes to the project with a high impact on timelines and budget;
- Assess project progress and report on project to senior management and higher authorities;
- Provide advice and guidance on business issues facing the project;
- Use influence and authority to assist the project in achieving its outcomes;

- Review and approve final project deliverables; and
- Perform reviews at agreed stage boundaries.

1.3.2 Project Resource

The WPD project manager Matt Watson is supported by Smart Grid Consultancy (SGC). SGC has provided the commercial lead, Gary Swandells and the commercial officer, Gareth Dauley.

1.4 Procurement

The following table details the current status of procurement for this project.

Table 1-1: Procurement Details

Provider	Services/goods	Area of project applicable to	Anticipated Delivery Dates
Smart Grid Consultancy	Project Support	Whole Project	Full duration of Project
Kiwi Power	Control system	Whole Project	System to be delivered by April 2018

The delivery of the Kiwi Power control system was delayed due to the changing scope caused by the project review. This has been managed by the project team.

1.5 Project Risks

A proactive role in ensuring effective risk management for Entire is taken. This ensures that processes have been put in place to review whether risks still exist, whether new risks have arisen, whether the likelihood and impact of risks have changed, reporting of significant changes that will affect risk priorities and deliver assurance of the effectiveness of control.

Contained within Section 7.1 of this report are the current top risks associated with successfully delivering Entire as captured in our Risk Register. Section 7.2 provides an update on the most prominent risks identified at the project bid phase.

1.6 Project Learning and Dissemination

Project lessons learned and what worked well are captured throughout the project lifecycle. These are captured through a series of on-going reviews with stakeholders and project team members, and will be shared in lessons learned workshops at the end of the project. These are reported in Section five of this report.

Project learning to date was shared at the following events over the reporting period:

- WPD's Balancing Act conference on 20/06/2018

- The Energyst DSR event on 13/09/2018
- Power Responsive Local Authorities Workshop 26/09/2018
- Extensively through the Open Networks programme, especially through WS1 P2.

This has been supplemented with sharing learning where requested on an individual basis. An abstract has also been submitted for the CIRED 2019 conference, which if accepted will cover the key findings on the development of new DSR products.

2 Project Manager's Report

2.1 Project Background

DNOs have been running limited scope trials in order to assess the potential of DSR as an enhancement to existing network operations. These have to date not addressed the issue of customer participation in multiple DSR schemes and the need for a service provider that can aggregate and optimise capacity to meet the requirements of multiple schemes (System Operator (SO), Transmission Operator (TO), DNO & Supplier) and maximise value to asset owners. If this is not addressed it is unlikely that DNOs will be in a position to recruit participants for the exclusive purpose of constraint management due to higher, or more frequent, income stream from non-DNO sources. Prior DSR trials have so far been limited in their scope with only small sample groups being engaged to offer limited functionality specifically for distribution constraint management. As the name **'Entire'** suggests, we will now extend the previously limited scope to fully develop and test the skills, relationships and systems necessary for a DNO to provide a comprehensive, commercially effective DSR capability. We will be doing this in areas within the WPD network that may need significant capital upgrades but where the certainty of immediate need is absent. The project will also demonstrate how DSR can be used to defer capital investment which can sometimes take up to ten years.

In order to achieve this, the **'Entire'** project scope includes:

- Recruitment of the required team and partners;
- Development of policies, DSR contracts, technology and systems to facilitate services;
- Increasing knowledge of legacy embedded generation and its impact on network and updating of asset records;
- Assessment of varying DSR offerings for constraint management;
- Engagement of Stakeholders including recruitment of DSR programme participants;
- Interaction with external DSR programmes to optimise commercial attractiveness of DNO DSR. Establishing direct relationships with the largest demand customers to understand their usage, flexibility and possible changes. This will be combined with advice around Agreed Supply Capacity (ASC) and DSR to reduce their costs and introduce new revenue opportunities;
- Identification the skills gaps and organisational structure issues that are required to be addressed to operate a commercial DSR programme and ongoing migration to DSO;
- Measurement of the impact of Low Voltage (LV) connected DSR on 33kV & 132kV infrastructure and establishing financial use case;

- Determination of data required for customer recruitment. This will include an assessment of the benefits (and any confidentiality barriers) from market availability of this data; and
- Assessment of results and reporting.

The three year project is split into five delivery phases: Design, Build, Test, Operate and Report. These cover the following topics:

1. Design:
    - Network analysis
    - Project and product development
    - Specification of required systems
    - Supplier engagement
2. Build:
    - Development of required systems (customer portal, monitoring, dispatch and settlement)
    - Market engagement and customer recruitment
    - Remote asset interface, central dispatch
    - Background data cleansing
    - Staff Training
3. Test:
    - Test control systems
    - Test Interfaces
    - End to end testing
4. Operate:
    - Trial administration
    - Operate DSR
    - Assess participant availability and reliability
5. Report:
    - Stakeholder interviews
    - Knowledge Management
    - Closedown reports
    - Public dissemination

The following Gantt chart shows when the phases are expected to be carried out.

Table 2-1: Gantt chart

Phase	06-16	07-16	08-16	09-16	10-16	11-16	12-16	01-17	02-17	03-17	04-17	05-17	06-17	07-17	08-17	09-17	10-17	11-17
Design																		
Build																		
Test																		
Operate																		
Review and Report																		

Phase	12-17	01-18	02-18	03-18	04-18	05-18	06-18	07-18	08-18	09-18	10-18	11-18	12-18	01-19	02-19	03-19	04-19
Design																	
Build																	
Test																	
Operate																	
Review and Report																	

2.2 Project Progress

This reporting period has covered the continuation of the project build and test phases as well as the start of the operational phase.

2.2.1 Build Phase

Progress within this reporting period

Within this reporting period the main build phase action was the completion of the control system. This delivered the final functionality including asset dispatch and monitoring (Figure 1). The full reporting system was also completed including the development of performance reports, earning statements and invoices (Figure 2). This is all delivered through the Collar system which is accessed at www.flexiblepowerwpd.co.uk.

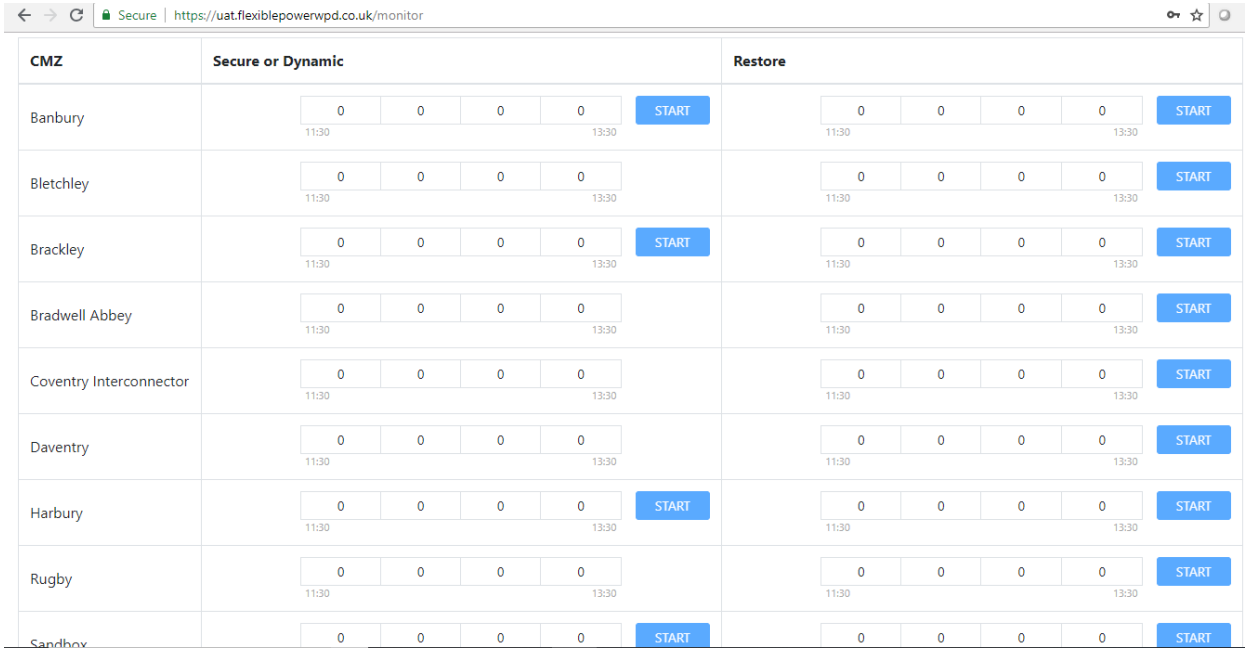


Figure 1: Dispatch and monitoring function in Collar

Training on the systems was also delivered for the relevant operators

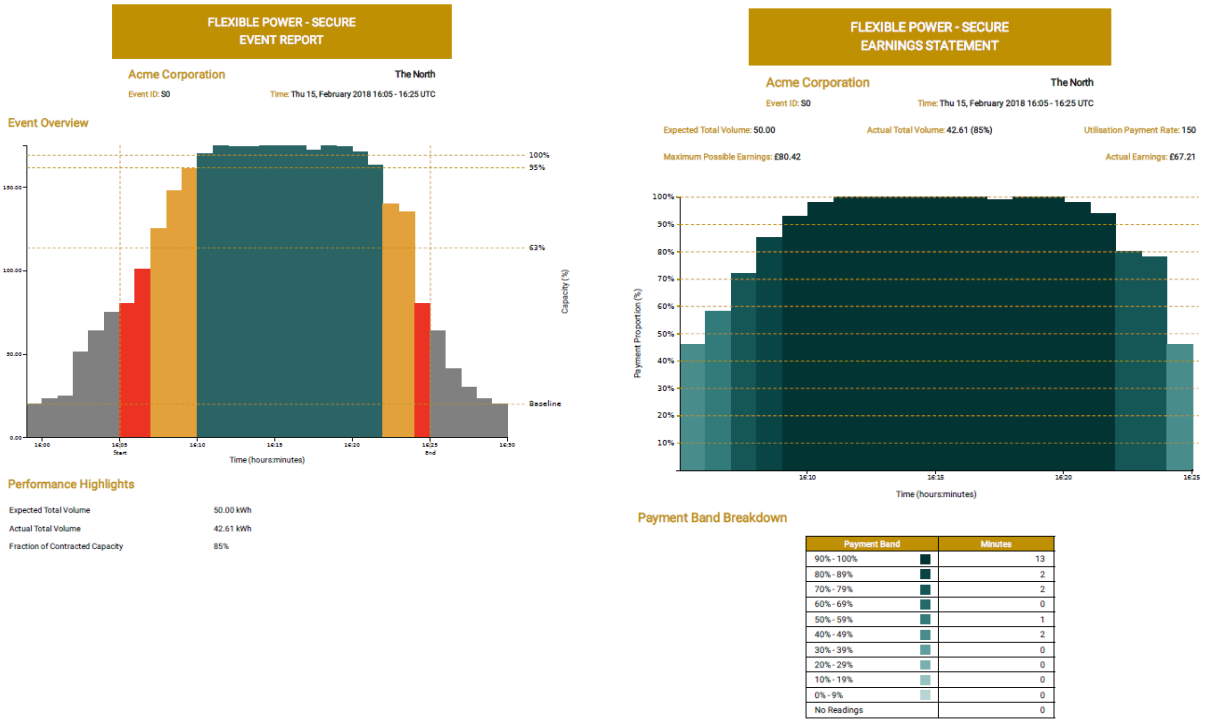


Figure 2: Sample Performance Report and Earning Statement

In addition the PowerOn-Collar link was progressed with the initial site installations (Figure 3) completed. This involved connecting an RTU in a WPD communications room alongside the Kiwi Fruit device as well as all the backhaul communications. Unfortunately the installation highlighted some challenges with the voltages being outputted by the RTU. This is now being resolved by Kiwi Power.

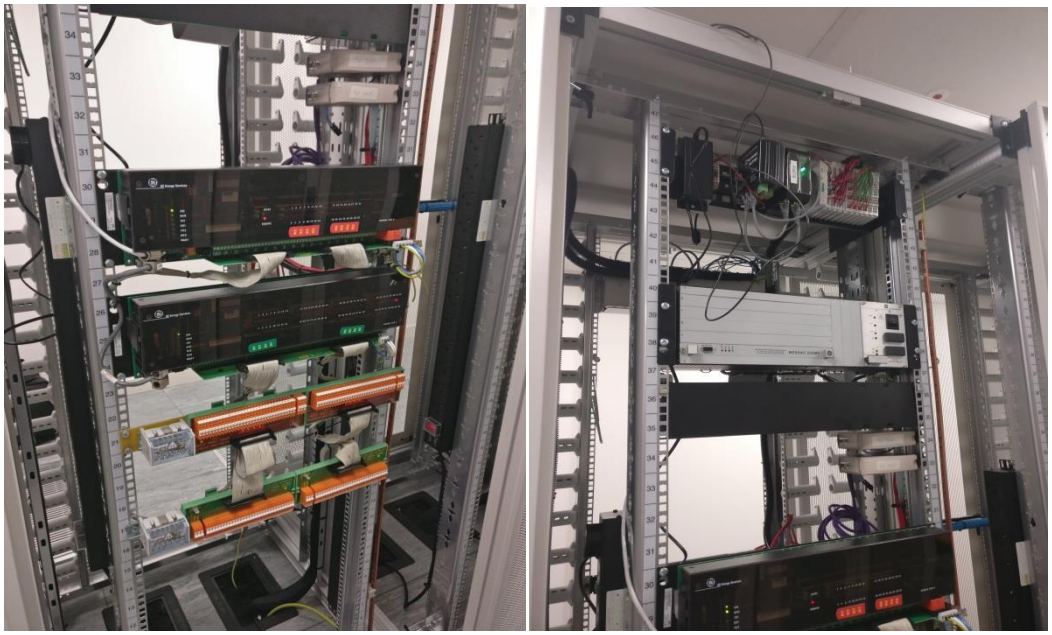


Figure 3: PowerOn - Collar link build

Next steps

The only remaining step in the build phase is the completion of the Poweron-Collar link. Follow this; the build phase will be completed.

2.2.2 Test Phase

Progress within this reporting period

The test phase has progressed well with all the features delivered by the Collar system in the build phase were tested. This included the testing of the dispatch and monitoring systems, ensuring the correct signals were sent out. The reporting systems were also extensively tested to ensure that data was processed in the correct manner and ensure payment details were correct.
As with all IT projects bugs were found within the first implementations and were worked through to avoid impact to customers. In addition a robust process for the addition of new features was implemented to ensure the delivery of any new features did not compromise any existing functionality.

Next steps

The remaining features relate to the PowerOn-Collar link. As the build has been delayed the testing of it has as well.

2.2.3 Operate Phase

Progress within this reporting period

The project went live in this reporting period with zones going live on the 1st of April.
As such the trial has been operating over the summer.
Calls on the system have been limited due to limited customer availability (see recruitment section). However calls have been made successfully and end to end processes are working.
Reliability has been high in terms of start times, durations and volume of energy delivered.
Due to the limited sample size these results are anecdotal to date.

Next steps

The operational phase of the trial will run till March. As more customers come live more calls will be made and more data will become availability on customer availability.

2.2.4 Recruitment

Progress within this reporting period

The recruitment phase runs in parallel with the build and operations phases of the project.
Throughout the reporting period the Flexible Power team have engaged with a wide group of potential partners which included both direct participants and aggregators. This included proactive engagement of potential participants, education sessions to improve

understanding of the processes and weekly update calls with engaged participants. Technical support was also provided to help participants understand the requirements of the API. Whilst initial reception has been positive, translation into sign ups have been limited. This has been due to a number of factors including lack of resource, and trial fatigue. In total 7 contracts for the services have been signed so far. However not all signatories have provided active capacity into the zones.

Next steps

Recruitment will continue until the end of the operation phase of the project.

3 Progress against Budget

As mentioned in the previous report a major review of the project was undertaken. As such the project budget has changed from the original report. Details of the changes can be found in the previous report.

Table 3-1: Budget

Spend Area	Budget (£k)	Budget (£k) Minus SGC contribution	Expected Spend to Date (£k)	Actual Spend to Date (£k)	Variance to expected (£k)	Variance to expected %
Design	85	85	85	141.158	56.158	66%[1]
Build	786	636	636	576.805	-59.195	-9%[2]
Test	50	40	40	50.625	10.625	27%[3]
Trial	842	652	200	21.699	-178.3	-89%[4]
Report	75	60	0	0	0	0%
TOTAL	1838	1473	961	790.287	-170.71	-18%

Comments around variance

1. The Design Phase took significant additional resourcing than expected. This is due to the additional work described in previous reports.
2. Spend is below the expected value not all invoices have been submitted
3. Spend is higher than expected due to the phase taking longer than expected
4. Spend is lower than expected due to low recruitment

4 Progress towards Success Criteria

NETWORK: Identify, audit and update all generation connected to the 11kV network within the trial zone(s). This should enable the return of any unused export capacity to network planners. Identify all connected generation above 150kW and identify where these may affect dynamic network operation. We will also interact with other WPD initiatives to advise where increased telemetry may be required to monitor active locations in the network and update future forecasting models.

Progress – The initial investigations in the target areas have been started. The ASC studies have been completed with limited success. Over 5MW of capacity has been returned however progress was limited by data quality and complex customer change processes. The generation audit has been designed and will be delivered in the next reporting period.

SYSTEMS: Identify, develop and demonstrate new policies, processes and systems that are required in order for WPD to operate standalone DSR services. (Monitor, control, meter and settle)

Progress – The technical systems are being delivered. Feedback on their effectiveness will be collected over the operational phase of the project. The customer journey and sign up processes have also been designed. Feedback is being actively sought so they can be refined.

OPERATIONAL: Identify new skills and roles that currently don't exist within the DNO organisational structure and either train existing staff to address gap or create appropriate job specifications for future recruitment.

Progress – The final roles will be designed once the learning form the operational elements of the trial have been gathered.

COMMERCIAL: Develop an economic business model for combined internal and external DSR service provision that demonstrates enhanced value to customers. This will integrate savings with additional opportunities that could generate new incremental revenues from third party DSR schemes and cost avoidance. Broadening the scope of what a DNO can do with DSR we would expect to achieve improved efficiencies for overall GB system operation.

Progress – Improved commercial propositions have been developed as part of the project review. WPD services have been designed to be cost effective for the WPD requirement as well as commercial effective against the Flexible STOR programme. The effectiveness of this design is being tested by both the recruitment and operational parts of the trial.

MARKET: Agree a new set of conditions that allow and incentivise DNOs to design DSR services that not only address internal constraint issues but incentivise the efficient use of these new capabilities to support overall GB System operation requirements. This will enable the use of customer assets to participate in external DSR schemes, including SO balancing services.

Progress – Three stackable services have been designed. Their effectiveness and attractiveness are being tested in the recruitment and operational phases of the trial.

KNOWLEDGE: Document and share all key learning that is achieved in order that the results should be replicable across all UK Distribution Networks.

Progress – Project learning is being documented. This will be shared with the wider industry later in the project.

5 Learning Outcomes

This period has focussed on the build of the project and the project review.

The main new learning in this reporting period is:

Customer proposition:

- The original contract addendums carried forward from standard WPD contracts are not ideally suited for a CMZ contract. Changes have been highlighted for future contracts.
- Whilst most feedback has been positive, a potential participant fed back that the value of the service was too low and that more income guarantees were required.
- Some end users have experienced confusion about the Flexible Power services following interactions with their aggregators. There have been occasions where Aggregator messaging on the service has been confused.
- Engagement of participants through aggregators has limited the visibility of site progression. Whilst the initial engagement with the Aggregator may be straightforward, there is a high dependency on the interactions with customers. This can create delays.
- Significant wider market activity has limited the available resource that can be allocated by third parties. This includes changes to existing ancillary services, company acquisitions…

Technical implementation:

- Robust change management and testing processes are required to ensure that new software development does not compromise existing functionality. Following the deployment of some minor bugs to the production systems a new process was developed. This improved the alignment of the UAT and Production environments, increased testing required for deployment and avoided deployment of changes around critical times.
- Remote Terminal Units (RTUs) are configured for substation environments and hence have non-standard interfacing requirements with more standard IT hardware (operating at -50V)
  The move away from all or nothing dispatch will bring significant complexity. This will be primarily driven by the requirements to develop clear rules for the

prioritisation of participants. The development of such meritocracies also creates complexities around optimisation.

- The set-up of participants on the customer portal currently requires developer time from Kiwi. Any roll out would require the development of better admin tools to allow the DNO to perform such tasks.
- The trial developed several online tools (website, customer portal) developed by different organisations. It is important these are reviewed by a central party to avoid items such as cookie policies from being omitted.

6 Intellectual Property Rights

A complete list of all background IPR from all project partners has been compiled. The IP register is reviewed on a quarterly basis.

The key background IPR is:

Table 6-1: Key intellectual property

IPR	Comment	Background/Foreground	Owner	%
KOMP V2	Being licenced from Kiwi Power for project	Background	Kiwi Power	100%
Fruit	Being licenced from Kiwi Power for project	Background	Kiwi Power	100%
Client App	Being licenced from Kiwi Power for project	Background	Kiwi Power	100%

This IPR is being licenced from Kiwi Power as part of the technology tender.

The relevant foreground IPR identified in this reporting period is:

- Reporting processes and documents

7 Risk Management

Our risk management objectives are to:

- Ensure that risk management is clearly and consistently integrated into the project management activities and evidenced through the project documentation;
- Comply with WPDs risk management processes and any governance requirements as specified by Ofgem; and
- Anticipate and respond to changing project requirements.

These objectives will be achieved by:

- ✓ Defining the roles, responsibilities and reporting lines within the Project Delivery Team for risk management;
- ✓ Including risk management issues when writing reports and considering decisions;
- ✓ Maintaining a risk register;
- ✓ Communicating risks and ensuring suitable training and supervision is provided;
- ✓ Preparing mitigation action plans;
- ✓ Preparing contingency action plans; and
- ✓ Monitoring and updating of risks and the risk controls.

7.1 Current Risks

The Entire risk register is a live document and is updated regularly. There are currently 12 live project related risks. Mitigation action plans are identified when raising a risk and the appropriate steps then taken to ensure risks do not become issues wherever possible. In Table 7-1, we give details of our top five current risks by category. For each of these risks, a mitigation action plan has been identified and the progress of these are tracked and reported.

Table 7-1: Top five current risks (by rating)

Details of the Risk	Risk Rating	Mitigation Action Plan	Progress
Resource for Entire is limited by roll out	Major	Where possible, separation of responsibilities. Addition of new resource to Flexible Power	Ongoing
Cyber security risks from new systems	Major	Involvement of IR in tendering processes. extensive penetration testing	Ongoing
CMZ running hour uncertainty limits participation	Moderate	Design of CMZ as a top up revenue	Ongoing
Access to customers is limited by aggregators	Moderate	Active engagement with aggregators	Ongoing
The value available from CMZs limits participation	Moderate	Design of CMZ as a top up revenue	Ongoing

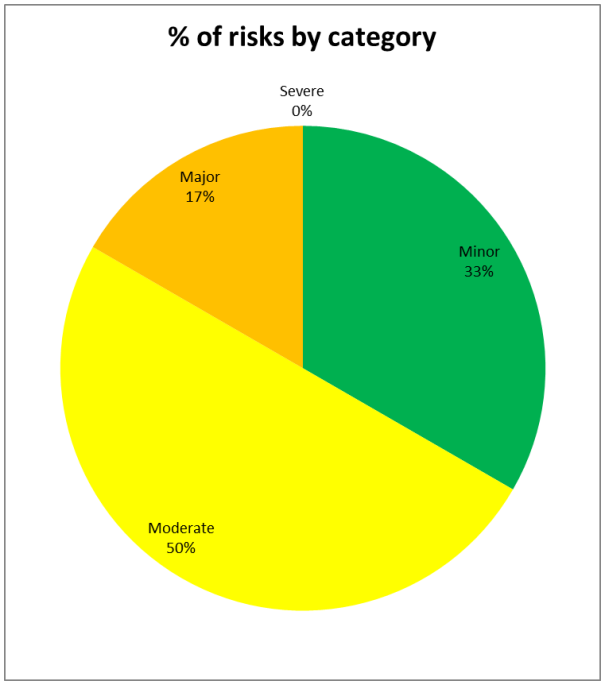
Table 7-2 provides a snapshot of the risk register, detailed graphically, to provide an on-going understanding of the projects' risks.

Table 7-2: Graphical view of Risk Register

Likelihood = Probability x Proximity						
	Certain/Imminent (21-25)	0	0	0	0	0
	More likely to occur than not/Likely to be near future (16-20)	0	0	0	0	0
	50/50 chance of occuring/ Mid to short term (11-15)	0	1	0	0	0
	Less likely to occur/Mid to long term (6-10)	0	2	4	1	1
	Very unlikely to occur/Far in the future (1-5)	0	0	2	1	0
		1. Insignificant changes, re-planning may be required	2. Small Delay, small increased cost but absorbable	3. Delay, increased cost in excess of tolerance	4. Substantial Delay, key deliverables not met, significant increase in time/cost	5. Inability to deliver, business case/objective not viable
		Impact				

Table 7-3 provides an overview of the risks by category, minor, moderate, major and severe. This information is used to understand the complete risk level of the project.

Table 7-3: Percentage of Risk by category



7.2 Update for risks previously identified

Descriptions of the most significant risks, identified in the previous six monthly progress report are provided in Table 7-4 with updates on their current risk status.

Table 7-4: Risks identified in the previous progress report

Details of the Risk	Previous Risk Rating	Current Risk Rating	Mitigation Action Plan	Progress
Development of Komp2 is delayed	Severe	Closed	Active management of contract. Milestone based payments	Closed
Development of Fruit is delayed	Major	Closed	Active management of contract. Milestone based payments	Closed
Cyber security risks from new systems	Major	Major	Involvement of IR in tendering processes. extensive penetration testing	Ongoing
Insufficient volume is available in target area	Major	Now an issue	Significant customer engagement. Active management of potential targets	Now an Issue
Access to customers is limited by aggregators	Moderate	Moderate	Active engagement with aggregators	Ongoing

8 Consistency with Project Registration Document

No additional change requests have been created during this reporting period.
In total there have been five throughout the duration of the project.

The registration documentation can be found here:
www.westernpower.co.uk/innovation/projects/project-entire

9 Accuracy Assurance Statement

This report has been prepared by the Entire Project Manager (Matt Watson), reviewed and approved by the Future Networks Manager (Roger Hey).

All efforts have been made to ensure that the information contained within this report is accurate. WPD confirms that this report has been produced, reviewed and approved following our quality assurance process for external documents and reports.

Glossary

Term	Definition
API	Application Programming Interface
ASC	Agreed Supply Capacity
BAU	Business as usual
BSP	Bulk Supply Point
CDM	Construction Design Management
CMZ	Constraint Management Zone
DNO	Distribution Network Operator
DSR	Demand Side Response
EoI	Expression of Interest
GB	Great Britain
GSP	Grid Supply Point
IPR	Intellectual Property Register
KOMP	Kiwi Operations Management Platform
LV	Low Voltage
NIA	Network Innovation Allowance
NG	National Grid
NPV	Net Present Value
PSD	Primary System Design
SCO	Second Circuit Outage
SGC	Smart Grid Consultancy
SO	System Operator
STOR	Short Term Operating Reserve
TO	Transmission Operator
WPD	Western Power Distribution