

The logo for Electricity North West, featuring the word "electricity" in blue and "north west" in green, with a stylized green leaf icon to the left.

Bringing energy to your door

Respond Project Progress Report

Version 1.0

19 December 2017



RESPOND

VERSION HISTORY

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V1.0	05/12/2017	Paul Marshall Project manager	First draft	
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REVIEW

Name	Role	Date
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APPROVAL

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GLOSSARY OF TERMS AND ABBREVIATIONS

Abbreviation/Term	Definition
AP	Adaptive Protection is the use of adjustable protection settings that can be changed in real time
ADE	The Association of Decentralised Energy is a leading industry advocate of an integrated approach to delivering energy services using combined heat and power and district heating. Previously known as the Combined Heat and Power Association (CHPA)
CB	A Circuit Breaker is a device that interrupts the flow of current in an electric circuit
CHP	Combined Heat and Power is the simultaneous generation of usable heat and power (usually electricity) in a single process
CT	A Current Transformer is a transformer designed to scale down large primary currents to smaller values for the purpose measurement and protection.
DNO	A Distribution Network Operator is the owner and/or operator of an electricity distribution system and associated assets
ECP	The Engaged Customer Panel is a panel of industrial and commercial customers used to help shape the customer survey approach and survey materials.
FLAT	The Fault Level Assessment Tool is intelligent software which assesses near real time fault current peaks on the network and decides to enable or disable the mitigation technologies
Fault current	Actual current which flows during a fault
FCL service	The Fault Current Limiting service is a distributed generation and/or industrial and commercial customer-provided response to reduce overall fault current on the distribution network
Fault level	Prospective maximum current which will flow during a fault
FlexDGrid	A Second Tier LCN Fund fault level mitigation project run by Western Power Distribution
IPSA+	Interactive Power Systems Analysis Plus software is used to model and assess network power flows, voltage profiles, fault levels, stability and harmonics.
I _s -limiter	A fault current mitigation technology
LCNF	Low Carbon Networks Fund
Near real time	A measure of the frequency of the calculation by the Fault Level Assessment Tool. For Respond this will be every five minutes
NMS	Network Management System
PPR	Project Progress Report
Primary substation	A point on the network where the voltage changes from 33kV to 11kV or 6.6kV

Protection relays	Device that analyses power system voltages and currents to detect faults and sends signals to circuit breakers to open
SDRC	Successful Delivery Reward Criteria are key milestones to be delivered throughout the project
Substation	A point on the network where voltage transformation occurs
Switchgear	Device for opening and closing electrical circuits (including circuit breakers)

1 EXECUTIVE SUMMARY

1.1 The Respond project

This is the sixth in a series of six-monthly project progress reports for the Respond project. This project was approved under the name Fault Level Active Response (FLARE). This report covers the period from the end of May 2017 to the end of November 2017.

Respond is demonstrating that a network's fault level can be estimated in near real time, and in responding to that estimation, a series of innovative technical and commercial techniques can be initiated to reduce the fault level without the need for expensive and time-consuming asset replacement.

1.2 Progress to date

The project is on track and all of the SDRCs have been delivered as planned. The project has entered the second half of the two-year trial and analysis phase to collect data and analyse the effectiveness of the installed techniques.

A second knowledge sharing event took place on 5th July in Manchester and a third webinar was presented on 28th September to provide an update of current progress in the Trials and Analysis phase of the project.

An interim Cost Benefit Analysis and Buy Order of the Respond techniques have been completed and have been published on the Respond website.

Work has started on the development of the Safety cases for the fault level mitigation techniques which are scheduled to be peer reviewed in June 2018.

All documentation relating to the progress of the project and the achievement of SDRC are available on the [project website](#).

The key project highlights during the reporting period are outlined below according in the project workstreams.

1.2.1 Technical workstream

Fault Level Assessment Tool

The Fault Level Assessment Tool has been successfully integrated into the Network Management System for the last 18 months, calculating close to real time fault levels and taking the appropriate action following comparisons with plant ratings and enabling/disabling the techniques.

Adaptive Protection

Since the trial period began seven network faults have occurred and the Adaptive Protection solution has responded correctly in every case.

Two alternative installation methods are presently being designed to demonstrate that Adaptive Protection can be implemented by:

- Utilising an existing digital relay with a new setting group and using a single transformer CT input for fault measurement.
- Installing a new digital relay to replace an existing electromechanical relay and using a transformer CT input for fault measurement.

We intend to trial each of these methods by modifying the existing installations at Atherton Town Centre and Denton West primary substations.

I_S-limiter and I_S-sensing units

Since the trial period began we have had two network faults where the I_S-limiter has responded correctly; no faults have occurred to cause any of the I_S-sensing sites to operate.

1.2.2 Trials & analysis workstream

Post-fault monitoring and analysis procedure

Every fault that occurs within the Respond network must be validated to ensure that the correct action has taken place. The post fault analysis methodology details the process and data requirements to confirm fault level, operation of each of the respective fault level mitigation techniques and FLAT action.

Nine successful post-fault operations have occurred during the trials and analysis phase with the data being collected, monitored and analysed prior to publication on the project website.

Asset health study

An asset condition monitoring site selection and equipment rotation programme has been agreed with EA Technology. The equipment has been installed at a number of selected sites and continues to be rotated across the Respond sites during the trial period. An interim report for partial discharge results to date has been completed and published on the project website.

Fault level monitors

Outram fault level monitors have been installed at eleven Respond sites for the purpose of network model validation of both the Electricity North West IPSA+ network model and the Schneider FLAT. The reports detailing the predicted fault level at nine sites can be viewed on the website.

Purchase of FCL service

The project team has continued to engage with project partner United Utilities (UU) regarding trialling of the FCL service and a contract has been agreed. We are currently working closely with UU to design and install the technical installations at two of their sites.

Negotiations have also continued with a second customer who operates a CHP plant, about participating in the FCL service trial.

FCL service contract

The preparation of the FCL service standard contract has been completed in conjunction with our project partner UU and the contract template is available on the project website.

FCL service tested in the marketplace

The Respond project team have found it difficult to engage with customers willing to participate in the FCL service trial due to a number of barriers previously identified and documented. Active discussions have taken place with 13 organisations who had indicated a willingness to participate with only one moving into the final stage of technical and commercial discussions. No further potential customers have been identified in this reporting period.

1.2.3 Learning and dissemination

The Respond project team have been utilising a range of tools in this reporting period to disseminate and share knowledge about the project with stakeholders. These include an advertorial, an industry newsletter, company internal magazine articles, updates on the project website and via social media.

The Respond project was due to be presented at Electricity North West’s Innovation dissemination event on 24th May 2017 at the Marriot Victoria & Albert Hotel in Manchester but was cancelled on 23rd May following the tragic events at the Manchester Arena on the evening of 22nd May. This decision was made both as a mark of respect for the victims and their families and for logistical / safety reasons, as streets around the venue were inaccessible and all modes of transportation into the city were severely disrupted. Ofgem has noted this and the event was rearranged, at the same venue, on 5th July 2017. The Respond project was presented as originally planned.

The six SDRCs due in the reporting period were successfully delivered and those due in the next period are on track. The most significant of these are shown in Figure 1.1 below, and all are discussed in Section 5.

Figure 1.1: Most significant SDRCs delivered in this reporting period

SDRC (evidence)	Planned date	Completion date
Issue 5th Project progress report	June 2017	June 2017
Arrange second knowledge sharing event (Deferred)	May 2017	July 2017
Hold third webinar	September 2017	September 2017

Project expenditure as at the end of November 2017 was £3,675,456 compared to a cost baseline of £4,332,368. The estimated project completion costs are exceeding budget, excluding contingency, due to the project design and installation being more complex and time consuming than expected.

1.3 Risks

Risks identified in the Respond project bid are regularly reviewed by the delivery team. A significant proportion of them has been mitigated during the delivery phase and is therefore no longer active and closed. No new risks have been identified in this reporting period.

The principal risk continues to be the ability to secure a customer willing to participate in the FCL trial. The project team are continuing to work with United Utilities to agree technical installations at identified sites. The team have continued to liaise with project partners ADE and Ener-G to actively publicise the project to attract trial participants but it is unlikely to be achieved at this late stage of the project.

Risks are monitored on a continuous basis, including the potential risks that were documented in the full submission. The revised status of each of these risks is described in Appendix A.

2 PROJECT MANAGER'S REPORT

2.1 General

During this reporting period we have been monitoring and analysing the fault level mitigation techniques, as well as pursuing the Fault Current Limiting service by engaging with external customers and United Utilities. We have agreed a FCL service contract with United Utilities and are currently reviewing the technical proposals and site selection.

An interim Cost Benefit Analysis and Buy Order of the Respond techniques have been completed based on our experience to date.

An interim Carbon Impact Assessment of the Respond project has been completed which outlines the carbon impact of the techniques compared to traditional reinforcement.

Work has started on the development of the safety cases for the fault level mitigation techniques which is due to be peer reviewed in June 2018.

The key project management activities undertaken during the reporting period are summarised below:

- **Trials and Analysis Monitoring:** Investigation of every fault from the Respond sites and detailed post analysis of the nine fault level mitigation activations.
- **Regular engagement with project partners:** The Respond project team has engaged, and continues to hold regular meetings with, the project partners Parsons Brinkerhoff in the development of the safety case and post fault analysis, and United Utilities to develop the FCL Service. We have also worked closely with ADE and EnerG to publicise the project and attract participants. During the trials and analysis period the project steering group meeting frequency has been adjusted to reflect project development.
- **Cost Benefit Analysis:** Production of an interim cost benefit analysis and buy order of the Respond fault level mitigation techniques.

2.2 Technology workstream

The key activities undertaken by the technology workstream during the reporting period are summarised below:

Adaptive Protection

The five Adaptive Protection schemes are designed to operate for multi-phase faults which may occur on the network they protect. To date there have been seven successful operations, three at Atherton Town centre, one at Blackbull, one at Irlam and two at Littleborough; all of the data has been analysed and the details published on the Respond website.

I_S-limiters and I_S-sensing units

The two I_S-limiters have been designed and installed to operate for a multi-phase fault on the networks they are protecting and we have had two successful operations at Bamber Bridge substation.

The five I_S-sensing units are also designed to detect multi-phase faults on the networks they monitor and are passive in that no actual fault level mitigation is carried out. They are designed to sense rather than switch but if a fault occurs, and the fault conditions are met, an alarm will be sent to the NMS. To date no such faults have occurred on the I_S-sensing networks.

Fault Level Assessment Tool

The project team are working closely with the network management system replacement programme team to ensure that their programme has minimal impact on the Respond trials.

2.3 Trials & analysis workstream

Respond faults

Since going live, there have been nine HV faults where the magnitude of the fault current has been sufficiently high enough to initiate operation of a fault level mitigation technique within the trial area. The table in Figure 2.1 below lists all faults to date in the trial area which have caused operation of the respective fault level mitigation technique along with a web link, where available, to the post fault reports produced by our project partner WSP.

Figure 2.1: Faults to date

Respond Fault Ref	Substation Name	Date	FLM Technique	Web Link
001	Atherton Town Centre	29/07/2016	Adaptive protection	What we have learned - trials
002	Atherton Town Centre	28/08/2016	Adaptive protection	What we have learned - trials
003	Atherton Town Centre	16/09/2016	Adaptive protection	What we have learned - trials
004	Blackbull	03/04/2017	Adaptive protection	What we have learned - trials
005	Littleborough	08/05/2017	Adaptive protection	What we have learned - trials
006	Bamber Bridge	22/05/2017	I _S Limiter	What we have learned - trials
007	Littleborough	20/06/2017	Adaptive protection	What we have learned - trials
008	Irlam	17/08/2017	Adaptive protection	What we have learned - trials
009	Bamber Bridge	18/08/2017	I _S Limiter	What we have learned - trials

Post fault analysis of the seven Adaptive Protection operations above has shown clearly that the techniques have been successful for each event.

Post fault analysis of the two I_S-limiter events at Bamber Bridge substation has shown that the I_S-limiter operated as designed and limited the prospective fault current. However, the disturbance recorders integral to the protection relays at Bamber Bridge substation did not capture the fault current prior to the operation of the I_S-limiter due to its extremely fast operating time. Without any captured analogue waveforms it has not been possible to analyse the magnitude and duration of the initial fault current.

Figure 2.2 shows an example of the disturbance records of a fault at Atherton Town Centre substation on the York Street 11kV circuit on 29th September 2016 at 18.25.

Prior to the phase to phase to earth fault, which the Adaptive Protection responded to, there was a red phase to earth fault present. The magnitude of the earth fault current was 1712.7

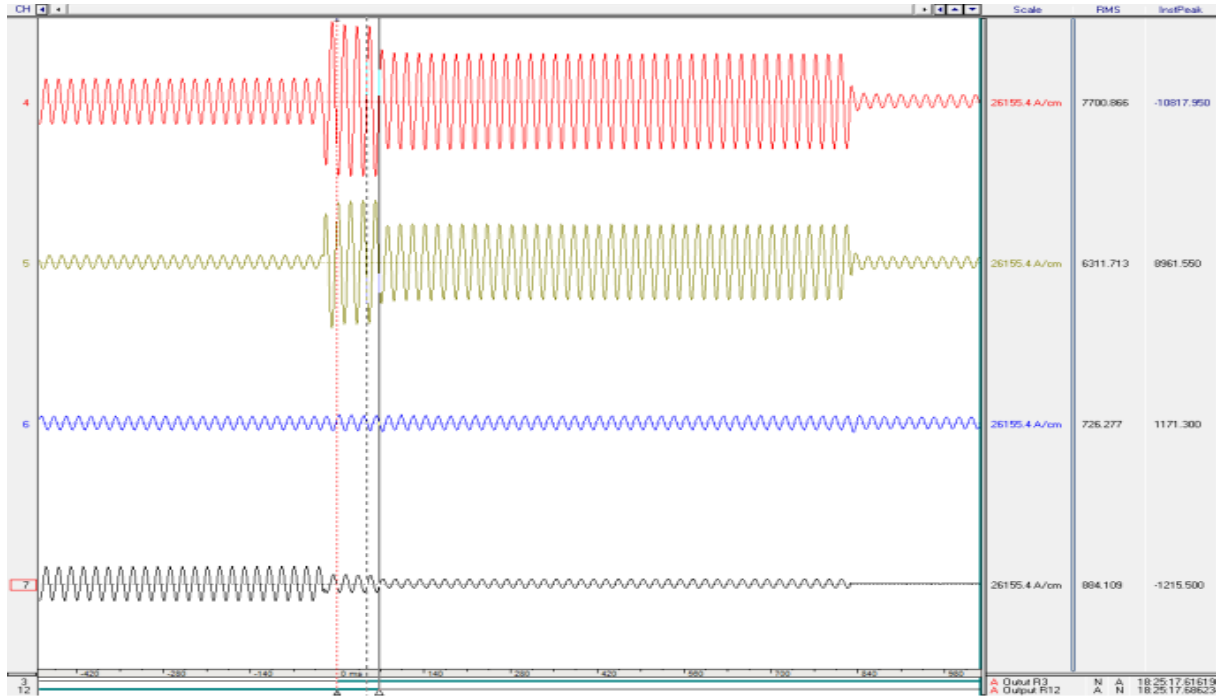
Amps with a corresponding red phase fault current of 2306.6 Amps (inclusive of load current).

The phase to phase to earth fault with 7652.5 Amps and 6262.7 Amps in the red and yellow phases respectively and a 918.7 Amp residual fault current, occurred 22.5 ms prior to being detected by the Adaptive Protection relay. The 11 kV bus-section circuit breaker tripped 70.9 ms after the trip signal from the Adaptive Protection relay was sent. The total duration of the phase to phase to earth fault which the Adaptive Protection responded to, up to the tripping of the 11 kV bus section circuit breaker, was 93.4 ms.

After the 11 kV bus section circuit breaker tripped, the phase to phase to earth fault current reduced to 4979.4 A and 3923.2 A in the red and yellow phases respectively and the residual fault current reduced to 463.4 A. These fault currents continued for a further 758.9 ms, until the feeder protection operated i.e. the fault was eventually cleared 829.8 ms after the Adaptive Protection detected the initial phase to phase to earth fault.

The residual current is seen to reduce from 918.7 A to 463.4 A (a reduction of approximately 50%). This reduction in residual current reflects the dominant effect of the earthing resistors at Atherton Town Centre substation and the expected doubling of the earth resistance as the bus section is opened and the earthing resistors on each bus section are no longer in parallel.

Figure 2.2: Instantaneous Adaptive Protection Relay Recordings (IA=red, IB=yellow, IC=blue and IN(residual)=black)



Overall, the analysis has confirmed that the Adaptive Protection operated as expected and reduced the fault current to be interrupted by the feeder circuit breaker.

Reports for the first three faults have been completed and published on the website as per SDRC 9.3.3. For full details of each fault follow the link in the table above

Asset health study

The asset condition monitoring is on-going, using the site selection and equipment rotation programme previously agreed with EA Technology during the trial period. As part of this work an interim partial discharge report has been completed.

This report has provided analysis for 8 Respond sites for the period 31st May 2016 to 8th May 2017. During this period there were a total of 10 faults, 5 of which correctly caused operation of Adaptive Protection at Atherton Town Centre (3), Blackbull (1) and Littleborough(1) substations. The five other faults during this period did not, and correctly so, cause operation of the respective fault level mitigation techniques due to the fault type and magnitude.

The conclusion of the analysis has shown that there is no correlation between faults and Transient Earth Voltage (TEV) activity with the TEV activity recorded before and after the faults remaining the same. The full report can be viewed by on the Respond website.

In the next reporting period, the trials and analysis workstream will undertake the following activities:

- Publish on the Respond website a summary of each fault event, three months after each event

Purchase of FCL service

During this reporting period the project team has continued to engage with United Utilities regarding the provision of a FCL service. Negotiations have now been completed and site visits have been arranged to agree details of the technical installations at two sites.

Negotiations have also continued with a customer operating a CHP plant, about participating in the FCL service trial. This customer is unable to consider trial participation during the TRIAD period but, subject to the agreement of terms, we seek to deliver a limited trial of enabling technologies at this site from March 2018. The outline of a technical solution has been provisionally agreed with regards to the FCL service, via the reduction in 90ms break fault level in-feed from a CHP scheme to the network. Negotiations around the technical installation are still ongoing.

2.4 Customer engagement workstream

FCL service contract

The FCL service standard contract has been drafted and published on the project website. Negotiations have now been finalised with project partner, United Utilities, to commence trials subject to the modification of specific terms and clauses agreed by commercial and legal representatives of both parties. The technical workstream is now working with United Utilities to agree the technical arrangements required to actively trial the interface technologies at two proposed sites.

Refinements to the commercial template provide a means of testing adaptive protection on a partner's equipment, under carefully managed and controlled trial conditions. Nevertheless, this has imposed certain limitations on the delivery team and restricts the length of the trial period available to test the enabling technologies.

FCL service tested in the marketplace

The Respond project team have found it difficult to engage with customers willing to participate in the FCL service trial due to a number of barriers that have been previously identified and documented. Active discussions have taken place with 13 organisations who had indicated a willingness to participate with only one moving into the final stage of technical and commercial discussions.

No further potential customers have been identified in this reporting period.

2.5 Learning & dissemination workstream

The project team attends relevant industry events to present developments in the project

The third Respond webinar was held in September 2017 to which a wide range of stakeholders were invited. The event was well attended and the feedback was positive.

The sixth Respond industry newsletter was circulated in November 2017 to approximately 700 industry stakeholders, details of whom are held in an internal database, developed as a result of interest/engagement in previous LCN Funded projects.

Social media forums exploited: To ensure that the key messages from Respond are disseminated as widely as possible, the project team is using a range of social media outlets to communicate Respond-related information, specifically:



<http://www.facebook.com/ElectricityNorthWest>



<https://twitter.com/ElectricityNW>



<http://www.linkedin.com/company/Electricity-North-West>



<http://www.youtube.com/ElectricityNorthWest>

In the next reporting period, the learning and dissemination workstream will undertake the following activities:

- Participate in the annual LCNI conference
- Issue 7th Project progress report
- Publish contracts for FCL service with new and existing customers and commercial agreements learning
- Publish 7th and final newsletter

3 CONSISTENCY WITH FULL SUBMISSION

At the end of this reporting period, it can be confirmed that the Respond project is being undertaken in accordance with the full submission.

4 RISK MANAGEMENT

The project risks identified in the project bid document have been migrated into the Respond delivery risk register, reviewed and updated.

Risks identified in the project bid are regularly reviewed by the delivery team and a significant proportion of them have been mitigated and are therefore no longer active or are considered to be at a low level.

The following risk remains active:

- There is a risk that the project team is unable to secure an FCL service participant to take part in the trial to conduct trials at one demand and one generation 'project partner owned' site negates this risk. However, the delivery team will continue to collaborate with ADE, Ener-G and other internal and external stakeholders to publicise the project and attract existing Electricity North West customers along with new customers connecting to the electricity network, to attain up to five suitable participants.

Risks will be monitored on a continuous basis, including the potential risks that were documented in the full submission. The project risks are described in detail in Appendix A.

5 SUCCESSFUL DELIVERY REWARD CRITERIA (SDRC)

Six SDRC were successfully delivered in this reporting period. These are shown in Figure 5.1 below.

Figure 5.1: Respond project SDRC delivered in the reporting period

SDRC (evidence)	Planned date	Completion date
Arrange 2nd Knowledge sharing event (Deferred from May to July)	May 17	July 17
Issue 5th Project Progress Report	June 17	June 17
Publicise RESPOND within Electricity North West in monthly team brief pack	June 17	June 17
Publish 4th advertorial	July 17	July 17
Hold 3rd webinar	Sept 17	Sept 17
Publish 6th newsletter	Nov 17	Nov 17

The 2nd Respond project 'knowledge sharing event' was presented as part of the Electricity North West's Innovation dissemination event on 5th July 2017 at the Marriot Victoria & Albert Hotel in Manchester which replaced the event scheduled for 23rd May that was cancelled following the tragic events at the Manchester Arena on the evening of 22nd May. Ofgem were informed of the postponement and have taken note of this change.

The SDRC due in the next reporting period are shown below.

Figure 5.2: Respond SDRC due in the next reporting period

SDRC (Evidence)	Planned date	Status
Actively participate at four annual LCN Innovation conferences.	Nov 2017	Event held Dec 2017
Issue 6th Project progress report	Dec 2017	On Track
Publish equipment specifications and installation reports for the FCL service	April 2018	On Track
Publish contract templates for FCL service with new and existing customers and commercial arrangements learning	May 2018	On Track
Publish 7th & final newsletter	May 2018	On Track
Publish updated fault level management, planning, design, protection settings and operation and maintenance policies	Jun 2018	On Track

The current status of the evidence for all Respond SDRC is shown in Appendix B. Progress against the SDRCs and the project plan will continue to be monitored, and if the current forecast for SDRC delivery changes, future project progress reports will be updated accordingly.

6 LEARNING OUTCOMES

A project website has been established as a repository for sharing project learning to interested stakeholders. No key learning outcomes have been identified in this reporting period.

7 BUSINESS CASE UPDATE

The project team are not aware of any developments that have taken place since the issue of the Respond (formerly FLARE) project direction that affects the business case for the project.

8 PROGRESS AGAINST BUDGET

The project budget as defined in the project direction is shown in Appendix C.

Actual spend to date compared to project budget is summarised in Figure 8.1 below. The report includes expenditure up to and including 30th Nov 2017.

Actual spend to date is reported as being below the planned expenditure to date (excluding contingencies) yet for the total project an overspend (excluding contingencies) is anticipated.

The overspend is due to a variety of issues which arose during detail design and site installation phase of the project within each of the technologies that were unforeseen and unbudgeted. This has resulted in an increase in forecast costs across labour, equipment and contractors as shown for the total project.

Project spend to date is £3,675,456 compared to planned expenditure of £4,332,368.

Forecast expenditure at completion is £4,774,000 against a plan of £5,024,000 including contingencies.

Figure 8.1: Summary of project expenditure

£'000s Excluding Partner Funding Ofgem Cost Category	Spend to date			Total Project		
	Actual	Plan	Variance	Forecast	Plan	Variance
Labour	1,199	1,097	(102)	1,447	1,305	(142)
Equipment	984	1,030	46	1,106	1,058	(49)
Contractors	808	894	86	1,180	1,140	(41)
IT	548	573	25	573	573	(0)
IPR Costs	0	0	0	0	0	0
Travel & Expenses	0	0	0	0	0	0
Payments to Users	7	61	54	61	61	0
Contingency	0	451	451	0	484	484
Decommissioning	0	0	0	54	54	0
Other	129	226	97	352	349	(2)
Total	3,675	4,332	657	4,774	5,024	251

Detailed expenditure is shown at Appendix D at project activity level.

Note: Respond is budgeted at £5.544 million including £0.52m of partner contributions. For reporting these partner contributions have been removed from both the relevant budget and actual financial statements, resulting in the restated project budget of £5.024 million.

9 BANK ACCOUNT

The Respond project bank statement is shown in Appendix E. The statement contains all receipts and payments associated with the project up to the end of Nov 2017.

10 INTELLECTUAL PROPERTY RIGHTS

Electricity North West is following the default IPR arrangements. No IPR have been generated or registered during the reporting period.

The IPR implications of forthcoming project deliverables are currently being considered, and will be reported in the next project progress report.

11 ACCURACY ASSURANCE STATEMENT

This document has been reviewed by a number of key business stakeholders. The project team and select members of the Respond project steering group, including the lead member of the bid development team, have reviewed the report to ensure its accuracy.

The financial information has been produced by the Respond project manager and the project's finance representative who review all financial postings to the project each month in order to ensure postings are correctly allocated to the appropriate project activity. The issue of the document has been approved by the Engineering and Technical Director.

APPENDIX A: STATUS OF RISKS FROM THE FULL SUBMISSION

Project Phase / Workstream	Description (Delivery Risk Category)	Probability Score	Impact Score	Mitigating Action/ Contingency Action	Revised Probability	Revised Impact Score	Status
Mobilisation	Closed on 31st May 2016 as project mobilisation delivered and project live. There is a risk that project partners are not able to mobilise their resources in time because of other commitments leading to a delay in achieving potential milestones which could have a project, reputational, and financial repercussion. (Other)	2	4	<ul style="list-style-type: none"> Suitable partnership agreements that ensure collaborative working, value for customers' money and achievement of learning objectives in a timely manner have been identified for all partners. A project initiation document will be issued to the project partners to ensure that all parties are ready. <p><i>Contingency: Electricity North West will seek new partners should existing partners fail to mobilise.</i></p>	1	1	Closed
Technology	Closed on 31st May 2016 as project delivered and project live. There is a risk that installation of the new Fault Level Assessment Tool or configuration of the network management system will overrun leading to delayed start of live trials. (Installation)	3	5	<ul style="list-style-type: none"> Robust T&Cs for the Fault Level Assessment Tool provision will be agreed to ensure partner focus on achieving the Respond project timescales. Resources and mobilisation plan will be defined to achieve the project milestones and will be developed in conjunction with the selected software partner. <p><i>Contingency: Regular progress meetings/reports to track progress against the plan. Electricity North West will commit additional operational resource should any delays occur to the installation, testing and commissioning programme.</i></p>	1	1	Closed
Technology	Closed on 31st May 2016 as project FLAT tool commissioned and project live. There is a risk that the new Fault Level Assessment Tool will not perform as expected during testing and commissioning, leading to delayed start of live trials. (Installation)	3	4	<ul style="list-style-type: none"> Guidance on the use of a fault level monitor to validate the Tool's calculations has been sought from WPD using their learning from FlexDGrid. Validation of the Fault Level Assessment Tool will occur prior to live trials and periodically, and at different points on the trial networks during the live trial period. <p><i>Contingency: n/a</i></p>	1	1	Closed
Technology	Closed on 31st May 2016 as project delivered and project live. There is a risk that the six month lead time for delivery of I _s -limiters may lead to a delay in the installation of this technology. (Procurement)	4	3	<ul style="list-style-type: none"> Project plan specifies that a purchase order will be raised to procure I_s-limiters at the beginning of March 2015. ABB will expedite the order. <p><i>Contingency: Flexibility is built into the installation programme so that installation of this technology can occur in spring 2016.</i></p>	1	1	Closed

Project Phase /Workstream	Description (Delivery Risk Category)	Probability Score	Impact Score	Mitigating Action/ Contingency Action	Revised Probability	Revised Impact Score	Status
Technology	Closed on 31 May 2016 as project delivered and project live. There is a risk that retrofit of Adaptive Protection (for distribution system and electrical machines) may be more complex than anticipated leading to a delay in the installation programme. (Installation)	3	3	<ul style="list-style-type: none"> The installation programme will be considered alongside known operational and maintenance activity peaks to allow for extra resource to be secured and deployed. Electricity North West has scoped Respond with the input from a generator manufacturer and a customer with motors. Protection requirements for generators are explored in ENER-G's test cell. The Project cost includes for external contractor retrofit of the Adaptive Protection for electrical machines. <p><i>Contingency: Alternative substations may be selected to ensure Respond trials are not delayed. Learning from every installation/ attempted installation will be published through knowledge dissemination activities.</i></p>	1	1	Closed
Technology	Closed on 31 May 2016 as project delivered and project live. There is a risk that appropriately skilled resource may not be available to perform the retrofit installation of technologies leading to a delay in the installation programme. (Installation)	3	4	<ul style="list-style-type: none"> Guidance on the specific skills requirements has been sought and Respond's installation programme will be designed in consideration of known operational and maintenance activity peaks. <p><i>Contingency: Contractors may be brought in to cover business as usual activities to allow internal resource to cover installation requirements of this project.</i></p>	1	1	Closed
Technology	There is a risk that Respond technologies do not perform as anticipated leading to trial circuits exceeding their fault level limits. (Other)	3	5	<ul style="list-style-type: none"> Forerunner projects explored techniques with academic and technical colleagues. Fault level mitigation techniques will be installed at substations with no fault level constraints. Standard protection capability will not be exceeded. <p><i>Contingency: n/a</i></p>	2	5	Open
Customer	Closed on 31 May 2016 as no issues accessing customers. There is a risk that the data protection strategy will be complicated by accessing customer survey participants from outside the company's area leading to legal and reputational issues. (Recruitment)	3	5	<ul style="list-style-type: none"> The CHPA/ ENER-G has members/ customers across the UK and will promote involvement in the survey. Impact Research will work with the CHPA/ ENER-G to design and undertake the customer survey work and ensure complete compliance with data privacy requirements. Impact Research and Electricity North West will undertake a pilot communication trial, with a range of stakeholders to ensure that they are able to effectively communicate and engage with the project's stakeholders. <p><i>Contingency: n/a</i></p>	1	1	Closed

Project Phase /Workstream	Description (Delivery Risk Category)	Probability Score	Impact Score	Mitigating Action/ Contingency Action	Revised Probability	Revised Impact Score	Status
Customer	There is a risk that customers with relevant demand or generation equipment do not engage in the customer survey leading to a lack of robust data for Hypothesis 5. (Recruitment)	3	4	<ul style="list-style-type: none"> Impact Research has experience of this issue in a Second Tier project delivery environment. The survey contact list will be designed to identify key decision makers within organisations. Incentive payments are being offered for participation. <p><i>Contingency: More customers are being approached and incentivised to participate.</i></p>	3	4	Open
Trials & Analysis	There is a risk that the selected networks do not experience a fault during the period of the trials leading to the techniques and devices being untested. (Other)	3	5	<ul style="list-style-type: none"> Up-to-date fault statistics will be used in the site selection phase to ensure that networks with higher than average faults are selected for Respond demonstration. No risk as all techniques have operated. <p><i>Contingency: None as all techniques have operated during the trial phase</i></p>	1	1	Open
Trials & Analysis	There is a risk that a FCL service participant decides they no longer wish to participate in the trial. (Recruitment)	2	3	<ul style="list-style-type: none"> The Respond team will work with the customer to understand why customer perception has changed and to capture learning from the trial. <p><i>Contingency: n/a</i></p>	2	2	Open
Technology	Closed on 31st May 2016 as project delivered and project live . There is a risk that the Respond project is delayed due to the replacements of Electricity North West's network management system taking priority. (Installation)	2	4	<ul style="list-style-type: none"> The project team will work closely with the network management team to ensure goals are aligned and the Respond network and attributes are prioritised for data cleanse, network build and attribute population <i>Contingency: Build the Respond network and attributes on an islanded server with an ICCP link to the NMS system for live data and topology changes</i> 	1	1	Closed
Customer	Closed on 31st May 2016 as project delivered and project live There is a risk that the customer survey participants will not complete the minimum number of surveys required for the project (Recruitment)	2	2	<ul style="list-style-type: none"> The Respond team will work with project partners, Impact Research, Ener-G and the Association of Decentralised Energy (ADE) to ensure the surveys are completed and aim to identify more participants. 251 who have shown an interest to participate have been identified <i>Contingency: Increase the financial incentive to existing participants and recruit more new participants</i> 	1	1	Closed

As the project progresses, the project team will gain a better view of the likelihood of these risks and will also identify more evidence-based ones.

APPENDIX B: SUMMARY OF PROJECT SDRC

SDRC (evidence)	Due date	Status
Publicise Respond within Electricity North West in monthly team brief pack and/ or Volt (intranet) and/ or Newswire (quarterly employee magazine) by January 2015	Jan-15	Delivered
Publish first newsletter by May 2015	May-15	Delivered
Send customer engagement plan and data privacy statement to Ofgem by June 2015	Jun-15	Delivered
Issue first project progress report in accordance with Ofgem's June and December production cycle and publish on Respond website	Jun-15	Delivered
Deliver live Respond website and social media forums by July 2015	Jul-15	Delivered
Publish first advertorial by July 2015	Jul-15	Delivered
Deliver engaged customer panel workshop by September 2015	Sep-15	Delivered
Publicise Respond within Electricity North West in monthly team brief pack and/ or Volt (intranet) and/ or Newswire (quarterly employee magazine) by September 2015	Sep-15	Delivered
First webinar held by September 2015	Sep-15	Delivered
Deliver lessons learned from testing customer survey materials incorporated into survey and all survey materials published on the Respond website by October 2015	Oct-15	Delivered
Publish second newsletter by November 2015	Nov-15	Delivered
Actively participate at 2015 annual LCNi conference	Nov-15	Delivered
Issue second project progress report in accordance with Ofgem's June and December production cycle and publish on Respond website	Dec-15	Delivered
Brief and train Electricity North West operational teams, including planning engineers, on fault level mitigation management protocols by April 2016	Apr-16	Delivered
Publish second advertorial by April 2016	Apr-16	Delivered
Publish monitoring and analysis procedures for trials on Respond website by May 2016	May-16	Delivered
Publicise commencement of live trials on Respond website by May 2016	May-16	Delivered
Publish third newsletter by May 2016	May-16	Delivered

SDRC (evidence)	Due date	Status
Hold first knowledge sharing event by May 2016	May-16	Delivered
Publicise Respond within Electricity North West in monthly team brief pack and/ or Volt (intranet) and/ or Newswire (quarterly employee magazine) by June 2016	Jun-16	Delivered
Issue third project progress report in accordance with Ofgem's June and December production cycle and publish on Respond website	Jun-16	Delivered
Publish third advertorial by July 2016	Jul-16	Delivered
Publish equipment specifications and installation reports for the Adaptive Protection and the I _S -limiter by September 2016	Sep-16	Delivered
Publish NMS interface and configuration specifications and commissioning reports by September 2016	Sep-16	Delivered
Second webinar held by September 2016	Sep-16	Delivered
Publish report on validation of the Fault Level Assessment Tool by November 2016	Nov-16	Delivered
Publish fourth newsletter by November 2016	Nov-16	Delivered
Actively participate at 2016 annual LCNI conference	Nov-16	Delivered
Issue fourth project progress report in accordance with Ofgem's June and December production cycle and publish on Respond website	Dec-16	Delivered
Publish customer survey report and information for customer evaluation of FCL service provision on Respond website by May 2017	May-17	Delivered
Publish fifth newsletter by May 2017	May-17	Delivered
Hold second knowledge sharing event by May 2017	May-17	Delivered
Issue fifth project progress report in accordance with Ofgem's June and December production cycle and publish on Respond website	Jun-17	Delivered
Publicise Respond within Electricity North West in monthly team brief pack and/ or Volt (intranet) and/ or Newswire (quarterly employee magazine) by July 2017	Jul-17	Delivered
Publish fourth advertorial by July 2017	Jul-17	Delivered
Hold third webinar by September 2017	Sep-17	Delivered
Publish sixth newsletter by November 2017	Nov-17	Delivered
Actively participate at 2017 annual LCNI conference	Nov-17	Delivered

SDRC (evidence)	Due date	Status
Issue sixth project progress report in accordance with Ofgem's June and December production cycle and publish on Respond website	Dec-17	Delivered
Publish equipment specifications and installation reports for the FCL service by April 2018	Apr-18	On track
Publish on Respond website a summary of each fault event three months after each event, with the expectation that a minimum of 18 faults will be reported on	May-18	On track
Purchase a Fault Current Limiting service from at least one Electricity North West demand customer and one Electricity North West generation customer	May-18	On track
Publish contract templates for FCL service with new and existing customers and commercial arrangements learning by May 2018	May-18	On track
Publish seventh and final newsletter by May 2018	May-18	On track
Publish updated fault level management, planning, design, protection settings and operation and maintenance policies by June 2018	Jun-18	On track
Issue seventh project progress report in accordance with Ofgem's June and December production cycle and publish on Respond website	Jun-18	On track
Publish on Respond website the cost benefit analysis study report and the buy order of Respond/ FlexDGrid/ traditional reinforcement fault level mitigation solutions by July 2018	Jul-18	On track
Publish on Respond website the carbon impact assessment report by July 2018	Jul-18	On track
Publish asset health study on Respond website by July 2018	Jul-18	On track
Submit a DCUSA change proposal for amending application approach to Fault Level Cost Apportionment Factor in Common Connection Charging Methodology by August 2018	Aug-18	On track
Publish peer reviewed safety cases on the Respond project website by September 2018	Sep-18	On track
Hold third knowledge sharing event September 2018	Sep-18	On track
Hold fourth webinar	Oct -18	On track
Publicise Respond within Electricity North West in monthly team brief pack and/ or Volt (intranet) and/ or Newswire (quarterly employee magazine)	Oct-18	On track
Publish fifth advertorial by October 2018	Oct-18	On track
Issue Respond project closedown report to Ofgem and publish on Respond website by October 2018	Oct-18	On track

SDRC (evidence)	Due date	Status
Publish Electricity North West's approach to managing fault level reinforcement on Respond website by October 2018	Oct-18	On track
Actively participate at 2018 annual LCNI conference	Oct-18	On track

APPENDIX C: PROJECT DIRECTION BUDGET

£000's	
Excluding Partner Funding	
Ofgem Cost Category	
Labour	1,305
Project Management - Labour	866
Install/Commissioning - Labour	396
General Labour - Labour	43
Equipment	1,058
Materials - Equipment	4
General Equipment - Equipment	22
Monitoring Equipment - Equipment	163
IS Limiter - Equipment	685
Adaptive Protection - Equipment	184
Contractors	1,140
Project Management - Contractor	20
Install/Commissioning - Contractor	554
Research - Contractor	295
Customer Survey - Contractor	59
Customer Engagement - Contractor	169
Dissemination - Contractor	43
IT	573
IT Hardware - IT	0
IT Software - IT	564
IT Licences - IT	9
IPR Costs	0
IPR Costs	0
Travel & Expenses	0
Travel & Expenses	0
Payments to Users	61
Payments to Users	36
Fault Current Limiting Service	0
Customer Payments	26
Contingency	484
Contingency	484
Decommissioning	54
Decommissioning	54
Other	349
Rent - Other	60
Telecoms - Other	0
Dissemination - Other	289
Customer Survey - Other	0
Conference Reg. Fees - Other	0
Other	0
Total	5,024

Note: Value restated to £5,024,000

APPENDIX D: DETAILED PROJECT EXPENDITURE

£'000s Excluding Partner Funding Ofgem Cost Category	Spend to date			Total Project			Comments
	Actual	Plan	Variance	Forecast	Plan	Variance	
Labour	1,199	1,097	(102)	1,447	1,305	(142)	
Project Management - Labour	661	658	(3)	861	866	(15)	
Install/Commissioning - Labour	516	396	(120)	523	396	(127)	Multiple design & installation issues.
General Labour - Labour	22	43	21	43	43	(0)	
Equipment	384	1,030	46	1,106	1,058	(49)	
Materials - Equipment	3	4	1	4	4	(0)	
General Equipment - Equipment	7	19	12	22	22	(0)	
Monitoring Equipment - Equipment	152	163	11	163	163	0	
IS Limiter - Equipment	723	677	(47)	761	685	(76)	Part of equipment cost budgetted as contractor
Adaptive Protection - Equipment	99	167	68	156	184	28	Savings identified in settings design & application
Contractors	808	894	86	1,180	1,140	(41)	
Project Management - Contractor	7	20	13	14	20	6	Savings identified in Project Management
Install/Commissioning - Contractor	567	544	(23)	606	554	(52)	£131k £76k budget allocation & £45k installation costs
Research - Contractor	33	107	74	295	295	(0)	
Customer Survey - Contractor	41	56	15	53	59	6	
Customer Engagement - Contractor	150	156	7	169	169	(0)	
Dissemination - Contractor	10	10	1	43	43	(0)	
IT	548	573	25	573	573	(0)	
IT Hardware - IT	0	0	0	0	0	0	
IT Software - IT	548	564	16	564	564	(0)	
IT Licences - IT	0	9	9	9	9	0	
IPR Costs	0	0	0	0	0	0	
IPR Costs	0	0	0	0	0	0	
Travel & Expenses	0	0	0	0	0	0	
Travel & Expenses	0	0	0	0	0	0	
Payments to Users	7	61	54	61	61	0	
Payments to Users	0	35	35	36	36	0	
Fault Current Limiting Service	0	0	0	0	0	0	
Customer Payments	7	26	19	25	26	0	
Contingency	0	451	451	0	484	484	
Contingency	0	451	451	0	484	484	
Decommissioning	0	0	0	54	54	0	
Decommissioning	0	0	0	54	54	0	
Other	129	226	97	352	349	(2)	
Rent - Other	26	37	11	61	60	(0)	
Telecoms - Other	0	0	(0)	0	0	(0)	
Dissemination - Other	103	189	87	291	289	(2)	
Customer Survey - Other	0	0	(0)	0	0	(0)	
Conference Reg. Fees - Other	0	0	0	0	0	0	
Other	0	0	0	0	0	0	
Total	3,675,456	4,332,368	657	4,773,743	5,024	251	

APPENDIX E: PROJECT BANK ACCOUNT

The bank statement below details all transactions relevant to the project. This includes all receipts and payments associated with the project since the previous report up to the November 2017 month end reporting period.



Lloyds Bank

Statements and Balances

Yesterday's Statement

308012-11782760

ENWL NO.14 LCNF (FLARE_RESPOND) (GBP)

Date	Type	Narrative	Value Date	Payments	Receipts	Balance
01JUN17		Opening Ledger Balance				1,547,164.70 Cr
09JUN17	CR	INTEREST (GROSS)			328.93	1,547,493.63 Cr
09JUN17	DR	TO A/C TFR 02749020 300002		28,848.44		1,518,645.19 Cr
10JUL17	CR	INTEREST (GROSS)			322.45	1,518,967.64 Cr
03AUG17	DR	TO A/C TFR 02749020 300002		53,166.67		1,465,800.97 Cr
09AUG17	CR	INTEREST (GROSS)			260.14	1,466,061.11 Cr
31AUG17	DR	TO A/C TFR 02749020 300002		34,089.96		1,431,971.15 Cr
11SEP17	CR	INTEREST (GROSS)			262.85	1,432,234.00 Cr
28SEP17	DR	TO A/C TFR 02749020 300002		29,606.16		1,402,627.84 Cr
09OCT17	CR	INTEREST (GROSS)			217.79	1,402,845.63 Cr
09NOV17	CR	INTEREST (GROSS)			315.16	1,403,160.79 Cr
15NOV17	DR	TO A/C TFR 02749020 300002		47,858.58		1,355,302.21 Cr
16NOV17	DR	TO A/C TFR 02749020 300002		48,291.21		1,307,011.00 Cr
08DEC17	DR	TO A/C TFR 02749020 300002		42,791.71		1,264,219.29 Cr
11DEC17	CR	INTEREST (GROSS)			520.05	1,264,739.34 Cr
15DEC17	CR	FROM A/C TFR 02749020 300002			657.93	1,265,397.27 Cr
15DEC17		Value of Credits (8)			2,885.30	
15DEC17		Value of Debits (7)		284,652.73		
15DEC17		Closing Ledger Balance				1,265,397.27 Cr
15DEC17		Closing Cleared Balance				1,265,397.27 Cr

*** End of Report ***