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FLEXDGRID

HEAT AND POWER FOR BIRMINGHAM

PROJECT PROGRESS REPORT
REPORTING PERIOD: DECEMBER 2012 TO MAY 2013

LCN Fund Low Carbon Networks

THE UNIVERSITY OF WARWICK

PARSONS BRINCKERHOFF

DOCUMENT CONTROL

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EXECUTIVE SUMMARY

The FlexDGrid project is funded through Ofgem's Low Carbon Networks Second Tier funding mechanism. FlexDGrid was approved to commence on the 7th January 2013 and will be complete by 31st March 2017. FlexDGrid aims to develop and trial an Advanced Fault Level Management Solution to improve the utilisation of Distribution Network Operators' (DNO) 11kV (HV) electricity networks while facilitating the cost-effective and early integration of customers' generation and demand connections.

Progress to date

During the first reporting period (January – June 2013) the project has completed its first three Successful Delivery Reward Criteria (SDRC) deliverables:

- SDRC-1 – Enhanced Fault Level Assessment Processes – on time;
- SDRC-2 – Detailed Design Completion – on time; and
- SDRC-5 – Fault Level Mitigation Technology Procurement Procedure Report – delivered early.

All three SDRC documents have been made available on Western Power Distribution's (WPD) innovation website[1]. Significant progress has also been made in working towards the delivery of other project SDRCs.

Contracts

FlexDGrid's two project partners are Parsons Brinckerhoff (PB) and the University of Warwick (UoW). A three way collaboration agreement was originally to be created to confirm the contractual relationship between WPD, PB and UoW. To de-risk the project it is now planned to produce two, two-way collaboration agreements; one between WPD and PB and the other WPD and UoW. The collaboration agreement between WPD and PB for the project life cycle is complete. The collaboration agreement between WPD and UoW is currently being finalised and UoW are committed to supporting FlexDGrid.

Resourcing

The project commenced on 7th January 2013 and by the 14th January 2013 the core project team was fully mobilised. Significant pre-contract work between WPD and PB allowed this swift transition from bid to project delivery to take place. At the project bid phase the engineering resource on the project was to be led by WPD engineers with support from PB engineers. Due to a better operational fit the team structure has adapted to be formed of PB engineers supported by WPD engineers. The transfer of knowledge in to WPD is not affected by this change.

Project Delivery Structure

The FlexDGrid team has been developed, at this stage, consisting of WPD and PB personnel. The team has a central operating location, WPD's Tipton Office, where all individuals, whether WPD or PB, have full access to WPD systems. A project steering committee has been set up and within the first reporting period has met three times.

[1] *www.westernpowerinnovation.co.uk/FlexDGrid*

Financial Highlights

There are no significant financial highlights at this stage of the project. WPD's labour costs have not emerged due to the change in the project delivery structure. FlexDGrid is within its budget and ahead of target in terms of delivery.

Risks

Project risks were highlighted at the bid stage, which centred on the ability to successfully deliver the project in relation to personnel, external dependencies and equipment procurement. These risks, through the initial six months of FlexDGrid, have been significantly reduced. The Risk Management section (10) provides further detail.

Recruitment

Both Cofely District Energy and Birmingham City Council have supported this project, from bid phase, and during the project they will be engaged to provide customer participation. The recruitment of customers for participation in FlexDGrid is not a big part of the project's learning, however is still important. FlexDGrid's aim is to have novel commercial arrangements in place by the completion of the project (SDRC-11). The key part of this will be to engage customers and future customers to ensure that the novel commercial arrangements are not only developed to allow adaptive engineering solutions but to also be appealing to customers.

Procurement

The completion of SDRC-5 (Fault Level Mitigation Technology Procurement Procedure Report) has significantly de-risked the procurement aspects of FlexDGrid. Although the SDRC was specifically centred on the Fault Level Mitigation Technology procurement procedure, the document works as a reference to the wider procurement practice employed for FlexDGrid.

Installation

Through the delivery of SDRC-2 (Detailed Design Completion) the risk of not being able to install the required technology on to the network has been significantly de-risked.

Learning

During the first reporting period of FlexDGrid (January – June 2013) the key learning outcomes have centred on the working and outputs of SDRCs, 1 and 2 and 5.

Approach to learning capture

WPD employs a consistent approach to the process of capturing learning. This is formed and centred on the robust capturing of information, such as ensuring that all meetings are appropriately recorded, and that all options and possible methods to provide a solution are recorded to understand the learning in deriving an output.

Summary of Key Learning

A framework for the integration of Fault Level Monitoring and Mitigation technologies in to existing electrical network systems has now been formed (SDRC-2). This can now be used to inform other DNO licence areas on how the integration of these technologies can be best achieved.

SDRC-1, centring on the Enhanced Fault Level Assessment Process, has now allowed the FlexDGrid project to understand the key similarities and differences in the way that the DNO community model and calculate their fault level values, which are used to design and manage their network.

External Dissemination

External dissemination in the first reporting period has centred on a DNO workshop relating to enhanced fault level assessment processes and a Gold Partner Sponsorship of a Birmingham sustainability event, Base Birmingham, where FlexDGrid was presented to the general public. FlexDGrid also featured in a BBC Midlands' Today television news article on the installation of DG in to the Birmingham area.

Internal Dissemination

Companywide, internal dissemination has been a FlexDGrid leaflet providing all parties in WPD initial information on the project. A three monthly FlexDGrid newsletter will be developed and distributed through the project's lifetime containing key features and progress. The first newsletter will be available July 2013.

As the project is still at an early stage there have not been any defined, specific, internal dissemination on decisions or learning, however, focussed internal dissemination on specific aspects of FlexDGrid has taken place. In the main to gain wider company involvement in the area of the project to achieve an internal milestone, such as the proposal to enhance the fault level assessment process used by design engineers.

1 PROJECT MANAGER'S REPORT

The FlexDGrid Low Carbon Networks Fund project aims to develop and trial an Advanced Fault Level Management Solution to improve the utilisation of Distribution Network Operators' (DNO) 11kV (HV) electricity networks while facilitating the cost-effective and early integration of customers' generation and demand connections. The FlexDGrid project was awarded funding through Ofgem's Low Carbon Networks Second Tier funding mechanism and commenced on the 7th January 2013.

The Carbon Plan aims to deliver carbon emission cuts of 34% on 1990 levels by 2020. This national target is devolved, in part, through local government carbon emission reduction targets as set out in their strategy planning documents. The Carbon Plan sets out ways to generate 30% of the UK's electricity from renewable sources by 2020 in order to meet the legally binding European Union (EU) target to source 15% of the UK's energy renewable sources by 2020. The UK Government has identified distributed generation (DG) as a major low carbon energy enabler and an important part of the future electricity generation mix.

Fault level is a measure of electrical stress when faults occur within networks. It is a growing issue in the connection of Distributed Generation (DG), especially in urban networks, as the majority of DG increases the system fault level. Conventional solutions to manage Fault Level often entail significant capital costs and long lead times.

In order to address the Fault Level Management Problem, three methods will be trialled and evaluated within the Central Business District (CBD) of Birmingham. The findings from these three methods will be extrapolated in order to understand the wider applicability to GB urban networks.

These Methods are:

Method Alpha (α) – Enhanced Fault Level Assessment;
Method Beta (β) – Real-time Management; and
Method Gamma (γ) – Fault Level Mitigation Technologies.

These three methods aim to defer or avoid significant capital investment and create a wider choice of connection options for customers who can accept a flexible connection to the network. These benefits will be provided to customers through advanced and modified generation connection agreements. Each method on its own will help customers to connect DG more flexibly. The three methods used together will aim to create greater customer choice and opportunities for connection.

The project focus in the first reporting period has been to ensure that the following points have been completed to allow the successful completion of SDRCs 1, 2, and 5:

- Project delivery team establishment;
- Development of project governance and controls; and
- Internal stakeholder engagement.

Following the project kick-off meeting (7th January 2013) the full time project team has been constructed to form three main workstreams, Detailed Design, Enhanced Fault Level Process Development and Advanced Network Modelling. Each member of the project team, whether WPD, PB or UoW, has been provided full access to WPD's systems at the FlexDGrid office within WPD's existing Tipton site. Providing this integrated access and working has facilitated key communications within the project team and WPD stakeholders to ensure that FlexDGrid is designed and delivered using a suitable, integrated, approach.

1.1 Detailed Design – Method Beta and Gamma

The focus of the Detailed Design workstream is to complete detailed design activities for the inclusion of the technologies associated with the delivery of FlexDGrid on to WPD's existing Birmingham 11kV network (SDRC-2).

During the detailed design period (7th January 2013 – 31st May 2013) all 18 Primary Substations in the project area were visited, in order for a site survey to be completed, and a preliminary site design report completed. These reports were reviewed by the wider FlexDGrid team and also with WPD network teams to progress to the detailed design works for ten of the 18 Primary Substations.

These ten detailed design documents, along with a supporting document detailing the optioneering and decision making process were supplied to Ofgem (31st May 2013) as evidence of completion of SDRC-2.

During the next reporting period the Detailed Design team will focus on the production of the documentation required to move towards construction and how to include the specific technologies, which are currently being tendered (ITT supplier information received on 10th June 2013).

1.2 Modelling – All Methods

An advanced network model is to be constructed for the project area to support all aspects of FlexDGrid's deliverables. The model is to be constructed in WPD's standard EHV power systems analysis (PSA) tool, PSS/E[2], and be formed of information from the point of interconnection with National Grid's transmission system to WPD's 11kV distribution system and all network data connecting these systems.

WPD's current practice is to model its EHV (33, 66 and 132kV) systems in one PSA tool and its HV (11kV) system in another PSA tool. This practice is appropriate for BAU DNO engineering, however for the increased complexity required in FlexDGrid another approach to modelling is required. In order to allow the full extent of the differing network parameters' and operating regimes' to be understood in relation to their effect on fault level a complete, combined, model will be delivered.

During this first reporting period a robust methodology for the gathering of the required WPD data to populate the complete model has been put in place, where it has been created to allow a business as usual (BAU) roll out if appropriate. This means that the process, as far as reasonably practicable, is automated and created on a replace on exception basis, to ensure that updating of the models is as reliable and robust as possible.

[2] *PSS/E - Siemens Power Systems Analysis Tool*

The first three Primary Substations in the FlexDGrid network area have been fully constructed and used in the initial development of the proposed Enhanced Fault Level Assessment Process work (represented in SDRC-1). In the next reporting period the remaining seven Primary Substations will be fully modelled creating a complete FlexDGrid integrated PSA model.

1.3 Enhanced Fault Level Assessment Process – Method Alpha
Existing processes to model fault level were last updated in 1992[3], when the connection of DG was not as prevalent as now, there was not the requirement to consider how to model the specifics of DG connections. The Enhanced Fault Level Assessment (EFLA) process work will propose how to best model the connection of DG on to the 11kV system and how to consider different operating regimes.

The initial works in this first reporting period have centred on understanding the variables to be considered in fault level analysis, as instructed in G74 and how WPD and the wider DNO community apply these. Work has also been undertaken as to how the modelling of fault level for the connection of DG might move from a deterministic to a probabilistic approach. This work has been explained and summarised in the document, Development of Processes to Enhances DNOs' Knowledge of Fault Level. This document was submitted to Ofgem on 31st May 2013 to satisfy SDRC-1.

The next phase of this work, to be completed in the next reporting period, is to use this process proposal, along with the developed advanced network models, to simulate and apply the EFLA process to demonstrate what can be achieved with customers' connections.

1.4 Procurement – Methods Beta and Gamma
A condition precedent[4] of Ofgem's award of FlexDGrid was the delivery and authority approval of a report detailing WPD's procedures and methodology for the procurement of the Fault Level Mitigation Technologies, to ensure value for money is delivered.

This activity has been led by WPD's Purchasing department. This document was produced by a Senior Buyer in the Purchasing department and was approved by Ofgem on 24th April 2013 (SDRC-5).

It was decided that no technology tendering would begin until Ofgem had approved the procurement process for the Fault Level Mitigation Technologies. Therefore, following the approval from Ofgem the following technologies' procurement process began with the release of an invitation to tender (ITT):

- Fault Level Monitors;
- Voltage Conditioning Units; and
- Fault Level Mitigation Technologies.

The ITTs were released on 3rd May 2013 and were completed by the interested parties by 10th June 2013. The next steps are for these ITTs to be reviewed and scored by key WPD stakeholders to determine who has been successful to move to post tender negotiations (PTN).

[3] *ER G74 – Procedure to Meet the Requirements on IEC 909 for the Calculation of Short-Circuit Currents in Three-Phase AC Power Systems, ENA, 1992*
[4] *Project Direction ref: WPD/FLEXDGRID, Ofgem, 2013*

1.5 Installations – Methods Beta and Gamma
Following the completion of the detailed design work package for the inclusion of the new technologies in to the 11kV network, the distribution team's work is to focus on the installation of these technologies. Each site has been assigned to a design engineer to deliver the construction requirements for equipment installation.

During the detailed design works (SDRC-2) a suitable site (Substation 3) was identified, for the installation of both Fault Level Monitoring and Mitigation technologies, that is having its 11kV switchgear replaced in 2014 as part of WPD's programme of asset replacement. During the equipment specification stage, additional equipment has been included for the use in FlexDGrid, to be installed in 2014. This has ensured that the costs and delivery requirements have been minimised.

Monitoring equipment in the ten Primary Substation sites is also being installed. This work will allow the project to gather data to characterise the network conditions prior to the installation of the new technologies, which will significantly support the project learning.

1.6 Project Management – All Methods
During the transition from project award, mobilisation through to delivery, a robust project management plan was put in place. This includes the formation of key team and management structures including a steering committee as an appropriate point of escalation.

The project commenced on 7th January 2013 and by the 14th January 2013 the core project team was fully mobilised. This included all members of WPD and PB having access to WPD buildings, systems and data. The fast transition from bid phase to full delivery has meant that a significant amount of work has been undertaken in the first six months towards the completed and on-going SDRCs.

A full time project office support has been appointed, following extensive interviewing, to support the team and the project management administration activities, such as actions logs, RAID logs and project planning. This has ensured that key deliverables, milestones and interdependencies are managed and understood to ensure all learning is captured and disseminated.

Key document templates have been created, which allows all personnel working on FlexDGrid to ensure that a common structure for documentation is employed. To further enhance this a secure online repository has been set up to allow key information to be stored and disseminated to the FlexDGrid team.

2 BUSINESS CASE UPDATE

There is no change to the business case. The business case was to facilitate the increased connection of DG, specifically combined heat and power (CHP), in urban HV electricity networks, is still applicable. Some recently published detail on the connection of CHP is provided below for information.

Using the latest available statistics from DECC[5] 300 additional CHP units have come in to operation, increasing the total installed capacity to 7,386MW from 6,054MW, providing 7.5% of the UK's electricity requirements. Compared to traditional electricity production this represents a 14 million tonnes CO2 saving per year.

[5] *Chp.decc.gov.uk – DECC CHP Focus website, 2013*

3 PROGRESS AGAINST BUDGET

	Total Budget	Expected Spend to Date	Actual Expenditure to date	Variance £	Variance %
Labour	**1809.49**	**264.12**	**20.5787**	**243.54**	**92%**
WPD Project management	320	26.12	20.58	5.54	21%
Detailed Investigation of Substation for Technology Inclusion	71.26	47.51	0.00	47.51	100%
Detailed Investigation of Technologies	71.14	47.43	0.00	47.43	100%
Detailed design of substation modifications for Technology Inclusion	72.43	48.28	0.00	48.28	100%
Determine Enhanced Assessment Processes	71.88	48.10	0.00	48.10	100%
Create Advanced Network Model	72.32	46.68	0.00	46.68	100%
Installation of Fault Level Measurement Technology	5.75	-	0.00	0.00	0%
Installation of Fault Level Monitoring Technology	296.65	-	0.00	0.00	0%
Installation of Fault Level Mitigation Technology	445.1	-	0.00	0.00	0%
Installation of VCU Technology	148.11	-	0.00	0.00	0%
Capture, Analyse Data and performance	234.85	0.00	0.00	0.00	0%
Equipment	**9779.63**	**116.69**	**137.475**	**-20.79**	**-18%**
Procurement of Fault Level Measurement Technology	117.01	116.69	137.48	-20.79	-18%
Installation of Fault Level Measurement Technology	9.58	-	0.00	0.00	0%

Procurement of Fault Level Monitoring Technology	1554.99	-	0.00	0.00	0%
Installation of Fault Level Monitoring Technology	494.52	-	0.00	0.00	0%
Implementation of Real Time Modelling	3.76	-	0.00	0.00	0%
Procurement of Fault Level Mitigation Technology	5830.14	-	0.00	0.00	0%
Installation of Fault Level Mitigation Technology	741.84	-	0.00	0.00	0%
Procurement of VCU technologies	777.86	-	0.00	0.00	0%
Installation of VCU Technology	246.85	-	0.00	0.00	0%
Equipment to enable modelling and technology installation	3.08	0.00	0.00	0.00	0%
Contractors	**1927.36**	**257.31**	**108.13**	**149.18**	**58%**
PB Project Support	340.94	28.41	16.51	11.91	42%
Detailed Investigation of Substation for Technology Inclusion	96.14	64.09	56.26	7.83	12%
Detailed Investigation of Technologies	102.89	68.41	3.11	65.31	95%
Detailed Design of Substation Modifications for Technology Inclusion	48.85	32.57	0.00	32.57	100%
Determine Enhanced Assessment Processes	64.85	36.74	8.87	27.87	76%
Create Advanced Network Model	51.38	21.64	23.39	-1.74	-8%
Implementation of Real Time Modelling	350.94	-	0.00	0.00	0%
Capture Monitored & Measured Data	49.61	0.54	0.00	0.54	100%
Analyse Monitored and Measured Data	157.49	1.09	0.00	1.09	100%
Verify and Modify Advanced Network Models	253.89	2.18	0.00	2.18	100%
Gather Performance of Mitigation Technologies	50.07	0.54	0.00	0.54	100%
Knowledge Capture and Learning Dissemination	281.62	1.09	0.00	1.09	100%
Procurement & Installation Support	78.69	0	0	0.00	0%
IT	57.73	45.63	5.54	40.09	88%
IT Costs	**57.73**	**45.63**	**5.54**	**40.09**	**88%**
IPR Costs	3.29	0.00	0.00	0.00	0%
IPR Costs	**3.29**	**-**	**0.00**	**0.00**	**0%**
Travel & Expenses	465.62	49.93	10.81	39.12	78%
Travel & Expenses	**465.62**	**49.93**	**10.81**	**39.12**	**78%**
Contingency	1407.05	108.07	-	108.07	100%
WPD Project management	**40**	**8.41**	**0.00**	**8.41**	**100%**
PB Project Support	37.5	4.69	0.00	4.69	100%
Detailed Investigation of Substation for Technology Inclusion	18.42	13.30	0.00	13.30	100%
Detailed investigation of technologies	19.18	13.84	0.00	13.84	100%
Detailed design of substation modifications for Technology Inclusion	13.35	9.64	0.00	9.64	100%
Determine Enhanced Assessment Processes	15.27	10.46	0.00	10.46	100%
Create Advanced Network Model	13.68	8.77	0.00	8.77	100%
Procurement of Fault Level Measurement Technology	12.56	1.98	0.00	1.98	100%

Installation of Fault Level Measurement Technology	2.63	0.13	0.00	0.13	100%
Procurement of Fault Level Monitoring Technology	156.35	25.94	0.00	25.94	100%
Installation of Fault Level Monitoring Technology	87.6	4.75	0.00	4.75	100%
Implementation of Real Time Modelling	38.61	2.30	0.00	2.30	100%
Procurement of Fault Level Mitigation Technology	584.19	-	0.00	0.00	0%
Installation of Fault Level Mitigation Technology	131.27	-	0.00	0.00	0%
Procurement of VCU technologies	78.95	-	0.00	0.00	0%
Installation of VCU Technology	44.57	-	0.00	0.00	0%
Capture Monitored & Measured Data	10.72	0.43	0.00	0.43	100%
Analyse Monitored and Measured Data	19.82	0.66	0.00	0.66	100%
Verify and Modify Advanced Network Models	32.97	1.17	0.00	1.17	100%
Gather Performance of Mitigation Technologies	13.48	0.54	0.00	0.54	100%
Knowledge Capture and Learning Dissemination	35.93	1.07	0.00	1.07	100%
Other	27.21	0	0	0.00	0%
Other	27.21	0	0	0.00	100%
TOTAL	15,477.38	841.75	282.54	559.21	66%

4 BANK ACCOUNT

A bank account has been set up and all the monies have been paid in on time.

5 SUCCESSFUL DELIVERY REWARD CRITERIA (SDRC)

During this first reporting period three planned SDRCs were completed and submitted to Ofgem in a timely manner. Two of these SDRCs (1 and 2) were planned for completion in this reporting period and another (SDRC-5) has been delivered significantly earlier than planned.

SDRC MILESTONE	RAG	PLANNED DATE	SUBMITTED DATE	COMMENTS
SDRC-1 EFLA Process	Green	1st June 2013	31st May 2013	Complete on time
SDRC-2 Detailed Design Complete	Green	1st June 2013	31st May 2013	Complete on time
SDRC-5 Procurement Report	Green	31st Dec 2013	24th April 2013	Early Completion

Table 1 - SDRCs delivered in reporting period

5.1 SDRC-1

The specific deliverable of SDRC-1 was to have, by 1st June 2013, developed an Enhanced Fault Level Assessment Process. This document outlines the current methods and techniques that UK DNOs employ to calculate the fault level on existing systems and how, through enhanced processes, these methods and techniques could be refined to give greater granularity and accuracy of electrical network fault levels. The SDRC-1 document also outlines the methodology by which, as part of FlexDGrid, these advanced processes will be trialled. Through a workshop with other DNOs (held at the IET in Birmingham on 2nd May 2013) the methods and techniques proposed have been peer reviewed, challenged and approved.

5.2 SDRC-2

The specific deliverable of SDRC-2 was to have, by 1st June 2013, confirmed the project detailed design. To facilitate methods beta and gamma the installation of ten real-time fault level monitors and five fault level mitigation technologies are to be installed, across ten primary substations. This document details the specific engineering requirements to include the technologies in these ten primary substations. The production of this document has significantly de-risked the future engineering and construction phases of FlexDGrid. The sites considered have had detailed site surveys and designs carried out to ensure that the proposed works and technologies are feasible, both electrically and environmentally.

5.3 SDRC-5

In order to release an invitation to tender (ITT), for the procurement of five Fault Level Mitigation Technologies, a procurement process report was to be delivered to and approved by Ofgem. The report details WPD's standard procurement procedures and the specific criteria used in the process of Fault Level Mitigation Technology procurement. The report was approved by Ofgem on 24th April 2013.

5.4 Next Steps

Table 2 captures the remaining SDRCs for completion during the project life cycle. At this stage in the project all future SDRCs are on track. As all SDRCs have some degree of interdependency the importance of ensuring that FlexDGrid remains on track with all SDRCs is critical to delivering the proposed learning.

SDRC MILESTONE	RAG	PLANNED DATE	FORECAST DATE	COMMENTS
SDRC-3 DNO FLMT Workshop	Green	31st Oct 2013	30th Sept 2013	On track
SDRC-4 Apply EFLA processes	Green	1St Dec 2013	1St Dec 2013	On track
SDRC-6 DNO FLMT Report	Green	31st Dec 2013	30th Nov 2013	On track
SDRC-7 Open-loop test of FLMs	Green	31st Dec 2015	31st Dec 2015	On track
SDRC-8 Open-loop test of FLMTs	Green	31st Dec 2016	31st Dec 2016	On track
SDRC-9 Closed-loop test of FLMs & FLMTs	Green	31st Dec 2016	31st Dec 2016	On track
SDRC-10 Analysis & Benefits	Green	31st Dec 2016	31st Dec 2016	On track
SDRC-11 Novel commercial aggs	Green	31st March 2017	31st March 2017	On track

Table 2 - SDRCs to be completed

[6] *Log of Risks, Assumptions, Issues and Dependencies*

6 LEARNING OUTCOMES

As FlexDGrid has been at the design phase for much of this reporting period there have been no specific learning outcomes that have required disseminating in a structured way. There has been lots of learning generated in setting up the project and throughout the first six months that have been shared at conferences and within other DNOs.

Key project learning has been achieved in the initial stages of the project and is documented in SDRCs 1, 2 and 5.

6.1 Detailed Design

A key learning outcome from the detailed design workstream to include new technologies in to the existing 11kV network is that the design solutions can be, in large, standardised. As part of SDRCs 3 and 6 this learning will be ratified by the involvement of other DNOs.

6.2 Enhanced Fault Level Assessment Processes

Following the DNO workshop on the initial EFLA processes proposal a key piece of learning was to ensure that the processes and procedures are useable by varying levels of engineering ability. The feedback from other DNOs was that to ensure these processes are employed consistently they must be developed, in a suitable format, to enable both technical and semi-technical engineers to accurately model system fault levels. Another key learning outcome from the DNO workshop and the preparatory questionnaires were that there is an inconsistency in the way that fault level is calculated between different DNOs.

7 INTELLECTUAL PROPERTY RIGHTS (IPR)

A complete list of background IPR from all project partners has been compiled. Relevant foreground IP for methods alpha, beta and gamma has been identified and recorded in the first reporting period. The IP register is reviewed on a quarterly basis.

8 RISK MANAGEMENT

Significant risks were identified at the project bid phase and transferred to the FlexDGrid RAID log[6] once the project commenced (7th January 2013).

8.1 Bid phase risks

Descriptions of the most prominent risks, identified at the project bid phase, are reported below.

Risk 1 – Insufficient WPD resource for project delivery
Status – From Amber to Green

Significant interaction with the WPD delivery teams has taken place. The site specific detail has been presented and a delivery engineer has taken ownership of the site construction activity.

Risk 2 – Partners and supporter perception of the project changes
Status – From Amber to Green

Detailed schedules of work (SoW) have been produced for the complete project activities with both PB and UoW. These SoWs are the basis of the contractual collaboration agreements between each party.

Risk 3 – Cost of high cost items are significantly higher than expected
Status – From Amber to Green

Following the authority approval of SDRC-5 (Fault Level Mitigation Technology Procurement Procedure Report) the ITTs were released for these high cost items. Negotiations are on-going, with suppliers and manufacturers, and due to confidentiality issues cannot currently be reported.

Risk 4 – No suitable Fault Level Mitigation Technologies will be available
Status – From Amber to Green

In line with risk 3 the received ITT information has identified a number of suitable Fault Level Mitigation Technologies. These technologies are currently being evaluated against the ITT criteria.

Risk 5 – No suitable Fault Level monitors will be available
Status – From Amber to Green

Following the ITT responses there has been four suitable FL monitors identified. These technologies are currently being evaluated against the ITT criteria.

Risk 6 – The overall project scope and cost could creep
Status – Remains at Amber

The scope of the project has been well defined in the initial delivery phase of FlexDGrid, which has been represented and documented in the SoWs with each

party. This has significantly controlled this risk and therefore the cost of delivery. All potential scope creep is managed at project management level, where a decision is made as to the viability of inclusion and/or recommendation for future work.

Risk 7 – A partner may withdraw from the project or have oversold their solution
Status – Remains at Amber

A contractual collaboration agreement is in place with PB for the project lifecycle and the collaboration between WPD and UoW is currently being finalised. Delivery of three SDRCs in the initial reporting period has delivered confidence that project partners can provide the required solution.

Risk 8 – The project delivery team does not have the knowledge required to deliver the project
Status – From Amber to Green

Project partners have provided personnel with significant experience in all project areas. A review of individual's CVs takes place prior to their engagement with the project.

8.2 Project phase risks

Descriptions of the most significant risks, identified in the current reporting period are reported below.

Risk 1 – equipment procurement / delivery is delayed by supply chain
Status – Amber

Included in the ITT documentation was the delivery timescales for the proposed equipment. The timescales have now been identified and understood in the received ITTs. As expected different technologies and manufacturers have different timescales to supply equipment, which is useful for the programme of delivery.

Risk 2 – 10 substations in Birmingham cannot accommodate FLM
Status – Green

Following the completion of the detailed design work (SRDC-2) ten Primary substations have been proposed to accommodate Fault Level Monitors (FLM), however, there are 14 identified sites that can, if required, accommodate FLMs.

Risk 3 – Evidence feedback from other GB DNOs to proceed to the method Gamma is unsatisfactory
Status – Amber

The detailed design to install the new technologies as part of Method Gamma is complete (SDRC-2) and the technologies have been identified as part of the ITT responses. A workshop is to be held as part of providing evidence that other GB DNOs are satisfied that proceeding to Method Gamma is appropriate (SDRC-3). This is planned to take place in September 2013.

Risk 4 – The operation of FL Mitigation Technologies cannot be validated
Status – Amber

Fault Level Mitigation Technologies can only be validated by operating successfully under a fault condition. As part of the manufacture and installation process of all FLMTs there will be a laboratory test to confirm its performance under a fault condition. A piece of work is planned to be undertaken in the next reporting period to understand the fault frequency at each of the five Primary Substations chosen for FLMT inclusion.

Risk 5 – University of Warwick does not sign a contract with WPD
Status – Red

Following an initial slow start in relation to the formation and review of a collaboration agreement between WPD and UoW, a final version is now in circulation. It is expected that the collaboration agreement will be signed early in the next reporting period.

9 CONSISTENCY WITH FULL SUBMISSION

The transition from FlexDGrid's bid phase to mobilisation and delivery has been managed by the same core team from both WPD and PB. By using the same team it has ensured that there has been consistency between the information provided at the full submission stage and the work being undertaken post award.

The scale of the project has remained consistent for all three methods:

- Alpha – Build advanced network model of FlexDGrid network;
- Beta – Install ten Fault Level Monitors at Birmingham Primary Substations; and
- Gamma – Install five Fault Level Mitigation Technologies at Birmingham Primary Substations.

Each of the three completed SDRCs to date have been completed on, or before, schedule, ensuring that the proposed delivery plan at the full submission state is still applicable in project delivery.

10 ACCURACY ASSURANCE STATEMENT

This report has been produced by the FlexDGrid Project Manager (Jonathan Berry), recommended by the Future Networks Manager (Roger Hey) and approved for release by the Design and Development Manager (Nigel Turvey).

GLOSSARY OF TERMS

ABBREVIATION	TERM
BAU	Business As Usual
CBD	Central Business District
CHP	Combined Heat and Power
DG	Distributed Generation
DNO	Distribution Network Operator
EHV	Extra High Voltage
EU	European Union
HV	High Voltage
IET	Institution of Engineering and Technology
IPR	Intellectual Property Rights
ITT	Invitation to Tender
PB	Parsons Brinckerhoff
PSA	Power System Analysis
PTN	Post Tender Negotiation
SDRC	Successful Delivery Reward Criteria
SoW	Schedule of Work
UoW	University of Warwick
WPD	Western Power Distribution

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WESTERN POWER DISTRIBUTION

FLEXDGRID

LCN Fund
Low Carbon Networks

THE UNIVERSITY OF WARWICK

PARSONS BRINCKERHOFF