LCNF Competition ENWL FLARE Interrogation Report

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1. PROJECT SUMMARY

The Electricity North West (ENWL), Fault Level Active Response (FLARE) project seeks to trial three fault level management solutions with the aim to help increase the ease at which low carbon technologies (LCT) and distributed generation (DG) can be connected to the distribution networks.

ENWL propose that this work is required to support the move to a low carbon economy and compliments similar LCNF projects currently under way. Completing this project will allow fault level management technologies to be rolled out across the GB distribution network using normal business as usual practices, according to the claims made in the submission pro-forma.

The solutions all include the use of a Fault Level Assessment Tool. The Fault Level Assessment Tool assesses the potential maximum fault current in near real time. When potential fault current exceeds the existing switchgear rating, the Fault Level Assessment Tool will issue an “enable” command to one of the innovative fault current mitigation techniques retrofitted alongside existing assets. FLARE will trial three of these mitigation techniques, as follows.

1. Adaptive Protection – this technical concept involves the retrofitting of adjustable protection relays that can be changed in real time from a central control system. The relays would be changed between two groups of settings – one for “normal” operation and one for “exceeding fault level” operation.
2. I_s-limiter – this technical concept involves the installation of I_s-limiters into substations. These devices trigger on the detection of a fault in order to divert the current through a fuse element within milliseconds. These elements would have to be changed after every fault.
3. Machine Protection – this technical/commercial concept involves installing or modifying protection at synchronous generators and AC motors, which detects when they are contributing to a fault and disconnects them. Commercial benefit would be offered to the machine owner for participating. This would provide the basis of a Fault Current Limiting (FCL) service, which would depend upon market uptake.

The FLARE project will test the following hypotheses:

- FLARE can achieve fault current management through the retrofitting of devices to existing systems.
- FLARE is faster and cheaper to apply than traditional reinforcement, and that it will reduce bills to customers through reduced network reinforcement costs, without detriment to existing asset health.
- FLARE enables a market for the provision of a Fault Current Limiting (FCL) service.

Based on the Trial evidence, the project aims to deliver a Safety Case, a Cost Benefit Analysis and a Carbon Impact Assessment for each technique, with a view to determining which solution best demonstrates the release of network capacity allowing quicker and lower cost connections for customers, whilst enabling DNOs to support the UK decarbonisation strategy. The evidence from the I_s-limiter Trials would support a proposed modification to the Distribution Code DPC 4.4.4(d) in order to clarify the specific usage of this technology. With these deliverables in place, ENWL endeavour to be in a position to inform a purchase order of the chosen technologies for larger scale roll out.

Additionally, to ensure the costs due to fault current are apportioned correctly to distribution customers, FLARE will facilitate investigations into how to amend and implement the CCCM, consult, and recommend a Distribution Connection Use of System Agreement (DCUSA) Change Proposal.

This work builds on similar work undertaken by DNOs, such as ENWL first tier project Fault Current Active Management (FCAM) and Western Power Distribution's (WPD) Implementation of an Active Fault Level Management Scheme.

The project requests funding of £4,574,000 and has a total project cost of £5,749,000. ENWL are making a compulsory contribution of £519,000. ENWL has negotiated a contribution from all project partner organisations representing £562,000 of the total project expenditure.

ENWL state the methods trialled by FLARE are expected to release up to 341MW, in the Trial area. ENWL claim that once fully deployed, the roll-out of the methods across GB could unlock over 127GVA of capacity for the connection of low carbon generation and demand technologies. This is presented as a potential saving [redacted] of £1.4 billion when rolled out across GB by 2050.

2. ASSESSMENT AGAINST CRITERIA

2.1 SUMMARY OF ASSESSMENT CRITERIA

The criteria against which each submission will be assessed are outlined in the LCNF Governance Document. The criteria for the LCNF projects are:

(a) Accelerates the development of the low carbon energy sector and has the potential to deliver net financial benefits to existing and/or future customers;

(b) Provides value for money to distribution customers;

(c) Generates knowledge that can be shared amongst all DNOs;

(d) Involvement of other partners and external funding;

(e) Relevance and timing;

(f) Demonstration of a robust methodology and that the project is ready to implement.

2.2 CRITERION (A): ACCELERATES THE DEVELOPMENT OF THE LOW CARBON ENERGY SECTOR

2.2.1 Key statements

- The FLARE project trials more sophisticated system control methods required for the integration of increased distributed generation (DG) and low carbon technology (LCT) onto the distribution network. The electricity grid will undergo a reform in the transition to low carbon, and FLARE will prevent expensive network reinforcement that may otherwise be required.
- FLARE will ascertain whether customers are willing to provide a new Fault Current Limiting service and if so at what price.
- ENWL predict FLARE could release 23MVA and 90MVA of additional generation at each of their primary substations and bulk supply points, respectively, where the switchgear rating is at the system design fault level or below. Extrapolating to the whole of GB, ENWL predict that this would give 127,275MVA of cumulative additional capacity by 2050.
- ENWL estimate the planning and installation time for traditional reinforcement is 390 days. For the introduction of I_S-limiters, this is estimated to be 90 days, and for Adaptive Protection and Motor Protection just 20 days. This means FLARE is up to 95% faster at releasing capacity than traditional methods.
- FLARE has the potential to save up to £175m for ENWL customers, and £1.4 billion for all GB customers up to 2050, when compared to business as usual approaches.

2.2.2 Challenges and Potential Shortfalls

Criterion (A) – Accelerates the development of the low carbon energy sector and has the potential to deliver net financial benefits to existing and/or future customers;	
Sub-criterion (a.i) – Ability to facilitate the Carbon Plan through GB wide roll out.	**Challenge 1**: The submission states that all three methods could allow HV substations to gain the theoretical maximum of 23MVA of additional capacity, and all EHV substations 90MVA of additional capacity. When calculating the percentage of all sites across GB that would be applicable for the scheme in order to determine the total capacity released, ENWL has provided more information regarding primary substation break fault level as a percentage of switchgear rating for its own network than the whole of GB (excluding Manweb) – see the answer to clarification Question 11. Over 30% of ENWL substations and about 44% of GB substations have less than 50% of the expected fault current as a percentage of their rating. The number of appropriate applications of the FLARE methods (Appendix A1 of the pro-forma) appears optimistically high especially between 2030 and 2050. Information of the level of confidence, or minimum and maximum bounding figures, for the number of applicable sites, and therefore the impact on the confidence of the estimated total released capacity would assist in this evaluation.
	Answer 1: The figures used in the submission Appendix A1 for 2020 to 2030 and 2030 to 2050 are based on ENWL load forecasts for DECC 'Medium' scenario 1, with high heat pump adoption, medium EV take up, medium PV take up and no DSR take up. We would regard these figures for the number of applicable sites as close to the maximum bounding figures. We would expect the DECC 'High' scenario 3 (with high heat pump adoption, high EV take up,

high PV take up and no DSR take up) to provide the maximum bounding figures. To provide minimum bounding figures, we have revisited the calculations using ENWL load forecasts for DECC 'Low' scenario 4, with low heat pump adoption, low EV take up, low PV take up and no DSR take up.

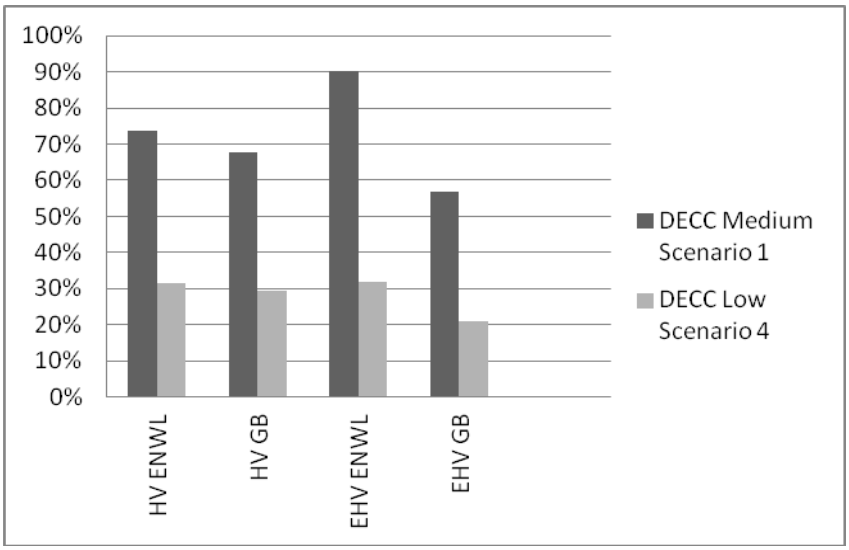
The resulting figures are much lower for 2030 to 2050 in particular, please see the attached document. This contains a revised table and shows the difference between DECC 'Medium' scenario 1 and DECC 'Low' scenario 4. A move to low carbon technologies represents an increase in demand and fault level, the only difference in the various DECC scenarios is the rate at which substations reach their switchgear fault rating, and hence the rate at which the FLARE methods can be applied.

Appendix A1 DECC Low Scenario 4.docx

Conclusion 1:

The addition of a lower bound adds further evidence that the methods ENWL have applied to its own network to determine the relevance of the FLARE methods are logical.

Use of the Low Scenario has no effect in the immediate time frame (up to 2020); however, has a large effect on the estimated additional capacity required, and hence the potential relevance of the FLARE methods, until 2050. However, use of the low scenario still indicates a significant need for additional capacity.



Number of sites up to 2050 suitable for the application of FLARE methods (%)

There is still some unclarity as to the applicability of the method for assessing additional capacity over the whole of GB, where it is feasible that the capacity restraints and time available before replacement could generally be different from those in the North West.

Overall, there is now stronger evidence that there will be a need for

	reinforcement that the FLARE methods can defer, should they be successful. It is deemed that a judgement has to be made on whether the size of this need is important. No further comment.
	Challenge 2: A summary of the asset, operational and facilitation carbon impacts has been presented in Appendix A3 for traditional reinforcement and the three FLARE techniques. No breakdown as to how these figures were achieved has been given. A tabulated breakdown as to how the carbon plan figures are to be achieved from the application of FLARE would assist in this evaluation.
	Answer 2: Appendix A3 in the FLARE Full Submission contains Tyndall Manchester's estimated carbon impact of FLARE. This Executive Summary only estimates the asset and operational carbon, whereas tables A1.4 and A1.5 contains the facilitated carbon, as prescribed by Ofgem. The attached excel worksheet contains the carbon impact assessment calculations and outputs used in the development of Appendix A3 of the FLARE Full Submission. We'd be happy to provide a run through of the workbook or explain any of the calculations via a teleconference.  FLARE CARBON CASE FINAL.xlsx
	Conclusion 2: The further information provides more evidence that a quantitative method has been applied to determine the Carbon impact of the FLARE methods. However, these techniques are still not clear, for example "% reduction from Trad" also contains a column for "Trad rein". In addition, for each of the four mitigation techniques, it is still not evident what equipment (predominantly what cable) has been selected for replacement, and therefore used in the carbon impact assessment calculation, and nor is the reasoning behind these choices. Many of the additional graphs are not labelled. Never-the-less, assuming the methodology used has been logical and is correct, the Carbon impact of the FLARE methods appears to be of the same order of magnitude as that of traditional reinforcement. Assuming the Carbon benefits due to the facilitation of the connection of LCTs vastly outweigh this, then there are no main concerns. No further comment.
Sub-criterion (a.ii) – Delivers the solutions more quickly than the most efficient existing method	**Challenge 1**: The estimated effort for Adaptive Protection on switchgear is 20 days (two weeks calculating the protection settings and two weeks for installation), on electrical machines it is 20 days (two and a half days' calculation and three and a half weeks for installation) and on I_s-limiters is 90 days. This is compared to 390 days for traditional reinforcement. It is recognised that in the delivery of the FLARE project, the time to plan for and to retrofit the Adaptive Protection into existing substation environment will take longer due to new challenges and development of the installation solutions. Delay to installation is an identified risk and mitigation actions are in place. Have the adaptive protection technologies been approved for use on the network by the ENA? If not will be a substantial delay while this is progressed.

Even accounting for initial installation delays, the prediction that FLARE methods will become 95% faster than traditional reinforcement as they become BAU without adequate supporting evidence is considered optimistic.

The provision of a level of confidence, or minimum and maximum bounding figures, for the planning and installation time of FLARE methods compared to traditional methods would assist in this evaluation.

Answer 1:

In the delivery of the FLARE project we expect that the time to plan for and retrofit the FLARE methods into existing substation environments will take much longer as we will be facing new challenges and developing the installation solutions. As we gain the knowledge and experience of the challenges and the solutions we suggest that the time required for a single installation of each FLARE Method will reduce. The FLARE project will develop and output the methods of installation and configuration for each FLARE Method at HV and EHV substations and from this we can derive the planning and installation time for each FLARE Method, showing whether the estimated time for planning and installation is optimistic or not.

We note that only if we are incorrect by a factor of 4 will the planning and installation times be close to current business as usual solution. The table below shows the comparison, assuming all the FLARE Method take four times longer than estimated in the FLARE Full Submission.

Method	Planning & Installation Time (days)
Traditional reinforcement	390
Adaptive Protection	80
FCL service	80
I_S-limiter	360

We will use our existing call off arrangements for the protection relays for the Adaptive Protection technique and this equipment has already been approved by the ENA. As we are only changing the time element of the standard protection settings to apply the Adaptive Protection technique this does not require ENA approval. However in the delivery of the FLARE Project we will engage with the ENA approvals panel to explain our version of Adaptive Protection methodology and make available the method of application through amending the protection settings.

Conclusion 1:

The reason for the selection of the factor of 4 is taken to be empirical. It is accepted that there is significant room for manoeuver in the original figures given, in order to achieve a reduction in planning and installation time compared to traditional reinforcement; however, there is no added confidence given to these figures.

It is indicated that the exact planning and installation time cannot be accurately estimated until after the trials. It is also noted that a risk of overrun is already included in the risk register.

Clarification of the interactions with the ENA and the Adaptive Protection method (amendment of time settings only) provides assurance that a significant delay due to negotiations with the ENA will not occur. For this reason, there is no major concern, and therefore no further challenge.

Sub-criterion (a.iii) – The financial benefit of each method compared to most efficient existing method	**Challenge 1**: It is unclear how £1.4bn of total cost saving to GB by 2050 is derived from the figures given in Appendix A1 Figures A1.2 and A1.3. Moreover, a tabulated breakdown of how the financial benefits in these tables are calculated has not been provided. In the CAPEX spreadsheet produced for ENWL clarification question Q15, row 28 (year 2043) shows a significant expenditure equivalent to the cost of traditional reinforcement at the substations fitted with FLARE technologies. This implies the financial benefits of FLARE are achieved through the deferral of investment. The longer term financial benefit of deferring reinforcement cost and the financial benefit to customers through to 2050 need to be clarified to assist this evaluation.
	Answer 1: Please see attached the excel workbook developed for completing the tables in Appendix A1.  Appendix A1 tables.xlsx In essence the net benefit tables A1.2 and A1.3 (in Appendix A1) have been completed using the following calculations: 1. For each Trial (ie Adaptive Projection, FLC service and I_S-limiter) the net benefit is calculated as the difference between the Method and Base Case costs. In the case of the FCL service a minimum and a maximum value is shown recognising that the net benefit cannot be fully calculated yet as the price for purchasing the FCL service is not known. 2. The net benefit of each Trial is multiplied by the number of sites that are projected to require fault level reinforcement at each time period ie at 2020, between 2021 and 2030, and between 2031 and 2050. The number of projected substations requiring fault level reinforcement is calculated using the DECC medium scenario detailing the penetration of LCTs up to 2050. 3. Each table has been completed to show the maximum potential net benefit of rolling out each Trial across the whole population of applicable substations to give a potential range. Any allocation methodology to specify the quantity of substations which each FLARE fault level mitigation technique would be applied to would be artificial as it ignores some of the other potential fault level mitigation solutions being trialled by FlexDGrid. The capacity release tables A1.4 and A1.5 (in Appendix A1) have been populated in the following manner: 1. For each Trial (ie Adaptive Projection, FLC service and I_S-limiter) the capacity released is calculated; 2. The capacity release of each Trial is multiplied by the number of sites calculated as described above. 3. Each table has been completed to show the maximum potential capacity that could be released through rolling out each Trial across

	the whole population of applicable substations to give a potential range. Again no allocation methodology has been proposed. The project business case is built around the avoidance of the reinforcement (ie the early replacement of network assets) due to fault level issues. The aim of the FLARE project is to avoid the need for reinforcement by managing the fault level issue through the retrofit installation of a FLARE Solution thereby allowing an existing asset to be used until the end of its life (as defined by our CBRM). In essence this reduces the size of the reinforcement capital expenditure within a period. The NPV calculation for each FLARE fault level mitigation solution shows the financial benefit of applying the retrofit technique and operating the existing and new assets until the existing assets need replacing due to condition.
	Conclusion 1: There are no further challenges regarding the capacity released. Regarding cost benefit, it is now clear that this is calculated from the deferral of costs for replacing existing equipment like-for-like, rather than preventing the costs entirely. However, the methodology (namely the time before replacing assets at each substation and the following NPV calculation) has not been presented and so there is still confusion over this issue. Note: There is also no discussion as to the potential for and benefits of reuse (transferal to other substations) of FLARE technologies, specifically I_s limiters. This may affect the cost benefit case.
Sub-criterion (a.iv) – The network capacity released and how quickly	**Challenge 1**: The additional fault level capacity introduced by the use of generator and motor active fault level management is given as 23MVA per HV substations and 90MVA per EHV substation. In reaching these figures, it does not appear that the market uptake of, or the number of potential participants who could provide a FCL service have been considered in sufficient detail. Justification of the ability to realise the full capacity increase using the motor protection method is required to assist in this evaluation
	Answer 1: The FLARE project proposes trialling whether a customer is willing and able to offer a new commercial service, the FCL service, to a distribution network operator, and if so at what price. FLARE will ascertain, through the customer survey, the willingness of customers and the price point at which customers will provide the FCL service; and in the live Trials FLARE will demonstrate that it is technically feasible for a customer to deliver a FCL service. Until the survey is complete we have only anecdotal evidence that we can purchase the FCL service from a customer or group of customers to mitigate the fault level issue and delivery the capacity release. At this stage the likely market uptake or potential participants who could provide a FCL service has not been established. Our answer to question 13 (attached for ease of reference) outlines in calculation note 13 how we arrived at the value of 4 to 7MVA per 1MW fault level contribution for the sizes of synchronous machines which connect to the distribution network. This is based on typical parameters used by our System Planning and Parsons Brinckerhoff engineers, and is the contribution to system fault level at the point of connection. A conservative figure of 4 MVA was used to calculate the theoretical released capacity. We have

	assumed, based on discussions with our partners, that it is possible to purchase the FCL service to deliver the stated 23MVA at HV and 90MVA at EHV from a customer or group of customers. FLARE will prove or disprove whether this is possible and economically sensible.  Q13 and Q14 attachment.docx
	Conclusion 1: The methodology has provided clarification of the technical assumptions made to achieve the theoretical released capacity. However, no further assurance is provided as to the market uptake of, or the number of potential participants who could provide a FCL service, although it is understood that this cannot be ascertained until after the survey. For this reason, success of the FCL service is still deemed at risk. However, it appears that the costs of the project activities related to the FCL service sum to less than the costs of those related to the Adaptive Protection and I_s-limiter methods. In order to ensure that value for money is achieved through the FCL service-specific project activities, it is suggested that for the FCL service, achievable milestones, relating to the identification and securing of suitable participants, are put in place; the level of success of which could determine whether or not to continue with the scheme.
Sub-criterion (a.v) – Potential for replication of the method across the GB	The potential for replication of the method across the GB has been reviewed, and it is considered that Challenge 1 to sub-criterion (a.i) is applicable; no further Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A

2.3 CRITERION (B): PROVIDES VALUE FOR MONEY TO APPLICABLE CUSTOMERS

2.3.1 Key Statements

- FLARE will lower the standard charges for fault level reinforcement paid by all customers under the Distribution Use of System (DUoS) charges.
- The ENWL pro-forma identities that the current CCCM does not facilitate the cost apportionment of the alternative fault current mitigation techniques considered by the FLARE and FlexDGrid projects. ENWL have described the issues with the current version of the CCCM, and have stated that FLARE will investigate how to amend the CCCM, consult, and recommend a Distribution Connection Use of System Agreement (DCUSA) Change Proposal.
- Project partners have been found using an open competitive procurement process, after advertising project requirements on the ENA Smart Networks Portal. The expected day rates for each partner are given in the pro-forma and generally seem reasonable, although the provider for the NMS replacement service has not yet been selected. ENWL has negotiated a contribution from all project partner organisations representing £562k (9.8%) of the total project expenditure. Note: the contribution from ENWL is limited to the compulsory contribution representing a further £519k (9%) of the total project expenditure.
- FLARE is the first demonstration of active management of fault levels on any GB distribution network; it is the first scheme to use real-time fault current assessment to control the mitigation techniques. Innovation in this area, provided by the project, will remove commercial and operational barriers to widespread uptake of the techniques.
- The cost for developing the ICCP link required for the Fault Level Assessment software to work was developed under the project Smart Street [redacted]. FLARE benefits fully from the previous work.

2.3.2 Challenges and Potential Shortfalls

Criterion (B) – Provides value for money to applicable customers;	
Sub-criterion (b.i) – Benefits attributable or applicable to the relevant network vs. elsewhere.	**Challenge 1**: The submission makes no specific claims about the benefits attributable or applicable to the relevant network vs. elsewhere; therefore no assessment can be made of this sub-criterion. Further arguments and evidence need to be presented in order for a proper assessment to be made.
	Answer 1: The requirement for fault level reinforcement is driven by general load growth or by new connections. Where the fault level reinforcement need arises from general load growth, a DNO would fund the reinforcement work from the price control allowance, funded by all DUoS customers. Where the fault level reinforcement need arises from a new connection, a DNO would calculate the proportion of reinforcement work to be funded by the connectee and the remainder would be funded from the price control allowance through DUoS chargeable to all customers. Therefore the biggest benefits will be seen by all our customers, through a reduction in overall DUoS with some direct benefits being seen by connectees. The proposal to review the cost apportionmment methodology for fault level reinforcement costs within the connection charging mechanism is to ensure that the connectee contributes an appropriate amount to the development of the network driven by their desire to connection to the distribution network.
	Conclusion 1: Answer is directly relevant to the sub-criterion; no further challenges are

	presented.
Sub-criterion (b.ii) – Steps taken to undertaken open, competitive procurement process.	The steps taken to undertaken open, competitive procurement process are defined in the pro-forma and summarised above in Section 2.3.1, therefore no challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (b.iii) – Other steps taken to ensure that funding request represents good value for money.	**Challenge 1**: The entire sum of the ENWL compulsory contribution is spent on project management between two roles: Project Manager and Technical/Trials Manager. £770k is assigned to overall project management activities; it is not clear from the project plan what activities are incorporated in the overall cost of project management. Note: there are two rows in the submission spreadsheet with the description 'Project Manager' (see rows 13 and 64). Is this intentional? A breakdown of the project management activates would assist in this evaluation.
	Answer 1: The project management structure for FLARE is based around Workstream outputs as in previous Second Tier projects. We have found that this provides the right focus on deliverables and learning (see Appendix E of the Full Submission which shows the Project Management structure). In essence the listed Project Management costs fund the Project Management Office and include the costs for the various project management personnel (ie Project Manager, various Workstream Leads and support services) and accommodation. In FLARE there is one full time Project Manager to oversee the delivery of FLARE Project. The PM is full time for the life of the FLARE Project and the PM's activities include: • overall responsibility for governance and management • scheduling of activities • interface and co-ordinate Project Partners • knowledge capture and dissemination, and • formal and informal reporting on project progress. The costs for the four Workstream Leads have been profiled with activities ie the Workstream Leads are full time for specified periods in the FLARE Project and at other times are not funded or funded part-time. For example, the Customer Workstream lead is in place full time for 12 months from April 2015 as this period includes: • Customer Engagement Plan and Data Privacy Statement drafting/ approval Customer engagement and identification • survey design, managing Engaged Customer Panel, and full customer survey, and • survey analysis and report. Following this peak in customer activities, the resource requirements lessen. For example the Customer Workstream lead is funded part-time (ie one week per month) during the live Trials period (May 2016 to April 2018) to support:

	• purchase of FCL service contracts • provide customer representation to FCL service providers, and • undertake post event analysis. After the live Trials the Customer Workstream Lead is funded part-time (ie two weeks per month) to finalise the analysis and report on the findings and create the dissemination materials, including elements of the Project Closedown report. We have allocated funds for one full-time person for the life of the FLARE project to lead and carry out activities across both the Technical and Trials & Analysis Workstreams; we will decide in project delivery whether this is the same person or two people. Key activities in the Technical Workstream will include: • site selection • installation and decommissioning planning • equipment and software installation • testing and commissioning • specification, procedure and protection policy updates, and • training of operational resource. Whereas key activities in the Trials & Analysis Workstream include: • Design of monitoring and post fault analysis • Completion of post event studies and reporting • Asset health study activities and CBRM updates, and • Close down reporting. In addition these Workstream Leads will work with the Project Manager to capture the learning and deliver the knowledge sharing through the dissemination activities defined by the SDRCs. Lines 13 and 64 in the Whole Project tab of the Full Submission workbook both relate to funding of the FLARE Project Manager. The PM will be jointly funded by Electricity North West and the LCN Fund, with line 13 showing the Electricity North West funded element and line 64 showing the LCN funded element. These act as the balancing elements in the workbook to achieve Electricity North West's 10% contribution value.
	Conclusion 1: This breakdown provides some assurance that the cost of the project manager has been achieved through assessment of the estimated time required to complete the necessary tasks. A judgement of these estimates has not been made by Frazer-Nash, apart from to confirm that the majority of the activities provided in the answer above appear distinct from those already costed in the Full Submission Spreadsheet. No further challenges are presented.

2.4 CRITERION (C) GENERATES KNOWLEDGE THAT CAN BE SHARED AMONGST ALL RELEVANT NETWORK LICENSEES

2.4.1 Key Statements

The Department of Trade and Industry (DTI - now Department for Business, Enterprise and Regulatory Reform and the Department for Innovation, Universities and Skills) report entitled The Contribution to Distribution Network Fault Levels from the Connection of Distributed Generation, issued in 2005, lists the potential techniques as options for managing increased fault levels. FLARE seeks to investigate those technologies not included as part of FlexDGrid, which will give a larger range of solutions for GB. In addition, fault level management is pertinent to a number of IFI and First Tier projects, listed in the pro-forma.

FLARE will provide DNOs with knowledge in a number of key areas:

- FLARE will provide new information on how to best engage with customers for the FCL service and share with the DNO community the most effective route to market for these new commercial arrangements.
- FLARE will test the willingness of customers to engage in FCL service contracts and deliver new commercial templates for purchasing a FCL service.
- FLARE will deliver carbon and economic analysis that will allow a DNO to assess the carbon savings and customer benefits of the solutions on its own networks.
- FLARE will deliver ready to use specifications enabling a DNO to purchase and install the FLARE technologies.

In order to disseminate this knowledge, ENWL will share the following information gathered from FLARE with the rest of the DNOs:

- The installation requirements (including any local planning considerations) and proposed substation configurations for the IS-limiter and an updated and peer reviewed Safety case.
- Device settings, configuration parameters and operating procedures for each piece of fault level mitigation equipment and the appropriate software algorithms.
- The list of parameters required by the manufacturer to enable the calculation of the I_S-limiter settings.
- The planning, design and operation standards for near real time fault level management.
- Developed health and safety documentation and operational training guides.
- The configuration and interface specifications for the Fault Level Assessment Tool with the NMS via a standard ICCP link.
- Supporting reports to demonstrate the accuracy of the calculations carried out by the Fault Level Assessment Tool, and demonstrate the success of the Trial via post fault analysis and confirmation that there are no asset health issues.

The knowledge sharing relevant to all key stakeholders is described in detail in the pro-forma. The methods by which ENWL plans to share information are as follows.

- FLARE website;
- ENA Smarter Networks Portal;
- Webinars;
- Knowledge sharing events;
- Consultations and advertorials;
- Internal workshops, intranet, newsletters etc. (within ENWL).

2.4.2 Challenges and Potential Shortfalls

Criterion (C) – Generates knowledge that can be shared amongst all relevant Network Licensees;	
Sub-criterion (c.i) – The level of incremental knowledge to be provided by the project.	The level of incremental knowledge to be provided by the project has been demonstrated in the pro-forma by summarising the relevant knowledge gained from previous IFI and First and Second Tier LCN Fund projects; no Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (c.ii) – Applicability of new learning to other DNOs.	The applicability of new learning to other DNOs is described in the pro-forma and summarised above in Section 2.4.1; no Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (c.iii) – Plans to disseminate learning.	The plans to disseminate learning are defined in the pro-forma and summarised above in Section 2.4.1; no Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (c.iv) – Robustness of the methodology to capture learning.	**Challenge 1**: There is no clear methodology for capturing the learning on the project; however, a knowledge dissemination roadmap will be created at the start of the project by a dedicated Learning and Dissemination workstream in line with project milestones. Therefore, no challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (c.v) – Treatment of IPR.	**Challenge 1:** There is no proposed IPR strategy for the work described in the pro-forma. Information on what IP ENWL and its project partners would retain and how this affects the knowledge sharing methodology need to be presented in order for a proper assessment to be made.
	Answer 1: FLARE complies fully with the default IPR arrangements of the LCN Fund Governance Document v6 and therefore all resultant IPR will be shared with the GB DNO community. Knowledge to be generated by FLARE will include: • Specifications, configuration and installation methodologies for each FLARE fault level mitigation technique and Fault Level Assessment Tool; • Draft DCUSA change proposal for amending Fault Level Cost Apportionment Factor in Common Connection Charging Methodology; • Protection settings and operational procedures for each FLARE fault level mitigation technique; • Customer survey outputs on willingness and price for a FCL service; • Commercial contract templates for FCL service; • Asset health study results; and • Cost benefit analysis, carbon impact assessment and safety case

	each FLARE fault level mitigation technique. We have considered the relevance of the above IPR to stakeholders and industry participants. All IPR from this project will be shared freely with the GB DNO community through our proposed knowledge dissemination programme.
	Conclusion 1: Response is deemed satisfactory; no further Challenges are presented.
	Challenge 2: Can ENWL confirm that the there will be no restrictions to knowledge sharing with WPD regarding the FlexDGrid project (e.g. caused by NDAs between the DNOs and Parsons Brinckerhoff etc.)? How will they ensure that the most beneficial technical and commercial solutions between the two projects will be put forward?
	Answer 2: The FLARE bid team have met with the FlexDGrid project team from WPD to discuss the scope of the two projects and potential future closer collaboration and knowledge sharing, if FLARE was awarded funding. Appendix L was created following that meeting to show that the projects are complimentary and, once completed will have demonstrated, on a GB distribution network, the entire list of proposed solutions described in the DTI report. In our answer to question 2, we confirm that we will comply with the terms of any NDA agreements signed with Parsons Brinckerhoff, but in essence there will be no restriction on sharing knowledge between the two projects. Roger Hey, the Future Networks Manager from Western Power Distribution confirms, in the attached e-mail, his support for collaboration between the FlexDGrid and FLARE projects and confirms there will be no restriction in the sharing of information between the two projects. We will, where possible collaborate on knowledge dissemination and reference each project in dissemination materials. Evaluation of the fault level mitigation techniques through cost benefit analysis and carbon impact assessments will identify the techniques most appropriate where differing scenarios create fault level issues.  FLARE-FlexDGrid colloboration e-mail.p
	Conclusion 2: Response is deemed satisfactory; no further Challenges are presented.

2.5 CRITERION (D) INVOLVEMENT OF OTHER PARTNERS AND EXTERNAL FUNDING

2.5.1 Key Statements

As described in Section 2.3.1, project partners have been found using an open competitive procurement process, after advertising project requirements on the ENA Smart Networks Portal. The expected day rates for each partner are given in the pro-forma and generally seem reasonable, although the provider for the NMS replacement service has not yet been selected. ENWL has negotiated a contribution from all project partner organisations representing £562k (9.8%) of the total project expenditure. Note: the contribution from ENWL is limited to the compulsory contribution representing a further £519k (9%) of the total project expenditure.

2.5.2 Challenges and Potential Shortfalls

Criterion (D) – Involvement of other partners and external funding;	
Sub-criterion (d.i) – Collaborators involved in the project	The collaborators involved in the project are listed in the pro-forma and summarised above in Section 2.5.1; no Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (d.ii) – Steps taken to indentify potential partners and ideas.	The steps taken to identify potential partners and ideas are defined in the pro-forma and summarised above in Section 2.5.1; no Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (d.iii) – External funding for the project.	The external funding for the project is presented in the pro-forma and summarised above in Section 2.5.1; no Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (d.iv) – How secure external funding is.	Letters from project partners confirming partnership are provided in the pro-forma (although the letters do not confirm that the amount of external funding is as proposed in the submission). Given the stage of project initiation, no Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A

2.6 CRITERION (E) RELEVANCE AND TIMING

2.6.1 Key Statements

- In March 2014, in RIIO-ED1, the DNOs agreed to share data tables containing their forecast spending. From these ENWL have identified the total forecast fault level related for the period from 2015 to 2023 was £156 million.
- FLARE complements FlexDGrid, a Second Tier project looking at other fault level mitigation techniques. ENWL believe that the FLARE fault level mitigation techniques will be more relevant to other DNO networks than those of FlexDGrid as the Trial substations used are more representative of the type and configuration found across GB. Furthermore, ENWL also envisage that the Fault Level Assessment Tool could enhance the technologies being demonstrated by FlexDGrid.

2.6.2 Challenges and Potential Shortfalls

Criterion (E) – Relevance and Timing;	
Sub-criterion (e.i) – The relevance of the solution to the move to a low carbon economy	It is considered that the relevance of the solution has been demonstrated in the pro-forma, and no Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (e.ii) – How the method will be used as part of future business planning.	FLARE will produce a series of techniques that can be deployed either in response to customer choice or network constraints. PB Power will provide electricity policy documents (EPD) and codes of practice (CoP) to support the transition from business as usual and rollout across GB; no Challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (e.iii) – How the method will be used as part of future business planning if uptake of LCTs is less than expected	**Challenge 1**: The submission makes no specific claims about how the method will be used as part of future business planning if uptake of LCTs is less than expected A statement on the applicability of the methods should the uptake of LCT be less than expected (paying particular note to sub-criterion (a.i)) need to be presented in order for a proper assessment to be made.
	Answer 1: The Cost Benefit Analysis of each FLARE and FlexDGrid technique will provide a suite of solutions to the GB DNOs for managing fault level issues. The solutions will be applied in the development of our business plan. All business planning exercises include identification of the size of a problem (ie in our case quantities and types of fault level issues) and the potential solutions to derive a future expenditure programme. If the driver of the problem varies then the size of the programme at a specific point in time varies. But this does not change the solutions that would be applied to remedy the problem. The uncertainty of the take-up of LCTs will amend our business plans in terms its financial size but not the solutions to manage the fault issues.

	Conclusion 1: This response has confirmed that the FLARE methods will be used for managing BAU fault current level issues. The benefits of this method should the uptake of LCTs be less than expected has not been quantified, which would provide assurance that the FLARE methods present a lower risk investment, although there is indication as to the related fault current level expenditure in Section 3 – Background (page 13) of the original submission. No further Challenges are presented.
Sub-criterion (e.iv) – The appropriateness of the timing of the project.	**Challenge 1:** No formal, quantitative estimate of the level of technology readiness of the FLARE methods, either before or after the programme, is provided in the submission. Detail of the TRL aims and expected outcomes of the project in terms of maturing the technology would assist in this evaluation.
	Answer 1: FLARE is a demonstration project where we will prove that we can apply active network management techniques to assess the network fault level and deploy a range of fault level mitigation techniques to manage the size and flow of the fault current. We estimate that the technology readiness level for the FLARE Project is seven (7).
	Conclusion 1: Response is deemed satisfactory; no further Challenges are presented.

2.7 CRITERION (F) DEMONSTRATE A ROBUST METHODOLOGY AND THAT THE PROJECT IS READY TO IMPLEMENT

2.7.1 Key Statements

There is no subsection f) included in Section 4 of the EMWL full submission, however there is information in the pro-forma Section 6: Project Readiness that can be used here.

ENWL started the First Tier LCN Fund project Fault Current Active Management (FCAM) in 2013 to explore the potential of using alternative techniques to manage the size and flow of fault current in distribution networks. This project involved working with many of the project partners proposed as part of the FLARE submission. FCAM identified that it is possible to employ different approaches to manage fault current, based around an enhanced centralised network management tool and enabling devices to operate in a prescribed manner should a fault occur. This work provides confidence that the concepts and Trials proposed within the FLARE Project are ready to be demonstrated at network scale.

Readiness

PB Power have been contracted to review the technical feasibility of the FLARE concepts, and presented the following information on perceived project readiness.

Adaptive Protection

The adaptive protection concept or protective sequence switching is not being implemented by distribution networks operators around the world but the approach is similar to the operational tripping schemes used by National Grid UK for other purposes.

They commented that “protective sequence switching can be used to reduce fault currents by tripping a designated breaker through which fault contribution would normally be supplied”.

Motor Protection (FCL service)

Technical reviews of the protection for AC electrical machines, specifically looking into how the protection could be modified to quickly disconnect the fault current, have been carried out by PB Power and the University of Manchester, which resulted in the following conclusions:

- There are technical issues and the potential risk with de-energising the rotor field, so the normal disconnection using the opening of the incoming circuit breaker to quash the fault current contribution is the preferred technical solution.
- The existing generator protection can be easily adapted or replaced for the FCL service.

Further research is necessary to adapt the existing protection for large motors to be involved in a FCL service, and opportunities for large motors are expected to be limited.

I_S-limiters

I_S-limiters are a proven short-circuit current limiting device used around the world at distribution voltage levels, but have not been used on public distribution networks in GB.

The specific mode of operation of the I_S-limiters within FLARE has been discussed with the HSE who are supportive of the approach. A safety case has been developed, which the results from FLARE will validate.

Risk Register

The key risks associated with the FLARE project are contained in Appendix D of which a significant risk across all Trials is expressed as follows:

- Suitably qualified resource may not be available to perform installation. As a contingency, consultants would be brought in to cover BAU activities, freeing up ENWL resource to conduct the installations. (Risk score 8)

The commercial solution risks have also been documented in the same table in Appendix D and are listed within the submission, of which two main risks are identified:

- The data protection strategy will be complicated by accessing customer survey participants from outside EMWL area leading to legal and reputational issues. To mitigate this risk, project partners will promote involvement throughout GB, and ENWL are working with Impact Research, who will ensure complete compliance with data privacy requirements and undertake a pilot communication Trial. (Risk score 10)
- Customers with relevant demand or generation do not engage with the customer survey. This is being mitigated by Impact Research's experience in creating a suitable survey contact list, and by offering incentive payments to participants. (Risk score 8)

Project Cost

The costs of the project have been summarised as part of this review process in Table 1 overleaf. This shows the project costs per workstream and per cost category in £k as presented in the full project breakdown provided by ENWL. The majority of the labour cost is spent on project management, as discussed in Section 2.3.2. Other major costs include IT and equipment, which are fairly evenly spread as expected. A significant amount of the total project budget – 20% – is also spent on contractors. A 7.2% contingency is provided to account for any changes to the cost of the project.

Successful Delivery Reward Criteria

The Successful Delivery Reward Criteria (SDRC) are split into the following five areas:

- Technology Build Workstream
- Customer Workstream
- Trials & Analysis Workstream
- Learning & Dissemination Workstream
- Close Down Report and Business as Usual

Each of these workstreams has several SDRC, detailing a comprehensive list of deliverables and milestones for each separate workstream in the project. Each has a corresponding level of evidence that is required to ensure it is met.

Table 1: Summary of project costs per workstream and per cost category in £k (before interest)

Workstream	Labour	Equipment	Contractors	IT	IPR Costs	Travel & Expenses	Payments to users	Contingency	De-commission	Other	Total
Adaptive Protection	[redacted]	[redacted]	[redacted]								£205,209
Asset Health Study			[redacted]								£28,100
Carbon Impact Assessment			[redacted]								£33,720
CBRM health indices updates			[redacted]								£44,340
Cost Benefit Analysis			[redacted]								£84,300
Customer Contingency								[redacted]			£37,674
Customer Survey			[redacted]								£140,146
Customer Survey Incentive Payments							[redacted]				£25,775
Decommissioning									[redacted]		£53,885
Extra post fault maintenance			[redacted]								£4,778
Fault Level Assessment Tool	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]					£1,715,645
FCL service		[redacted]	[redacted]				[redacted]			[redacted]	£250,995
Is-limiter	[redacted]	[redacted]	[redacted]					[redacted]			£1,274,920
Learning and Dissemination										[redacted]	£302,847
Monitoring		[redacted]	[redacted]								£170,431
Operational policy documentation and training	[redacted]										£21,837
Peer review site selection			[redacted]								£12,341
Post fault event analysis			[redacted]								£95,445
Procurement Support	[redacted]										£20,859
Project Management	[redacted]									[redacted]	£829,590
Safety cases										[redacted]	£32,945
Technology Contingency								[redacted]			£323,789
Trials & Analysis Contingency								£39,567			£39,567
Total (Funding outstanding)	**£1,306,767 (£786,538)**	**£1,341,904 (£1,057,839)**	**£1,128,851 (£1,096,028)**	**£1,033,827 (£833,827)**	**£0**	**£516 (£516)**	**£59,149 (£29,149)**	**£417,890 (£417,890)**	**£53,885 (£53,885)**	**£406,349 (£392,484)**	**£5,749,136 (£4,668,155)**

2.7.2 Challenges and Potential Shortfalls

Criterion (F) – Demonstrate a robust methodology and that the project is ready to implement;	
Sub-criterion (f.i) – Their project plan, risk management, mitigation and contingency plans, risk register and resources to deliver the project	**Challenge 1**: The claims in the pro-forma against criterion (F) need to be included in Section 4.
	Answer 1: We note that there is no Section 4f in the Full Submission template that covers the evaluation criteria f, as there is with the other sub-criteria a to e. The text in the Full Submission which covers sub-criterion f is contained in Section 6 and Appendices C, D, E and F.
	Conclusion 1: Response is accurate; no further Challenges are presented.
	Challenge 2: There are two risks that do not seem appropriately accounted for, as follows. 1) The risk that FLARE technologies do not operate as anticipated (leading to a lack of results to prove operational ability) has a risk score that is quite low. In the worst case, this could have a significant impact on successful project delivery. The probability of this risk occurring is mitigated considerably by the fact the technology has already been explored, however this would not reduce the impact. The second mitigating action for this risk, as presented in the submission, is that the technologies will only be installed at substations without fault level constraints, which addresses a slightly different problem: this ensures that should FLARE technologies fail to operate as anticipated the technologies do not have a detrimental impact on the network. As above, this risk would also have a high impact but the mitigating action would reduce the probability considerably. 2) The risk that installation of the new FLA or updated NMS tools will overrun, or that their results are not as expected, also incorporates more than one concern. If the installation of the tools overrun then with the mitigating and contingency actions in place, the impact would be lessened considerably, however it is unclear how the probability has been affected. Should the tools operate unexpectedly or produce unexpected results once installed, in the worst case this could have significant impact on successful project delivery. However, the mitigating and contingency actions in place would lessen this probability. The method for scoring these risks needs to be confirmed as appropriately weighted and accounting for all separate issues. Further information of the methodology used for risk probability determination should be provided to assist in this evaluation.
	Answer 2: The Risks and Issues register, Appendix D in the Full Submission, was developed to focus on the top ten risks associated with Project delivery. It is clear to us after reading the consultant's comments that we have not correctly worded some of the risks in the register and so we have revised these risks to hopefully better describe the risk and the mitigating action(s). We apologise for any confusion created and the attached table contains the revised risks. The amended risks follow the methodology described at the

	top of Appendix D. In project delivery we find it's important to register every potential risk or issue on the register, initially describing and scoring it. We note that a risk or issue may change from their original description as all risks and issues are constantly discussed and reviewed at weekly, monthy and quarterly progress meetings. There is sustained challenge that the risk, the risk score and the mitigating actions are accurate. The selection of the probability score involves an element of judgement, but as the knowledge and experience of the project team is wide and varied any bias is designed out by the project governance approach to risks and issues. In response to the bullet points made above we make the following comments 1) This risk should have read: "There is a risk that FLARE technologies do not perform as anticipated leading to Trial circuits exceeding their fault level limits". The two mitigating actions for this risk remain valid and we agree with the consultants' observation that the impact will remain unaffected. We have revised the impact upwards to five (5) and left the probability at two (2). We note that the risk associated with lack of results due to limited faults experienced is risk number 9 in the register. 2) We also agree with the consultant's comments that risk 2 in the register contains two issues. The revised table separates risk 2 into two separate risks considering the two issues of delayed installation of the NMS/ Fault Level Assessment Tool and delays due to operational issues in commissioning. The installation overrun risk and Fault Level Assessment Tool performance risk have been expanded and probability and mitigation actions specific to the identified risk defined.  Appendix D risks.docx
	Conclusion 2: The changes made to the Risks and Issues register address the Challenge made; no further Challenges are presented.
	Challenge 3: There is no evidence of the provision for measurement gateways to assess the technical and commercial feasibility of the project as it progresses. No consideration has been given to challenges that might arise that impede the project's continuation, either as a whole or regarding a particular method. There is no plan for how the contingency budget will be managed. The approach to monitoring project health needs to be considered and an action plan provided to facilitate key decision making processes.
	Answer 3: All our Second Tier LCN Fund projects are managed applying the principles of PRINCE 2 methodology. The management of each project includes regular review sessions; for example the governance procedures for FLARE will include:

	• Weekly Project Manager led review meeting; • Monthly Project review session led by the Project Director; • Quarterly Project Steering Group (PSG) led by the Project Director involving Partners and key stakeholders; and • Six monthly public project progress reports. Weekly review sessions mostly cover the operational aspects of project delivery. Whilst for monthly review meeting highlight reports are generated that delve deeper in the progress of the project. The participants for the weekly and monthly meetings are generally internal personnel, but will include project partners and suppliers were appropriate. These highlight reports cover, at least: • Project manager summary with RAG status on cost, time and quality (ie health check); • Monthly workstream lead key achievements; • Risks & issues review and dependencies review; • SDRC performance dashboard; • Cost review against budget with outturn, including use of contingency budget; • Change requests or halt project application. The quarterly PSG meetings consist of programme director, project manager, project partners and workstream leads for which a similar highlight report, as shown above, is generated. These meetings examine progress against project plan and look ahead to identify any risks before progressing to the next stage. This process provides the PSG with the information required to identify any situation requiring the suspension or halt of the project. In these circumstances, how to proceed to realise learning and benefits from FLARE will be established in agreement with Ofgem and through DNO consultation. The compliance manager for the FLARE project attends the monthly progress and quarterly PSG meetings. The compliance manager, who was the original bid manager, sits outside of the delivery team and provides impartial oversight to ensure the project is being delivered both in line with the Project Direction and the requirements of the Full Submission. In addition to the above, the six monthly project progress report mechanism obliges us to inform Ofgem of any changes that affect the business case for FLARE and update them on the status of risks and issues. Prior to submitting six monthly reports we conduct internal review and decide wether there are any risks and issues that might impede the project continuation.
	Conclusion 3: Response is deemed satisfactory; no further Challenges are presented.
	Challenge 4: The risk that the evidence collected for the I_S-limiters cannot support the safety case for whatever reason has not been considered, and therefore no resultant actions have been put in place for in this eventuality,

	The impact and probability of this risk needs to be addressed.
	Answer 4: Under our First Tier LCN Fund project, FCAM, we commissioned ABS Consulting, a specialist in safety management organisation with experience of safety assessments for the nuclear industry, to conduct an initial safety case for the I_S-limiter. The Executive Summary of their report is provided in Appendix G and the full Safety Case was issued in response to question 20 and is re-attached here for ease of reference.  Developing the Safety Case for ABB : The I_S-limiter is one of the three fault level mitigation techniques to be trialled by FLARE. The success, or otherwise, of each technique is an output of the project and will be evaluated through the Trials & Analysis Workstream. It is possible that the there are not sufficient fault events in the live Trials to generate the evidence and this risk is identified in the register as risk number 9. It is also possible that there is sufficient evidence generated by the live Trials but use of a technique is not supported by their respective Safety Case. The probability of this eventuality is unclear prior to demonstrating the technique through the live Trials. The impact of this risk is that the FLARE hypotheses are disproven and the buy order of FLARE/ FlexDGrid/ traditional reinforcement fault level mitigation solutions reduced.
	Conclusion 4: This response goes some way to addressing the risk; no further Challenges are presented.
Sub-criterion (f.ii) – The customer impact of the project	Once the fault is cleared, an Automatic Restoration System (as per business as usual) operates to restore customers within three minutes except those within the isolation points of the fault. For FLARE, this means that customers providing an FCL service will be reconnected within three minutes unless they are without supply due to being within the faulted circuit. ENWL, working with Impact Research who are a marketing and customer engagement organisation, will engage with selected I&C and DG customers across distribution networks to ascertain their willingness to provide this FCL service and if so at what price. There are no challenges presented.
	Answer 2: N/A
	Conclusion 2: N/A
Sub-criterion (f.iii) – Uncertainties in costs and benefits	**Challenge 1**: ENWL have not provided any comments or statements on the uncertainty of costs and benefits associated with the project. The benefits in terms of capacity released and reduction in connection times are considered to be estimates and a level of confidence or the associated error bands would assist in this evaluation.
	Answer 1:

	Section 6 of the Full Submission describes our approach to developing the costs for the delivery of the FLARE project and the Direct Benefits realised. A key principle of the rigorous approach we take includes embedding a management accountant within the bid team who controls the Full Submission spreadsheet and provides challenge for inclusion of all activities (ie line items). In summary the process for cost inclusion involved: • Competitive procurement activities have been used where possible to select products and services and persuade suppliers or stakeholders to be involved in FLARE as Project Partners: • Where available existing Framework Agreements have been used; • Internal specialists were consulted to validate partners/ suppliers costs. For example protection engineers with extensive experience installing protection relays and IT&T colleagues involved in software requirements for C_2C, CLASS and Smart Street (previously named *eta*) assessed requirements for installation of Fault Level Assessment Tool; and • All costs were considered for the value they add to the project delivery or project outputs. This level of challenge resulted in removal of non value add activities such as interim reports. This rigorous approach has enabled us to propose the accuracy of the costs is between 3 and 5%. Where we have identified there is uncertainty with an activity and/ or the costs for the delivery of a specified output a contingency item has been identified and costed. For example: • There is uncertainty around the installation, testing and commissioning of the Fault Level Assessment Tool; • Incentive payments to encourage customers for participating in the survey may increase if we extend this survey GB wide; and • The cost at which customers are willing to provide a FCL service is uncertain. Contingency has been allowed for this to fully test the market price. In Section 3 of our Full Submission we outlined the benefits anticipated through the delivery of FLARE and in Appendix A1 we described the methodologies for generating the net benefits in £s and capacity released in kVA. This information has been developed assuming the penetration of future LCTs follows the DECC 'Low' scenario (ie low heat pump adoption, low EV take up, low PV take up and no DSR take up) up to 2020, which is in line with our Well Justified Business Plan for RIIO ED1. After 2020 we assume the DECC 'Medium' 1 scenario (ie high heat pump adoption, medium EV take up, medium PV take up and no DSR take up) to 2030 and to 2050. As the number of substation sites that the techniques will be applied to by 2050 has been queried we have re-calculated the applicability of the techniques assuming the DECC 'Low' scenario 4 through to 2050. This should represent the lower estimate of the level of applicability. The attachment to sub-criterion (a.i) contains the re-calculated capacity released tables and the attachment below contains the re-calculated net benefit tables. Both tables show substantial reductions in the capacity released and the net benefits due to the reduce number of substations requiring intervention. Whilst Appendix A2 contains the methodology for estimating the planning and installation time benefit. In the response to the sub-criterion (a.i) we note that even if we have incorrectly estimated the planning and installation

	time by a factor of four the delivery times for the three fault level mitigation techniques are less than traditional reinforcement.
	Conclusion 1: The methods and reasoning for the proposed accuracy of the costs presented in this response is deemed satisfactory. Similar to the conclusion to the Challenges presented to sub-criterion (a.iii), the addition of a lower bound adds further evidence that the methods ENWL have applied to its own network to determine the relevance of the FLARE methods are logical. However, there is still a lack of clarity as to how the financial benefits are derived from this, as discussed in the conclusion to Challenges presented to sub-criterion (a.iii). Furthermore, the size of the benefits per substation has changed for some situations in the new spreadsheet provided. Without further information as to the methodology taken to arrive at these benefits, it is not clear why.
Sub-criterion (f.iv) – Project methodology	FLARE has in place, a detailed project plan and an organogram, which contains roles of separate workstreams. The roles of the project partners are detailed. ENWL do not have a detailed technology plan; however, the submission indicates that a lot of the detailed work in this area will form part of the FLARE project. No challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A
Sub-criterion (f.v) – Successful Delivery Reward Criteria	FLARE has in place a detailed list of SDRC. This has been reviewed and no challenges are presented.
	Answer 1: N/A
	Conclusion 1: N/A

3. INITIAL FINDINGS

ENWL claim that deployment of the methods in this submission will advance fault level management systems to support the move to a low carbon economy. The project builds on the previous work completed by other LCNF projects and limited trial data, and its aim is to allow these technologies to be rolled out as business as usual.

The methods to advance fault level management systems are claimed to be practicable and if deployed to have the capability to realise significant benefits on the GB distribution networks. One of the aims of the submission is to further develop the business cases for each of the methods proposed.

The submission demonstrates a project plan is in place and key deliverables for project success are identified. The learning generated from within this project has been identified with regard to its relevance to the wider low carbon community with particular bearing on UK DNOs, some of which are involved in similar schemes, and the methods for knowledge dissemination have been discussed. The specific roles of the project partners selected to support this project have also been clearly presented.

Generally, the challenges identified by Frazer-Nash in this report are to provide clarifications and simple justifications for the key statements made in the submission; however, there is further work required to substantiate the claimed estimates of the benefits and costs. The key concerns are discussed in the summary below.

1. The value for money of the project is largely derived from the deferral of traditional means of network capacity upgrade costs; however, the financial benefits require further substantiation. More detail is required to establish whether the traditional reinforcement costs are prevented or postponed, and the timescales over which this happens in order that net present value can be calculated. The total figure for the estimated cost saving throughout GB requires further justification.
2. The benefits in terms of both capacity released and reduction in connection times are considered to be estimates and a level of confidence or the associated error bands are necessary to facilitate in this evaluation.
3. The methods, descriptions, and calculations used to determine a carbon contribution have been challenged as these fail to provide a clear understanding of the reduction in carbon contribution. This information would be best presented in a tabular format to enable independent substantiation of the figures.
4. Challenges have been made to the risk register, particularly with regard to the technical uncertainties of the methods being Trialled. Roll out of the I_S-limiter is dependent on the validation of the safety case and in the event of the Trial data not supporting the safety case, no resulting actions are discussed: it is not clear what impact this outcome would have on the project as a whole.
5. The approach to monitoring project health needs to be considered and a methodology developed for effecting contingency plans in the event that a risk(s) leads to a significant setback, either technically or commercially, which has irresolvable impacts the project delivery.

4. UPDATED FINDINGS FOLLOWING DNO RESPONSES

From the review of the responses provided by ENWL, it is judged that the majority of the challenges raised by Frazer-Nash have been satisfactorily addressed. Of the 15 challenges initially raised, 8 have been addressed via the provision of either information to support the initial claim or via new information required to provide assurance that the sub-criteria have been met. A further three Challenges are thought to have been mostly addressed, although there are minor points either missing or requiring clarification. These are regarding:

1. The methodology applied to GB rollout of additional capacity. (Sub-criterion (a.i))
2. The carbon impacts of FLARE methodologies. (Sub-criterion (a.i))
3. The installation time of FLARE technologies. (Sub-criterion (a.ii))

The remaining four challenges are regarding three outstanding concerns, or important claims made requiring clarification. These concerns are summarised below:

1. No assurance is provided as to the existence of a suitable volume of customers for the FCL service, or their willingness to participate. This presents a risk to the buy order of fault level mitigation solutions being reduced. It is suggested that for the FCL service, achievable milestones are put in place; the level of success could determine whether to continue or not with the FCL service scheme. (Sub-criterion (a.iv))
2. There is also a risk that the I_s safety case does not reach a suitable level, even supported by trial results, such that its use in the GB network is approved. This would also lead to the buy order of fault level mitigation solutions being reduced. (Sub-criterion (f.i))
3. Regarding the financial benefits claimed by the FLARE proposal, it is now clear that this is calculated from the deferral of costs for replacing existing equipment like-for-like, rather than preventing the costs entirely. However, the methodology (namely the time before replacing assets at each substation and the following NPV calculation) has not been presented and so there is still confusion over this issue. (Sub-criterion (a.iii) and (f.iii))