

EDGE-FCLi

6 Monthly Progress Report
April 2021 – September 2021



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1. Executive Summary

The Embedded Distributed Generation Electronic Fault Current Limiting interrupter (EDGE-FCLi) project is funded through Ofgem's Network Innovation Allowance (NIA). EDGE-FCLi was registered in September 2018 and is due for completion by March 2022.

EDGE-FCLi aims to develop a prototype solid-state fault current limiter into a commercial scale device. The device is manufactured by GridON, Israel and has been designed to connect in series with Distributed Generators (DG) on the 11kV network with a maximum 5MW rated output. The device can quickly disconnect the generation from the network upon detection of a fault condition. The FCLi has the capability to limit the fault current contribution from DG and therefore overcome fault level issues that can limit network capacity and prevent future DG connections.

The project is currently being delivered collaboratively between WPD and UKPN to ensure that a device is developed that is safe to connect to the 11kV network and is also replicable so that it can be deployed throughout GB. Both WPD and UKPN plan to install and trial an FCLi device on their respective 11kV networks with significant coordination of the FCLi design, factory, and laboratory testing to ensure that the devices are suitable for longer-term testing and trials in the field.

This report details project progress from April 2020 to September 2021.

1.1. Business Case

The growth of connected DG has caused an increase fault level across the 11kV network. This is particularly an issue in urban areas, where the fault level is more likely to exceed the capability of the switchgear to safely disconnect a network fault. The following section describes the business case for the FCLi device.

A typical 33/11kV urban primary substation can be assumed to contain 25 no. circuit breakers in total, with on average 20 no. 11kV feeders per substation. It has been assumed that there is eight Ring Main Units (RMUs) per 11kV feeder.

Within the GB distribution network, the majority of the existing 11kV switchgear is rated at 13.1kA (250MVA). The typical reinforcement approach includes upgrading the switchgear to 25kA (476MVA) units. In addition, RMUs close to the primary would also need to be upgraded.

The typical cost of replacing an 11kV circuit breaker and all peripheral equipment is £50k. Similarly, the typical cost of replacing an 11kV RMU is £20k. It is assumed that 25% of RMUs will need to be replaced if the fault level at the site increases above the existing limits. Therefore:

Base Case Cost= 11kV switchgear cost + 11kV RMU cost = $(25 \times £50k) + 0.25 \times (20 \times 8 \times £20k) = £2,050k$

The fault level headroom enabled by the 25kA switchgear is 226 MVA per site and this can accommodate approximately six no. 5MW synchronous generators. Due to other technical constraints, it is reasonable to assume that there will be a 33% reduction in allowed DG connections, hence allowing only four additional 5MW DGs.

The business-as-usual (BaU) cost of an 11kV, 5MW FCLi is expected to be £275k, hence:

Method Cost = $4 \times £275k = £1,100k$

There is therefore a saving of £950k per installation (Base Case Cost – Method Cost).



1.2. Project Progress

During the period from April 2021 to September 2021, the EDGE-FCLi that is intended for trials on WPD’s network has been successfully installed and connected to the 11kV network at the 33/11kV University of Warwick (UoW) trial substation. The device was energised at 11kV on 13 May 2021. From this point forward the live trial of the FCLi has been in progress.

The EDGE-FCLi has experienced two trip events during the live trials that have caused the device to disconnect itself from the network and this has hindered the amount of trial data that we have been able to collect. A detailed description of the causes of the trip events, the learning we’ve gained from the root cause investigations, and our plan of action to remedy these issues is given in Sections 5.4 & 5.5 respectively.

There have been no delays in the project programme due to the COVID-19 pandemic in this reporting period. Throughout the reporting period we have continued to communicate regularly with UKPN to share progress information and to understand the respective impact of COVID-19 on each of our project programmes. This will continue as we proceed, however, it is not anticipated that there will any future delays due to COVID-19.

1.3. Project Delivery Structure

The EDGE-FCLi Project Review Group (PRG) meets on a bi-annual basis. The role of the PRG is to:

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

1.3.1. Project Resource

Table 1-1 provides an overview of the project resources for the project.

Table 1-1 Project resources

Project Partner	Name	Role
WPD	Yiango Mavrocostanti	Innovation Manager
GHD	Daniel Hardman	Project Manager
UKPN	Jack McKellar	Project Manager
GridON	Yoram Valent	CEO
	Roy Iscovitsch	President & Co-Founder
	Uri Garbi	Project Manager
	Alex Oren	Senior Engineer
	Dvir Landwer	Senior Engineer



1.4. Procurement

Table 1-2 provides a summary of the status of the procurement activities for the project. All procurement activities are complete.

Table 1-2 Procurement status

Provider	Services/Goods	Project Area	Status/Due Date
GridON	Detailed Design	Design	Complete
GridON	FCLi	Build	Complete
GridON	FAT	Testing	Complete
GridON	Short circuit testing	Testing	Complete
EMS	Sub.net monitoring system	Trial	Delivered
Envico	GRP housing	Installation	Delivered
Control Engineering Ltd	HMI wall box panel	Installation	Delivered
Nexans	Surge Arrestors	Installation	Delivered
Nexans	T-connectors	Installation	Delivered

1.5. Project risks

A proactive role has been taken to effectively manage risk in the delivery of the EDGE-FCLi project. Processes have been put in place to review the applicability of existing risks; identify and record new risks that have arisen; and update the impact, likelihood and proximity of risks that have developed. A summary of the most significant risks is provided in Section 7.2.

1.6. Project learning and dissemination

The project learning is captured throughout the project lifecycle by engagement with project the partners and stakeholders. Learning is regularly recorded and updated through our reporting processes and disseminated through various media. The project learning for the current reporting period is given in Section 5. Table 1-3 summarises the dissemination activities. A further virtual presentation will be given by the project team at the Energy Networks Innovation Conference (ENIC) 2021 on 12 October 2021.

Table 1-3 Project dissemination

Event	Date	Attendance	Location
ENIC 2020	8 December 2020	D. Hardman	Virtual
Low Carbon Network Fund Conference	16 October 2018	N. Pogaku*	Telford, UK
Electricity Innovation Forum on New Technology and Commercial Evolution, ENA	28 September 2018	N. Pogaku*	London, UK

*Note – These are RINA employees that were responsible for project management prior to the re-baselining activities in late 2019. RINA no longer have an active involvement in WPD’s programme delivery; however, they are providing support to UKPN’s.



2. Project Manager's Report

2.1. Project background

The project aims to design, build, test, install and trial a solid state FCLi on the 11kV distribution network. The FCLi is designed to connect in series with DG and quickly disconnect the generation upon the detection of a network fault. The FCLi is therefore able to reduce the fault current contribution from generation fitted with the device, thus allowing the cost-effective connection of DG to networks that are fault level constrained.

2.1.1. Project re-baseline

The FCLi project was re-baselined in December 2019 to allow for greater collaboration with UKPN to ensure that the device is replicable and deployable throughout GB. The collaboration will consist of working jointly on the design of the FCLi device, factory, and laboratory testing to ensure that it is suitable for longer-term testing and site trials. A further addition has been the inclusion of a LDPT into the programme to understand how the device behaves over an extended period in a controlled environment. This will give further assurances that the FCLi is safe to connect to the 11kV network.

The project work packages have been adjusted accordingly to meet the new project requirements. Table 2-1 gives the work package structure along with the status of each of these work packages.

An updated NIA Project Registration and Project Eligibility Assessment (PEA) document was subsequently submitted to the ENA on 3 January 2020 after agreement was made with UKPN on their more integrated role in the project.

Table 2-1 Adjusted work packages following project re-baseline

Work Package No.	Work Package Description	Status
1	Device specifications	Completed
2	Preliminary FCLi design and review	Completed
3	Detailed FCLi design and review	Completed
4	FCLi device manufacture	Completed
5	Performance testing (FAT & Short Circuit Testing)	Completed
6a*	LDPT (conditional on successful completion of WP 1-5)	Completed
6b*	Installation and operation of the UKPN FCLi on their 11kV network	In progress
7*	Trial of the WPD FCLi on the 11kV network	In progress

Asterisk (*) indicates the updated/new work packages

2.1.2. UKPN status

The UKPN FCLi has been fully manufactured and tested; it is currently in storage awaiting deployment to their trial site. However, UKPN are still in discussions with the generating customer due to changes in their operational environment because of COVID-19. Originally, Item 7 in Table 2-1 was conditional on UKPN's installation, however, this dependency could not be adhered to without delay to the overall project schedule. Therefore, to maintain progress and project learning, we have continued with our FCLi connection independently of UKPN. UKPN will now create a separate NIA project for the remainder of their programme. We will continue to communicate important learning from our trial to UKPN during the final phase of our project delivery, however, our regular communication will be tailored to accommodate the new project organisation.



2.2. Project progress in the last six months

The following sections summarise the progress that has been made on the EDGE-FCLi project in the last six-month period.

2.2.1. Preparation for final 11kV connection

The preparatory works for the final connection of the FCLi to the 11kV switchboard at the 33/11kV UoW substation began after the conclusion of the Long Duration Performance Test (LDPT) on 15 March 2021. The first step was to remove the wiring modifications and temporary cabling installed to facilitate the LDPT, and to restore the site to its original configuration.

The 11kV cables were then installed from the existing 11kV switchboard to the EDGE-FCLi HV cable box. The 11kV cables were then pressure tested and terminated onto the EDGE-FCLi at the end of April 2021, after which GridON carried out their final remaining commissioning activities which were witnessed by WPD.

2.2.2. Hot commissioning

GridON carried out the final hot commissioning of the EDGE-FCLi to verify signal interfaces and connectivity prior to energisation to the 11kV network. This involved:

- Reconnection of the Uninterruptable Power Supply (UPS) batteries (disconnected after completion of the LDPT);
- Initial power up check and dehumidification to allow the cooling fans to remove any moisture in the cooling system that may have accumulated; and
- A range of functional tests was then performed, including:
 - A full power sequence to ensure the EDGE-FCLi boots up correctly;
 - Verification that circuit breaker position inputs to the EDGE-FCLi are correctly interfaced; and
 - Verification that the Idle and Recovery commands are correctly triggered from WPD central control;

2.2.3. Connection and energisation

The EDGE-FCLi was successfully energised on the 11kV network at the UoW 33/11kV primary substation on 13 May 2021. Figure 2-1 shows the new single line diagram of the 33/11kV UoW substation with the EDGE-FCLi arrangement is shown in red. Figure 2-2 shows the EDGE-FCLi installed in its GRP enclosure at UoW in readiness for the 11kV cabling works to the device.

We were able to energise the EDGE-FCLi without an outage on the UoW CHP generator by utilising the bypass circuit breaker (CB92) across the device. Despite this we still liaised closely with the UoW energy centre to communicate the energisation schedule to ensure that there was minimum disruption to their activities.



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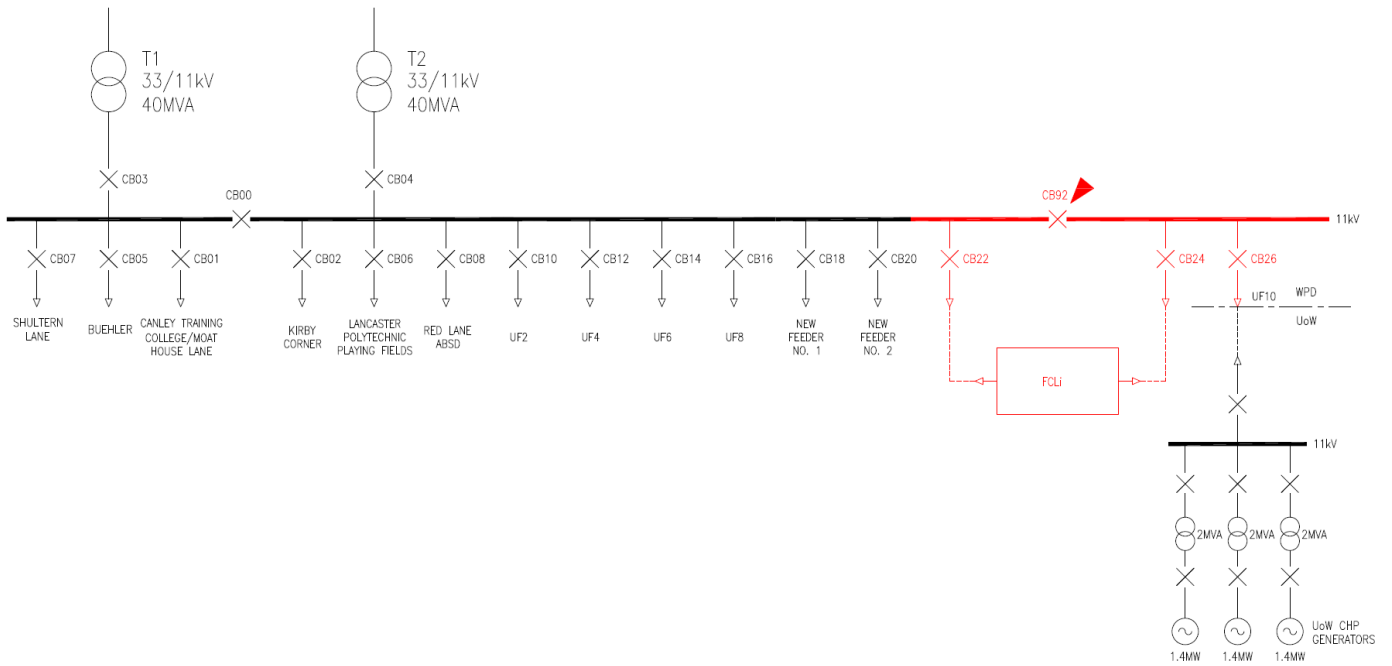


Figure 2-1 Final single line diagram of 33/11kV UoW substation



Figure 2-2 EDGE-FCLi installed in its final position at UoW



2.2.4. COVID-19 impact

Whilst having a significant impact on the project during the device testing phase over the summer in 2020, the COVID-19 pandemic has had minimal impact during this reporting period. However, we have continued to monitor and assess the COVID-19 risks on an ongoing basis. Table 2-2 presents a summary of the overall COVID-19 impact to the project and a summary of the actions being taken in response to the event.

Table 2-2 Summary of COVID-19 impact

Work Package No.	Work Package Description	Affected?	Comment
5	FAT & Short Circuit Testing	Yes	This work package is now complete. In the re-baselined programme, the FAT & Short Circuit Testing was due for 17-18 March 2020 and 23-24 April 2020, respectively. They were then postponed to 1 June 2020 and 29-30 June 2020 respectively
6a	Long Duration Performance Test (LDPT)	Yes	This work package is now complete. Whilst there were some minor restrictions, the impact on this phase of work was minimal
6b	Installation and operation of the UKPN FCLi on their 11kV network	No	This work package is now complete. There were no impacts due to COVID-19
7	Trial of the WPD FCLi on 11kV network	No	The trial is currently underway, and the situation is being monitored carefully, however, there are no indications at this time that there will be delays due to COVID-19



3. Progress against budget

Table 3-1 summarises the details of the progress that has been made with respect to the project budget.

Table 3-1 Project finances

Budget Item No.	Budget Item	Budget (£k)	Expected Spend to Date (£k)	Actual Spend to date (£k)	Variance to Expected (£k)	Variance to Expected (%)
1	GridON EDGE-FCLi Unit	1,250.0	1,250.0	1,249.7	-0.3	-0.02
2	Contractor Costs	367.6	360.5	360.5	0.0	0.00
3	WPD Project Management	122.1	67.1	67.1	0.0	0.00
4	Equipment and Labour	258.9	245.3	245.3	0.0	0.00
5	Schneider Switchgear	105.2	105.2	105.2	0.0	0.00
6	Long Term Performance Test	108.0	108.0	0.0	-108.0	-100
-	Totals	2,211.8	2,028.1	1,817.0	-211.1	-10.4

Comments around variance

The LDPT budget item (no. 6) was originally set up to account for the costs of testing the FCLi at a third-party external laboratory. As explained in previous six-monthly reports, an alternative method of performing the test at the UoW substation was explored and found to be the optimal solution. The cost for the alternative LDPT solution was significantly lower than the original solution and was able to be absorbed into the budget for the site commissioning activities, hence the reason for zero spend on the associated line item in Table 3-1.



4. Progress towards success criteria

Table 4-1 presents the progress towards the success criteria documented in the EDGE-FCLi Project Registration and PEA document.

Table 4-1 Progress towards success criteria

Criterion No.	Success Criterion	Progress
1	The FCLi limits and reduces the fault current contribution of the generator to zero before the first current peak	The FCLi underwent Short Circuit Testing on 29-30 June 2020. The device successfully detected and interrupted all short circuit conditions before the first current peak of the prospective short circuit current. Refer to further detail on the findings from the testing in April 2020 – September 2020 six monthly progress report. The device is currently under trial; however, no faults have been encountered
2	The FCLi introduces minimal disturbance to the network and the generator during normal operation	<p>The EDGE-FCLi has experienced two trip events during the live trial that have caused the device to disconnect itself from the network and this has hindered the amount of trial data that we have been able to collect. A detailed description of the causes of the trip events, the learning we've gained from the root cause investigations, and our plan of action to remedy these issues is given in Sections 5.4 & 5.5 respectively. The generating customer at UoW was able to be reconnected immediately following the trip event by using the bypass circuit breaker across the EDGE-FCLi, minimising the disruption of the generator.</p> <p>It's important to note that this success criterion can only be assessed fully following the completion of the field trial in March 2022</p>
3	The FCLi remains in normal conduction mode for transient non-fault related events and for faults outside the 11kV network on to which it is connected.	The FCLi underwent Short Circuit Testing on 29-30 June 2020. The device successfully detected and interrupted all prospective fault currents greater than the fault detection settings. The device did not trigger for currents below the settings value and remained in its conduction mode. Refer to further detail on the findings from the testing in April 2020 – September 2020 six monthly progress report. The device is currently under trial; however, no transients have been encountered



5. Learning outcomes

The following sections list some of the key learning outcomes that resulted from activities during this reporting period:

5.1. HV cable VLF 'pressure' testing

A routine requirement prior to the connection of a new piece of equipment is to carry out a Very Low Frequency (VLF) 'pressure' test on the HV cables after they are installed, but before they are terminated. For polymeric insulated 11kV cables this involves applying 10.8kV 0.1Hz sinewave between the conductor and earth for each cable. The purpose is to check that the integrity of the insulation is not compromised before final connection.

The HV cables had been terminated at the EDGE-FCLi but left unterminated at the switchgear cable box at the UoW site. It was therefore proposed to carry out the VLF test with the EDGE-FCLi in the circuit to avoid having to disconnect the terminations at the EDGE-FCLi. However, the manufacturer advised that this was not to be done to avoid any damage to the internal power electronic circuitry. As a result, the site project team carried out the VLF with the EDGE-FCLi in the circuit and reconnected the HV terminations after the test was successfully completed. This issue did not impact the overall connection and energisation activities.

5.2. Alarm screen configuration

A key element in connecting innovation equipment is consideration of how the alarm and trip signals from the device interface with the central control system. Our control engineers have two main alarm screens. The primary screen displays all alarms that are set to be 'acknowledgeable' i.e. the engineer needs to manually accept the alarm remove it from the page. The primary screen is typically used for high priority alarms that require control actions from the engineer. The second screen displays manual or auto-acknowledged alarms. It is used as an event viewer. Auto-acknowledge alarms are typically low priority alarms that go straight to the secondary screen to avoid presenting a burden of alarms to the engineer. The project team worked closely with the control systems team to ensure that the alarm priorities were correctly defined in the control system configuration prior to the final commissioning and energisation of the EDGE-FCLi.

5.3. Control polarity during hot commissioning

There was a key learning point on site during the hot commissioning of the EDGE-FCLi prior to the energisation onto the 11kV network at UoW. When carrying out the functional testing of the control commands from our control centre, it was observed that the Idle and Recovery commands were reversed i.e. the Idle command would trigger a Recovery action and vice versa. This was tracked to a wiring issue in the HMI panel that marshals all the signal wiring between the EDGE-FCLi and the substation equipment. This was quickly resolved during the commissioning and caused only minor delays; however, the point reinforces the need for robust testing and commissioning processes at site to identify issues and rectify them before final energisation. We recommend that the post-FAT or pre-commissioning procedures are updated to check and confirm that any subsequent wiring modifications have been carried out correctly.

5.4. BIT trip 1 during the trial

The EDGE-FCLi disconnected itself from the network on 19 May 2021. After the initial investigation on the cause of the trip event, it was found the device tripped due to the Built In Test (BIT) functionality incorrectly interpreting that there had been a power electronics failure within phase 3 of the unit. The reason for the BIT failure and trip was that the BIT protection function was triggered incorrectly when there was insufficient phase current magnitude to the specified requirement. The current was in the range of 25A when it is required to be in the range of 40A as per the design. This failure was attributed to noise in the transducer measurement system under field trial conditions. This also explains why this condition was not observed in the factory testing prior to the installation at the UoW site.

To resolve this issue the software was modified to raise the phase current threshold at which the BIT function is triggered to above 40A to avoid the impact of noise on the triggering logic. After a period of software implementation and verification by the manufacturer, the software was successfully uploaded to the device and the EDGE-FCLi was reconnected to the grid on 19 July 2021.



5.5. BIT trip 2 during the trial

The EDGE-FCLi was successfully reconnected following the software modification described in Section 5.4. However, the device only continued to operate until a further trip event occurred on 28 July 2021. After an initial investigation it was again observed that the device tripped due to a failure of the BIT protection function. The EDGE-FCLi control system logs various parameters in its internal memory and these log files were issued to the manufacturer to undergo a more detailed investigation into the cause of the error. While this investigation was ongoing the EDGE-FCLi was left disconnected from the 11kV network and the site was restored to its normal configuration.

The manufacturer carried out an analysis of the detailed log files and reported that in the lead up to the error, the EDGE-FCLi successfully passed several BIT initiations; however, the timing duration of a BIT triggered on phase 2 of the device was much smaller than the nominal duration programmed into the software. This then caused the second trip as described above. Subsequently, the manufacturer has carried out extensive testing and simulations in their laboratory to try and replicate the fault. However, none of the investigations have yielded any root cause. The manufacturer is building a new simulation test setup in their lab to carry out some final analysis, however, if this does not lead to any results, the microcontroller board in the EDGE-FCLi will be sent back to the GridON factory for detailed inspection.

It is important to note that the issues we have been experiencing in the live trial have been isolated to the BIT function only and there have been no indications that the fault current limiting capability of the device has been affected. The investigation so far has highlighted that the BIT protection system has been configured to be over-sensitive to possible internal power electronic faults. This has been the result of a conservative approach taken during the design phase due to the innovative nature of the unit.

A further update on the status of the BIT functionality is anticipated in the next reporting period. It is clear, however, that there is important learning generated from these series of events. In particular, the BIT protection functionality design should be reviewed in detail prior to the decision to move ahead with the BaU adoption of the EDGE-FCLi. An initial suggestion on any updated design would be that if there is a failure of a BIT test, subsequent tests are carried out to confirm that the failure is indeed a problem with the power electronics and not a spurious timing or measurement transducer anomaly. This would likely greatly reduce the likelihood of the EDGE-FCLi and the associated generating customer being disconnected from the network unnecessarily. We're currently working with the manufacturer to understand the root cause of the BIT trip issue and after this is more clearly understood we can then recommend specific remedial measures, should they be required.



6. Intellectual property rights

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

GridON entered this project with two relevant background IPR patent applications:

1. Patent application “DC Power Supply Arrangement” - filed on 24 January 2017
2. Patent application “AC Switching Arrangement” - filed on 21 March 2017



7. Risk management

7.1. General

Our risk management objectives are to:

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

These objectives will be achieved by:

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

7.2. Current risks

The EDGE-FCLi risk register is a live document and is updated regularly. There are currently two live project related risks, which has reduced from seven in the last six-monthly report. This is due to the successful connection and energisation of the EDGE-FCLi as well as easing of the COVID-19 restrictions. The risk register includes mitigation action plans for each identified risk and appropriate steps then taken to ensure risks do not become issues wherever possible.

Table 7-1 details the top risks by category. For each of these risks, a mitigation action plan has been identified and the progress of these are tracked and reported.

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

Risk	Risk Rating	Mitigation Action Plan	Progress
The FCLi persistently trips on BIT	Major	If tripping is persistent the FCLi software may need to be modified to mitigate the impact	The manufacturer is currently carrying out an investigation into the spurious BIT tripping and will report on their findings in the next reporting period
Root cause of BIT issues not found	Major	Manufacturer to carry out a detailed investigation and simulation of similar conditions in the lab	Manufacturer is currently carrying out the detailed investigations into the BIT failure



Risk	Risk Rating	Mitigation Action Plan	Progress
No faults occur during the trial period	Moderate	Ensure that the EDGE-FCLi is connected to the 11kV network for as much time as possible considering the technical constraints on the BIT function	Manufacturer is currently carrying out the detailed investigations into the BIT failure. After the root cause has been determined an action plan will be developed to rectify/mitigate the issue
Customer requests a change to their current supply arrangement	Moderate	There are no immediate plans to change the configuration, however, close communication with WPD internal teams and the customer will help with early identification	Communication with the appropriate parties is ongoing
FCLi fails to trip for a network fault	Moderate	EDGE-FCLi has undergone short circuit testing, however, there have been subsequent software modifications to mitigate issues with the BIT function. Manufacturer to review and ensure that no 'knock-on' effects are apparent	Manufacturer is currently carrying out the detailed investigations into the BIT failure. After the root cause has been determined an action plan will be developed to rectify/mitigate the issue and ensure that this is subsequently tested to avoid interference with the fault detection functionality

Figure 7-1 provides a graphical summary of the project risk register to give an ongoing understanding of the project risks.

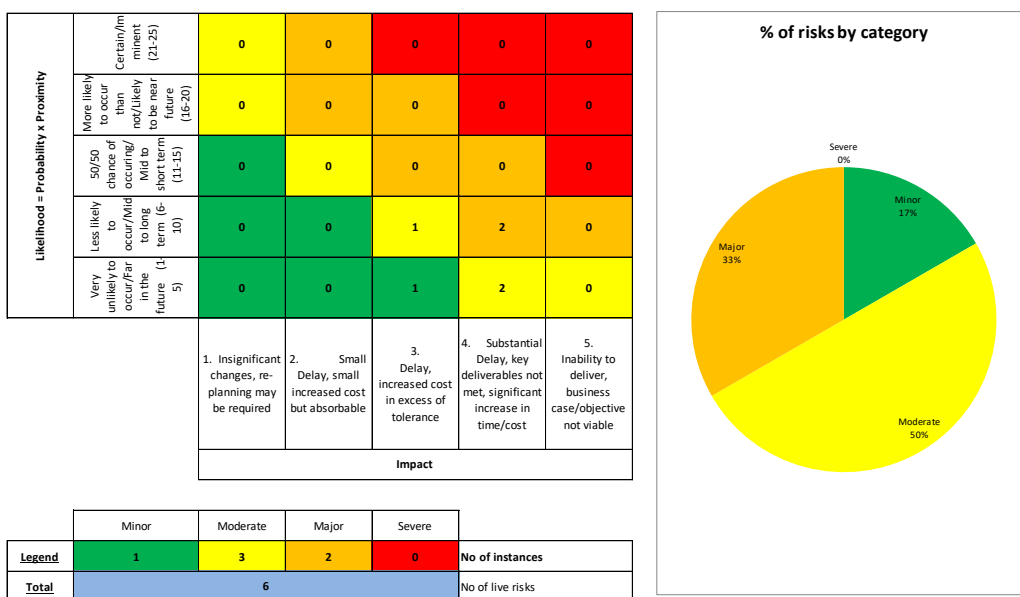


Figure 7-1 Graphical view of project risks



7.3. Update for risks previously identified

Descriptions of the most significant risks identified in the previous six-monthly progress report are provided in Table 7-2 with updates on their current risk status.

Table 7-2 Top five risks from previous reporting period

Risk	Previous Risk Rating	Risk Rating	Mitigation Action Plan	Progress
FCLi fails LDPT	Major	A robust test specification and test criteria are required to ensure that there is no ambiguity in the results of the test	LDPT was successfully completed on 15 March 2021 (Risk can now be closed)	Risk closed
UoW have concerns over the operational aspects of the FCLi in the run-up to HV connection	Moderate	Organise regular communication with UoW before HV connection and be transparent on schedule, technical requirements to sync with CHP	A plan for the final HV connection has been coordinated and agreed with UoW	The EDGE-FCLi energisation has been successfully completed in coordination with UoW. <u>Risk closed</u>
Delays in UKPN schedule requires modification of the project direction to account for updated trial duration	Moderate	The situation is to be monitored with regular calls between UKPN and WPD	No anticipated requirement to modify the project direction, however, monitoring ongoing	The project direction has been modified to consider the UKPN programme delivery. <u>Risk closed</u>
The COVID-19 pandemic continues for a long period of time creating extended delays to the NIA project programme	Minor	Monitor the situation closely to give time for altering the installation and commissioning plans	No indication of delays but review continuing	This risk is under ongoing review; however, it is not anticipated that COVID-19 will have any further impact to the project



8. Consistency with project registration document

A copy of the latest Project Registration and PEA document can be found online.

At this point in time the project is consistent with the project budget and programme. The COVID-19 pandemic is also not causing delays to the overall WPD and UKPN programmes. However, the situation is being reviewed carefully and it may be necessary to revisit the registration document in the future to adapt the project scope or timescales to consider COVID-19 related delays. Further details of the impact the COVID-19 pandemic on the project is given at the end of Section 0.



9. Accuracy assurance statement

This report has been prepared by the EDGE-FCLi Project Manager (Daniel Hardman), reviewed, and approved by the Innovation Manager (Yiango Mavrocostanti).

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



Glossary

Acronym	Definition
AC	Alternating Current
BaU	Business as Usual
BIT	Built In Test
CEO	Chief Executive Officer
CHP	Combined Heat and Power
COVID	Coronavirus disease 2019
DC	Direct Current
DG	Distributed Generation
EDGE-FCLi	Embedded Distributed Generation Electronic Fault Current Limiting interrupter
ENA	Energy Networks Association
ENIC	Energy Networks Innovation Conference
FAT	Factory Acceptance Testing
GB	Great Britain
GHD	Gutteridge, Haskins & Davey Limited
GRP	Glass Reinforced Plastic
HMI	Human Machine Interface
HV	High Voltage
IP	Intellectual Property
IPR	Intellectual Property Rights
KEMA	Keuring van Elektrotechnische Materialen te Arnhem
LDPT	Long Duration Performance Test
LVAC	Low Voltage Alternating Current
MCB	Miniature Circuit Breaker
MVA	Mega Volt-Amperes
NIA	Network Innovation Allowance
PEA	Project Eligibility Assessment
PRG	Project Review Group
PSD	Primary Systems Design
RMU	Ring Main Unit
SCADA	Supervisory Control and Data Acquisition
UKPN	UK Power Networks
UPS	Uninterruptible Power Supply
WP	Work Package
WPD	Western Power Distribution



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