SIF Discovery Round 2 Close Down Report Document

Date of Submission

May 2024

Project Reference Number

10060423

Project Progress

Project Title

D-Suite

Project Reference Number

10060423

Lead Funding Licensee

SPEN - SP Manweb Plc

Funding Licensee(s)

SPEN - SP Distribution Plc

Project Start Date

April 2023

Project Duration

2 Months

Nominated Project Contact(s)

a.moon@scottishpower.com

Project Summary

Compared with conventional solutions, we will better address both thermal and voltage issues that we increasingly experience in LV networks. The TRL of this project is approximately 4-5, and will benefit from dedicated innovation support to uplift the readiness of the following technologies:

LV Distributed STATCOM (D-STATCOM). This technology has never been deployed in UK network;

Distributed Soft Open Point (D-SOP) -- We aim to build up on the technology developed by UKPN to trial a more flexible and controllable solution;

Distributed Smart Transformer (D-ST) -- We build up on learnings from LV Engine project to fit a partially rated power electronics within slim design distribution transformer; and

Distributed Harmonic Filter (D-HF) -- There are number of solutions in the market that need further development for LV applications.

In addition to those well-established ENA and IEC standards for network interfaces, insulation requirements etc. we will particularly ensure the compliance with safety requirements in power electronics specified in IEC 62477 and for monitoring equipment in BS EN 61010. IT and OT cyber security of the control system is also need adequately implemented based on those specified in IEC 62433, recommendations by ENA OT/IT taskforce and our updated ED2 internally developed cybersecurity requirements.

Project Description

The record numbers of electric vehicles, renewable energy sources and heat pumps being introduced to our energy system has created an opportunity for new technologies that have not been conventionally considered.

Following an assessment of the energy innovation landscape, it has become clear that there has been limited research on the LV focused power electronic technologies. This might be due to the perception of the cost and size of power electronic devices. Medium Voltage (33kV or 11kV) has been the typical limit where the business case can be easily found.

The new knowledge our proposal will bring includes:

1. Optimised design of several D-Suite power electronic devices suitable for LV deployment that are capable of operating in a coordinated control regime or a stand-alone control solution;
2. Detailed operational and public safety requirements, protection considerations and overall network interface requirement in the hardware design;
3. Coordinated control algorithm to maximise the existing network utilisation;
4. Holistic and systematic approach to identify the niche scenarios for a practical guidance for the future network planning and investment; and
5. First GB demonstration of a resilient D-Suite enabled LV network (SIF-Beta).

Summary Key Findings

The project was successful in securing Alpha funding following the successful feasibility assessments.

The purpose of the Alpha phase is to be ready for the D-Suite Technologyprocurement and subsequent trial of between 2- 4 D-Suite Technologies on up to6 different LV networks. In the Beta Phase, SP Energy Networks would only wishto proceed where the Net Present Value of a D-Suite Technology is highest oneither an SP Energy Networks or UKPN network selected for trial. The AlphaPhase work is required to establish what the NPV is, at the individual LV networklevel, to inform the Beta stage trial benefits case.

User needs

Not applicable in Discovery.

Impacts and benefits

5% to 40% more of PV generation can beintegrated without triggering reinforcement. This can be estimated to be£10k perannum per feeder.

Providing additional income for ourcommunity, based on a 20% uplift on a LV network fed by a 100kVA secondarytransformer.

D-Suite technologies will not only increase the renewable connectivity, but alsocontribute to loss reduction due to the optimised voltage profile and local powerbalancing.

Risks, Issues and Constraints

All risks during discovery were activley managed and closed.

Working in the open

During discovery all necessary stakeholders were enguaged and results were implemented in the project deliverable documents.

Costs and value for money

No variations were encountered.

Each partner is contributed just over 10% of the Benefit in Kind (BiK) contribution,with Newcastle Contributing most of Dr Matt Deakin research time through agrant, which has been factored into the Benefit in Kind contribution. The remaining partner BiK figures are derived through addition contributions through Projectlabour provision from the general overhead of their teams.

Special conditions

None.

Documents uploaded where applicable

Yes