SIF Discovery Round 2 Project Registration

Date of Submission

Jul 2023

Project Reference Number

CAD_SIF0003

Project Registration

Project Title

Digital Inspector

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CAD_SIF0003

Project Licensee(s)

Cadent

Project Start

Apr 2023

Project Duration

2 Months

Nominated Project Contact(s)

Innovation@cadentgas.com

Project Budget

£53,241.00

Funding Mechanism

SIF Discovery - Round 2

SIF Funding

£47,600.00

Strategy Theme

Data and digitalisation

Challenge Area

Improving energy system resilience and robustness

Lead Sector

Gas Distribution

Other Related Sectors

Gas Transmission

Funding Licensees

Lead Funding Licensee

Cadent - Central

Collaborating Networks

National Gas Transmission PLC

Technology Areas

Gas Distribution Networks

Equality, Diversity And InclusionSurvey

Yes

Project Summary

The project looks to strengthen the UK's energy system robustness by supportingthe integration, adoption and deployment of Internet-of-things (IoT) technology
within the gas network supply chain by addressing specific challengesexperienced during network upgrades and new network construction.
The level of digitisation is extremely low in the gas sector, and the construction ofnetwork assets is still largely paper-based. To enable the efficient construction ofmajor capital projects such as HyNet in the north-west, critical path activities, suchas welding and its associated activities, need to be digitised and intelligentlylinked.
Whilst this program will provide immediate safety and quality improvements, whichinevitably lower costs, it also lowers construction costs by providing real-time 'costof delivery' metrics enabling project teams to laser focus on escalating expensesas they happen and mitigate immediately rather than retrospectively, which onlarge capital projects is often the case.
Partner 1
-- Triton electronics is a leader in the development, manufacture andsupply of welding monitors and software, with deployments in APAC, EMEA andThe Americas in Aerospace, Oil & Gas, Nuclear, Research and other demandingengineering sectors. They are providing the hardware expertise and overall designarchitecture for the solution.
Partner 2
--TWI is a technology and research organisation that is a leadingengineering institution supporting welding and joining professionals with welding,joining and allied technologies. They are providing access to their weldingsoftware platform and assisting in its integration with the hardware.
Partner 3
- United Living is a supply chain partner within the gas network and firstidentified the need for such a technology to enable the efficient build of largenetwork assets such as HyNet. Fully conversant in the construction of high-pressure gas networks, they will test and integrate the solution into theiroperations and provide the welding equipment and staff.
Partner 4
-- Cadent Gas are supporting this initiative looking to develop thetechnology for use by its supply chain network. If successful, they will allow theenvironmental test phase of the project to take place on several sites ensuringoutput is accurate and as described.

Project Description

Digital Inspector will be a complete ecosystem for monitoring and managingwelding activities across the current and future gas networks. Connectingprocedure approval and welder approval databases to real-time weld dataacquisition for quality and cost control. The project is designed to be scalable toinclude NDT digital data and connect to other Software as a Service (SaaS)systems, such as Building Information Management (BIM) software.
The project will design a rugged, app-controlled and cloud-connected weldingmonitor produced by Triton electronics, an industry leader in Portable ArcMonitoring systems. This will be connected to TWI-developed weldingmanagement software via a cloud dashboard; TWI is one of the world's foremostindependent research and technology organisations renowned for its weldingexpertise. The monitor will be designed to be retrofitted to existing welding plants, makingthem IoT connected; tested in workshop and environmental conditions by UnitedLiving, a leading UK gas infrastructure construction company and Cadent gas asthe lead GDN and project overseer.
The technology will give real-time information on fabrication progress acrossmultiple sites, live compliance to specifications and codes and enable remotedigital inspection of all fabrication welds. Any company that undertakes high-integrity welding can use the technology as its design for site use providessignificant versatility.
To assure data integrity, a blockchain-type approach will be adopted to verify dataand welders using immutable tokens stored on a distributed network.
In an industry where a weld failure can be catastrophic. Showing full real-timecompliance will reduce construction risk and enable more cost-effective, efficientbuilds, assist in quality control, facilitate root cause analysis, and prevent non-compliance to specifications and codes, ultimately reducing rework and loweringconstruction costs.

Nominated Contact Email Address(es)

Innovation@cadentgas.com

Project Description And Benefits

Applicants Location (not scored)

Cadent Gas Limited
, Ansty Park, Pilot Way, Coventry, West Midlands, CV7 9JU

NATIONAL GRID GAS PLC
1-3 Strand, London, WC2N 5EH

United Living
Head Office Media House, Azalea Drive, Swanley, Kent, BR8 8HU

TRITON ELECTRONICS LIMITED
Bigods Hall, Bigods Lane, Great Dunmow,Essex, CM6 3BE

TWI LTD
Granta Park, Cambridge CB21 6AL, United Kingdom

Project Short Description (not scored)

Digital Inspector will be a complete ecosystem for monitoring and managingwelding being undertaken across multiple different locations by connectingprocedure approval and welder approval databases to real time weld dataacquisition. The project is designed to be scalable to include NDT digital data andconnect to other SaaS systems such as Building Information Management (BIM)software. Successful delivery of the overall project concept will improve energysystem resilience and robustness through early identification of fabrication issuesand non-conformances, reducing down time and requirements for later stage re-work.

Video description

Innovation justification

Digital Inspector YouTube Video

Benefits Part 1

Environmental - carbon reduction – indirect CO2 savings per annum against a business-as-usual counterfactual
Financial - cost savings per annum for users of network services
Financial - future reductions in the cost of operating the network

Benefits Part 2

Digital Inspector will improve fabrication productivity and quality.
Digital Inspector will collect, aggregate and process all welding data from initiation,through procedure qualification and welder qualification and finally to theproduction welds. Previous site-side software deployment in vehicle tracking, fuelusage and temporary works control for example has shown an increase of over66% in efficiency and precision. Similar improvements in documentation. Poor documentation is a source of weld defects, an unqualified welder or use ofincorrect consumables for instance. Having welder sign ins and consumablescanning, using a welder and consumable credential system will guard againstthese. Providing these assurances automatically and in real time means noproduction hold ups that are caused by staff looking for paperwork or an inspectormanually corresponding procedure documentation to welder qualifications.
Production defects can be introduced by welders using incorrect weldingparameters. Heat input affects weld pool solidification and the

weld properties.Automatic data recording not only reduces out of tolerance occurrence by givingwelders instant feedback, but also flags anomalies so defects can be removedearly in the procedure.

Weld values are recorded accurately in real time so productivity rates can becompared within a site, and to greater benefit across multiple applications,simplifying the adoption of best practices. Further, new processes and practicescan be documented and systematically compared, inherent defect ratesestablished. Once the base lines are determined, problem areas and bottle necksare spotted early and alleviated.

Automatically storing weld fabrication data in TWI management software will allowthe easy reuse of welding procedures. New projects can use historicalprocedures, only running new procedure trials when necessary. Similarly storingwelder credentials and their qualification history seamlessly in TWIs managementsoftware means welders only need to requalify when necessary. Even allowingwelders to "carry" qualifications from one site to another, one job to another. Thisis a novel idea that could easily revolutionise the industry, allowing welders tomove between contractors without the need to be re-qualified.

A reduction in "cost of poor quality" is a big benefit for Cadent Gas. This is clearfrom recent incidents in North America and Asia, the issues that can arise frompoor weld quality, so prevention of construction incidents is a significant benefit.

Significant project costs are associated with countering fabrication risks, DigitalInspector will reduce both production overrun and quality risks. Reducing riskreduces project cost and delivery time.

Project Plans And Milestones

Project Plan and Milestones

The following work packages (WPs) are proposed for the feasibility study with allpartners being involved, but with a specific WP lead:
WP1 Infrastructure requirements (Lead UL): Identification of critical factors andvariables to be included in the digital inspector tool such as job references, sitespecifications, relevant codes and standards. (£17500)
WP2 Monitoring service development (TE): Identification and specification ofsystem changes required to enable monitoring service to be built, including APIrequirements. (£17500)
WP3 System design and integration (TWI): Assessment and specification ofrequirements to integrate real time data generated from site into the weldingcoordinator (WC) and welding qualifier (WQ) software systems. . (£17500)
A summary report for each WP will be issued as the deliverable and will identifythe required steps need to deliver the next phase of project work to be delivered inthe Alpha phase of funding (subject to successful grant award). A risk register willbe created as part of each WP activity, based on a PESTLE analysis typeapproach. At this stage, the most significant risks have been identified as followed:
*Partners are able to collaborate: This is a low risk as there have been a numberof meetings already held to discuss requirements and the partner have co-authored this proposal.
*Technical capability: This is a low risk as all of the partners already havesuccessful business activities relevant to the proposed collaboration and haveidentified outline approaches to the technical development.
The following project deliverables have been identified:
1.Specify the dashboard components -- what information we need to display
2.Specify the API to connect AMVRemote to TWI management software -- 2directions
3.Outline API to connect generic systems to AMVRemote

Regulatory Barriers (not scored)

Any system developed will need EMC and electrical safety compliance. Tritonproducts must comply with these regulations and the need to comply will be built
in as the physical product develops.
Normally, there will be a requirement for an inspector to 'verify' the acceptability ofwelds, both for qualifications (inspector needs to 'witness' the test weld beingmade) and for production, someone has to do a visual acceptance, which impliesactually looking at the weld. Verifying that all the documentation is correct (welderis qualified, WPS is good, filler is suitable) doesn't necessarily require hispresence.

Commercials

Route To Market

There are two routes to market identified which have potential following thediscovery phase of the project :
1.Triton and TWI will develop and distribute the resulting hardware and softwareusing their existing customer base and existing marketing channels. This willresult in increased sales. We see the project deliverables as complimentary, whichintegrates with software from TWI, who will also benefit from resulting sales oftheir software integration.
With success in the funding call, The Project Team would be able to develop aunique product offering in the space while providing real benefit to United Livingand Cadent. Exposure to Cadent's supply chain network for real world trials, andUnited Living's desire for such a system enabling rigorous development testingand feedback with extensive usage, puts the product development stage of theproject in the best possible incubator.
The Team will build and then provide a new product that will have been developedin collaboration with leading names in the energy sector and will then open upsales to the wider market.
OR
2.A new organisation would be created by the Project Team which seeks tocapitalise on the expected benefits resulting from a successful development andtrial period, as outlined above. This consortium would also seek to capitalise onthe value of the data generation and wider push towards AI-led statistical processmonitoring and control that would be an exciting proposition for widercommercialisation.
Due to the logistical constraints of generated data, this model would be best suitedto a consortium approach throughout the developmental and experimental phaseand into wider commercialisation. There would also be a need for a wider funding model to be pursued on completion of the project for the development of the AIstatistical analysis tools.

Intellectual property rights (not scored)

Triton Electronics Ltd has developed the AMV range of welding monitored over thelast 20 years. Recently developing AMVRemote and methods for transferring welddata to cloud storage. TWI has previously developed a number of welding-relatedsoftware packages for control of welding qualification, production welding andtesting activities, costing and estimating and training.

Costs and value for money

The total discovery project budget of £53,241 is split into 3 equal work packages.Work package 1 in essence sets out the problem and work packages 2 and 3detail how they can be overcome. The remaining 10% contribution from eachpartner will be funded from internal R&D budgets.

Obynote are experts in the Obyte a post blockchain distributed network. Thenetwork is used to securely store welder credentials and details of file transfers.The distributed network proves and deep level of security for all data transfers. ForDigtial Inspector, Obynote will look at how to adapt their API if needed to handleadditional transfers.

Digital Inspector seeks to revolutionise fabrication site data collection, digitisingand automating paper-based routines. Through fast and accurate data collectionboth fabrication productivity and quality will increase.

Examples of increased productivity are reuse of welding procedures, weld trialscan typically cost £33,000 per week, Reduced weld defects and earlier detection,typical repair costs can be £1 - £1.5m per year . By adopting best practices andeasing bottle necks fabrication rates from the best sites currently will becomestandard. Factoring these together projected savings could be £2.5m per year forone fabricator.

Overall, by improving fabrication knowledge and visibility project risk is reduced.Reducing project fabrication risk directly reduce project costs and increases ontime delivery. By documenting welds, welding procedures and the welders anylater maintenance can look back with clarity and ease -- identify any welds thatmight be susceptible to simpler maintenance. Likewise, by rigorously looking to use best practice throughout any fabrication lifetime maintenance could bereduced.

In the final analysis Digital Inspector will save initial production costs and lifetimemaintenance costs. Hence, reducing infrastructure costs ultimately benefiting the consumer.

Document Upload

Documents Uploaded Where Applicable

Yes

Documents:

Digital Inspector - End of Project Report.pptx

Digital Inspector - End of Project Report.pptx (1)

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This project has been approved by a senior member of staff

☑ Yes