

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 supporting the integration, adoption and deployment of Internet-of-things (IoT) technology

within the gas network supply chain by addressing specific challenges experienced during network upgrades and new network construction.

The level of digitisation is extremely low in the gas sector, and the construction of network assets is still largely paper-based. To enable the efficient construction of major capital projects such as HyNet in the north-west, critical path activities, such as welding and its associated activities, need to be digitised and intelligently linked.

Whilst this program will provide immediate safety and quality improvements, which inevitably lower costs, it also lowers construction costs by providing real-time 'cost of delivery' metrics enabling project teams to laser focus on escalating expenses as they happen and mitigate immediately rather than retrospectively, which on large capital projects is often the case.

Partner 1

-- Triton electronics is a leader in the development, manufacture and supply of welding monitors and software, with deployments in APAC, EMEA and The Americas in Aerospace, Oil & Gas, Nuclear, Research and other demanding engineering sectors. They are providing the hardware expertise and overall design architecture for the solution.

Partner 2

-- TWI is a technology and research organisation that is a leading engineering institution supporting welding and joining professionals with welding, joining and allied technologies. They are providing access to their welding software platform and assisting in its integration with the hardware.

Partner 3

- United Living is a supply chain partner within the gas network and first identified the need for such a technology to enable the efficient build of large network assets such as HyNet. Fully conversant in the construction of high-pressure gas networks, they will test and integrate the solution into their operations and provide the welding equipment and staff.

Partner 4

-- Cadent Gas are supporting this initiative looking to develop the technology for use by its supply chain network. If successful, they will allow the environmental test phase of the project to take place on several sites ensuring output is accurate and as described.

Project Description

Digital Inspector will be a complete ecosystem for monitoring and managing welding activities across the current and future gas networks. Connecting procedure approval and welder approval databases to real-time weld data acquisition for quality and cost control. The project is designed to be scalable to include 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 welding monitor produced by Triton electronics, an industry leader in Portable Arc Monitoring systems. This will be connected to TWI-developed welding management software via a cloud dashboard; TWI is one of the world's foremost independent research and technology organisations renowned for its welding expertise. The monitor will be designed to be retrofitted to existing welding plants, making them IoT connected; tested in workshop and environmental conditions by United Living, a leading UK gas infrastructure construction company and Cadent gas as the lead GDN and project overseer.

The technology will give real-time information on fabrication progress across multiple sites, live compliance to specifications and codes and enable remote digital inspection of all fabrication welds. Any company that undertakes high-integrity welding can use the technology as its design for site use providing significant versatility.

To assure data integrity, a blockchain-type approach will be adopted to verify data and welders using immutable tokens stored on a distributed network.

In an industry where a weld failure can be catastrophic. Showing full real-time compliance will reduce construction risk and enable more cost-effective, efficient builds, assist in quality control, facilitate root cause analysis, and prevent non-compliance to specifications and codes, ultimately reducing rework and lowering construction 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

TWILTLD
Granta Park, Cambridge CB21 6AL, United Kingdom

Project Short Description (not scored)

Digital Inspector will be a complete ecosystem for monitoring and managing welding being undertaken across multiple different locations by connecting procedure approval and welder approval databases to real time weld data acquisition. The project is designed to be scalable to include NDT digital data and connect to other SaaS systems such as Building Information Management (BIM) software. Successful delivery of the overall project concept will improve energy system resilience and robustness through early identification of fabrication issues and 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 the production welds. Previous site-side software deployment in vehicle tracking, fuel usage and temporary works control for example has shown an increase of over 66% in efficiency and precision. Similar improvements in documentation. Poor documentation is a source of weld defects, an unqualified welder or use of incorrect consumables for instance. Having welder sign ins and consumable scanning, using a welder and consumable credential system will guard against these. Providing these assurances automatically and in real time means no production hold ups that are caused by staff looking for paperwork or an inspector manually corresponding procedure documentation to welder qualifications.
Production defects can be introduced by welders using incorrect welding parameters. Heat input affects weld pool solidification and the

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

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

Automatically storing weld fabrication data in TWI management software will allow the easy reuse of welding procedures. New projects can use historical procedures, only running new procedure trials when necessary. Similarly storing welder credentials and their qualification history seamlessly in TWI's management software means welders only need to requalify when necessary. Even allowing welders to "carry" qualifications from one site to another, one job to another. This is a novel idea that could easily revolutionise the industry, allowing welders to move 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 clear from recent incidents in North America and Asia, the issues that can arise from poor weld quality, so prevention of construction incidents is a significant benefit.

Significant project costs are associated with countering fabrication risks, Digital Inspector will reduce both production overrun and quality risks. Reducing risk reduces 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 all partners being involved, but with a specific WP lead:
WP1 Infrastructure requirements (Lead UL): Identification of critical factors and variables to be included in the digital inspector tool such as job references, site specifications, relevant codes and standards. (£17500)

WP2 Monitoring service development (TE): Identification and specification of system changes required to enable monitoring service to be built, including API requirements. (£17500)

WP3 System design and integration (TWI): Assessment and specification of requirements to integrate real time data generated from site into the welding coordinator (WC) and welding qualifier (WQ) software systems. (£17500)

A summary report for each WP will be issued as the deliverable and will identify the required steps need to deliver the next phase of project work to be delivered in the Alpha phase of funding (subject to successful grant award). A risk register will be created as part of each WP activity, based on a PESTLE analysis type approach. 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 number of 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 have successful business activities relevant to the proposed collaboration and have identified 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 AMV Remote to TWI management software -- 2 directions
3. Outline API to connect generic systems to AMV Remote

Regulatory Barriers (not scored)

Any system developed will need EMC and electrical safety compliance. Triton products 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 of welds, both for qualifications (inspector needs to 'witness' the test weld being made) and for production, someone has to do a visual acceptance, which implies actually looking at the weld. Verifying that all the documentation is correct (welder is qualified, WPS is good, filler is suitable) doesn't necessarily require his presence.

Commercials

Route To Market

There are two routes to market identified which have potential following the discovery phase of the project :

1. Triton and TWI will develop and distribute the resulting hardware and software using their existing customer base and existing marketing channels. This will result in increased sales. We see the project deliverables as complimentary, which integrates with software from TWI, who will also benefit from resulting sales of their software integration.

With success in the funding call, The Project Team would be able to develop a unique product offering in the space while providing real benefit to United Living and Cadent. Exposure to Cadent's supply chain network for real world trials, and United Living's desire for such a system enabling rigorous development testing and feedback with extensive usage, puts the product development stage of the project in the best possible incubator.

The Team will build and then provide a new product that will have been developed in collaboration with leading names in the energy sector and will then open up sales to the wider market.

OR

2. A new organisation would be created by the Project Team which seeks to capitalise on the expected benefits resulting from a successful development and trial period, as outlined above. This consortium would also seek to capitalise on the value of the data generation and wider push towards AI-led statistical process monitoring and control that would be an exciting proposition for wider commercialisation.

Due to the logistical constraints of generated data, this model would be best suited to a consortium approach throughout the developmental and experimental phase and 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 AI statistical analysis tools.

Intellectual property rights (not scored)

Triton Electronics Ltd has developed the AMV range of welding monitored over the last 20 years. Recently developing AMV Remote and methods for transferring weld data to cloud storage. TWI has previously developed a number of welding-related software packages for control of welding qualification, production welding and testing 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 3 detail how they can be overcome. The remaining 10% contribution from each partner will be funded from internal R&D budgets.

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

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

Examples of increased productivity are reuse of welding procedures, weld trials can 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 and easing bottle necks fabrication rates from the best sites currently will become standard. Factoring these together projected savings could be £2.5m per year for one fabricator.

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

In the final analysis Digital Inspector will save initial production costs and lifetime maintenance 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