Energy Innovation Basecamp 2024
Problem Statement EIP109

Digital Commissioning of Large-Scale Equipment

The following problem statement has been developed by the innovation teams within the UK's Gas and Electricity Networks for the 2024 Energy Innovation Basecamp.

Theme: Decarbonising Network Operations

Network Areas: Electricity Distribution, Electricity Transmission, Gas Distribution, Gas Transmission

What is the problem?

The RIIO funding mechanism has enabled fast paced learning to be collated for the net-zero energy transition of the UK. Utilising this data will be a key aspect in ensuring any repurposing and new elements are well understood and commissioned. There is a risk that needs to be mitigated to prevent any significant delays and increase of cost to our consumer and take a pragmatic approach to the transition.

Today we use our Building Information Models (BIM) to support construction. This however cannot extend to commissioning the equipment on sites or the digital communication elements. We are looking for a solution that will focus on the digital commissioning elements but also support the wider asset commission.

During design and validation studies for future net-zero transition infrastructure projects, a significant amount of time is spent on completing multiple investigations both desktop studies and physical tests to understand large scale equipment safety, quality assessments and functionality of the system. This adds significant cost and duplication of effort. e.g. compressor design and upgrades.

The UK energy and utility networks heavily rely on automation to operate their networks safely and securely to deliver essential services to the consumer. The resilience of the energy systems, that all industrial customers and consumers rely upon depends on robustly designed, operated, and secured automation systems. These systems include a combination of 'Operational' and 'Information' technologies (OT and IT respectively) which have been installed over several decades and need modernisations to meet current and future operational, safety and cyber security requirements.

As part of RIIO-2 the TSO, DNOs and GDNs is investing billions in automation system upgrades. Within National Gas Transmission, during RIIO-T2 and T3, all the existing compressor stations will undergo major control, safety, and cyber security systems replacement on a previously unexperienced scale. At National Gas Transmission alone, new automation control system framework partners have been appointed to deliver over £300m works, which is unprecedented within the UK utility industry.

What are we looking for?

This project seeks to deliver a novel technology that helps overcome the key challenges in design validation, automation system delivery and ongoing quality assurance that utilises data and learning from other innovation projects to map current state of facilities. The solution would ideally be closer to implementation – TRL 6-8, but we will consider more challenging options.

A solution to this problem would develop a way to automate verification of the future control systems and their ongoing assurance. This tool could be used to verify that the operational, safety, and cyber security requirements are met during design, well in advance of any intrusive site works taking place.

A solution would be able to support networks to understand all commissioning aspects to a large-scale equipment operation and support real-time understand and decision making to reduce time, resources, cost and improve communication between suppliers, the networks and the operational construction teams commissioning the projects.

A proposed system could use simulation and verification processes to identify and address any potential issues with control systems' operational, safety, and cyber security requirements. The diagnostic system could help understand maintenance and repurposing strategies to understand where repurposing is a better solution than

buying new. A digital version of these validation studies would help ensure the design meets the desired outcomes before it goes live, saving time and reducing risks.

In the future, it may be used for ongoing assurance and training to allow for the automated verification of control systems in a simulated environment and to test changes to operations before implementing them.

What are the constraints?

All DNOs operate a design assurance process based on the IGEM/GL/5 framework. This solution seeks to automate the application of this assurance process for control system projects.

This solution aims to offer a solution that all networks can use to solve this problem. The solution must be compatible with current IT infrastructure and be compliant with all regulations and compliance.

Data can be accessed with RFI/TQ requests from each network or through any data that is readily available through the ENA Portal.

Who are the key players?

All Transmission and Network Operators will have this problem. There may be modifications to be made to a solution dependant on internal systems, but this solution should aim to be the base design and framework to enable quick scale-up and utilisation to the industry. The main internal stakeholders will be Asset Design, Control Room, Construction and Strategy teams within each DNO, TSO, and GDN.

Many different people will benefit on top of the key stakeholders mentioned above which include, financial, commercial, suppliers, and operational teams. The end customer, the UK population, would benefit greatly as we foresee significant savings in cost and time that would impact the consumer.

Whilst we are focused on energy system commissioning, we foresee any tool being able to be utilised in any industry or may have already been deployed in a separate industry.

Does this problem statement build on existing or anticipated infrastructure, policy decisions, or previous innovation projects?

There are currently no other projects ongoing that supports pre-studies for this problem statement. There are future dependencies on supporting the transition of our network and repurposing our current sites and infrastructure in the most economically and safe approaches. The integration of current information and results from material testing, asset studies, blending infrastructure studies should be high priority. This will enable a realistic modelling and understanding of our current systems versus new plans and understanding of future capabilities.

The future dependencies will be the reliance on changing our technology systems to enable the transition.

What else do you need to know?

Example submission would be:

Phase 1: A success outcome of Phase 1, would be to have a hardware interface, software model for a single site and a trial test

Phase 2: The outcome of the phase is a complete automation verification tool, ready to be used by the network and their system integrator partners.

Innovator submissions to this problem statement will be open here during March and April, but we encourage you to submit your response as early as possible, as networks will be able to review submissions as soon as they come in.

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You can also use the virtual Q&A on the Smarter Networks Portal to ask for more information about this problem statement. Questions may be answered online or at the ENA Problem Statement Launch in March 2024. More information on last year's Basecamp programme can be found here.