EIP011
Can we detect PCBs in PMTs in situ?

Problem Statement Details

The changes introduced in the European Regulations (and in turn the 2019 UK PCB Regulations) require all UK DNOs to replace or PCB (polychlorinated biphenyl) test any pre-1987 oil-filled assets by 31st December 2025, due to PCB's potential environmental impact as a Persistent Organic Pollutant (POP). These assets, which are mostly transformers, were accidentally contaminated with PCBs before the Stockholm Convention banned them in 1987. According to a statistical modem developed by the ENA PCB Working Group there are c. 88k transformers across all UK DNOs that need to be tested and/or replaced before the deadline. The majority of these assets are Pole Mounted Transformers (PMTs). While Ground Mounted Transformers (GMTs) can be relatively easily tested using existing equipment, PMTs are much more problematic due to the issues accessing and de-energising them; creating a tester that can test in situ with the asset energised would solve this problem.

Key Stakeholders

DNOs, Environmental contamination testing specialists, chemical labs, Environment Agency

Target Market

Around 88,000 transformers need to be tested/replaced before the deadline of 31st December 2025.

Enablers and Constraints

Previous NIA projects:

- **WPD PCB Sniffer** - This project was able to identify multiple solutions to test for PCB, but all of them required physical oil samples and hence cannot be used for live testing. This project concluded that there is no safe method of extracting oil from an overhead asset whilst it remains operational. It has also concluded that not all PCB congeners are present within the headspace of an asset under normal operating conditions and hence, headspace analysis isn't an accurate testing method for the detection of PCBs. Also, there is insufficient spectroscopic data for all 209 PCB congeners to be able to use this method of detection and this would require a significant laboratory-based task. There is a deadline of 2025 to remove all potentially contaminated assets and this task would not be feasible within those timescales.

- **SPEN On-Site Non-Intrusive Polychlorinated Biphenyls (PCB) Tester -** The initial objective of this project was PCB determination through naturally existing gamma rays from Chlorine-36, with the recognised challenge of finding a detector that is sensitive enough. It was then changed to the use of a deuterium-tritium neutron generator, which has health and safety concerns as there will be additional radioactivity introduced. Participating DNOs decided to close-down the project due to health and safety risks as well as the timescale needed for

understanding the incremental radioactivity and subsequently developing a suitable mobile device.

The need of the hour is a simple solution like a combination of Clor N oil test and swab test that can detect PCBs in transformer. The swab test solution exists in the US. The problem associated with sending the sample swabs to US is that they wouldn't reach there within the required timeframe and hence the test will fail. A similar kind of testing centre needs to be established in UK. The transformer oil swab for the test can potentially be collected using live line rode from transformer ceramic bushings.

Scalability and Target Implementation Date

The solution is required as soon as possible and specifically prior to December 31st 2025 deadline.

There are some PCB testing kits available in the US as indicated above, however, no lab facilities exist in the UK to send the samples to.

Innovation Strategy Target Areas

Innovation Theme	Target Area	Primary or Secondary
Data and Digitalisation	The shift to data-driven, digitally-enabled networks is critical as we move towards Net Zero. We need your help to drive standardisation, interoperability, security and digital skills whilst accelerating our transformation to data-driven networks by the mid 2030s.	
Flexibility and Market Evolution	Energy networks must quickly and efficiently respond to the rapidly evolving needs of the energy system transition. We need your support to eliminate barriers to new market entrants, deploy novel commercial and network management solutions whilst ensuring fair participation and eliminating regulatory barriers within the RIIO-2 price control periods.	
Net zero and the energy system transition	In order to meet the UK net zero targets of 2050 we must start converting our networks to deliver low carbon fuels today. We want to work with you to develop the role of our gas networks into the future by investigating, trialling, implementing and delivering safe, low carbon alternatives to natural gas such as Hydrogen.	
	Net Zero requires connection of more low and zero carbon sources of energy generation, storage and demand to both the transmission and distribution networks. We need your innovative methods for effective network management and accessing flexibility to improve visibility, forecasting and modelling of low carbon technologies.	
Optimised assets and practices	Innovation has a key role to play in ensuring our networks continue to remain reliable, safe, secure and resilient to our changing climate. We are constantly looking to improve and welcome support to identify methods to prevent interruptions, ensure resilience, reduce climate impact and future-proof our networks.	Primary
Supporting Consumers in Vulnerable Situations	Equality and fairness are the foundations of a just transition to Net Zero. We hope you can provide insight into the transient and situational nature of vulnerability and how we can overcome the impact the energy system has on consumers, building strong relationships for the future.	
Whole Energy System Transition	The energy system must consider the full range of opportunities, risks and interdependencies that exist across the energy networks to integrate and optimise them in a way that best serves the consumer. We are looking for ways to improve visibility of the networks and transitional options, co-ordinate approaches and collaborate across the UK.	

The voice of the networks