V2 Using Large Scale Renewable Developments to Enable Decentralised Supply to the Rail Infrastructure

What is the situation?

Opportunities exist to generate electricity close to the rail network, to feed electricity directly into the rail infrastructure. This would reduce costs by eliminating the proportion of the energy bills that deal with transmission and distribution through National Grid, whilst protecting key assets at times of supply uncertainty. Network Rail estimates that annual benefits from implementing renewable schemes could be up to £9m.

What is the challenge?

Electricity generated by wind or solar is increasingly commonplace. The best use of this generation is not to feed it back into the grid for redistribution, but to use it close to the point of generation, so minimising costs associated with transmitting and distributing energy to the point of use. The interfaces between the generation sites and the rail infrastructure networks are not simple, nor is the issue of the intermittency of generation.

Why is it a challenge?

Network Rail owns lots of land on, or around, the network. Some of this land is not suitable for development or traditional use and could be utilised for generation, specifically large solar arrays. Identifying suitable envelopes of land is a challenge due to poor or inaccessible data, and matching with other datasets such as solar efficacy. Further challenges are presented when considering solar as trackside solar arrays could lead to glare affecting driver performance and presenting accident risk.

Potential opportunities are the many tunnels across the rail network, where solar arrays could be mounted without the risk of glare affecting the driver. An example of where this has been successfully deployed is the Paris – Amsterdam rail link, where solar photovoltaic arrays have been installed along a 2 mile stretch of tunnel. Such projects are easily replicable in the UK rail sector.

Wind turbines present a challenge in terms of proximity to lineside, considering topple distance, shadow flicker etc. This, however is not insurmountable as the right site could still present significant opportunities for private-wire arrangements.

Matching demand with output may be difficult, although particularly for wind could be overcome by incorporating battery storage.

Commercial organisations who could develop private land adjacent to the railway are available to assist, and would then sell the electricity generated to Network Rail. The challenge here is to understand the best value option in these situations.

Priority problems

Specific priority problems

- Available land for development of large-scale renewables is not known at present.
- Lack of in-house capability to assess potential sites.
- Lack of knowledge of how risks such as glare or flicker may impact safety on the railway.
- Matching demand with output.
- Lack of in-house capability to assess options for commercial offers from third party developers.

Related goals

- An understanding of Network Rail's available land portfolio and its generation capacity.
- A clear understanding of the potential risks of deploying large scale renewables close to the rail infrastructure.
- Effective solutions to match demand and output.
- Identification of best value offers from third party developers, so that opportunities can be maximised.

Benefits

- Reduced carbon emissions by minimising grid-delivered electricity and utilising renewable generation.
- Increased knowledge of renewable technologies and how they can directly interface with the rail network.
- Ability to replicate projects to widen our scope of generation.
- Cost savings through elimination of transmission and distribution costs.
- Potential generation of revenue
- Improved reputation by publicising positive results and case studies.

Specific research needs

To address these challenges, and gain the associated benefits, it is expected that R&D actions will need to address the following aspects:

- Deployment of large scale renewable generation could reduce our reliance on National Grid whilst reducing costs and carbon emissions.
- Developing solutions to enable private-wire generation directly to the traction or non-traction infrastructure.
- Gaining intelligence in-house to enable exploitation of third party offers to maximise benefits to NR.

fig. 1

fig. 2