Implementing Energy Reduction Activities to Reduce our Carbon Impact

What is the situation?

Failure to effectively manage consumption of energy leads to unnecessarily high emissions of CO2 and increased operational costs. Network Rail spends £60m each year on utilities use across its non-traction operational estate and a further £3m in order to comply with carbon legislation. CO2e emissions are in the region of 300,000 tonnes each year.

The rail industry is relatively immature in terms of mitigating operational energyuse, and their resultant carbon emissions, with limited flexibility and agility to monopolise available opportunities. This leads to resource waste, unnecessary emissions of harmful greenhouse gases, and increased operational costs.

Network Rail has a regulated target to reduce CO2e emissions by 11.2 % by the end of CP5. In the first year of CP5, emissions increased by 9.2 % due to an increased portfolio and excessive energy use. Although this increase has been clawed back, we are not where we should be at this point in the control period and we have increasingly diminished opportunity to implement initiatives designed to meet our existing target. Our CP6 ambition is to build on the success delivered during the current control period, and to develop programmes to achieve a 25 % reduction on the CP5 exit position.

Whilst we need to focus on our short-term goal of achieving the CP5 target, there is a need to shape a much longer-term strategy to continually reduce Network Rail's operational carbon emissions in order to contribute towards the goal of the UK rail industry becoming a low carbon railway. Presently, NR's strategic view is – rightly – on our short-term challenges and a long-term strategy is yet to be developed.

The challenges currently facing the UK energy industry, in terms of balancing frequency, supply squeeze and optimising renewable generation present particular problems for the rail network. Supply security is essential to the smooth running of the railway and the risks of black- or brown-outs need to be minimised. The energy industry's response is being implemented through demand side response, capacity mechanism, frequency response and storage. Network Rail needs to become more agile, proactive and responsive if we are to benefit from these new innovations.

Analysis of causes

There is limited capability and capacity embedded within Network Rail's business units to enable swift reaction to the increasing pressures that inertia brings – budget squeeze, missed targets and reputational damage are all key risks in this area. Fragmentation of operations also presents challenges, as Route teams and project teams operate independently, often to the detriment of effective control and mitigation of utilities use.

Energy efficiency initiatives, although generally presenting a robust business case, often demonstrate a payback period of anywhere between 2-8 years. Operating within the boundaries of a 5-year control period therefore presents constraints on investment decisions.

In an understandably risk-averse operation, applying alternative technologies or practices is often difficult to achieve. The overarching priority of the smooth operation of the railway often means that there is a reluctance to change day to day procedures or try alternative products, even those that are commonplace and proven outside of the rail industry.

Priority problems

Specific priority problems

- Limited awareness, capability and motivation across Network Rail's business units.
- Restricted business agility to react to internal and external demands and opportunities.
- Fragmentation of activities around, and management of, utilities and energy related activities.
- Limited funding and/or investment opportunities.
- Need to focus on adopting new technologies or ways of working.
- The need to develop a long-term strategic roadmap for Network Rail to contribute to the goal of becoming a low carbon railway.

Related goals

- An educated and capable workforce which operates in an energy efficient manner.
- Agile business units that are able to react swiftly to maximise benefits.
- Close collaboration between route and project teams, providing a co-ordinated approach to future utility use.
- Easily accessible energy efficiency measures, with funding barriers removed.
- Simple implementation of proven technologies and processes.
- A long-term strategic view with a roadmap to the low carbon railway vision.

Benefits

- Reduced carbon emissions.
- Reduced operational costs.
- Income generation through active participation in initiatives brought about by Electricity Market Reform.
- Increasingly efficient operations.
- Improved reputation as NR strives to deliver a low carbon railway.
- Increasing Network Rail's skills bank and embedding new skills throughout the business.
- Enabling Network Rail to become more resilient and agile to meet future energy needs.

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:

Existing or newly developed technologies (including application of renewable technologies) should be widely implemented to reduce operational energy use at various applications e.g. buildings, points heaters, lineside buildings.

Developing solutions to improve business interfaces to facilitate collaborative working to minimise impact on future operational energy use and resultant costs and carbon.

Enabling innovative frameworks for delivery mechanisms to deploy holistic packages of energy efficiency measures, incorporating alternative funding, maintenance and delivery models.

Developing technology solutions which effectively reduce operational energy use in the railway environment.

Developing technology solutions which incorporate small-scale renewable energy sources, self-generation and storage in the railway environment.

Developing the capability of NR assets to react to opportunities presented through Electricity Market Reform and exploit the income generating mechanisms whilst protecting NR assets and operations.

fig. 1

fig. 2