CASE STUDY
LOCH WHINYEON
INTEGRATION OF ELECTRIC PLANT

PROJECT OVERVIEW

The works involved excavation, material haulage, placement of imported fill, profiling to design levels and compaction to ensure surface water could be effectively shed downstream. All works were carried out on an operational raw water reservoir supplying Glengap Water Treatment Works.

As part of the delivery approach, an electric plant trial was undertaken. Electric and fossil fuelled plant operated side by side on the same tasks to allow direct comparison of performance, energy use, emissions, noise and operational suitability.

EXECUTIVE SUMMARY

George Leslie undertook an electric plant trial during remedial works at Loch Whinyeon Reservoir for Scottish Water as part of the Measures in the Interest of Safety (MIOS) programme. The trial involved an electric excavator, electric dumper and electric roller, directly compared with fossil fuelled plant carrying out the same activities.

The trial demonstrated that electric plant can be effectively used on a live raw water asset, delivering clear benefits including zero workface emissions, reduced noise and lower environmental risk. It also highlighted practical limitations, particularly in relation to cost and the requirement for temporary off grid power.

OUR SUSTAINABILITY ROUTE

- Nature Based Solutions
- Recycled Aggregates
- Low Carbon Steel
- Low Carbon Concrete
- Battery Units
- HVO Fuel
- Welfare Eco Cabins
- Green Energy

PROJECT BACKGROUND

The works were undertaken on a live raw water reservoir, where protection of water quality and minimisation of environmental risk were key considerations. The use of conventional fossil fuelled plant presented an elevated risk due to refuelling activities and exhaust emissions close to the reservoir.

The site's remote location and lack of mains power introduced additional challenges for adopting electric plant. To address this, a temporary off grid charging solution was established using a generator and hybrid battery system to support daily operations.

There were also uncertainties around whether electric plant could deliver the productivity required for earthworks on the dam crest. This was addressed by adopting a structured trial, directly comparing electric and fossil fuelled plant undertaking identical activities to generate reliable, site specific evidence.

ENVIRONMENTAL BENEFITS

The electric plant trial delivered clear environmental benefits at the workface. The electric excavator, dumper and roller produced zero exhaust emissions during operation, removing combustion emissions near a live raw water reservoir. This reduced the risk of air pollution and eliminated the need for on site refuelling of working plant, lowering the potential for hydrocarbon spills.

Noise levels were consistently lower than those generated by fossil fuelled plant. Electric machines were significantly quieter during operation and silent when stationary, improving communication between operatives and reducing disturbance within the sensitive reservoir environment.

Energy consumption at machine level was substantially lower for electric plant compared to fossil fuelled equivalents across excavation, haulage and compaction activities. While overall site emissions were influenced using temporary off grid power generation, the trial demonstrated clear environmental improvements at the point of work.

CONCLUSION

The Loch Whinyeon project demonstrated that electric construction plant can be successfully integrated into reservoir maintenance works where environmental protection is a priority. The trial confirmed that electric plant can deliver the required activities - excavation, haulage and compaction - while providing measurable reductions in noise, workface emissions and environmental risk.

It also showed that under remote, off grid conditions, the use of electric plant currently carries higher costs and increased complexity due to charging infrastructure and reliance on temporary power generation. Productivity was achievable but influenced by plant size availability and charging requirements.

Overall, the project confirmed that electric plant is best suited to targeted use on environmentally sensitive sites. Its use is most effective where grid power is available or where environmental and compliance requirements are the primary drivers. The learning gained provides a strong evidence base to inform future plant selection and sustainable delivery approaches on similar schemes.

GEORGE LESLIE