

How hydrogen helped power Canvey Island's southern shoreline Revetment Project.

This trial of a hydrogen-powered fuel-cell generator, marks a significant step towards making innovative, zero-carbon solutions a reality for sites, sets and projects that rely on temporary power. It also demonstrates how collaborative working, in this case between Balfour Beatty, the Environment Agency, Sunbelt Rentals UK & Ireland, Hydrologiq and EODev is crucial to discovering how fuels like hydrogen can become a commercially viable solution that can safely fuel the future of our planet.



Zero Tail Pipe
Emissions



4256kg CO₂e
Saved



Successful 4
Week Trial with
H₂ Powered Fuel
Cell Generator

24/7

24/7 Silent
Power to Site

3,310

3,310kWh of
Energy Generated
by H₂ Fuel Cell
Generator

How hydrogen helped power Canvey Island's southern shoreline Revetment Project.



The Canvey Island Southern Shoreline Revetment Project will renew and improve 3km of shoreline flood defences along low-lying Canvey Island as part of the Thames Estuary Asset Management (TEAM) 2100 Programme. Once complete, it will protect thousands of homes, businesses and infrastructure from rising sea levels brought about by climate change.

The project is funded by the Environment Agency, with Balfour Beatty the appointed principal contractor, who, along with their supply chain partners, are already 12 months into delivery, with completion expected in 2025.

From the onset the team made a conscious effort to prioritise sustainability in all equipment related decisions. With the support of Sunbelt Rentals UK, Balfour Beatty opted to utilise EcoSense welfare cabins, energy management systems (Econet), battery (energy) storage units (BSU's), roof mounted solar frames, rainwater harvesting systems, solar-powered environmental monitoring equipment (Casella Guardian), Trakway panels (to protect the ground and minimize the need for excessive stone transportation), and an ANPR carbon capture barrier system to accurately measure the carbon emissions produced by vehicles visiting site.

This was an approach shared with the Environment Agency, and resulted in a sustainable site set up that was cost efficient and provided a lower impact on both environment and local community.

With the lower carbon solutions also enabling site to optimise their power consumption and operate 'fuel free' for significant periods, including evenings and weekends.

However, there is a shared desire between Balfour Beatty, the Environment Agency, and Sunbelt Rentals to drive innovation and explore solutions that can accelerate net zero plans.

And when the opportunity arose to trial a hydrogen powered fuel-cell generator over a controlled four-week period, the three parties collaborated to install this groundbreaking solution. Collectively taking a step forward to gain a deeper understanding about this zero-carbon fuel, which has the potential to help shape the future of our planet.

Our equipment and services supplied at a glance

- 100kVA Hydrogen Fuel Cell Generator
- Roof Mounted Solar Panels
- EcoSense Welfare Units
- Battery Storage Unit
- Energy Management System
- Trakway Panels
- Casella Guardian – Solar Powered Site Monitoring
- Rainwater Harvesting System

Objectives

The key long-term objective for all is to deliver and support zero carbon sites, and this trial certainly enabled all involved take one step closer to achieving this.

However, there were many shorter-term objectives also set out, which include:

- Achieving a safe and compliant deployment of a H2 (diesel free) temporary power solution in an off-grid compound, with a small carbon footprint.
- Develop a deeper understanding of the operational management, performance, cost, and safety procedures associated with H2 fuel and H2 powered technologies.
- Foster a collaborative approach to hydrogen, bringing together industry experts and build long-term working relationships with H2 industry experts and end users.



How hydrogen helped power Canvey Island's southern shoreline Revetment Project.



Challenges

The operational deployment of hydrogen requires its own safety rules and playbook, including an updated and renewed set of health and safety rules, DSEAR assessments, safety processes and certification around hydrogen sourcing and storage, along with new refuelling procedures, compound design, ATEX zones and emergency procedures.

Supply of Hydrogen also poses a challenge. Although storage and transport capacity in the supply chain is growing, it's still limited. This means greater forethought and planning must go into hydrogen deployments (compared with diesel). However, availability is increasing all the time (as demand grows), and more investments are made throughout the supply chain.

There is a global gap in knowledge of working with hydrogen, however this is a growing market, and as live trials take place, and production grows, experts are emerging, bringing with it opportunity to share knowledge, learn from each other and future job growth.

Cost of hydrogen vs diesel remains a challenge, hydrogen is fundamentally more expensive to implement, however only with increased demand is the industry likely to see production rise and cost fall, and industry experts predict H2 costs will fall (and near parity with diesel) by 2027, thanks in part to funding under the Hydrogen Production Business Model.

And questions remain over the carbon impact of producing different methods of hydrogen, with ongoing research into quantifying the true CO2 output of the different methods of producing hydrogen. However, one thing is clear - all types of hydrogen produce less emissions than burning fossil fuels, therefore it's important to act now by educating ourselves about this fuel and explore ways to implement it as a substitute for diesel.

Fundamentally, these are all-standard challenges in the commercialisation of any new technology, and only by collaborating, identifying, and overcoming challenges can we move forward.

“ These trials are really important to reaching the goal of diesel-free construction sites. As a client organisation, this is critical to our overall carbon reductions, clean air, and sustainability goals. This is a massive challenge but with these small trials at Canvey Island and other projects we are breaking it down into smaller manageable trials which can then be shared across our organisation to accelerate adoption. ”

Jo Driffield

Senior Engineer, Environment Agency

“ The key role of this trial was to learn more about hydrogen fuel and the technologies supporting its use and its safe deployment with the existing industrial challenges. Our commitment to delivering low and zero carbon solutions is a driving force in exploring hydrogen as (part of) the solution to achieving net zero on our sites and projects. Our long-term goal is to reach a point whereby it's the first choice of fuel/energy, providing a zero-emission solution to powering all our projects. ”

However, these things don't happen overnight, and they most certainly don't happen without trialling. We will take the learnings of this trial to the next with the goal of achieving a 'business as usual deployment', in the way diesel is used as the primary fuel today in temporary power. ”

Mehrnoosh Khan

Energy Graduate, Balfour Beatty

Solution

A shared desire to deliver low carbon solutions made this trial possible, but it's important to outline that collaborative working undoubtedly played its part here to overcome the challenges faced, coupled with aligned objectives, and the experience that each party brought to the table:

Balfour Beatty's roadmap and vision to delivering zero-carbon construction sites, working with customers, designers, and supply chain partners to get as close to delivering zero carbon on as many elements of their projects as possible, including the use of fuels of the future helped drive this trial forwards.

The Environment Agency's drive for a cleaner, greener future and (innovation) funding to support the trial played its part in making this possible and demonstrates their commitment to helping our planet.

And Sunbelt Rental's position as H2 facilitators brought together equipment, in house experts and their H2 supply chain with (manufacturers) EODev and H2 industry experts Hydrologiq playing key roles in guiding all parties through pre-site assessments, operational set up, sourcing of fuel and ongoing management, unrivalled knowledge of delivering hydrogen on live sites proving instrumental to the success of the trial.

How hydrogen helped power Canvey Island's southern shoreline Revetment Project.



Result

The main objectives of this trial were to implement a safe H2 solution, learn more about deploying Hydrogen on a live site, and take another step towards achieving net zero sites, and all parties undoubtedly achieved this.

The hydrogen generator delivered 24/7 silent power to the site across the 4-week period, its only tailpipe emission, H2O.

During the 4-week period, the site consumed 202.5kg of green hydrogen, generated 3,310kWh of energy at an average 49% generator efficiency, and saved 4256kg CO2e*, eliminating the (scope 1) direct emissions associated with powering the compound.

Operationally, the deployment was achieved on time due to a close working collaboration between key stakeholders and was expedited by the efficiencies built into Hydrologiq's H2 operations platform.

The EODev GEH2 generator remained silent for the duration of the trial, and its silence didn't go unnoticed, as on-site personnel commented on its positive impact from both a sound level and improved air quality, with the GEH2 producing only water vapour as its by-product.

The more we can learn and share knowledge about alternative fuels, how to integrate with renewable energy technologies, and how to begin to introduce them into live applications - the sooner industries can make zero carbon alternatives a reality for the masses, but it takes a few pioneers and problem solvers to turn what-if into what-is.

In summary, Hydrogen fuel successfully supported an off-grid temporary power application and delivered a sizeable reduction in carbon emissions. If we continue to explore what's possible, collaborate and share our learnings, together we will make zero carbon temporary power solutions a reality, and help secure the future of our planet.

“ As consensus grows that hydrogen plays a key role in removing diesel from construction sites, the key to its acceptance lies in seamless integration. We need collaboration across the entire supply chain, ensuring that the physical, digital, process and regulatory pieces all come together to unlock the true potential of this fuel source. Hydrologiq is building the bridges to make hydrogen adoption effortless, and this project at Canvey Island is a major step forward in that mission. ”

Aran Bates
CEO, Hydrologiq

“ Projects such as Canvey Island are a must for us to build our foundations, knowledge, and experience that we all need to succeed in creating a new landscape where hydrogen powered solutions start penetrating today's current methods at scale.

All parties embarked on this journey together with common objectives that included understanding if existing technologies are a feasible solution in the rentable and temporary energy space and how they can use used at scale to sizably impact reaching 2050 net zero targets.

This trial demonstrates the power of a collaborative approach and desire to move forwards with emerging technologies that can make a difference to our planet and our future.

Christian Spence

Head of Greener Technologies, Sunbelt Rentals



Scan the QR code to view more information on the Canvey Island Southern Shoreline Revetment Project.

**Emissions calculated are based on GHG factor of 2.66kg CO2e produced per litre of diesel burned, with an equivalent sized diesel fuel powered generator burning an average of 400litres per week.*