



## Delivering sustainable mobility solutions

### Hitachi partners with Turntide to provide more sustainable rail journeys in the UK

As the UK moves closer to its 2050 net zero target, the need to decarbonise the country's transport network is ever more pressing. Reducing rail emissions and supporting net zero has long been a priority for Hitachi Rail. Cutting-edge battery technology represents one of the ways Hitachi Rail can meet its sustainability goals.

To make battery technology for the UK railways a reality, [Hitachi Rail](#) has partnered with Turntide Technologies.

#### The challenge:

Hitachi Rail, a fully integrated, global provider of rail solutions wanted to lead the rail decarbonization movement by bringing to market a more sustainable electric rail system. By providing a hybrid solution that could be used to retrofit existing trains, they hoped to dramatically reduce carbon emissions without requiring a complete redesign of the trains.

Hitachi was looking for an innovative electrification partner who could work with them throughout the research and development process to produce integrated battery technology capable of delivering the energy needed without compromising performance, range, or carrying capacity. They needed an experienced electrification supplier with a deep understanding of cell chemistry and how to integrating battery technology into vehicle systems.

#### Finding the right electrification partner

Hitachi needed an electrification partner with an in-depth understanding of battery chemistries, knowledge of stringent rail standards, and experience creating large-scale battery systems. The Turntide team's decades of experience with battery cell technology made them an ideal choice for the project.

Turntide worked closely with Hitachi to understand the vehicle specifications, drive and duty cycles of the train, regulatory specifications and safety concerns, and other project requirements such as cooling and thermal management.



### High-Performance Rail Application Battery Pack

with intelligent built-in battery management

- High energy density
- Flexible & scalable modular design for rapid deployment

Series system voltage: **48-630V**

Capacity: **over 750kWh**

Over 1000V rail applications

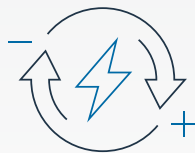


## Turntide's battery design and electrification expertise



### Battery chemistry and cell module selection

Turntide was able to help Hitachi navigate the complex process of battery system design, evaluating cell chemistry options based on factors such as energy and power specifications, lifespan, safety, cost, and fast charging capabilities.



### Simulation and testing of duty and drive cycles

To ensure the battery system would meet the necessary demand of the trains, Turntide modeled duty and drive cycle simulations looking at the state of charge and temperature. Later, during the rigorous testing process, modules were cycled for over a year, testing the thermal management system.



### Industry regulation and safety standards

Rail standards are some of the most stringent in the world. Hence, adherence to industry regulations such as BSEN and IEC standards was another critical part of the battery project. The Turntide battery solution was designed to meet the following standards for rolling stock and railway applications: BSEN-62928, BSEN-62619, BSEN-50155, and IEC-61508.

## Solution design

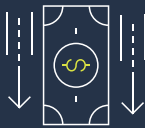
The partnership produced a high-performance rail application battery pack of 16 batteries with nominal system voltage over 2500V, designed to last four years on arduous routes or up to 15 years on lighter routes. This modular solution is ideal for retrofitting existing trains and avoiding extensive reengineering or rebuilding of the entire train.



## Hitachi battery hybrid trains

The modular design of the battery technology is ideal for retrofits of existing trains and can be used to replace diesel engines without reengineering or rebuilding them. This means minimal disruption to service since trains can be updated and returned to service quickly.

The battery will enable the train to run up to 90km on battery power and to recharge via overhead wires while in motion. The hybrid trains can enter and leave stations in battery mode, reducing diesel emissions and providing a quieter environment with improved air quality.



**20-30%**  
Expected Reduction in Fuel Costs

Adding a battery to an intercity train is expected to reduce fuel costs by up to 30%.



**20-30%**  
Expected Carbon Savings

Upgrading the trains in the UK would result in carbon savings of up to 30%.



Today Turntide provides the battery systems for Hitachi Rail as the relationship continues to develop. To find out more, contact us at [electrificationsales@turntide.com](mailto:electrificationsales@turntide.com)

### TURNTIDE TECHNOLOGIES

Our breakthrough technologies accelerate electrification and sustainable operations for energy-intensive industries

Turntide Technologies | 1295 Forgewood Avenue, Sunnyvale, CA 94089  
[turntide.com](http://turntide.com) | [electrificationsales@turntide.com](mailto:electrificationsales@turntide.com)