Hydrogen Powered Trains are a Reality

The Government has set an objective to remove all diesel-powered trains from the UK railway network by 2040 which is an achievable objective as new forms of traction are developed.

It is acknowledged that electrification of the whole network will not be cost effective although the growing use of bi-mode trains will reduce pollutants as there will be less use of diesel traction on existing electrified routes. The longer-term goal is to replace diesel engines with new technology such as the development of hydrogen powered trains.

This system produces energy from fuel cells that are charged using electricity at a fixed supply point removing the need for trains to be supplied with traction current from either overhead wiring or a third rail source. There is added efficiency as the growth in wind power has resulted in a large surplus of energy for overnight charging as output is not required by the National Grid.

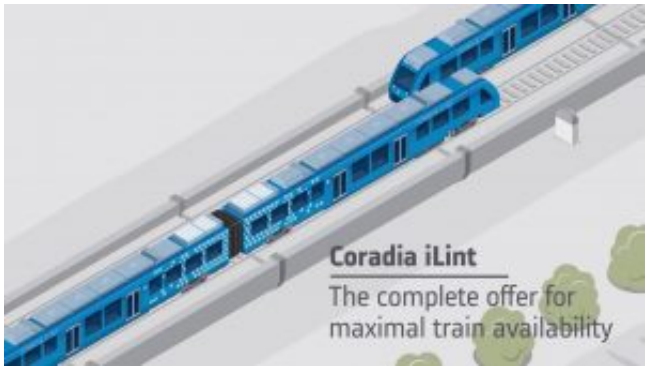
Hydrail is the shorthand description adopted for hydrogen powered trains and a number of light rail vehicles have been developed starting with the East Japan Railway in 2006, the Spanish metre-gauge operator FEVE in 2011 and more ambitious 200kW (278hp) rolling stock operated in Qingdao, China from 2015. It has been found that thermal efficiency of 30% is similar to conventional diesel-powered trains although it is below what is possible when current is supplied direct to traction motors.

For locomotives, a project led by the US Army Corps has resulted in a 240kW (320hp) hydrogen powered fuel cell being developed for a shunting locomotive. The overall weight is 132-tonnes which compares to the 50-tonne weight of a British 08 shunter with similar power.

Transport Canada has funded research into Hydrail use for commuter trains serving Ottawa and Toronto. Here diesel locomotives rated at 3,000kW (4020hp) are used. Initial findings are that to produce sufficient power a locomotive would require to be accompanied by an auxiliary vehicle with the loss of passenger carrying capacity for a given length of train.

In Germany the abundance of wind power has resulted in four German states with devolved responsibility for transport funding a fleet of Hydrail trains built by Alstom following the development of the Coradia iLint multiple unit. It has roof mounted power cells provided by Hydrogenics, a Canadian-based company with a battery pack provided by Akasol.

The train can be described as a hydrogen / battery hybrid which utilises both resources for acceleration and then uses the fuel cells to keep the traction batteries fully powered. In this way the iLint can offer the same 100mph performance and range as a diesel multiple unit with the fuel cell providing 200kW per vehicle and the battery 225kW, a total of 570hp. This power output is in excess of the most recently built Class 172 diesel units in Britain that have a rating of 480hp. Range before refuelling is in excess of 600 miles.



Alstom has promoted the iLint train for use in the UK with a proposal to base a prototype at Stanlow oil refinery where hydrogen is available with test running between Chester and Liverpool as it is close to Alstom’s maintenance facility at Widnes.

Hitachi has also undertaken research based on the AT200 vehicle platform which has suggested that there would be a 52% energy saving for a converted multiple unit operating between Norwich and Sheringham.

It is anticipated that as a result of the UK Government initiative new franchise contracts will include a requirement for technical innovation on specified routes. FCP has always offered new ideas for franchise bidders in the content of delivery plans and we can provide support for proposals to decarbonise railway operations.