



Hydrogen Trains: Here? Now?

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Locations across UK&I



#1

UK Rolling Stock & Services



UK&I Employees
6,000

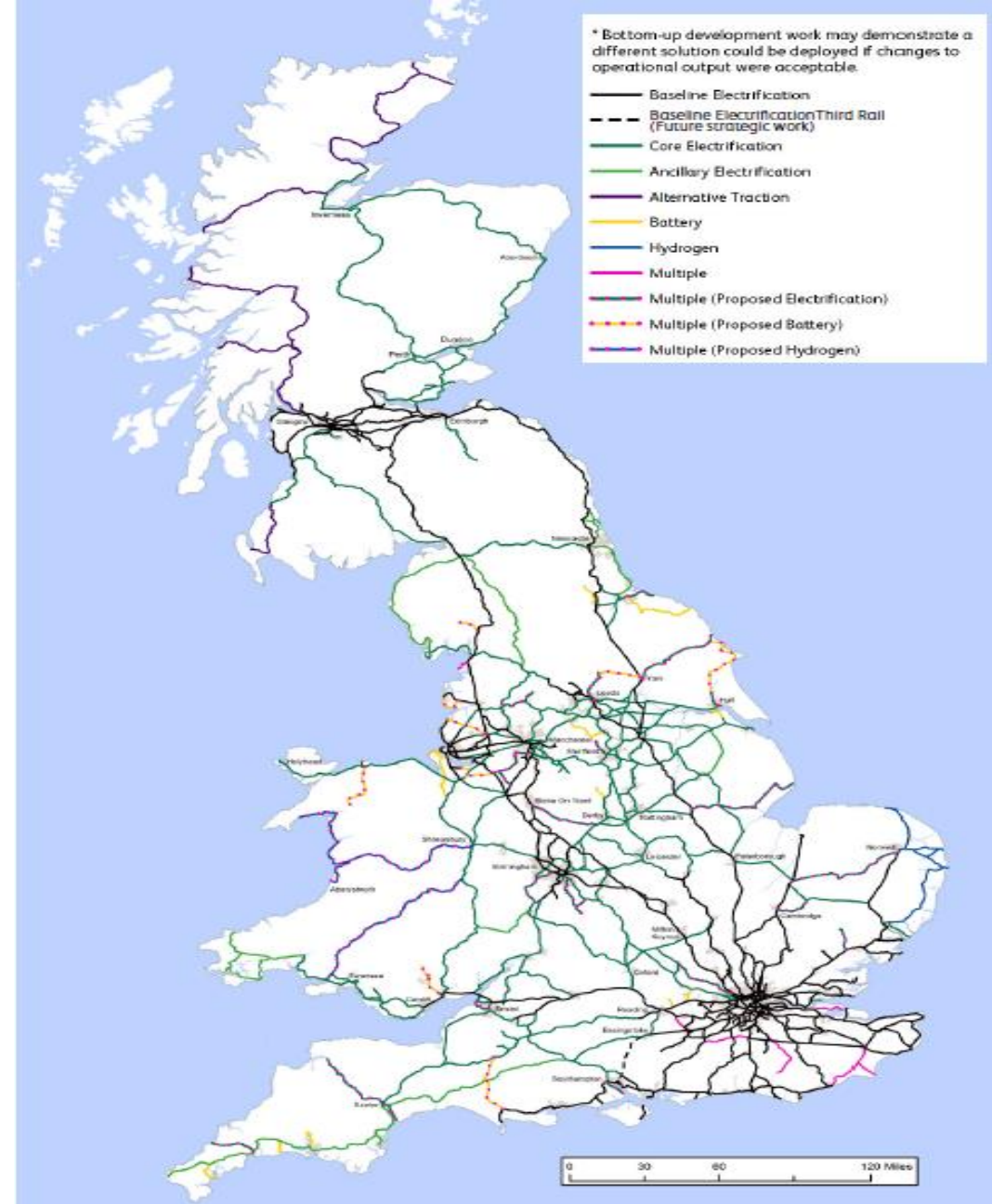


A hydrogen train for the UK



The right technology in the right places

- The technologies for decarbonising rail traction are known – electrification hydrogen and batteries
- Battery trains offer flexibility and transitional support during electrification but range and performance is limited
- Hydrogen offers the best compromise for green onboard energy storage because it is more compact and much lighter than batteries – for longer range **there is no other choice**
- To some, this makes hydrogen a “competitor” with electrification for longer, trickier regional routes
- In reality, electrification, batteries and hydrogen are complementary and need to be pursued in parallel
- Plans and maps are being redrawn as the rail industry is “reorganised” once again



Capacity – rail carries 9.6% of journeys for 1.4% of the emissions



What do people believe?

- What is the greenest way to make your journey?
- Electric car, or
- Diesel train
- In most cases, the train's emissions, per passenger km are, *today*, lower...



The greenest mode of transport

- According to the Office of Rail and Road, rail emissions accounted for **0.4%** of the UK's total CO2e emissions in 2019
- Rail made up **1.4%** of the UK's transport CO2e emissions in 2019, but in comparison **9.5%** of all passenger kilometres were made using rail
- But since 2019 passenger numbers are down, emissions per passenger are up, has the age of the train simply passed?
- So, why decarbonise it at all? Do we get enough “bangs for our buck” with rail decarbonisation?
- And, why start now? There's loads of time...



Alstom hydrogen trains – *there* (not here) and now

Fleets are being built elsewhere to meet decarbonised transport vision



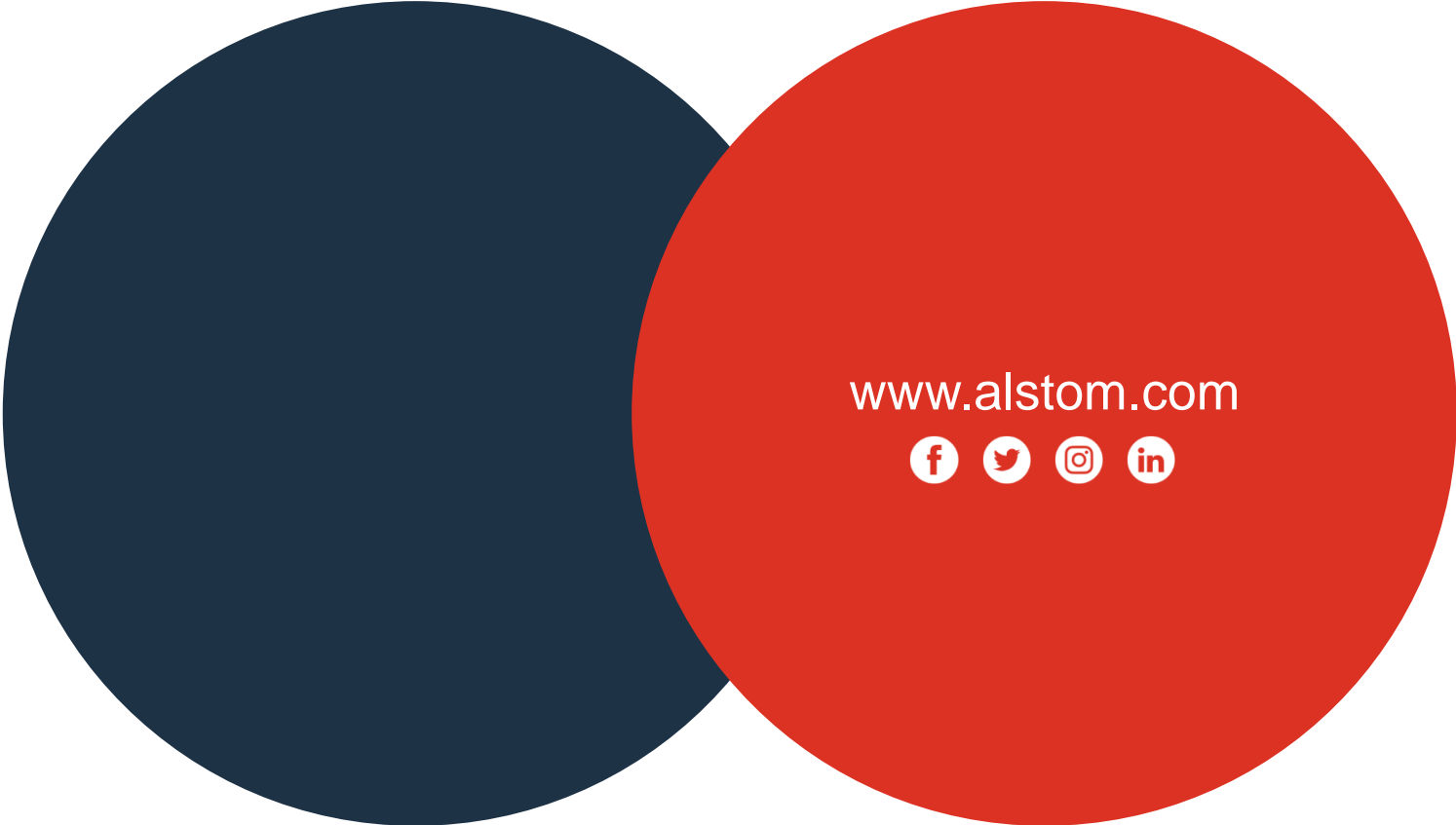
- **Coradia Stream (Italy)**
- 6 trains plus 8 options
- Fleet to deploy in Lombardy
- Enters service Q4 2023



- **Coradia iLint (Germany)**
- 41 trains ordered in two fleets
- Enters full service H1 2022
- Pre-series trains in passenger service **since 2018**



- **Coradia Polyvalent (France)**
- 12 trains plus 2 options
- To operate in four regions
- Bi-mode hydrogen-electric



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