Hydrogen Highways... the path to net zero or a road to nowhere? An Australian perspective.

Hydrogen is fast becoming the great hope of the green transition. Governments, investors and industry consortia across Australia have announced ambitious strategies to build out Australia's hydrogen ecosystem, including another AU$2 billion in funding recently announced for large-scale green hydrogen projects.

The heavy vehicle sector is often flagged as one of the key markets for future hydrogen technologies. Fuel Cell Electric Vehicles (FCEVs) and even hydrogen combustion engines (H-ICE) are routinely promoted as suiting those segments of Australia's truck fleet that cannot be readily transitioned to battery electric vehicles (BEVs). But is it really that clear-cut?

Increasingly, these assumptions are being tested. Hydrogen trucks have not yet reached market in significant numbers, refuelling infrastructure is yet to be established, and even today's battery-electric technology is emerging in applications once thought to be the unique preserve of fuel cells. Conversely, the operational constraints of using heavy battery electric trucks, and the cost and practicality of associated grid upgrades to meet depot charging demands or on-route Megawatt charging, appear to be stifling the rollout of BEVs in road freight. It seems the carbon-conscious freight carrier always must pay the piper: payload reductions and charging time on the one hand (BEV), or higher costs and slow network development on the other (FCEV).

This presentation analyses Australia's regional and long-haul road freight tasks to better understand the suitability of zero emission truck technologies. It presents three case studies to show how "conventional wisdom" might not play out in the real world, and how relatively small changes can result in big financial outcomes. The analysis also considers emerging battery-swap technology, drawing on indicative data from early Australian trials and more developed international experience. The combined analysis questions whether the increasing convergence and competition of once complementary technologies might affect the rate of decarbonisation required of long-haul freight. It also offers a 'reality check' into the Australian truck sector's pathway to net zero, to better inform policy development and investment decisions.

Key words: *net zero freight, hydrogen fuel cell truck, battery electric truck, FCEV, BEV, logistics decarbonisation, hydrogen, case studies, battery swap*