Hydrogen: The pursuit of progress, not perfection

In the Summer edition of Elements, Antonio Matamala well-described the state of the hydrogen production economy. However, very little remains the same for any length of time, and perhaps even less so in the world of hydrogen production. Hydrogen remains as volatile, but technology around storage advances with almost every vessel that's delivered. Mobile storage too, is increasing in size and safety. And greater efficiencies (in terms of hydrogen delivery, and water and power consumption) are being realised with every model of electrolyser that's conceived.

And, despite some notable disappointments, more and more users are entertaining the use of hydrogen. In Scotland, where I and IKM Consulting are based, there's long been talk of hydrogen as a fuel source for ferries and the odd filling station or two with a dispenser. In particular, Aberdeen City Council has made great strides in its use of, and making available, hydrogen.

Further south on the east coast there are now live opportunities to heat houses and cook meals with zero-carbon fuel. While on the west coast serious conversations are happening around replacing a proportion of natural gas with green hydrogen in isolated gas networks. This might not be perfect, but it must be a step in the right direction in comparison to bringing gas to isolated areas by road-going (diesel-drawn) tankers. Speaking of tankers, we know of several fleet operators that are only holding back from procuring hydrogen-fuelled vehicles because of concerns around reliability of supply.

Hydrogen production in Scotland (and the United Kingdom) makes sense. There is an abundance of its raw ingredients and increasing wherewithal to power production. There's also demand for its by-products, including oxygen and heat.

While this sounds ideal, it presents challenges to developers and their consultants: How to arrive at an optimised solution when the means to meet your objective is evolving? And what is the optimal solution when demand is in a state of rapid, potentially exponential, growth?

These are some of the challenges we're addressing as we design a new production and dispensing facility. Along with our client (and others) we have gone to pragmatic lengths to assess what demand may be in 3-5 years. Nothing's guaranteed of course, so we propose using several smaller plants in a scalable solution. Smaller plant has the added advantage of allowing our client to respond to seasonal fluctuations in demand. And we're taking lessons from the wind energy sector where more efficient nacelles are installed on existing masts: Bases will be designed and arranged to reduce the effort necessary to 'plug and play' larger plant in the future.

Where power is being drawn from the grid, how much is too much network reinforcement? Where power is from client-operated turbines, a bona fide green solution, it's perhaps less critical. Similarly, where quality can be achieved, water from a watercourse is superior to drawing potable water from stretched water company resources, and there's an albeit modest contribution to alleviating flooding.

Another consideration is process safety and overall safety and security of a site that will attract public, media and industry attention. How much fire/ blast wall is too much? Are hostile vehicles a risk? What's the fire (and fire water) strategy? Should occupied buildings be blast resistant? If so, to what extent? Looking for precedents from existing facilities, the answers vary from simply clad palisade fences to dominating concrete monoliths – not ideal for showcasing new technology!

In a perfect world, I'd now say we have answers to each of the questions above and can see what the facility will look like, how it'll operate and how much it'll cost. The reality is we're on a journey. We know what the journey is and we're travelling it with good data, but that data will continue to improve. Recognising that change is integral to the solution and should be embraced, we're moving ahead.

On that journey with us is an entire team including our client, architects, an array of engineers as well as regulators and the planning authority. Collectively, we're convinced of the part hydrogen plays in our net-zero future. Whether it's the panacea or only part of the picture is another conclusion that will only become clearer over time.

Very soon we hope the public and consumers will join us on our journey too.

For further details visit https://www.ikmconsulting.co.uk/

About Paul Robertson

Paul has more than 30 years' experience in civil engineering and construction generally. He has significant experience in leading design teams and developing innovative solutions to emerging issues including some of the earliest SuDS schemes constructed in Scotland as well as internationally acclaimed car-free housing developments.