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EXCLUSIVE | Nikola hydrogen station czar on what went wrong – and how others could get it right

By **Charlie Currie** on Jul 16, 2025

At the heart of every failure are lessons that might just pave the way to success. In the case of now-bankrupt zero-emission truck maker Nikola, its attempt to build a hydrogen-powered trucking market single-handedly exposed the fragility of refuelling – from staggering boil-off losses to the high cost of keeping stations running.

When Nikola set out to develop its hydrogen fuelling network to support its Class 8 Tre FCEV trucks, it was betting on its ability to build a hydrogen supply chain from scratch.

With no third-party developer willing to take the risk on hydrogen refuelling for heavy-duty trucks, Nikola bet on building its own stations from the ground up. And the company's "station czar," David Leese, quickly found himself overseeing a crew of 70 field technicians and commissioning mobile refuellers, built largely in-house.

Initially, Nikola focused on developing gaseous systems, until cryogenic offers from Taylor-Wharton, Plug Power, and Chart arrived, promising higher flow rates fit for Class 8 trucks. "We started deploying Plug and Taylor-Wharton refuellers, and by the end of 2023, we had the first Chart system getting installed," Leese exclusively told H2 View.

The company had three stations on the ground in California under its Hyla brand – Ontario, Santa Fe Springs, and Long Beach – with two more planned to come online in 2025.

As part of the Californian deployments, Nikola built a control room to centralise data from every fuelling event to monitor performance. The team didn't expect perfection, but it wasn't ready for what unfolded.

David Leese © Nikola

While liquid hydrogen can also offer reduced logistics costs and station footprint, boil-off occurs when liquid hydrogen warms above -253°C, where it reverts to gas that builds pressure inside the bulk storage tank and is often vented. While Nikola anticipated around 10% losses during transfills, reality proved far worse.

"When we first turned on our systems, our boil-off losses were 50% to 80%," Leese stated. "Nobody was expecting anything like that."

It stemmed from a combination of regular cool-down cycles, idle periods, pump inefficiencies, and equipment failures. By working with equipment OEMs to optimise timing and programming, many of the losses were reduced to around 25% to 50% due to venting and boil-off.

"After a few months, we were running a loss range of 15% to 35%," Leese said, "and that was just the operating losses. When we refilled the main cryotank, there was still an additional 10% to 15% loss on that."

The cost impact

Boil-off wasn't just a technical hiccup. It was a cash vacuum.

Nikola's delivered liquid hydrogen often cost $12–$15/kg by the time it reached its stations, before any losses. On days where stations dispensed 1,000kg, losing 30% meant 300kg was vented into the air, equating to $4,500 per day, per station.

Hydrogen sourcing, of course, played into the cost challenge. With industrial gas majors dominating liquid hydrogen supply, Nikola was left with little negotiating power on price, timing, or purity.

"It's not a liquid market – it's a handful of industrial gas companies with infrastructure, if one couldn't deliver, you didn't just call another," Leese said.

Gaseous versus cryogenic supply

Stage	Gaseous refuelling	Cryogenic refuelling
Delivery to station	Delivered as compressed gas in tube trailers	Delivered as liquid hydrogen at -253°C in cryogenic tankers
On-site storage	Stored in high-pressure buffer tanks	Stored in insulated cryotanks to minimise boil-off
Conditioning	May require pre-cooling before dispensing	Liquid hydrogen is vaporised and compressed to 350/700 bar
Dispensing to vehicle	Dispensed as gas into vehicle tanks at 350/700 bar	Dispensed as compressed gas
Fill time	Slower for heavy-duty vehicles due to compression throughput	Faster due to high-density liquid input and buffer capacity
Key challenges	Limited volume per delivery	Boil-off losses, heat management, higher capex/O&M costs

This lack of flexibility left Nikola exposed to delivery delays, price fluctuations, and purity inconsistencies – none of which helped in an already fragile system. This was combined with overstaffing and stockpiling spare parts to reduce station downtime.

Initially, Nikola absorbed these costs to promote truck adoption. Fleet customers were charged as low as $5–$7/kg to maintain diesel parity.

"We were willing to lose some money at the start of fuelling in order to promote the sale and adoption of Class 8 trucks," Leese explained. Fleet operators were initially excited by the vehicles, but hesitant due to fuelling uncertainty. "We made them comfortable," he added.

However, it proved financially untenable. By the end, the company was charging up to $25/kg to keep the stations running. Leese said that Nikola estimated fuelling 100 trucks per day at a station, at under $10/kg could have seen a break-even.

“You’ve got to keep the molecule moving,” Leese said, noting that a station needs to serve around 100 trucks daily to be viable. “You’d need 1,000 trucks on the road before you have a station that’s regularly seeing 100 trucks a day,” he said.

The escalating costs contributed to Nikola’s well-documented financial struggles and ultimately played a role in its bankruptcy in February this year.

Lessons learned – and lost

Even as the business unravelled, the engineering team had a roadmap for technical improvement – but no time to test it. For Leese, this is perhaps the greatest frustration.

After Nikola filed for bankruptcy, Lucid Group announced plans to acquire the company’s Arizona-based facilities and assets, but excluded any technology related to its hydrogen truck programme.

“It was disappointing,” he said. “We had some great experience and some tremendous data collected in our system, and it’s uncertain that anything’s going to happen with that.”

Hyla’s Santa Fe Springs station © Nikola

During his time at Nikola, Leese identified three main strategies for tackling liquid hydrogen boil-off, but none made it past the planning stage.

The first is relatively well-known: capture and compress the boil-off gas, then store it for reuse in gaseous vehicle dispensing. But Leese said this approach was “basically now building a second fuelling station next to your existing one, just to eliminate the boil-off,” adding bluntly, “that never really made sense for our mobile assets.”

The second option – and the one Leese appeared the most hopeful about – involved preserving subcooled liquid hydrogen to prevent vaporisation, venting and boil-off losses.

Systems designed by GenH2 Corp. use a technique known as controlled storage, keeping liquid hydrogen cold enough to avoid gasification in the first place, and allowing re-densification if it does occur. “That was my top goal at Hyla,” Leese said. “We just never got the funding to try it.”

The third possibility is a wildcard: a two-phase pump reportedly developed by Air Products that can handle both gas and liquid hydrogen simultaneously without damage.

But despite the promise, Leese acknowledged the technology may never become widely available. “Air Products is a very closed environment. They don’t sell their technology outside the company.”

For Leese, it was especially frustrating to see these innovations out of reach. “We had ideas. We had options. We just never had the time or money to act on them.”

Aside from using novel technologies, Leese said one key element could help mitigate losses: size. Of the three systems Nikola operated, he said one was better than the others.

“The more compact you can make the piping, the less loss you have. Once hydrogen exits the main cryotank and enters the vacuum jacketed piping, if there’s a lot of piping, the higher the losses.”

Additionally, he stressed the need for standardised transfill protocols.

Leese explained, “The big industrial gas companies each have their own proprietary method with their own proprietary hook-up requirements, and they want you to modify your infrastructure so that you can’t use any other gas company to supply.

“That needs to end. They need to get together and agree on one standard, and then that would accommodate all sorts of improvements to the system. That’s going to be how we solve losses at transfill.”

Who picks up the torch?

The challenges faced by Leese and Nikola underscore the well-discussed chicken-and-egg hurdle in hydrogen mobility.

“The infrastructure side is just so much of a challenge,” the former station boss said. “I think there’s a better chance at a start-up on the vehicle side than infrastructure.”

While companies like Hyroad Energy are developing promising alternatives – including a ‘zero-loss’ station in Texas with Bosch Rexroth and GenH2 – Leese stressed that a widespread, sustainable future will depend on government intervention, OEM coordination, and shared standards.

He supported the notion of governments buying hydrogen trucks and renting them out to operators to “jump start” adoption and support fuelling. However, he suggested a similar OEM-led approach to EV charging could work for hydrogen.

In the US, the IONNA coalition made up of eight EV OEMs, is rolling out chargers across the country. “If you got the manufacturers of hydrogen trucks together and funded a company to then go out and build the infrastructure so that they could sell the vehicles, then that could work.”

For all the turmoil experienced during his time with Nikola, Leese still fundamentally believes in the benefits of hydrogen trucking. While he admits electric vehicles are enjoying a lot more press right now, he believes they will hit bottlenecks in grid availability and cost structure, with hydrogen poised to take some market share.

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Nikola’s collapse may be remembered for its controversies, but for those inside the hydrogen trenches, it revealed hard-earned truths the next wave of mobility players can’t afford to ignore.

But if the hard-earned data and lessons go unused, the next wave of developers could repeat an expensive cycle of failure.

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