



# A Canadian hydrogen dynasty believes its moment has finally come. Can it happen here?

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From inside a former auto-parts factory in Owen Sound, a town a couple hundred kilometres northwest of Toronto that's known mainly for its nearby hiking trails, Canada's royal family of hydrogen is trying to rebuild its empire.

For more than a century, off and on, the Stuarts have been pioneers and leaders in making and selling electrolyzers – devices that, powered by electricity, split water into oxygen and hydrogen so that the latter can be used as an energy source to replace fossil fuels.

Along the way, they've risen and fallen with an industry frequently on the brink of a breakthrough never quite achieved.

“When hydrogen is important, the Stuart family is very important,” said Andrew Stuart, the third-generation leader of his family's efforts in the sector. “And when hydrogen is not important, the Stuart family is very not important. We live on the derivative of the wave.”

They left the game in the early 2000s, after the latest hype cycle had fizzled, to focus on a second business that produces heavy water for sectors such as life sciences. But now they're back again with Hydrogen Optimized – a new company that Mr. Stuart is steering as president and chief executive officer, alongside his son, Edward (Ted) Stuart as vice-president.

As father and son recently offered a tour of their site – where there are currently about 60 employees, demonstration technology in place and an assembly line being installed – this time felt different.

At various points, hydrogen has been touted as a novel way of maximizing power grids, a solution to the 1970s oil-embargo crisis or an environmental panacea.

Today, in the early stages of a decades-long energy transition to fight climate change, the latest global push to ramp up hydrogen production has a sense of both urgency and staying power. Unlike in the past, when hydrogen was cast as a magical all-purpose fuel source, this wave of interest is more focused on specific uses in hard-to-decarbonize sectors. Those include certain types of manufacturing (steel, cement, chemicals) and heavy commercial transport.

And the fuel's current proponents are especially interested in hydrogen produced using renewable energy, such as electricity from large wind farms. The Stuarts say their technology, tweaked from past iterations, is especially well suited to this.

The first steps have been promising. Hydrogen Optimized has announced a partnership with ABB Inc., a Swiss technology manufacturing giant, which has taken a minority stake in the company. Andrew Stuart said he's in discussions with about 25 companies globally about projects. He was preparing to set off for the Middle East to build relationships and speak at an industry conference in Dubai.

But whether the Stuarts are able to strike deals and successfully scale up will depend on their ability to navigate an increasingly competitive international market, filled with developers and suppliers making untested promises.

The future of their enterprise will also be a measure of Canada's effort to be a major player in the hydrogen industry. To date, that effort has mostly involved trying to advance wind-powered hydrogen projects in Atlantic Canada. (There are also Western Canadian projects that would involve producing hydrogen with natural gas and carbon-capture technology, a different process that doesn't require electrolyzers.)

To listen to the Stuarts, who have a reputation for being unusually committed to growing in Canada, their company represents a chance to avoid hydrogen becoming another clean-energy sector in which the country misses out on building a domestic supply chain. They are calling for a more aggressive government strategy, and greater funding, to back their type of manufacturing.

"There have been decades where Canada has had over a third of the global market share of electrolyzers," Ted Stuart said. "We're at a critical crossroads right now, where we need to get to the table and have our own technology in these megaprojects, or just be stuck – like in solar and wind – being an importer."

There are other Canadian makers of electrolyzers, notably Hydrogenics – owned by the American multinational Cummins Inc. – and Next Hydrogen, both of which have roots in the Stuarts' technology.

But the Stuarts have a unique standing because of their legacy and how they're leveraging it.

Their family history, featured prominently in Hydrogen Optimized's promotional materials, traces a colourful path. They partnered with hydroelectricity pioneer Adam Beck to use surplus power. They also helped the Allied forces with hydrogen-related intelligence during the Second World War and took on leadership of fledgling international hydrogen organizations.

Along the way, they have accumulated about 50 patents for their electrolyzers. Now, the latest iteration of the devices promises a few key differences from past versions.

One of those is that the Stuarts believe they have figured out how to build very large electrolyzers at low cost by simplifying the technology. Their past models, they say, involved thousands of parts, which have been aggregated to fewer than 100.

They acknowledge that their manufacturing method isn't flexible enough to scale down efficiently for small orders, but they point to the fact that megaprojects dominate current plans internationally.

Another advantage Hydrogen Optimized is touting is responsiveness to the intermittent nature of renewable electricity, which is often contingent on how much sun is shining, or how much wind is blowing. The company says its electrolyzers allow hydrogen production to be scaled up or down immediately.

That's unusual for alkaline electrolyzers, the type Hydrogen Optimized makes. It's more common for proton exchange membrane (PEM) electrolyzers, which are more expensive and better suited to smaller projects. The Stuarts are arguing they have achieved the best of both worlds.

These and other selling points have seemingly withstood scrutiny from prospective partners, who have dispatched experts to Owen Sound to perform technical feasibility assessments.

Those potential partners include ABB, which makes rectifiers – devices that essentially channel electrical currents into electrolyzers – and wants to work alongside Hydrogen Optimized in supplying projects.

“We're comfortable the technology could scale,” ABB Energy Industries president Brandon Spencer said in an interview.

But being able to scale technologically is different than being able to do so commercially. That's especially the case for a relatively small company, even one with the Stuarts' pedigree, playing in the same electrolyzer-making space as global giants such as Cummins and Siemens AG.

This is where the call for government help comes in.

Hydrogen Optimized has received some financial support from Ottawa, including a recently announced \$3.5-million loan for its factory buildout. The Stuarts also stand to

benefit eventually from federal investment tax credits for clean technology, although nobody is banking on those until a slow implementation process finishes.

Their complaint is that while many billions of dollars are being explicitly targeted for hydrogen by governments elsewhere, Canada is taking a comparatively passive approach. It doesn't have a comprehensive strategy to build the sector, similar to what the U.S. Department of Energy is advancing.

What Canada is missing in particular, they say, is commercialization support, such as government contracts or financial backing for initial projects, to demonstrate credibility to the private sector. This type of backing is more commonly provided in the U.S., Europe and elsewhere. (One Canadian federal agency that provides some support along those lines, Sustainable Development Technology Canada, just had its funding powers temporarily frozen because of mismanagement.)

"Canada used to do a lot to develop and de-risk technology," Andrew Stuart said. "Now it's all about incentives for project developers to get foreign direct investment by foreign technology, and get Canadian airspace with the wind blowing."

None of this has stopped them from continuing to speak bullishly about where they're located.

As is common among clean-tech companies, they have cited Ontario's low-emissions electricity supply and skilled work force as draws. And Owen Sound has proven a good fit because they are able to make use of the building that housed the community's old shock-absorber plant, and re-employ some of the plant's workers.

Realistically, if Hydrogen Optimized takes off it will have to expand outside Canada, in part because it might be easier to get contracts in other countries if the company has facilities there.

"But we're trying to build out here first," Andrew Stuart said, "and then use this factory as the mothership."

It feels so close, this dream their family has so long been pursuing. But it could easily slip away.

For now, they're testing how much Canada shares their vision of what seizing the long-awaited hydrogen moment looks like.

<https://www.theglobeandmail.com/business/article-a-canadian-hydrogen-dynasty-believes-its-moment-has-finally-come-can/>

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