REPORTS

BRUCE POWER CENTRE FOR NEXT GENERATION NUCLEAR

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THE HYDROGEN UNITY PROJECT

The hydrogen jobs we'll need

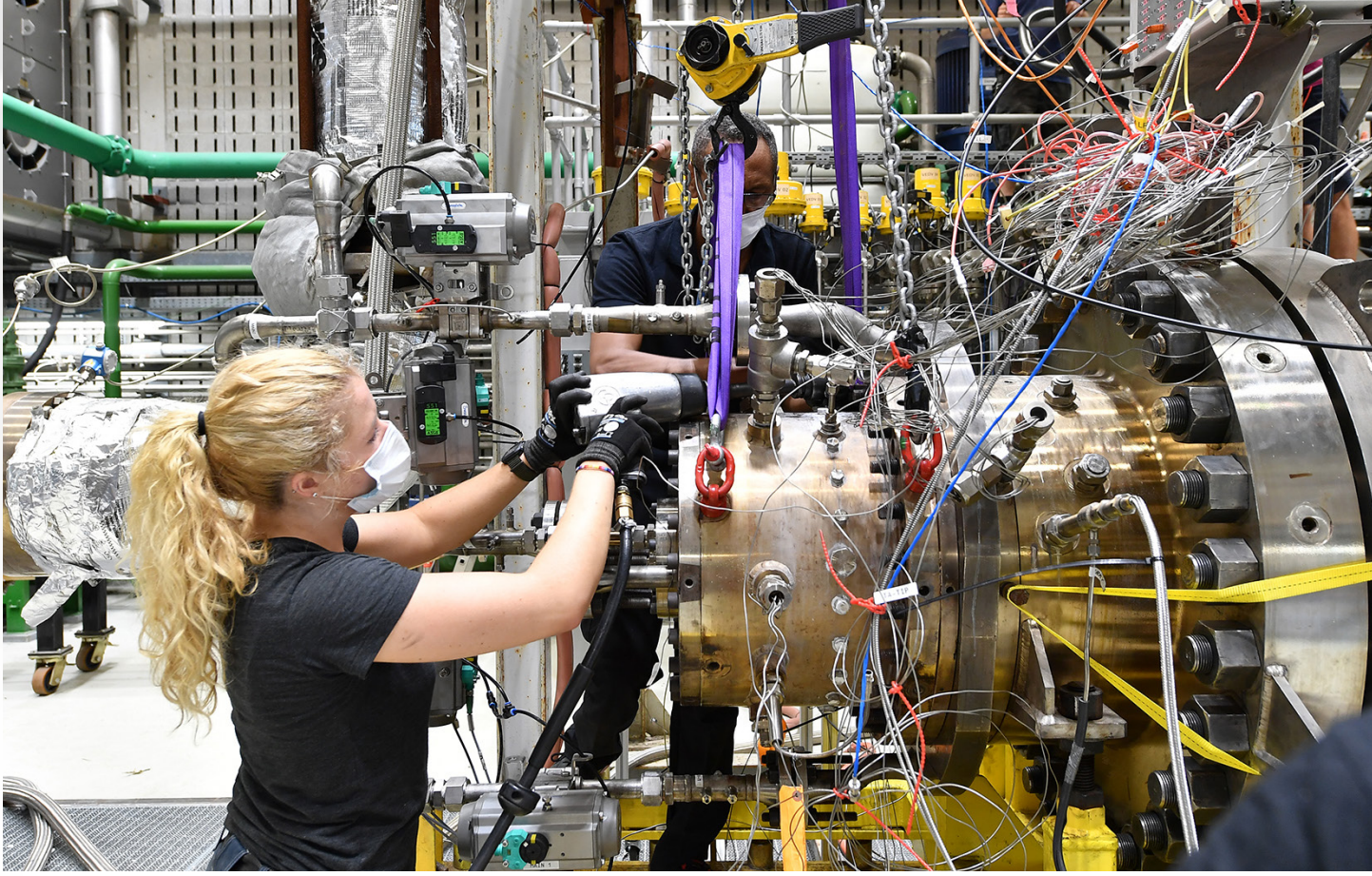
Assessing demand, ensuring supply

SUMMARY

The clean energy provided by Ontario's nuclear power advantage offers the province a path to creating a low-carbon economy that incorporates a significant amount of hydrogen in its energy mix. But to get there, the province must ensure its workforce has the skills and knowledge required for the demands of a hydrogen economy. We urge Ontario to create a hydrogen workforce council that can consult widely to identify the skills that will be needed—and the gaps that need to be filled—to attract the investment required to incubate a hydrogen economy.

TAKEAWAYS

- **Assess demand:** A shortage of skilled workers could hold back critical investment.
- **Ensure supply:** Identify any skills gaps and create programs to train and certify workers.
- **Start now:** Create a hydrogen workforce council to consult broadly on Ontario's talent strengths and needs.



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Capturing Ontario's hydrogen advantage.

Hydrogen holds remarkable promise for reducing the carbon intensity of our economy and society. Used as a substitute for carbon-based fuels, hydrogen can dramatically reduce greenhouse gas (GHG) emissions in an array of important sectors, including those in the "toughest third" of GHG emissions—heavy transportation (notably trucking), heavy industry (cement, steel and glass) and agriculture. Ottawa's recently released National Hydrogen Strategy is a welcome long-term policy commitment, as are initiatives such as Ontario's Low-Carbon Hydrogen Discussion Paper. Policy certainty is a vital catalyst for unlocking the private sector investment needed to realize hydrogen's potential.

Ontario has inherent advantages in developing a hydrogen economy. The province's energy sector is the second largest in Canada, contributing more than $15 billion to the nation's GDP in 2019. The industry has strong supply chains, technical expertise, and a skilled workforce that are primed to enable a hydrogen economy. And Ontario's nuclear sector, which provides about 60 percent of the province's electricity, is a reliable source of the clean electricity that can produce low-carbon hydrogen.

Much work, undoubtedly, remains to be done to fulfill hydrogen's promise. Transitioning major economic sectors to hydrogen requires overcoming infrastructure challenges, notably the storage and distribution of the fuel. Bulk production raises a host of cost questions. And any effort to incorporate hydrogen into the Ontario economy requires the province to have a workforce that is significantly large, skilled and knowledgeable.

> *'We have the abundant clean electricity a hydrogen economy requires.'*

To prepare for a hydrogen economy, Ontario needs a comprehensive understanding of the labour supply and demand challenges that will arise as it gets deeper into the hydrogen game. It must ask: How do we identify labour needs for a hydrogen sector? How do we measure those

against the current availability of skilled workers? And, if we find a gap, how do we propose to overcome it?

The inherent nuclear strengths of the Bruce-Grey-Huron region make it an important leader on issues—such as workforce readiness—facing the nascent hydrogen sector. Reactors at the Bruce nuclear site produce about 30 percent of Ontario's electricity, all of it emissions-free. The refurbishment of the Bruce Power reactors—Canada's biggest infrastructure project and the largest clean energy project in North America—has created a critical mass of local industry, innovation, and talent. And Bruce Power has itself been using large quantities of hydrogen to cool generator rotors since 2001, creating a base of local experience with hydrogen use and safety.

Meanwhile, more than 60 companies have an established presence in the region, bringing global-leading expertise ranging from energy to construction, engineering and design to Bruce, Grey and Huron counties. Many of these companies are actively engaged in developing expertise in hydrogen and can match that knowledge to the experience of working collaboratively on energy sector infrastructure projects. An alliance of businesses, politicians and Indigenous leaders in and around the region are eager to be a home to investment and innovation in hydrogen. Together, these conditions make the region fit for a leading role in the emerging hydrogen economy.

> *'Do we have the right skills and knowledge to build a competitive hydrogen sector?'*

But this experience with ambitious energy projects tells us that a knowledge-based economy is only as good as the quality of its talent. Talent is crucial to attracting investment, to providing the ingenuity and capabilities needed in a shift to new energy source or technologies. A domestic hydrogen sector won't grow without enough skilled people to meet the challenge. And the work to making sure Ontario is fit to play starts now.

PHOTO CREDIT: SHUTTERSTOCK

The need to prepare a hydrogen workforce.

50 BILLION DOLLAR INDUSTRY

The federal government's National Hydrogen Strategy projects that hydrogen will be a $50 billion domestic industry by 2050, generating more than 350,000 high-value jobs. Those jobs will require all manner of skills and training—from hydrogen-oriented engineers and scientists, to skilled tradespeople and new safety designations for the transport, storage, and use of hydrogen.

Ontario currently faces hard questions about its ability to match that demand. For example, the province already faces a critical shortage of skilled trades workers. A 2020 report by BuildForce Canada found that Ontario's construction and maintenance sectors will require an additional 100,000 workers by 2029 in order to continue work at full capacity. Without this labour force, work on critical projects will fall behind—including the construction of new hydrogen infrastructure.

The nuclear sector has experience with the challenges that can arise from labour shortages. In 2018, an audit report from Ontario Power Generation (OPG) highlighted that an overlap between ongoing refurbishment work at OPG's Darlington plant and the pending refurbishment at Bruce Power could soon result in a critical shortage of skilled tradespeople in the province.

But these innovative solutions took significant time and effort, and workforce challenges still have not been completely eliminated. Ontario needs proactive planning to avoid a similar problem arising in the emerging hydrogen economy.

PHOTO CREDIT: SHUTTERSTOCK

Table 1 - *A sample of new occupations in a hydrogen economy, identified in a 2018 study from Cavendish Energy*

Hydrogen-related occupation	Average salary (2021 CAD)	Minimum educational requirements
Fuel cell retrofit installer	$57,400	*Apprenticeship / Trade school*
Fueling station manager	$77,700	*Bachelor's*
Pipeline construction worker	$63,900	*Apprenticeship / Trade school*
R&D director	$178,000	*Doctoral*
Sales consultant	$74,200	*Bachelor's*
System operations engineer	$94,000	*High school / GED*
Systems safety investigator	$121,900	*Bachelor's*

The talent question: matching supply with demand.

Our team reviewed hydrogen strategies from jurisdictions around the world where governments have begun to strategically assess workforce needs in a hydrogen economy, including places like the United States, Europe and China. From these strategies, we identified best practices Ontario could follow to craft our own, made-in-Ontario hydrogen talent strategy. The approach relies on two critical steps—first, identifying demand for workers, and second, planning for supply.

1. Solicit early input from business leaders and industry experts to determine the demand

For any talent strategy, early consultation is key. The most robust strategies we studied were developed through early, meaningful consultation with business leaders and industry experts.

For example, the Portuguese government launched a process in 2020 that brought together government, industry, and educators in a comprehensive 45-day consultation process as part of developing a national plan. Similarly, Germany formed a national hydrogen council in 2020 that consisted of 25 representatives from industry, science, academic institutions, and civil society to provide guidance during the development and implementation phases of their hydrogen strategy. By bringing the full set of stakeholders into the process, these countries ensured their strategies captured a realistic view of the jobs and skillsets required in a hydrogen economy.

Ontario should consider following this best practice and convene a provincial hydrogen workforce council. This advisory group would bring together insights from industry, academia and government to identify the jobs and skills required in a growing hydrogen ecosystem.

We already know that the jobs produced in a hydrogen economy will vary widely in the knowledge and skills they require. A 2018 study from Cavendish Energy in the U.S. identified 42 emerging occupations and certifications that will be required in a hydrogen economy (a list from the study is included in Table 1). Production of hydrogen will require new technician roles; distribution will demand bespoke safety certification; hydrogen cells will require professionals to build, operate, and maintain them; and much more.

Some of these jobs will be similar across different industries. But others will be sector-specific, requiring skills unique to particular applications. Widespread use of hydrogen as a transportation fuel, for example, will require different skills and professionals than the use of hydrogen

in heavy industry for producing steel or cement. In order to evaluate workforce readiness, the hydrogen workforce council will therefore need to consider a range of scenarios for hydrogen adoption and evaluate the demands on the workforce resulting from each one.

2. Develop a plan to educate and certify skilled workers across the hydrogen value chain

A hydrogen workforce council can identify where the greatest demand for new skills is likely to emerge. This will enable the province to confront the second, crucial part of the equation: ensuring an adequate supply of accredited, skilled workers.

While some experience working with hydrogen already exists in the province, hydrogen deployment at a larger scale is going to require a new set of standards, trainings, and designations for workers. Some hydrogen professionals will need graduate-level education, including engineers, chemists, and an expanded understanding of skills like data analysis and robotics. Still other professionals will require more hands-on training such as with safety and maintenance.

To meet these divergent needs, Ontario will require a strategy that leverages a diverse suite of educational tools. Certain designations will present prime opportunities to introduce micro-credentialling and remote learning. Others may be best met through changes to the skilled worker visa, while still others may demand the creation of new programs on college and university campuses. Designing new designations will require the participation of stakeholders from all levels of education, industry, and worker representatives. Wherever possible, new training should build upon the significant sector expertise and skilled workforce that already exists in the province.

This effort will pay dividends. As evidenced in the Cavendish study, while jobs in the hydrogen economy are expected to vary widely in their requirements for education level, training and accreditation, they all share one important feature: they are high-skilled, high-paying careers.

And on top of providing good jobs, a hydrogen workforce will be a key enabler for attracting new investment to Ontario. Jumpstarting a hydrogen economy will require significant private sector investment, and businesses will prioritize jurisdictions that can offer the right base of skills and talent. Ontario needs a sophisticated understanding of the different skills required across sectors and a strategy for meeting that demand. This work must start now.

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Looking ahead.

Hydrogen is a promising addition to the solutions-mix required to decarbonize the global economy. It also offers opportunities for economic growth and job creation here in Ontario, provided we act early to create the conditions and confidence that can attract investment in hydrogen production and use.

From our vantage point in the Bruce-Grey-Huron region, we can see the enormous potential for hydrogen to help Ontario—and the world—achieve its goals of a net-zero emissions economy. Our nuclear assets are part of the hydrogen solution. Our supply chain and skilled workers can apply their expertise and technologies to developing new energy sources.

We've seen what happens when great companies and talented workers come together in a common mission to tackle big challenges. But we cannot fly blind. We need to begin the work now to understand the extent of our strength and the tools of the future, ensuring that the next generation of Ontarians is set up to prosper from the opportunities that lie ahead.

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NUCLEAR INNOVATION INSTITUTE

The **Nuclear Innovation Institute (NII)** is an independent, not-for-profit organization that provides a platform for accelerating the pace of innovation in the nuclear industry.

Nuclear energy is a powerful force for decarbonization. It creates good jobs, drives economic growth and produces radioisotopes that are used—among other benefits—for cancer detection and therapies that save lives in Canada and around the world. The Institute is founded on the belief that the industry can enhance these vital contributions by adopting a structured approach to fostering innovation.

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BRUCE POWER CENTRE FOR NEXT GENERATION NUCLEAR

Based within the Nuclear Innovation Institute, the **Bruce Power Centre for Next Generation Nuclear** nurtures a deeper understanding of the role of nuclear power in developing new energy technologies that can help forge Canada's path to a net-zero economy.

Initially operating as a research/think tank, the Centre examines the market and technology challenges facing energy sources such as hydrogen, new nuclear technologies such as small modular reactors and fusion energy. The Centre will also explore opportunities for Bruce Power assets to be optimized and leveraged to maximize the impact they will have on Canada's clean energy future.