## Special

# Proponents say nuclear energy is an affordable, stable and safe option for Canada – and the planet

hen it comes to clean, safe and convenient renewable energy, nuclear power has an important advantage over other options: it's also affordable.

That's the message that Heather Kleb, acting president and CEO of the Canadian Nuclear Association (CNA), wants people to hear.

It's a position that confronts critics who have long assailed nuclear energy as expensive and risky.

"Our members have already built one of the cleanest, lowestemitting, most reliable and affordable energy sources available to Canadians," she says. "Generally speaking, nuclear is cheap, on the same order as large hydro or coal, and well below solar or wind."

That raises what Ms. Kleb sees as one of nuclear's less obvious benefits: long-term price stability.

ity. "The fuel is a small part of the cost of nuclear power, so once

### **ABOUT THE CNA**

The Canadian Nuclear Association (CNA) represents almost 100 organizations in the Canadian nuclear industry. Its aim is to build a better world by applying nuclear science to a broad range of uses, all for peaceful purposes. CNA member companies employ over 60,000 Canadians supporting nuclear medicine and materials science, exploring for and mining uranium, gen-erating power and advancing Canada's nuclear advantage worldwide. The CNA participates in National Science and Technology Week, which raises awareness about the importance of science and technology in today's world and celebrates Canada's historic and ongoing role as a leader in innovation.

the nuclear plant is built, you have a good idea of your unit power cost for the next five or six decades. This is a big deal if you're deciding where to locate a business. Natural gas is just the opposite; fuel is a large portion of the cost, and it can double or triple in a few years. Building gas-fuelled plants essentially locks a region into commodity price risk, which is not going to help attract long-term business investment," she says.

In response to critics who argue that the environmental risk posed by nuclear outweighs its affordability, Ms. Kleb questions what environmental risk they are referring to, and whether they have compared that to the risks posed by other fuels.

"Go down the list of possible environmental impacts. Land use? Nuclear has a tiny footprint. Airborne emissions? Pretty much zero. Radiation? Going out in the sun swamps the risk from anything our licensed facilities pose. Water use? Yes, a bit for cooling, depending on the design, but really not much. Solid waste? Yes, it exists, but again, the volume is very small and the technical methods are received "she save

problems are resolved," she says. It is equally inaccurate to suggest that the capital cost of building new nuclear power stations and maintaining existing ones would be better applied to the development of other "clean" energy sources such as wind or solar, adds Ms. Kleb.

"Capital cost is not what matters; in fact, it's a red herring. It's the long-term unit cost of energy that matters, and that's where nuclear wins, because that capital cost is spread over several decades. And even if wind and solar get down to nuclear's level of affordability, which is a long way off, what are we supposed to

### **ONLINE?**

For more information, visit cna.ca.

do on windless winter nights?" she asks.

Douglas Boreham, the Bruce Power Research Chair in Radiation and Health at the Northern Ontario School of Medicine, says nuclear is the cheapest source of non-hydro, low-carbon electricity in Canada.

"Electricity from nuclear power provides a stable and reliable source of baseload power for Canadian consumers and industry. Nuclear is a technology that has high capital costs up front, but low operating costs over the long term," says Dr. Boreham.

He acknowledges that all forms of energy production pose potential environmental risk, but nuclear is clean and safe compared with burning fossil fuels, and should be an integral part of the clean-energy portfolio.

"Electricity currently generated by nuclear power facilities globally saves the potential emission of about 2.4 billion tonnes of greenhouse gases per



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**Heather Kleb** is acting president and CEO of the Canadian Nuclear Association year that would result from the same amount of electricity generated by fossil-based sources," explains Dr. Boreham.

It's a "common misconception" that nuclear power costs more than other forms of clean renewable energy such as wind and solar, he says. "All things considered, nuclear has the best safety record and the lowest environmental impact of any large-scale electricity source."

That's important, notes Dr. Boreham, because the "de-carbonization" of the energy supply, while maintaining economic growth, is a formidable and urgent challenge.

"Nuclear power has been, and remains, the solution to our current predicament of excessive air pollution, growing carbon emissions and climate change," he adds. "It's encouraging to see some countries embracing nuclear power, but future energy demands will need a large-scale global effort to ensure the health of the planet."



The turbine hall at the Bruce A nuclear power facility in Tiverton, Ontario. Bruce Power operates one of the world's largest nuclear sites and is the source of approximately 25 per cent of Ontario's electricity. PHOTO: SUPPLIED

CAREERS



By the numbers

## **\$6.6** billion

Economic activity generated annually by the Canadian nuclear industry Job opportunities strong in booming sector

anada's nuclear sector offers a strategy for energy, jobs and innovation, ays John Stewart, the Canadian

says John Stewart, the Canadian Nuclear Association's director of policy and research.

"Nuclear was researched here

Oshawa, notes that career prospects in the sector go well beyond Canada's borders.

"Many countries are looking to start nuclear power programs and offering new and exciting opportunities for people with the right skills and training. The sector offers unlimited opportunity for those who are willing to work diligently and try new things,' says Mr. Froats. "Most in the industry will speak of never being bored - and I've certainly found that to be true in my 38 years in the nuclear sector.' He believes that over the next two decades, there will be demand in Canada for nuclearsector workers to replace those who retire. Globally, nuclear is increasingly seen as part of the solution to reduce greenhouse gas emissions. "In Canada, we know that there is a need to replace the nuclear workforce that pioneered growth in the 1970s and 1980s, while overseas, many countries are in need of expanding their electricity capacity, to help their economies develop and meet the needs of growing popula-tions," says Mr. Froats. "At least 50 countries have said they plan to develop nuclear energy programs, so they will need skilled workers. Certainly, over the next 10 to 20 years, it's hard to imagine how we will satisfy humankind's appetite for energy without a strong and increased base of nuclear energy."

## **MAKE POPCORN?**



Right now nuclear power generates 15% of all electricity in Canada. And nearly 60% in Ontario alone. It powers our microwave ovens, homes, hospitals, and businesses. Nuclear power is a low-carbon energy source that has been providing Canadians with safe, affordable, and reliable electricity for 50 years.

It's power we create right here, right now, with our own resources.

## THE POWER TO POP A BAG OF POPCORN. AND TO POWER OUR ENERGY FUTURE.



To learn more go to www.cna.ca

**60,000** Jobs provided by the nuclear industry

**19** Nuclear power producing facilities in Canada

**34** CANDU nuclear reactors worldwide

Source: Canadian Nuclear Association in Canada at a very early stage in its evolution. It's a Canadiangrown energy technology that has very high knowledge content and very high wages. It also underlies a lot of our successes in nonenergy technologies, like medicine and advanced materials. As a result, nuclear is an integral part of our manufacturing and innovative capacity," says Mr. Stewart.

Career opportunities in nuclear are diverse, he adds, and include research scientists, engineers of many kinds, plant operators, electricians, pipefitters, heavy equipment operators, health and safety experts and laboratory technicians.

"The nuclear sector offers job quality and duration. Earnings in our direct jobs average about \$100,000 a year, and companies make big investments in their people. In addition, our industry is the largest industrial employer of Aboriginal people in Canada, so the payoff for those communities is tremendous, bringing durable prosperity," says Mr. Stewart.

John Froats, P.Eng., an associate professor and nuclear engineer in residence at the University of Ontario Institute of Technology in



The University of Ontario Institute of Technology's nuclear engineering program features the most extensive nuclear power plant computer simulation of any engineering program in Ontario. PHOTO: SUPPLIED

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#### **OPINION**

### NUCLEAR

# Enhanced CANDU 6 reactors – proven technology for a better environment and economic prosperity



President, Power Workers' Union

anadians expect our leadership to create economic growth while responding to a global recession and taking action on climate change. One of the cornerstones of our national economic policy, making Canada an energy superpower, is largely based on the rapid development of fossil fuel resources. While this creates jobs and economic growth, it also makes better management of greenhouse gas (GHG) emissions imperative.

One proven Canadian energy advantage – Enhanced CANDU 6 (EC6) nuclear reactors – needs immediate attention. This technology can help achieve significant GHG emission reductions; generate abundant, reliable and affordable electricity; improve our energy security; support the transition to emission-free electric vehicles; and produce economic wealth.

Canada's \$6 billion plus a year nuclear industry supports 160 supply chain companies and 60,000 high-value jobs. A 2012 Canadian Manufacturers and Exporters study indicates that new investments could drive an estimated 40 per cent growth in Canada's nuclear industry employment over the next five years.

Environment Canada data indicates that by 2020, GHG emissions from the oil sands will exceed those from all transportation and electricity generation in Canada and the total emissions of every province except Alberta and Ontario. Both oil sands extraction technologies, mining and "in situ" development will contribute; however, in situ production is more GHG intensive and will overtake mining by 2017.

This will continue to put pressure on Canada's global environmental brand. However, as noted in a September 2011 National  well as materials innovation and development while benefiting our universities and research agencies.
By continuing to support this

unique reactor design with its inherent competitive advantages, our provincial and federal leadership can better position Canada in the estimated trillion-dollar global nuclear market. It would offer additional promising economic and environmental opportunities here at home by powering tomorrow's zero-emission vehicles and backstopping climate-change-vulnerable hydroelectric generation.

Realizing these opportunities requires leadership that takes decisive action.

Specifically, Ontario must select Enhanced CANDU 6 technology for its new reactors, and the federal government must provide the support required to secure project financing. This collaborative support is essential to secure CANDU reactor sales in other provinces and countries.

There is too much at stake for all Canadians for our leadership to ignore the potential of our CANDU technology.

# WALK AWAY FROM WALK AWAY FROM SOMETHING THAT DELIVERS AFFORDABLE ELECTRICITY, LOWER GHG EMISSIONS AND THOUSANDS OF JOBS?

For over 50 years, CANDU reactors have safely, provided affordable, low-carbon electricity 24/7.

Round Table on the Environment and Economy (NRTEE) report, there is also a substantial financial cost for all Canadians. Unless our GHG emissions are reduced, the economic impacts of climate change on Canada could be billions of dollars per year.

Globally, nuclear generation avoids about two billion to three billion tonnes of carbon dioxide emissions per year. In Canada, CANDU reactors have avoided 2.4 billion tonnes of GHG emissions since 1972. On an annual basis, Canada's CANDU fleet avoids about 90 million tonnes of GHG emissions, the equivalent of about 18 million cars, or about 12 per cent of Canada's total emissions.

With continued investments in CANDU reactors, these GHG emission reductions can be sustained while generating significant economic wealth for Canada. This can be accomplished by continuing support for uranium mining operations and ongoing reactor refurbishments; constructing two new reactors at the Darlington Generating Station in Ontario; building new reactors in Western Canada to help with in situ oil sands production; and revitalizing international reactor sales initiatives.

Canada's \$6 billion plus a year nuclear industry supports 160 supply chain companies and 60,000 high-value jobs. A 2012 Canadian Manufacturers and Exporters study indicates that new investments could drive an estimated 40 per cent growth in Canada's nuclear industry employment over the next five years. Building a pair of Enhanced CANDU 6 reactors outside of Canada supports over 2,200 person-years of direct, highwage work and over \$2.5 billion in economic activity here in Canada.

CANDU reactors have safely provided affordable, low-carbon electricity for over 50 years to Canadian homes and businesses. CANDU reactors, 29 of which have been constructed in seven countries, are one of Canada's few hightechnology exports. This technology has also helped make Canada a leader in nuclear medicine as This has helped Canada avoid about 90 million tonnes of GHG emissions annually, the equivalent of about 18 million cars, or about 12% of Canada's total emissions.

And created a \$6 billion plus a year nuclear industry, 60,000 high value jobs and world leading research at our universities.

Refurbishing Ontario's existing nuclear fleet and building two new Enhanced CANDU 6 [EC6] reactors could drive an estimated 40% growth in Canadian nuclear industry employment over the next 5 years.

Exporting a pair of EC6 reactors supports over 2200 person-years of direct, high-wage work and over \$2.5 billion in economic activity here in Canada.

Using Canadian EC6 reactors to help extract oil, backstop climate changevulnerable hydroelectric power and to fuel new zero-emission vehicles can deliver even more benefits.

With so much at stake for all Canadians, we need our federal and provincial leaders to make these investments now.

For more information please go to www.abetterenergyplan.ca

# FROM THE PEOPLE WHO HELP KEEP THE LIGHTS ON

