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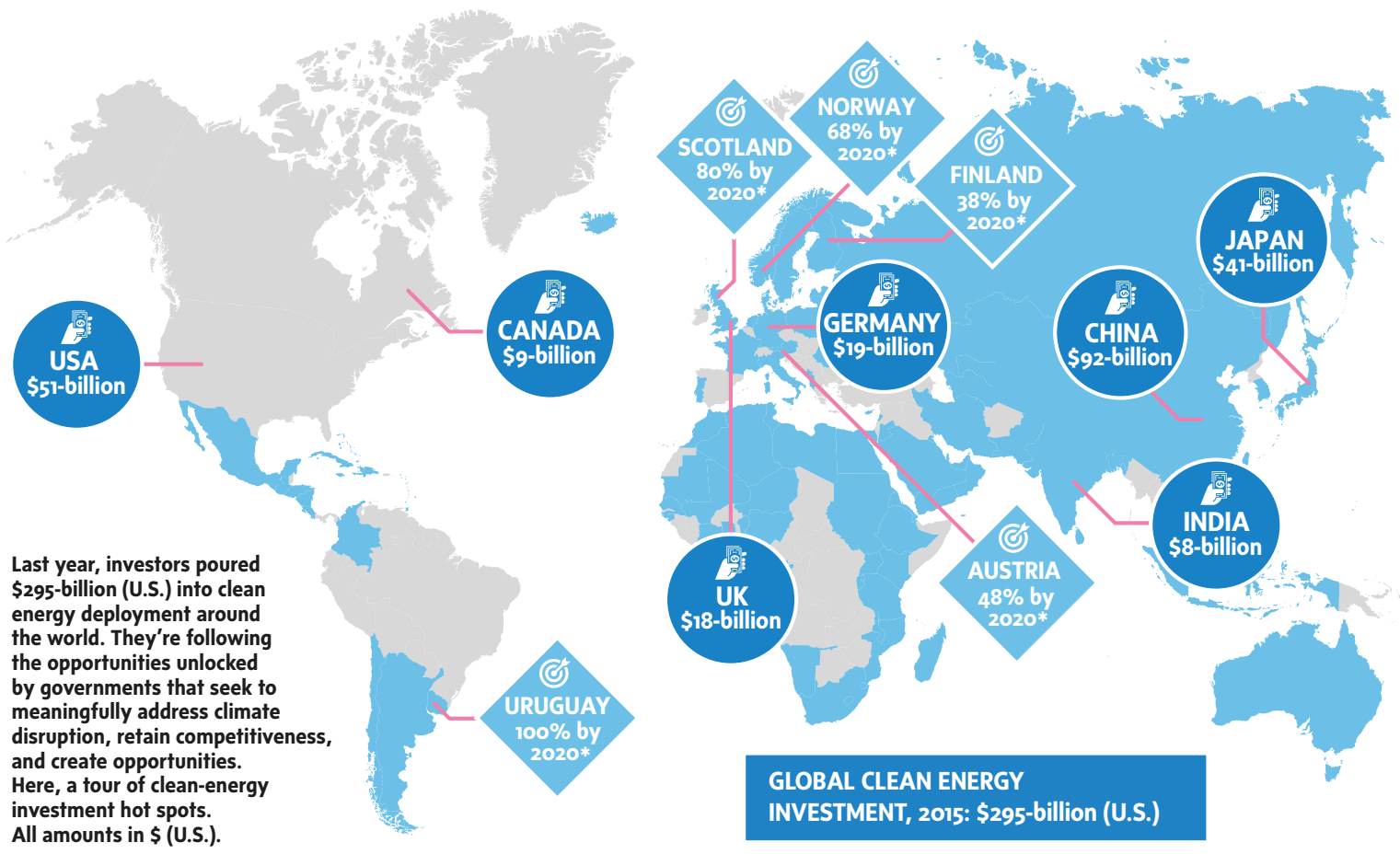
CLIMATE CHANGE



Last year, investors poured $295-billion (U.S.) into clean energy deployment around the world. They're following the opportunities unlocked by governments that seek to meaningfully address climate disruption, retain competitiveness, and create opportunities. Here, a tour of clean-energy investment hot spots. All amounts in $ (U.S.).

Countries with national clean and renewable energy targets.

SOURCE: BLOOMBERG NEW ENERGY FINANCE

*Top 2020 policy targets. Targets represent the percentage of primary or final energy to be sourced from clean and renewable sources by 2020.

Time for strong global plan and climate action commitments

Summits that bring world leaders to the table to discuss climate change are generally regarded with a fair bit of pessimism, but the 2015 United Nations Climate Change conference in Paris will be different, believes Toby A.A. Heaps, CEO of Corporate Knights. He's seen growing momentum in environmental sustainability efforts – an indication that the time is right for announcing an ambitious plan.

"The two biggest economies in the world – China and the United States – have already made hard commitments to cap emissions over the next 15 years," he says. The two states' joint announcement set targets for the U.S. to slash its carbon emissions below 2005 levels, while China will halt growth of greenhouse gas pollution and double the proportion of renewable and nuclear electricity on its grids.

> "There is a certain moral charge that comes from the appreciation and awareness that we are brushing up against some potentially serious climate limits."
>
> **Toby A.A. Heaps**
> is CEO of Corporate Knights

The result will be a dramatic change in the energy landscape, says Mr. Heaps, who adds that more and more companies – and countries – are moving away from viewing this new reality as a threat. "It's now widely regarded as an opportunity," he says. "The train has left the station on the low carbon energy production economy – it's really a matter of getting on or being left behind."

Merran Smith, director of Clean Energy Canada, says when "superpowers go from finger-pointing to handshaking, it's a sign that the energy transition is gaining real momentum.

"Countries like the U.S. and China used to be obstacles – now they are ready to step up to the plate," she says. Ms. Smith believes this willingness is shared by the Canadian delegation. "Our new government is sending people to [Paris] who are good diplomats and want to be part of finding a path forward."

Part of the incentive for the shift comes from facing hard realities, she adds. "People across the globe are already living with the impacts of climate change – this is motivating countries to take action."

Mr. Heaps believes the realization that the planet's resources are finite is another consideration. "We are approaching nine billion people," he explains. "With our global population growing in number as well as consumption habits, the changing ratio of people over resources is a driving force for increasing resource productivity."

For achieving the same or a higher standard of living, Mr. Heaps believes that the use of resources, including energy, has to be more progressive. Reflecting this approach is a trend in investments, he says. "Globally, investors poured twice as much money into new renewable-electricity projects than into new fossil fuel projects last year."

Around the world, utilities added 123 gigawatts of renewable electricity to their grids in 2014, increasing the world's renewable energy capacity by eight per cent.

The numbers send a clear message. "The momentum behind clean energy is big. With $295-billion (U.S.) invested globally last year, this is a big industry," says Ms. Smith. "By providing clean electricity for powering industry and households – including meeting transportation needs – we'll be able to get off fossil fuels and reduce our carbon footprint."

Clean energy is not only a good climate change solution, says Ms. Smith, it's also "good business" and creates jobs. Canada has a wealth of opportunities, with renewable energy potential from coast to coast to coast, she adds. "Wind, solar, run-of-river, hydro, biomass, tidal, we have it all – we could be a leader."

To take on a leadership role, Canada needs to better support the players in the clean energy economy, such as renewable energy, energy efficiency and clean technology, suggests Ms. Smith. "We already have a renewable electricity advantage, our grid is relatively clean – we only need to scale it up. For Canada, it's not a matter if, but a matter when – and those first into the game are going to be the winners."

It's high time to step up the game, agrees Mr. Heaps. "There is a certain moral charge that comes from the appreciation and awareness that we are brushing up against some potentially serious climate limits," he says. "Getting a handle on our greenhouse gas emissions is important and we are starting to move, even if it isn't fast enough."

"Not everything is going to be solved in Paris," adds Ms. Smith. "But there is momentum going into the talks and I believe it's going to inspire strong global action as well as climate action commitments."

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PANEL

Experts share their views on key strategies for moving the needle on Canada's climate change performance

JOSHA MACNAB
B.C. Director for the Pembina Institute

The key thing that Canada needs to get right in order to move the needle on climate-change performance is a new approach to governance. For too long, at all levels of government, "environment" has been hived off as a special initiative or pitted against other objectives, particularly those of an economic nature.

Canada will only succeed at addressing climate change if it recognizes that healthcare can no longer be separated from climate change when asthma is on the rise due to coal pollution from electricity generation, that immigration can no longer be separated from climate as refugees claiming asylum on our shores will be fleeing inhospitable (or completely disappeared) environments, and that trade can no longer be separated from climate as Canada loses ground in the global clean-tech market.

We are already seeing progress on a new governance approach with the announcement of cabinet mandate letters last week. We need to see these initial commitments lead to real change in a new "all hands on deck" approach to climate change.

BOB OLIVER
CEO, Pollution Probe

When it comes to climate change, Canadians too often focus inwardly, judging our performance by how much we reduce greenhouse gas emissions domestically. But it's at least as important, if not more so, for Canada to provide solutions that help reduce emissions globally. Looking outward, we should embrace international efforts to reverse global warming as an export opportunity. Canada is already a global leader in certain technologies that could play a key role in decarbonizing some of the world's largest, most polluting economies. Hydrogen fuel cells, nuclear reactors and high-strength/light-weight materials are just a few examples of Canadian technology and expertise that are in demand worldwide.

Innovative industry policy can expand these export advantages, while cultivating competitive positions in new products and services necessary for a decarbonizing world (such as carbon capture-and-sequestration systems). Ultimately, Canada's trade balance and job growth can improve as a result of an accelerating global transition to a low-carbon economy because our country is a leading supplier of clean-technology solutions that are applicable and scalable in the world's biggest markets.

EDDY ISAACS
CEO, Alberta Innovates - Energy and Environment Solutions

The increase in greenhouse gas (GHG) emissions in Canada since 2000 has been dominated by oil sands development. As a major exporter of energy products and in a world moving toward a decarbonized economy, Canada needs to make certain our energy products are GHG competitive with emissions trending toward the lowest in the world. Strong leadership and new investments in next-generation technologies and accelerated innovative approaches are required if we aspire to be international leaders.

In the short term, energy-efficiency improvements such as innovative high temperature water treatment, efficient boiler designs and lower energy recovery technologies can lead to GHG emission reductions of at least 20 per cent by 2020. In the mid to longer term, there needs to be an accelerated focus on electrical generation from renewable and low carbon-emitting sources and their use in oil sands processes. Integrating low cost carbon-dioxide capture technologies as well as small modular nuclear reactors into operations will also enable Canada's oil sands producers to provide products that meet global demand for low carbon-emitting transportation fuels.

IAN BRUCE
Science and policy Director, David Suzuki Foundation

For Canada to take its place as a climate leader, the federal government must build on and coordinate the amazing action we've already seen from municipalities and provinces and direct a unified approach to ambitious emissions reductions.

The work that has been done across the country – including B.C.'s carbon tax; the developing cap-and-trade market between Quebec, Ontario and California; and the City of Vancouver's commitment to 100 per cent renewable energy by 2050 – has been outstanding, but the piece that has been missing is federal leadership to set minimum standards across the country.

Co-ordinated action leads to greater emissions reductions and levels the playing field so provinces don't have to worry about competing with each other economically. We are strongest when we move forward as a country. It's fair and it allows us to be proud of the work our government is doing.

The shift to a cleaner economy is already happening – now we need to seize this opportunity to speed things up.

ANDREW WEAVER
Lansdowne Professor, University of Victoria

From the point of view of a traditional cost-benefit analysis, it is in the best interest of every person in every household in every municipality in every city in every province in every country in the world to do absolutely nothing about global warming since the costs of action are borne by the individual and the costs of inaction are distributed amongst more than seven billion people in the next generation.

Whether or not we deal with global warming fundamentally boils down to the question as to whether or not the present generation owes anything to future generations in terms of the quality of the environment that they inherit. I happen to think that we do, and so the single most important policy that can and must be implemented is aggressive greenhouse gas emissions pricing.

This forces internalization of the externalities associated with using the atmosphere as an unregulated dumping ground for greenhouse gases. It forces us to pay the true costs of our behaviour on present and future generations. And it says to the children of today, whose voices are not at the decision-making table, that we value the importance of intergenerational equity.

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OPINION

Pickering Nuclear Generating Station can continue to deliver economic and environmental value

By Don MacKinnon,
President, Power Workers' Union

Greenhouse gas (GHG) emissions from Ontario's electricity sector are expected to more than double from 2014 levels, and could negate the reductions already achieved by closing the province's coal stations. Ontario's growing dependence upon carbon-emitting natural-gas-fired generation in the next decade is particularly concerning as more and more of this fuel comes from environmentally questionable shale gas. Carbon pricing, likely in the form of a cap-and-trade program with Quebec and California, will bring new cost pressures for residential, commercial and industrial electricity consumers if Ontario's carbon emissions rise.

In the coming months, as the province's 2013 Long-Term Energy Plan is being updated, Ontario's decision-makers will need to address these and some other critical challenges. Besides meeting the province's GHG targets and ensuring system reliability, Ontarians will expect to see rising electricity prices kept in check and a healthy and expanding economy that sustains existing jobs and creates new ones.

Ontario's Independent Electricity System Operator (IESO) has identified a 2,000 to 3,000 megawatt shortfall in reliability reserve capacity resulting from the scheduled closure of the 3,100-megawatt Pickering Nuclear Generating Station in 2020 that will persist beyond 2032. As part of an interconnected power system, Ontario must fill this shortfall to comply with the reliability requirements of the North American Electric Reliability Corporation and the Northeast Power Coordinating Council Inc.

A recent analysis by Strategic Policy Economics (Strapolec) demonstrates that extending the operation of the Pickering Nuclear Station for four years is a near-term, low-cost option that can help address all of these challenges. Moreover, this option keeps more dollars in Ontario while significantly improving the province's energy security.

The Strapolec analysis demonstrates that continuing operations at the Pickering Nuclear Station will displace natural gas generation, helping to avoid over 18 million tonnes of GHG emissions over a four-year period. That's the equivalent of taking about three million vehicles off the road. Without the continued operation of Pickering, Strapolec predicts Ontario's increased reliance on natural-gas-fired generation will increase the overall consumption of natural gas in Ontario by 25 per cent.

In addition to producing electricity, Ontario uses natural gas for heating and industrial applications. Over 99 per cent of this natural gas is imported, which exposes Ontarians to significant natural gas price volatility. President Obama's Clean Power Plan, which is causing a major shift in U.S. dependency on coal generation to natural gas, can be expected to exacerbate this volatility.

Since operating the Pickering facility is 25 per cent less expensive than natural gas generation, Ontario's electricity system costs will be reduced by over $600-million over four years. The analysis also estimates an additional $950-million in avoided natural gas generation risks.

Overall, Strapolec modelling shows $7-billion in net new economic benefit to Ontario and 40,000 additional person years of employment. By continuing the operation of the Pickering Nuclear Station, Ontario saves $4-billion from avoided energy imports. Durham Region, where Ontario Power Generation (OPG) is the largest employer, retains $1.2-billion of economic activity. The Government of Ontario could realize over $1.2-billion in additional revenues from an increase in GDP and cost savings at OPG.

Strapolec suggests that Ontario's industrial and residential ratepayers should also see a benefit with comparative rates lower by four per cent and one per cent respectively.

Continuing to operate reactors at the Pickering generating plant for a four-year period can deliver substantial environmental and economic benefits. Achieving these outcomes requires the Government of Ontario to direct the Minister of Energy, the IESO and OPG to consult with the Canadian Nuclear Safety Commission for the purpose of securing approval for the longest possible period of continued safe operation of the Pickering Nuclear Generating Station beyond 2020.

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OPPORTUNITIES

Sustainable growth fuelled by clean-tech solutions

The clean-technology industry has the potential to be a source of sustainable growth, especially at a time when commodity-led industries come under price and competitive pressures, according to a 2015 report by Analytica Advisors. While the study finds improved productivity and exports of clean-tech products and services, it also notes that an "absence of government policies to stimulate take-up of these new technologies and scaling up of these firms does not bode well for Canada."

"The industry is saving money, using natural resources more efficiently and improving environmental performance," says Céline Bak, president of Analytica Advisors, the company that compiles the yearly Canadian Clean Technology Industry Report. But while leading companies have gained international recognition, they haven't enjoyed the kind of strategic capital and private-sector engagement that aerospace and other sectors have enjoyed for the last several decades.

> "Our industry is a vibrant and progressive one that is creating new jobs, providing economic stimulus, spurring research and development, and, most importantly, contributing significantly to greenhouse gas reduction."
>
> **Jim Grey**
> is chair of the Canadian Renewable Fuels Association

Jim Grey, chair of the Canadian Renewable Fuels Association, agrees that policy-makers have to take the contribution of companies offering clean-technology solutions, such as Canadian ethanol and biodiesel manufacturers, into account.

Canadian clean technologies are finding recognition in the global arena, for example Hydrogenics, a company that provides energy storage solutions in Germany. But experts say the industry needs better support to realize its full potential. SUPPLIED

"We are part of the solution," says Mr. Grey, who is also CEO of IGPC Ethanol Inc. in Aylmer, Ontario. "We significantly contribute to the reduction of greenhouse gases. If you look at our facilities in isolation, we emit CO_2 because we burn natural gas as an energy source. However, on a life-cycle basis, our products – blended into the national fuel mix – reduce carbon emissions by 4.2 megatonnes every year – the equivalent of removing nearly one million cars from our roads."

He adds that the roll-out of the ethanol and biodiesel industries is ushering in a new economic era in the renewable fuels sector and needs to be encouraged. "Our industry is a vibrant and progressive one that is creating new jobs, providing economic stimulus, spurring research and development, and, most importantly, contributing significantly to greenhouse gas reduction by reducing emissions in the transportation sector."

IGPC recently invested $30-million in its Aylmer facility, where R&D is focusing on using a variety of inexpensive feedstocks and waste materials to produce a range of chemical and food products from the ethanol platform.

"Canadian companies have very good technologies," says Ms. Bak, who notes that clean-tech is an industry with significant investments in R&D. From 2008 to 2013, cumulative investment in R&D in the clean-tech sector was $6.4-billion, of which $4.5-billion came from small and mid-size enterprises (SMEs).

Canada's history of technological innovation positions the country as a very strong contributor in the global quest for environmental sustainability, says Daryl Wilson, president and CEO of Hydrogenics, a company that has seen several milestone successes this year. These include recent wins in China supporting zero emission transit buses; in Germany with the start of a 34-MWh energy storage facility; and the largest commercial contract in its history with Alstom Rail, worth 50-million euros.

"Progress in clean technology requires persistence in innovation and a strong focus on cost reduction," says Mr. Wilson. "Many of our 800 clean-technology leaders are internationally recognized in water treatment, energy and waste remediation."

Ms. Bak says that while Canadian technology has earned wide global recognition, the clean-tech sector is mostly made up of SMEs. "The firms will be able to employ more people if irritants and barriers are removed systematically," she adds.

Mr. Wilson explains that smaller clean-tech companies struggle to participate in the game when major established players have set the rules and created many barriers to new entrants. Recognizing this challenge, the Independent Electricity System Operator (IESO) in Ontario recently arranged a specialized competition for energy storage services where some of these potential barriers were explicitly addressed to ease the path of new market entrants.

"Here in Canada, we need more of these types of thoughtful approaches so that we can win at home and then take our technology to the world with strong reference sites here," says Mr. Wilson. He suggests that linkages between government procurement, energy policy and incentives for large market players to partner with smaller innovative companies would be a good start.

Clean technology is already part of the Canadian brand, according to Mr. Wilson. "But we need to strengthen it with policy, program and financing structures that help our leading companies grow."

IMPACT

In Canada, 26 renewable fuels plants are now generating gross economic benefits in excess of
$3.5-billion
to the Canadian economy every year – creating more than 1,000 direct and indirect jobs annually.

In 2014, the global clean-tech market was worth close to
$1-trillion.

In 2015, Canadian clean-technology industry revenues grew at
four times
the rate of the overall Canadian economy.

Between 2012 and 2013, employment in clean-tech grew by
21% (9,000 jobs)
reaching 50,000 jobs (direct employment in clean-tech exceeds that of the forestry, aerospace, pharmaceutical and medical device industries).

People aged
30 years
or under represent about one-fifth of all employees in the industry.

In 2015, exports of clean-technology industries equalled domestic revenues and reached
$5.8-billion.

Source: Analytica Advisors and Canadian Renewable Fuels Association

BY THE NUMBERS

Percentage of the grid that is clean and renewable across Canada

British Columbia
95%

Alberta
18%

Saskatchewan
25.7%

Manitoba
99.7%

Ontario
30%

Quebec
99+%

Atlantic provinces
70%

The North
65.9%

Source: Tracking the Energy Revolution, Clean Energy Canada (2014).

POLICY

Measures for reducing our carbon footprint

Canada has pledged to reduce greenhouse gas (GHG) emissions by 30 per cent below 2005 levels by the year 2030. The trick will be to achieve that goal without damaging the economy or impairing the right of Canadians to drive to and from work or the kids' hockey games. The good news is that it is doable, says Dr. Mark Jaccard, a professor of sustainable energy at Simon Fraser University in British Columbia.

Other than asking Canadians to park their cars or industry to shutter its doors, there are three policy solutions with the potential to reduce carbon emissions, he says. These include: imposing a carbon tax; coming up with a slate of regulations affecting a wide range of activities from electrical generation and fuels to farming and transportation; or establishing a cap-and-trade system. "You have to have at least one of these options in play, or a combination of all three, or you're never going to meet climate targets," he says.

A carbon tax is hard to sell politically, and while regulations can be effective, and are likely to be utilized in some cases, the cap-and-trade system is slowly emerging as the policy of choice for politicians. It has already proven its effectiveness; it was used successfully in the 1980s to reduce emissions of sulphur dioxide and nitrous oxide, key ingredients in acid rain. Although there have been calls to establish a pan-Canadian system, Dr. Jaccard says a nascent national system is already happening by default. Quebec already has one and Ontario is expected to join. "With Ontario and Quebec alone, you would have a system in place that encompasses 60 per cent of Canadians," he says.

Dr. Mark Jaccard, professor of sustainable energy at Simon Fraser University in British Columbia, believes a pan-Canadian cap-and-trade system would increase fairness. SUPPLIED

That's a good start, but to work effectively and fairly, especially for industries operating across provincial boundaries, it would be better if all provinces were involved. Dr. Jaccard believes the best way to create a pan-Canadian system would be to build around the work of Quebec and soon Ontario, which prices carbon dioxide in such a way as to make polluting progressively more expensive, but at a rate of implementation that does not damage the economy or impair mobility. "You can't force any of the other provinces to join, but you could create incentives that would make it easier to do so," he says.