



Clean Technology

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Global clean technology activity is expected to exceed \$2.5 trillion by 2022.¹ As a strong innovator and producer of clean technology solutions, Canada is well positioned to seize the opportunities this growth presents both at home and abroad. Canadian clean technology developers have already proven their capacity for practical, real-world, results-driven innovation. These solutions are key to supporting Canada's transition to a low-carbon economy and enabling other industries to become cleaner, with improved environmental outcomes and competitiveness. Canada is ready to meet the world's needs.



There is an enormous opportunity for Canadian businesses in clean technology to grow and capture a large share of global markets while improving environmental outcomes.

Audrey Mascarenhas
Chair, Clean Technology
Economic Strategy Table

VISION

By 2025, Canada's globally competitive clean technology companies will be transforming industries and improving environmental outcomes in Canada and around the world. Driven by a dynamic, diverse, talented workforce, our innovative solutions will create a top-five Canadian export industry that generates significant economic benefits for Canada and diversifies its economy.

¹ <http://www.smartprosperity.ca/content/308>

“Clean technology is emerging at an explosive rate: unprecedented global demand, acceleration of technologies, geo-political shifts—how do we position Canada as a global leader?”

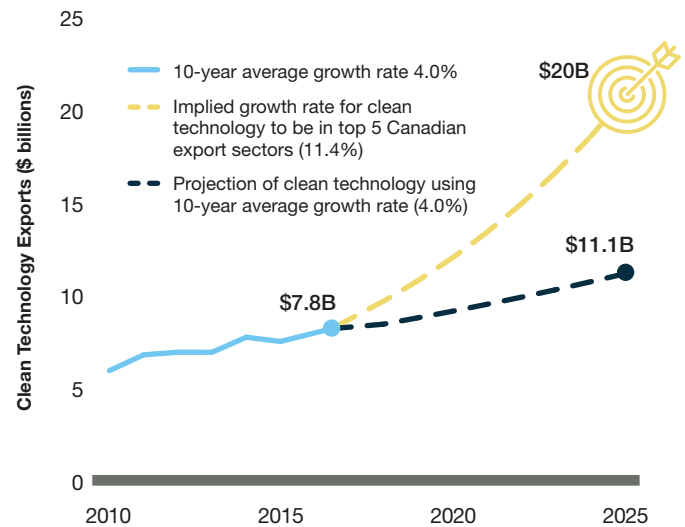
TARGET

In 2025, clean technology is one of Canada’s top five exporting industries, nearly tripling current value to

\$20 billion annually in exports

Our Clean Technology Table selected the ambitious, export-focused target of clean technology becoming one of Canada’s top five exporting industries, nearly tripling the sector’s current value for exports to \$20 billion annually by 2025.² Given the relatively small size of Canada’s domestic market, strong export growth is crucial. For clean technology and environmental products and services to be in the top five exports by 2025, exports will have to grow by an average of 11.4% per year.

Historical and Projection of Clean Technology Exports to 2025³



² Clean technology exports were valued at \$7.8 billion in 2016, excluding electricity, energy products and primary products, waste management and other services. Environmental and Clean Technology Products Economic Account (CANSIM 153-0203).

³ Historical data from Environmental and Clean Technology Products Economic Account (CANSIM 153-0203), excluding electricity, energy products and primary products, waste management and other services.

■ WHAT WE NEED TO OVERCOME

Clean technology refers to any process, product or service that reduces environmental impacts. These technologies are developed by a broad array of firms, and their adoption spans all sectors of the economy. By developing and adopting clean technologies, companies and industry can better control costs, meet new regulatory requirements at home and abroad, improve global competitiveness and reduce impacts on climate, water, land and air. However, the following factors are hindering potential transformative growth in clean technology activity:

- A risk-averse domestic market with low adoption rates of clean technology
- Low access to patient growth capital, scale-up investments and grant funding suited to the unique risks and costs of clean technology
- Disconnect between environmental policy targets and regulations
- Lack of stringent domestic environmental regulations hinders the adoption of new technologies
- Small relative firm size, a lack of strategic expertise, market information and participation in targeted international bodies hamper market access for Canadian clean technology firms
- Women and Indigenous people are insufficiently represented in the workforce
- Limited entrepreneurial/business and soft skills among start-ups

■ WHAT WE NEED TO BECOME

The global demand for clean technology is growing year over year. For Canada's clean technology activity to grow and play an active role in global markets, we will need to transform existing industrial sectors, and displace less efficient and polluting elements of the economy. These are the conditions we need to realize our ambitions:

- A stronger clean technology innovation ecosystem across the public and private sectors that gets new ideas to market faster and that grows firms to scale sooner
- Large industry and government partner with and procure from smaller/innovative clean technology companies
- Financing instruments are available to address unique risks and cost of capital and enable and accelerate scale-up in the global marketplace
- Policies and regulations reflect and respond to sector risks and opportunities, encouraging innovation and responsibly enabling the timely introduction of technologies to market
- Decision makers recognize the long-term economic advantage of clean technology along with its potential to reduce global greenhouse gas while improving environmental outcomes for water, soil and air
- Greater access to international markets and climate financing, with more presence and influence on international bodies
- A dynamic, diverse and inclusive clean technology workforce and leadership
- Clean technology for economic development and sustainability in remote and Indigenous communities

“Canada has what it takes to capture a big slice of the global clean innovation opportunity, but right now we’re falling short. We’re great at generating ideas and developing them into promising technologies. But we’re behind other countries in getting those ideas to market. That means we’re missing out on the jobs, business opportunities and wealth that we could be generating.”

THE ACTIONS WE PROPOSE

After months of research and consultation with stakeholders, our Clean Technology Table has drafted six proposals to take full advantage of Canada’s clean technology economic potential:





GLOBAL EXAMPLES OF INNOVATIVE REGULATORY APPROACHES

NETHERLANDS' FRONT-RUNNERS DESK

In support of its energy transition, the Netherlands created the Front-Runners Desk for companies to report barriers created by existing policy and regulatory structures. The Desk promoted information flow to government to improve policy design and implementation, and helped innovators navigate government processes.

FRANCE EXPÉRIMENTATION

France Expérimentation supports the testing and evaluation of new technologies in real-world conditions. It creates a transparent framework for experimenting with existing regulatory and administrative procedures to unblock technology adoption and further drive innovation, with a phased approval approach for choosing candidates for regulatory exemptions. At the end of the experimentation period, an evaluation is carried out to determine whether the exemption should be extended or generalized.

THE SHERPA MODEL: GERMANY, POLAND AND ISRAEL

To encourage innovation, these countries are experimenting with “convener” or “sherpa” models, using credible third parties to bring players together without industry or regulator bias. In writing for the Mowat Centre, [Sunil Johal and Michael Crawford Urban \(2017\)](#) have suggested this role could be taken on by the federal government in Canada and have called for the creation of a Deputy Minister-level “Innovation Advocate” to provide this function.

PROPOSAL

Develop an agile, high-performing regulatory system

Current regulations often create significant barriers to innovation, growth, commercialization and adoption of Canadian clean technologies because they are based on old standards and processes. We need both imagination and accountability to reset our regulatory regime so that it enables the adoption of new clean technologies to more quickly transform industries and deliver world-leading outcomes.

WHY THIS MATTERS

Strong regulatory institutions protect public health and safety and the environment but must also facilitate innovation. Clean technology, which works to achieve specific environmental objectives, needs a regulatory system that is outcome-based and supportive of technological change.

Canada can become a global leader in implementing innovative approaches to regulation and permitting that allow for rapid, responsible testing and approval of new clean technologies. Health, safety and environmental protection need not be compromised in stimulating the sector's growth. In fact, by increasing the stringency of regulations to levels slightly above those of our competitors, we can use regulation to drive domestic adoption, innovation and competitiveness.

Regulations that uphold strong outcomes would foster a market for clean technology in Canada by giving consumers confidence in new technologies and levelling the playing field between large incumbents and new entrants, domestically and internationally.

For instance, non-renewable forms of energy generation often outcompete cleaner alternatives in terms of cost, owing to the fact that the full cost and health impacts of pollution have not been considered. Carbon pricing is an efficient way to reduce greenhouse gas emissions while stimulating innovation. Committing to strong outcomes would provide an advantage to firms that choose to adopt clean technology—and ultimately benefit Canadians through better environmental outcomes and international competitiveness.

WHAT WE RECOMMEND

An agile and high-performance regulatory system will enable innovation and competition. To grow the domestic market, we also need to create regulatory pathways for new clean technologies that often fall outside our current regulatory structure. First adopters need governments to de-risk compliance in a thoughtful, staged and controlled way, supporting deployment of technologies through clear rules that increase investment certainty for customers and innovators alike; streamlined and efficient

regulatory processes; and synchronized or harmonized regulations across Canada's provinces and territories, or across international jurisdictions. A new, unbiased convener of regulators, regulated companies and solutions providers could be established to assist in this regard.

Establish a Canadian Innovation and Regulation Charter

The Charter would provide a strong, clear vision to ensure Canadian regulations protect and improve health, safety and the environment while accelerating decision making and strengthening investment certainty. It must include indicators, targets and service standards and commit to accelerating the regulatory process to help drive innovation and promote regulatory harmonization.

Establish an Office of Regulatory Innovation

An Office of Regulatory Innovation should be established to direct information sharing, discuss emerging technologies and flag/refer potential opportunities for regulatory harmonization. It would not replace or supersede regulatory authority but instead would be a centre of expertise to address

challenges using sandboxes and pilots. As regulations are not subject to independent audits, the Office could introduce new oversight mechanisms similar to functions provided by the Auditor General. These would be ongoing and could include live tracking of regulatory processes, whether service standards are being met (if they exist) and/or the extent of any review of a department's stock of regulations.

The scope of the Office is significant and will take time to establish. In the interim, the Clean Growth Hub could be mandated and resourced to complete a critical first step: convening principal stakeholders to study key regulatory issues facing Canadian clean technology companies.

Strike an Innovative Regulations Advisory Council

The Office would be complemented by an Innovative Regulations Advisory Council with representation from the private sector and civil society. The Council would advise the Office on emerging regulatory issues that hamper Canada's ability to innovate and adopt commercial innovations, and would also prepare regular public progress reports.



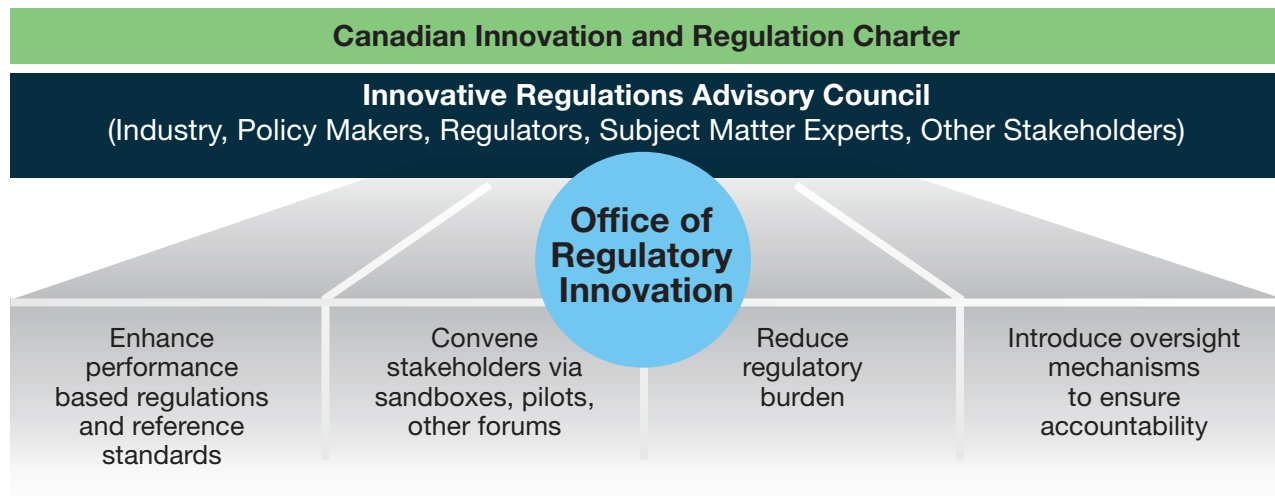
GLOBAL EXAMPLES OF INNOVATIVE REGULATORY APPROACHES

ANTICIPATORY REGULATION: UNITED KINGDOM

Anticipatory regulation is an emerging method of regulation that is proactive, iterative and responds to evolving markets, distinguishing it from other more reactive or traditional forms of regulation which are increasingly struggling to cope with the pace of change in technology. As an innovation method, the central goal of anticipatory regulation is that it enables and supports innovation around new technologies or business models in a 'responsible' and more inclusive way.

Enhance performance-based regulations and reference standards

Regulations should set outcomes, not the process that is used to achieve them. This approach would give innovators the freedom and flexibility they need to determine how to best achieve those outcomes.



To ensure market relevance, technical standards need to be referenced in regulation as a matter of course.

Create regulatory sandboxes and conduct regulatory pilots

The Office of Regulatory Innovation would be mandated to convene regulatory sandboxes for early, collaborative testing and idea-sharing related to regulatory options for emerging technologies. The Office would also oversee pilot projects for testing products, services and new business models outside of standard regulatory conditions. These pilots would be

time-limited, with a stage-gated process for demonstrating results. Utilities and federal, provincial and territorial governments could collaborate on these pilots to reduce the risks associated with technology adoption and help clean technology firms obtain their first large reference customers. Faster deployment of clean technology solutions can also be supported by bringing greater clarity to testing and performance requirements, increasing testing and demonstration opportunities, and by adopting global best practices and technology verification standards. New

opportunities can be harnessed by bringing key stakeholders together to address conventional and emerging regulatory issues that constrain innovation and economic development.

Reduce regulatory burden

Canada should continue efforts to reduce regulatory burden, especially in areas where specific industries have identified regulation as a constraint to clean technology innovation. Overlapping regulations should be streamlined and reduced, and voluntary technical standards should be used wherever possible to aid in the



EARLY ACTION IDEAS FOR REGULATORY SANDBOXES AND PILOTS

STREAMLINE AND ACCELERATE REGULATORY EXEMPTION OR HARMONIZATION PATHWAYS

Made-in-Canada clean technology solutions for the heavy-duty transportation and freight sector are being sold globally with limited uptake in Canada. Different emissions certifications and test cycles for different geographic markets are a barrier to the deployment of commercially available engines and vehicles. Given the long lead time associated with technology development programs, the current lack of cost competitive, market-ready solutions for long-haul commercial freight applications and the urgency of greenhouse gas emission reduction targets from this sector, we have an opportunity to accelerate the deployment of low-carbon and zero-carbon vehicles. The current regulatory exemption pathway under the Canadian Environmental Protection Act (CEPA) could be improved via a mechanism that connects regulators and industry in a strategic way to provide timeline and process certainty through a documented stage-gated approach that sets out mutually agreed-upon milestones that lead to exemptions or regulatory harmonization.

REGULATORY SANDBOX FOR WATER REGULATIONS

Convene regulators (federal, provincial/territorial, municipal) and industry stakeholders through a regulatory sandbox to review current water quality standards, aim to harmonize regulations across the country, and adopt more stringent international standards through a phased-in approach. The specific objectives would be to reduce the number and allowable concentration of water pollutants, to standardize these requirements across Canada where feasible, and in doing so, to enhance the effectiveness of Canada's multi-jurisdictional regulatory system for water.

REGULATORY SANDBOX FOR AIR QUALITY AND METHANE EMISSIONS REGULATION

Canada currently has too many overlapping federal and provincial regulations policing the same industrial air emissions creating confusion, inconsistency, uncertainty and cost to industry. The current regulatory system across Canada is complex and a multi-jurisdictional patchwork. The recently announced federal methane regulation specifically focuses on process rather than outcomes, deterring the deployment and adoption of innovative solutions that can further improve health, safety and environmental outcomes. The urgency to address air quality and methane emissions could be supported through a regulatory sandbox to review global outcome based regulatory best practices such as those implemented in Colorado and California. This would lead to an effective regulation that is top-quartile globally, conducive to innovation, creates public trust and attracts investment in Canada.

INCREASE ADOPTION OF CLEAN TECHNOLOGY BY UTILITIES

Create a regulatory sandbox for utilities that wish to increase adoption of clean technologies (e.g., energy storage, energy and power substitution, renewable natural gas, water technologies, methane reduction technologies, carbon capture etc.). The regulatory sandbox would enable the creation of a common framework for the adoption of new technologies, agreed upon by technical and economic regulators, and allow firms to use a reserved portion of ratepayer funding to satisfy the due diligence required on technologies prior to deployment. This pilot would help address and eliminate common problematic variables across the sector, such as failures to adopt standards established elsewhere, inconsistent standards and overlaps across jurisdictions, long lead times for environmental permitting of sites, and content requirements—all of which result in lower adoption, delays in implementation and significant cost.

TECHNOLOGY DEMONSTRATION PILOTS FOR WASTEWATER TREATMENT PLANTS

Create a pilot program for municipal wastewater treatment plants that allows them to try innovative new technologies, building on the Southern Ontario Water Consortium model. The pilot program would allow for the creation of a “safe harbour” for plants to test new technologies without penalty for not meeting specific water quality parameters. The goal of this pilot would be to enhance innovation within plants to achieve significant space, energy or life cycle cost savings, and to allow manufacturers to enhance the performance of their new technologies through continued innovation if they do not initially consistently perform at the required level.

DISPATCHABLE RENEWABLE ENERGY SHOWPIECE PROJECT PARTNERSHIP PILOT

A well-recognized challenge with renewable energy is its intermittent nature. Advances in energy storage present early-stage solutions to this challenge, but their effective demonstration is faced with provincial and federal regulatory challenges, including recognition of benefits within the regulated electricity sector, and permitting and approval processes such as the Canadian Environmental Assessment Act. This pilot would bring provincial and federal regulators and decision-makers together with private-sector clean technology companies and financiers to provide clean renewable energy to government facilities, under contract for power via a power-purchase agreement financed entirely by the private sector with technology provided by the private sector and showcase different Made-in-Canada energy storage technologies.

strategic application of international standards. Measures should ensure consistency among Canadian regulations, Canadian standards and standards established by international standard-setting bodies. The Regulatory Reconciliation and Cooperation Table under the Canada Free Trade Agreement should focus on addressing the patchwork of provincial/territorial laws and regulations that affect clean technology, aligning with jurisdictions that have developed best practices to support innovation.

TRACKING SUCCESS

By 2025, Canada will move into a top-three ranking in the [Global Cleantech Innovation Index](#), up from fourth overall (2017).

By 2025, Canada will rank in the top fifteen, up from thirty-eighth (2017–18) for [Burden of Government Regulation in the World Economic Forum Global Competitiveness Index](#).

“Ultimately, we will need as much innovation in our public policy tools as there is in technology to ensure progress on critical economic and environmental objectives.”

**BUDGET 2017:
\$2.3 BILLION
ALLOCATED TO
CLEAN TECHNOLOGY
SCALE-UP**

Business Development Bank of Canada (BDC): \$950 million (\$570 million for working capital support and \$380 million for equity) for technologies that have been validated or demonstrated in a commercially representative environment or that have commercial traction, significant revenue growth potential and interest from strategic partners.

Export Development Canada (EDC): \$450 million for financing, bonding, and a new project finance window for first-of-kind, commercial-scale, Canadian clean technology projects.

Sustainable Development Technology Canada (SDTC): \$400 million to recapitalize demonstration programs.

Strategic Innovation Fund (SIF): \$1.2 billion to facilitate the growth and expansion of Canadian firms. While not exclusive to clean technology, project-based funding catalyzes new investments to help companies grow and compete.

PROPOSAL

Accelerate the growth of Canada's leading clean technology firms by addressing the gaps in scale-up finance, and implementing the Own the Podium signature initiative

To support the country's most promising clean technology companies—those demonstrating the greatest potential to succeed and make significant economic contributions—Canada needs to make full use of the programs we already have in place and introduce new supports where needed.

WHY THIS MATTERS

Canada needs to change its way of thinking about the support offered to firms and shift its focus to rally behind the highest performers, allowing them to grow and compete in a global market. The Government of Canada needs to adopt the Own the Podium culture across its programs and focus on clean technology firms and projects that demonstrate the highest potential for growth and success in the near or long-term to grow anchors of a Canadian clean technology cluster. If Canada fails to support its highest potential firms, we risk losing them to other countries.

While Budget 2017 allocated more than \$2.3 billion to support the growth of clean technology in Canada as part of the Innovation and Skills Plan, clean technology firms and projects still face obstacles associated with access to capital when seeking to commercialize and scale-up their technologies.

This prevents them from realizing their economic potential and accessing markets.

We put forward an ambitious export target and further support is needed to achieve it.

WHAT WE RECOMMEND

Proposed activities to support the growth of high-potential Canadian clean technology firms include:

Implement “Owning the Podium” for our leading clean technology firms

The types of support that are particularly valuable for clean technology companies include a concierge service to provide information on available support programs; identification of opportunities within the regulatory process to create markets and drive adoption; Trade Commissioner Service (TCS) support to identify and enter new markets; an aggressive approach to Canadian

participation in the development of international standards relating to clean technology; and support to identify global clean technology talent that firms can draw on as they develop their export strategies. Support would also include general business development services and identification of impediments to growth along with effective countermeasures that would help companies or their projects. The support would be flexible and address the individual needs of companies as they strive to scale up and grow.

We expect companies that would benefit from the program could be grouped into three categories according to the lifecycle position of the business or its proposed growth project. The identification criteria for each category should be developed in consultation with experts and be driven by market-based metrics, founded on firm performance. The selection criteria for Category 1, for example, could include revenue growth and ability to raise private capital, as well as patents, ownership structure, location of operations, etc. In addition, the government would establish clear, transparent outcomes and, if firms did not show performance, they should be able to “fail-out” of the program so that these high-intensity supports could be allocated elsewhere.

The Government of Canada would align support in clean technology areas of specialization that have promising market potential, in which Canada has demonstrated strength. The first step to this will be strengthening our data analytics capacity to ensure we have more information on the characteristics

of high-performing firms in our sector and on the corresponding global market opportunities.

Increase financing for scale-up and maximize impact of existing funding

Canada has the opportunity to fill gaps in government financing, especially end-stage capital for scale-up and commercialization. There is a need to blend public and private funding so it is focused on—and available to—Canada’s top clean technology performers. Private capital would guide decision-making about which firms are ready to scale up while Government support would be used to provide an acceptable risk profile and unlock typically risk-averse private capital, de-risking project deployments and providing a source of competitive financing to high-potential firms, allowing our strong performers to excel.

By integrating knowledge and mentorship into financing, leading firms will be further empowered to compete internationally. Part of this would include transferring relevant market intelligence to Canadian firms and providing business development and financial advice to help them structure bankable deals.

Public scale-up funding should be used to significantly de-risk clean technology deployments and drive down the cost of capital by focusing on large projects and on non-equity-based financing for later-stage companies ([technology readiness](#) level 8 and above) that are not yet bankable as defined by market lenders.

Any government intervention at the corporate level via this new financing should be appropriate to the

PROPOSED CATEGORIES AND SELECTION CRITERIA FOR “OWN THE PODIUM” FIRMS

Category 1: Firms with established sales and with a focus to grow domestic and international markets

Category 2: Firms with demonstrated technologies working toward commercialization

Category 3: Firms in earlier stages of development and that may be pursuing disruptive technologies (the ones to watch)

POSSIBLE CRITERIA FOR IDENTIFYING HIGH-POTENTIAL FIRMS:

Innovation: The problem the technology solves and its added value

Market potential: Market size, growth dynamics and barriers to entry

Ability to execute: Including finances, team competencies, business plans, freedom to operate and growth objectives

capital needs in the firm’s validated business plan. Concessional financing mechanisms such as blended financing should be included to lower the cost of capital. Available financing needs to be sufficient for Canada to reach its growth targets and drive maximum social and environmental impact.

Funding would be complementary to financing from BDC, EDC, SDTC and to programming offered by [Canada Commercial Corporation](#) (CCC). Eligible companies should also have access to independent specialized financial advisory



CONCIERGE SERVICE HELPING FIRMS NAVIGATE THE SYSTEM

SelectUSA, led by the U.S. Department of Commerce, is cited as a successful concierge model that helps companies of all sizes find the information they need to make decisions, connect to the right people at the local level, and navigate the federal regulatory system. Its mission is to facilitate job-creating business investment into the U.S. and raise awareness of the critical role that foreign direct investment plays in the U.S. economy.

SelectUSA also assists U.S. economic development organizations to compete globally for investment by providing information, a platform for international marketing and high-level advocacy.

services to ensure they are able to structure optimal financing solutions and successfully interact with lenders. A carve-out to defray the cost of these advisory services should be considered.

Clean technology scale-up and the impact of Budget 2017 investments can be maximized by:

- Having BDC integrate the “Own the Podium” signature initiative into its clean technology practice, focusing on leading the market in its underwriting of deals, driving down the cost of capital for firms, and on disruptive and pure play (rather than incremental) clean technologies.
- Increasing access to EDC project financing by providing grant-based funding for clean technology companies to use key independent advisory services (e.g., detailed

commercial plant engineering studies, project finance structuring specialist advice and more). Crown lenders should not recover these service costs from clean technology companies.

- Establishing BDC and EDC project financing targets to cover all stages of firm development. We suggest BDC and EDC invest project financing as follows: 20% of funds made available to early-stage firms, 40% to medium-stage firms and 40% to later-stage firms. This would include firms identified for the “Own the Podium” initiative.



CLEAN TECHNOLOGY SCALE-UP FUNDING IN ACTION

ELYSIS TECHNOLOGIES:

Quebec will be home to “Elysis”, a joint venture project announced in 2018 between aluminum industry leaders Alcoa and Rio Tinto. Elysis will pioneer a ground-breaking process that will virtually eliminate GHG emissions from aluminum production. The project will entail an investment of \$558 million, with \$60 million from the federal Strategic Innovation Fund (SIF).

Once the technology is rolled-out in Canada, industry will invest an estimated \$10 billion into the adoption of this new smelting process. By 2030, Elysis is expected to create over 1000 jobs, in fields ranging from R&D to advanced manufacturing, while eliminating 6.5MT of GHG emissions from Canada’s aluminum production—the equivalent of taking nearly 1.8 million light-duty vehicles off the road.

“Government programs are often too focused on early-stage companies and technologies. We need to own the global clean technology podium and identify, celebrate and scale-up our Canadian clean technology stars.”

PROPOSAL

Drive clean technology adoption by having government be a lead buyer and incentivizing industry procurement

Governments at all levels can accelerate the adoption and growth of clean technology companies—particularly small and medium enterprises (SMEs)—by acting as lead buyers of commercialized Canadian solutions. Industry should also grow the domestic market by adopting Canadian clean technology innovations, as doing so will bring competitive benefits to their businesses in the process. Government incentives can help propel this private-sector uptake.

WHY THIS MATTERS

The Government of Canada procures an average of \$20–26 billion⁴ in goods and services a year (approximately 1% of GDP). Leveraging that purchasing power could be an effective tool for advancing the adoption of clean technologies in Canada, while providing domestic references critical to international credibility and expansion. It could accelerate growth and commercialization, provide a critical pathway to bring at-scale new clean technologies to market, share risks, experiment on innovative approaches and expand market access opportunities.

Using public procurement to support innovative industries is an increasingly accepted practice. Finland, Australia, China, the United States and Brazil have all put in place targeted procurement policies to support innovation, often at impressive GDP percentage scale. In Canada, public procurement targeted specifically at clean technology SMEs would allow the federal government to better support domestic jobs, prime the market for clean technology solutions, improve trade

balance and spur innovation by showcasing leading technology. Companies looking to grow their exports could capitalize on “government as a first buyer” to demonstrate the credibility of their technologies to potential buyers and investors, domestically and internationally.

The private sector also has a role to play. Companies that adopt these solutions gain a competitive advantage and improve the “Canada Brand” of extractive industries for the carbon-constrained markets of the future, while becoming more productive and efficient. Yet in 2014, clean technologies were adopted less by Canadian businesses than other advanced technologies (at 9.9% compared to the next highest level adoption rate of 29.2% for advanced business intelligence technologies).

WHAT WE RECOMMEND

The federal government becomes a lead buyer of clean technology

We call on the federal government to become a lead buyer of at-scale Canadian clean technologies by

establishing an ambitious procurement target of 5% for 2025, up from 3.74% in 2016.

Several barriers need to be overcome for this to happen. Today, bids are frequently assessed by lowest cost of purchase often without considering lifetime maintenance costs, broader industrial-base development, fiscal payback, improving health, or decarbonizing of the economy. New clean technologies introduce challenges for procurement officials to evaluate economic and other benefits that enable new technologies to compete and secure a foothold to disrupt larger scale incumbents. As a result, the same specifications are often repeated year after year.

The Greening Government Strategy promotes “best value” based on a full life cycle analysis of goods and services. We endorse this strategy as an early action—and challenge the government to go beyond its green procurement targets for real property, fleets, infrastructure, energy and goods by supporting departments with a central source of funds to offset potential additional upfront costs.

⁴ Total federal procurement for 2015–2016 was \$25.3 billion. <https://open.canada.ca/data/en/dataset/c37d7510-c54c-4652-8e6f-79023e44be62>

“It may be risky to adopt new technology ideas, but let’s not hide that. Let’s spotlight it, champion it and say that it’s worth taking that risk to do things better, and then incentivize adoption as much as we can.”



HOW OTHER JURISDICTIONS INCENTIVIZE ADOPTION THROUGH ACCELERATED CCA

UNITED KINGDOM

The [Enhanced Capital Allowance Scheme](#) provides a 100% accelerated CCA for certain low-emission vehicles and refuelling stations as well as thousands of specified energy and water saving products set out by manufacturer and model number in an [Energy Technology Product List](#) and a [Water Efficient Technologies Product List](#).

IRELAND

Ireland has a similar program to the UK. Its [Accelerated Capital Allowance](#) scheme provides a 100% accelerated CCA for specified equipment listed in a [Triple E Register](#) of products meeting certain stringent energy efficiency criteria.

NETHERLANDS

The Netherlands provides a 100% accelerated CCA for investments in environmentally friendly assets included in an [Energy and Environment List](#) which covers nearly 300 categories of equipment used in a wide range of activities such as agriculture, transportation and biomaterials.

Finally, we recommend the government strengthen its procurement policies, guidelines, directives and procedures to favour overall environmental performance rather than focus on price alone. It should also seek ways to use procurement to support clean technology firms owned or operated by underrepresented groups including women and Indigenous peoples; and simplify procurement processes for greater participation by SMEs. Without baselines or metrics, it can be difficult to set targets, but it is known that women and Indigenous peoples are underrepresented in Canada’s innovation economy. For instance, only 5% of Canadian technology companies have a sole woman as a founder or CEO, and only 13% have a woman co-founder.

Incentivize industry procurement with the accelerated capital cost allowance

Canada needs to speed up adoption of proven, commercialized, at-scale Canadian clean technologies. We call for the federal government to help incent this through a five-year, 100% accelerated capital cost allowance (ACCA)

applicable against an expanded list of clean technology equipment.

Canada’s *Income Tax Act* and *Income Tax Regulations* currently make the capital costs of specified clean energy generation and energy conservation equipment described in Class 43.1 and 43.2 eligible for ACCA at rates of 30% and 50%, respectively. There is an opportunity to increase ACCA to 100% for clean energy equipment, and to broaden the scope of the technologies included.

Tax incentives such as flow-through shares could also be used to promote early procurement and adoption, helping entrepreneurs enter the market more easily.

TRACKING SUCCESS:

By 2025, federal expenditures on clean technology procurement will rise to 5% of total spending from 3.74% of total spending in 2016.

PROPOSAL

Engage with Indigenous communities to create opportunities for partnership and co-development of clean technology initiatives

In support of economic reconciliation, and to increase the self-reliance of Indigenous and remote communities, we strongly believe there is a need for increased engagement to explore opportunities for partnership and co-development of clean technology initiatives with Indigenous communities. A condition to enable this collaboration requires enhancement of physical and digital infrastructure in Indigenous and remote communities. We strongly endorse the Economic Strategy Tables' technology adoption and digital infrastructure signature initiatives to make that happen.

WHY THIS MATTERS

Many Indigenous businesses are often small, community-based and unincorporated, and operated by entrepreneurs with goals and strategies that often prioritize cultural values, community investment, and concern for the environment. In addition, most Indigenous communities face inadequate access to financing, a formidable barrier to economic growth, job creation, and autonomy. Constraints in water, food and energy security coupled with infrastructure deficits also pose challenges to community empowerment and sustainable development.

Collaboratively developing clean technology solutions and demonstrations to support food, water and energy security will help address Indigenous communities' unique barriers and create opportunities. Co-investing and partnering in Indigenous clean technology

solutions and demonstration sites catalyzes a small but vital link to energy security, sustainable economic development, reconciliation and self-determination while helping Canada's transition to a low-carbon economy. In addition, technology demonstration sites would enable further economic development and provide flagship examples or reference sites for global exports of Canadian clean technology to the 1.5 billion people worldwide in remote locations without electricity.

Indigenous communities can be agents of change, with an unprecedented opportunity to partner and lead in a major economic opportunity, which combines social, economic and environmental objectives. We must design "with" instead of "for" Indigenous communities to ensure clean technology solutions put forward meet their needs.



INCREASED COMMUNITY SELF-RELIANCE AND ECONOMIC OPPORTUNITY

FISHER RIVER CREE NATION 1.0 MEGAWATT SOLAR FARM

The Fisher River Cree Nation in the heart of Canada's prairies will be home to the provinces' first utility-scale solar-pv (photovoltaic) project.

This 1.0-megawatt solar farm will be capable of producing enough power for roughly 400 homes. In partnership with W Dusk Energy Group, an Indigenous-owned and operated energy developer, trained members of the community will install nearly 3,000 solar panels.

The solar farm will be located in the heart of the community—integrated into the landscape to maximize a positive visual impact. The project also integrates an apiary, eco-tourism observation deck, and an electric vehicle charging station. The community is already planning to increase the farms' capacity and is exploring options to export its power.

AKI ENERGY

Aki Energy is a social enterprise working in Manitoba First Nations communities to develop and implement sustainable energy and food solutions. By transitioning on-reserve households to geothermal and solar power, this non-profit venture seeks to make communities electrically self-sufficient while providing local opportunities for young people to be trained in renewable energy and employed on clean technology projects. Aki Energy has partnered with Manitoba Hydro using an innovative "pay-as-you-save" arrangement. It invests revenues from its energy business in local organic farms that are helping to address nutrition and food security issues in remote communities.

WHAT WE RECOMMEND

To advance economic reconciliation with Indigenous peoples, we call for more and targeted co-investments in Indigenous and remote communities that feature Canadian clean technologies designed to develop

water, energy and food sources. This would be done through engagement and partnership with government, industry and Indigenous communities.

In endorsing the signature initiatives for technology adoption

and infrastructure, we specifically call for enhanced physical and digital infrastructure in remote and Indigenous communities. This has the potential to further enable opportunities for co-development of clean technology solutions.

“In clean technology, Indigenous communities can find opportunities for leadership in a major emerging economic sector well aligned with their cultural values.”



HIGHLIGHTS OF CANADIAN CLEAN TECHNOLOGY STRENGTHS

Renewable energy: solar energy, wind energy, bioenergy and biofuel technology, small and micro-hydro, hydrogen and fuel cells, energy storage, smart grid, marine energy, waste to energy

Water and wastewater: treatment (UV disinfection, membranes) resource recovery, pipe leak inspection/detection, digital water tech, quality monitoring, water use, treatment for resource sector, decentralized treatment

Industrial processes: emission and odour detection and control, analytical testing, carbon capture, utilization and storage process controls systems and equipment

PROPOSAL

Seize domestic and international clean technology opportunities where Canada has strengths, and enable access to global climate finance

There is a sizable opportunity for Canadian clean technology companies to capture a significant share of the growing global clean technology demand while improving environmental outcomes. Propelling Canadian clean technology solutions into international markets and levelling the playing field for Canadian companies—in both established and developing markets—requires better coordination and leveraging of networks, engagement on international standard committees, as well as access to global climate financing.

WHY THIS MATTERS

The global clean technology market is expected to exceed \$2.5 trillion by 2022. Given the small size of Canada’s domestic market,

accessing these international markets is crucial for Canadian clean technology companies. And the sector has made enormous inroads. In 2016, exports by Canadian clean

technology firms totalled \$7.8 billion—a 42.8% increase over 2007. However, challenges remain.

The sector is dominated by small and medium-sized enterprises (SMEs). These companies typically lack the resources to compete for financing and customers, navigate global supply chains or have the necessary networks and intellectual property protection to be competitive on a global scale. And Canada has only a few large clean technology “integrators” (e.g., large engineering and construction companies) interested in developing their business internationally. This means too few Canadian end-to-end integrated solutions are showcased on the international stage.

Under the 2009 [Copenhagen Accord](#), developed countries—including Canada—committed to mobilizing up to US\$100 billion a year by 2020 to help developing countries tackle climate change. There are also a number of multilateral funds for research, development and adoption of clean technology. But compared to competitors in other countries, available data indicate very few Canadian firms have successfully accessed current global climate financing. We are missing this opportunity to get Canadian expertise into the international marketplace, despite contributing significantly to these global pools of capital.

Active participation in international standards bodies creates competitive advantages for Canadian clean technology firms. It provides

the chance to shape standards in ways that reflect Canadian capabilities—and Table members also have experienced the credibility boost that a firm’s participation on these bodies can give when securing global contracts. Standards are closely linked to market opportunities: countries reference international standards in their domestic regulations and purchasers look for solutions they know will align with the standards so they can implement them quickly. Our country needs to be proactive about getting involved in the establishment of international clean technology standards.

WHAT WE RECOMMEND

Canada must seize global clean technology opportunities by developing a new approach to strategically align Canadian clean technology strengths and capabilities to global needs, pressures and opportunities. The following activities will help Canada grow its clean technology sector:

Match domestic strengths to international opportunities

This can be achieved by establishing a joint industry-government working group to conduct a diagnostic and review current export activities. That review could point the way to focused trade missions that promote Canadian end-to-end clean technology solutions clustered for high export potential in key subsectors.

The new [Trade Commissioner Service \(TCS\) International Business Development Strategy](#) can be built upon to help Canadian

firms gain access to global climate finance-supported projects in key hubs. Opportunities in the international market for clean technology currently demand large-scale turnkey developments, whereas Canadian clean technology firms are typically smaller and limited to just parts of an end-to-end solution. This strategy can help fill this gap by assembling consortia of Canadian clean technology SMEs to target foreign buyers and provide fully integrated solutions so the combined capacity can fill larger project requirements and level the playing field against international bidders.

Targeted international and domestic trade missions showcasing integrated clean technology solutions with well-defined objectives and clear measures of impact would also help grow Canadian opportunities abroad and domestically. Participation in organizations and networks such as [Mission Innovation](#) and the [United Nations International Renewable Energy Agency \(IRENA\)](#) also help to facilitate market and finance access for Canadian companies and provide a platform to showcase our clean technology expertise.

At the federal level, the Clean Growth Hub could coordinate activities and support. TCS could identify opportunities while Innovation, Science and Economic Development (ISED) Canada could identify suitable Canadian clean technology firms. Where buyers are foreign governments, CCC could play a core role, although enhancing its role would require access to new risk capital.



CHINA'S STANDARDIZATION STRATEGY

China has become a global leader in standardization. In 2010, it began to implement a strategy for securing key positions on ISO technical committees and working groups. As a result, it now manages 63 ISO technical committees in areas that align with its economic and industrial interests.

Increase access to global climate financing

The federal government should establish a Canadian-administered technical assistance fund so

Canadian firms can advocate and showcase their technologies to developing countries, positioning themselves for larger-scale downstream projects.

Canadian clean technology firms need to be able to participate in projects financed by multilateral climate funds to which Canada has contributed. The Government of Canada needs to participate in key international organizations such as IRENA to ensure these doors are open.

Develop a clean technology strategy for international standard setting

The Standards Council of Canada facilitates the development of national and international standards and accreditation services. We call for it to develop a plan to enhance Canada's involvement

in establishing international clean tech standards. To do this, it should work with firms to identify Canadian subsectors that have the capacity to play a more active role in standard-setting processes, promote Canadian representation on bodies and specifically target some standards areas where we will take a leadership role. Moreover, the Table calls for enhanced support for Canadian clean technology firms, which may be early-stage, to play technical advisory roles within standards forums.

TRACKING SUCCESS

By 2025, clean technology's contribution to Canada's GDP will grow to nearly \$80 billion from \$26.7 billion in 2016.

PROPOSAL

Grow jobs by expanding skills development and enable meaningful diversity and inclusiveness target-setting though increased access to data

The transition to a clean-growth economy will create new opportunities and jobs in Canada's traditional resource sectors. Clean technology development is a driver of high-skill, high-wage, knowledge-based jobs, and the low-carbon economy offers an opportunity for Canadians to transition to new roles and growth opportunities. Existing government and private-sector initiatives need to be expanded to prepare the workforce for new opportunities.

“Clean technology is a global issue. Canada has diversity and we can use our openness to come together and create solutions—this is our brand.”

WHY THIS MATTERS

Clean technology companies face many of the same challenges finding and hiring skilled workers as other STEM-related fields. That said, clean technology companies face a particularly short supply of talent experienced and skilled in entrepreneurship, business development, finance, advocacy, risk management and forecasting—all of which are needed to transition a company from start-up to commercialization and scale up.

WHAT WE RECOMMEND

The Table endorses the skills signature initiative and calls for the expansion of existing government and private-sector initiatives to prepare the workforce for opportunities in clean technology. This can be done by:

Develop a reskilling and lifelong learning strategy

Clean technology entrepreneurs note the need for well-rounded workers trained in technical, business, financial and softer skills like critical thinking, relationship building and communication. The Future Skills Centre and the Sectoral Initiative Program could help

reduce talent shortfalls and ensure meaningful career opportunities for workers in clean technology and other new high-growth economic sectors.

Activities could include expanding the role of environmental certifications for professionals and companies to raise the profile of clean technology careers, collaborating with the Future Skills Centre to identify skills sought and required, and incorporating business skills training (e.g., intellectual property, marketing) into government programming for late-stage research and development and early-stage commercialization companies.

The [Business/Higher Education Roundtable](#) could be encouraged to work with educational institutions to co-develop curricula to support a clean technology career path, and school children could be made more aware of clean technology careers.

A multidisciplinary approach to skills training, including adding an arts element to STEM programs, would help ensure that clean technology entrepreneurs, workers and students have the broader skillset clean technology activity needs.



INCREASING ACCESS TO LABOUR MARKET INFORMATION AND DATA

This may involve:

- Increasing the availability of information on the labour market, including data on clean technology/environmental jobs and skills, and about federal, provincial and territorial government programs that are relevant to jobs and skills development
- Adding Employment and Social Development in the Clean Growth Hub to raise awareness of these programs to companies, particularly to SMEs who may not have the capacity to access the information they need to grow their workforce
- Expanding the Labour Market Information Bank to include skills and knowledge applicable to careers in clean technology
- Encouraging incubators and accelerators to play a central role in helping smaller companies with fewer resources gain access to valuable market intelligence so they can grow their companies and fill their employment needs
- Examining global best practices to identify what works



LEARNING ON THE JOB

Initiatives to support the expansion of work-integrated learning programs could include:

- Scaling up existing programs such as [Venture for Canada](#), [Collaborative Research and Training Experience \(CREATE\)](#), [Student Work Placement Program](#), [Lazaridis Scale-Up Program](#), [the Industrial Research Assistance Program](#), [Futurpreneur Canada](#), [Mitacs and its “Career Connect” stream](#), and the [Colleges and Institutes Canada Clean Technology Internship](#)
- Opening streams of these programs for workers to re-skill, and provide a venue to learn and apply their newly acquired skills so they can succeed in the clean-growth economy
- Adding new eligibility criteria for these programs to promote an inclusive and diverse workforce

Endorsing and expanding work-integrated learning programs

Work-integrated learning programs give students the business, financial, technical and market skills they need to transition to the workforce full time. Clean technology firms and entrepreneurs have stressed the need to give students the opportunity to train in a formal work environment, develop a well-rounded skill set (i.e., strategic thinking, problem solving, teamwork), and prepare to transition into the workforce. These programs also accrue benefits to clean technology firms—at any stage in their evolution—by supplying a stream of talented workers, and encouraging them to consider a clean technology career path.

Make labour market information more available to clean technology entrepreneurs

Clean technology companies need better access to resources that will help them hire and make informed business decisions. SMEs in particular may not have the capacity to access the resources they need to grow their workforce. The industry requires increased availability of labour market information, data on clean technology/environmental jobs and skills, and government (federal and provincial/territorial) programs relevant to jobs and skills.

Increase the participation of underrepresented groups

Underrepresented groups will be essential in alleviating the shortage of skilled workers. Given current commitments to and broad support of diversity and inclusiveness, there is an opportunity to expand recruitment and promotion from underrepresented groups, including Indigenous people and women.

Attracting and retaining this talent may require a cultural shift as well as concerted efforts and increased support to ensure that we have a diverse workforce at all levels, including leadership and executive roles. Encouraging their participation would require increased support for those who want jobs in clean technology.

Increase access to data on diversity and inclusiveness

Promoting greater participation by underrepresented groups is imperative in creating an effective clean technology workforce. Metrics on inclusivity and diversity must be established to better understand our current baseline and to enable meaningful target setting. Initiatives in Budget 2017 and Budget 2018 can be leveraged—namely the Clean Technology Data Strategy and the Centre for Gender, Diversity and Inclusion Statistics.

“We can demonstrate to the world a unique Canadian brand that is ambitious, will generate economic value and can help mitigate our greatest environmental challenges.”

■ CONCLUSION

We are at a critical juncture for Canada and its clean technology activity. We have a unique opportunity to deploy innovative Canadian clean technologies to help address the defining issue of our time—climate change—while generating significant economic and societal benefits. Few sectors have opportunities like this: to advance economic, social and environmental imperatives all at the same time.

While steady progress has been made toward transitioning to a clean-growth, low-carbon economy, significant barriers remain. These must be resolved to fully capture the economic potential of Canada's clean technology. Clean technology solutions will drive transformative growth and innovation while reducing harmful impacts on people, climate, water, land and air. At the same time, these technologies will create valuable, highly skilled and knowledge-based employment opportunities across the country and across economic sectors.

We already have much of what it takes to position Canada as a global leader in clean technology, including a strong research ecosystem, a world-ranging immigration base and a passionate, entrepreneurial workforce. The proposals we've put forward are needed to realize our potential and push the development and adoption of clean technologies at home and abroad.

Canada has clean technology solutions that the world needs. We must embrace this opportunity to build a diversified, prosperous, sustainable and low-carbon economy that will protect the environment and create wealth for generations to come.

CLEAN TECHNOLOGY KEY PERFORMANCE INDICATORS FOR 2025

| Proposed target | Background | Rationale |
|--|---|---|
| By 2025 Canada, will move into a top-three ranking in the Global Cleantech Innovation Index, up from fourth overall (2017). | Canada currently ranks fourth, behind Denmark, Finland and Sweden (2017). In 2014 Canada ranked seventh. | <ul style="list-style-type: none"> Global metric with rankings updated every few years. Ranking explores where entrepreneurial clean technology companies are most likely to emerge from over the next 10 years. Global Cleantech Innovation Index was released in 2017 in partnership with World Wide Fund for Nature (WWF), United Nations Industrial Development Organisation (UNIDO), Asian Development Bank (ADB), Swedish Energy Agency (SEA) and Tillväxtverket. |
| By 2025 Canada will rank in the top fifteen, up from thirty-eighth (2017–18) for Burden of Government Regulation in the World Economic Forum Global Competitiveness Index. | Canada currently ranks thirty-eighth out of 137 countries for Burden of Government Regulation in the World Economic Forum Global Competitiveness Index. | <ul style="list-style-type: none"> Globally recognized metric with consistent standards, rankings are updated annually. Undue regulatory burden harms the ability of businesses to succeed, expand and locate in Canada, especially when competing internationally with those firms situated in countries where the burden is less. |
| By 2025, federal expenditures on clean technology procurement will rise to 5% of total spending from 3.74% of total spending in 2016. | Current baseline for the Government Gross Fixed Capital Formation (Capital Investment) is \$323.4 million or 3.74% of government investment in clean technology for 2016. | <ul style="list-style-type: none"> Direct measure of federal procurement of clean technologies. Data source: Statistics Canada. Environmental and Clean Technology Products Economic Account. |
| By 2025, clean technology's contribution to Canada's GDP will grow to nearly \$80 billion from \$26.7 billion in 2016. | Current baseline of \$26.7 billion (2016) for contribution of clean technology to GDP. The average annual growth rate is 3.4% per year since 2007; to reach \$80 billion by 2025, an average growth rate of 13% per year is required. | <ul style="list-style-type: none"> Authoritative statistic. Average historic growth rate 4.2%. Data source: Statistics Canada. Environmental and Clean Technology Products Economic Account. |

CLEAN TECHNOLOGY TABLE MEMBERS

Chair

Audrey Mascarenhas, Questor Technology

Members

Andrée-Lise Méthot, Cycle Capital Management

Annette Verschuren O.C., NRStor

Christofer Mowry, General Fusion

Daryl Wilson, Hydrogenics Corporation

David Isaac, W Dusk Energy Group

Jodi Glover, RealTech

Judi Hess, Copperleaf Technologies

Karen Hamberg, Westport Fuel Systems

Malini Giridhar, Enbridge Gas Distribution

Marvin DeVries, Trojan Technologies

Mike Andrade, Morgan Solar

Pierre Rivard, Tugliq Energy

Robert Niven, CarbonCure Technologies

Tom Rand, Arctern Ventures