



JUMP ON IN

The Role of Energy Innovation Sandboxes in Getting to Net-Zero

OCTOBER 26, 2021

QUEST



POLLUTION PROBE
CLEAN AIR. CLEAN WATER.

ACKNOWLEDGEMENTS

Co-authors

Richard Carlson, Pollution Probe
Aïda Nciri, QUEST

Project Team

Richard Carlson, Pollution Probe
Mariana Eret, Pollution Probe
Emily Finstad, QUEST
Laura Gareau, QUEST
Sabah Ibrahim, Pollution Probe
Aïda Nciri, QUEST
Eric Timmins, QUEST
Ericka Wicks, QUEST

Main Editor

Eric Timmins, QUEST

Editors

Mariana Eret, Pollution Probe
Emily Finstad, QUEST
Sabah Ibrahim, Pollution Probe

Design and Layout

Sabah Ibrahim, Pollution Probe

Project Supporters

Suncor Energy Foundation

Project Partners

QUEST
Pollution Probe



About QUEST

QUEST is a national non-government organization that works to accelerate the adoption of efficient and integrated community-scale energy systems in Canada by informing, inspiring, and connecting decision-makers. QUEST undertakes research, communicates best practices, convenes government, utility, private-sector and community leaders, and works directly with local authorities to implement on-the-ground solutions. QUEST grounds all its activities in the “Smart Energy Community”– a concept that encapsulates the ideal end state of the organization’s work.



About Pollution Probe

Pollution Probe is a national, not-for-profit, charitable organization which is improving the health and well-being of Canadians by advancing policy that achieves positive, tangible environmental change. It is a leader in building successful partnerships with industry and government to develop practical solutions for shared environmental challenges.

Copyright © QUEST - Quality Urban Energy Systems of Tomorrow and Pollution Probe Foundation, 2021.

These materials may be reproduced in whole or in part without charge or written permission, provided that appropriate source acknowledgements are made and that no changes are made to the contents. All other rights are reserved.

The analyses/views in these materials are those of QUEST and the Pollution Probe Foundation, but these analyses/views do not necessarily reflect those of QUEST or Pollution Probe Foundation affiliates (including supporters, funders, members, and other participants) or any endorsement by QUEST or Pollution Probe Foundation affiliates.

These materials are provided on an “as is” basis, and neither QUEST, the Pollution Probe Foundation, nor their affiliates guarantee any parts or aspects of these materials. QUEST, the Pollution Probe Foundation, and their affiliates are not liable (either directly or indirectly) nor accept any legal responsibility for any issues that may be related to relying on the materials (including any consequences from using/applying the materials’ contents). Each user is solely responsible, at the user’s own risk, for any issues arising from any use or application of the materials’ contents.

TABLE OF CONTENTS

ii	ACKNOWLEDGEMENTS
1	ACRONYMS
1	EXECUTIVE SUMMARY
2	1. THE SHIFT TO NET ZERO: THE NEED FOR INNOVATION
3	2. THE ICEBERG OF LOW-CARBON INNOVATION
10	3. THE ROLE OF INNOVATION SANDBOXES IN REMOVING BARRIERS
14	4. KEY CONSIDERATIONS FOR CREATING AN INNOVATION SANDBOX



ACRONYMS

DER	Distributed Energy Resources
ESG	Environment, Social and Governance
GHG	Greenhouse Gas
ZEV	Zero-Emission Vehicles

EXECUTIVE SUMMARY

This report is part of the multi-year Innovation Sandbox Initiative¹ led by QUEST and Pollution Probe. During the first two years of the initiative, we published two reports highlighting how Innovation Sandboxes could accelerate the deployment of low-carbon solutions.

The first report, *Enter the Sandbox: Developing Innovation Sandboxes for the Energy Sector*, conducted an international comparison of energy Innovation Sandbox-like initiatives deployed in 10 jurisdictions. The report provided a definition and highlighted the benefits of well-run initiatives. The report also highlighted key lessons and considerations to keep in mind when designing Innovation Sandboxes.²

Getting to Deployment: Bridging the Gaps in Energy Innovation in Canada, our second report, examined 10 energy innovation programs across Canada, and concluded that they were predominantly and disproportionately focused on technological R&D and demonstration and relied mainly on public funding. There were no major programs aiming at scaling up readily available technologies and removing structural barriers, such as by supporting new entrants to access and understand the regulatory landscape, collaboration and knowledge sharing, and real-world trialing. The report concluded that given their multiple benefits, Innovation Sandboxes can complement current innovation programs by accelerating the deployment of innovation and addressing non-technological barriers in Canada's energy sector. The report also outlined how Canada is no stranger to Innovation Sandboxes; in fact, several are already being used at the federal, provincial, and local governments levels in various sectors, such as in securities, agrifood, and transportation.³

This third report is a continuation of this research and focuses on Canada. It builds on previous report findings as well as a series of national and international workshops hosted by QUEST and Pollution Probe.⁴ Through innovative and interactive online facilitation techniques, the workshops engaged provincial, territorial and federal representatives from regulators and governments as well as utilities, consumers advocates, academics, civil society and expert consultants. These workshops brought 50 participants from 37 different organizations, as well as nine individual Canadian provincial and territorial jurisdictions together. The workshops were conducted under Chatham House Rule to promote open, candid discussion and protect participant identities and contributions.

We found that Innovation Sandboxes have the potential to overcome many of the structural barriers that are delaying the deployment of the low-carbon innovation that Canada will need to meet its net-zero targets.

1 See <https://questcanada.org/innovation-sandboxes-project/> and <https://www.pollutionprobe.org/energy/innovation-sandboxes-project/>

2 Richard Carlson and Aida Nciri (July 2020). *Enter the Sandbox: Developing Innovation Sandboxes for the Energy Sector*. Retrieved from: <https://questcanada.org/wp-content/uploads/2020/07/Innovation-Sandboxes-Report-1-EN.pdf>

3 Richard Carlson, Mariana Eret, Michael Lee, and Aida Nciri (November 2020). *Getting to deployment: Bridging the Gaps in Energy Innovation in Canada*, Pollution Probe and QUEST. Retrieved from: <https://questcanada.org/wp-content/uploads/2020/11/Innovation-Sandboxes-Report-2-EN-1.pdf>

4 The workshops were conducted in May 2021, therefore before a number of federal funding announcements, including the adoption of the Canadian Net-Zero Emissions Accountability Act to deliver on the Government of Canada's commitment to legislate Canada's target of net-zero greenhouse gas emissions by 2050.



1. THE SHIFT TO NET ZERO: THE NEED FOR INNOVATION

The future of Canada’s energy sector is at a crossroad and the federal target of reaching net-zero emissions by 2050 has shifted the debate. Innovation now has a clear and ambitious objective, yet the current pace at which change is occurring is far from sufficient. Innovation in the energy sector needs to generate transformational, large-scale change in a short period of time.

The reassuring news is that we already have readily available technologies that can dramatically reduce greenhouse gas emissions^{5,6} — the difficulty is in overcoming the “valley of death” when trying to move from demonstration to deployment. The challenge thus is to develop an adequate set of policies, programs and regulatory tools that would enable the deployment and scale up of available technologies so we can meet the net-zero target.

While funding is an important component, there is more a need to reduce the policy, institutional and regulatory barriers preventing deployment. Overcoming these barriers will require significant collaboration to navigate uncertainty, direct capital investment decisions, and ensure that unexpected outcomes do not harm consumers or the entire system.

To help identify barriers to the deployment of net-zero innovation in Canada, Pollution Probe and QUEST convened a National Workshop on Energy Innovation with policymakers, regulators, utilities, energy companies and academics. Our findings from these discussions emphasized the important role Innovation Sandboxes can play in helping Canada meet its targets.

5 Canadian Institute for Climate Change (2021). Canada’s Net Zero Future. Retrieved from: <https://climatechoices.ca/reports/canadas-net-zero-future/>

6 International Energy Agency (2021). Net Zero by 2050: A Roadmap for the Global Energy Sector. Retrieved from: <https://www.iea.org/reports/net-zero-by-2050>

2. THE ICEBERG OF LOW-CARBON INNOVATION

Using an iceberg as a metaphor allows for the consideration of the root causes for the slow diffusion of low-carbon innovation and the transition to net-zero in Canada. The visible part of the iceberg represents a small fraction of the entire system, while what is hidden out of sight below the waterline are the primary influencers.

We can apply the same principle to low-carbon innovation in the energy system. The events and trends that we see, hear and talk about are driven by underlying structures such as policies, behaviours and practices that are often not visible or obvious, and yet create the conditions for the events and trends that occur. If we want to transition in Canada's energy system to net-zero at a scale and pace compatible with a 2050 timeline, we need to go beyond the events and trends observed above the water line — those that we see on a daily basis and that dominate the conversation — and investigate what is beneath the waterline. During Pollution Probe and QUEST's National Workshop on Energy Innovation in April 2021, we sought to delve below the waterline in order to understand what really needs to change to achieve net-zero.

2.1 ABOVE THE WATERLINE: THE VISIBLE TRENDS

What we see above the waterline are those events and trends that are clearly observed on a regular basis. These events, however, rarely give us opportunities to examine the reasons or underlying structures that created them, and acquiring a deeper understanding requires intent focus. The key trends in Canada's energy landscape as they relate to low-carbon innovation are (see Figure 1):

- 1. A continued gap between interest in a low-carbon economy and actual implementation by investors, the public and governments.** At the subnational level, more than 300 local governments across Canada (representing over 65% of the Canadian population) pledged to reduce their greenhouse gas (GHG) emissions by joining the Federation of Canadian Municipalities' (FCM) Partners for Climate Protection program.⁷ The emergence of green financing, and the increasing requirement for climate disclosure and carbon liability are putting stress on fossil fuels investment. Consumers increasingly want more control over their energy system and they are starting to consider related environmental impacts, as well as their perceptions of energy companies, and the protection of their data and privacy, which is threatened by the digitalization of the electricity system. At the same time, more households and companies are choosing to invest in low-emissions options.⁸
- 2. More competitive zero-carbon energy alternatives.** The economics have flipped and now low cost renewables are beginning to out-compete conventional fossil-fuel generation. In 2019, for example, more than half the renewable electricity capacity deployed globally provided electricity at rates lower than the cost of a new coal-fired power station.⁹ The cost declines have been impressive: between 2010 and 2020, costs for wind have fallen by 70% and solar by 90%. That

⁷ The Partners for Climate Protection is a program operated by FCM.

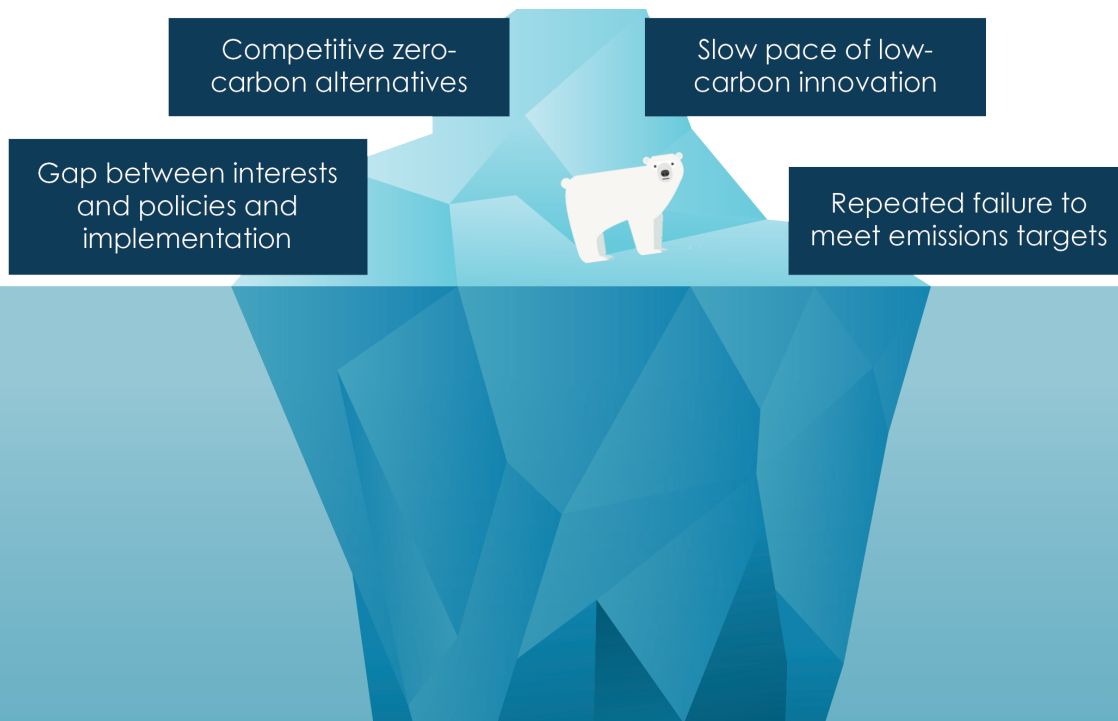
⁸ Deloitte (2019). Beyond the Energy Transition: When the demand side is demanding change. Retrieved from: https://images.content.deloitte.com.au/Web/DELOITTEAUSTRALIA/%7Be9dbf836-2492-49e8-9eca-204fee0676d3%7D_20191009-ene-inbound-beyond-energy-transition-report.pdf

⁹ International Renewable Energy Agency (June 2019). Renewable Power Generation Costs in 2019. Retrieved from: <https://irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019>

would make new renewable energy plants cost competitive to existing fossil fuel plants, depending on the location.¹⁰ In Canada, a recent report highlighted how renewable energy could provide the same services like natural gas plants at a competitive price.¹¹

- 3. Slow pace of diffusion of low-carbon innovation.** The pace and scale of the deployment of low-carbon innovation has been slow in Canada over the past decade. For example, consumption of fossil fuels has increased by 8% between 2005 and 2019¹² and the country has one of the lowest zero-emission vehicles (ZEV) penetration rates in the world.¹³ ZEVs represented only 3.5% of total new vehicles registered in 2020, with strong variations from one province to another.¹⁴
- 4. Repeated failure to meet GHG emission reduction commitments.** Canada has always failed to meet its international commitments to reduce GHG emissions. After missing the federal Canada Action Plan 2000 on Climate Change, the country is not on track to achieve its commitment made in 2015 to reduce GHG emission by 30% compared to 2005 levels by 2030, nor the updated target of 45% reduction by 2030. The adoption of an ambitious federal 2050 target of net-zero in 2021, as well as recent policies and programs (such as the ban on the sale of new internal combustion light duty vehicles from 2035), has changed the conversation. To meet that target, the scale and pace of change required in energy infrastructure has to be greater than just the incremental improvements we have seen to date. Utilities, regulators and policymakers will need to keep up with the rapid and in-depth transformation.

Figure 1: Above the waterline: The visible trends



10 Nick Schumacher, Victoria Goodday, Blake Shaffer and Jennifer Winter (November 2020). "Cheap Renewables Have Arrived," Energy and Environmental Policy Trends, The School of Public Policy, University of Calgary. Retrieved from: <https://www.policyschool.ca/wp-content/uploads/2020/11/Energy-Trends-Renewables-Nov.pdf>

11 Jan Gorski and Binu Jeyakumar (2019). Reliable, affordable: The economic case for scaling up clean energy portfolios, The Pembina Institute. Retrieved from: <https://www.pembina.org/pub/reliable-affordable-economic-case-scaling-clean-energy-portfolios>

12 Barry Saxifrage (July 16, 2020). "Global fossil burning breaks record in 2019: Canadians in top 1%," National Observer. Retrieved from: <https://www.nationalobserver.com/2020/07/16/opinion/global-fossil-burning-breaks-record-2019-canadians-top-1>

13 International Energy Agency (June 2020). 2020 Global EV Outlook 2020 Entering the decade of electric drive? Technology report. Retrieved from: <https://www.iea.org/reports/global-ev-outlook-2020>

14 Statistic Canada (2021). Zero-emission vehicle registrations down slightly in 2020. Retrieved from: <https://www150.statcan.gc.ca/n1/daily-quotidien/210422/dq210422e-eng.htm>

2.2 BELOW THE WATERLINE: THE HIDDEN STRUCTURE

As we continue with the iceberg model and go below the waterline, we discover hidden structures and invisible forces that explain the trends observed at the tip of the iceberg. Structures are the conditions that exist that serve to normalize the occurrence of the events or trends. Structures shape the relationships among actors in the system, they can be explicit or unspoken, and they show up in the form of policies, practices, norms, and power dynamics.

In the Workshops, participants identified structures that were slowing down the deployment of low-carbon innovation, and require immediate attention if Canada wants to transition its energy system to net-zero at a scale and pace compatible with a 2050 timeline, and in a cost effective manner. The six primary structures that were identified in the Workshop are (see Figure 2):

- 1. Lack of clear, consistent and long-term policies.** Part of the failure in meeting carbon emissions targets can be explained by the historical lack of strong leadership and the absence of strong and consistent climate policies and programs, or sometimes their reversal.¹⁵ Climate change targets have been recently changed.¹⁶ The 2016 *Pan-Canadian Framework on Clean Growth and Climate Change*, the *A Healthy Environment and a Healthy Economy* plan, adopted in 2021, and most recently the *Canadian Net-Zero Emissions Accountability Act* have set the track for more ambitious policies and programs, including a higher price on carbon, that have the potential to create the conditions to accelerate the diffusion of low-carbon innovation. But there is a general caution on whether or not these strengthened policies will be continued in future election cycles. There is also uncertainty on how the expected economic crisis related to COVID-19 will play out — as a catalyst of the transition through a green stimulus or a barrier with reduced expenses to address the deficit.

Some participants also noted a lack of policy alignment, suggesting that the federal government should set sectoral targets, such as net-zero electricity targets. Political leadership and consistency — at all levels: federal, provincial, territorial, and municipal — are essential to accelerate the rapid deployment of low-carbon innovation. Such leadership will help direct the actions of four major stakeholders who will shape this transition: regulators, utilities, private sector developers, and energy consumers. Regulators often need policy direction and support to consider climate objectives. Only with such direction, can they undertake the work needed to be more proactive in investigating the value of emerging business cases and models connected to the broader energy sector transformation. Utilities and new entrants need long-term visions, such as infrastructure and technology roadmaps, to inform their investments. Consumers need to trust that their interests are taken into consideration, which is only possible with strong policy leadership and opportunities to meaningfully engage.

“Governments need to articulate their path to net-zero to guide regulators, investors and other players.”

-Participant’s quote

“You see people doing incremental innovation and we are losing the sight of the big picture, we need to have bigger conversation making sure everyone acknowledges the order of magnitude required by innovation to reach the overall target.”

-Participant’s quote

“You need innovation with an angle in mind, the context here should be to get to net-zero by 2050, but it’s not an objective that is acknowledged by many governments.”

-Participant’s quote

¹⁵ For instance, Canada withdrew from the Kyoto Protocol in 2011 and adopted new commitment targets again only in 2015.

¹⁶ Office of the Auditor General of Canada (2019). Spring Reports of the Commissioner of the Environment and Sustainable Development: Report 3 and Report 4. Retrieved from: https://www.oag-bvg.gc.ca/internet/English/parl_cesd_201904_e_43295.html

2. Limited collaboration within and across jurisdictions and siloed planning. Canadian jurisdictions tend to do their work independently from one another, and not share ideas and lessons. Given all the critical changes that need to happen, all the players evolving in the energy sector, new and old, public and private, large and small, must work together and align their priorities. This is exacerbated through siloed energy planning in most jurisdictions, where electricity, thermal and transportation are considered separately. As such, collaboration is required within jurisdictions and between jurisdictions.

Yet, there is no mechanism to coordinate collaboration and knowledge exchange within provinces and territories, and bring together regulators, government agencies, energy utilities, innovators, consumer advocates and civil society to work on a shared vision and understanding of what needs to be changed and how, and identify common solutions. Similarly, there is no collaboration mechanism among provinces/territories and the federal government to share knowledge, and best practices. There is a strong need for improved national dialogue and cooperation so we can learn from one another. Beyond knowledge sharing, other expected outcomes resulting from more collaboration among jurisdictions and stakeholders mentioned by workshop participants include: preventing market fragmentation and aligning standards (such as around ZEVs); coordinating funding and investment priorities; collaborating on pilots and initiatives; developing shared recommendations and understanding of visions and required policy changes; and monitoring of funding programs outcomes.

“There is a lack of national communication channels among governments, regulators, utilities, innovators and consumers.”

-Participant’s quote

“There is a culture of secrecy around innovation and no one likes to share lessons.”

-Participant’s quote

“Relationships exist with utilities, consumers and stakeholders; however they don’t have relationships with each other. They need a go-between. We need some way to convene even if there are competing interests.”

-Participant’s quote

“There is not one body coordinating innovation or sharing knowledge across Canada, this could be improved to reduce duplication, improve funding.”

-Participant’s quote

3. Insufficient investments in the deployment of new infrastructure. The deployment of low-carbon innovation depends on the pace and scale to which capital will be directed toward the new infrastructure required by the net-zero transition.¹⁷ And it takes time and resources to deploy DERs, ZEV charging stations, deep retrofits and so on. Canada requires an investment of \$128 billion over the next 10 years to achieve the federal 2030 emission reduction target, with at least \$52.6 billion in the transportation sector, \$10.8 billion in the building sector and \$16.2 billion in the electricity sector.¹⁸ The Royal Bank of Canada sees the need for sustainable investing to increase dramatically, to \$70 billion a year from its current level of \$10 billion, if Canada is to meet its net-zero targets.¹⁹ Yet, “the role of financial markets in driving this change has yet to be fully leveraged.”²⁰

17 E. Larson, et al. (December 15, 2020). Net-Zero America: Potential Pathways, Infrastructure, and Impacts, interim report, Princeton University, Princeton, NJ. Retrieved from: <https://netzeroamerica.princeton.edu/the-report>

18 Simon Martin and Ryan Riordan (September 2020). Capital Mobilization Plan for a Canadian Low-Carbon Economy Smith School of Business, Queen’s University. Retrieved from: <https://smith.queensu.ca/centres/isf/research/cmp.php>

19 Colin Guidiman (August 16, 2021). “Why isn’t Canada investing enough in green projects, despite ambitious climate targets?,” RBC Thought Leadership. Retrieved from: <https://thoughtleadership.rbc.com/why-isnt-canada-investing-enough-in-green-projects-despite-ambitious-targets/>

20 Government of Canada (2019). Final Report of the Expert Panel on Sustainable Finance: Mobilizing Finance for Sustainable Growth, p iii. Retrieved from: https://publications.gc.ca/collections/collection_2019/eccc/En4-350-2-2019-eng.pdf

Key factors slowing investment in new infrastructure include:

- **The role of legacy infrastructure:** There is still uncertainty about the potential for current energy infrastructure to be repurposed for the transition or whether there will be stranded assets. In addition to the ability of the infrastructure, divestment trends and increasing interest in impact financing^{21,22} may quickly change the landscape of infrastructure financing.
- **Institutional legacy and perception of risk:** The main perception from workshop participants is that the energy sector is a risk-averse sector. We heard that the current regulatory and policy framework tends to reward “trusted and tested” solutions rather than encouraging investment in new infrastructure and technologies, which are perceived as more risky. Also, there is no mandate for regulators to encourage investment in innovation.
- **Uncertain transformation of business-models and services:** The capacity to scale up innovation depends on the capacity to test and introduce new business models and new services. This capacity is limited by different factors, including how rate structures are designed, how access to the grid and the energy market is conducted, and how consumers will be impacted. The development of new business models will also depend on infrastructural pathways to net-zero: will the energy systems stay centralised and continue to develop large-scale projects relying on large upfront capital, or will it be decentralized and rely on less capital-intensive infrastructure? Will it be a sector relying on monopolies or large dominant utilities or will it allow for a fragmented landscape with multiple actors?

“It’s a lot of a smoke screen — you have to think about how utilities make money because we have for-profit utilities and they make money by putting steel in the ground. If utilities start engaging in innovation — they will likely lose money if there is no incentive to pursue new business models.”

-Participant’s quote

4. **Out-of-date regulations and the need for revised mandates:** There is general agreement that innovation in energy regulatory decision-making is needed in Canada due to changing special demands, the need to improve decision-making efficiency and changing economic interests.²³ Fortunately, most regulators recognize the need to be part of the energy transition, and highlight their ability to complement the policy-making processes through independent regulatory reviews. However, generally speaking, they are rarely given the resources or mandate to do so, leading to a potential misalignment between governments’ net-zero policy and the incumbent regulatory landscape. At the same time, there is a need for regulatory modernization. For decades, energy regulators have been mandated to focus on economic regulation. Yet this economic lens makes it difficult to consider and include in regulatory decisions, the transition to net-zero energy systems and non-energy benefits, such as environmental, climate and social considerations. As an example, there is no regulator in Canada that has in its mandate that it must work towards cost-effective decarbonization. This can make it difficult for some regulators to promote innovation, or to develop new assessment tools and decision-making frameworks that include the transition to a net-zero energy system. Regulatory mandates will thus need to be modernized and expanded. While regulatory independence is key, workshop participants noted that there were ways to change the scope without jeopardizing their independence.

21 The Bank of Canada recently joined the steering committee of the Network for Greening the Financial System, a climate-focused group of more than 80 central banks.

22 Ottawa is expected to establish a Sustainable Finance Action Council this year to work on ESG standards.

23 Patricia Larkin (July 2021). What Works: Identifying and Scaling up Successful Innovations in Canadian Energy Regulatory Decision-Making, University of Ottawa Positive Energy. Retrieved from: https://www.uottawa.ca/positive-energy/sites/www.uottawa.ca.positive-energy/files/what_works_identifying_and_scaling_up_web_final.pdf

“Regulators are generally economic regulators, but there are other areas where they can be powerful, e.g. they can set up incentives to promote clean energy. But if the government doesn’t empower them, if it doesn’t formally ask them — it’s not in their scope and they can’t be blamed later.”

-Participant’s quote

“Regulators don’t have the mandate to say this is a problem or this is the solution we propose. It is about waiting for someone to bring a problem to regulators.”

-Participant’s quote

“Part of this conversation needs to be played out on the policy side, they need to decide that regulators have to help with achieving the target and regulators will find a way to do it, but you need to empower the regulators.”

-Participant’s quote

5. Inadequate support for new entrants to the energy sector and the need for more inclusivity:

Decarbonization and low-carbon generating and smart grid technologies come with significant change in who is able to participate in energy systems. These new entrants can bring new technologies and innovative solutions that are ready to play a role in the net-zero transition but they need support to understand the existing regulatory landscape, access capital, and test new business models and services. Participants noted that energy regulators, utilities and policymakers need to make the energy systems more accessible, inclusive, and reflective of the increasing diversity of players and actors. This could be achieved by adapting proceedings and consultations, and developing new channels of communication to include new entrants’ specific needs and stances.

“Energy regulators are very transparent. They post all information on their website. What is challenging is to make sense of it, and to make sure it is accessible and legible to everyone.”

-Participant’s quote

“Such discussions tend to be very limited as the same group of people talks to each other. So they (policy-makers and regulators) have to be inclusive.”

-Participant’s quote

- 6. Lack of consideration on changing consumer preferences:** Participants acknowledged that consumers should be central to every decision and may drive innovation as they have the opportunity to become prosumers and control their energy demand such as through smart demand response, storage or even DERs to reduce costs or even make money. There were also concerns with consumers not being well educated on some emerging innovations, especially on ZEVs and DERs, and the need to bring consumers along to ensure their reliability and affordability needs continue to be met. But how consumers will be central is not clear. It is perceived that the way energy utilities, policy makers and regulators will engage with consumers will change their behaviors and the adoption of innovation. While consumers can potentially play a more active role in the energy market, there is an uncertainty on whether they will seize this opportunity and to which extent. There was also a recognition that the potential increasing roles of consumers and the digitalization of the energy systems also raise issues about consumers’ privacy and the use and control of their personal data.

Figure 2: Below the waterline: The hidden structures

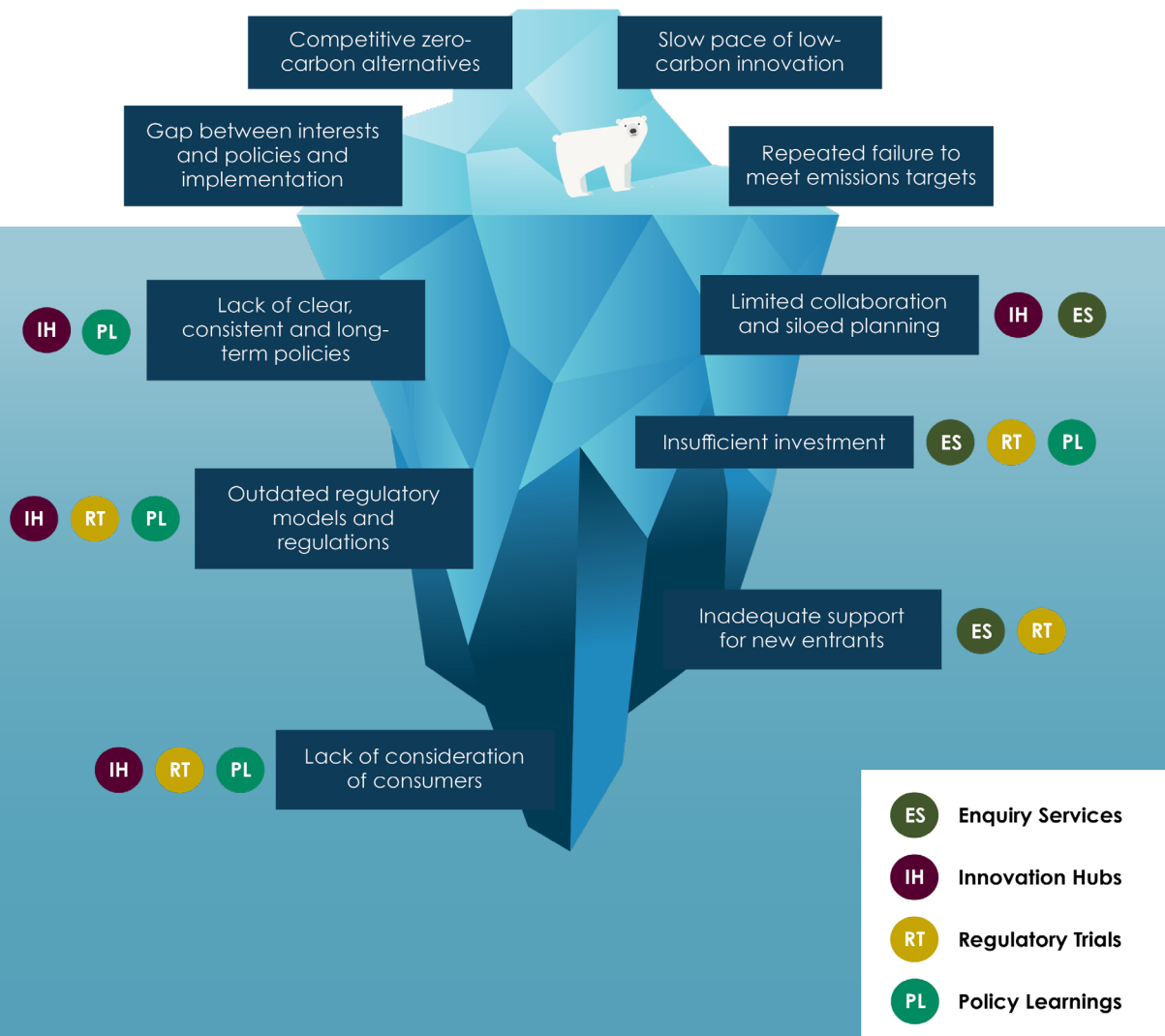


3. THE ROLE OF INNOVATION SANDBOXES IN REMOVING BARRIERS

Innovation Sandboxes are not new in Canada, and they have been used in a number of sectors, primarily in FinTech (see Box 1). Ontario developed the first energy-specific Innovation Sandbox in Canada, but elements of sandboxes can be found in other energy innovation programs throughout the country.²⁴ There is significant interest in using Innovation Sandboxes in the energy sector internationally as well, and Canada has been involved in international dialogues.²⁵

What we heard from participants was that Innovation Sandboxes can play an important role in accelerating the net-zero transition of Canada’s energy systems. Participants stressed that the four tools included in Innovation Sandboxes can promote collaboration to efficiently and cost-effectively reduce the structural barriers to net-zero innovation identified above (see Figure 3).

Figure 3: How Innovation Sandboxes can help with structural barriers to innovation in Canada



24 Richard Carlson, Mariana Eret, Michael Lee, and Aida Nciri (November 2020). Getting to deployment: Bridging the Gaps in Energy Innovation in Canada, Pollution Probe and QUEST. Retrieved from: <https://questcanada.org/wp-content/uploads/2020/11/Innovation-Sandboxes-Report-2-EN-1.pdf>

25 Richard Carlson and Aida Nciri (June 14, 2021). From Consensus to Action: How to Transform Canada’s Energy System. Retrieved from: <https://questcanada.org/project/from-consensus-to-action-how-to-transform-canadas-energy-system/>

Box 1: Innovation Sandboxes 101

Innovation Sandboxes promote innovation in a broad sense. Technological innovation, such as new technologies, or an innovative method of deploying or integrating new or existing technologies, is only one aspect of innovation. Most of the focus of Innovation Sandboxes is on other aspects of innovations, such as new business models, services and practices.

Innovation Sandboxes combine four tools that address regulatory, policy, and procedural barriers to innovation (see figure below). Jurisdictions can choose among the tools, selecting those that meet their specific needs and will help to achieve the desired outcomes.

INNOVATION SANDBOXES

INNOVATION HUBS

- Places of collaboration among diverse stakeholders
- Assistance to conduct trials under existing rules
- Knowledge exchange and information sharing to ensure transparency
- Pathway to other tools

ENQUIRY SERVICE

- Customized guidance to help innovators navigate the system and overcome perceived barriers
- Written assurance that the project does not raise compliance concerns

REGULATORY TRIALS

- Time-bound derogation or exemption to existing rules for specific trials
- Development of new rules or changes to existing rules
- Formal and publicly available assessment and evaluation
- Only used when necessary

REGULATORY AND POLICY LEARNING

Results and outcomes will be used by regulators, policymakers and others to inform discussion on the future of energy transition

- **Innovation Hubs** employ collaborative tools or platforms that enable knowledge exchange and sharing of lessons learned amongst innovators, and general information about regulatory systems for conducting trials.
- **Enquiry Services** provide innovators with more specific information relevant to their particular idea. For instance, innovators may have informal discussions with the Innovation Sandbox administrator and have ideas assessed. This may help to uncover situations where ideas may be permissible within existing regulations, in other words, if the regulatory barrier is more perceived than actual. Alternatively, an assessment may identify real regulatory barriers and if a Regulatory Trial is needed. It should be noted that this does not replace legal advice.

- **Regulatory Trials** may be used in cases where an innovative idea faces a real regulatory barrier. Time-bound exemptions and derogations from regulations (such as licensing requirements, reporting requirements, etc.) may be applied to enable a trial under specific conditions. The length of exemptions and derogations varies, often case-by-case, and can last two years (as was the case in the UK) or up to 10 years (as is the case in the Netherlands), with possibilities for extension. Ensuring customer protection underlies all approvals for experiments under regulatory trials, with potentially impacted customers and risk identified, and mitigation and exit strategies in place. Additionally, regulatory trials come with a series of criteria that determine who and how one is eligible to enter that experimental space. These criteria include the area of the systems that experiments will be deployed in, the geographical scope of the experiments, eligible participants, and monitoring and regular reporting requirements to sandbox administrators.
- **Regulatory and Policy Learning** should be taken from all other elements — Innovation Hubs, Enquiry Services, and Regulatory Trials — and be used to inform longer-term policies and regulatory processes. Using real-world information would allow regulators, policymakers and other stakeholders to better prepare for the future of energy in their jurisdiction.

Well-run Innovation Sandboxes have five benefits. They:

1. Can help remove non-technological barriers to innovation.
2. Value learning-by-doing to remove perceived barriers and create pragmatic and practical change.
3. Protect consumers.
4. Can flexibly work with different forms of energy.
5. Promote collaboration to identify problems and frame solutions.

Source: Richard Carlson and Aida Nciri (July 2020). *Enter the Sandbox: Developing Innovation Sandboxes for the Energy Sector*. Retrieved from: <https://questcanada.org/wp-content/uploads/2020/07/Innovation-Sandboxes-Report-1-EN.pdf>

Participants noted that by offering a combination of versatile services (see Table 1), Innovation Sandboxes can help durably reduce ongoing structural barriers to innovation. Another highlighted benefit of Innovation Sandboxes is that by creating a space for collaboration on possible solutions, they can contribute to developing clear and consistent long-term policies that inform low-carbon, programs and technological pathways.

Innovation Sandboxes will thus be crucial if Canada is to meet its 2050 net-zero targets in an equitable and efficient manner, allowing jurisdictions to continue to meet long-established regulatory goals while ensuring that there is space for needed modernization. They can complement other policy tools such as carbon pricing, standards, and regulatory bans, thus creating conditions to explore solutions that scale up low carbon innovation.

Table 1: How Innovation Sandbox services can address structural barriers to innovation

Innovation Sandbox tools	Structural barriers to innovation	Innovation Sandbox services can
Innovation Hubs	<ul style="list-style-type: none"> • Lack of clear, consistent and long-term policies • Lack of collaboration • Limited collaboration and siloed planning • Outdated regulatory models and regulations • Lack of consideration of consumers 	<ul style="list-style-type: none"> • Foster collaboration, both within the energy sector, across jurisdictions, and with other players outside the energy sector • Allow for more holistic solutions that break down the energy planning siloes and allow for integration of electricity, thermal and non-regulated energy, such as transportation • Provide a safe space for open dialogue among policy makers, regulators, industry and new entrants • Provide an opportunity to identify problems and solutions that are overlooked or neglected • Prevent market fragmentation and support standard alignment (eg, interconnection standards, EV charging, etc) • Promote Policy Learning from the collaboration and information sharing
Enquiry Services	<ul style="list-style-type: none"> • Limited collaboration and siloed planning • Insufficient investment • Inadequate support for new entrants 	<ul style="list-style-type: none"> • Encourage collaboration and conversation among regulators, policy makers and other participants • Increase the capacity of new entrants to more easily enter the energy sector • Provide a platform to coordinate funding and help identify market opportunities for regulated and unregulated energy companies • Identify specific barriers and problems to innovation that can inform Policy Learning and the design of Regulatory Trials • Identify barriers and problems to low-carbon innovation outside the energy sector
Regulatory Trials	<ul style="list-style-type: none"> • Insufficient investment • Outdated regulatory models and regulations • Inadequate support for new entrants • Lack of consideration of consumers 	<ul style="list-style-type: none"> • Make regulators comfortable with proposed changes • Allow regulators (utility, market or other) to try out new approaches and rate structures to the “tried and trusted” • Help regulators develop new assessment frameworks and decision-making tools aligned with decarbonization objectives for regulatory analyses • Allow for identification of issues, barriers and problems, and to test innovation outside formalized regulatory proceedings • Include non-regulated energy sources for a more holistic evaluation of energy innovation
Policy Learning	<ul style="list-style-type: none"> • Lack of clear, consistent and long-term policies • Insufficient investment • Outdated regulatory models and regulations • Lack of consideration of consumers 	<ul style="list-style-type: none"> • Identify which types of projects succeed or fail, and why, and highlight areas where policy, regulatory or market changes are required • Include feedback from Innovation Hubs, Enquiry Services and Regulatory Trials to inform policy, regulatory and market changes and decision making processes • Improve design and allocation of incentive programs to better meet government targets • Be used to experiment and test an array of innovations in the short term, and identify and select solutions to deploy in the medium and long term

4. KEY CONSIDERATIONS FOR CREATING AN INNOVATION SANDBOX

An equitable and a fair transition is a planned transition. This is true for the policies and tools used to transition Canada to its net-zero future. As such, the following considerations are key to setting up a successful Innovation Sandboxes:

- 1. Collaborative design:** To be effective and meaningful, it is important that the objectives of the Innovation Sandbox, including the barriers it aims to address, are clearly identified in a collaborative and inclusive way, as objectives and barriers could be different for diverse stakeholder groups and organizations.
- 2. Identify administrative elements:** A body has to run the Innovation Sandbox, and they will need adequate resources and capacity to do that effectively. While regulators tend to be seen as the natural “administrator” of Innovation Sandboxes, that may not always be the case. Internationally, there are examples of industry associations and innovation funding organizations tasked with IS administration. Regardless, it is important that the body in charge has a clear mandate and sufficient resources to operate the Innovation Sandbox, and that this body is seen as unbiased to ensure transparency and that a learning process is in place.
- 3. Establish a holistic cost-benefit framework:** Existing regulatory measures tend to only consider economic costs and benefits, while environmental and social considerations are generally excluded. A transparent framework for evaluating all costs and benefits is required for a holistic analysis of what should be prioritised and the trade-offs that may be acceptable.
- 4. Innovation Sandboxes are efficient when they complement other low-carbon policy tools:** The issues and barriers slowing down the diffusion of low-carbon innovation in energy systems do not always come from energy policy and regulation. In some cases, other regulators, industry association standards or market agreements can slow down innovation in the energy sector. This is why coordinating with other government initiatives and bodies, and the private sector is important. In addition, Innovation Sandboxes alone cannot promote low-carbon innovation. They need to be complemented with transformative/structural policies, such as sound carbon pricing and regulatory policy (e.g., coal phase out, ban on the sale of internal combustion engine vehicles, and stringent fuels standards).
- 5. No two Innovations Sandboxes are alike:** In this paper we identified general structures that were seen to be slowing down low-carbon innovation in Canada. Canada’s energy systems however are diverse and mainly driven by provincial/territorial policies and energy mix. As a result, the structures that are slowing down innovation may differ in different jurisdictions.

As our multi-year Innovation Sandbox Initiative progresses, the next phases will build on these results and work to apply them at a more granular level by working with selected provincial and territorial jurisdictions throughout 2022. In collaboration with these jurisdictions, the project will shift focus to the development of tailored Innovation Sandbox frameworks that consider the unique context of provincial and territorial energy systems.

One such jurisdictional workshop was conducted September 2, 2021, to inform the renewal of the Ontario Energy Board’s (OEB) Innovation Sandbox, launched in 2019. QUEST and Pollution Probe hosted an interactive workshop that brought diverse players in Ontario’s energy sector together, and provided the OEB with specific recommendations with respect to Ontario’s specific context. The recommendations provided to the OEB are now publicly available, and work with additional jurisdictions in 2022, will similarly consider local contexts and leverage existing initiatives or opportunities.²⁶

²⁶ Pollution Probe and QUEST (September 28, 2021). A State of Renewal: Ontario’s Innovation Sandbox. Retrieved from: <https://www.pollutionprobe.org/wp-content/uploads/2021/09/A-State-of-Renewal-Ontarios-Innovation-Sandboxes.pdf>