TAKING THE NEXT STEP: Nova Scotia's Innovation Sandbox Framework

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QUEST

Pollution Probe

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About QUEST Canada
QUEST Canada is a national non-profit that supports communities in Canada on their pathway to net-zero. Since 2007, we've been facilitating connections, empowering community champions and influencing decision-makers to implement efficient and integrated energy systems that best meet community needs and maximize local opportunities. We develop tools and resources, convene stakeholders and rights holders and advise decision-makers — all with the goal of encouraging and enabling communities to contribute to Canada's net-zero goals.

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.

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The Shift to Net Zero: The Need for Innovation

In April 2022, the federal government released its Emissions Reductions Plan, detailing how Canada intends to hit its target of at least a 40% reduction in GHG emissions by 2030. Developing the clean-tech industry and deploying innovation are key components of the plan.

Nova Scotia already has some of the strongest emissions reduction commitments among Canadian provinces. In addition to a legislated goal of reducing emissions 53% below 2050 levels by 2030 and achieving net-zero emissions by 2050, the province has also introduced the following targets:

- 80% of electricity on the provincial grid to be supplied by renewable energy by 2030
- Phase out coal-fired electricity generation by 2030
- 30% of new car sales to be zero-emissions by 2030, in addition to improvements in public and active transportation
- New government buildings to be net-zero, with commitments to reduce emissions from all government buildings

The provincial energy sector has clear and ambitious targets, yet the current pace at which change is occuring in the energy system is far from sufficient. We will need innovation to achieve our objectives.

The reassuring news is that we already have readily available technologies that can dramatically reduce greenhouse gas emissions[1,2]—the difficulty is in overcoming the so-called "valley of death" when trying to move from demonstration to deployment. While Nova Scotia and Canada have a history of energy innovation, current policies and programs in the energy sector are falling short. A recent report by Pollution Probe and QUEST Canada found that current policies and programs across Canada—including Nova Scotia—don't provide the necessary support to develop the new business models and services needed to introduce innovation and meet our net-zero targets.[3]

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[1] Canadian Institute for Climate Change (2021). Canada's Net Zero Future. Retrieved from: https://climatechoices.ca/reports/canadas-net-zero-future/

[2] 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

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

The challenge is to develop policies, programs, and regulatory tools that will enable the deployment and scaling of available technologies in order for the province to meet its emissions reduction targets. As part of a multi-year Innovation Sandbox Initiative, Pollution Probe and QUEST Canada are working together to understand how "Innovation Sandboxes" can help propel low-carbon innovation in the energy sector. This report is the outcome of two virtual workshops held with 23 energy-sector stakeholders in Nova Scotia during the summer of 2022, which explored the barriers to energy-innovation in the province, detailing the process of designing an innovation sandbox to overcome said barriers.

The introduction of Innovation Sandboxes into Nova Scotia's energy sector can mitigate against the potential risks associated with innovation, provide opportunities to safely learn about and trial new approaches, and reduce uncertainty. Innovation Sandboxes in the energy sector can also inform policy and regulatory changes, and enhance collaboration among diverse stakeholders.

This report provides background information on barriers to innovation and how Innovation Sandboxes could be used to overcome them, along with a framework containing key design elements for Innovation Sandboxes in Nova Scotia.

Overcoming Barriers to Innovation Deployment

In Canada, energy policy is mainly the purview of provincial and territorial governments and regulators. Research undertaken by Pollution Probe and QUEST Canada suggests that most of Canada's energy innovation policies are not adequate to ensure the rapid deployment of low-carbon innovation needed to achieve our national and provincial emissions reduction goals. By focusing predominantly on research, development, and the demonstration of emerging technologies, as well as relying primarily on public funding, policies and programs designed to encourage innovation in the Canadian energy sector have all but neglected the importance of deployment. Unlike research, development, and demonstration (which are technology-focused), the deployment of innovation is centered around integrating and managing new technology, changing perspectives and corporate cultures, building new competencies, filling skill gaps, inventing new business models, and re-envisioning how utilities are going to be run and managed.

Innovation Sandboxes are a set of policy tools that promote innovation in a broad sense; adopting new technology is only one aspect. Innovation Sandboxes focus primarily on innovation in business models and in the ways in which we use energy.

Innovation Sandboxes provide the opportunity to change how processes, procedures, policies, rules and regulations are applied in a controlled manner, with the ultimate goal of creating durable and lasting systemic changes that enable innovations that benefit the energy sector, consumers, and society. They create safe and controlled spaces for

innovation to be integrated into the energy system by examining real (and often perceived) barriers, as well as testing solutions in controlled, real-world environments. They allow for the development of new energy products, services, and business models that can survive without subsidies.

Innovation Sandboxes can complement existing innovation and climate policies and programs to help Canada's jurisdictions quickly and collaboratively transform their energy sectors to net-zero by overcoming non-technological barriers. They accomplish this by doing the following:

1. Increasing collaboration and knowledge sharing so that everyone in the sector can work together to reduce barriers.
2. Helping innovators navigate complex energy regulatory and policy landscapes.
3. Creating space for safe, real-world trials to test and demonstrate market readiness of new technologies or business models.
4. Using lessons from innovative initiatives and pilot projects to inform policy and regulatory changes, removing the social and economic barriers to innovation.

Canadian federal and provincial governments are no stranger to innovation sandboxes, which already exist in the financial technology sector in Canada. Programs that have sandbox-like elements have been developed in several sectors within Canada, including energy, as well as at the federal, provincial, territorial, and local government levels. The Ontario Energy Board—the the province's energy regulator—introduced Canada's first energy innovation sandbox in 2019 following feedback from those in the sector who expressed concern about regulatory barriers to innovation.[4] There is significant interest in using Innovation Sandboxes in the energy sector internationally as well, and Canada has been involved in international dialogues with regulators and international organizations.[5]

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

[5] Richard Carlson and Aïda 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/

What are Innovation Sandboxes?

Originating in the FinTech sector, Innovation Sandboxes have already been developed for the energy sector in many countries, primarily in Europe, with others in the process of developing more.[6]

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 achieve their desired outcomes.

Innovation Sandboxes

Innovation Hubs

- Places of collaboration among diverse stakeholders
- Assisance 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 assurances 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 in 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, policy makers, and others to inform discussion on the future of energy transition.

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[6] For more information, see report one from Pollution Probe and QUEST Canada, Enter the Sandbox: Developing Innovations Sandboxes for the Energy Sector, which looked at 10 jurisdictions that had developed or were developing innovation sandboxes: https://questcanada.org/wp-content/uploads/2020/07/Innovation-Sandboxes-Report-1-EN.pdf

• **Innovation Hubs** employ collaborative tools or platforms that enable knowledge exchange and sharing of lessons learned amongst innovators, as well as general information about regulatory systems for conducting trials.

• **Enquiry Services** provide innovators with more specific information relevant to their particular idea. For instance, they allow innovators to have informal discussions with the Innovation Sandbox administrator to have their ideas assessed. This may help to clarify situations in which ideas are permissible within existing regulations; in other words, where the regulatory barrier is more perceived than actual. Alternatively, an assessment may identify real regulatory barriers and help to determine whether 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 or reporting requirements) may be applied to enable a trial under specific conditions. The length of exemptions and derogations can vary, often determined on a case-by-case basis, and can last from two years (as has been the case in the UK) 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 risks identified, and mitigation and exit strategies put in place. Additionally, regulatory trials require criteria to be developed that determine who and how one becomes eligible to enter the experimental space. These criteria include where the experiment will be deployed, the type of energy source, and the requirements for monitoring by and regular reporting to sandbox administrators.

• **Regulatory and Policy Learning** should be taken from all other sandbox elements — Innovation Hubs, Enquiry Services, and Regulatory Trials — and used to inform the reform of existing policies as well as the development of new policies and processes. Using real-world information will allow regulators, policymakers, and other stakeholders to better prepare for the future of energy in their jurisdiction.

How we Design Innovation Sandboxes for Nova Scotia

There is no one way to design and run an Innovation Sandbox. Innovation Sandboxes are diverse in three ways, based on the following conditions:

1. **Who is creating and implementing them:** they can be developed by governments and regulators—in some cases, both—to pursue specific policy outcomes. Other examples of sandbox administration include a republic research body and an industry association.

2. **The energy sources they consider:** while the focus has tended to be on the electricity system, some include (or will be expanded to) natural gas. A few have also included transportation and electrical vehicles.

3. **The policy tools that are associated with them:** such as funding, data sharing, academic research, and even the design of regulatory trials, such as whether innovators approach them with ideas or if the administrator issues a call for potential projects on identified needs.[7]

Based on assessments conducted in a few jurisdictions, as well as results from initiatives already in place, we have identified six lessons below, to inform the development of future successful Innovation Sandboxes:

Lesson 1: Prioritize ongoing learning. A key purpose of Innovation Sandboxes is to create systems that encourage and foster innovation. To this end, it is important to ensure that what is learned from running them informs the development of future energy policies and regulatory initiatives.

Lesson 2: Prioritize collaboration, transparency, and knowledge sharing. Open collaboration and knowledge-sharing among all participants, including traditional and non-traditional energy players, encourages innovation.

Lesson 3: Establish a culture of innovation and leadership. Innovation Sandboxes can only be successfully designed and implemented when there is clear leadership and a culture of innovation within the organizations establishing them as well as support from policymakers.

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[7] Pollution Probe and QUEST Canada, Enter the Sandbox: Developing Innovations Sandboxes for the Energy Sector, https://questcanada.org/wp-content/uploads/2020/07/Innovation-Sandboxes-Report-1-EN.pdf

Lesson 4: Regulators will need to be included in the energy future. Regulators need to play key roles in Innovations Sandboxes if they are to be successful in facilitating innovation, and should be willing to work with potential new players in the energy sector by developing enquiry services and engaging net stakeholders in a different way. Non-energy traditional players are not always fluent in the regulator's language and often feel overwhelmed by the regulatory "machine." Regulators need to be open to rethinking the way they engage stakeholders in order to make the system accessible to new actors.

Lesson 5: Promote real innovation that protects and benefits consumers. Without proper guidelines and safeguards in place, innovation can lead to territorial and social fragmentation and inequality, and impact consumers' privacy and the protection of personal data. When developing guidelines for Innovation Sandboxes, the protection of consumers' needs to be a primary consideration. Successful Sandboxes clearly set up criteria that define genuine innovation, and put in place sound post-experiment evaluation mechanisms.

Lesson 6: Design Sandboxes based on desired outcomes. The objectives that an Innovation Sandbox is intended to achieve should dictate its design. There is no one model of an Innovation Sandbox that will work for all of the diverse jurisdictions across Canada. Every energy jurisdiction in Canada is unique, with its own mix of technologies, policies, and customer needs and desires. Developing effective Energy Innovation Sandboxes in Canada means developing specific sandbox frameworks tailored to individual jurisdictions, each of which incorporates the inputs and feedback from diverse stakeholders representing the entire energy system, including energy end-users, new entrants, utilities, regulators, and government.

Nova Scotia Opportunities and Barriers

Pollution Probe and QUEST Canada held two interactive workshops with energy stakeholders from Nova Scotia throughout the spring and summer of 2022. These workshops were designed to identify barriers to the deployment of low-carbon innovation in the province and inform the development of an Innovation Sandbox that could help meet the needs of Nova Scotia's energy sector.

During the first workshop, participants completed two facilitated exercises to identify and prioritize barriers to low-carbon innovation in the province's energy sector, as well as potential actions that could help overcome those barriers. During the second workshop, working with the barriers identified during the first session, participants engaged in collaborative exercises to determine the value proposition of Innovation Sandbox tools to Nova Scotia, as well as elements of a potential framework design.

In addition to the ambitious emissions reduction targets laid out in Section 1 of this report, three initiatives were identified that promote or enable innovation in Nova Scotia's energy sector: (1) the Innovation Justification Criteria, (2) Smart Grid Atlantic, and (3) the 2021 and 2022 amendments to the provincial Electricity Act (see Table 1).

Table 1: Current energy innovation policies in Nova Scotia

Policy	What was done	How it promotes innovation
Innovation Justification Criteria	In 2018, the NSUARB created an Innovation Justification Criteria. The criteria says that "innovation capital investments may be justified on the basis that they are reasonably expected to allow for testing before deployment at scale, provide valuable data and learnings, or aid in the development of business cases where applicable."	Providing clear criteria which will be used to assess proposed projects. Will assist utilities in understanding what they can propose to the regulator.
Smart Grid Atlantic	Smart Grid Atlantic is a four-year initiative of NS Power, NB Power and Siemens Canada, partially funded by the federal government. Projects in both provinces will test distributed energy resource technologies. The Innovation Justification Criteria (see above) was developed to determine whether the capital investment for the Smart Grid Atlantic pilot project was justified.	The Smart Grid Atlantic pilot is testing whether new software developed by Siemens can monitor and manage distributed energy resources (DERs) in a way that would increase grid reliability and reduce costs.

Policy	What was done	How it promotes innovation
Amendments to the Electricity Act	In 2021 and 2022, the provincial government amended the Electricity Act. The amendments allow consumers more choice over their supply, increase net-metering opportunities, allow for community-owned solar, and add consumer protection for net-metering.	Consumers were given more options for energy supply and production, which could allow for new business models to develop. In addition, the amendments demonstrate the government's commitment to clean energy innovation.

Despite these developments, workshop participants agreed that the pace of low-carbon innovation needs to be accelerated and the energy system needs to change for the province to meet its emissions reduction targets.

Below are the key barriers that workshop participants identified as limiting low-carbon innovation:

- **An outdated regulatory system:** the current provincial regulatory system was seen as inflexible and outdated because it embeds traditional roles, thereby limiting innovative projects by making it difficult (if not impossible) for new entrants to offer different services. Participants also identified that the regulatory system was confusing, with many current players uncertain of regulatory rules.

- **A lack of collaboration:** Opportunities for collaboration need to be better: not only expanded, but also given more structure and purpose to provide a platform for inclusive collaboration. This was seen as crucial to move projects beyond the 'eternal pilot' stage and allow for the scale-up of innovative initiatives.

A lack of policy certainty was also identified as a barrier to innovation by workshop participants—but they felt that it would be faster and easier to reform the regulatory system than to work through the legislative process.

An Innovation Sandbox for Nova Scotia

While Innovation Sandboxes can help any jurisdiction deploy the innovation needed to achieve a low-carbon future, each jurisdiction will require a different Sandbox suited to its own mix of technologies, policies, and customer needs and desires.

To facilitate the design of an Innovation Sandbox, the workshop participants answered a series of questions aimed at identifying some key features and characteristics that would tailor it to suit local needs.

What should be the objectives of the Innovation Sandbox?

Innovation Sandboxes need to be aligned with wider provincial policies on energy and emissions reductions. Innovation is only useful if there is a goal towards which people are innovating.

The primary objective of the Innovation Sandbox should be to promote the innovation energy systems that are needed to achieve Nova Scotia's provincial emissions reduction targets and to help the province move towards a net-zero energy system along the legislated timeline.

To achieve this objective, the Innovation Sandbox should be designed to reduce the two primary barriers to low-carbon innovation in Nova Scotia that were identified by workshop participants: (1) an outdated regulatory system and lack of flexible regulations, and (2) the absence of a mechanism to facilitate meaningful collaboration.

What Innovation Sandbox tools are needed?

Innovation Sandboxes contain four tools: (1) Regulatory Trials, (2) Innovation Hub, (3) Enquiry Services, and (4) Policy and Regulatory Learning (see text box on pages 4-5). Note that not all of these tools need to be included in every jurisdiction's Innovation Sandbox. Priority should be given to tools that will best reduce the barriers to low-carbon innovation relevant to the jurisdiction.

Based on input from workshop participants, the two Innovation Sandbox tools that could provide value to Nova Scotia are Innovation Hubs and Regulatory Trials. See below for more information about each prioritized tool:

- **Innovation Hubs:** A need was identified for an inclusive space for collaboration among diverse players in the energy sector. This collaborative opportunity needs to be structured and open so that all potential participants can benefit. The collaboration needs to be energy-sector wide, which can create other mechanisms for collaboration on specific issues, such as business models for storage or other upcoming disruptions.

- **Regulatory Trials:** A clear need was identified for flexible regulations, and for the ability to pilot new regulatory ideas in such a way that results could inform wider regulatory reform. Such trials should be inclusive and based on public-private collaboration.

Who should administer the sandbox and who should be included?

Most Innovation Sandboxes are administered by the energy regulator, but that is not always the case. In some jurisdictions, innovation agencies or industry groups run Sandboxes, sometimes in partnership with the regulator.

There was broad consensus among workshop participants that an Innovation Sandbox in Nova Scotia should not be administered by the regulator, as innovation is not part of its mandate. Though the regulator would need to be involved in the Regulatory Trials, it was felt that the Sandbox itself should be housed separately. One option suggested was to house it with the government. Another option would be with an NGO or innovation agency.

The process itself, particularly the Innovation Hub, should be inclusive and should include not only actors from the traditional energy sector but also diverse groups such as academics, civil society, consumer advocates, and new entrants. Given the role of the federal government in funding many innovation initiatives, it was suggested that they be included as well.

How will it operate?

Because Innovation Sandboxes aim to foster innovation, oversight requirements should not be burdensome, but transparency and openness need to be ensured.

To ensure that Innovation Sandbox is working to meet the needs of the jurisdiction, periodic reviews are required. Three years between full reviews was seen as an ideal period to learn lessons from implementation and then refine the Sandbox and repeat the process to meet emerging needs.

Workshop participants highlighted the need for continuous reporting on progress and on lessons learned, ideally through the Innovation Hub.

Outline of the Proposed Nova Scotia Sandbox

Barriers

- Outdated regulatory system
- Lack of collaboration

Needs

- Public-private collaboration
- Regulatory experimentation
- Regulatory clarity
- Diverse collaboration
- Formal knowledge exchange system

Tools

- Regulatory Trial
- Innovation Hub

Nova Scotia Innovation Sandbox

Structure

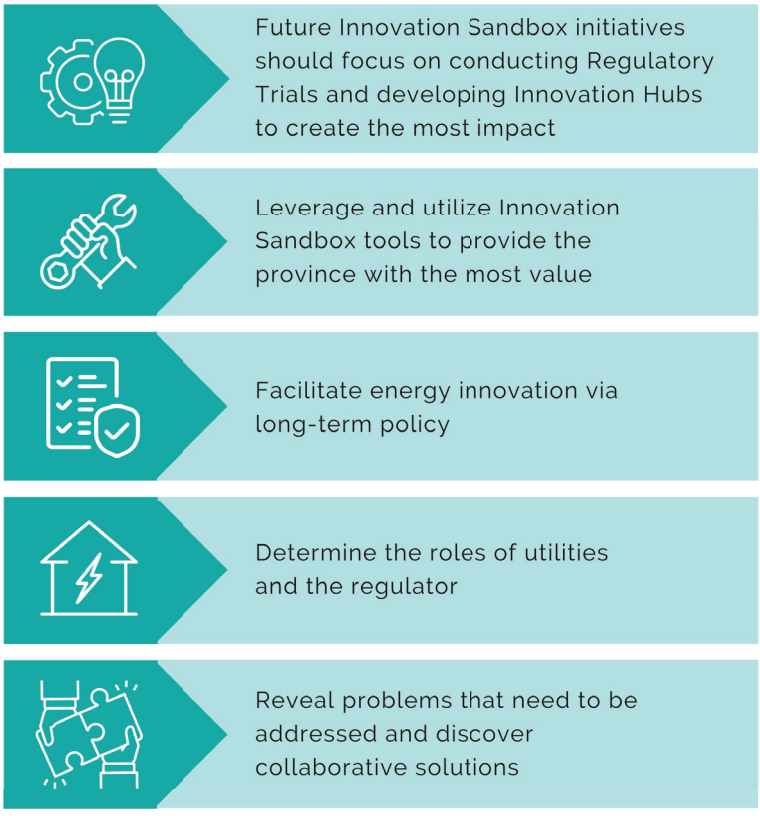
- Government or NGO as administrator
- Prioritize openness to diverse stakeholders, including civil society, academics and all levels of government (federal, provincial and municipal)
- Innovation Hub to bring all stakeholders together for winder ranging discussions, as well as discrete issue-based discussions (such as on business models for storage or other potential disruptions)
- Publish all data and results from Regulatory Trials
- Three-year timetable for renewal
- Annual reporting through the Innovation Hub

Next Steps

Nova Scotia has made moves already towards a low-carbon future, and the province has introduced ambitious emissions reduction targets. But to meet these targets, and to move to a net-zero energy system, more will be necessary and additional innovative technologies and practices will be needed; this is where Innovation Sandboxes can help.

The information contained in this report provides the framework for developing an Innovation Sandbox in Nova Scotia.

Given the primary barriers that were identified to low-carbon innovation in Nova Scotia—an outdated and inflexible regulatory system and lack of an effective collaborative mechanism—the focus of any Innovation Sandbox should be on conducting Regulatory Trials and developing Innovation Hubs. While the other tools of Innovation Sandboxes could also benefit the province, initial steps should be taken on tools that can provide the most value.



It should be noted that workshop participants identified an additional need to facilitate energy innovation in Nova Scotia: long-term policy certainty and clarity. Questions around the role and involvement of utilities and the regulator in the path to net zero will need to be asked and addressed. At the moment, the Nova Scotia regulator does not consider emissions. Will that need to change? While answering these questions was beyond the scope of the current project, developing an Innovation Sandbox will reveal the problems that need to be addressed, and will develop a platform for collaboration that can help provide the answers.