

# Innovating Toward Sustainability



**2023-24  
ANNUAL  
REPORT**

**net-zero**  
atlantic

### **Net Zero Atlantic is based in Mi'kma'ki.**

This ancestral and unceded territory of the Mi'kmaq is covered by the Treaties of Peace and Friendship, which the Mi'kmaq and Maliseet people first signed with the British Crown in 1725. We honour and respect those treaties.

Our collective work takes place in many traditional territories of Indigenous Peoples, including those of the Mi'kmaq, Beothuk, Innu, Inuit, Maliseet and Passamaquoddy.

In our shared work, we acknowledge the historical partnership between the land and Indigenous Peoples and our joint commitment to its protection. We show our gratitude and appreciation of past and ongoing contributions from our Indigenous partners by the mentioning of this historical relationship.

We are committed to an inclusive transition to a net-zero future.

# Advancing the Energy Transition

Net Zero Atlantic is a leading energy research organization advancing Atlantic Canada's transition to a low-carbon future. We encourage growth of a sustainable energy sector by identifying knowledge gaps, connecting experts to projects, and leading applied research and innovation.

Our team is dedicated to an inclusive and successful energy transition in Atlantic Canada. We work collaboratively with stakeholders and community members as we enable knowledge sharing and innovation. Our focus is on credible and unbiased research and projects that will prepare policymakers, industry leaders and sector investors to work together on pathways to decarbonize our region's economy, mitigate climate change impacts, and move Atlantic Canada toward net-zero greenhouse gas (GHG) emissions.

As we progress, our vision, mission and purpose inspire and guide our efforts:

## VISION

Net Zero Atlantic will be a leading energy research organization advancing Canada's transition to a carbon-neutral society.

## MISSION

To lead applied research and contribute to projects that enable the transition of Atlantic Canada's energy system to a carbon-neutral future through collaboration with academia, governments, private sector, Indigenous Peoples and other non-government organizations.

## PURPOSE

To advance a sustainable and inclusive transition to a carbon-neutral Atlantic Canada through the provision of credible and objective data and support services.

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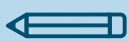
*Net Zero Atlantic is comprised of a passionate team with exceptional leadership and is well-positioned to assist our governments, industry, not-for-profits and communities to achieve a carbon neutral Atlantic Canada. Our region has a unique opportunity to be a leader in the country and a jurisdiction for others to follow.”*

— Net Zero Atlantic Board Chair, Stephen Hartlen, Assistant Vice President, Industry Relations, Office of Commercialization and Industry Engagement, Dalhousie University

# We are driving change

For the 2023-24 fiscal year:

**52**  
active  
research  
projects



**16**  
funders

**40%**  
increase in the number  
of employees on staff



Hosted more than

**800**  
total attendees  
across 12  
in-person  
and hybrid  
events held in  
Atlantic Canada  
and Europe

**20**  
webinars  
attended by a  
total audience  
of nearly  
**3,700**



during fiscal year 2023/24

## 16 years of energy and environment research

with a total to date of:

**333**

research  
projects

**\$54.5M**

in research  
projects

**\$85M**

in research projects  
(funded +  
leverage/in-kind)

Since the founding of our originating organization in 2008



Net Zero Atlantic Director of Finance and Administration Kendra Patrick presents to the team during a recent planning session.

“

*The work we've done through our strategic planning around being unbiased and evidence-based speaks to me at my core as someone who comes from **both a science and a financial background**. I was an environmental biologist and worked in environmental consulting for more than eight years before I switched to accounting. I like to be able to point to the data and say, 'This is a path forward'.*

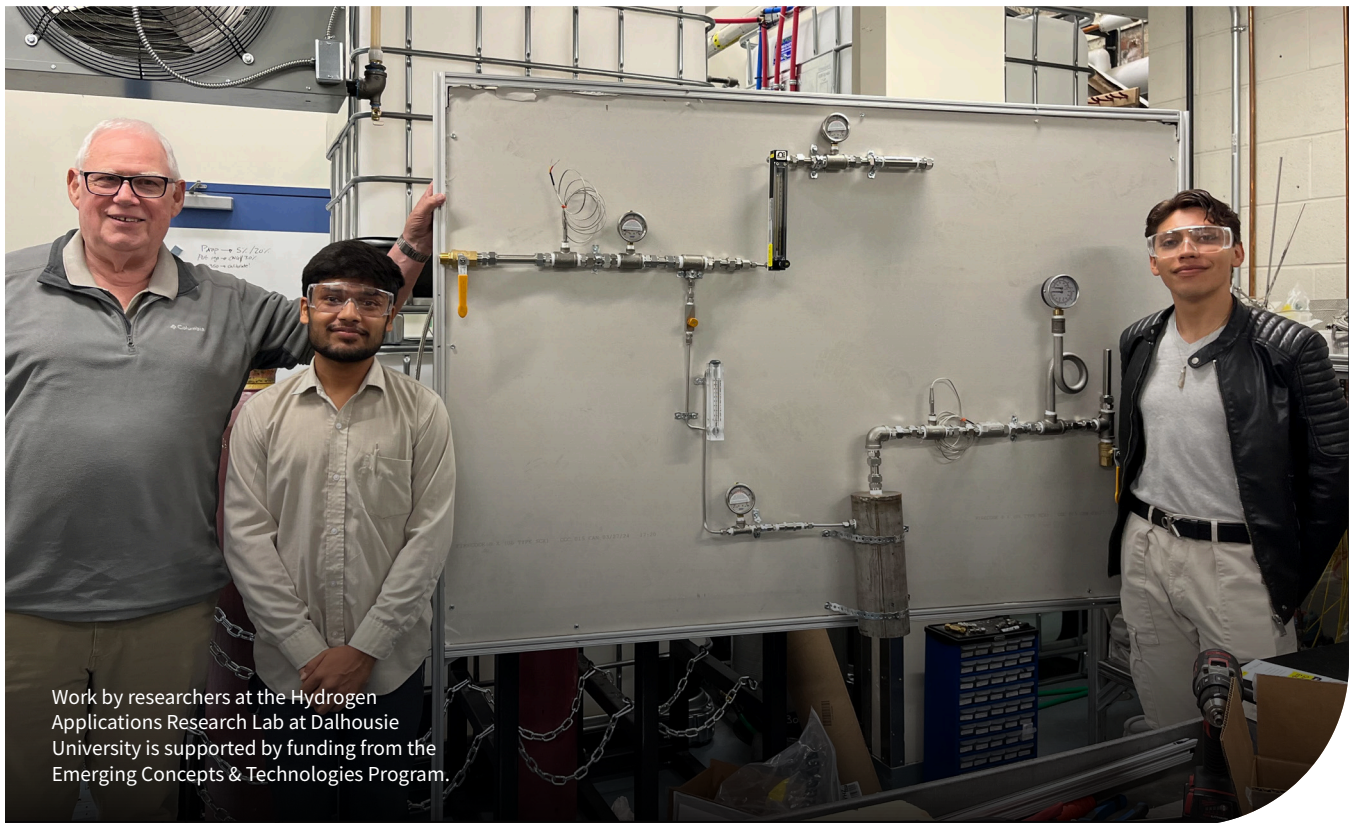
— Net Zero Atlantic's Director of Finance and Administration Kendra Patrick



# Toward a Net-Zero Future

Our work focuses on critical areas in need of development, including electricity and clean fuels. In 2023-24, we focused on:

- low-carbon hydrogen
- offshore wind
- emerging concepts and technologies
- geothermal energy
- net-zero building practices
- pro-climate behaviours
- energy system modelling



Work by researchers at the Hydrogen Applications Research Lab at Dalhousie University is supported by funding from the Emerging Concepts & Technologies Program.

# LOW-CARBON HYDROGEN

Low-carbon hydrogen has the potential to play an important role in Atlantic Canada’s future energy system. To help shape the path forward, Net Zero Atlantic is supporting and participating in critical conversations and carrying out the focused research needed to create a sustainable hydrogen ecosystem.

## HOW WE’RE HELPING

We’re actively working to fully understand and evaluate hydrogen’s potential for Atlantic Canada. In recent years, we have coordinated multiple hydrogen-related projects, including:

- [feasibility studies](#) related to hydrogen production, storage, distribution, and use in Atlantic Canada
- a study investigating hydrogen production potential from offshore wind in Atlantic Canada
- an analysis of the [socioeconomic impacts of hydrogen production](#) in Nova Scotia

We’re also the co-creator and an ongoing supporter of the Atlantic Hydrogen Alliance, a consortium which had more than **90 members** at the beginning of 2023 from sectors including academia, industry and utilities. Through collaborative efforts, we are exploring how best to enable an economically viable clean hydrogen value chain and support the transition to a prosperous low-carbon economy in Atlantic Canada.

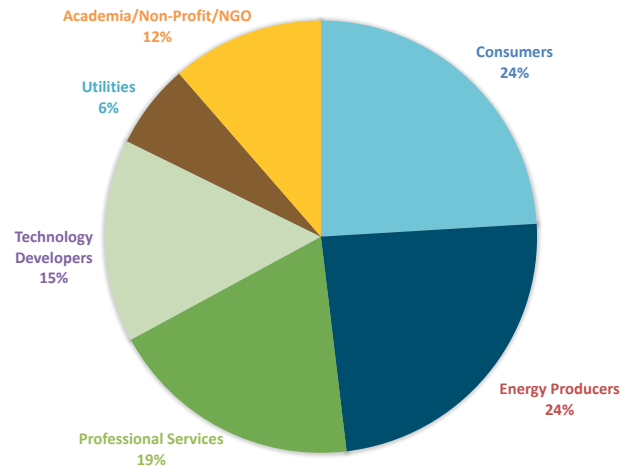
## IMPACT

In fiscal year 2023-24 through our [Emerging Concepts & Technologies Research Program](#), Net Zero Atlantic supported research into [seven novel projects](#) investigating areas including:

- hydrogen production
- hydrogen applications
- hydrogen leak detection



## 90 Members by Sector



## SUPPORT

Funding for low-carbon hydrogen projects completed in 2023-24 was provided by Natural Resources Canada and the Nova Scotia Department of Natural Resources and Renewables.



# OFFSHORE WIND

Net Zero Atlantic is contributing to the development of offshore wind energy as a potential new source of clean electricity in Atlantic Canada by contributing expert input to important conversations and helping to build local community capacity.

## HOW WE'RE HELPING

Our team collaborates with subject matter experts to identify and close offshore wind knowledge gaps. Together, we're carrying out [research](#) meant to inform the evolution of offshore wind energy development in our region.

In 2023-24, our work included:

- [Creating a Workplan for Offshore Wind Pathways to Market Studies](#)  
A work plan for an analysis of potential routes to markets for offshore wind and their anticipated impact on Atlantic Canada's electricity grid
- [Value mapping Nova Scotia's Offshore Wind Resources](#)  
Offshore wind is an untapped resource in Nova Scotia, which, if developed, has the potential to enable energy exports, stimulate rural economies, and contribute towards meeting the province's GHG emission reduction targets

## BUILDING LOCAL CAPACITY

We've been collaborating to co-create and deliver community-tailored information on the development of offshore wind in Nova Scotia. Through the [Capacity Building for the Sustainable and Inclusive Development of Nova Scotia's Offshore Wind Resource](#) program, we've helped to build local capacity in Indigenous and rural communities in Nova Scotia. This program began in late 2022 and will wrap up in March 2025.





Presenters from Net Zero Atlantic and the Cape Breton Partnership speak to a community group in Cape Breton.

## BUILDING OFFSHORE WIND KNOWLEDGE

Through the Capacity Building for the Sustainable and Inclusive Development of Nova Scotia's Offshore Wind Resource project, we've supported:

**4**

engagement sessions in Indigenous communities in Unama'ki led by Unama'ki Institute of Natural Resources

**11**

community engagement sessions in Indigenous communities in Mi'kma'ki led by the Confederacy of Mainland Mi'kmaq

**8**

rural community engagement sessions in mainland Nova Scotia

**11**

rural community engagement sessions in Cape Breton (in collaboration with Cape Breton Partnership)

*Supported by \$1.8 million in funding from the Smart Renewables and Electrification Pathways Program – Natural Resources Canada*

# EMERGING CONCEPTS AND TECHNOLOGIES

Many of the solutions needed to achieve net-zero GHG emissions by 2050 must still be invented, proven and scaled up to commercial availability. Significant knowledge and technology gaps remain, and these must be identified and addressed to tackle the most hard-to-abate GHG emissions in the 2030-2050 period.

## HOW WE'RE HELPING

The [Net Zero Emerging Concepts and Technologies Research Program](#), designed and led by Net Zero Atlantic, is helping to expedite this process. The goal is to identify and develop promising, emerging clean technologies, approaches and practices. The program supports R&D investments in:

- fostering conceptual, early-stage genesis of novel technologies
- encouraging the adaptation of technologies emerging in other jurisdictions to the needs and conditions of Atlantic Canada

The ECT program involves recurring open calls for R&D projects. Areas of focus are province-specific and include:

- Fishing and Ferry Fleets
- Nature-Based Solutions for Carbon Sequestration
- Agricultural Emissions
- Long-Term Energy Storage
- Electricity System Challenges Post 2030
- Carbon Capture & Utilization
- Hydrogen as an Alternative Fuel

“

*The ECT program is providing support for our local innovation sector to help and drive economic development in the region. We are taking global challenges and trying to find local solutions. This is empowering for our recipients. Additionally, our involvement allows us to inform the region of the work that is happening and provide the public with important information about the work their neighbours are doing.”*

— Molly Noseworthy, Project Manager –  
ECT, Net Zero Atlantic



**NEW WAYS OF REDUCING GHG EMISSIONS**

*Ola Popoola from Dalhousie University operates an unmanned aerial vehicle demonstrating targeted applications of fertilizer to blueberry fields in Nova Scotia. This Emerging Concepts & Technologies project is identifying ways to more effectively and efficiently apply fertilizers to reduce emissions in the agricultural sector.*

**ADVANCING EMERGING CONCEPTS & TECHNOLOGIES**

- Research funding program launched in 2023 – ongoing through to 2026
- Currently supporting **26** clean technology innovation initiatives with \$925,810 million in funding
- Active in **two** provinces (Nova Scotia and New Brunswick)
- **Two** calls for submissions in fiscal year 2023/24

**“Scientists, engineers, and backyard inventors were invited to provide solutions to reduce greenhouse gas emissions required to achieve net-zero by 2050. Specifically, their challenge was to identify gaps in carbon-reduction pathways for hard-to-abate emissions. The result is a coordinated acceleration of momentum in finding highly practical clean tech solutions that have the potential to be locally applicable.”** — Tim Bachiu, Net Zero Atlantic Director of Research

Supported by:  
Nova Scotia Department of Environment and Climate Change  
and New Brunswick Innovation Foundation



# GEOTHERMAL ENERGY

Geothermal energy has the potential to help displace current reliance on other energy sources, such as oil, natural gas and electricity, bringing Atlantic Canada closer to achieving emissions reduction goals.

## HOW WE'RE HELPING

Net Zero Atlantic is building project development capacity for mid-depth geothermal energy projects in Mi'kmaw and rural Nova Scotia communities through the [Community Geothermal Resource: Capacity Assessment and Training Program \(GeoCAT\)](#).

GeoCAT involves building relationships in communities across Nova Scotia to co-create and deliver information on geothermal energy opportunities. The goal is to help to create a roadmap for potential geothermal energy project development in communities that are adjacent to geothermal potential.

For the GeoCAT project, Net Zero Atlantic is partnering with [Confederacy of Mainland Mi'kmaq \(CMM\)](#), [Unama'ki Institute of Natural Resources \(UINR\)](#), [Nova Scotia Department of Natural Resources and Renewables](#), as well as community liaisons in Nova Scotia communities located on or near geothermal resources.

## UNLOCKING GEOTHERMAL POTENTIAL

Through the *Community Geothermal Resource: Capacity Assessment and Training Program*, we're advancing understanding around the potential for **mid-depth geothermal energy projects** through:

●  
Engagement sessions in Hantsport, Windsor and Wolfville

●  
10 interviews with businesses, councilors, municipal staff and others

●  
Outreach in all four Cape Breton counties and meetings with many community organizations

●  
Geothermal opportunity presentations in all eight Nova Scotian Confederacy of Mainland Mi'kmaq (CMM) communities

●  
Creating a 'geothermal toolkit' for use by municipalities and others

# NET-ZERO BUILDING PRACTICES

We'll need to quickly and efficiently retrofit and create high-performance buildings at a large scale if we're going to meet GHG emissions reduction targets. This shift requires both collaboration among sectors and capacity growth among building professionals.

## HOW WE'RE HELPING

Net Zero Atlantic serves as the secretariat for the [Building to Zero Exchange](https://www.buildingtozero.ca/) (BTZx), an innovative initiative bringing together industry, researchers, municipalities and other stakeholders to grow the number of net-zero buildings in Nova Scotia. Through BTZx, we're supporting research, events, resource development, skills training, and communications. BTZx currently has 112 members working together as collective champions for the innovation, policy, business, and regulatory actions necessary to advance the net-zero transition. There is no membership fee to be a part of the exchange at this time and more information is available at <https://www.buildingtozero.ca/> on joining the Building to Zero Exchange.

## BUILDING A NET-ZERO FUTURE

We're helping to grow the number of net-zero buildings in Nova Scotia as the secretariat for the Building to Zero Exchange (BTZx)

This initiative brings together industry, government and others and supports research, events, resource development, skills training, and communications

***“The Building To Zero Exchange is about preparing Atlantic Canada’s building sector for a net-zero future. Decarbonizing our buildings requires new skills and greater collaboration, and there is a great deal of work to be done on a fairly tight timeline to help achieve provincial and federal climate targets.”***

— Taylor Owen, Director, Building to Zero Exchange

Supported by the Halifax Climate Investment, Innovation, and Impact Fund (HCI3)



# PRO-CLIMATE BEHAVIOURS

Achieving net-zero GHG emissions will require significant changes in human behaviour together with technological advancement.

## HOW WE'RE HELPING

We're putting a behavioural science lens on the work needed to reach our targets to help make sure that proposed climate change mitigation solutions are technically feasible, socially acceptable, and economically viable. Determining critical behavioural interventions for enabling an effective transition to net-zero emissions in Atlantic Canada is a Net Zero Atlantic-led project involving academic partners across Atlantic Canada. Together with researchers from Pier Labs, Dalhousie University, Memorial University, Cape Breton University, University of Prince Edward Island, and University of New Brunswick, we're exploring existing barriers and opportunities related to pro-climate behaviours and how we can integrate behavioural interventions into our ACES model to evaluate socially feasible emissions reduction opportunities.

## SUPPORT

To support the research mandate of Canada's [Net-Zero Advisory Body](#), this project was undertaken with the financial support of the Government of Canada. Funding was provided through the Environmental Damages Fund's [Climate Action and Awareness Fund](#), administered by Environment and Climate Change Canada.

“

*Technology's not enough. We need to consider the human factor if we're going to get to net zero. So we're working to integrate the two together.”*

— Nicolle Jaramillo, Net Zero Atlantic's Research Manager for Pro-Climate Behaviours

# ENERGY SYSTEM MODELLING

Energy system modelling can help us understand how technologies like electric vehicles and heat pumps can affect energy demand, energy system dynamics, costs, and GHG emissions associated with the energy system. At Net Zero Atlantic, our goal is to manage research in an objective way and to put the results into the public domain to encourage discussion.

## HOW WE'RE HELPING

We created the [Atlantic Canada Energy System \(ACES\) model](#) as a tool Atlantic Canadians can use to help answer ‘what if’ scenario questions about the future long-term development of our energy system. The model covers all four Atlantic provinces and six GHG-emitting sectors: electricity, buildings, transportation, industry, agriculture, and waste. It calculates least-cost solutions that satisfy the energy demand for each time period included in the model. Model users can customize and analyze possible scenarios to test outcomes that are best suited for their needs, while also tracking GHG emissions and economic key performance indicators.

Using an open-source model like ACES provides researchers, policy-makers, industry, and others with the insight needed to effectively reduce GHG emissions and beneficially participate in the energy system transition. Net Zero Atlantic has also continued to receive support in 2023/24 through the IBM Sustainability Accelerator to help Indigenous communities in Atlantic Canada enable informed climate decision-making and empower participation in the clean energy transition. Together, they have been transforming the ACES Model into a user-friendly, accessible application to support Mi'kmaq communities in energy planning.

“

*One of UINR's roles is to engage community. In addition to scientific research, we also engage community Elders and knowledge holders to weave traditional knowledge into our work. In developing this tool, we asked ourselves ‘How can this help to inform community engagement in a transition to net zero? How does it help community members make informed decisions?’”*

— Lisa Young, Executive Director of the Unama'ki Institute of Natural Resources (UINR) and a member of the Net Zero Atlantic Board of Directors commenting on the ACES Lite Model created through a collaborative effort between Mi'kmaq communities, IBM and Net Zero Atlantic



Net Zero Atlantic Energy System Modeller Dr. Mohammed Alkatheri

## ANSWERING ‘WHAT IF’ QUESTIONS ABOUT ENERGY

We created the Atlantic Canada Energy System (ACES) model. Atlantic Canadians can use this tool to help answer 'what if' scenario questions about our energy system. We've also:

- created and presented the **first-ever** Atlantic Canadian Conference on Energy System Modelling together with the Energy Modelling Hub

- collaborated with IBM to create and pilot the Atlantic Canada Energy System (ACES) Lite Model, a user-friendly, accessible application focused on **supporting the role of Mi'kmaq communities in energy planning and the transition to net zero**

- continued to **finetune the ACES model's functionality**, continuously customizing it to meet evolving stakeholder needs



## **DEVELOPING EMERGING TALENT**

We're dedicated to fostering the next generation of young professionals – those who will lead the way to achieving net-zero GHG emissions by 2050.

### **HOW WE'RE HELPING**

We're a long-time provider of paid internships providing hands-on experience to students in fields including environmental science and engineering. Our growing team includes the fresh perspectives of early career employees. We also provide mentorship and educational opportunities, including student poster competitions and career fairs.

We also coordinated the Net Zero Atlantic Student Poster Competition held in conjunction with the Smart Energy Conference, and members of the Net Zero Atlantic team shared their expertise through a number of classroom presentations that took place over the course of the year.

### **SUPPORT**

Support for student interns and permanent positions at Net Zero Atlantic comes from:

- Nova Scotia Labour; Skills and Immigration Youth Initiatives - Co-operative Education Incentive
- Nova Scotia Labour; Skills and Immigration Youth Initiatives - Student Summer Skills Incentive
- Nova Scotia Labour; Skills and Immigration Youth Initiatives - Graduate to Opportunity Grow Program
- EcoCanada Science Horizons Youth Internship Program funded by Environment and Climate Change Canada



Members of the Net Zero Atlantic team meet with students participating in The PIER's student career fair.

## DEVELOPING EMERGING TALENT

We're dedicated to fostering the next generation of young professionals — those who will lead the way to achieving net-zero GHG emissions by 2050. In fiscal year 2023-24, Net Zero Atlantic:

**6**

student interns employed

**2**

permanent employees welcomed into their first jobs after graduating with bachelor's degrees

**2**

permanent employees hired upon completion of their master's degrees

**1**

employee brought aboard as they completed their PhD

# Continuing to Advance

We're continuing to contribute to the energy transition by:

- Using our knowledge and expertise to identify knowledge gaps
- Attaining funding to support the research and projects needed to close knowledge gaps
- Sharing our findings with decisionmakers and the general public
- Driving collaboration between academia and industry
- Enabling informed decisions towards a carbon-neutral future

Moving forward, our work will continue to focus on the themes of earth systems and innovation, electricity and clean fuels, energy efficiency and pro-climate behaviours.

**“ In a very short timeframe Net Zero Atlantic has established itself as the ‘go to’ energy transition research organization.”**

*— Net Zero Atlantic board member Lydia Bugden,  
Chief Executive Officer and Managing Partner, Stewart McKelvey*

