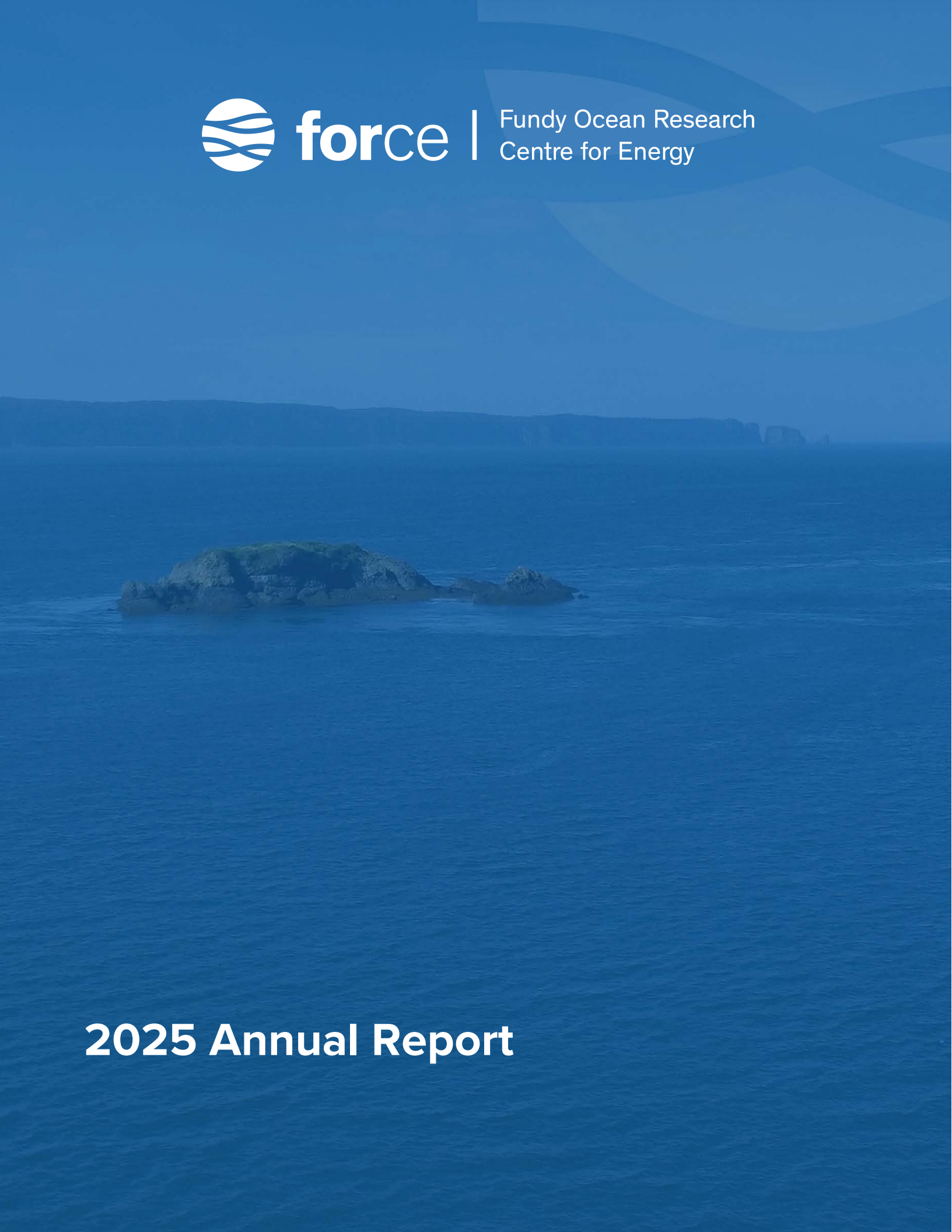


FORCE | Fundy Ocean Research Centre for Energy

2025 Annual Report

Section One
OVERVIEW

Established in 2009 and located in Minas Passage, Bay of Fundy, the Fundy Ocean Research Centre for Energy (FORCE) is North America's leading facility for tidal stream energy development. FORCE is a not-for-profit company and has received funding support from the Province of Nova Scotia, the Government of Canada, and participating developers.

FORCE advances tidal energy as a shared priority for Nova Scotia and Canada with:

- A technology site, connected to the grid
- Environmental monitoring data, shared with the public
- Services and solutions to help projects succeed safely, bringing together industry, government, Rights Holders, academia and other partners

Technology

Tidal stream energy technology generates renewable, emission-free electricity. A tidal stream device operates like a wind turbine placed under the water – passively harnessing the kinetic energy of flow and ebb tides to generate electricity.

Unlike wind and solar, tidal offers a significant strategic advantage: predictability. Tidal energy is not weather dependent; its power is derived by the movement of the earth combined with the gravitational influence of the sun and moon. This offers utilities an ability to reliably predict tidal resource levels years in advance.

Because tidal power produces energy when other renewables may not, it helps smooth overall supply, supports a more stable and resilient grid, and reduces the need for storage.

When paired with storage technologies, tidal becomes a dispatchable resource —making it ideal for meeting utility-scale clean energy requirements.

To date, a total of six devices have been built in Nova Scotia for deployment at FORCE: three by OpenHydro; two by Sustainable Marine Energy; and one by Occurrent Power. In 2023, Eauclaire Tidal announced its partnership with Orbital Marine Power to deploy its technology at FORCE. Orbital currently operates the world's most powerful tidal turbine in Scotland, the O2: a floating device 74 meters in length, supporting two 1-MW turbines. Orbital is designing a larger device for the Bay of Fundy: the O2-X, a 2.4 MW device.

Resource

A 2006 study by the Electric Power Research Institute identified the Bay of Fundy as North America's best site for tidal stream energy potential, due to both the size of the resource and its proximity to the existing power grid.

Approximately 160 billion tonnes of water flows through the Bay of Fundy each tide, equal to four times the estimated flow of all the freshwater rivers and streams in the world combined. Tidal waters moving past FORCE through the Minas Passage can reach speeds over 5 meters per second and rise up to 13 meters vertically – the height of a five-storey building.

As the coastline narrows through the Minas Passage, the water flow is pinched – causing it to speed up and creating one of the most powerful tidal resources in the world.

Initial research suggests up to 2,500 MW of this energy – more than Nova Scotia's total electricity demand – may be extracted without significant impacts on the tidal range; this estimate must be tested against ongoing environmental effects monitoring.

In 2012, the Province of Nova Scotia published a strategic target of developing 300 megawatts of tidal stream energy production. This number remains a long-term goal; at present, FORCE has 30 megawatts of transmission capacity from its onshore substation. Generating at 30 MW of full capacity could meet the power needs of over 10,000 homes and displace the equivalent GHG emissions of 20,000 cars.

Infrastructure

The FORCE facility is designed to connect tidal energy devices to the provincial power grid. More specifically, its assets include:

- Subsea cables: Four double-armoured, 34.5kV subsea power cables, each 2 to 3 km in length, running from the ocean site to underground vaults at shore.
- Substation: This includes a 30 MW transformer, turbine control bays, switch gear and collector circuits, and revenue class metering.
- Transmission lines: 10km of overhead 69kV transmission line connecting the FORCE substation to the provincial power grid near the existing substation in the community of Parrsboro.

Science

FORCE's science program, which includes both in-house expertise as well as partnerships with world-leaders in marine science, is designed to support informed discussion among policymakers, regulators, Rights Holders, industry, scientists, and stakeholders. FORCE helps:

- Design and execute monitoring programs
- Support regulatory review and authorization processes
- Publish peer-reviewed research in collaboration with academic partners, including Acadia University and Dalhousie University

FORCE's environmental effects monitoring program (EEMP) is designed to better understand the natural environment of the Minas Passage and the potential effects of turbines as related to fish, seabirds, marine mammals, lobster, and marine noise.

The global evidence so far is encouraging: in over 15 years of international research, the few observed fish interactions have not resulted in obvious harm, and marine mammals appear to have adapted without harm to a turbine installation. All these findings must be tested in the Minas Passage.
FORCE has a significant inventory of science equipment to monitor the site, including:

- Acoustic Doppler Current Profilers
- Active acoustic imaging cameras
- C-PODs (and subsurface buoys)
- Conductivity, Temperature & Depth sensors
- Echosounders
- Fish tag acoustic receivers
- Hydrophones
- Meteorological station
- Multiplexers, junction boxes
- Passive acoustic sensors
- Sonar
- Subsea sensor platforms
- Subsea video camera and lighting
- X-band radar

All of FORCE's monitoring reports are available publicly at https://fundyforce.ca/document-collection.

Engagement

The Bay of Fundy is an enormous energy resource. It is also a complex ecosystem and

sacred Mi'kmaw watershed. As a shared resource, any tidal activity in the Bay of Fundy must co-exist with many users; harnessing this power responsibly requires rigorous science and respectful collaboration to earn the trust of the people who live, work, and depend on the Bay. Public opinion research suggests the vast majority of Nova Scotians support tidal stream energy demonstration; this support depends on public confidence that tidal projects, and their potential impacts, are understood. FORCE regularly engages with:

- Regulators at Fisheries and Oceans Canada (DFO) and the Nova Scotia Department of Environment and Climate Change (NSECC)
- Rights Holders, including representation by Mi'kmaw organizations on FORCE's board, community and environmental monitoring advisory committees, through involvement in FORCE science initiatives, and through regular meetings with the Mi'kmaq Rights Initiative and community leadership
- The local and international scientific community, including academia, Acadia Tidal Energy Institute, Fundy Energy Research Network (FERN), Pacific Northwest National Laboratory (PNNL) and independent research organizations
- Senior government representatives, including membership on the federal *Task Force on Sustainable Tidal Energy in the Bay of Fundy*
- The local community: including regular meetings with members of FORCE's Community Liaison Committee, and an on-site visitor centre, open spring to fall, which has welcomed over 33,000 people to date.

FORCE Project Timeline

2008

- Strategic Environmental Assessment
- Major vessel study
- Tender for facility and test sites

2009

- *Environmental Assessment* approved
- FORCE established as not-for-profit.
- Nova Scotia Power deploys 1 MW OpenHydro device
- Environmental monitoring begins

2010

- OpenHydro device retrieved

2011

- Visitor/observation centre built

2012

- Electrical substation completed

2013

- Nova Scotia sets feed-in tariff for tidal arrays
- First subsea data cable laid at FORCE
- Meteorological station, radar, tide gauge installed

2014

- FORCE installs four subsea power cables at test site, totaling 11km

2015

- Province releases tidal legislation
- FORCE builds first underwater monitoring platform

2016

- Cape Sharp Tidal deploys 2MW OpenHydro turbine, connects to power grid
- Turbine monitoring program includes fish, lobster, marine mammal, seabirds, and sound

2017

- Substation upgrade to 30MW complete
- Province creates new demonstration permits for 10 MW

2018

- Cape Sharp Tidal deploys second turbine at FORCE

2019

- Sustainable Marine Energy (SME) begins testing 280 kW device in Grand Passage

2020

- FORCE begins Risk Assessment Program, acoustic telemetry program for fish with many partners

2022

- SME successfully deploys 420 kW device and connects to the grid; Canada's first floating turbine to deliver electricity

2023

- SME ends its project; federal *Task Force on Sustainable Tidal Energy* struck
- Eauclaire announces partnership with Orbital Marine Power to build project

2024

- *Task Force* announces DFO's staged approach to *Fisheries Act Authorizations (FAA)*, new research, and collaboration.

2025

- Delegation of Mi'kmaw Chiefs and AFN Regional Chief visit Scottish tidal technology at European Marine Energy Centre
- FORCE begins sensor platforms project with Acadia and others, funded by NRCan
- Eauclaire/Orbital granted DFO authorization; awarded sites by Province

Section Two

Strategy

MISSION

FORCE advances tidal energy as a shared priority for Nova Scotia and Canada.

STRATEGIC GOALS

1. Devices are deployed at the site, delivering clean energy to the grid and contributing to Nova Scotia and Canada's energy security and diversity.
2. Nova Scotians share in the economic opportunities and advantages of tidal energy.

STRATEGIC DIRECTION AND INITIATIVES

Support development

- Conduct and facilitate applied research to reduce uncertainty and inform decision-making
- Uphold high standards in environmental management
- Create the conditions for success, and identify and remove barriers
- Demonstrate measurable and meaningful outcomes for developers
- Support paths to commercialization

Engage partners

- Clarify, articulate, and reinforce the shared priorities that connect industry, Indigenous, community, research and other partners
- Optimize and activate key partnerships to accelerate progress
- Model leadership and support the sector ecosystem

Showcase the potential

- Tidal is here: share the story
- Communicate FORCE's role and responsibilities, and provide accountability
- Demonstrate the industry's alignment with government priorities
- Attract investment

Section Three

Progress

1. SUPPORT DEVELOPMENT

Facility Maintenance

Central to technology demonstration is the ability to transmit power to the electricity grid. The FORCE facility includes the transmission system, the collector circuits and switchgear, cable vaults, subsea cables, communications systems for real time monitoring and data transfer, the real property and easements, and the visitor center on West Bay Rd. near Parrsboro.

Last year, Strum Engineering completed the maintenance testing program of terrestrial and subsea cables, substation yard equipment, and the cable vaults system. Overall results of the annual maintenance testing program were satisfactory, with no critical deficiencies reported.

In October 2025, FORCE moved its previously separate office and warehouse staff and equipment into a single new workspace in Dartmouth, enabling more integrated planning, research and operations.

Upgrades to the visitor centre this year included: exterior shingle staining (Rafes Construction), FAST-1 platform painting and delivery (AF Theriault & Son), exterior panels (Atlantex CreativeWorks)

Operations

Operations in 2025 included:

- **Major research:** NRCan's $8.2M investment in the Ocean Sensor Innovation Platforms (OSIP) project, a collaboration with Acadia University, the Confederacy of Mainland Mi'kmaq, Pacific Northwest National Laboratory, Ocean Tracking Network, and others. Study design, marine assets, and field work for OSIP are all underway.
- **Scientific activity:** Expanded fish tracking programs with AI (HydroAware); alignment of acoustic receiver network with OTN and program enhancements to minimize data collection downtime; revitalization of the Environmental Monitoring Advisory Committee; fish synthesis report; and expanding in-house science expertise.
- **Implementing *Task Force* actions:** Input to Adaptive Environmental Effects Monitoring Program (AEEMP) templates and guidance; guidance and support for developer *Fisheries Act Authorizations*; and outreach to international science community.
- **Indigenous participation:** Delegation of Mi'kmaw Chiefs to Scotland to observe tidal activity firsthand; workshop at the Marine Renewables Canada conference with Mi'kmaw leadership; Mi'kmaw Ecological Knowledge Study underway.
- **Provincial partnership**: Technical support for the new berth tendering process; initial subsea assessments of OpenHydro turbine.
- **Active engagement:** Hosting provincial and international delegations, creating summer employment opportunities for visitor centre staff.

Further details on these and other operations are found below.

Governance

FORCE is in the process of establishing a new model to help tidal projects succeed responsibly anchored by a revised governance structure, and relationships with tidal developers defined under a new Licensee Agreement. Combined with deeper engagement with regulators, Rights Holders, and academia, these changes are designed to create a much stronger, more sustainable foundation for new projects at the site. This includes:

- **Independent Board of Directors**: This new governance model – independent of developers – strengthens FORCE's role as site steward and coordinator. This change creates a more transparent, sustainable framework for provincial tendering and future deployments by clarifying developer responsibilities, protecting FORCE's infrastructure and regulatory commitments, and aligning with provincial marine renewable energy strategy.
- **Licensee Agreement:** This new agreement governs how developers engage with the site while protecting FORCE's assets and regulatory standing. It grants developers rights to use FORCE's electrical infrastructure to connect to the grid. In return, developers must pay annual fees and deposits, follow FORCE's procedures, rules, and environmental approvals, and maintain insurance.
- **Licensee Advisory Committee:** The committee serves as a forum for developers to share information and provide policy advice to the FORCE Board related to facility operations, tidal energy development and regulation, engagement, organizational stability, and other relevant matters.

Technology Development

Eauclaire Tidal

In December 2023, Eauclaire Tidal announced it had partnered with Orbital Marine Power (Orbital) to deploy its technology at FORCE. Scottish-based Orbital already operates the 2-megawatt O2 – a floating device 74 meters in length, supporting two 1-MW turbines (image below). Orbital's floating technology is designed to:

- Make installation and maintenance easier, lowering operational costs and risk
- Capture energy from stronger currents near the surface, generating more electricity

In November 2025, the Province awarded Eauclaire/Orbital two additional berths at FORCE, allowing the companies to pursue a total of 16.5 MW at the site. The award includes tidal energy licences and power purchase agreements with NS Power. DFO also issued a *Fisheries Act Authorization* to Eauclaire/Orbital to deploy up to three Orbital O2-X tidal energy devices at FORCE – marking the first project to proceed under Canada's revised, staged approach for tidal stream energy development.



Orbital Marine Power's 2-megawatt "O2" device, 74 meters in length.

Sustainable Marine / reconcept Gmbh

Sustainable Marine Energy Canada (SMEC) decided to shut-down operations in the Bay of Fundy in 2023, underlining a need to better

clarify the approach to securing a *Fisheries Act Authorization* from DFO. DFO and NRCan responded by launching the *Task Force on Sustainable Tidal Energy Development in the Bay of Fundy* (covered in detail below). The Province has granted SMEC's principal investor, reconcept GmbH, permission to retain their licence while they explore options to continue the project.



Sustainable Marine PLAT-I 420kW device in Grand Passage



Image: Parliamentary Secretary Kody Blois announces NRCan funding for OSIP project at Acadia University.
[link to NRCan release] [link to CBC interview with Lindsay Bennett]

Ocean Sensor Innovation Platforms (OSIP) Project

On September 19, 2025, NRCan announced $8.2M to support the Ocean Sensor Innovation Platforms (OSIP) project. Led by FORCE, OSIP will deploy a floating platform for sea-surface environmental monitoring as well as submersible sensor systems deployed on the seafloor. In future tidal turbine deployments, sensors and methods tested by these platforms will capture essential data on fish-turbine interactions, addressing one of tidal energy's greatest challenges: accurately measuring and monitoring risk to marine species. OSIP is intended to:

- Offer regulators confidence that environmental effects data can be reliably collected,
- Provide evidence-based metrics for project review and approval, and
- Provide regulatory clarity to encourage investment and advance the sector

OSIP directly responds to *Task Force* recommendations to address environmental risk and supports companion initiatives by Acadia University to reduce environmental effects uncertainty.

Partners include:

- **Natural Resources Canada**, supporting OSIP through its Energy Innovation Program, which advances clean energy technologies that will help Canada maintain a competitive, reliable, and affordable energy system while transitioning to a low-carbon economy.
- **Acadia University**, the project's central research partner, providing scientific leadership, experimental design, data analysis, and student training in fish sensing through the Acadia Tidal Energy Institute (ATEI).
- **The Confederacy of Mainland Mi'kmaq** (CMM), supporting OSIP with a Mi'kmaw Ecological Knowledge Study, ensuring Indigenous perspectives inform monitoring priorities.
- **Pacific Northwest National Laboratory** (PNNL), advising on study design, sensor configuration and data interpretation.
- **Innovasea**, providing support and expertise with fish tracking and monitoring technology.
- **Orbital Marine Power, reconcept,** and **Nova Innovation**, providing input on

study design and technical considerations for monitoring platforms and equipment.

- **Huntley's Diving and Marine**, providing vessel services, enabling deployment, recovery, and maintenance of bottom-mounted platforms.
- **Ocean Tracking Network** (OTN), loaning acoustic tracking receivers and offering expert support in design, deployment, and maintenance of receiver arrays. Data collected will be stored in OTN's system and shared per FAIR principles and OTN's data policy.
- **The University of the Highlands and Islands – Environmental Research Institute**, contributing expertise in sensor platform design, sensor selection, field deployments and data analysis.

Additional partners, including Fisheries and Oceans Canada (DFO), researchers, and equipment suppliers are providing critical input and guidance.

In December 2025, as part of the OSIP project, FORCE completed a vessel-based testing campaign aboard the Nova Endeavor to evaluate optical camera and lighting configurations for subsea monitoring, including multiple camera systems, lighting arrangements, and target types at depths of 5-25m. The work also included pre- and post-deployment CTD casts with additional sensors, supporting the selection of an optimized camera and lighting setup for future subsea deployments in the Minas Basin.

Image (right): Lowering a frame in Minas Passage to test optical camera and lighting configurations.

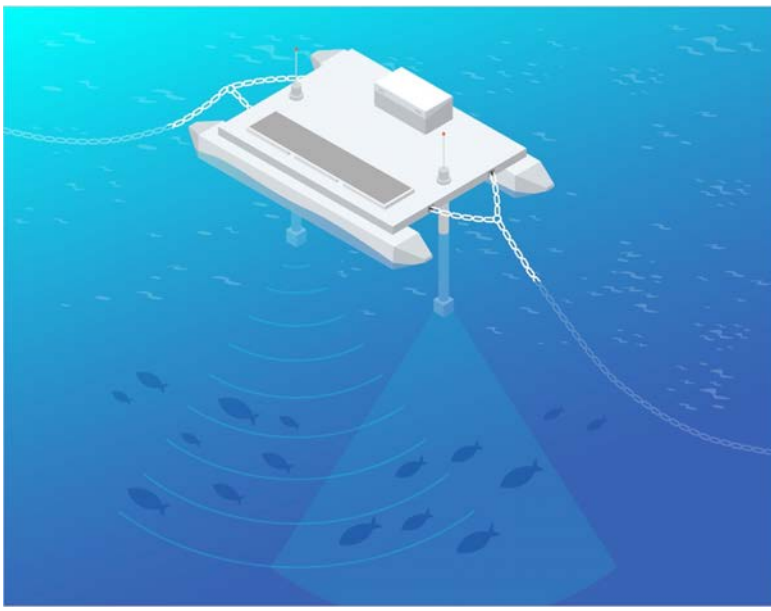


Illustration: OSIP will trial different optical and acoustic sensor configurations to test their effectiveness in monitoring fish around tidal devices.



Environmental Effects Monitoring

Together with academic and research partners, monitoring activities have been underway at FORCE since 2009. Partners include Acadia University, Envirosphere Consultants, GeoSpectrum Technologies Inc., JASCO Applied Science, Luna Ocean Consulting, Nexus Coastal Resource Management, Ocean Sonics, Sea Mammal Research Unit Consulting (Canada), University of Maine, Fishermen and Scientists Research Society, and local commercial fishers.



Working in partnership with universities, research entities, and local marine operators, FORCE has led a monitoring program focused on the five key variables mentioned above: fish, marine mammals, lobster, seabirds, and marine sound. Since 2016, FORCE has completed:

- Collaboration with OTN to create a 24-station acoustic receiver array spanning majority of Minas Passage (increasing the probability of detecting tagged fish)
- Over 560 hours of hydroacoustic fish surveys
- Over 5,000 'C-POD' marine mammal monitoring days
- Bi-weekly shoreline observations
- 49 observational seabird surveys
- Four drifting marine sound surveys and additional sound monitoring, and
- 11 days of lobster surveys

Building Scientific Expertise

Dr. Aidan Bharath is the Director of Science and Environmental Programs at FORCE, appointed in July 2025. Dr. Bharath holds a Ph.D. in fluid dynamics from the Australian Maritime College and brings significant expertise in wave and tidal energy, particularly in computational fluid dynamics and resource assessment. He joins FORCE from the U.S. National Renewable Energy Laboratory (NREL), where he contributed to offshore energy research, data systems, and marine renewable energy innovation. Dr. Bharath, a Canadian and an Acadia University alumnus, leads scientific research and environmental monitoring programs at FORCE and is helping to strengthen academic and industry partnerships across the sector.



Larissa Pattison is FORCE's new Environmental Program Manager, appointed in October 2025. Pattison holds a Bachelor of Science in Biology from MSVU and an Advanced Diploma in Oceans Technology from NSCC. She brings extensive field and technical experience in ocean imaging, acoustic and optical monitoring, and data management from roles with the Ocean Frontier Institute, JASCO Applied Sciences, Innovasea, and NSCC's Applied Oceans Research Group. Her work has spanned instrument integration, offshore operations, and environmental data analysis across multiple research and industry collaborations, supported by a range of marine and safety certifications.



As of December 2025, **Dr. Peter Porskamp** is FORCE's new Marine Optics and Acoustics Research Scientist, bringing expertise in benthic habitat mapping, acoustic monitoring, and marine survey operations to FORCE's environmental research programs. Peter holds a PhD in Biology from Deakin University, an Advanced Diploma in Marine Geomatics from the Centre of Geographic Sciences, and an MSc in Biology from Acadia University. Most recently a postdoctoral researcher at Dalhousie University, his work spans multibeam sonar surveying, backscatter analysis, species distribution modelling, and passive acoustic monitoring across Atlantic Canada and beyond. His connection to the Bay of Fundy runs deep: his graduate research at Acadia focused on harbour porpoise detection in the Minas Passage, contributing to pre-turbine baseline studies at the FORCE site.



HydroAware

HydroAware is expanding the use of artificial intelligence in fish tracking, in both acoustic telemetry technology and emerging tagless detection. FORCE is partnering with Innovasea, NB Power, Canada's Ocean Supercluster, and NS Power to enable energy generation while protecting critical fish populations.

If HydroAware can perform in Minas Passage, it can dramatically reduce the cost, time and effort required for environmental monitoring and informing regulatory decisions – a potential game-changer for the tidal energy sector.

HydroAware aims to take that a step further, using AI to capture better data up front in dynamic environments and then speeding up the raw data processing on the back end – a process that includes retrieving equipment, downloading data, processing the data and then teasing out conclusions. The end goal is the ability to process hundreds of studies in the time that researchers previously might be able to process one or two.

In spring 2025, FORCE and Innovasea deployed a cabled FAST platform in the intertidal zone at the FORCE site, equipped with 3 cameras and shore-based communications allowing for continual video upload to train the AI fish detection model. The platform began detecting fish in the area and continues to train the model.

In September, standard contrast and reflective targets were added to the cameras' field of view. Following discussions with the Innovasea team and considering the proven durability of the shore-based sensing platform at the FORCE test site, it was determined that introducing standardized targets would enhance ongoing research on fish detection and AI applications – particularly by improving the ability to quantify visibility levels within the tidal current.

In November 2025, after seven months of data collection, the subsea platform being used to conduct the work for the HydroAware project was recovered from the intertidal zone at FORCE. Innovasea is currently reviewing the datasets.



Images: A view from two different cameras after reflective (left) and standard contrast (right) targets were installed on the FAST-2 platform as part of HydroAware

Bay of Fundy Acoustic Telemetry Consortium

FORCE, in collaboration with DFO, academic institutions, non-governmental organizations and the Confederacy of Mainland Mi'kmaq (CMM) has helped establish the Bay of Fundy Acoustic Telemetry Consortium. The group works together to coordinate acoustic receiver deployment and acoustic tagging activities for a variety of fish species in the Bay of Fundy enhancing efficiencies and knowledge sharing.

Field Studies with Acadia Tidal Energy Institute (ATEI)

FORCE is working with ATEI to improve monitoring capabilities by designing field studies for new and existing technologies, testing different sensor mounting configuration and exploring AI and machine learning. One of the studies involved optical camera trials to help determine the clarity of the water column and its turbidity. These studies help to inform future work and help to determine the limitations and capabilities of monitoring equipment.

Adaptive Environmental Effects Monitoring Program (AEEMP) Guidance

FORCE, also in partnership with ATEI, has developed a detailed Adaptive Environmental Effects Monitoring Program (AEEMP) Template and Guidance Documents to help tidal energy developers create project specific AEEMPs in support of *Fisheries Act Authorization* and *Species at Risk Act Permit* applications. The documents guide developers through preparing an AEEMP that identifies potential environmental effects—such as collision risk and habitat changes—and outlines monitoring, mitigation, and reporting requirements.

FORCE also provided input to DFO's high level guide for developers outlining requirements for adaptive monitoring programs in the Bay of Fundy. The guide provides a standardized framework to help developers meet federal environmental requirements for device deployment at FORCE and aligns with DFO's *Revised Staged Approach*.

Fish Synthesis Report

FORCE commissioned a report by Dr. Graham Daborn (professor emeritus, Acadia): a synthesis of all fish studies in the Minas Passage to date describing what is known and identifying gaps. The report is intended to serve DFO, developers, and other interested partners and help inform and strengthen developer AEEMP's for Fisheries Act authorizations. The report is now available on the FORCE website.

OpenHydro Turbine Assessment

FORCE has completed an initial high resolution multi-beam scan of the area as well as more detailed ROV surveys of the turbine, base, and lifting points to assess the feasibility of safely retrieving the OpenHydro turbine. FORCE and NSDOE are conducting a more comprehensive analysis of options.

2. ENGAGE PARTNERS

Outreach activities in 2025 included the following:

Indigenous Outreach

FORCE is working to incorporate Rights Holders' perspectives within the sector, and position them to participate economically, through engagement with Kwilmu'kw Maw-Klusuaqn (KMK), CMM, and Mi'kmaw communities. In 2025, this included a delegation to Scotland, a Mi'kmaq Ecological Knowledge Study, a FORCE site visit by Chief Sidney Peters from Glooscap First Nation, co-chair of the Assembly of Nova Scotia Mi'kmaw Chiefs, organizing a workshop session with Mi'kmaw leadership at the 2025 Marine Renewables Canada conference, and exploring opportunities for greater involvement on technical and planning activities related to monitoring and OSIP.

To provide formal input into FORCE's activities, the KMK has a representative on FORCE's Community Liaison Committee, and the Risk and Monitoring Working Group. FORCE also holds regular meetings with KMK staff engaged on the energy file and facilitates meetings/introductions with other sector partners at KMK's request.

Scottish Delegation

In April 2025, FORCE supported a delegation of Mi'kmaw Chiefs, AFN Regional Chief Paul, technicians, and community leaders on a visit to Orkney, Scotland to observe an operating, grid-connected tidal energy device, learn from local experience, and explore how tidal energy interacts with coastal communities. The visit involved more than a year of planning and coordination, was developed in close partnership with KMK, CMM, Eauclaire, Orbital, and the local community of Kirkwall, and was supported by funding from Canadian and UK governments, as well as FORCE.



Observing Orbital's O2 in operation

The visit included a vessel tour at the European Marine Energy Centre's (EMEC) Fall of Warness test site and direct observation of Orbital Marine Power's O2 tidal energy device, technical sessions with the Orbital team and FORCE, and an EMEC-led briefing on their experience and technology testing. Delegates also visited cultural and Neolithic sites, participated in guided bus tours around Orkney, attended a reception hosted by the Orkney Islands Council, and had time to explore the town of Kirkwall.

Key takeaways from the exchange included the importance of partnership and early community involvement, environmental monitoring, and site compatibility with traditional fishing areas.

Mi'kmaq Ecological Knowledge Study (MEKS)

The Confederacy of Mainland Mi'kmaq is conducting a MEKS in collaboration with FORCE to inform tidal energy development in the Bay of Fundy. Designed and led by CMM's MEKS Team, the study draws on Mi'kmaw knowledge and community engagement to document traditional use, environmental values, and cultural significance within the project area. The project leverages CMM's broad experience in aquatic and terrestrial research, community engagement, and rights-based stewardship. Work is underway,

including engagement, study tools development, community open houses in Glooscap, Pictou Landing, and Membertou.

MRC Conference Workshop

At the 2025 Marine Renewables Canada (MRC) Conference, FORCE organized a workshop entitled *Stronger Relationships: Netukulimk, Etuaptmumk and the Future of Ocean Energy* which brought together Chief Sidney Peters (Glooscap First Nation; Co-Chair, ANSMC), Angeline Gillis (Executive Director, CMM), Patrick Butler (Senior Mi'kmaq Energy and Mines Advisor, KMK), and Lindsay Bennett (FORCE). Panelists reflected on the recent Chiefs' visit to Kirkwall, Scotland, and discussed opportunities to integrate Mi'kmaw knowledge, leadership, values, and practices into marine renewable energy development. Framed through *Netukulimk* (respectful resource use) and *Etuaptmumk* (Two-Eyed Seeing), the session offered practical insights on strengthening partnerships and advancing industry collaboration with the Mi'kmaq.



Chief Sidney Peters addresses the audience at the 2025 MRC Conference Workshop

In 2025, FORCE also met with Sipekne'katik First Nation, participated in the Atlantic Indigenous-Led Energy Symposium, and presented on a panel at the CI Consultation & Engagement Atlantic Conference, focused on improving consultation practices, advancing Indigenous participation, and strengthening relationships across energy projects in Atlantic Canada.

Government Engagement

FORCE supports conversations and engagement among regulators, government bodies (federal, provincial and municipal), and other sector partners.

In July 2025, FORCE welcomed Minister of Environment and Climate Change Minister Tim Halman, then-Minister of Natural Resources Tory Rushton, Ministerial Assistant Marco MacLeod, and provincial staff for a site tour and research update.



Site tour with provincial Ministers and staff

In September, FORCE welcomed Science and Technology Advisor Melinda Tan from Natural Resources Canada, the federal liaison for the OSIP project.

FORCE continues to focus on strengthening its relationship with DFO and has engaged BlueDot Environmental to support discussions between the regulator and developers in support of the authorization process and continuity for tidal projects.

FORCE worked closely with both DFO and Orbital Marine Power in support of their *Fisheries Act Authorization* application; the application was approved in November.

FORCE also maintains regular and ongoing communication with staff from:

- Nova Scotia Department of Energy

- Nova Scotia Environment & Climate Change
- Fisheries and Oceans Canada
- Natural Resources Canada

Community Engagement

FORCE continues to provide free public access to its visitor centre and demonstration site to promote education and awareness about tidal energy. In May, FORCE re-opened its visitor centre five days a week for the 2025 season; the total number visitors since 2012 is now over 33,000.

In July, FORCE welcomed international representatives from UNESCO, supporting the continued designation of the Cliffs of Fundy Geopark.

FORCE also employed summer students Benjamin Boshoff and Keagan MacKenzie at the Visitor Centre through Canada's Summer Jobs program and Nova Scotia's Student Summer Skills Incentive.

FORCE is also grateful to collaborate with community organizations that include:

- Parrsboro Board of Trade
- Cumberland Chamber of Commerce
- Bay of Fundy Ecosystem Partnership
- Parrsboro Shore Historical Society
- Ottawa House By-the-Sea in Parrsboro
- Support for Parrsboro food bank, Adult Community Daycare and Parrsboro Rink

In 2025, FORCE represented at AGMs for Parrsboro Shore Historical Society, Cliffs of Fundy, Parrsboro District Board of Trade, and gave keynote remarks at the Cumberland Chamber of Commerce Small Business Awards.

Community Liaison Committee (CLC)

FORCE's CLC provides a forum for open communication, transparency, and community input related to tidal energy activities at the FORCE site. The committee brings together representatives from local communities, fishers, municipalities, businesses, and other stakeholders to share perspectives, identify concerns, and exchange information about project plans, monitoring, and site operations. Through regular meetings and dialogue, the CLC helps ensure that FORCE's work reflects community priorities, supports local benefits, and builds trust through ongoing, two-way engagement. FORCE is grateful to have strengthened the CLC this year with the additions of Adele Van Schalkwyk, a local Inn owner with a background in science, Rod Sutherland, a business owner and resident of Parrsboro, and Iain Odlin, a teacher in the area.

International Collaboration

FORCE continues to work closely with OES-Environmental and its members to document and improve the state of knowledge about the interactions of MRE devices interactions with the marine environment.



OES-Environmental's *State of the Science Report* represents the global state of knowledge about the environmental effects of marine renewable energy (MRE) devices from studies and monitoring activities, and is built on publicly available peer-reviewed scientific literature and

reports published by researchers, developers, and government agencies, and as seen through the lens of many of the leading MRE researchers in the field. FORCE's Director of Science and Environmental Programs is one of the Canadian analysts for this work.

OES-Environmental incorporated new research topics for the 2024 State of the Science Report related to: i) knowledge of environmental effects as the tidal energy industry scales up from single devices to arrays; ii) understanding the cumulative impacts of marine renewable energy with other anthropogenic effects; and iii) an ecosystem approach for understanding environmental effects, including interactions between trophic levels, between ecosystems and between ecosystem services. FORCE was involved in the development of all three of these topics and led the effort to understand the 'scaling up' of environmental effects of devices as the tidal energy sector transitions towards the development of commercial-scale arrays. A synopsis of this work and the other topics outlined above is included in chapter 9 of the Report.

FORCE also maintains key relationships with members of International WaTERS – a network of international open water test centres that share information and work together to address common challenges. For the first time last November, FORCE and EMEC co-hosted active test centres from around the world in Halifax for a tour of the FORCE site followed by a workshop on regulatory challenges, consenting and permitting, with participants from USA, Scotland, China, and Korea. FORCE continues to engage with the network as part of strategic discussions on its governance and opportunities for greater impact across the global sector by sharing experience and best practices.

Risk and Monitoring Working Group (RAM WG) of the *Task Force on Sustainable Tidal Energy Development in the Bay of Fundy*

FORCE executive director Lindsay Bennett serves as co-chair (along with Dr. Anna Redden, Acadia University) of the *Task Force*'s RAM WG. Its primary role is to engage expertise that helps to inform a work plan to evaluate and monitor the collision risk of fish with different designs of tidal stream energy devices; RAM WG met in June to discuss progress on the research and monitoring agenda.

FORCE has partnered with the Acadia Tidal Energy Institute to support activities informed by the RAM WG. This includes a series of four complementary desktop studies to inform field-based work to understand how fish interact with tidal stream energy devices at FORCE. The studies include:

- Developing a standardized Adaptive Environmental Effects Monitoring Program (AEEMP) Template and Guidance Document (mentioned above)
- Reviewing approaches to measuring and modelling fish distribution and both encounter rate and collision risk probabilities, with probabilities determined for inner Bay of Fundy (iBoF) Atlantic salmon kelt
- Reviewing and providing recommendations for underwater cameras and their practical and integrated/synchronized use in Minas Passage
- Reviewing the needs and options for a data management system for analyzing, storing and sharing environmental effects monitoring data, and recommend a data management system that best suits the needs of FORCE and the tidal stream energy sector

Environmental Monitoring Advisory Committee (EMAC)

FORCE's Environmental Monitoring Advisory Committee (EMAC) provides expert, independent advice on the design, implementation, and continuous improvement of FORCE's Environmental Effects Monitoring Program (EEMP). FORCE is advancing the revitalization of EMAC – a committee required under its *Environmental Assessment* approval. This renewal includes the development of a new Terms of Reference (TOR) that provides stronger technical alignment and additional resources to support the committee's work; approval for the new TOR rests with NSECC. FORCE is also pleased to report that Dr. Graham Daborn has joined EMAC, bringing deep expertise in coastal and estuarine science.

Fishers

Fishers bring deep, place-based knowledge of the Bay of Fundy's marine environment and fishing activity – insights that are essential to ensuring tidal energy development is informed, responsible, and grounded in real-world experience. Local fishers participate directly in the project through research activities, including fish tagging and other monitoring studies. Fishers are also represented on the CLC, ensuring their perspectives inform site activities; the Atlantic Herring Advisory Council contributes expert input through representation on EMAC.

Attendance at Events/ Conferences

FORCE staff regularly participate in events and conferences locally, regionally and internationally to strengthen relationships with partners and stakeholders in government, academia, industry, and Mi'kmaw communities. In addition, ongoing public engagement work takes place in the community of Parrsboro. Events, presentations, and meetings in the past year included participation at:

- Marine Renewables Canada Annual Conference
- Atlantic Policy Congress of First Nations Chiefs Secretariat (APC) Fisheries Conference & Award Ceremony
- International WaTERS (Workshop on Tidal Energy Research and Science) Conference
- European Wave and Tidal Energy Conference (EWTEC)
- Ocean Energy Europe (OEE) Annual Conference
- Atlantic Indigenous-Led Energy Symposium
- Testing Expertise and Access for Marine Energy Research (TEAMER); MarineSitu project/testing campaign hosted in Seattle

3. SHOWCASE THE POTENTIAL

Global interest and support for tidal stream technology is growing, contingent on public confidence that its effects on marine life and the environment are acceptable, its eventual market cost is affordable, and the technology will successfully deliver power. Most residents of Nova Scotia have limited knowledge about the industry, but polling indicates that many support both renewable energy use and responsible tidal stream demonstration.

International Performance Indicators

In 2025, operational data from international tidal-stream deployments continued to provide evidence of maturing system performance that is relevant to Minas Passage.

The MeyGen Phase 1 array in Scotland has produced more than 75 GWh of electricity since 2016, demonstrating multi-year turbine survivability, consistent operation in high flow conditions, and routine maintenance cycles documented across peer reviewed analyses. Orbital Marine Power's O2 platform at EMEC has accumulated thousands of hours of grid-connected operation since 2021, with published performance summaries showing capacity factors in the expected range for tidal devices and validated through third party testing.

Nova Innovation has provided some of the sector's longest operational datasets – over eight years – cited in engineering studies examining drivetrain reliability, blade fatigue, and environmental interaction monitoring. Meanwhile, European-funded demonstration programs such as Tocardo's Oosterschelde project and Flowatt's prototype deployments in France have provided publicly reported data on power curves, maintenance, and power-export consistency under variable tidal regimes.

For the Bay of Fundy, these operational records support growing evidence that tidal stream devices can maintain performance for multiple years, withstand harsh marine environments, and deliver forecastable electricity.

Growing Canadian Activity

This year, DFO built a staged regulatory process requiring evidence from single-device deployments before scaling. This approach was applied in the *Fisheries Act Authorization* process for the Eauclaire/Orbital project at FORCE, marking Canada's first authorization under the revised framework. DFO also advanced guidance for adaptive monitoring requirements under the *Fisheries Act* and *Species at Risk Act* with input from FORCE and Acadia University. NRCan's $8.2 million investment in environmental monitoring research has created capacity to test collision-risk and fish-presence detection methods. The Province of Nova Scotia's competitive procurement for two FORCE berths received multiple qualified bids, demonstrating strong market interest – and a signal that the world is responding not only to Fundy's enormous energy potential, but also a revised approach to regulatory decisions designed to ensure both environmental protection and investor clarity.

Media

Tidal energy in Nova Scotia had recent regional, national and international media coverage focused on the award of new berth sites to Eauclaire/Orbital and DFO's authorization. Headlines included:

- *"Why N.S. may be 'closer than ever' to harnessing Bay of Fundy tidal power"* – CTV, Apr 2025
- *"Nova Scotia prepares procurement for tidal energy projects in Minas Passage"* — Offshore-Energy.biz, Apr 2025
- *"N.S. government will oversee recovery of abandoned tidal turbine"* – CBC Apr 2025

- *"Nova Scotia opens new tidal stream procurement round at FORCE"* — Offshore-Energy.biz, Jun 2025
- *"Bay of Fundy tidal power: Another kick at the can"* – Halifax Examiner Sept 2025
- *"Tidal power proponent plans to modify turbine on failed company's vessel"* – CBC Sept 2025
- *"New funding to advance tidal energy monitoring in the Bay of Fundy"* — Offshore-Energy.biz, Sept 2025
- *"Bay of Fundy tidal energy projects receive $10.7M federal boost"* — Offshore-Energy.biz, Sept 2025
- "*Canada's big investment in monitoring fish and marine life in the Minas Basin,"* CBC Information Morning, Oct 2025
- *"Canadian-Scottish partnership adds 2 tidal energy sites to the Bay of Fundy"* – CityNews Halifax Nov 2025
- *"Scottish firm expands presence in Canada with 12.5 MW tidal award"* — Offshore-Energy.biz, Nov 2025
- *"Investors show renewed interest after 12.5 MW licence award for Bay of Fundy tidal projects"* — ReNews.biz, Nov 2025
- *"Federal Fisheries authorization clears way for three-turbine array at FORCE"* — CityNews Halifax Nov 2025
- *"Tides are changing for the tidal energy industry"* – Signal Nov 2025
- *"Bay of Fundy tidal turbines get regulatory green light"* — Offshore-Energy.biz, Nov 2025
- *"Canada Authorizes First Tidal Energy Array Under New Adaptive Regulatory Framework"* — Ocean-Energy-Systems (OES), Nov 2025
- *"FORCE site becomes test-bed under Canada's staged-approach for tidal-stream deployment"* — OceanNews.com, Nov 2025

Visitor Centre

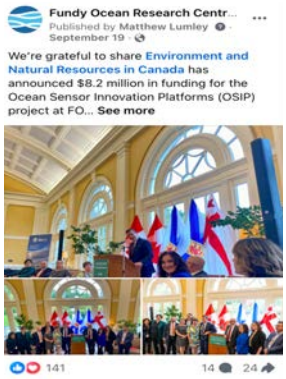
The Visitor Centre (VC) is the flagship of FORCE's engagement efforts. This year, the VC was open five days a week, free to the public Thursday – Monday, 10AM – 4PM, attracting over 1500 visitors this year, bringing the total to over 33,000 visitors since opening in 2012.

Social Media

In 2025, interest in FORCE on LinkedIn increased significantly, (growing by 254% in a single year, to 1,345 followers).

Social media interactions generally related to developer activity, science work, and visitors to the site. Technology progress received the most interactions, followed by employment opportunities and local community activity (e.g. science programs, visitors, beach clean-up).

Posts with the highest interactions included:



NRCan funding (9608 views)



DFO authorization (3929 views)



MRC workshop "Stronger Relationships: Netukulimk, Etuaptmumk & the Future of Ocean Energy" (2289 views)

CONCLUSION

In 2025, FORCE took significant action in advancing tidal energy as a shared priority for Nova Scotia and Canada, making measurable progress across all three of its strategic directions:

- supporting development,
- engaging partners, and
- showcasing the potential of tidal

The year was defined by both consolidation and change: consolidating FORCE's role as steward of a complex site with world class data and infrastructure, while adapting its governance, science program, and partnerships to meet higher expectations for transparency, rigour and success.

On the development side, the most significant milestone was the progress toward multi-device deployment at FORCE. Eauclaire Tidal and Orbital Marine Power secured provincial licences and power purchase agreements for up to 16.5 MW and received a *Fisheries Act Authorization* from DFO for up to three O2-X devices under Canada's revised staged approach. This authorization is the first of its kind in Canada and demonstrates that tidal projects can move through a clearer regulatory pathway grounded in environmental evidence and adaptive monitoring. The news captured international attention, positioning Canada as a forward-thinking leader in regulatory approaches to climate action.

Investments in science and monitoring expanded FORCE's role as a global knowledge hub, aligned with the recommendations of the *Task Force*. The launch of the $8.2M Ocean Sensor Innovation Platforms (OSIP) project, together with continued work under HydroAware and the Bay of Fundy Acoustic Telemetry Consortium is building a more robust toolbox to understand fish-turbine interactions and other environmental effects in high energy conditions. New staff appointments, including the Director of Science and Environmental Programs and Environmental Program Manager, strengthen FORCE's capacity to design, implement, and interpret complex monitoring programs, while revitalization of EMAC and development of AEEMP guidance help align site activities with regulatory expectations.

Perhaps most importantly, FORCE deepened relationships with Rights Holders, communities, regulators, and international partners. The Mi'kmaw delegation to Orkney, development of a Mi'kmaq Ecological Knowledge Study with CMM, and a flagship workshop on Netukulimk and Etuaptmumk to open the 2025 MRC conference all reflect a growing commitment to Indigenous leadership and knowledge in shaping the future of ocean energy.

Locally, an active Community Liaison Committee, expanded visitor centre operations, and participation in community events and regional organizations reinforced FORCE's accountability to people who live and work around the Bay.

International collaboration through OES-Environmental, International WaTERS, and test-centre exchanges maintained FORCE's leadership in supporting dialogue around global best practice and emerging evidence.

Underlying these efforts is a shift in how FORCE is governed and how it

positions itself within the sector. The move to an independent Board of Directors, a Licensee Agreement, and a new Licensee Advisory Committee, clarifies roles and responsibilities, safeguards shared infrastructure and environmental obligations, and better aligns FORCE with public policy objectives and funding opportunities. Together, these changes support a more stable framework for tendering, project development, and long-term site stewardship.

Looking ahead, FORCE's priorities are clear: support the safe deployment and operation of tidal devices at the site, deliver high-quality environmental and technical data to inform decisions, and maintain open, honest engagement with Rights Holders, communities, governments, and the broader public. If FORCE and its partners can continue to meet these expectations, Minas Passage will provide not only a test bed for technology, but a credible model for how tidal energy can contribute to a clean, secure, and inclusive energy future.

