



FERN
FUNDY ENERGY RESEARCH NETWORK

Annual Report to FORCE on FERN Activities and Accomplishments

1 April 2013 – 31 March 2014

Submitted to FORCE by Lisa Isaacman and Dr. Anna Redden

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FERN MISSION & OBJECTIVES

The **Fundy Energy Research Network (FERN)** is an independent non-profit organization initiated by academic and government researchers as a forum to:

Coordinate and foster research collaborations, capacity building and information exchange to advance knowledge, understanding and technical solutions related to the environmental, engineering & socio-economic factors associated with tidal energy development in the Bay of Fundy.

FERN Objectives

1. To identify and provide objective guidance on emerging and priority issues related to tidal energy proposals and developments;
2. To facilitate research collaboration and information sharing among government scientists, academia and tidal energy developers to address environmental, socioeconomic and engineering issues and challenges associated with tidal energy development;
3. To foster collaborative research and partnerships, and training of the next generation of highly qualified people;
4. To promote investment in tidal energy research and optimization of its use by enhancing communication and cooperation among those involved;
5. To develop and maintain productive relationships with regional, national and international groups involved in tidal energy research;
6. To communicate information and research progress through meetings, seminars, conferences, reports, FERN website, and other forms of public presentation.

FERN MEMBERSHIP

- our 137+ registered members (77 institutions) include individuals and organizations from 7 nations (UK, US, Spain, Ireland, Australia, Africa and Canada)
- within Canada, membership spans 6 provinces (Nova Scotia, New Brunswick, PEI, Quebec, Ontario, British Columbia)
- 37 active Subcommittee members
- 8 Executive Committee members: two Executive co-chairs and co-chairs from each of the 3 discipline-specific Subcommittees.

FERN Committee Members

Name	FERN Committee	Affiliation
Alan Howell	Socioeconomics	NS Dept. Energy
Alex Hay	Natural Sciences	Dalhousie
Andrew Henry	Engineering	Consultant
Anna Redden	Executive Committee co-chair & Natural Sciences	Acadia / ACER / ATEI
Brent Law	Natural Sciences co-Chair	GSC
Dan Thompson	Natural Sciences	NS Power
Dana Morin	Socioeconomics co-chair	Fundy Tidal Inc.
Danika van Proosdij	Natural Sciences	Saint Mary's University
David Greenberg	Natural Sciences	DFO
Dean Steinke	Engineering co-chair	DSA Ltd
Eric Christmas	Socioeconomics	Mi'kmaq Rights Initiative
Gary Melvin	Natural Sciences	DFO, St. Andrews
Gerhard Pohle	Natural Sciences	Huntsman Marine Science
Ghanashyam Ranjitkar	Engineering	NRCan
Graham Daborn	Natural Sciences	Acadia / ATEI
Greg Trowse	Natural Sciences	Fundy Tidal Inc.
Gregory Heming	Socioeconomics	Annapolis County
Isabel Madeira-Voss	Socioeconomics	NSCC
Jamie Ross	Engineering	OpenHydro
Jason Woods	Natural Sciences	SMRU
Jean-Marc Nicholas	Natural Sciences	NS Power
Joel Culina	Natural Sciences	FORCE
John Colton	Socioeconomics co-chair	Acadia / ATEI
John Shaw	Natural Sciences	GSC
Kay Crinean	Socioeconomics	Maritime Tidal Corp.
Kim Dunn	Socioeconomics	Dalhousie
Mary McPhee	Socioeconomics	FORCE
Michelle Adams	Socioeconomics	Dalhousie
Mo El-Hawary	Engineering	Dalhousie
Peter Smith	Executive Committee co-chair & Natural Sciences	DFO
Richard Karsten	Natural Sciences co-Chair	Acadia / ATEI
Ryan Mulligan	Natural Sciences	Queen's University
Simon Melrose	Natural Sciences	Oceans Ltd.
Sue Molloy	Engineering co-chair	Glas Ocean/ Dalhousie
Terry Thibodeau	Socioeconomics	Municipality of Digby
Tiger Jeans	Engineering	University of New Brunswick
Tony Wright	Engineering	FORCE

ACTIVITIES & ACCOMPLISHMENTS

The following section highlights key activities FERN was directly engaged in during April 2013 – March 2014.

1. Communication and Collaboration

FERN serves as a venue for information sharing, open dialogue, idea generation and collaboration.

Over the past year, FERN's network of researchers and institutions has expanded regionally, nationally and internationally with over 22 new individual and institutional members (16% increase), including several new subcommittee members. In addition to membership growth, FERN has seen a growth in national and international institutional partnerships and collaborations, particularly with Marine Renewables Canada (MRC), Fisheries and Oceans Canada (Ottawa), Natural Resources Canada (Ottawa), Sea Mammal Research Unit Ltd (UK), University of Massachusetts - Dartmouth, University of Washington, University of Maine, OpenHydro, Marine Current Turbines, Ocean Renewable Power Company, Pacific Northwest National Laboratories, OES-Annex IV (Environmental Monitoring) and IEC TC-114 (Standards Committee).

FERN is represented by members serving on numerous regional, national and international marine renewable energy committees, including IEC TC-114, OES-Annex IV, MRC, FORCE, OERA, and EMAC. Members regularly contribute to national and international conferences and research and monitoring workshops and symposia. FERN members have also been involved in several major collaborative projects and reports completed during the past year.

FERN SUBCOMMITTEES

At the heart of FERN are our three standing Subcommittees. They represent the core tidal energy research themes: **Natural Sciences (biological and physical), Engineering and Socio-Economics.**

The role of the Subcommittees is to bring together diverse interests and expertise to share information and to collectively identify and resolve priority issues related to tidal energy by:

- Strengthening relationships between academia, government and industry;
- Identifying potential project ideas and research teams; and
- Developing communication and information sharing tools to foster and facilitate research in areas of need.

Each of these Subcommittees meet regularly (in person and/or by teleconference) and communicate via email to exchange news and ideas and plan future work. FERN held 11 committee meetings in 2013/14:

- Annual General Meeting (May 14, 2013)
- Executive Meetings (spring and fall)
- Subcommittee Meetings:
 - Natural Sciences (2/yr)
 - Socioeconomics (3/yr)
 - Engineering (3/yr)

The main outcomes of these exchanges have been the generation of new ideas and innovative, collaborative projects. In 2013/2014, key areas of discussion and/or advancement included:

- FORCE monitoring platform progress, with Subcommittee member involvement on the FAST Advisory Committee (Natural Sciences and Engineering)
- Environmental monitoring technologies (Natural Sciences and Engineering)
- Cable laying, connecting and monitoring (Engineering)
- Community engagement (Socioeconomics)
- Marine spatial planning and socioeconomic implications (Socioeconomics)
- Value proposition for tidal energy
- Research priority setting
- Effective use of research vessels (e.g. Hudson cruise to Minas Basin/Passage)
- Overviews and updates of recent projects and other tidal related activities

In 2014/2015, the FERN Subcommittees plan to engage with the broader community, via:

- A webinar series on key topics (all Subcommittees)
- Data sharing and analysis workshops, starting with one on sediments (Natural Sciences)
- Establishing expert working groups on cable lay and other pressing topics (Engineering)
- Guest speaker invitations and appointment of meeting observers (Socioeconomics)
- Encouraging greater research student involvement in FERN's activities (all)

KEEPING INFORMED

FERN provides a number of communication tools, including the FERN website. The website includes a searchable publications catalogue, field research calendar and notice boards. Website improvements are planned for the coming months, including new search functions, a research/researcher database and other functionalities. FERN members are also kept informed on tidal energy related events and opportunities via monthly e-blasts.

ANNUAL FERN NEWSLETTER

The annual FERN Newsletter (Issue 3 – Fall 2013; 16 colour pages) was released in December 2013. Content highlights include:

- Report from the 2013 Annual General Meeting
- Report on the FERN Subcommittees
- 2013 Nova Scotia Tidal Energy Research Symposium & Forum
- FORCE: 2013 Highlights
- Nova Scotia Tidal Energy Projects & Activities 2010-2013
- Tidal Energy at the Nova Scotia Department of Energy
- Update from the OERA
- Tidal Research & Development (R&D) in Maine
- Acadia Tidal Energy Institute
- Tidal Research in Digby Neck
- 2013 Hudson Cruise in Minas Basin & Minas Passage
- First Submarine Cable Installed at FORCE

The 2013 FERN Newsletter was distributed to members and associates via email and posted on the website (<http://fern.acadiau.ca/newsletter.html>). Hardcopies are available at the FORCE office and will be displayed at the FORCE Visitor Centre. The newsletter will also be distributed at the EIMR Conference in Scotland (May 2014), the Nova Scotia Energy R&D Conference (May 2014), the Coastal Zone Canada Conference (June 2014) and ICOE (Nov 2014).

NOVA SCOTIA TIDAL ENERGY RESEARCH SYMPOSIUM & FORUM

This 2 day event, co-hosted by FERN, OERA, ATEI and Nova Scotia Energy, was held on May 14 - 15, 2013 at the KC Irving Environmental Science Centre, Acadia University, Wolfville, NS. It was supported by grants from the OERA and NSERC, and in-kind venue and personnel support from Acadia University. The purpose of the event was to present research results and discuss activities, findings and insights among those engaged in ongoing and recently completed environmental, technological / engineering and socioeconomic research and other tidal energy activities in the region. The event was attended by >100 delegates from Canada (Nova Scotia, New Brunswick, British Columbia) and the US (Washington and Massachusetts), with delegates representing the full range of sectors involved in tidal energy development and research.

Sector Breakdown:

- Private industry / consultants (24%)
- Academia/ faculty (22%)
- Students (22%)
- Federal government (15%)
- Provincial government (9%)
- Non-profit associations (8%)

The symposium and forum included:

- Updates on marine renewable energy developments and related activities in Nova Scotia;
- Overviews of recently funded research projects and associated technical needs;
- Oral and poster presentations on results and lessons learned from ongoing and recently completed research and technical work related to Nova Scotia's tidal energy resources and its practical relevance to development and regulation;
- Focused break-out sessions with facilitated discussions on:
 - collaboration and engagement in tidal energy R&D
 - information/technology gaps and challenges
 - technological solutions to address industry challenges;
- A panel session featuring tidal energy R&D financing (including Feed-in-Tariffs) and regional and national priorities and opportunities; and
- Networking opportunities to foster dialogue, understanding and cooperation among the research community, industry and regulators.

The Symposium Proceedings have been distributed to members and associates via email and are posted on the FERN website (<http://fern.acadiau.ca/ns-tidal-energy-research-symposium-forum-2013.html>).

2. Guidance and Contributions to Tidal Energy Reports

One of FERN's main objectives is to provide guidance and advice on tidal energy research and monitoring priorities. Examples of recent involvement include:

- FORCE's Fundy Advanced Sensor Technology (FAST) Advisory Committee
- FORCE's Environmental Monitoring Advisory Committee (EMAC)
- OERA Tidal Area Technical Committee

In the past year, FERN members have been involved in the review and production of the following reports and guidance documents:

- Community & Business Toolkit for Tidal Energy Development. Released in spring 2013
- Community Engagement Strategy for Tidal Energy. Released in summer 2013
- Fundy Strategic Environmental Assessment Update. Released in early 2014
- FORCE's Environmental Effects Monitoring Program Report 2011-2014. *Current Status:* Draft under review by EMAC. EMAC workshop to be held May to develop conclusions and recommendations; Final revisions/ draft expected late spring 2014.
- FORCE's Research and Monitoring Program Summary Report: 2008-2013. *Current Status:* Underway; to be completed spring/summer 2014.
- Tidal Energy chapter in a new Bay of Fundy Ecosystem Partnership book to be released in spring/summer 2014.

3. Engaging Students & Young Professionals

Student research in the field of tidal energy has grown at several tertiary institutions (universities, colleges) in the region. Students and young professionals make up ~20% of the FERN membership. This year there was a marked increase in student interactions with FERN, in large part due to the Nova Scotia Tidal Energy Research Symposium held in May 2013. The event included 20 student research posters and opportunities for students to network with peers (a student only breakout session) and with professionals in the field. FERN has served as a popular resource for graduate and undergraduate students (Canada-wide) working on projects in tidal energy.

FERN has facilitated training and learning opportunities for students and young professionals, including those associated with co-op programs, INORE and the Acadia Tidal Energy Students' Association which is currently being assisted to expand to an Atlantic-wide student network. The FERN coordinator has co-supervised and mentored co-op students and a tidal energy intern, and assists those seeking jobs and graduate opportunities by connecting them with relevant professionals and by posting resumes, and internship and job opportunities, on FERN's notice board and email listserv.

4. Capacity Building

Areas in which the FERN has had a direct impact on building capacity for the tidal energy sector in the region include:

- Training of highly qualified personnel, including research students (Honours, MSc and PhD), research assistants, technicians, interns and post-doctoral fellows;
- Acquisition of research infrastructure and equipment (at numerous institutions) for conducting world-class field and lab-based research;
- Development of expertise in research and monitoring at tidal energy development sites and enhancement of capabilities in modelling and mapping tidal energy resources, sediments and other site characteristics;
- Formation of productive multidisciplinary teams for conducting large tidal energy projects funded by federal and provincial entities;
- Participation in international research partnerships and related activities (committees working on international standards, monitoring best practices, etc.); and
- Generation of social licence (which acts to diminish risk) through transparent, collaborative and independent research, and by engaging the broader community via public presentations and dissemination of research findings and related products (e.g. tidal energy toolkit).

PROPOSED ROLES OF FERN IN 2014/15

In anticipation of turbine deployments at FORCE and elsewhere, FERN's priority is to continue to foster cooperative partnerships to build the capacity (e.g. expertise, techniques, instrumentation, infrastructure), baseline data, and political/industry support necessary to execute effective, credible, multi-disciplinary research and monitoring to resolve the environmental, technical and socioeconomic uncertainties of tidal energy development in dynamic high flow environments.

Much of FERN's activities and accomplishments to date have been of direct or indirect benefit to FORCE. In the coming year, FERN activities that could serve to support FORCE's ongoing research and monitoring efforts include:

- Establishing and maintaining a research and monitoring database for both data and related documents, including the FAST project. This could include activities that facilitate user access to information;
- Continued assistance with the preparation or review/synthesis of research and monitoring reports. These reports would support funding applications, public & industry relations, and the needs of EMAC and industry regulators;
- Organizing and facilitating research and monitoring related workshops and events;
- Assisting in the preparation of national funding applications to support the long-term operational and research needs of FORCE;
- Preparation of the annual FERN newsletter with a focus on FORCE activities; and
- Website reporting of FORCE activities and successes.

FERN recognizes the importance of its role in actively engaging and educating the public on tidal energy topics of interest. Our efforts in supporting impartial collaborative research and projects, communicating broadly, engaging the community and in advancing social license creates significant benefits to FORCE, tidal energy developers, and the government sector - provincially and nationally.

ACKNOWLEDGEMENTS

The commitment and efforts of FERN's 38 volunteer committee members are greatly appreciated. We thank ATEI intern, Meghan Swanburg, for assistance with the newsletter and other reports. FERN is grateful to FORCE for annual funding to support the network's operations. Acadia University is thanked for providing office space and associated facility and administrative support for the FERN coordinator as well as in-kind meeting room space for FERN committee meetings and special events.