Request for Proposals

The Maritimes' Net-Zero Future

A Feasibility Study of Hydrogen Production, Storage, Distribution and Use in The Maritimes

RFP Release Date: 17 June, 2020
Proposal Due Date: 03 July, 2020, 5:00PM ADT

Contract Manager

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1. Introduction

OERA is an independent, not-for-profit research organization in Nova Scotia that funds research aimed at reducing risk and encouraging the sustainable development of energy resources. OERA supports research into renewable energy technologies, cleantech initiatives and geoscience by facilitating collaborative, made-to-order teams of experts. Consistent with this mandate, the assessment of economic opportunities and technical challenges of hydrogen production, storage, distribution and use in the Maritimes is the subject of this Request for Proposals (RFP). This RFP is issued by OERA in the context of a collaborative program funded by the Nova Scotia Department of Energy & Mines, the Atlantic Canada Opportunities Agency, Heritage Gas Limited (HGL), and Liberty Utilities. This work supports the region's broad energy policy objectives related to climate change, inclusive economic development and the sustainable development of energy resources.

2. Context and Objectives

Context: The Atlantic Clean Power Roadmap aims to provide a vision for interjurisdictional collaboration to build a clean electricity network across Atlantic Canada. In 2019 Nova Scotia established the Sustainable Development Goals Act that has set a target to become a net-zero greenhouse gas (GHG) emission economy by 2050. A new integrated resource plan for the electricity sector is set to be released in 2020. While the path to net-zero emissions includes decarbonizing the electricity system and electrifying end uses such as transportation and building heating, other approaches must be considered to further reduce GHG emissions. Hydrogen can be a GHG-free energy source with a variety of potential applications.

The role of hydrogen in deeply decarbonized energy systems has been thoroughly discussed within the academic community, but industrial applications and emerging business development opportunities are only now coming into focus. This study will investigate hydrogen's potential contribution to the Maritime's sustainable development goals, from creating hydrogen from local raw materials, through transport and storage, to ultimate end uses in the Maritimes and other markets. Knowledge gaps relating to the economic opportunities and technical challenges of a hydrogen future currently represent a significant impediment to business planners, government regulators and the public at large. The results of this work can be used to identify research priorities, set development policy, and help local businesses identify energy transition supply chain business opportunities.

Objective: The objective of this study is to provide a technical and economic assessment of the role that hydrogen could play in the Maritime's energy transition. The assessment will review all aspects of this resource from creation to end-use and evaluate the economic and technical constraints and opportunities as hydrogen use and production scales up over time in the Maritimes.

3. Scope of Work

OERA is seeking a broad understanding of the technical and economic challenges and opportunities that hydrogen presents to the Maritimes, with a particular emphasis on the evolving economic picture over

time (2020 – 2050) and scale. The study will identify potential advantages and disadvantages of developing hydrogen infrastructure in the Maritimes, especially in the context of the region's geographic location near the "end" of the national gas & electricity grid.

The scope of work consists of three primary tasks:

Task 1: Information Review and Data Gathering

Task 2: Assessment and Analysis

Task 3: Reporting

The final deliverable must include a description of the following subject areas; the report structure can be defined by the proponent.

1. Production

Hydrogen is commonly classified by the carbon intensity and nature of the energy supply that is used to produce it:

- Grey hydrogen produced with fossil fuel-based energy input (e.g. coal);
- Green hydrogen produced with energy from renewable sources (e.g. wind); and
- Blue hydrogen produced with energy from non-renewable low-carbon sources (e.g. combined cycle gas turbines with carbon capture and sequestration).

The emphasis of this project will be on local green and blue hydrogen production as its objective is to help enable the Maritimes to meet their sustainable development goals. Grey hydrogen, however, might be considered during the transition to a hydrogen economy.

The production technologies discussed in the report should include but are not limited to:

- Electrolysis,
- Biomass gasification,
- Steam methane reforming (SMR),
- Methane pyrolysis and
- Industrial by-product hydrogen including current estimated emission volumes.

The report should briefly explain each production technology and its local feedstock supply (including estimates of surplus electricity from renewable sources) and describe the production pathways that would minimize the cost for end-use services. It should also describe any local competitive advantages of

the different hydrogen production methods in the Maritimes. This assessment should describe expected changes to the overall economics of hydrogen production as costs change and production is increased over time. Additionally, the GHG emission impacts of the different production technologies should be quantified.

This section should also discuss the possibility to produce hydrogen close to the feedstock source (e.g. close to electricity production) or close to the user (e.g. close to a harbour for marine end-users). It should be noted which end-use scenarios benefit from which production location.

2. Storage

The report should identify the appropriate storage technology for a variety of end uses including long-term, large-scale storage within the region. The report should also broadly describe the legal implications and potential public health risks associated with each storage technology.

3. Transport

Transporting hydrogen to the place of consumption will require a sophisticated transport system and skilled operators. The report should describe possible hydrogen transport infrastructure if warranted. This section should consider the advantages and disadvantages of creating infrastructure that would transport hydrogen from the source of its creation to its place of end use, versus adding to the existing electrical infrastructure so electricity can be transported to a hydrogen end user who in turn uses the electricity to create hydrogen in place. This ties into the question of where hydrogen should be produced (see above).

4. Use

The report should identify potential hydrogen uses, the technical and economic challenges of realizing these end uses, the GHG emission reduction potential and the broad economic benefits of hydrogen use and scale-up over time. Fundamentally, the report must illustrate the key economic drivers and constraints to the adoption of hydrogen in the Maritimes. If warranted by an economic argument, the uses to be discussed include but are not limited to:

- ***Decarbonizing the natural gas system:*** Blending hydrogen into the natural gas system is a possible way to reduce the carbon intensity of natural gas. The report should point to factors that affect the technical blend limit and describe which infrastructure improvements are necessary to increase the blend limit. The report should evaluate the technical possibility of avoiding infrastructure upgrades through hydrogen methanation.

- ***Heating buildings:*** The report should elaborate on the potential to reduce peak electricity demand by using hydrogen in heating applications, either solely or in hybrid systems.

- ***Transportation:*** The report should contain information on how hydrogen can be used in the following transport sectors:

    - Heavy road transport,
    - Public transport and
    - Personal transport.

- ***Marine:*** Even though a subset of transportation use, the report should take the marine sector's unique relevance in the Maritimes into account and should provide detailed information on the potential use of hydrogen in the marine sector.
- ***Industrial applications:*** The report should identify the opportunities for companies in the Maritimes to use hydrogen for process or building heat and as a feedstock.
- ***Export:*** With many jurisdictions moving toward a hydrogen future, global demand for hydrogen is expected to rise in the coming decades. The report should discuss opportunities for large-scale hydrogen production in the Maritimes and potential export markets for locally produced hydrogen. Specifically, the report should investigate whether the Maritimes have or can create a competitive advantage due to its geographic location along key international shipping lines and potentially abundant renewable resources such as offshore wind and tidal energy that can be used to create hydrogen.

5. Supply Chain Capability Assessment

The report should provide an overview of the types of supply chain services that can be provided by local service providers and identify where expertise is lacking. This part of the report should touch upon the production, storage and distribution value chains.

6. Regulation & Policy

The introduction of hydrogen to the regional energy system will require dedicated policies and a regulatory framework. The report should analyze whether regulatory limitations exist that would prevent investment in any part of the hydrogen value chain and identify regulations that may be required to support the development of hydrogen in the region. In addition, the report should include an evaluation of the role that hydrogen can play in the achievement of Nova Scotia's net-zero-by-2050-target. Specifically, the report should identify necessary next steps, timelines and key stakeholders.

7. Carbon Capture and Sequestration

To produce blue hydrogen by gasification, SMR or pyrolysis, carbon capture and sequestration (CCS) technology will need to be adopted. The report should identify what further research is needed to quantify CCS opportunities in the Maritimes. OERA will provide background documentation on past findings from the CCS Research Consortium.

8. National Potential for Hydrogen

While the study should focus on the Maritimes, Natural Resources Canada's (NRCan) pending national hydrogen study should be reviewed and put into a regional context. Furthermore, the study should provide brief commentary on the potential role of hydrogen on a national level.

4. Deliverables

Upon project completion, the proponent will provide:

(1) A Report that presents the findings of Tasks 1 and 2. Both a draft version and final version are required with the opportunity for the review committee to recommend reasonable changes to the draft version for inclusion by the proponent in the final version before the project ends.

(2) A presentation (in PowerPoint) to the review committee to accompany submission of the draft version of the report. The presentation will review the project and its main findings.

5. Timelines

The proponent is expected to host regular project status meetings via video conference. OERA will host the kickoff meeting. The following timeline outlines OERA's expectations with respect to timing. It is anticipated this project will be completed within two months of contract award.

1. RFP release date: 17 June, 2020
2. **Proposal due date:** **03 July, 2020 (5 pm ADT)**
3. Project kickoff: 13 July, 2020
4. Draft report: 4 September, 2020
5. Final Report: 18 September, 2020

	June Week Ending				July Week Ending					August Week Ending				September Week Ending			
	5th	12th	19th	26th	3rd	10th	17th	24th	31st	7th	14th	21st	28th	4th	11th	18th	25th
PMC + RFP created / issued			■														
Proposal preparation				■	■												
Proposals reviewed/selection						■											
Project start / Kickoff meeting							■										
Report drafting							■	■	■	■	■	■	■	■			
Report finalized															■	■	

6. Funding

Funding available for this project is capped at a maximum of CAD $90,000 excluding taxes. Proposals that exceed this amount will not be considered. Note that proposals will be rated first in terms of the team/work plan and second in terms of total price.

7. Proponent Qualifications

The successful applicant must have proven experience in energy system analysis and research. Proposals should explain the experience and qualifications of the project team and provide references where available (both literature and previous clients).

8. Proposal Requirements

1. The proposal should be concisely worded with clearly described objectives, methods, budget, schedule and deliverables. Maximum 15 pages excluding appendices.

2. The proposal should include a description of the Respondent's organization and its relevant experience with similar projects. The Respondent must also describe the relevant work experience of the key staff assigned to this project and their roles on the project. This material should be summarized in the body of the RFP and can be presented in more detail, if needed, in the appendix.

3. Familiarity with the subject matter at the international level is an asset.

4. This funding is open to non-Canadian entities as well as project teams consisting of Canadian and non-Canadian partners. No preferential weighting for Canadian companies will be applied.

5. Please provide a project organizational chart showing the role and reporting hierarchy of project partners, and reporting lines to the OERA review committee.

6. A single electronic document is sufficient. Please ensure the proposal or cover letter is signed by an officer or equivalent with authority to bind the Respondent to the statements made in the proposal.

The electronic copy should be uploaded in WORD and/or PDF format to the OERA-FTP site available at https://oera.sharefile.com/r-r75132f1056648b69: The file name should include an abbreviated form of the proponent's name.

9. Questions and Clarifications

The OERA will accept questions from interested applicants on an ongoing basis until 5 pm ADT June 26, 2020. A Q&A page will be available on the OERA website https://oera.ca/opportunities/request-proposals/maritimes-net-zero-future-feasibility-study-hydrogen-production. The names and organizations of those submitting questions will remain anonymous; only the question and OERA's response will be posted. Interested parties are encouraged to check the Q&A page for updated information and/or clarifications that may help in completing their proposal.

Please submit your questions by email to Sven Scholtysik (sscholtysik@oera.ca).

10. Evaluation

This project will be administered through OERA. As shown below, proposals will be quantitatively evaluated against a set of criteria.

Factor	**Weight**
Experience and Knowledge: Qualifications, experience and capabilities of the company and delivery team; demonstration of local and international knowledge relevant to this study.	40%
Project Plan, Approach and Methodology: Proponent demonstrates an understanding of the project service requirements and has outlined a clear and effective work plan. Proposal describes the objectives, methodology, milestones and deliverables, and a sound approach in undertaking this project. Communication format and frequency between the Respondent and OERA are clearly described.	40%
Proposal Presentation and Organization: Proponent describes an achievable schedule with well-defined milestones and demonstrates the ability to complete the work on or before the desired completion date. The project will offer good value for the proposed budget. The budget is clear, complete, and well-described. The proposal includes all RFP requirements, demonstrates attention to clarity, grammar, presentation, comprehensibility, etc.	20%
Total:	100%