



**COMMISSION  
AGENDA MEMORANDUM**

**Item No.** 10b

**ACTION ITEM**

**Date of Meeting** April 26, 2022

**DATE :** March 29, 2022

**TO:** Stephen P. Metruck, Executive Director

**FROM:** Sarah Ogier, Director, Maritime Environment & Sustainability  
Alex Adams, Senior Manager, ME&S  
David Fujimoto, Senior Environmental Program Manager, ME&S

**SUBJECT: Hydrogen Storage Cooperative Research and Development Agreement**

**Amount of this request:** \$35,000

**Total estimated project cost:** \$1,100,000

**ACTION REQUESTED**

Request Commission authorization for the Executive Director to execute a Cooperative Research and Development Agreement with Pacific Northwest National Labs (PNNL), Sandia National Labs (SNL) and Seattle City Light (SCL) to study risk assessment of large-scale hydrogen storage in a port environment. PNNL is the lead agency in the project and through the Agreement the Port would provide an amount not to exceed \$35,000 in funds toward a total estimated project cost of \$1,100,000.

**EXECUTIVE SUMMARY**

With the Seattle Waterfront Clean Energy Strategy (SWCES), the Port is leading the development of an infrastructure strategy for maritime decarbonization of Port and tenant operations. The SWCES is a key implementation project within the Maritime Climate and Air Action Plan (MCAAP) and the Northwest Seaport Alliance Implementation Plan for the Northwest Ports Clean Air Strategy.

As a part of the SWCES, the Port is working in collaboration with SCL to evaluate applications for renewable hydrogen to support a combination of future heavy-duty maritime transportation end uses such as heavy-duty trucks, equipment, maritime vessels and back-up power and energy services, such as energy storage, grid support and resiliency.

In 2021-2022, SCL, PNNL and SNL are studying the potential for a small-scale heavy duty trucking hydrogen “node” to support limited uses under an existing Cooperative Research and Development Agreement (or CRADA) with the Department of Energy. The proposed Hydrogen Storage CRADA —the subject of this action request—builds upon the work currently underway

Meeting Date: April 26, 2022

to perform a risk assessment for large volume hydrogen storage to understand the factors needed for hydrogen storage systems in an urban, industrial setting. Funding for this work has been secured with the Department of Energy and, if approved by partners, will start in Q2 2022 and run through 2023. These studies will not provide a level of analysis for regulatory compliance purposes or site-specific design. Rather, the studies inform research and potential future development while contributing to a body of knowledge for hydrogen storage applications in port environments that is valuable regionally and nationally.

The project includes \$220,000 in in-kind support split between SCL and the Port, as well as \$35,000 in direct contributions from the Port, \$75,000 from SCL and \$770,000 in federal funds. This is not a request for funding as this is already included in our approved 2022 budget.

### **JUSTIFICATION**

The CRADA supports the following Century Agenda Goals:

- (1) Be the greenest and most energy-efficient port in North America
- (2) Achieve a reduction of Port-controlled and indirect emissions to net-zero by 2040, and Port-influenced emissions to carbon neutral or better by 2050.

In addition, the CRADA directly supports the vision of the Northwest Ports Clean Air Strategy to phase out emissions from seaport-related activities by 2050, as well as exploration of hydrogen technologies for consideration within the SWCES, which is a key implementation action within the adopted MCAAP.

### **DETAILS**

The project will perform a risk assessment of large scale hydrogen storage using the Port of Seattle as a test case. The study will evaluate risk components such as safety, health, environment, infrastructure and other assets, and infrastructure component and system designs and technologies including compressed hydrogen, liquified hydrogen and liquid organic hydrogen carrier storage and operation.

These system designs will be useful for understanding how technologies perform in terms of facility and public safety. The operating states associated with various end uses (such as fueling, back-up power, grid support, etc.) of the hydrogen system would then be analyzed and incorporated into an overall storage risk assessment. Scalability will also be analyzed to understand how future uses would affect the overall risk assessment.

### ***Scope of Work***

PNNL and SNL will lead the development of the study, with support from SCL and the Port. The project would be divided into five primary tasks taking place over a twenty-four month period:

Meeting Date: April 26, 2022

- (1) Large scale hydrogen risk assessment. This task will assess three hydrogen storage technologies and related generation and compression infrastructure requirements and will consider multiple site conditions and maritime and port operations.
- (2) Operational considerations for storage risk assessment. Various operating states will be examined such as vehicle fueling, power storage, arbitrage, transmission and distribution system upgrade deferment and resiliency.
- (3) Risk assessment scalability. The applicability of the analysis in tasks 1 and 2 will be assessed under large volume storage conditions to understand the scalability of the risk assessment methodologies.
- (4) Cyber security risk assessment. PNNL will apply cyber security analysis capabilities to identify the types of measures which should be applied for projects of this type.
- (5) Risk assessment for stakeholder engagement. This task will consider how the risk assessment and related products developed under tasks 1-4 could be used as a means of educating and engaging stakeholders, which is anticipated to be vital for these types of projects.

***Schedule***

Activity	Timing
Commission Inter-agency Agreement Authorization	2022 Quarter 2
Project Start	2022 Quarter 2
Project Workshop	2023 Quarter 1
Final Report and Completion	2023 Quarter 4

**ALTERNATIVES AND IMPLICATIONS CONSIDERED**

**Alternative 1** – Do not authorize execution of the Cooperative Research and Development Agreement

Cost Implications: \$0 (funds would not be spent - the Port would not contribute to the study)

Pros:

- (1) Port funds and staff time could be reserved for other activities.

Cons:

- (1) The Port would lose the opportunity to gain insight into risks, benefits and key considerations of large volume hydrogen storage for port and utility applications; lost opportunity to make advancements related to clean hydrogen in support of the Seattle Waterfront Clean Energy Strategy, the Maritime Climate and Air Action Plan, the Northwest Ports Clean Air Strategy and the Century Agenda goals on decarbonization.
- (2) Similar studies if separately pursued by the Port in future would likely be at much greater expense.

Meeting Date: April 26, 2022

- (3) SCL, a key partner in the Seattle Waterfront Clean Energy Strategy, along with PNNL and SNL, would need to identify alternative sources of matching funds to support the project.

This is not the recommended alternative.

**Alternative 2 – Authorize execution of the Cooperative Research and Development Agreement**

Cost Implications: \$35,000

Pros:

- (1) Advances understanding of risks and design factors for hydrogen storage applications in the urban-industrial port environment; supports the goals of the Seattle Waterfront Clean Energy Strategy, the Maritime Climate and Air Action Plan, the Northwest Ports Clean Air Strategy, and the Century Agenda related to maritime decarbonization.
- (2) Limited commitment of resources relative to overall project funding. The Port's contribution would leverage the expertise of two national labs and federal energy funds.
- (3) The project supports the Port's efforts to work in collaboration with SCL to explore solutions for waterfront electrification.
- (4) The CRADA provides an opportunity for the Port to lead in development of the knowledge base for clean hydrogen infrastructure at scale for port applications, with potential benefits nationally and internationally.

Cons:

- (1) Participation in the project requires a commitment of funding and staff time.
- (2) Specific goals for hydrogen storage and use have not been determined by the Port or SCL, so the direct application of the study is not known at this time. However, analysis such as this study is generally recommended, prior to setting goals.

***This is the recommended alternative.***

**FINANCIAL IMPLICATIONS**

Funding for the Port's direct cash contribution of \$35,000 to the CRADA would be provided through the general fund under the Maritime Environment and Sustainability annual budget, with one-half provided following execution of the agreement and the balance before the start of the second year of the study. In-kind support would be provided through staff participation in the study.

***Future Revenues and Expenses (Total Cost of Ownership)***

The CRADA does not commit the Port of Seattle to any action as a result of the study, and accordingly there are no related future revenues or expenses as a result of this action.

Meeting Date: April 26, 2022

**ADDITIONAL BACKGROUND**

Storage of hydrogen will be a key component for utilization of renewable hydrogen for many port industry applications and may provide utility solutions to address electrical distribution system constraints. The CRADA is a low-risk way to leverage the expertise of two national labs and federal energy investment funds to explore key segments necessary for advancement of renewable hydrogen applications. It provides an opportunity for the Port to help lead in the development of port applications nationally. In addition, hydrogen research holds the potential to help open opportunities for clean energy investments of national significance, such as the development of regional Clean Hydrogen Hubs for which \$8 billion was appropriated in the U.S. Infrastructure Investment and Jobs Act. The Port is currently participating in the development of a regional Northwest Hydrogen Hub proposal along with the State of Washington, the Consortium for Hydrogen and Renewably Generated E-fuels (CHARGE) / Washington State University, PNNL, Maritime Blue, the Clean Tech Alliance, and other public and private parties. Hydrogen research, development and deployment may also provide valuable insights into sustainable fuels for aviation and maritime applications.

**ATTACHMENTS TO THIS REQUEST**

- (1) Presentation slides
- (2) Cooperative Research and Development Agreement

**PREVIOUS COMMISSION ACTIONS OR BRIEFINGS**

Sustainability, Environment and Climate Committee, briefing on hydrogen activities at the Port, March 16, 2022