ELECTRIC OR LOW-EMITTING FERRY

Presented to the

Alaska Marine Highway Operations Board

SOUTHEAST CONFERENCE

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BACKGROUND: SEC & AKDOT

In March 2022, AKDOT&PF and Southeast Conference signed an MOU wherein SEC would oversee a project to

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ALASKA MARINE HIGHWAY SYSTEM MOA: 2522S060

MEMORANDUM OF UNDERSTANDING

No: 2522S060

Between

STATE OF ALASKA

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

ALASKA MARINE HIGHWAY SYSTEM

and

SOUTHEAST CONFERENCE

This Memorandum of Understanding (MOU) sets forth the terms and understanding between the State of Alaska, Department of Transportation and Public Facilities (DOT&PF), Alaska Marine Highway System (AMHS) and the Southeast Conference (SEC) for a detailed examination of the costs, benefits, and overall technical and financial feasibility of low-emission ferry operations within the AMHS service area.

Background

Section 71102 of Public Law 117-58 (also known as the "Bipartisan Infrastructure Law") directs the US Department of Transportation to carry out a pilot program to provide grants for the purchase of electric or low-emitting ferries and for the electrification of existing ferries to reduce emissions. With the understanding AMHS operates the ferry system containing the largest number of marine highway system miles in the United States, AMHS is well-positioned to sponsor the evaluation of alternative fuel, low emission propulsion systems on specified routes in coastal Alaska. This Public Law effort is well timed given Alaska's need to plan for new vessels to replace AMHS's aging fleet. The research into alternative fuel ferries can advance the current industry state of low emission technology toward increasing the range and capacity of zero emission power source ferries.

Purpose

This MOU establishes an agreement between the State of Alaska and Southeast Conference to examine the operational, technical, and financial feasibility, as well as the economic benefits associated with low-emission ferry operations within the AMHS service area.

Roles and Responsibilities

Through this MOU, the State of Alaska agrees to:

- Contract with Southeast Conference to manage this low-emissions ferry service analysis and to incorporate forward-thinking opportunities into the long-term comprehensive plan.
- Provide technical assistance, data sharing, and plan designs as requested.
- Provide necessary funding, not to exceed $200,000.00 for the project.

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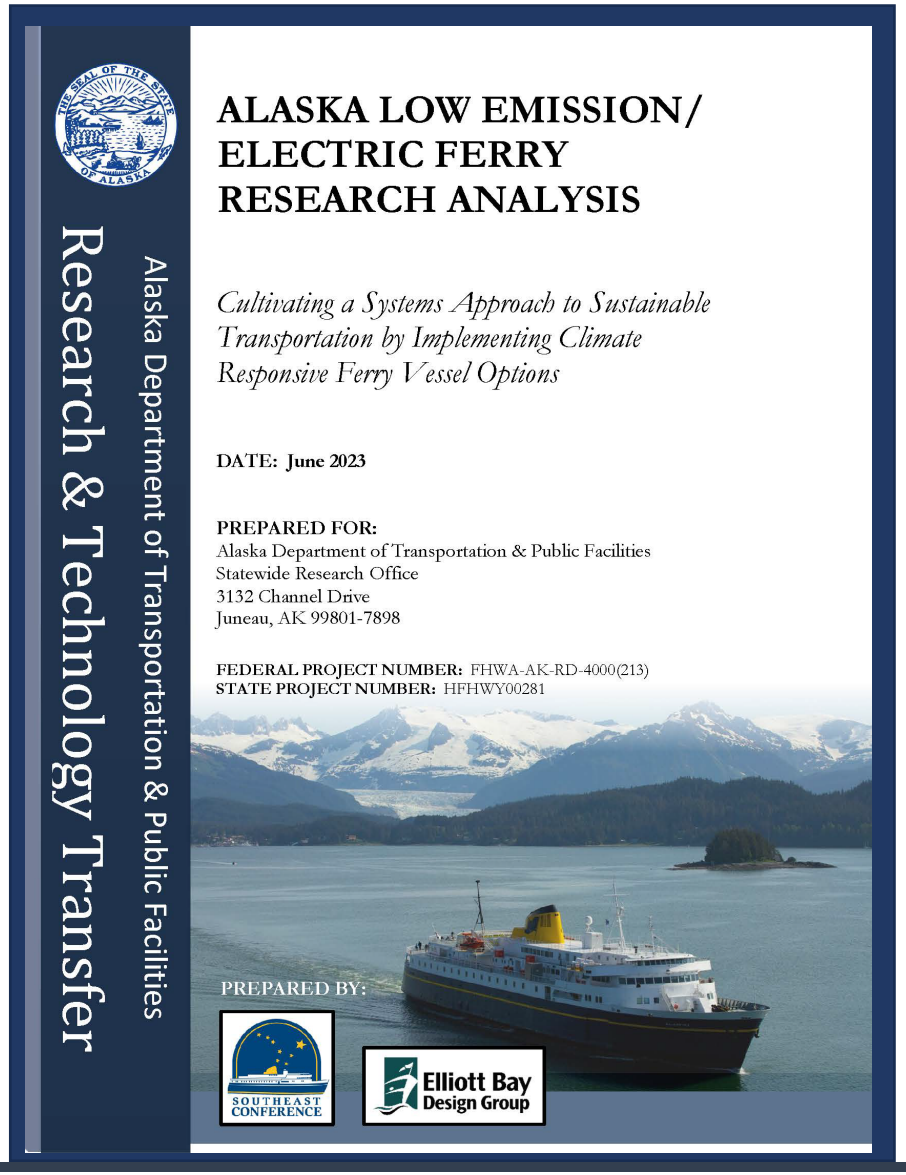
"examine the operational, technical, and financial feasibility, as well as the economic benefits associated with low-emission ferry operations within the AMHS service area."



Elliott Bay Design Group

Prepared a description of the state of current technology and proposed the notional routes based on currently available sustainable electricity sources.

RESPEC

Prepared existing utility details and prepared summaries of the additional infrastructure needed at each port to support all-electric ferries.

McKINLEY RESEARCH GROUP, LLC
Formerly McDowell Group

Prepared economic analyses and conducted community engagement.

Low/No-Emission Routes

- Short Route <16nm (suitable for batteries)
- Availability of sustainable electricity

IIJA FUNDING

for Low/No Emissions Vessels

- Currently provisions exist for up to $50 million per year
- $46 Million has already been awarded to Alaska

SEC. 71102. ELECTRIC OR LOW-EMITTING FERRY PILOT PROGRAM.

(a) DEFINITIONS.—In this section:

(1) ALTERNATIVE FUEL.—The term ''alternative fuel'' means—

(A) methanol, denatured ethanol, and other alcohols;

(B) a mixture containing at least 85 percent of methanol, denatured ethanol, and other alcohols by volume with gasoline or other fuels;

(C) natural gas;

(D) liquefied petroleum gas;

(E) hydrogen;

(F) fuels (except alcohol) derived from biological materials;

(G) electricity (including electricity from solar energy); and

(H) any other fuel the Secretary prescribes by regulation that is not substantially petroleum and that would yield substantial energy security and environmental benefits.

(2) ELECTRIC OR LOW-EMITTING FERRY.—The term ''electric or low-emitting ferry'' means a ferry that reduces emissions by utilizing alternative fuels or onboard energy storage systems and related charging infrastructure to reduce emissions or produce zero onboard emissions under normal operation.

(3) SECRETARY.—The term ''Secretary'' means the Secretary of Transportation.

(b) ESTABLISHMENT.—The Secretary shall carry out a pilot program to provide grants for the purchase of electric or low-emitting ferries and the electrification of or other reduction of emissions from existing ferries.

(c) REQUIREMENT.—In carrying out the pilot program under this section, the Secretary shall ensure that—

(1) not less than 1 grant under this section shall be for a ferry service that serves the State with the largest number of Marine Highway System miles; and

(2) not less than 1 grant under this section shall be for a bi-State ferry service—

(A) with an aging fleet; and

(B) whose development of zero and low emission power source ferries will propose to advance the state of the technology toward increasing the range and capacity of zero emission power source ferries.

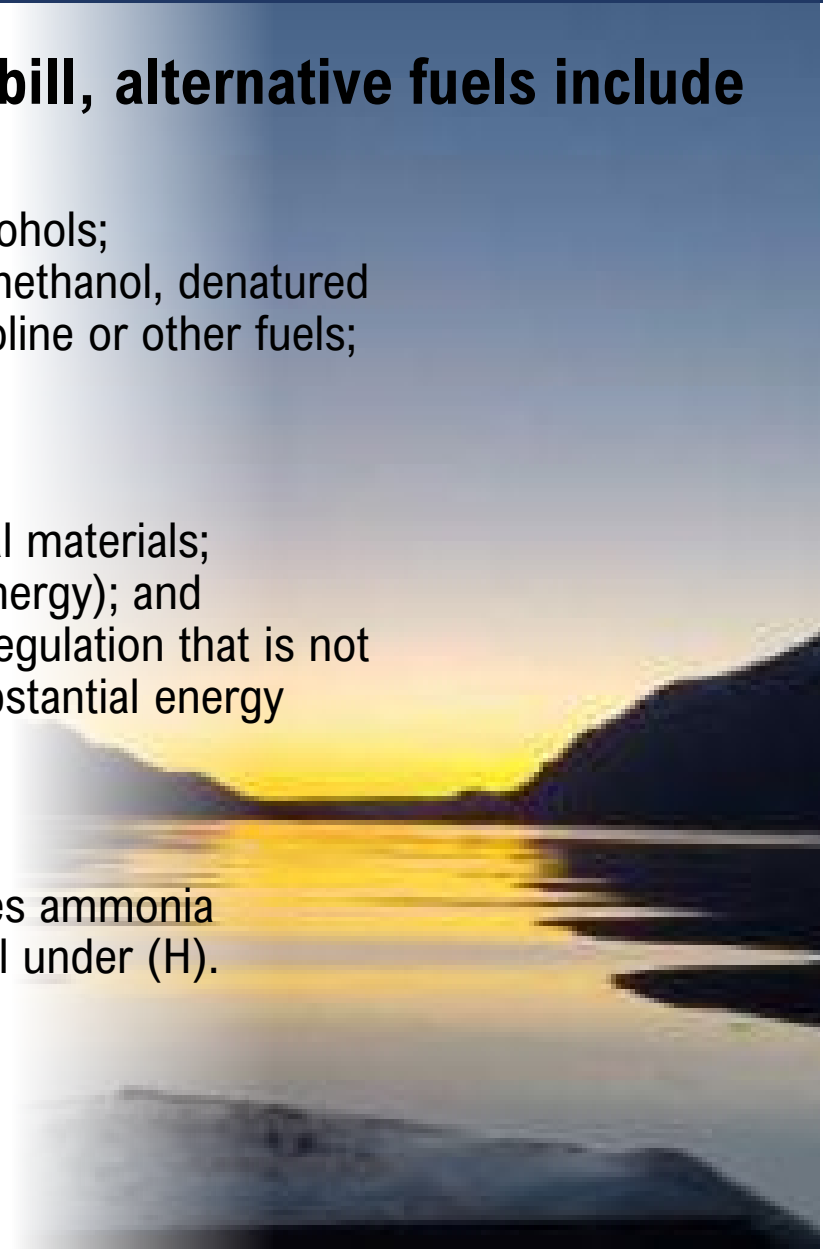
(d) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Secretary to carry out this section $50,000,000 for each of fiscal years 2022 through 2026.

ALTERNATIVE FUELS

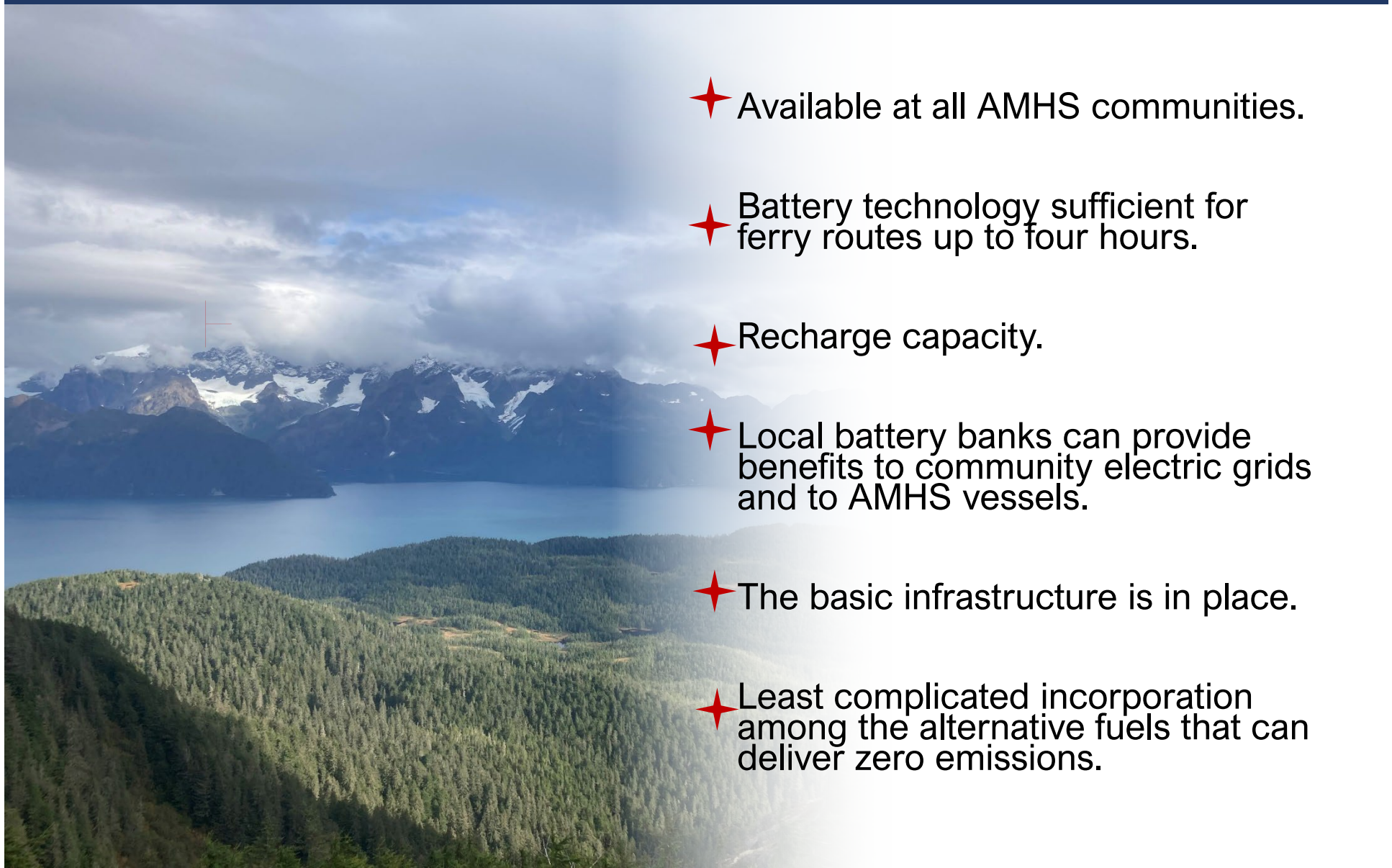
Per Section 71102 of the infrastructure bill, alternative fuels include

(A) methanol, denatured ethanol, and other alcohols;
(B) a mixture containing at least 85 percent of methanol, denatured ethanol, and other alcohols by volume with gasoline or other fuels;
(C) natural gas;
(D) liquefied petroleum gas;
(E) hydrogen;
(F) fuels (except alcohol) derived from biological materials;
(G) electricity (including electricity from solar energy); and
(H) any other fuel the Secretary prescribes by regulation that is not substantially petroleum and that would yield substantial energy security and environmental benefits.

The study considers each of these, and also analyzes ammonia combustion, which may qualify as an alternative fuel under (H).



ALTERNATIVE FUELS:
ELECTRICITY



- Available at all AMHS communities.
- Battery technology sufficient for ferry routes up to four hours.
- Recharge capacity.
- Local battery banks can provide benefits to community electric grids and to AMHS vessels.
- The basic infrastructure is in place.
- Least complicated incorporation among the alternative fuels that can deliver zero emissions.

NOTIONAL VESSEL PARTICULARS

SIZED FOR CURRENT & FUTURE EXPECTED PASSENGER AND CAR DEMAND

Length	~198 ft
Passenger Capacity	>150
Car Capacity	>20
Propulsion Arrangement	Hybrid
Installed Propulsive Power	3000 hp
Battery Capacity	>4000 kWh
Gross Registered Tonnage	<100 tons
Cruise Speed	10-14 kt
Car Deck	Enclosed
Cost	~$50 million each
46 CFR Designation	Subchaper K

GREENHOUSE GAS SAVINGS WITH NOTIONAL VESSELS

Metric Tons

2016 Route Data	COLUMBIA	KENNICOTT	LECONTE	LITUYA	MALASPINA	MATANUSKA	TUSTUMENA
Service Speed (kts)	17.3	16.75	14.5	11.5	16.5	16.5	13.3
Fuel Consumption (gal/hr)	397	354	188	55	270	234	151
Trips HNS-SKG	64		44		84	84	
Trips ANB-KTN				84			
Trips HOM-SLD		56					56
Operation (hr/yr)	57	61	46	65	78	78	75
Fuel Consumption (gal)	22,740	21,767	8,567	3,582	21,099	18,286	11,328
CO_2 Production (Mt)*	231	221	87	36	214	186	115
Total (Mt)	1,091						

FUEL COSTS: DIESEL VS. ELECTRICITY

ROUTE	*Cost per round trip* **ELECTRICITY**	*Cost per round trip at $2.31/Gallon* **DIESEL**	*Cost per round trip at $3.50/Gallon* **DIESEL**
SKAGWAY-HAINES	**$1,057**	**$688**	**$1,043**
KETCHIKAN - METLAKATLA	**$288**	**$392**	**$595**
HOMER - SELDOVIA	**$1,458**	**$846**	**$1285**

ADVANTAGES OF A BESS

Battery Energy Storage System

large battery bank used to recharge vessels

- Off-peak BESS recharge
- Benefits to local grid
- Increase kWh sales
- Design to capacity of local transmission & distribution
- Rapid DC recharge of ship batteries

WORK NEEDED – NEXT STEPS

- **Community/AMHOB Engagement**
- **Design Elements/Study Report**
- **Move Ahead with AMHS project**
  - Shoreside Energy Storage System Sizing
  - Testing of Hull Design to Increase Efficiency
  - Site Plans for Potential Charging Ports
- **Research**
  - Transit Speed requirements
  - Cold Ironing practices
  - Availability, community impact, and costs of hydropower
  - Impact to local power costs, tariff modifications
- **Develop System to Calculate Environmental Benefits**
- **New Ferry Design Considerations**
  - EV Weight on Car Deck
  - EV Charging Station Incorporation
  - Electric Load Sharing on Longer Routes

Questions/Comments?

Download this report at:
https://www.seconference.org/wp-content/uploads/2023/06/22027-053-0-Low-Emission-and-Electric-Ferry-Feasibility-Analysis.pdf

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