

Strategic Partnership Projects
Funds-In Agreement No. FIA-21-17442
Modification No. 1

Contractor: Alliance for Sustainable Energy, LLC
Operator of the National Renewable Energy Laboratory

Sponsor: Port of Seattle

Period of Performance: 5/11/21 through 8/11/22
This modification adds scope and \$200,000 to the value of the agreement.

Except as stated herein, all terms and conditions of the Funds-In Agreement shall remain in full force and effect without change. In the event of any conflict between the terms of the subject Agreement and this Modification, the provisions of this Modification shall take precedence.

Block 3, Financial is hereby amended as follows:

Cost Estimate Modification No. 1	\$200,000.00
DOE Administrative Charge Modification No. 1	<u>\$0.00</u>
TOTAL Modification No. 1	\$200,000.00
Prior Cost Estimate:	\$150,000.00
Prior DOE Administrative Charge	<u>\$0.00</u>
Total Cost to Sponsor	\$350,000.00

Block 6, Agreement Terms and Conditions is modified to reflect the addition of “Appendix A – Statement of Work for Modification 1 to Funds-In Agreement No. FIA-21-17442” and “Appendix C-1 – Rights in Technical Data for Modification 1”

“**Funds-In Agreement–FIA-2117442 Appendix A – Statement of Work for Modification 1**” is hereby added to the Agreement.

“**Funds-In Agreement-FIA-21-17442-1 Appendix C-1 – Rights in Technical Data for Modification 1**” is hereby added to the Agreement. This Appendix C-1 is only applicable to the work under Modification 1. Appendix C-3 of the original agreement remains applicable to the original scope of work.

The parties have indicated their acceptance of this Modification between Sponsor and Contractor by signature below.

Accepted:
Sponsor

Accepted:
Contractor

By: _____

By: _____

Name: _____

Name: Anne Miller

Title: _____

Title: Director Technology Transfer

Date: _____

Date: _____

Alliance for Sustainable Energy, LLC
manager and operator of the
National Renewable Energy Laboratory

Strategic Partnership Projects
Funds-In Agreement—FIA-21-17442

Appendix A – Statement of Work for Modification 1

Notice: By signing this Agreement, the Sponsor acknowledges in advance that its entity name and the title and non-proprietary description of the project are available for public release by the Contractor without further notice.

I. Project Title:

Passenger travel mode choice modeling

II. Non-Proprietary Description of Project:

Provide technical assistance to develop a mode choice simulator for passenger travel to and from Seattle-Tacoma International Airport.

III. Background:

Parties to this agreement are:

Contractor: Alliance for Sustainable Energy, operator of the National Renewable Energy Laboratory under Prime Contract No. DE-AC36-08GO28308 for the U.S. Department of Energy (DOE). Contractor has a facility at 15013 Denver West Parkway, Golden, CO 80401.

Sponsor: Port of Seattle (Port). Sponsor has a facility at 2711 Alaskan Way, Seattle, WA 98121. The Seattle-Tacoma International Airport (SEA) is a facility of the Port of Seattle.

IV. Statement of Work - Task Descriptions, Deliverables, and Estimated Completion Dates:

Task 1 – Mode Choice Modeling

The Ground Transportation Access Plan (GTAP) is SEA's programmatic planning initiative that seeks to balance and address policy challenges related to ground transportation at SEA, namely (a) greenhouse gas emission reduction, (b) congestion reduction, (c) ground transportation revenues, (d) customer choice and (e) equity. These policy priorities were formally adopted by Commission in June 2019 (Resolution 3759).

One of the priority strategies in the 2021 and 2022 GTAP work plans is to study the potential implications of implementing access fees on private vehicles accessing SEA roadways. To accurately predict and measure the potential effects of access fees on

passenger mode choice, it is necessary to develop a passenger survey-based Mode Choice Simulator model (MCS).

A robust passenger MCS could have benefits beyond consideration of access fees, such as:

- Analyzing the effects of potential changes to fee structures for parking or other ground transportation (GT) products to maximize revenue
- Helping to identify opportunities to influence passenger behavior to achieve the goals included in Resolution 3759 and the Port's Century Agenda of limiting private vehicle curbside use to 30% of passengers and reducing greenhouse gas emissions from all sources, including GT, 50% by 2030.

Project Description

The primary goal of this project is to create a model that can predict SEA passengers' mode choice changes in response to changes in the pricing, travel time, or other aspects of airport trips. Passengers will be segmented into groups to account for differences in travel behavior between resident and non-resident travelers as well as business and leisure travelers. The model will initially be based on existing data sources, including SEA's enplaning passenger survey. The model will be structured so that it can easily be updated with additional survey information in the future if the SEA chooses to conduct additional passenger surveys.

To this end, NREL will:

- 1.1. Data Preparation: communicate with SEA on the data sources needed for the mode choice modeling work, i.e., the relevant variables collected by the enplane passenger surveys (EPS), and then acquire/process supplemental data required alongside the survey data for modeling. This will include travel times for all modes available to each respondent, and the collation of relevant cost and headway data for airport access modes.
- 1.2. Model Specification: develop segmented models by trip purpose and resident status (e.g., resident business, resident non-business, non-resident business, non-resident non-business) and determine the appropriate model format based on prior modeling efforts and model fit based on input data. The models will include primary attributes such as time and cost and may include additional explanatory variables such as bags, party size, age, income, etc.
- 1.3. Review of Model Fit and Iteration: review the model output and consider viability of the results for practical applications and policy testing. This is an iterative process through which any issues or anomalies in the statistical model can be debugged. Multiple model specifications and frameworks will be tested and the one with the best performance will be recommended for use.
- 1.4. Model Sensitivity Analyses: calibrate the resultant model to any available recent, accurate mode share data from the airport and perform various sensitivity analyses and discuss with the SEA team on the intuitive interpretations of the model estimates.
- 1.5. Interfaces with Other Models: advise the SEA staff on the integration of the access mode choice models with other SEA specific modeling tools and PSRC regional travel demand models.
- 1.6. Model dashboard: develop a dashboard based on the model developed in tasks 1.1 through 1.4 and any other relevant data sources that allows the SEA to analyze how potential changes in policies, operations, or capital projects could affect passenger mode split in the future.

- 1.7. Passive and Future Survey Advising: advise on the sampling and data collection along with the specific questionnaire design of the passive survey, should the SEA team decide that the mode-choice related passive data collection is necessary. The NREL team will advise the SEA on modifications to existing/future relevant surveys to maximize future modeling opportunities.

Data Requirements

- Enplaning passenger survey data
- Pricing information for GT modes (e.g., airporters, taxis, etc.)
- Data on ground truth mode share, for example aggregate volume and average vehicle occupation monthly or quarterly for 2019 for services such as Transportation Network Companies (TNC), taxi, rental car and airport shuttle
- Total enplaned passenger volume, monthly or quarterly for 2019
- Data on business/leisure travel ratio

Task 1 Deliverables Table

Task	Deliverable	Schedule
1.1 Data preparation	List of data requested	Month 1
1.2 Model specification	a) Model scripts	Month 2
	b) Demonstrate model to SEA staff	Month 2
1.3 Model fit and iteration	Model methodology memo	Month 3
1.4 Model sensitivity analyses	Brief memo describing: a) goodness of fit metrics, including uncertainty range b) summarizing model fit methodology and results c) Model sensitivity analysis	Month 5
1.5 Interfaces with other models	N/A	TBD
1.6 Model dashboard	Model dashboard	TBD
1.7 Survey advising	N/A	TBD

Task 2: Sustainable Infrastructure Advisory Support

Project Description

In parallel to technical tasks, NREL will be available for consultation in an advisory role for discussions related to sustainable infrastructure and long-term planning related to the integration of energy-efficient and renewable energy technologies.

To this end, NREL will:

- 2.1. Work with SEA staff to identify an advisory mechanism and meeting framing suitable for informing ongoing discussions at the Port.
- 2.2. Support SEA staff with references and connections to research staff able to advise on particular technical integration and planning questions.
- 2.3. Attend meetings, as needed quarterly, in support of long-term planning discussions at the SEA.

Task 3: Policy Evaluation Tool

Project Description

Leveraging the SEA access mode choice models developed in Task 1, a policy evaluation tool with a friendly user interface will be developed under this task. This tool will allow flexible inputs, primarily featuring an access mode choice simulator, and will generate outputs in formats that are intuitive to the users at the SEA and that allow SEA staff to evaluate various ground transportation policies.

SEA and NREL agree that NREL will publish any software created under Task 3 under an open-source software license.

To this end, NREL will:

- 3.1. Design Plan: draft a tool design plan based on discussion with SEA staff on needs, requirements, software preferences, maintainability, existing solutions, and other issues. The SEA will review the plan and work with NREL to finalize the plan. Once finalized, the tools will be posted on an easily accessible repository such as GitHub for future access and maintainability.
- 3.2. Multi-Criteria Evaluation (MCE) benefits calculator: investigate potential solutions for a multi-criteria evaluation cost benefit analysis calculator, including attributes such as cost, environmental impact, and equity elements. NREL will design the calculator in such a way that it will leverage the predicted mode choice decisions whenever appropriate and discuss with the SEA staff on the assumptions for other additional inputs, such as the capital/maintenance cost for the system on curbside access fee. NREL will also leverage variables on sociodemographic characteristics in the EPS to develop indicators on equity evaluation, to answer questions such as whether subsidizing TNC will only benefit the high-income group and whether implementing the access fee will impact different demographic groups to the similar extent.
- 3.3. User Interface/Dashboard: develop a user interface and analysis dashboard for this policy evaluation tool that allows the user to define policy inputs, run the models, and review outputs in tabular and visual form. This policy evaluation tool will be in a format of either a standalone application based in R/Python or a web interface and it will enable long-term usability and maintainability. NREL will discuss with the SEA on the preferable format for the SEA staff.
- 3.4. Tool Validation and Calibration: test the tools to ensure they predict ground access behavior in ways that are intuitive and reasonable to SEA staff. As part of this work, tools will be calibrated as necessary to enplanements and other metrics.

Data Requirements

- Current and anticipated future flight schedule
- SEA dwell time distribution for departing and arriving passengers

Task 3 Deliverables Table

Task	Deliverable	Schedule
3.1 Design plan	Policy evaluation tool design plan memo	TBD
3.2 Multi-Criteria Evaluation benefits calculator	a) Model scripts (software)	TBD
	b) Demonstrate model to SEA staff	TBD

3.3 User interface/dashboard	Standalone model application (software)	TBD
3.4 Tool validation and calibration	Brief memo describing goodness of fit metrics, including uncertainty range	TBD

Task 4: Policy Scenarios

Project Description

Utilizing the policy evaluation tool developed in Task 3, NREL will evaluate a fixed number of policy/infrastructure scenarios and train the SEA staff to use the tool. This part of the work will focus initially on airport roadway access fee scenarios. However, there are many other policy levers that this model will be used to evaluate, including improvements in existing transit options, new transit or other ground access services, policy incentives (e.g., expedited security for HOV users), operational changes (e.g., relocating TNCs pickup), and other pricing beyond access fees (e.g., TNCs, parking, taxis, transit, etc.)

To this end, NREL will:

- 4.1. Scenario Development: work with SEA staff to define several policy scenarios. This will include helping to develop and define data inputs and assumptions, as well as output performance measures.
- 4.2. Scenario Implementation: configure and run the scenarios in the tools and provide results to SEA staff. The scenario interface / dashboard will allow SEA staff to run scenarios themselves as well.
- 4.3. Training: provide training to allow SEA staff to run additional policy scenarios independently.

Task 4 Deliverables Table

Task	Deliverable	Schedule
4.1 Scenario development	Policy scenario descriptions	TBD
4.2 Scenario implementation	a) Summary technical memo, including all study methodology and results	TBD
4.3 User interface/dashboard	a) Port staff training session	TBD
	b) Documentation memo/reference guide	TBD

Task 5 Other work

Other work at the direction of the SEA, consistent with the scope and subject to the availability of funding.

V. Schedule:

The anticipated period of performance for the work under this modification is 5 months.

Alliance for Sustainable Energy, LLC,
manager and operator of the
National Renewable Energy Laboratory

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Appendix C-1 – Rights in Technical Data for Modification 1
(Alternative I - unlimited rights/nonproprietary - software)

1. The following definitions shall be used.
 - A. "Generated Information" means information produced in the performance of this Agreement or any Contractor's subcontract under this Agreement.
 - B. "Proprietary Information" means information which is developed at private expense, is marked as Proprietary Information, and embodies (1) trade secrets or (2) commercial or financial information which is privileged or confidential under the Freedom of information Act (5 USC § 552 (b)(4)).
 - C. "Unlimited Rights" means the right to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.
 - D. "Computer Software" means (i) computer programs that comprise a series of instructions, rules, routines, or statements, regardless of the media in which recorded, that allow or cause a computer to perform a specific operation or series of operations; and (ii) recorded information comprising source code listings, design details, algorithms, processes, flow charts, formulas, and related material that would enable the computer program to be produced, created, or compiled.
2. For work performed at the DOE facility, the Sponsor agrees to furnish to the Contractor or leave at the facility that information, if any, which is (1) essential to the performance of work by the Contractor personnel or (2) necessary for the health and safety of such personnel in the performance of the work. Any information furnished to the Contractor shall be deemed to have been delivered with Unlimited Rights unless marked as Proprietary Information. The Sponsor agrees that it has the sole responsibility for appropriately identifying and marking all documents provided containing Proprietary Information
3. The Sponsor, Contractor, and the Government shall have Unlimited Rights in all Generated Information, except for information which is disclosed in a Subject Invention disclosure being considered for patent protection.
4. The Government and Contractor agree not to disclose properly marked Proprietary Information without written approval of the Sponsor, except to Government employees who are subject to the statutory provisions against disclosure of confidential information set forth in the Trade Secrets Act (18 USC § 1905).
5. The Sponsor is solely responsible for the removal of all of its Proprietary Information from the facility by or before termination of this Agreement. The Sponsor may request the Contractor to return or destroy all of the Sponsor's Proprietary Information subject to paragraph (2) above. The Government and Contractor shall have Unlimited Rights in any information which is not removed

from the facility by termination of this Agreement. The Government and Contractor shall have Unlimited Rights in any Proprietary Information which is incorporated into the facility or equipment under this Agreement to such extent that the facility or equipment is not restored to the condition existing prior to such incorporation.

6. The Sponsor agrees that the Contractor will provide to the Department of Energy a nonproprietary description of the work performed under this Agreement.
7. COPYRIGHT: The Parties may assert Copyright in any of their Generated Information. Subject to the other provisions of this clause including Computer Software generated by the Contractor below, and to the extent copyright is asserted, the Government reserves for itself and others acting in its behalf, a paid-up, world-wide, irrevocable, non-exclusive license for Governmental purposes to publish, distribute, translate, duplicate, exhibit, prepare derivative works, and perform any such copyrighted works.

For Computer Software generated by the Contractor under this agreement, the Contractor grants to the Sponsor a royalty-free, nontransferable, non-exclusive, irrevocable worldwide copyright license for its own use.

When the Contractor asserts copyright in its Computer Software developed under this Agreement, the Government has for itself and others acting on its behalf, a royalty-free, nontransferable, nonexclusive, irrevocable worldwide copyright license to reproduce, prepare derivative works, and perform publicly and display publicly, by or on behalf of the Government (narrow-license). After the Contractor abandons or no longer commercializes the Copyrighted Computer Software, the Government has for itself and others acting on its behalf, a royalty-free, nontransferable, nonexclusive, irrevocable worldwide copyright license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government (broad-license).

A separate copyright license may be necessary in Contractor Computer Software developed outside of this Agreement and used to perform the work in this Agreement, such as creating derivative works.

8. The terms and conditions of this Clause shall survive the Agreement, in the event that the Agreement is terminated before completion of the Statement of Work.