

ALTERNATIVE FUEL INFRASTRUCTURE CORRIDOR COALITION (AFICC)

MEDIUM- AND HEAVY-DUTY ALTERNATIVE FUEL INFRASTRUCTURE STRATEGIC DEVELOPMENT PLAN

MARCH 2020

Led by:

CALSTART

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Disclaimer: This document captures a snapshot in time and should be considered as an initial, possible framework for medium and heavy-duty alternative fuel infrastructure investments. The West Coast Collaborative believes that the infrastructure development project proposals listed in this document cover a small percentage of the demand for medium and heavy-duty alternative fuel infrastructure on the West Coast, and it welcomes feedback on additional infrastructure needs not reflected in this document.

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WEST COAST COLLABORATIVE
A public-private partnership to reduce diesel emissions



This Medium and Heavy-Duty Alternative Fuel Infrastructure Strategic Development Plan was commissioned by the West Coast Collaborative Alternative Fuel Infrastructure Corridor Coalition (WCC AFICC). This document was prepared by CALSTART for the purposes of identifying potential diesel emission reduction strategies in California, Oregon, and Washington. This document captures a snapshot in time and should be considered as an initial, possible framework for medium and heavy-duty (MHD) alternative fuel infrastructure investments, not a prescriptive list of specific projects that must be endorsed for funding, or implementation. The information and recommendations presented herein do not represent the views of any individual WCC AFICC Steering Team Member, WCC AFICC Workgroup Member, or other WCC Partners.

WCC AFICC Steering Team Member Organizations

California Air Pollution Control Officers Association
California Air Resources Board
California Association of Councils of Government
California Department of Transportation
California Energy Commission
California Environmental Protection Agency
California Governor's Office of Business and Economic Development
California Public Utilities Commission
CALSTART
Columbia-Willamette Clean Cities Coalition
Discovery Institute: West Coast Corridor Coalition
Oregon Department of Energy
Oregon Department of Environmental Quality
Oregon Department of Transportation
Oregon Metro
Port of Portland
Port of Seattle
Port of Tacoma
Puget Sound Clean Air Agency
Puget Sound Regional Council
Rogue Valley Clean Cities Coalition
Ross Strategic: Pacific Coast Collaborative
United States Department of Energy, National Energy Technology Laboratory
United States Department of Energy, Vehicle Technologies Office
United States Department of Energy, National Renewable Energy Laboratory
United States Department of Transportation, Federal Highway Administration
United States Department of Transportation, Volpe National Transportation Systems Center
United States Environmental Protection Agency, Region 9
United States Environmental Protection Agency, Region 10
Washington State Department of Commerce
Washington State Department of Ecology
Washington State Department of Transportation
Western Washington Clean Cities Coalition

Guidance for Submitting Additional Infrastructure Project Proposals After Release of this Plan

This plan contains MHD alternative fuel infrastructure project proposals submitted by fleets and fuel providers who participated in the 2016-2019 WCC AFICC alternative fuel infrastructure needs assessment for MHD fleet operations in California, Oregon, and Washington. Following publication of this report, the WCC intends to create an AFICC submission form on its website to solicit additional MHD alternative fuel infrastructure project proposals from partners seeking funding assistance and partnerships to support implementation elsewhere in the WCC states and territories, including: Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, Washington, Tribal Lands, and the U.S. Pacific Islands: American Samoa, Guam, and Northern Mariana Islands (www.westcoastcollaborative.org).

EXECUTIVE SUMMARY

This document presents the Strategic Development Plan of the West Coast Collaborative Alternative Fuel Infrastructure Corridor Coalition (WCC AFICC) for medium and heavy-duty (MHD) alternative fuel infrastructure in California, Oregon, and Washington. The West Coast Collaborative (WCC) is a United States Environmental Protection Agency (EPA) led public-private partnership including representatives from federal, state, local, and tribal governments, as well as the private sector, academia, and environmental groups, all with a stated goal to reduce diesel emissions. In 2017, the WCC formed the Alternative Fuel Infrastructure Corridor Coalition (AFICC), a partnership committed to accelerating the modernization of West Coast transportation corridors by deploying alternative fuel infrastructure for medium- and heavy-duty vehicles (MHDVs). Consistent with the United States Department of Transportation Federal Highway Administration's (FHWA's) Alternative Fuel Corridor Program; the fuels covered under this effort include plug-in electric vehicle charging (EV), hydrogen (H₂), propane (LPG), and compressed and liquefied natural gas (CNG and LNG). Since its formation, the AFICC has focused its efforts on evaluating regional priorities within West Coast states for MHD alternative fuel infrastructure, understanding MHD infrastructure investment needs, and identifying projects suitable for funding when it is available to support MHD alternative fuel corridor development.

To help states and industry partners improve coordination and prioritization for infrastructure development, this strategic plan provides important context for policies and programs aimed at supporting deployment of alternative fuels in the three West Coast states. Secondly, AFICC's engagement process to collect feedback on infrastructure needs is carefully described and shares best practices and methods to evaluate infrastructure projects depending on maturity and development readiness. Lastly, recommendations are provided to help AFICC partners meet MHD alternative fuel infrastructure expansion goals on the West Coast. This strategic plan is intended as a living document to highlight the strong evidence of projects in need of funding, and ways the Coalition can continue to advance solutions for MHD alternative fuel transportation corridors. California, Oregon, and Washington State Departments of Transportation and Metropolitan/Regional Transportation Planning Organizations (MPOs/RTPOs) are encouraged to use this Strategic Development Plan to help advance MHD alternative fuel infrastructure development and implementation in their jurisdictions. The WCC also encourages other regions of the U.S. to replicate this project by developing their own partnerships to assess local demand for MHD alternative fuel infrastructure development.

As the market for alternative fuel vehicles (AFVs) grows, so does the need for alternative fuel infrastructure, and vice versa. Currently, diesel-fueled vehicles make up the majority of MHDVs on the road in the United States. However, market forces and state policies, such as mandates to drastically reduce mobile source emissions for purposes of National Ambient Air Quality Standards (NAAQS) attainment, toxic air contaminant exposure reduction, and climate change mitigation are increasing demand for MHD AFVs. This projected increase in demand, and the goals to reduce emissions from transportation on the West Coast, serve as key drivers for the WCC AFICC's efforts to understand MHD alternative fuel infrastructure investment needs in California, Oregon, and Washington.

CALSTART, a national clean transportation non-profit organization, was selected through a competitive solicitation to facilitate the WCC AFICC and assist the Coalition in conducting a regional infrastructure

needs assessment and drafting a strategic plan outlining near-term development opportunities along West Coast corridors. There are six core AFICC objectives to advance a strategy and effort to expand alternative fuel corridors in California, Oregon, and Washington:

1. Convene a stakeholder coalition focused on MHD alternative fuel infrastructure development.
2. Conduct stakeholder workgroups and targeted outreach to identify a subset of desired and/or unfunded MHD alternative fuel stations.
3. Synthesize stakeholder input into a plan document.
4. Provide a platform for sharing MHD alternative fuel infrastructure investment needs.
5. Use the plan as the basis for joint applications to competitive funding programs.
6. Obtain funding assistance to help implement MHD alternative fuel infrastructure in California, Oregon, and Washington.

The efforts presented in this strategic plan represent those conducted to meet objectives (1), (2), (3) and (4) in preparation for pursuing objectives (5) and (6).

To start the strategic planning process, AFICC facilitated numerous workgroup sessions for WCC Partners and other stakeholders in California, Oregon, and Washington. Through these workgroup sessions, AFICC collected feedback on which research questions would help to identify viable MHD alternative fuel infrastructure projects for development. These workgroup sessions were attended by stakeholders with varying perspectives, including but not limited to federal, state, and local government agencies, private sector entities such as fleets, infrastructure providers, original equipment manufacturers (OEMs), Clean Cities Coalitions, utilities, port authorities, and environmental groups. With the feedback obtained from these sessions, AFICC started its next step in conducting an infrastructure needs assessment.

AFICC developed project readiness criteria which served as guiding considerations for evaluating infrastructure project proposals. The readiness criteria helped AFICC develop two surveys to obtain information on infrastructure needs from fleets and fuel providers. Both surveys sought to understand MHD alternative fuel infrastructure needs, required funding for MHD infrastructure development, and proposals on where to locate infrastructure that benefit MHD fleets most. Once developed, AFICC distributed the surveys to a wide audience using the combined networks of WCC partners.

The surveys yielded responses from 26 fleets and 31 fuel providers from organizations in all three states. This included responses from MHD fleets across a variety of vocations, including but not limited to food and beverage distribution, drayage, transit, cargo handling, and school districts. Along with MHD infrastructure project proposals received through responses to these two surveys, the AFICC received additional proposals through follow-up outreach to various partners outside of the surveys. These two methods yielded a handful of important takeaways, as described below.

There is significant and proven demand for MHD alternative fuel infrastructure in all three West Coast states: California, Oregon, and Washington.

First, the surveys found that all fleet respondents are interested in procuring MHD AFVs within the next five years, creating an increased demand for MHD alternative fueling stations throughout the West Coast. Fleets expressed interest in all alternative fuel types in the AFICC purview, with electricity being the most

popular choice with 81% of respondents stating an interest in procuring MHD plug-in electric vehicles (PEVs).

Fuel providers also shared similar interest and plans to develop MHD alternative fuel infrastructure throughout the West Coast. Most fuel providers surveyed stated plans to develop MHD alternative fuel infrastructure in California within the next three to five years. Of those planned projects, most were EV charging stations, followed by CNG, H₂, LPG, and LNG. The assessment received a lower response in developing MHD alternative fuel stations in Oregon and Washington, with most fuel providers stating that they did not have current plans to build infrastructure in those states. Those that do have plans, however, are most interested in building EV charging stations.

Combined, the survey respondents and outreach participants proposed 147 alternative fuel infrastructure projects on the West Coast: 67 in California, 57 in Oregon, and 23 in Washington. Project proposals were received for all five fuel types within the AFICC planning scope: 62 EV charging stations, 36 CNG stations, 23 H₂ stations, 13 LPG stations, and 7 LNG stations. Some participants also proposed technologies outside the AFICC planning scope: 5 catenary electric infrastructure projects; and, 1 liquid biofuel station.

Fleets and fuel providers alike have a significant need for funding assistance to develop both new MHD alternative fuel infrastructure and to expand existing alternative fuel infrastructure projects.

Most fleet survey respondents required funding support to purchase and install new MHD alternative fuel infrastructure: 73% of fleet respondents require funding support to justify the decision to install infrastructure, 8% stated that they do not need funding support, and 19% stated that they do not know if they need funding support. Likewise, most fleet respondents currently developing alternative fuel infrastructure have a need for additional funding support: 68% of fleet respondents indicated they need additional funding for current projects to support a variety of uses, including but not limited to the following examples: purchasing equipment and materials, adding gas compression capacity, and expanding project scope.

Regarding funding needs, CALSTART solicited information via fleet and fuel provider surveys as well as additional outreach via phone calls. When asked what percentage of the total capital expense (CAPEX) of installing an alternative fueling station must be covered for them to consider development, 28% of these combined outreach participants' infrastructure proposals stated that at least 50% of the CAPEX must be covered by external funding, followed by 14% of proposals that said 70% of CAPEX should be covered, and then a tie between 30% and 80% of CAPEX at 9% of proposals each. Less than 1% of proposals stated that 100% of the CAPEX must be covered by funding, and nearly 22% of proposals did not list a minimum funding need amount. The remaining ~17% of proposals stated other funding amounts needed at lower frequencies than those listed above. Effectively, 77% of all proposals would be viable for development with external funding assistance up to 80% of project CAPEX.

MHD alternative fuel infrastructure development is already underway in many locations throughout West Coast states, and many of those projects require additional funding support.

When surveyed, 65% of fleet respondents had MHD alternative fuel projects underway with varying fuel types, fleet sizes, locations, and timelines. Of those projects listed, 65% are EV projects, 26% are CNG stations, and a smaller share are LNG and H2 projects, at 9% and 4% respectively. 22% of fleet survey respondents with projects underway stated that they were for other fuel types, including renewable diesel. Most projects underway are private access stations and are likely located within the respondents' facilities. These existing projects may well serve as starting points for MHD alternative fuel infrastructure expansion on the West Coast, but given their private nature, more public and limited access stations would be needed to expand MHD AFV corridor fueling.

Survey respondents and other partners provided 147 specific proposals for MHD alternative fuel infrastructure placement. These proposals only represent a small portion of MHD alternative fuel infrastructure development needs on the West Coast as of December 2019.

As stated in an earlier takeaway, survey respondents and other partners provided 147 unique proposals for alternative fuel infrastructure development in California, Oregon, and Washington. This represents the number of proposals made to the AFICC as of December 2019 and does not fully capture all the MHD alternative fuel infrastructure development needs on the West Coast.

The West Coast Collaborative believes that the infrastructure development project proposals listed in this document, captured through responses to surveys and other targeted outreach, only cover a small percentage of the full need for comprehensive MHD alternative fuel infrastructure access on the West Coast, and it welcomes feedback on additional infrastructure needs not reflected in this document.

Table 1 shows all project proposals by fuel type and state.

Table 1 Project Proposal Numbers by Fuel Type and State

	EV	H2	LPG	CNG	LNG	Other¹	Totals
California	34	6	6	16	0	5	67
Oregon	15	14	5	17	5	1	57
Washington	13	3	2	3	2	0	23
Totals	62	23	13	36	7	6	147

Table 4 through Table 6 below show each proposal per state. Additionally, Figure 1 shows all proposed sites mapped by their locations. All but 20 proposals were evaluated based on a standard set of criteria

¹ This column includes 5 catenary electric infrastructure projects proposed in California, and 1 liquid biofuel station proposed in Redmond, Oregon. Per Section 1413 of the Fixing America's Surface Transportation (FAST) Act, these technologies are outside the scope of this plan (see Section IV, Federal Policy Landscape), and were not evaluated.

to vet projects for development readiness.¹¹ These project proposals were evaluated on the readiness criteria outlined in Section VI. Subsequently, each project was grouped into one of three readiness categories based on those evaluations. The readiness categories are defined below. The cut-offs between each of these three readiness categories were made quantitatively based on the results from evaluations using the readiness criteria defined in Section VI, Table 15.

1. **Advanced Site:** Advanced Sites are the project proposals deemed most ready for development. These sites have a high degree of readiness for funding and development. For example, this could be a proposal that includes a location which is highly specific (e.g. a street address, city, and state), a clear estimate of annual fuel throughput, a location near a major west coast corridor, and a clearly defined CAPEX estimate.
2. **Emerging Site:** Emerging Sites are the second to most ready for development, behind Advanced Sites. These sites are considered less ready for funding and development than Advanced Sites, but more so than Potential Sites. These proposals were often deemed less ready than Advanced Sites due to a lack of information about project scope. For example, this could be a proposed site with demonstrated demand for fuel but lacking a specific location (e.g. proposing a county instead of a cross street or address).
3. **Potential Site:** Potential Sites are the proposals deemed least ready for development. The reasons for the lower readiness category vary across proposals, but often the project scope for these proposals is vague or is lacking responses to multiple readiness criteria metrics. For example, this could be a proposed site with a vague location (e.g. proposing location on a certain highway near a city, but with no address or cross street), and not many associated details (e.g. no listing for annual throughput or number of vehicles that the station is expected to support, no response on the amount of funding needed, and no listing for estimated CAPEX).

¹¹ 20 of the 147 proposed projects were not evaluated: 6 proposals were outside the technological scope of this plan, and 14 proposals did not contain enough information to properly evaluate them.

Estimated cost to build the 141 proposed stations for targeted alternative fuel technologies is \$373,600,000.^{III}

This plan includes 141 proposed stations of various size, throughput, and level of construction for targeted alternative fuel technologies.^{III} Based on CALSTART’s estimates, it would cost approximately \$373,600,000 to fund the development of all 141 sites, assuming they were newly constructed, capable of accommodating MHD AFVs, and had average throughput and size levels. Again, these 141 sites do not represent the total need on the West Coast, therefore \$373,600,000 does not represent the total funding amount needed to provide comprehensive MHD alternative fuel infrastructure access in California, Oregon, and Washington.

Table 2 Estimated Funding Needed to Build Proposed Infrastructure Projects in the AFICC Plan^{IV,V}

Fueling Type	Number of Sites Proposed by Outreach Participants	Average Assumptions for Each Station	Average Estimated CAPEX Per Station	Total Cost
EV	62	750kW-1MW Peak Capacity	\$2,000,000	\$124,000,000
H2	23	1,000-4,800 kg/Day	\$6,000,000	\$138,000,000
LPG	13	1,000 gallons/Day	\$1,700,000	\$22,100,000
CNG	36	1,695-2,260 DGE/Day	\$2,000,000	\$72,000,000
LNG	7	1,695-2,260 DGE/Day	\$2,500,000	\$17,500,000
Total	141			\$373,600,000

Table 3 Estimated Funding Needed to Build Proposed Infrastructure Projects by State

State	Number of Stations by Fuel Type					Total Cost
	EV	H2	LPG	CNG	LNG	
California	34	6	6	16	0	\$146,200,000
Oregon	15	14	5	17	5	\$169,000,000
Washington	13	3	2	3	2	\$58,400,000
Total	62	23	13	36	7	\$373,600,000

^{III} Cost estimate does not include catenary electric, or liquid biofuel proposals (6 projects omitted).

^{IV} CAPEX estimate does not represent the total funding needed to deploy comprehensive MHD alternative fueling infrastructure in California, Oregon, and Washington; only includes proposals obtained through AFICC outreach.

^V Table does not include catenary electric, or liquid biofuel infrastructure proposals (6 projects omitted) as these technologies are outside the AFICC planning scope.

Based on the results of AFICC's outreach and surveying efforts, CALSTART offers the following recommendations to advance the Coalition's goals in meeting objectives (5) and (6) listed above:

1. **State Plans** -Take the learnings from this plan document and develop targeted MHD alternative fuel infrastructure investment plans per state.
2. **Alternative Fuel Policy** - Examine, in more detail, the state-level policy barriers to alternative fuel infrastructure deployment and develop policies that support accelerated MHD infrastructure project implementation.
3. **Communication and Outreach** - Share this strategic plan document throughout the WCC and with partners around the nation.
4. **Public Funding Assistance** - WCC partners are well positioned to both fundraise for MHD alternative fuel infrastructure development and to petition for increased public funding support.
5. **Implementation** - All parties interested in developing alternative fuel infrastructure are encouraged to leverage the information gathered through this effort for purposes of implementing the projects listed within this plan.
6. **Workforce Development** - Consider workforce development opportunities which are likely to arise as a result of MHD alternative fuel infrastructure development on the West Coast.
7. **Environmental Justice** - MHD infrastructure development in environmental justice communities should be prioritized where there is synergy with alternative fuel demand.
8. **Sustained Partnership** - The partnerships formed between WCC AFICC partners should be sustained, and other geographic regions are encouraged to replicate the WCC AFICC through similar regional partnerships across the United States.

By following through with these recommendations, the WCC AFICC can work toward achieving its stated goal of deploying alternative fuel infrastructure for MHD vehicles and equipment along the West Coast of the United States.

Figure 1 All Proposed MHD Alternative Fuel Infrastructure Sites

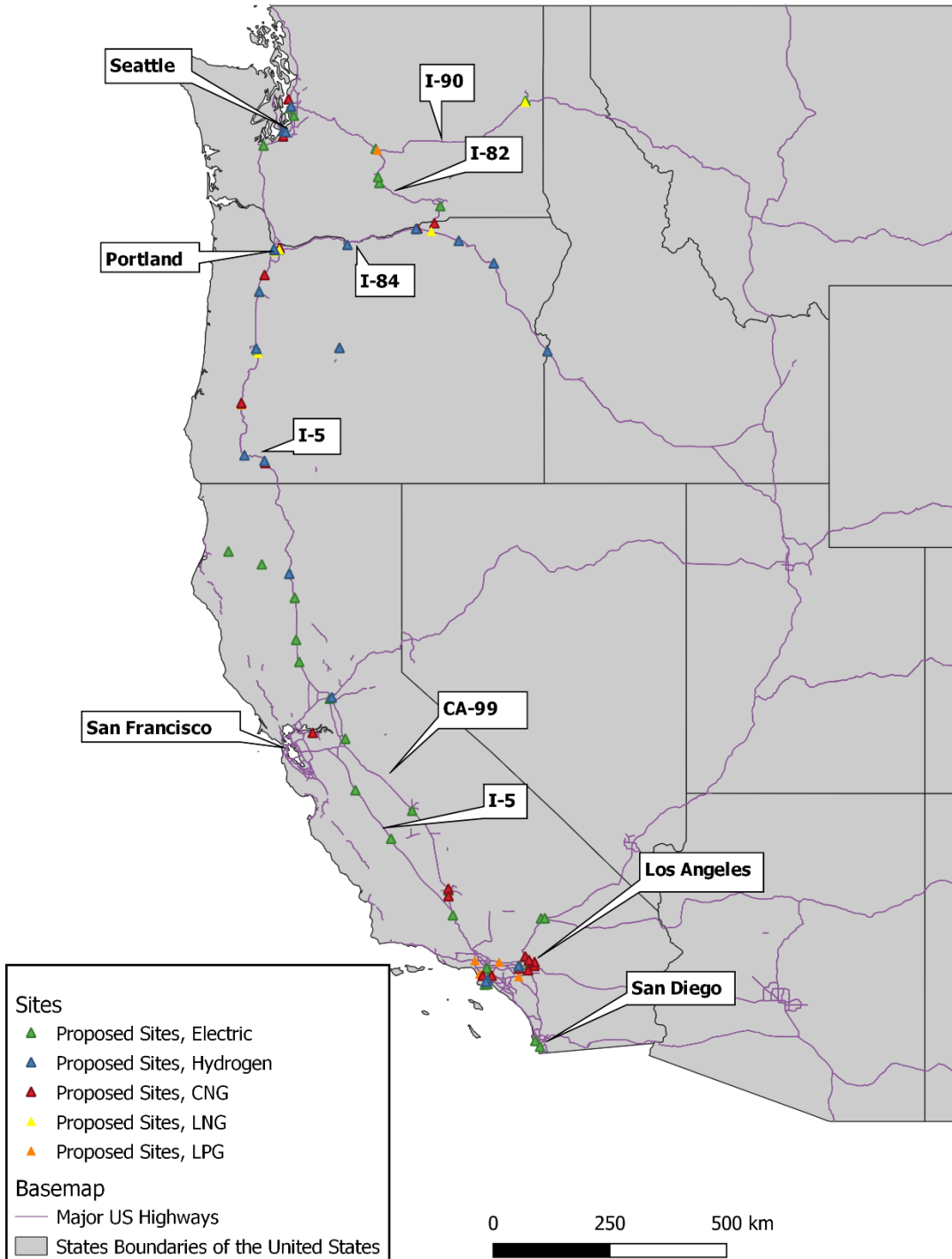


Table 4 Proposed Alternative Fuel Infrastructure Projects by Readiness Category - California^{VI}

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
CA-1	EV	CA	Banta	I-5 & I-205	750 kW minimum (1 MW ideal)	\$2,017,499 (Reported)	50%	Advanced
CA-2	EV	CA	Barstow	I-15 & I-40	750 kW minimum (1 MW ideal)	\$2,017,499	50%	Advanced
CA-3	EV	CA	Blythe	I-10 & CA-78	750 kW minimum (1 MW ideal)	\$2,017,499	50%	Advanced
CA-4	EV	CA	Fresno	CA-99 & CA-41	750 kW minimum (1 MW ideal)	\$2,017,499	50%	Advanced
CA-5	EV	CA	Hamburg Farms	I-5 & CA-165	750 kW minimum (1 MW ideal)	\$2,017,499	50%	Advanced
CA-6	EV	CA	Long Beach	301 Mediterranean Way, Long Beach CA	50 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	30%	Advanced
CA-7	EV	CA	Long Beach	Port of Long Beach Terminal	N/A	\$2,250,000	90%	Advanced
CA-8	EV	CA	National City	I-5 & CA-54	200 truck trips a day	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Advanced
CA-9	EV	CA	Red Bluff	I-5 & CA-36	6 vehicles	\$100,000	50%	Advanced
CA-10	EV	CA	Redding	I-5 & CA-44	6 vehicles	\$100,000	50%	Advanced
CA-11	EV	CA	Sacramento	I-80 & US-50	750 kW minimum (1 MW ideal)	\$2,017,499	50%	Advanced

^{VI} The proposals marked “Unevaluated” did not contain enough data to properly evaluate them.

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
CA-12	EV	CA	San Bernardino	1535 West 4th St San Bernardino, CA 92411	7 electric hostlers, 2 electric service trucks, 1 hybrid RTG, 1 electric side loader, 1 electric drayage truck	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Advanced
CA-13	EV	CA	San Diego	I-5 & I-8	200 truck trips a day	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Advanced
CA-14	EV	CA	Weaverville	CA-299 & CA-44	6 vehicles	\$100,000	50%	Advanced
CA-15	EV	CA	Williams	I-5 & CA-20	750 kW minimum (1 MW ideal)	\$2,017,499	50%	Advanced
CA-16	EV	CA	Willow Creek	CA-299 & CA-96	6 vehicles	\$100,000	50%	Advanced
CA-17	EV	CA	Willows	I-5 & CA-162	6 vehicles	\$100,000	50%	Advanced
CA-18	H2	CA	Long Beach	1926 East Pacific Coast Highway	547,500 kg (12 vehicles) (assuming 365 days)	\$10,000,000	80-85%	Advanced
CA-19	H2	CA	Ontario	4325 East Guasti Road	547,500 kg (12 vehicles) (assuming 365 days)	\$10,000,000	80-85%	Advanced
CA-20	H2	CA	Redding	I-5 & CA-44	365,000 kg (assuming 365 days)	\$4,000,000	30-100%	Advanced
CA-21	LPG	CA	Corona	CA-91 & I-15	200,000 Gallons (50-60 vehicles)	\$110,000	30-40%	Advanced
CA-22	LPG	CA	Duarte	I-605 & I-210	200,000 Gallons (50-60 vehicles)	\$110,000	30-40%	Advanced
CA-23	LPG	CA	Hawthorne	N/A	200,000 Gallons (50-60 vehicles)	\$110,000	30-40%	Advanced
CA-24	LPG	CA	Norwalk	I-605 & I-105	200,000 Gallons (50-60 vehicles)	\$110,000	30-40%	Advanced

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
CA-25	LPG	CA	Ontario	I-10 & I-15	200,000 Gallons (50-60 vehicles)	\$110,000	30-40%	Advanced
CA-26	LPG	CA	Sherman Oaks	US-101 & I-405	200,000 Gallons (50-60 vehicles)	\$110,000	30-40%	Advanced
CA-27	CNG	CA	Bellflower	15330 Woodruff Ave., Bellflower, CA 90706	791,000 DGE	\$2,750,000	20%	Advanced
CA-28	CNG	CA	Gardena	14800 South Spring St., Gardena CA 90248	60 CNG tractors	\$4,000,000	80%	Advanced
CA-29	CNG	CA	Lost Hills	I-5 & CA-46	339,000 DGE (8-10 vehicles)	Not reported by participant; See Table 7 for estimated average CAPEX	40-60%	Advanced
CA-30	CNG	CA	Lost Hills	I-5 & CA-46	N/A	\$1,000,000	N/A	Advanced
CA-31	CNG	CA	Near Kettleman City	I-5 & CA-41	N/A	\$1,000,000	N/A	Advanced
CA-32	CNG	CA	Tehachapi	CA-58 & CA-58B	339,000 DGE (8-10 vehicles)	N/A	40-60%	Advanced
CA-33	EV	CA	Bakersfield	N/A	70 vehicles	N/A	0%	Emerging
CA-34	EV	CA	Barstow	2825 W. Main St. Barstow, CA 92311	N/A	N/A	50%	Emerging

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
CA-35	EV	CA	Los Angeles / Hobart	4000 East Sheila St Los Angeles, CA 90023	10 electric hostlers, 1 electric service truck	N/A	50%	Emerging
CA-36	EV	CA	Stockton	6450 South Austin Rd. Stockton, CA 95215	6 electric hostlers, 1 hybrid RTG	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Emerging
CA-37	CNG	CA	Barstow	I-15 & Lenwood Road	339,000 DGE (8-10 vehicles)	Not reported by participant; See Table 7 for estimated average CAPEX	40-60%	Emerging
CA-38	CNG	CA	Coachella	I-10 & Dillon Road	339,000 DGE (8-10 vehicles)	Not reported by participant; See Table 7 for estimated average CAPEX	40-60%	Emerging
CA-39	CNG	CA	Near Bakersfield	I-5 & CA-119	N/A	\$1,000,000	N/A	Emerging
CA-40	CNG	CA	Riverside County	N/A	225 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Emerging
CA-41	CNG	CA	Riverside County	N/A	225 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Emerging
CA-42	CNG	CA	San Bernardino County	N/A	225 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Emerging
CA-43	CNG	CA	San Bernardino County	N/A	225 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Emerging
CA-44	CNG	CA	San Bernardino County	N/A	225 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Emerging

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
CA-45	CNG	CA	San Bernardino County	N/A	225 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Emerging
CA-46	EV	CA	Bakersfield	Bakersfield, CA	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Potential
CA-47	EV	CA	Between Los Angeles & Santa Barbara	US-101	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Potential
CA-48	EV	CA	Between Sacramento & San Francisco	I-80	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Potential
CA-49	EV	CA	Grapevine	I-5 & Edmonston Pumping Plant Road	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Potential
CA-50	EV	CA	Inland Empire	I-15	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Potential
CA-51	EV	CA	Inland Empire	Warehouse Districts Around Inland Empire	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Potential
CA-52	EV	CA	Long Beach	Port of Long Beach	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Potential
CA-53	EV	CA	Long Beach	Port of Long Beach Terminal	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	60-80%	Potential

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
CA-54	EV	CA	Los Angeles	I-10	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Potential
CA-55	EV	CA	Los Angeles	Warehouse Districts Around Los Angeles	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Potential
CA-56	EV	CA	Los Angeles	Port of Los Angeles	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	50%	Potential
CA-57	EV	CA	Near Coalinga	I-5 & CA-198	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Potential
CA-58	EV	CA	Near Los Banos	I-5 & CA-152	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Potential
CA-59	H2	CA	Long Beach	I-710 & I-405	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	20%	Potential
CA-60	CNG	CA	Bakersfield	Bakersfield, CA	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Potential
CA-61	H2	CA	Sacramento	N/A	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
CA-62	H2	CA	Sacramento	N/A	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
CA-63	Catenary Electric	CA	Between East Los Angeles and Riverside	CA-60 (East LA to Riverside)	6000 trucks per day per direction	\$5-8.7M /Mile	0%	Unevaluated

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
CA-64	Catenary Electric	CA	Between Los Angeles and Las Vegas	I-15 Los Angeles to Las Vegas	6000 trucks per day per direction	\$5-8.7M /Mile	0%	Unevaluated
CA-65	Catenary Electric	CA	Between Mettler and Sacramento	CA-99 (Mettler to Sacramento)	6000 trucks per day per direction	\$5-8.7M /Mile	0%	Unevaluated
CA-66	Catenary Electric	CA	Between San Diego and Redding	I-5 (San Diego to Redding)	6000 trucks per day per direction	\$5-8.7M /Mile	0%	Unevaluated
CA-67	Catenary Electric	CA	Los Angeles County	I-710	14,000 trucks per day and direction	\$8.7M/Mile	0%	Unevaluated

Table 5 Proposed Alternative Fuel Infrastructure Projects by Readiness Category - Oregon^{vii}

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
OR-1	EV	OR	Bend	US-20 & US-97	750 kW minimum (1 MW ideal)	\$2,017,499	50%	Advanced
OR-2	EV	OR	Bend	US-97 & US-20	500 vehicles @ 350kW	\$100,000	70%	Advanced
OR-3	EV	OR	Boardman	I-84 & South Main Street	500 vehicles @ 350kW	\$100,000	70%	Advanced
OR-4	EV	OR	Eugene	I-5 & OR-126	500 vehicles @ 350kW	\$100,000	70%	Advanced
OR-5	EV	OR	La Grande	I-84 & OR-82	500 vehicles @ 350kW	\$100,000	70%	Advanced
OR-6	EV	OR	Medford	I-5 & OR-62	500 vehicles @ 350kW	\$100,000	70%	Advanced
OR-7	EV	OR	Ontario	I-84 & US-30	500 vehicles @ 350kW	\$100,000	70%	Advanced
OR-8	EV	OR	Pendleton	I-84 & US-395	500 vehicles @ 350kW	\$100,000	70%	Advanced
OR-9	EV	OR	Portland	I-84 & I-205	30 vehicles	\$2,000,000	50%	Advanced
OR-10	EV	OR	Portland	I-5 & I-405	500 vehicles @ 350kW	\$100,000	70%	Advanced
OR-11	EV	OR	Salem	I-5 & OR-22	500 vehicles @ 350kW	\$100,000	70%	Advanced
OR-12	EV	OR	The Dalles	I-84 & US-197	500 vehicles @ 350kW	\$100,000	70%	Advanced

^{vii} The proposals marked “Unevaluated” did not contain enough data to properly evaluate those proposals.

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
OR-13	H2	OR	Eugene	I-5 & I-105	365,000 kg/year	\$4,000,000	30-100%	Advanced
OR-14	H2	OR	Grants Pass	I-5 & CA-99	365,000 kg/year	\$4,000,000	30-100%	Advanced
OR-15	H2	OR	Portland	I-5 & I-84	365,000 kg/year	\$4,000,000	30-100%	Advanced
OR-16	LPG	OR	Boardman	I-84 & South Main Street	3000 DGE/Hour	\$100,000	50-60%	Advanced
OR-17	LPG	OR	Ontario	I-84 & US-30	3000 DGE/Hour	\$100,000	50-60%	Advanced
OR-18	LPG	OR	Pendleton	I-84 & US-395	3000 DGE/Hour	\$100,000	50-60%	Advanced
OR-19	LPG	OR	Roseburg	I-5 & SE Oak Avenue	3000 DGE/Hour	\$100,000	50-60%	Advanced
OR-20	LPG	OR	The Dalles	I-84 & US-197	3000 DGE/Hour	\$100,000	50-60%	Advanced
OR-21	CNG	OR	Bend	US-97 & US-20	500 DGE/Hour	\$1,500,000	70%	Advanced
OR-22	CNG	OR	Boardman	I-84 & South Main Street	500 DGE/Hour	\$1,500,000	70%	Advanced
OR-23	CNG	OR	La Grande	I-84 & OR-82	500 DGE/Hour	\$1,500,000	70%	Advanced
OR-24	CNG	OR	Ontario	I-84 & US-30	500 DGE/Hour	\$1,500,000	70%	Advanced
OR-25	CNG	OR	Pendleton	I-84 & US-395	500 DGE/Hour	\$1,500,000	70%	Advanced
OR-26	CNG	OR	Portland	I-205 & Sandy Boulevard	40 vehicles	\$1,000,000	50-70%	Advanced
OR-27	CNG	OR	The Dalles	I-84 & US-197	500 DGE/Hour	\$1,500,000	70%	Advanced
OR-28	CNG	OR	Umatilla	I-82 & US-730	30 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	70%	Advanced
OR-29	CNG	OR	Woodburn	OR-214 & I-5	40 vehicles	\$1,000,000	50-70%	Advanced

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
OR-30	LNG	OR	Eugene	I-5 & OR-58	5 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Advanced
OR-31	LNG	OR	Portland	N/A	7,352 DGE (5 vehicles)/year	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Advanced
OR-32	LNG	OR	Portland	I-205 & I-84	5 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Advanced
OR-33	H2	OR	Bend	US-97 & US-20	222,650 kg/year	\$4,000,000	80%	Emerging
OR-34	H2	OR	Boardman	I-84 & South Main Street	222,650 kg/year	\$4,000,000	80%	Emerging
OR-35	H2	OR	Eugene	I-5 & OR-126	222,650 kg/year (assuming 365 days)	\$4,000,000	80%	Emerging
OR-36	H2	OR	La Grande	I-84 & OR-82	222,650 kg/year	\$4,000,000	80%	Emerging
OR-37	H2	OR	Medford	I-5 & OR-62	222,650 kg/year	\$4,000,000	80%	Emerging
OR-38	H2	OR	Ontario	I-84 & US-30	222,650 kg/year	\$4,000,000	80%	Emerging
OR-39	H2	OR	Pendleton	I-84 & US-395	222,650 kg/year	\$4,000,000	80%	Emerging
OR-40	H2	OR	Portland	I-5 & I-405	222,650 kg/year	\$4,000,000	80%	Emerging
OR-41	H2	OR	Salem	I-5 & OR-22	222,650 kg/year	\$4,000,000	80%	Emerging
OR-42	H2	OR	The Dalles	I-84 & US-197	222,650 kg/year	\$4,000,000	80%	Emerging
OR-43	CNG	OR	Baker City	N/A	30 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	70%	Emerging
OR-44	CNG	OR	Portland	I-5 & I-405	500 DGE/Hour	\$1,500,000	70%	Emerging
OR-45	CNG	OR	Salem	I-5 & OR-22	500 DGE/Hour	\$1,500,000	70%	Emerging

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
OR-46	LNG	OR	Hermiston	I-82 & I-84	5 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Emerging
OR-47	CNG	OR	Medford	N/A	30 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	70%	Potential
OR-48	EV	OR	Eugene	3500 E 17th Ave Eugene OR 97403	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
OR-49	EV	OR	Hood River County	N/A	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
OR-50	EV	OR	Josephine County	N/A	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
OR-51	H2	OR	Portland	N/A	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
OR-52	CNG	OR	Eugene	3500 E 17th Ave Eugene OR 97403	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
OR-53	CNG	OR	Eugene/Portland	I-5 Corridor	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
OR-54	CNG	OR	Portland	N/A	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
OR-55	CNG	OR	SE Portland	I-5 Corridor	33,900 DGE	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
OR-56	LNG	OR	Eugene	3500 E 17th Ave Eugene OR 97403	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
OR-57	Biofuel	OR	Redmond	N/A	3-5 million gallons	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated

Table 6 Proposed Alternative Fuel Infrastructure Projects by Readiness Category - Washington^{VIII}

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
WA-1	EV	WA	Bellevue	I-405 & I-5	200 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	60-80%	Advanced
WA-2	EV	WA	Ellensburg	Main and Washington	200 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	60-80%	Advanced
WA-3	EV	WA	Kennewick	I-82 & US-395	750 kW minimum (1 MW ideal)	\$2,017,499	50%	Advanced
WA-4	EV	WA	Olympia	Capital & Jefferson	200 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	60-80%	Advanced
WA-5	EV	WA	Spokane	Division & Mission	200 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	60-80%	Advanced
WA-6	EV	WA	Tacoma	Market & Pacific Avenue	200 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	60-80%	Advanced
WA-7	EV	WA	Yakima	Yakima & 4th	200 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	60-80%	Advanced
WA-8	EV	WA	Yakima	Nob Hill & 1st	200 vehicles	Not reported by participant; See Table 7 for estimated average CAPEX	60-80%	Advanced
WA-9	H2	WA	Seattle	I-5 & I-90	365,000 kg (assuming 365 days)	\$4,000,000	30-100%	Advanced
WA-10	H2	WA	Tacoma	Tacoma	10,000 kg/day with electrolyzer production	\$90,000,000 ^{IX}	10%	Advanced
WA-11	H2	WA	Tacoma	I-5 & WA-7	365,000 kg (assuming 365 days)	\$4,000,000	30-100%	Advanced

^{VIII} The proposals marked “Unevaluated” did not contain enough data for evaluation.

^{IX} This proposal is for a 35 MW electrolysis station with an expected capacity of 10,000 kg/day. A hydrogen fueling station may or may not be included in the project. CAPEX includes but is not limited to an electrolyzer, electrical connections to substations, transportation infrastructure, liquefaction, and storage.

Number	Fuel Type	Proposed State	Proposed City or County	Proposed Address or Interchange	Estimated Annual Fuel Throughput / # of Vehicles the Station Would Serve	Reported CAPEX Estimate	Funding Needed (% of CAPEX)	Readiness Category
WA-12	LPG	WA	Ellensburg	I-90 & I-82	360,000 gallons	\$1,700,000	25-50%	Advanced
WA-13	LPG	WA	Ritzville	I-90 & WA-261	360,000 gallons	\$1,700,000	25-50%	Advanced
WA-14	EV	WA	Everett	Cedar and Wentworth	N/A	MHD station not reported by participant; See Table 7 for estimated average CAPEX	0%	Emerging
WA-15	EV	WA	Everett	Cedar and Pacific	N/A	MHD station not reported by participant; See Table 7 for estimated average CAPEX	0%	Emerging
WA-16	EV	WA	Everett	Cedar and Pacific	10 buses, 5 small vehicles	\$292,000	50%	Emerging
WA-17	EV	WA	Seattle	Port of Seattle	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Potential
WA-18	EV	WA	Tacoma	Tacoma	15 vehicles	\$500,000	100%	Potential
WA-19	LNG	WA	Seattle	N/A	7,352 DGE (5 vehicles)	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Potential
WA-20	LNG	WA	Spokane	N/A	7,352 DGE (5 vehicles)	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Potential
WA-21	CNG	WA	Clark County	I-5 Corridor	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
WA-22	CNG	WA	Vancouver	I-5 Corridor	113,000 DGE	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated
WA-23	CNG	WA	Washington State	I-5 Corridor	N/A	Not reported by participant; See Table 7 for estimated average CAPEX	N/A	Unevaluated