

Existing Conditions

Transportation Electrification Investment Needs Assessment (TEINA)

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Research in Support of the Oregon Transportation Electrification Investment Needs Assessment (TEINA)

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Contents

INTRODUCTION.....	4
About this document	4
Objective from the Statement of Work	4
Section 1: Geographic characteristics and ZEVs/chargers distributions.....	4
Section 2: Summary of existing charging infrastructure conditions by use case	8
Urban LDV	8
Rural LDV.....	9
Corridor LDV.....	10
Disadvantaged communities.....	11
Local commercial and industrial vehicles	12
Transit and school buses.....	13
TNCs	13
Long-haul trucking	13
Micro-mobility	14
END NOTES.....	14

INTRODUCTION

About this document

This document represents the results of a review of existing conditions that a project team composed of Kittelson & Associates, Inc.; Rocky Mountain Institute (RMI); HDR Inc.; and Forth performed in December 2020 as part of a project funded by Oregon Department of Transportation (ODOT) entitled “Transportation Electrification Infrastructure Needs Analysis (TEINA)”. RMI staff are the primary authors of this document, which collects publicly available information (ODOT database, Oregon utility filings, local news, press release, multiple initiative proposals, etc.,) designed to inform the charging infrastructure needs assessment.

This Existing Conditions Assessment considers efforts within Oregon. The companion Literature Review focuses on efforts outside of Oregon. The Literature Review and Existing Conditions Assessment were summarized and presented during the TEINA Advisory Group Meeting #2 on January 12, 2021.

There are two main parts to this document:

- Section 1: Geographic characteristics and ZEVs/chargers distributions
- Section 2: Research relevant to each of the nine use-cases that are modeled for the TEINA project

Objective from the Statement of Work

The portions of the TEINA project’s Statement of Work (SOW) that guided this work effort included the following:

“[This work effort shall] examine existing conditions, determine data sources, identify trends in ZEVs, vehicle charging technology and costs, travel patterns and demographics...to contrast near-and-midterm charging infrastructure needs...A literature review [shall be conducted] of comparable research, studies and policies advancing TE infrastructure, including state, regional and national studies, and collaborative and public-private efforts....Consultant shall research current transportation electrification use types and vehicle classes and gather relevant data, especially on preferred charging modes, needs, and availability in Oregon, from the available literature, such as: ZEV registration and other TE adoption rates by geography, travel patterns, dwell time, land use data, commercial activity, demographics, GIS information and other information on rural and disadvantaged communities, and local policies.”

SECTION 1: GEOGRAPHIC CHARACTERISTICS AND ZEVs/CHARGERS DISTRIBUTIONS

- Key takeaways from Figure 1:
 - Urban Populations:
 - ~2.8M (65%)
 - Concentrated in the yellow circles.

- Rural Populations:
 - ~1.5M (35%)
 - Dark and light green areas

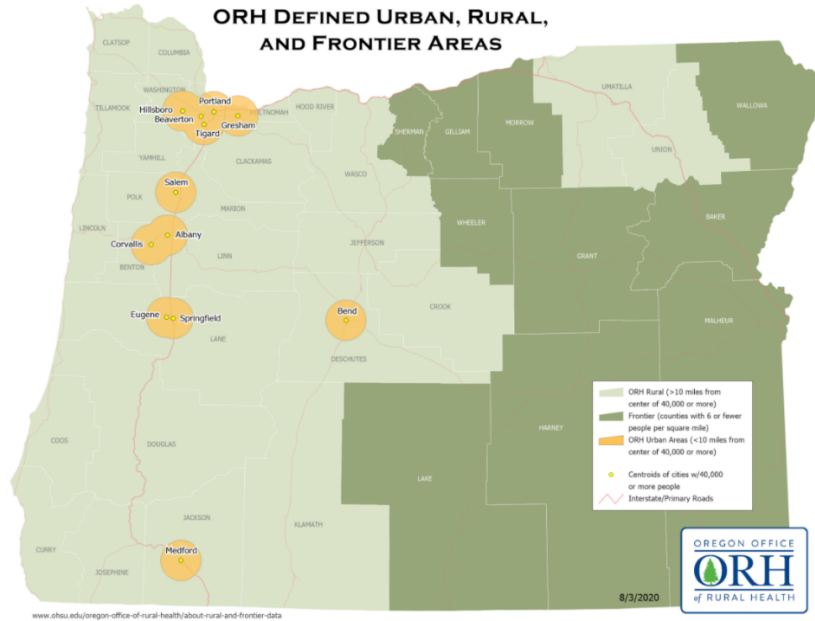


Figure 1: A Map Defining Urban and Rural Oregon (yellow circles are urban, the rest are rural (33% (1,390,536) of Oregon’s population lives in rural areas, 2% (93,887) in frontier, and 65% (2,780,180) in urban areas.))¹

- Key takeaways from Figure 2:
 - Total number of ZEVs: 32,000
 - BEVs: 67%
 - PHEVs: 33%
 - Concentrated in urban areas
 - Statewide LDVs (EV and ICE): ~3.2 M
 - Currently 1% electrification level
 - Electrification Goals (SB 1044)
 - 2020: 1.15% (50,000 registered motor vehicles will be ZEVs)
 - 2025: 8% (250,000 registered motor vehicles will be ZEVs)
 - 2030: 25% of registered motor vehicles and at least 50% of new motor vehicles sold annually will be ZEVs (800,000+ ZEVs)

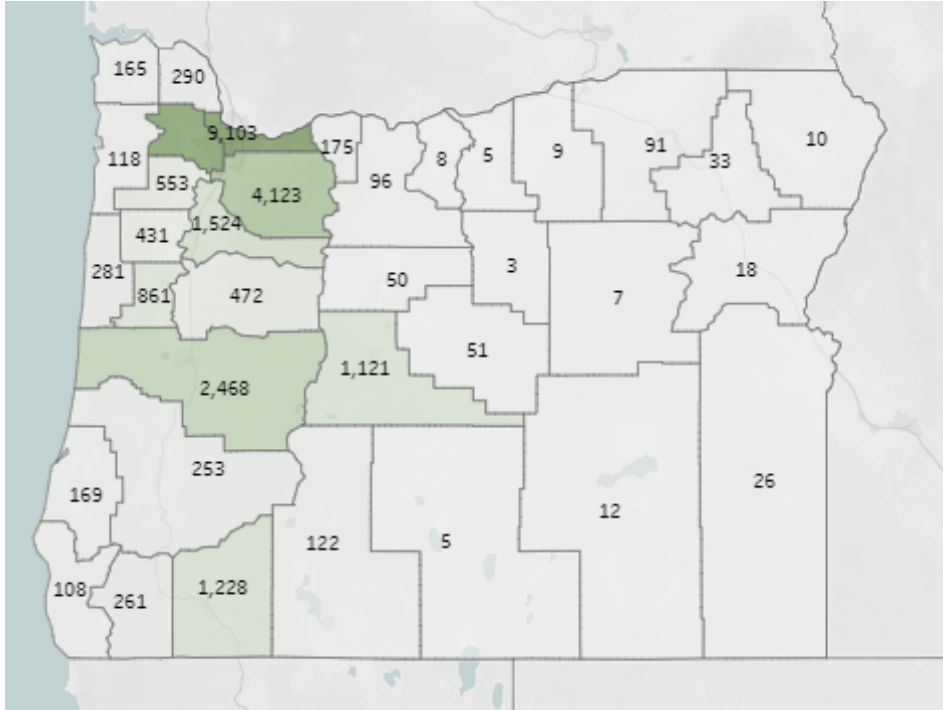


Figure 2: Where are the ZEVs (visually concentrated at urban areas) (31,000 ZEVs) (with 3,200,000 LDVs in OR, its 1% electrification)²

- Key takeaways from Figure 3:
 - Total number of public plugs: 2,300
 - Level 2 chargers: 75%
 - DC Fast Chargers (DCFCs): 23%
 - Concentrated in urban areas
 - Distributed along the major corridors and coast

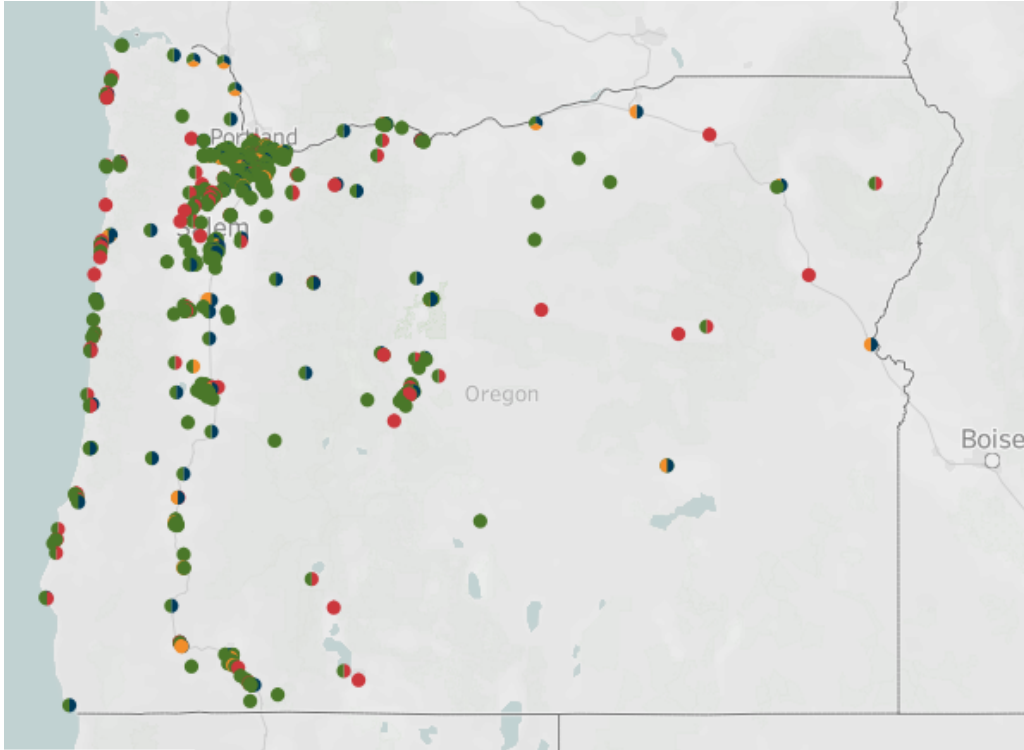


Figure 3: Where are the chargers (visually concentrated at ZEV hot zones)³

- Key takeaways from Figure 4:
 - The DCFC chargers available to each EV driver are even less than the total number of available chargers, because EVs – manufactured by European/ North American auto manufacturers; some Japanese auto manufacturers; and Tesla -- use three different types of connectors for fast charging,

DC Standard	Connector	Used By
SAE Combined Charging System (CCS)		<ul style="list-style-type: none"> • GM • Ford • Honda • Kia • Hyundai • Nissan • Mitsubishi • BMW • Mercedes • Porsche • Audi • VW
CHAdemo		<ul style="list-style-type: none"> • Nissan • Mitsubishi
Tesla Supercharger		<ul style="list-style-type: none"> • Tesla

Figure 4: Charging suitability (this is to acknowledge that different types of chargers can only serve specific models)⁴

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SECTION 2: SUMMARY OF EXISTING CHARGING INFRASTRUCTURE CONDITIONS BY USE CASE

Urban LDV¹

- PGE as the representative player. (Note: urban municipal and public utilities also host chargers)
 - Over 60% of current ZEVs are registered in PGE service area
- Existing⁵:
 - Urban Population: 2.8 million
 - LDVs: 26,000 (83% of total)
 - Chargers: 600 Stations
 - Level 2: 1,200
 - DCFC: 300
 - People per EV: 100 people/EV (~1% fleet penetration)
 - People per charger:
 - Level 2: 2,000 people/plug
 - DCFC: 9,000 people/plug
 - Electric LDVs per charger:
 - Level 2: 20 EVs/plug
 - DCFC: 90 EVs/plug
- Finding: the most outstanding issue is a lack of sufficient electric vehicle supply equipment (EVSE)
- Near future: Electrify America: the VW subsidiary has committed to two rounds of investment in Oregon. Electrify America plans to deploy 2 more charging stations soon in urban areas (Portland and Bend).
- PGE: Electric Avenue Pilot
 - Upgrade existing stations
 - Six new sites
 - 12 Level 2 ports, 40 DCFC ports

Table 45 summarizes PGE’s TE activity outlook by vehicle class (passenger vehicle and fleet), by offering type (rates, infrastructure, and customer programs), and by time frame (in flight, on the horizon, and long-term considerations). This is consistent with how the remainder of the section is outlined.

Table 45 – Summary of TE Activity Outlook

Activity	In Flight	On the Horizon	Long-term Considerations
Passenger Vehicle Adoption (Residential Customers)			
Rates	Schedule 38 (no demand charge); Residential TOU (and separately metered EV option)	Residential TOU as an option for EV drivers with home charging	On-bill payments/subscriptions; Integrated/bundled pricing; Multi-family billing; Sub-meter charging billing
Infrastructure (Public Charging)	Electric Avenue Pilot (six new sites)	Make-Ready for DCQC; DCQC where market gaps exist; Distribution Pole Charging; Mobility Hubs	Network expansion (charge rate, number of chargers per site, additional sites)
Infrastructure (Home Charging)	n/a	Residential smart charging; Make-Ready for MF	Charging as a Service
Infrastructure (Business Charging)	n/a	Make-Ready for destination and workplace charging	Charging as a Service
Customer Programs	Technical Assistance	Home smart charging rebates Business charging Rebates	Business charging integration into Energy Partner Program Charging co-optimization (with locational value)
Fleet Electrification (Business Customers)			
Rates	Schedule 38 (no demand charge)	n/a	Hedged pricing / long-term fueling contracts
Infrastructure	Electric Mass Transit Pilot; I5 Fleet Electrification Study	Make-Ready; Charging as a Service (school & transit); E-truck demonstration sandbox	Charging as a Service
Customer Programs	Technical Assistance	Business charging rebates; Electric fleet planning	Fleet charging integration into Energy Partner Program; Charging co-optimization (with locational value)

Rural LDV⁶

- Pacific Power as the representative player. (Note: rural municipal and public utilities also host chargers)
 - Large rural service area
 - 88% of Pacific Power chargers are in nonmetropolitan areas
 - Over 20% of current EVs are registered in its service area
- Pacific Power utilized alternative fueling station data from the US Department of Energy (US DOE) to map the number of existing Oregon public electric fueling stations (Figure 10). Currently, there are over 600 publicly available electric fueling stations (with approximately 1,600 “ports” or “outlets”), with 45 percent of these stations being in Oregon’s major metropolitan area. To date, Pacific Power has contributed funds to 46 total charging stations, 41 being customer owned charging stations, and an additional 5 stations to be owned and operated by Pacific Power. Of the 46 charging stations, 88 percent are located in nonmetropolitan areas.

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These sites will assist Oregon in building out its EV infrastructure in rural and coastal communities across the state.

- Existing⁷:
 - Populations: 1,500,000
 - Electric LDVs: 5,500 (17% of statewide total)
 - Chargers: 300 Stations
 - 500 Level 2 ports
 - 200 DCFC ports
 - People per electric LDV: 300 people per electric LDV (~0.3% fleet penetration)
 - Electric LDV per charger:
 - 10 electric LDVs per Level 2 port
 - 30 electric LDVs per DCFC port
 - People per charger:
 - 3,000 people per Level 2 port
 - 9,000 people per DCFC port
- Finding: the most outstanding issue is a lack of EV adoption
- Near future: Electrify America: the VW subsidiary has committed to two rounds of investment in Oregon. Electrify America plans to deploy 2 more soon in Newport and Warrenton.

Corridor LDV

- Existing: The “West Coast Electric Highway”⁸ is an extensive network of electric vehicle (EV) DC fast charging stations located every 25 to 50 miles along Interstate 5, Hwy 99, and other major roadways in British Columbia, Washington, Oregon, and California. Oregon’s portion of the WCEH operates as a public-private partnership, with **44** electric vehicle charging locations along I-5, parts of I-84, US Highway 101 and routes into Central Oregon. It continues to serve as a critical link for electric vehicle travel throughout the state. Oregon’s WCEH has dispensed more than 1.3 million kWh of charging and powered about 4 million miles of all-electric driving via more than 130,000 charging events since its inception.
- Utility Providers⁹: About 40% of WCEH sites are served by IOUs while 60% of sites are served by POU. Nineteen of the sites are serviced by one of the two investor-owned utilities operating in Oregon:
 - Portland General Electric Company (8)
 - PacifiCorp (11).

The remaining 25 sites are serviced by 19 different providers:

- Electric coop (11)
- Municipal utility (5)
- Peoples’ Utility District (9)

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- Oregon offers Standard and Charge Ahead rebates (income qualified; enables rebates for used EVs)
- PGE and Pacific Power are using Clean Fuel Program funds for equity-centered projects
- Many disadvantaged community residents live in MUDs
- Many pilot infrastructure programs are not in disadvantaged communities
- Utilities are increasingly aware of disadvantaged communities in the decision-making process. Utilities are building frameworks to promote transportation diversity, equity, and inclusion.
- PGE's 2021 electric school bus project is addressing underserved communities
- Pacific Power¹³: Current and near term actions already underway: The Company is actively involved in a number of initiatives today that improve the economics of charging infrastructure for customers.
 - The competitive EVSE grant program has reduced the cost of installations for 32 non-residential grant projects to date.
 - In addition, the Electric Mobility Grant funded through Clean Fuels Program Credits is designed to target funds towards nonprofit and public entities for projects which benefit residential customers in underserved communities. The Company anticipates \$1.3 million of grant awards in 2020 under this program.

Local commercial and industrial vehicles

- The development of local commercial and industrial electric vehicles is still in an early stage.
- VW/DERA funds may be used for some MD/HD vehicles, but no specific MD/HD ZEV vehicle purchase incentive are available today (vs. Standard and Charge Ahead rebates for light-duty vehicles)
- Near future¹⁴: Portland General Electric (PGE) and Daimler Trucks North America (DTNA) on Dec. 1 announced the co-development of "Electric Island," a large public charging site for medium- and heavy-duty electric commercial vehicles. The charging site is expected to be the first of its kind in the U.S. Electric Island will help accelerate the development, testing and deployment of zero emissions (tank-to-wheel) commercial vehicles.
 - The site is under construction now near DTNA headquarters in Portland and is designed to support up to nine vehicle charging stations with charging levels of up to one megawatt by spring of 2021. Electric Island will provide DTNA, PGE and the public the opportunity to charge light-, medium-, and heavy-duty vehicles. Plans for more chargers, on-site energy storage, solar power generation, and a product and technology showcase building are currently being finalized.
 - The site will be greenhouse gas emissions-free, including all vehicle charging.
 - Use of vehicle chargers featuring power delivery of up to over one megawatt (over 4 times faster than today's fastest light-duty vehicle chargers), enabling PGE and DTNA to develop best practices for cost-effective future deployments;

DRAFT

- Integration of heavy-duty charging technology into PGE’s Smart Grid, such as vehicle-to-grid technologies, second-life use of Daimler’s battery packs, and onsite energy generation¹⁵; and
- Testing information technology opportunities like fleet and energy management by captive solutions and services.

Transit and school buses

- Existing¹⁶:
 - Though there are few electric MHDVs in our service area today, TriMet’s first electric bus line (Line 62) has been operational since April 2019. This line is comprised of 5 battery electric buses that run between the Sunset Transit Center and Washington Square. Electricity for Line 62 is served by a combination of on-route and depot charging solutions. (Electric Mass Transit 2.0: a pilot with TriMet whereby PGE owns, operates, and maintains high-powered) Today, PGE-sponsored electric school bus pilots are just beginning to operate on Oregon roads, with the first one starting up in Beaverton, OR in February 2021.
 - South Metro Area Regional Transit (SMART): Since June 2019, 2 e-buses with depot chargers have been in service
 - Josephine Community Transit: Since November 2019, 2 e-buses with depot inductive chargers have been in service
- Near future¹⁷:
 - Lane Transit District: 11 e-buses will be operating in 2021 with multiple depot chargers
 - In 2021, Portland General Electric and Oregon Clean Fuels Program funds will support Electric Buses for Five Oregon School Districts (Beaverton, Newberg, Portland, Reynolds, and Salem-Keizer)

TNCs

- Existing¹⁸: Nothing dedicated for TNC.
- There are no significant infrastructure investments dedicated to TNC use, nor specific incentives in place to support TNC electrification.
- Other relevant information:
 - PGE has developed a subscription-based model that reduces cost for TNC drivers
 - In Oregon, most stakeholders assume TNC demand is part of the public charging demand, so no TNC dedicated stations have been announced

Long-haul trucking

- Existing¹⁹:

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- The development of electric long-haul trucking is still in an early stage
- Truck charging requires greater electrical upgrades and planning due to larger charging capacity
- No MD/HD specific incentives are in place in Oregon
- Near future²⁰: West Coast Clean Transit Corridor Initiative
 - Plan and design charging sites for medium and heavy-duty electric trucks along I-5
 - Propose to develop 27 charging sites to support MD electric trucks by 2025. Oregon will operate 8 of them
 - Expand 14 of those sites to accommodate HD electric trucks by 2030

Micro-mobility

- Existing:
 - Pacific Power's \$1.3 million Clean Fuels Program grants fund innovative clean transportation projects to fund a range of community-driven electric transportation projects such as purchasing e-bike instant rebates
 - Nike Biketown program: 1,500 e-bikes at 180 stations across Portland
 - B-line eTrike urban delivery program in Portland

Near Future²¹:

- PGE is currently planning to lead the design of a mobility hub in inner southeast Portland. This hub will include active modes of new transportation (e.g., scooters, e-bikes, electric car share, etc.).
- PGE is working closely with the City, County, TriMet, and local businesses to identify transportation priorities in the future. Such a project can help Oregon better understand the long-term system impacts of micro-mobility, facilitate adoption of electricity as a transportation fuel for customers who do not or cannot drive, and support Oregon communities in transitioning to multi-modal and active transportation options. This first deployment is exploratory and will inform how to engage with micro-mobility in the future.

END NOTES

1

Oregon Office of Rural Health (<https://www.ohsu.edu/oregon-office-of-rural-health/about-rural-and-frontier-data>)

² Oregon Department of Energy (<https://www.oregon.gov/energy/Data-and-Reports/Pages/Oregon-Electric-Vehicle-Dashboard.aspx>)

³ Oregon Department of Energy (<https://www.oregon.gov/energy/Data-and-Reports/Pages/Oregon-Electric-Vehicle-Dashboard.aspx>)

⁴ PGE's 2019 Transportation Electrification Plan: (<https://edocs.puc.state.or.us/efdocs/HAA/haa165721.pdf>)

⁵ Oregon Department of Energy (<https://www.oregon.gov/energy/Data-and-Reports/Pages/Oregon-Electric-Vehicle-Dashboard.aspx>)

⁶ Pacific Power 2020 Oregon Transportation Electrification Plan

(<https://edocs.puc.state.or.us/efdocs/HAA/haa17127.pdf>)

⁷ Oregon Department of Energy (<https://www.oregon.gov/energy/Data-and-Reports/Pages/Oregon-Electric-Vehicle-Dashboard.aspx>)

⁸ODOT West Coast Green Highway

(https://www.oregon.gov/odot/Programs/Electric%20Vehicle%20library/7_Characterization_Site%20Agreements.pdf)

⁹ ODOT Host Sites Agreements

(https://www.oregon.gov/odot/Programs/Electric%20Vehicle%20library/7_Characterization_Site%20Agreements.pdf)

¹⁰Oregon WCCEH Map

(https://www.oregon.gov/odot/Programs/Electric%20Vehicle%20library/OR_EV_map_locate_2-5-2020.pdf)

¹¹ ODOT West Coast Green Highway

(https://www.oregon.gov/odot/Programs/Electric%20Vehicle%20library/7_Characterization_Site%20Agreements.pdf)

¹² Oregon WCCEH Map

(https://www.oregon.gov/odot/Programs/Electric%20Vehicle%20library/OR_EV_map_locate_2-5-2020.pdf)

¹³ Pacific Power 2020 Oregon Transportation Electrification Plan

(<https://edocs.puc.state.or.us/efdocs/HAA/haa17127.pdf>)

¹⁴ The Trucker (<https://www.thetrucker.com/trucking-news/equipment-tech/electric-island-public-charging-site-for-commercial-electric-vehicles-planned-for-portland-Oregon>)

¹⁵ PGE News Room (<https://www.portlandgeneral.com/our-company/news-room/news-releases/2020/12-01-2020-daimler-trucks-north-america-pge-announce-public-electric-truck-char>)

¹⁶ PGE's 2019 Transportation Electrification Plan: (<https://edocs.puc.state.or.us/efdocs/HAA/haa165721.pdf>)

¹⁷ Go Electric Oregon (<https://goelectric.oregon.gov/blog/2020/5/12/pge-announces-five-electric-school-bus-winners>)

¹⁸ PGE's 2019 Transportation Electrification Plan: (<https://edocs.puc.state.or.us/efdocs/HAA/haa165721.pdf>)

¹⁹ 2020 West Coast Clean Transit Corridor Initiative (<https://cyanstrategies.com/wp-content/uploads/2020/06/WCCTCI-Report.pdf>).

²⁰ Business wire (<https://www.businesswire.com/news/home/20200617005125/en/I-5-Electric-Truck-Charging-Sites-Mapped-Out-by-Electric-Utilities>)

²¹ PGE's 2019 Transportation Electrification Plan: (<https://edocs.puc.state.or.us/efdocs/HAA/haa165721.pdf>)