

# Additional Electrification

Oregon Clean Fuels Program Advisory  
Committee Meeting #3

January 27,  
2017



Oregon Department of  
Environmental Quality

Jeffrey Rosenfeld  
Senior Technical Specialist

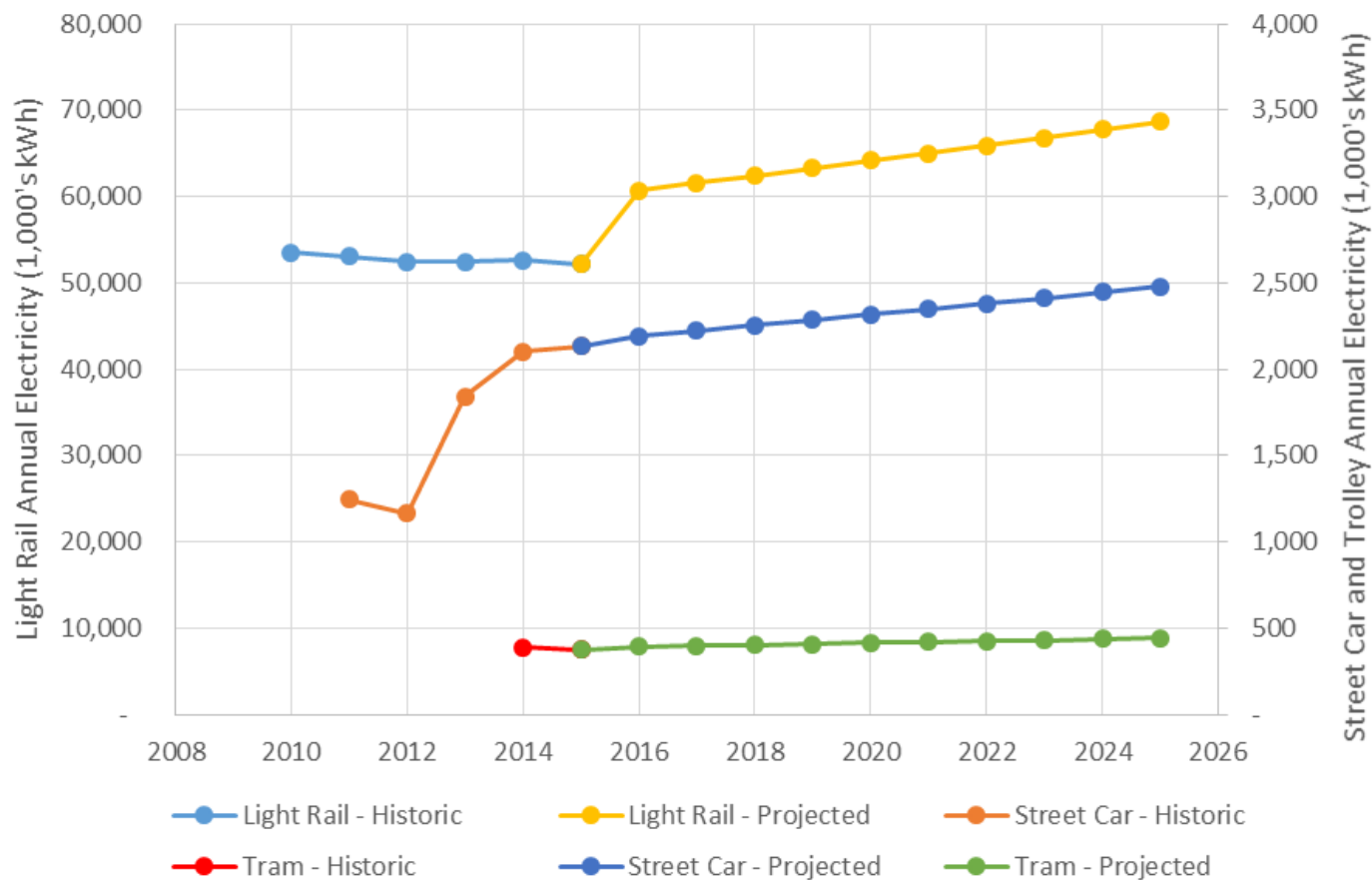
# Additional Electrification Technologies

- **Fixed guideway transit including TriMet Max (light rail), City of Portland Street Car (street car), and the Portland Aerial Tram (tram)**
- **Forklifts**
- **Truck stop electrification**

# Fixed Guideway Assumptions

- **Utilized National Transit Database (NTD) for annual electricity consumption from 2010-2014**
- **Annual escalation of 1.4% from 2014 to 2025 was assumed based on the updated 2040 Household Forecast Distribution for Portland**
- **Increased in electricity consumption of light rail from 2014 to 2015 is due to Max increased track mileage from 52 to 59.7 miles**

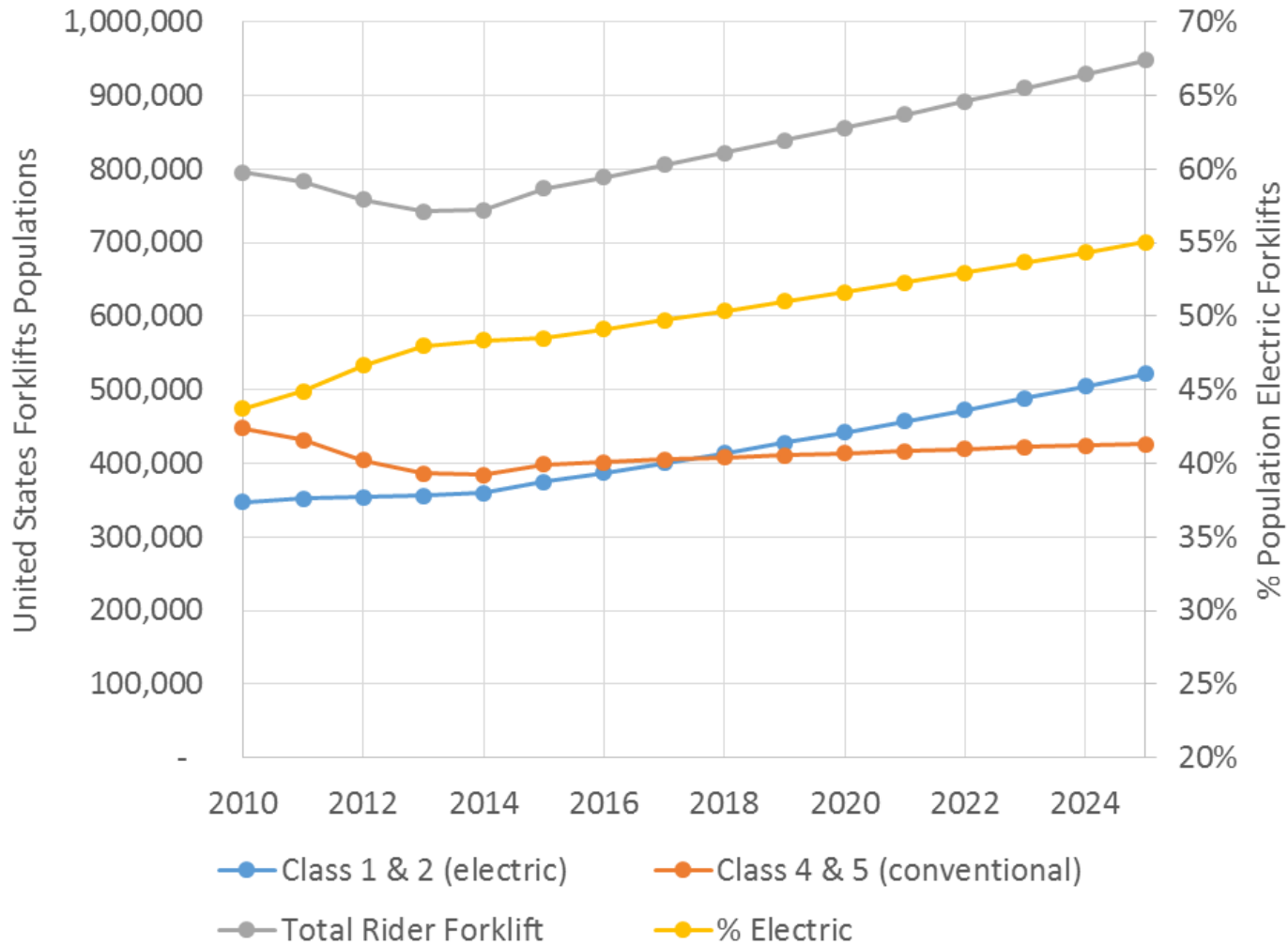
# Fixed Guideway Estimated Electricity Consumption



# Forklift Assumptions

- Utilized the Industrial Truck Association (ITA) historical forklift sales to estimate current US forklift populations
- Recent trends in forklift sales and population including growth rates and changes in the penetration of electric forklifts were used to project future forklift populations and sales
- Allocated US forklifts to Oregon by population
- CalETC Phase 1 TEA estimate of 18,312 kWh/forklift was used to quantify electricity consumption

# US Forklift Populations



# Oregon Forklift Population and Electricity Consumption

Year	Oregon <2015 Forklifts	Oregon 2016+ Forklifts	Total Oregon Forklifts	Oregon <2015 Forklift Electricity (kWh)	Oregon 2016+ Forklift Electricity (kWh)
2016	4,101	721	4,822	75,097,512	13,202,952
2017	3,747	1,237	4,984	68,615,064	22,651,944
2018	3,352	1,800	5,152	61,381,824	32,961,600
2019	2,795	2,530	5,325	51,182,040	46,329,360
2020	2,184	3,320	5,504	39,993,408	60,795,840
2021	1,526	4,162	5,688	27,944,112	76,214,544
2022	810	5,070	5,880	14,832,720	92,841,840
2023	-	6,077	6,077	-	111,282,024
2024	-	6,281	6,281	-	115,017,672
2025	-	6,492	6,492	-	118,881,504

It is estimated that TSE could contribute 50,000 – 100,000 kWh/yr

# Truck Stop Electrification

- Only 5 truck stops in Oregon with TSE available

Truck Stop	Number of Bays	City
Jubitz	28	Portland
Arrowhead	46	Pendleton
Baker	24	Baker City
Truck n Travel	26	Coburg
Seven Feathers	36	Canyonville
Total	160	-

- Based on data from Shorepower's ARRA funded project, the most complete data set was from Jubitz truck stop in Portland with average space usage of 3.4%
- Using the average load of 0.69 kW, ICF estimates 32,930 kWh/yr





# Credit Calculation Assumptions

- Oregon version of GREET electricity carbon intensity of 120.27 g/MJ

Technology	EER Value	Source
Light Rail, Tri-Met Max	3.33	NTD for Portland specific diesel buses and fixed guideway technologies
Street Car, City of Portland	1.81	
Tram, City of Portland	2.46	
Forklifts	3.8	LCFS Regulatory Order
Truck Stop Electrification	3.8	LCFS Regulatory Order for forklifts

Direct Electricity Consumption	Displaced Conventional Fuel
<ul style="list-style-type: none"> <li>• Tri-Met Max Line Prior to 2015</li> <li>• City of Portland Street Car Prior to 2015</li> <li>• Forklifts purchased before 2016</li> <li>• City of Portland Aerial Tram</li> </ul>	<ul style="list-style-type: none"> <li>• Tri-Met Max line expansion in 2015 (7.7 mi)</li> <li>• City of Portland Street Car Expansion in 2015 (1.2 mi)</li> <li>• Forklifts purchased 2016+</li> <li>• Truck Stop Electrification</li> </ul>

# Additional Electrification Credit Potentials

Year	Fixed Guideway	Forklifts	TSE	Total
2016	18,368	30,549	31	48,947
2017	18,546	37,585	30	56,161
2018	18,649	45,010	30	63,689
2019	18,755	54,400	30	73,185
2020	18,701	63,906	29	82,637
2021	18,642	73,737	29	92,409
2022	18,421	83,392	28	101,842
2023	18,187	93,639	28	111,854
2024	17,946	94,438	27	112,411
2025	17,528	94,374	26	111,929
Total	183,745	671,029	289	855,063
% of Total Deficits, 2014 Illustrative Compliance Scenarios	1.4-1.9%	4.9-6.7%	0.002-0.003%	6.0-8.2%

# Comparison of Direct Energy vs Displacement

Year	All kWh Direct Energy	All kWh Displacement	Technology Specific
2016	35,742	128,565	48,947
2017	36,521	131,456	56,161
2018	37,178	133,916	63,689
2019	37,851	136,436	73,185
2020	38,230	137,906	82,637
2021	38,603	139,354	92,409
2022	38,669	139,705	101,842
2023	38,704	139,942	111,854
2024	38,727	140,135	112,411
2025	38,384	139,017	111,929
Total	378,609	1,366,432	855,063

Questions?

