

Business Models for Financially Sustainable EV Charging Networks

PRESENTATION TO THE WASHINGTON STATE TRANSPORTATION COMMISSION

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JOINT TRANSPORTATION COMMITTEE

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Charge from the Legislature ESSB 6001, Sec 205(6)

- Evaluate current status of electric vehicle (EV) charging network in Washington
- Recommend business models to increase private sector participation in funding the EV charging networks
- Recommend alternative public sector and private sector roles in financing the network
- Interim report December 31, 2014; final report March 1, 2015
- \$250,000 appropriation

Advisory Panel

Legislators:



Washington EV experts: Seattle EV Association, Plug-In North Central Washington (Wenatchee), Puget Sound Energy, Cowlitz PUD, Washington Clean Cities Association, WSDOT

National EV Experts: Nissan Vice President (LEAF), ChargePoint & NRG (charging station operators)

3 meetings (July 31, October 1, November 13) and 2 webinars (June 30 and September 16)

C2ES

- JTC hired the Center for Climate and Energy Solutions (C2ES) from Arlington, VA to conduct the study.
- Formerly known as the Pew Center for Climate Change
- <http://www.c2es.org/policy>
- Nick Nigro is the C2ES Project Manager
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Not all EVs are alike



Toyota Prius Plug-in
 Electric Range: 11 miles
 Total Range: 540 miles



Chevy Volt
 Electric Range: 38 miles
 Total Range: 380 miles



Nissan LEAF
 Electric Range: 84 miles
 Total Range: 84 miles



Tesla Model S
 Electric Range: 265 miles
 Total Range: 265 miles

PHEV: Plug-in hybrid EV.
Battery + gasoline engine

BEV: Battery EV.
Solely battery powered.

PHEVs

BEVs

	USA	WA
PHEVs	56%	31%
BEVs	44%	69%
	222,985	8,148

June, 2014 data

Three kinds of EV chargers serve different purposes



Focus of our study

Low – AC 120V *LEVEL 1*

- Uses standard outlet
- Power requirements are like a toaster
- Adapter comes with the car
- Accommodates average daily driving needs
- Very low cost installation, often free

• *Fully charge a Nissan LEAF: 17 hours*

Medium – AC 240V *“AC” LEVEL 2*

- Requires high-voltage circuit
- Power requirements are like a clothes dryer
- Charging stations can cost about \$500
- Installation costs vary widely (~\$1,500)

• *Fully charge a Nissan LEAF in 3.5 - 7 hours*

High – DC Fast Charge *“DC” LEVEL 2*

- Requires very high voltage circuit & 3-phase power
- Power requirements are up to max power for 15 homes
- No common standard for electric vehicles
- Equipment costs vary widely
- Very high installation cost (~\$100k)

• *80% charge a Nissan LEAF in 30 minutes*

Washington's Charging Network

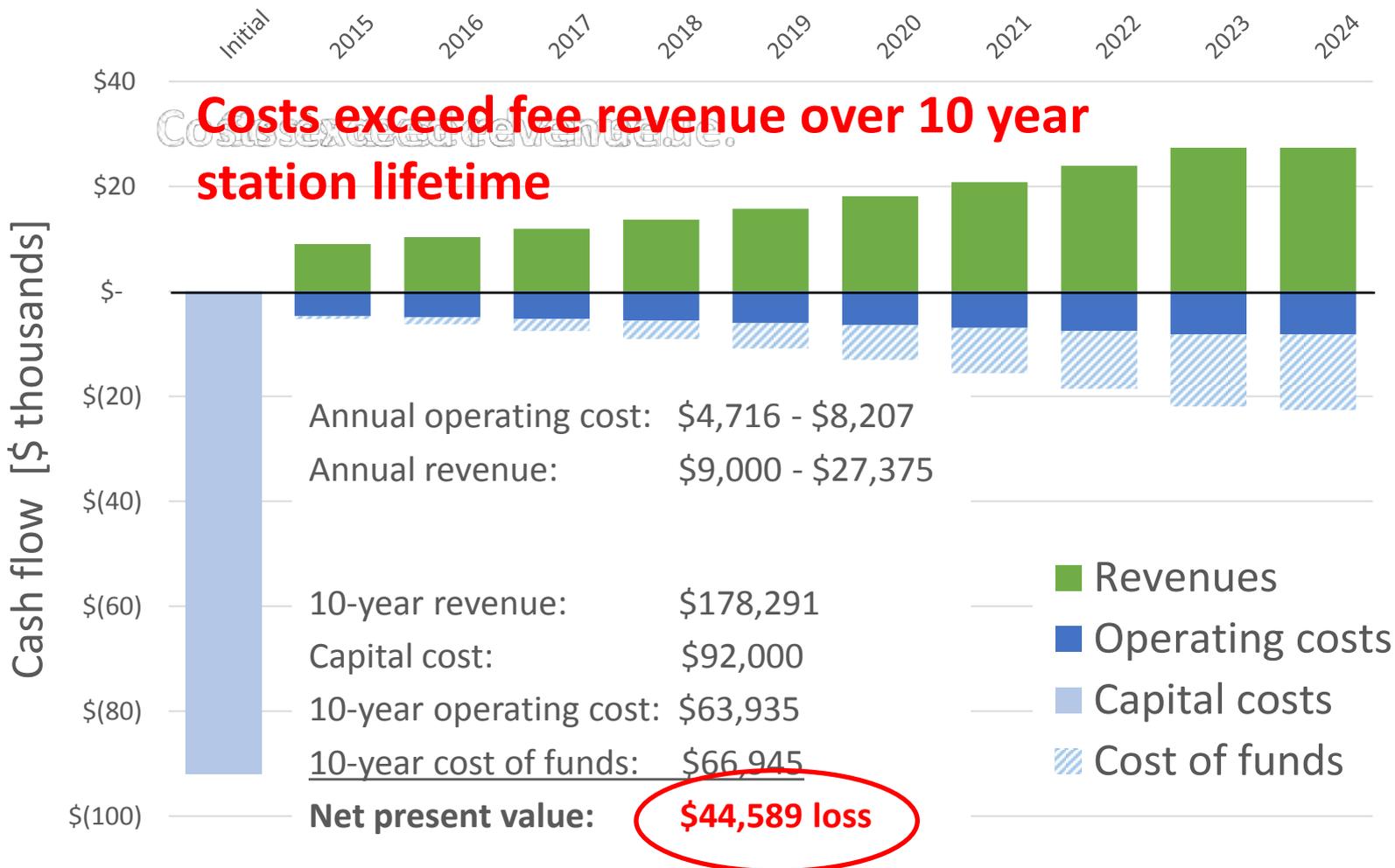
440+ publicly available charging locations in Washington

- 400+ Level 2 charging locations
- 40 DC Fast Charging locations (DCFC)
- Located mostly in Puget Sound, along I-5 and around Vancouver
- Also in Ritzville, Wenatchee, Leavenworth and along SR 2

Most are privately owned and operated (12 owned by local gov'ts)

- AeroVironment, Blink or ChargePoint own, operate and maintain
- **Federal funds subsidized initial costs of most charging equipment before 2013.**

Why can't the private sector just fund the DCFC charging network?



Three business models investigated

How to get more private sector \$ invested in EV charging network

Business Model 1: Large business provides up-front capital subsidy to owner/operator of charging network.

- Automakers, who benefit indirectly by increased EV sales (\$7,000 subsidy per DCFC station; \$500 per Level 2 station)

Business Model 2: Local businesses provide annual revenue stream to owner/operator of charging network.

- Hotels, retailers, restaurants, tourism attractions which benefit indirectly by increased sales from new EV customers (10% of attributable EV tourism sales revenue for 10 years)

Business Model 3: Large business and local businesses both contribute (combination of 1 & 2)

Business models tested on 3 routes

1. I-90, from Seattle to Spokane

- Interregional travel
- Business Model 1 (automaker capital subsidy)

2. Ocean Shores, via Longview, Olympia and Seattle

- Tourist destination
- Business Model 2 (local businesses revenue subsidy for 10 years)

3. Tri-Cities and Walla Walla, via Seattle and Spokane

- Tourist destination
- Business Model 3 (subsidies from automaker and local businesses)

Financial Results: Business Model 1 on I-90 Route



- Despite \$42,000 in up-front capital subsidies from an automaker, the owner/operator of the 6-station charging network loses money over the 10 year life of the project.

Financial Metric	Result
<i>Owner/operator</i>	
Funds spent on stations (equity)	\$224,640
Funds spent on stations (loans)	\$336,960
NPV	-\$118,207
Payback period	No payback
<i>Funding partner</i>	
Amount of funds transferred to owner/operator	\$42,000
NPV	+\$19,532
Payback period	5 years
<i>Total project level</i>	
Capital investment (spent on charging station deployment)	\$561,600
NPV	-\$87,777
Payback period	No payback

Financial Results: Business Model 2, Ocean Shores Network



- With annual revenue transfers from local businesses, the Ocean Shores network makes money, but a 9 year payback may be too long for most private investors

Financial Metric	Result
<i>Owner/operator</i>	
Funds spent on stations (equity)	\$200,600
Funds spent on stations (loans)	\$300,900
NPV	+\$49,439
Payback period	9 years
<i>Funding pool</i>	
Amount transferred annually to owner/operator	\$28,000 - \$84,125
NPV	+\$206,566
Payback period	1 years
<i>Total project level</i>	
Capital investment (for charging station deployment)	\$501,500
NPV	+\$292,320
Payback period	6 years

Applying Business Model 3 to Enable EV Travel to and within Tri-Cities and Walla Walla



- **Not enough charging stations to enable travel to and within Tri-Cities and Walla Walla from Seattle and Spokane.**
- **To fill the charging gap, install 10 DCFC stations, 50 Level 2 charging stations, hosted by local businesses.**



Financial Results: Business Model 3, Tri Cities/Walla Walla



- With subsidies from both automakers and local businesses, the Tri Cities/Walla Walla network makes money, but a 9 year payback period may be too long to attract private investors

Financial Metric	Result
<i>Owner/operator</i>	
Funds spent on stations (equity)	\$553,640
Funds spent on stations (loans)	\$830,460
NPV	+\$54,166
Payback period	9 years
<i>Funding partner/pool</i>	
Funds transferred to owner/operator initially	\$95,000
Funds transferred to owner/operator annually	\$56,000 - \$168,250
NPV	+\$457,312
Payback period	2 years
<i>Total project level</i>	
Capital investment (spent on charging station deployment)	\$1,384,100
NPV	+\$513,518
Payback period	6 years

- **Under current market conditions, it is unlikely that business models will be implemented by private sector alone**
 - Only providing an upfront cost subsidy to owner/operator (Business Model 1) does not yield a positive NPV
 - Local businesses sharing revenue with owner/operator achieves payback (Business Models 2 and 3), but is likely too long for private sector
- **Sensitivity analyses show that business models hold promise**
 - Business Model 1 can become NPV positive if initial utilization is 75% higher than expected, resulting in higher charging service revenue
 - Business Models 2 and 3 can approach 5-year payback if initial utilization is 65% higher than expected, resulting in higher charging service revenue

What effect will different public sector interventions have on the financial sustainability of new charging networks in Washington?

- **Direct funding interventions, such as grants and loans**
- **Other interventions to increase EV deployment and reduce charging network upfront costs**
 - Building codes, consumer education, shared use of public sector charging infrastructure, ZEV program

Low-Interest Loan

- Finance 50% of project debt at 5.4% interest rate

Grant

- Subsidize cost of charging station equipment by 50%

Extending BEV Sales Tax Exemption

- Increase charging station utilization growth rate from 15% to 22%

Consumer Education

- Increase charging station utilization growth rate from 15% to 18%

ZEV Program

- Increase charging station utilization growth rate to 15% to 30%

Building Codes

- Subsidize 50% of cost of grid interconnection for DC fast charging; subsidize 50% of installation cost

Shared Use Public Sector EV Charging Stations

- Increase initial charging station utilization level by 30%; increase maximum utilization level by 10%



• Public Sector Interventions

- Low-interest loan: \$110,000 at 5.4%, 10 year term
- One-time grant: \$220,000
- Extension of BEV sales tax exemption

• Project Capitalization

- Total project cost = \$561,600
 - 20% owner/operator equity
 - 20% private loans
 - 20% public loans
 - 40% public grant
- Private sector partner (automaker) contributes \$42,000 up front

Financial Performance

<i>Owner/operator</i>	
NPV	+\$136,835
Payback	5 years
<i>Funding partner</i>	
NPV	+\$19,532
Payback	5 years
<i>Public sector</i>	
NPV	-\$222,394
Payback period	n/a
<i>Total project level</i>	
NPV	-\$61,033
Payback period	n/a



No public subsidies are needed

- **Public Sector Interventions**
 - Sales tax exemption ends in 2020
 - No loans or grants are issued for this project
- **Project Capitalization**
 - Total project cost = \$508,170
 - 40% owner/operator equity
 - 60% private loans
 - Private sector partner (automaker) contributes \$42,000 up front

Financial Performance

<i>Owner/operator</i>	
NPV	+\$115,566
Payback	5 years
<i>Funding partner</i>	
NPV	+\$19,532
Payback	5 years
<i>Public sector</i>	
NPV	n/a
Payback period	n/a
<i>Total project level</i>	
NPV	+\$155,450
Payback period	5 years

Business Model 2: Ocean Shores Charging Gap, Near Term



• Public Sector Interventions

- Low-interest loan: \$150,000 at 5.4%, 10 year term
- One-time grant: \$85,000
- Extension of BEV sales tax exemption

• Project Capitalization

- Total project cost = \$501,500
 - 23% owner/operator equity
 - 30% private loans
 - 30% public loans
 - 17% public grant
- Local business funding pool contributes \$28k - \$84k annually

Financial Performance

<i>Owner/operator</i>	
NPV	+\$213,107
Payback	5 years
<i>Funding pool</i>	
NPV	+\$236,304
Payback	<1 year
<i>Public sector</i>	
NPV	-\$83,750
Payback period	n/a
<i>Total project level</i>	
NPV	+\$418,851
Payback period	6 years

Business Model 2: Ocean Shores Charging Gap, 5 Years from Now



No public subsidies are needed

- **Public Sector Interventions**
 - Sales tax exemption ends in 2020
 - No loans or grants are issued for this project
- **Project Capitalization**
 - Total project cost = \$481,275
 - 40% owner/operator equity
 - 60% private loans
 - Local business funding pool contributes \$62k - \$84k annually

Financial Performance

<i>Owner/operator</i>	
NPV	+\$347,310
Payback	3 years
<i>Funding pool</i>	
NPV	+\$327,135
Payback	<1 year
<i>Public sector</i>	
NPV	n/a
Payback period	n/a
<i>Total project level</i>	
NPV	+\$728,746
Payback period	2 years

Business Model 3: Tri-Cities/Walla Walla Charging Gap, Near Term



Public Sector Interventions

- Low-interest loan: \$415,000 at 5.4%, 10 year term
- One-time grant: \$240,000
- Extension of BEV sales tax exemption

Project Capitalization

- Total project cost = \$1,384,100
 - 23% owner/operator equity
 - 30% private loans
 - 30% public loans
 - 17% public grant
- Private sector partner (automaker) contributes \$95,000 up front
- Local business funding pool contributes \$56k - \$168k annually

Financial Performance

<i>Owner/operator</i>	
NPV	+\$886,073
Payback	6 years
<i>Funding partner/pool</i>	
NPV	+\$516,792
Payback	2 years
<i>Public sector</i>	
NPV	-\$237,500
Payback period	n/a
<i>Total project level</i>	
NPV	+\$886,073
Payback period	6 years

Business Model 3: Tri-Cities/Walla Walla Charging Gap, 5 Years from Now



No public subsidies are needed

- **Public Sector Interventions**
 - Sales tax exemption ends in 2020
 - No loans or grants are issued for this project
- **Project Capitalization**
 - Total project cost = \$1,308,030
 - 40% owner/operator equity
 - 60% private loans
 - Private sector partner (automaker) contributes \$95,000 up front
 - Local business funding pool contributes \$124k - \$168k annually

Financial Performance

<i>Owner/operator</i>	
NPV	+\$805,762
Payback	3 years
<i>Funding partner/pool</i>	
NPV	+\$698,446
Payback	<1 year
<i>Public sector</i>	
NPV	n/a
Payback period	n/a
<i>Total project level</i>	
NPV	+\$1,630,710
Payback period	2 years



- **EV driver-based revenue sources**

- Increase the annual registration fees for EVs

- \$50 increase (to \$150) generates \$500,000 in 2015, \$1.9 million annually by 2024
- Assumes 15% annual growth in EVs

- Limit BEV sales tax exemption to cars below a certain value, and use a portion of the new sales tax revenue

- **Federal transportation funding**

- Congestion Mitigation and Air Quality Improvement Program (\$2.2 billion annually)

- Surface Transportation Program (\$10 billion annually)

- **State transportation funding**

- **Private businesses that gain indirect value from EV charging station deployment play a critical role in improving financial performance of EV charging station investments**
- **Difficult to make EV charging investment attractive to private owner/operators (5-year payback) with private sector partners alone**
- **Public sector can make the business models profitable in near term**
 - In near term, public sector interventions are needed for owner/operator to reach payback within 5 years for each business model
- **If the EV market develops, the role for government can be scaled back to virtually nothing in 5 years**
- **Potential funding sources for public interventions**
 - EV registration fee increases, EV sales tax revenues, and state and federal transportation funding sources

Questions?

About the Zero Emission Vehicle (ZEV) Program



- **ZEV Program in 10 states**

- Ambitious requirement for manufacturers to produce and deliver ZEVs for sale
- Includes electric and hydrogen fuel cell passenger vehicles
- Relevant vehicles:
 - ZEV: no emissions
 - TZEV: plug-in hybrids like Chevy Volt
- Participants: CA, CT, MA, MD, ME, NJ, NY, OR, RI, VT
- ZEV requirements for all states can be met in California up to Model Year 2017 through “travel provision”
 - Vehicles must be available in those states for MY 2018

