New Business Models to Expand EV Charging

Value capture for public charging services

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About Atlas Public Policy

- DC-based policy tech firm started in 2015
- **Mission**: equip businesses and policymakers to make strategic, informed decisions through the greater use of technology that interprets publicly available information

Atlas Key Focus Areas

- ***Access**: Collect and disseminate publicly available information for free.*
- ***Interpret**: Develop open-source apps to spur insights and conduct analyses.*
- ***Empower**: Strengthen policymakers, businesses, and non-profits' ability to meet emerging challenges and identify and seize opportunities.*

Overview

- Key near-term challenges for EV market
- EV market state of play
- Public charging business challenge
  - Upfront costs, willingness to pay, and consumer demand
- Indirect revenue improves charging business case
- Charging gaps in Washington
- Example of applying indirect revenue business models to charging gap in Washington

EV and Charging Terminology

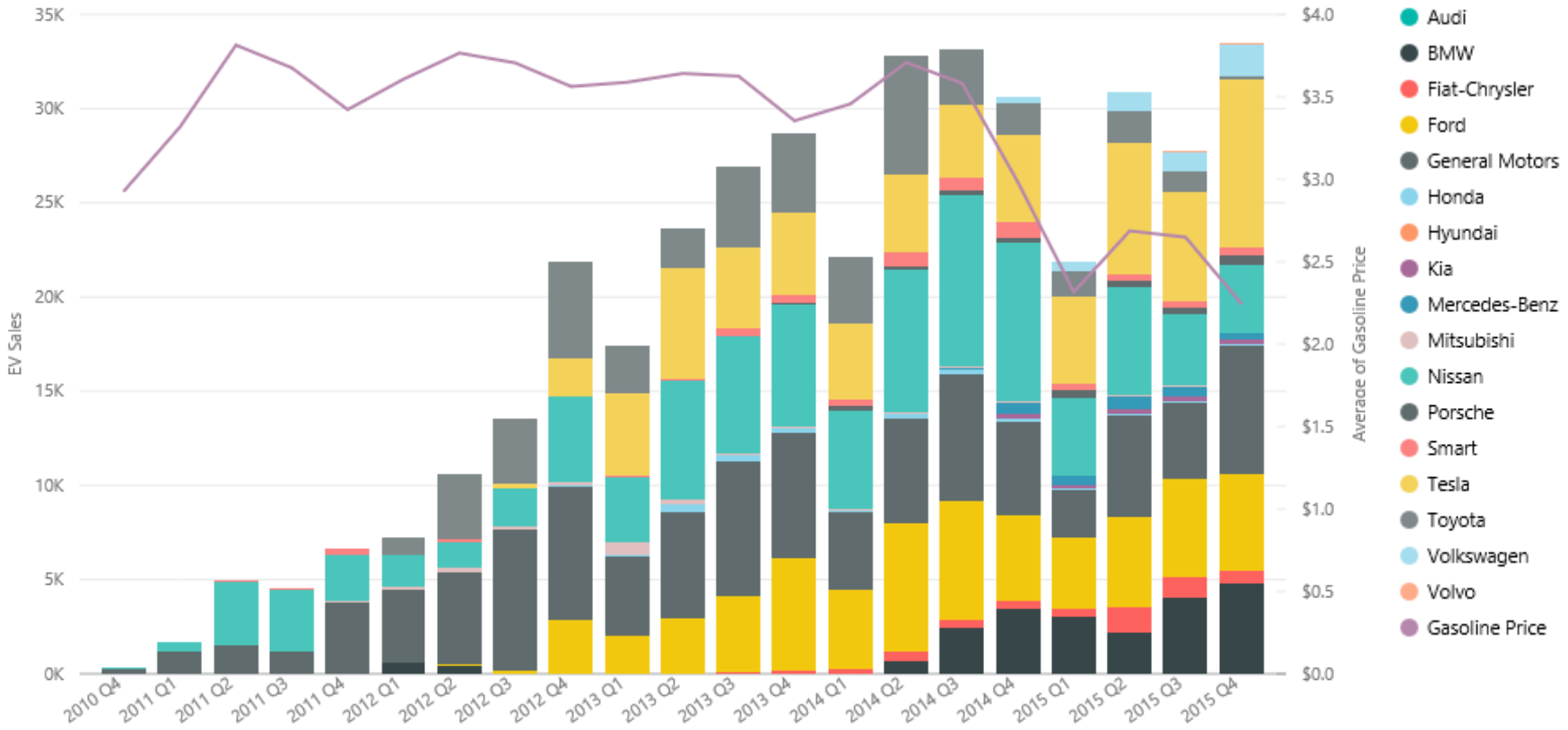
- Plug-in electric vehicle (EV)
  - Battery Electric Vehicle (BEV): all-electric car only powered by batteries
  - Plug-in Hybrid Electric Vehicle (PHEV) or Extended Range Electric Vehicle (EREV): vehicle that can be powered by either batteries, a gasoline engine, or both
- Charging Levels

Low – AC 120 V "AC" LEVEL 1	Medium – AC 240 V "AC" LEVEL 2	High – DC Fast Charge "DC" LEVEL 2
• Uses standard outlet • Power requirements similar to a toaster • Up to 1.4 kilowatts • Can use existing power outlets resulting in no cost installation • Charging rate: 3-5 miles per hour	• Requires high-voltage circuit • Power requirements similar to an electric clothes dryer • Up to 19.2 kilowatts • Equipment & installation costs vary widely (~$6,500 in public and ~$2,000 at home) • Charging rate: 12-75 miles per hour	• Power requirements are up to max power for 15 homes • Up to 90 kilowatts • Currently, three systems used (CHAdeMO, SAE Combo, Tesla) • Can have very high equipment & installation costs (up to $90,000) • Charging rate: 100-300 miles per hour

Key Challenges through 2020

- Market must get to third generation of EVs
  - Automakers need to drive costs down and electrify more drivetrains to make EVs competitive and profitable
  - Policymakers must support technology in near term
- Infrastructure business model
  - Must capture indirect value of charging services
  - Electric utilities must be engaged
- Adjust to changing needs of EV drivers
  - 2nd generation EVs will have longer range creating greater need for DC fast charging
- Sustained low oil prices could hurt EV viability
- Consumer awareness still lacking

400,000 EVs Sold Since 2010



Source: hybridcars.com, U.S. EIA

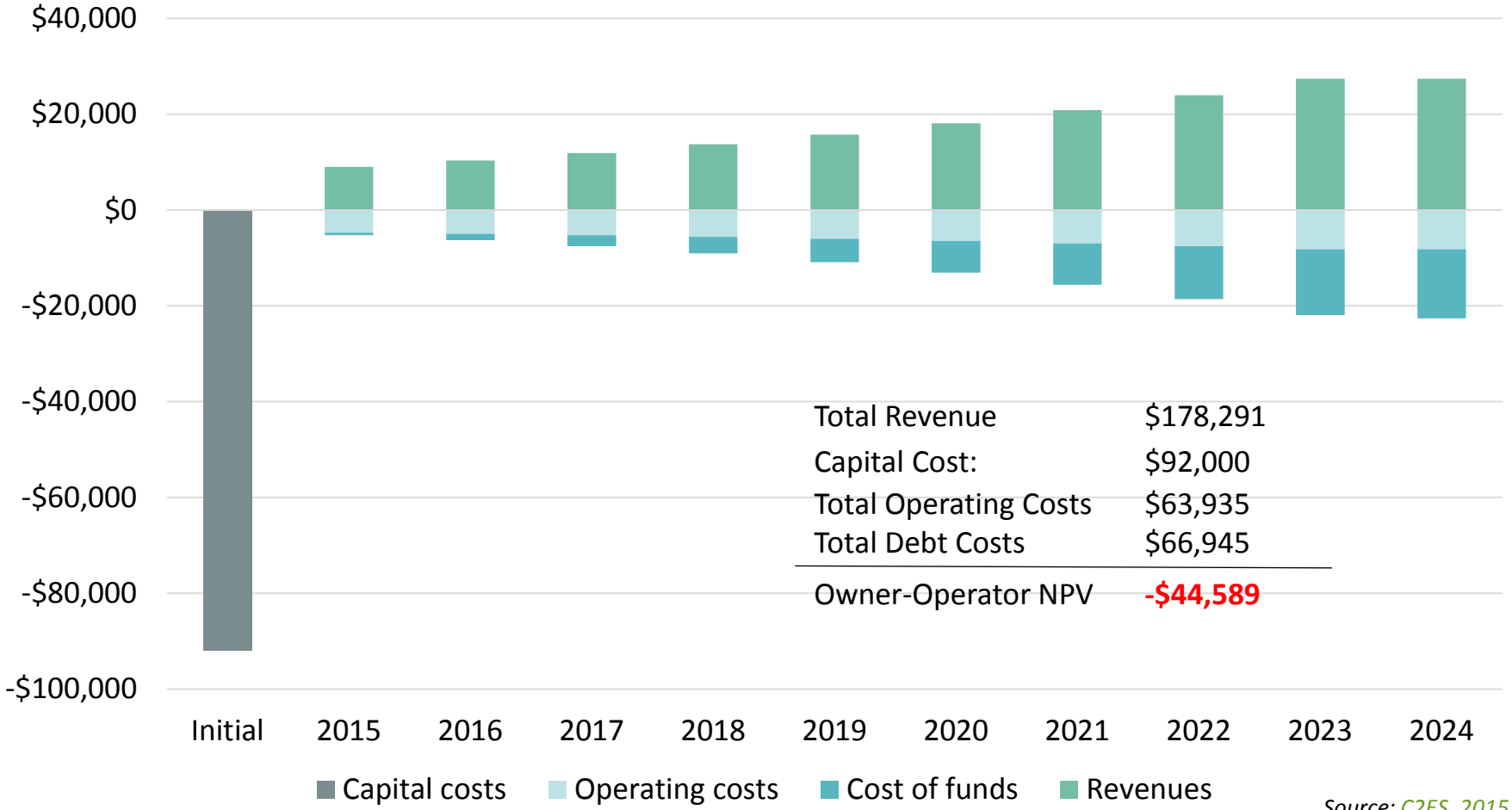
Public Charging Costs More than Residential Charging

- Key Cost Drivers Compared to Residential Charging
  - Can require trenching, extensive wiring, or pavement replacement
  - Must comply with regulations to serve public
  - Often requires charging network access
  - Must be designed and manufactured to withstand significant wear and tear
- DC Fast Charging Costs
  - Electric panel upgrades
  - Host-site identification, analysis, and screening
  - Legal and permitting costs
  - Electric utility interconnection fee

DC Fast Charging Project	Installation Cost per Station
Washington West Coast Electric Highway	$49,000 to $61,500
EV Project (average)	$20,848
EV Project (median)	$20,188
EV Project (highest)	Over $45,000
Orlando Utilities Commission	$6,939 to $8,928

Source: Idaho National Laboratory and Washington State Department of Transportation, Orlando Utilities Commission, 2014.

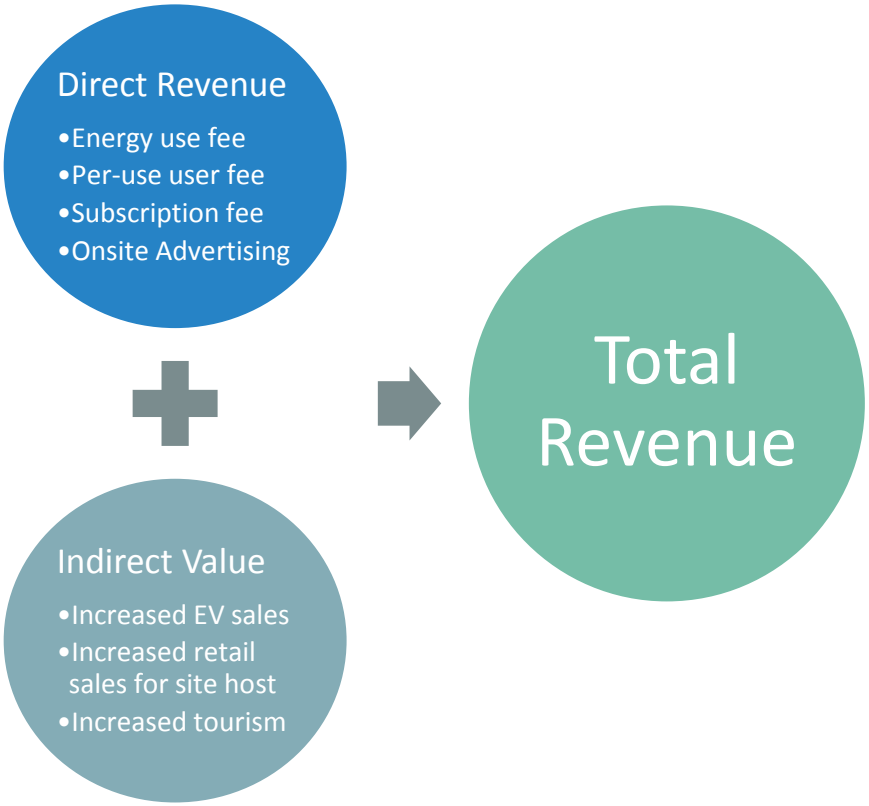
Discounted Cash Flow of DC Fast Charging Station Project in Washington



Source: C2ES, 2015

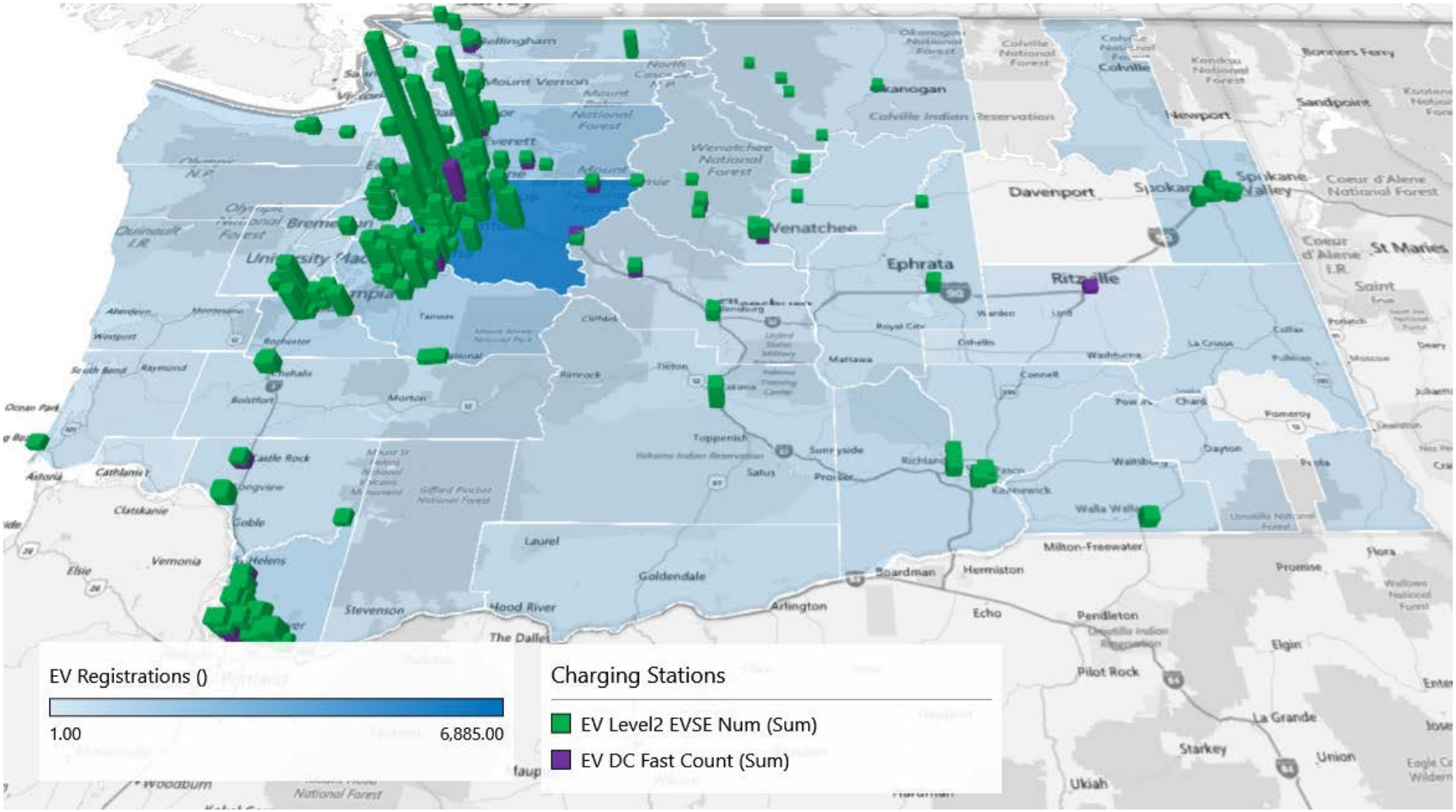
Indirect Value of Charging Services Can Increase Private Investment

- Business models based solely on direct revenues from EV charging services are currently financially infeasible
- Models that capture indirect value from EV charging services will increase private sector investment



Key private sector partners: automaker, electric utility, and retailer

Charging Infrastructure in Washington



Source: U.S. Department of Energy, NREL

Analyzing Viability of Charging Station Projects with Financial Analysis Tool

- A charging station project can involve multiple partners with different roles:

Owner Operator	Private Sector Partner(s)	Public Sector Partner
• Organization that owns and operates charging station equipment • Receives direct revenue from charging	• Organization(s) that receive indirect revenue from charging stations • May share revenue or subsidize installation or operation	• Public sector may provide support for project in form of loans, grants, or other means

Business Model 1: Business Funding Partners for Charging Network Development along Major Roadways

- Value Proposition
  - A large business that benefits from expanded access to EV charging infrastructure contributes funding to subsidize deployment a DC fast charging network for interregional EV travel
- Sources of indirect value
  - Increased sales of EVs
  - "Clean energy" marketing and brand-strengthening opportunities
- Candidate funding partners are larger businesses that can capture the indirect value, such as:
  - Automakers, Electric Utilities, Retail Chains
- Funding partner grants funds directly to charging station owner operator to subsidize network construction

Charging Gap: Interregional EV Travel on Interstate 90

- I-90 between Seattle to Spokane is a critical east-west corridor in the state
- DC fast charging station availability is insufficient to enable east-west travel of BEVs between Seattle and Spokane
- Filling the Charging Gap: 6 DC Fast Charging Stations

Business Model 2: Funding Pools for Charging Network that Enables EV Travel to Tourism & Employment Regions

- Value Proposition
  - Businesses that benefit from tourism destination or employment region establish a funding pool that subsidizes capital cost of deploying a charging network for EV travel to and within the region
- Sources of indirect value
  - Increased sales of other products and services at businesses located near EV chargers
  - Increased tourism business from EV travel to popular destinations
  - Employee engagement and retention benefits of offering EV charging at the workplace
- Candidate funding partners likely smaller local businesses, such as:
  - Hotels, Retailers, Restaurants, Tourist Attractions, Commercial Real Estate Owners
- Local businesses contribute to an annual funding pool that is transferred to the charging station owner operator

Charging Gap: EV Travel to and within Ocean Shores

- Ocean Shores is a popular destination due to its coastal tourism, convention centers, casino, and other attractions
- DC fast charging station availability is insufficient to enable BEV travel to Ocean Shores from inland, populated areas
- No publicly available DC fast charging or Level 2 charging stations available to enable BEV travel within the destination region
- Filling the Charging Gap:
  - 3 DC Fast Charging Stations
  - 25 Level 2 Charging Stations

Business Model 3: Large Funding Partner & Funding Pools for Charging Network that Enables EV Travel to Tourism & Employment Regions

- Value Proposition
  - A large funding partner subsidizes deployment of a DC fast charging network for interregional EV travel
  - Businesses located in popular tourism destination or employment region contribute to funding pool that subsidizes cost of deploying a charging network for EV travel to and within the region
- Candidate funding partners are a large business and small, local businesses
- Funding Summary
  - Upfront transfer of funds from a large business to charging station owner operator
  - Local businesses contribute to an annual funding pool that is transferred to the charging station owner operator

Charging Gap: EV Travel to and within Tri-Cities and Walla Walla

- Demand for EV charging services may be relatively high to and within these tourism and energy employment destinations
- DC fast charging station availability is insufficient to enable BEV travel to Tri-Cities and Walla Walla from Seattle and Spokane and Level 2 charging is very limited in these cities
- Filling the Charging Gap: 10 DC Fast Charging Stations and 50 Level 2 Charging Stations

Business Model 3: Financial Analysis Shows Positive NPV but Return May Be Too Far Into the Future

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

Owner/operator	
NPV	+$490,899
Payback	5 years
Funding partner/pool	
NPV	+$516,792
Payback	2 years
Public sector	
NPV	-$237,500
Payback period	n/a
Total project level	
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

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

Summary of Key Findings for Public EV Charging

- Private sector entities that gain indirect value from EV charging station deployment can play a critical role in improving financial performance of EV charging stations
  - Automakers, electric utilities, and retailers
- Difficult to make EV charging investment attractive to business owner-operators (5-year payback) with private sector partners alone
- Public sector can enable new business models in near term
  - Public sector interventions are needed for owner-operator to reach payback within 5 years
  - If EV market develops, government role could be scaled down to virtually nothing in 5 years

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