November 13, 2014

New Approaches to Financing the Public EV Charging Network

Nick Nigro, Matt Frades, and Philip Quebe

The fourth meeting of the Advisory Panel and C2ES

CENTER FOR CLIMATE AND ENERGY SOLUTIONS

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Meeting Agenda

10:00 a.m.	**Welcome and Introductions**
10:15 a.m.	**Project Overview and Update** *Nick Nigro, C2ES*
10:30 a.m.	**Task 2: Business Model Summaries** *Matt Frades, C2ES* *Phillip Quebe, Cadmus Group*
12:00 p.m.	**Lunch**
1:00 p.m.	**Task 2: Financial Analysis for Business Models** *Matt Frades, C2ES* *Phillip Quebe, Cadmus Group*
2:00 p.m.	*Break*
2:15 p.m.	**Task 3 Preview: Identifying the Role of Public and Private Stakeholders** *Nick Nigro, C2ES*
2:45 p.m.	**Summary, Discussion and Next Steps** *Nick Nigro, C2ES*
3:00 p.m.	Adjourn

Project Timeline

Task 1: Evaluate Current Status of EV Charging in Washington

- Establish a stakeholder network
- Construct Public Charging Network Database
- Create interactive maps for charging suitability assessment
- Provide insights into role of public charging networks in encouraging EVs
- Summarize findings

May – August

Task 2: Develop Business Models

- Leverage C2ES's AFV Finance Initiative
- Conduct Business Model Workshop
- Create 2-3 Business Model Summaries

July – November

Task 3: Identify Public & Private Roles

- Execute financial analysis on business model viability
- Identify public sector role in addressing barriers to private investment

October – December

Project Progress

- **May 14**: Project Overview presented to Joint Transportation Committee
- **May 15**: Kickoff meeting with JTC Staff Workgroup
- **June 26**: Delivered draft of Public Charging Network Database
- **June 30**: Advisory Panel Webinar on Study Overview
- **July 31**: Advisory Panel Meeting in Olympia to Review Task 1 Work
- **September 16**: Advisory Panel Webinar on Role of Electric Utilities
- **September 26**: Published Task 1 Paper, *Assessing the Electric Vehicle Charging Network in Washington State* and Interactive Web Maps
- **October 1**: Business Model Workshop in Olympia with Advisory Panel
- **November 13**: Advisory Panel Meeting in Olympia to Review Tasks 2 and 3

Task 2: Business Model Summaries

Matt Frades, C2ES and Philip Quebe, Cadmus Group

Overview of this Session

- **Goals**
  - Present business models and financial analysis tool
  - Discuss results and implications of financial analyses
  - Solicit feedback on financial model assumptions
- **Outline**
  1. Background on Task 2 and concept of a business model
  2. Descriptions of Business Models 1 and 2
  3. Overview of financial analysis approach
  4. Financial analysis results and discussion

Background on Business Model Summaries (1 of 2)

- **Goal of this study is to identify sustainable EV charging business models that the private sector can execute**
- **What does a 'business model' consist of?**
  - Value proposition for a business or businesses
  - Target market for a product or service
  - Estimated cost and revenue streams
  - Success and failure conditions
  - Guidance on implementation or demonstration

Background on Business Model Summaries (2 of 2)

- **Business models based solely on direct revenues from EV charging services are currently financially infeasible**
- **Other sources of 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
  - Increased sales of EVs
  - Sales of advertising at EV charging stations
  - "Clean technology" marketing and brand-strengthening opportunities

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

- **A large business that benefits from expanded access to EV charging infrastructure contributes funding to subsidize the deployment a DC fast charging network for interregional EV travel**
- **Sources of indirect value**
  - Increased sales of EVs
  - "Clean technology" marketing and brand-strengthening opportunities
- **Candidate funding partners likely relatively large businesses, such as:**
  - Automakers
  - Electric utilities
  - Retail chains
  - Restaurant chains
- **Direct transfer of funds from funding partner to charging station owner operator**

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

- **A group of businesses located in a popular tourism destination or employment region contributes to a funding pool that subsidizes cost of deploying a DC fast 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
  - Employers
- **Funding pools from smaller contributions by local businesses transferred to charging station owner operator**

Discussion

- **Are the business models clear? How might they be clarified?**
- **Are there other types of businesses that might derive value from EV charging that are not captured?**

Financial Analysis Tool for Business Models

- **C2ES and Cadmus Group created the Financial Analysis Tool to quantify expected performance of business models**
- **Tool was used to analyze application of each business model to address a real-world example EV charging infrastructure gap in Washington**

	BUSINESS MODEL 1	BUSINESS MODEL 2	BUSINESS MODELS 1 & 2 (COMBINATION)
EV Infrastructure Gap	Interregional travel on I-90 between Seattle and Spokane	Travel to Ocean Shores (from Longview and the Puget Sound region) and within the destination region	Travel to Tri-Cities and Walla Walla (from Spokane and the Puget Sound region) and within the destination regions

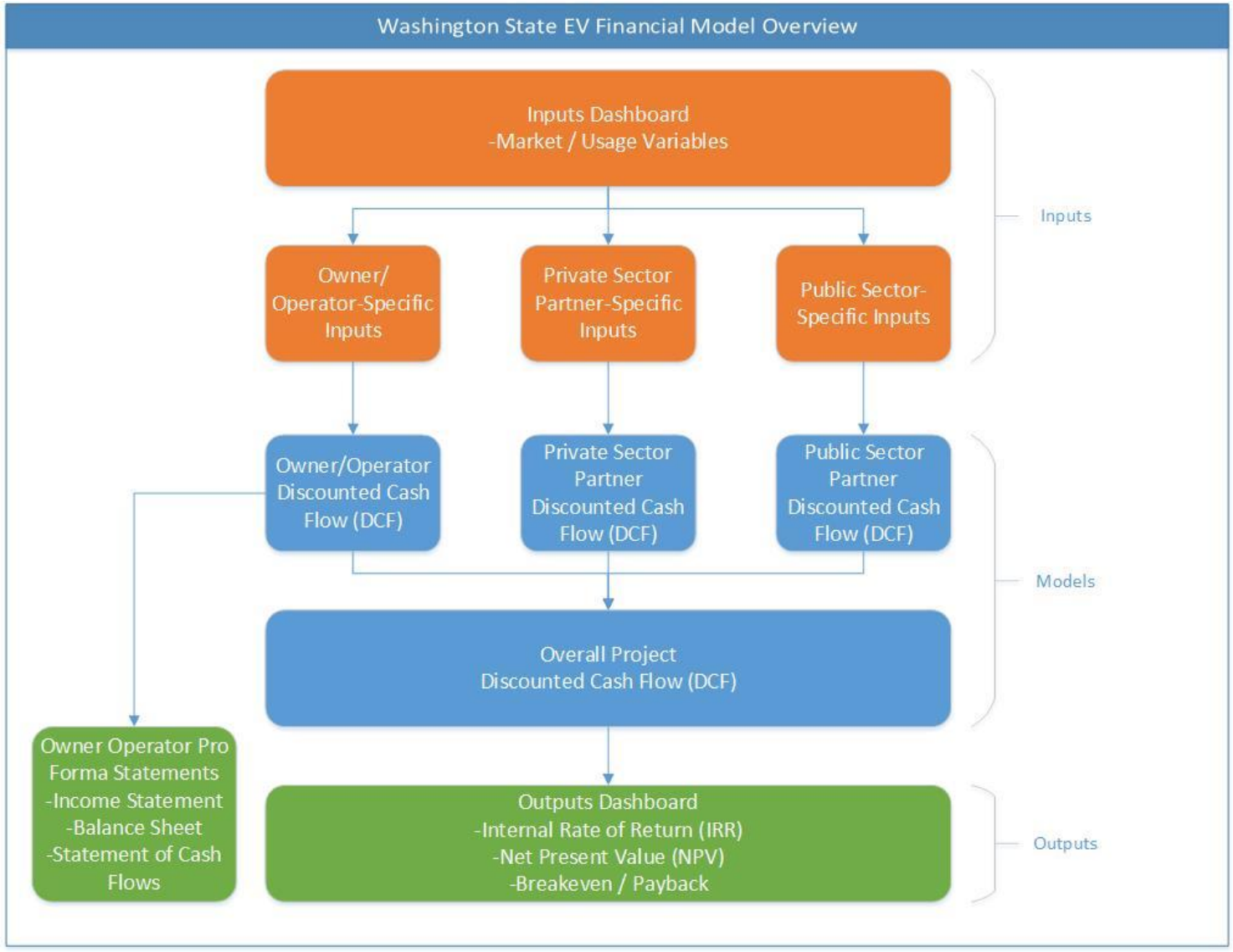
Financial Analysis Tool – Perspectives

- **Each business model involves multiple partners with a different role:**

	OWNER OPERATOR	PRIVATE SECTOR PARTNER	PUBLIC SECTOR PARTNER
Role	Organization that owns and operates charging station equipment. Receives direct revenue from charging.	Organization or group of organizations that receive indirect revenue from charging station visibility or placement. May share revenue or subsidize installation or operation.	Public sector may provide direct support for project in form of loans, grants, or equity.

- **The Financial Analysis Tool provides insights into each partner's financial perspective**
- **Financial Analysis Tool evaluates an entire business model as applied to a specific charging gap (multiple stations / multiple partners) as a single project**

Financial Analysis Tool - Model Structure



Discounted Cash Flow (DCF) – A method of analyzing future free cash flow projections and discounting them to arrive at a present value, which is used to evaluate potential for investment.

Financial Analysis Tool - Inputs and Assumptions

- **Over 100 unique inputs**
- **Types of Inputs:**
  - Market
    - Station Utilization*
    - Growth Rates*
  - Owner/Operator
    - Equipment Costs
    - Number/Type of Stations
  - Private Sector Partner
    - Additional Sales from EV Traffic*
    - Amount of Subsidy to Owner Operator*
  - Public Sector
    - Interest Rate for Loans
    - Grant Amounts

- **Assumptions:**
  - Timing of cash flows
  - Interest and discount rates*
  - Terminal values
  - Interaction of inputs
  - Sources of capitalization (debt / equity)

*Sensitivity analyses provided for these variables

Financial Analysis Metrics Used to Evaluate the Success of the Business Model

- **Total capital investment / Amount of station funding provided**
  - Indicates whether it is realistic for the entity to invest/contribute funds at this level, based on that entity's access to funds.
- **Net present value (NPV)**
  - Shows whether the entity will realize net profitability over the lifetime of the project.
  - In most cases, a business entity's NPV must be positive for that entity to consider involvement in the project.
- **Discounted payback period**
  - Helps determine whether involvement in the project generates net profitability quickly enough to attract investment from the entity.
  - Many private investors are only interested in projects that can achieve payback within 3 to 5 years.

Discussion

- **Does the Financial Analysis Tool provide the right amount of flexibility to analyze these business models?**
- **Can you review the input assumptions and provide feedback on the validity of each variable?**
- **Are there cost or revenue elements that you would expect to be part of the financial model that you're not sure are included?**
- **What sensitivity variables should we add/remove?**

Applying Business Model 1 to Enable Interregional EV Travel on Interstate 90 (1 of 5)

- 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

Brown circles (●) indicate locations of existing DC fast charging stations. Lengths of road highlighted in green (▬) indicate sections along the route where BEV travel is currently possible using existing publicly accessible DC fast charging stations. Lengths of road highlighted in red (▬) indicate sections along the route where BEV travel is currently not possible using existing publicly accessible DC fast charging stations.

Applying Business Model 1 to Enable Interregional EV Travel on Interstate 90 (2 of 5)

- **Charging station deployment scenario**

- New station (min deployment, 40 mile spacing)
- New station (max deployment, 20 mile spacing)
- Box: Rural siting
- Existing station

- Minimum deployment scenario (only scenario analyzed):
  - 6 total stations near commercial locations along I-90

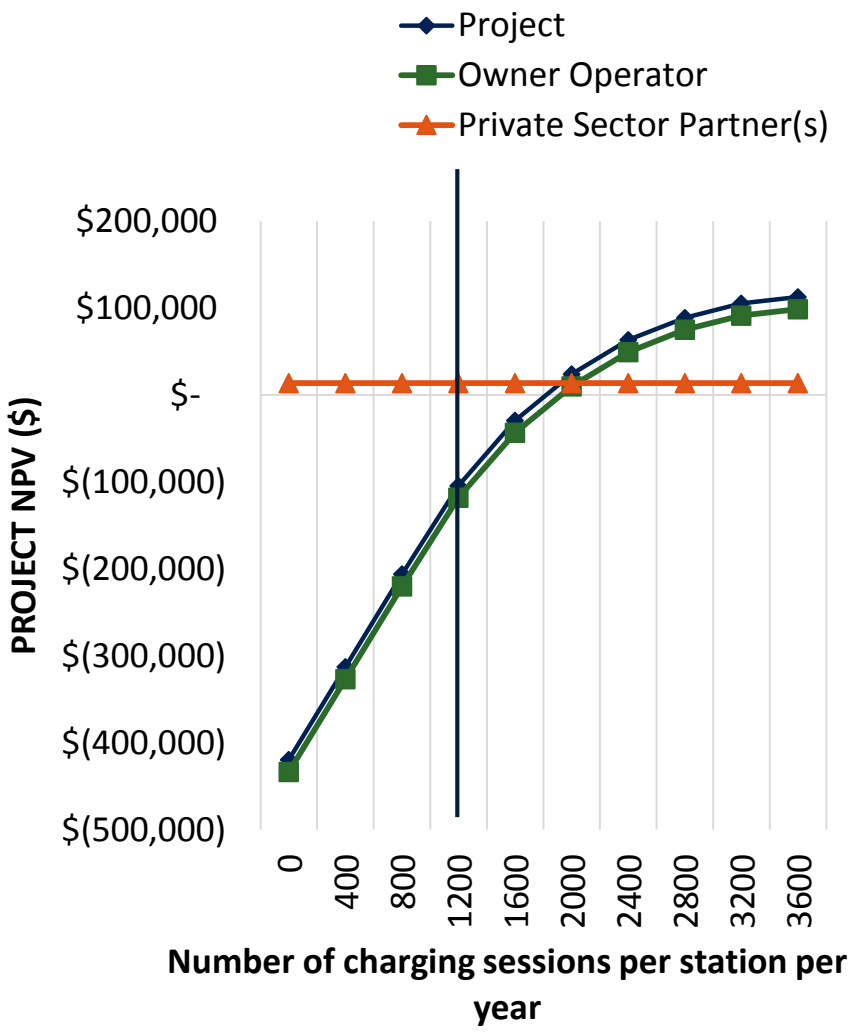
Applying Business Model 1 to Enable Interregional EV Travel on Interstate 90 (3 of 5)

- **Financial analysis results**
  - Station deployment costs a total of $561,600
  - Owner operator
    - Funds project with a mix of equity and debt and receives $42k from funding partner
    - Business model not sustainable
  - Funding partner
    - Business model is sustainable but still may not attract funding partners because 6 years may be too long for some businesses

	RESULT
OWNER OPERATOR	
NPV	-$118k
Payback	No payback
FUNDING PARTNER	
Cash transfer to owner operator	$42k at project start
NPV	+$14k
Payback	6 year

Applying Business Model 1 to Enable Interregional EV Travel on Interstate 90 (4 of 5)

- **Higher utilization yields a positive NPV from project and owner operator perspective**
  - Base model assumes station utilization in first year is 1,200 times per year (3.3 charging sessions per day)
  - If station utilization in first year is greater than 2,000 sessions per year (5.5 sessions per day), then project generates a positive NPV and is financially sustainable for owner operator



Applying Business Model 1 to Enable Interregional EV Travel on Interstate 90 (5 of 5)

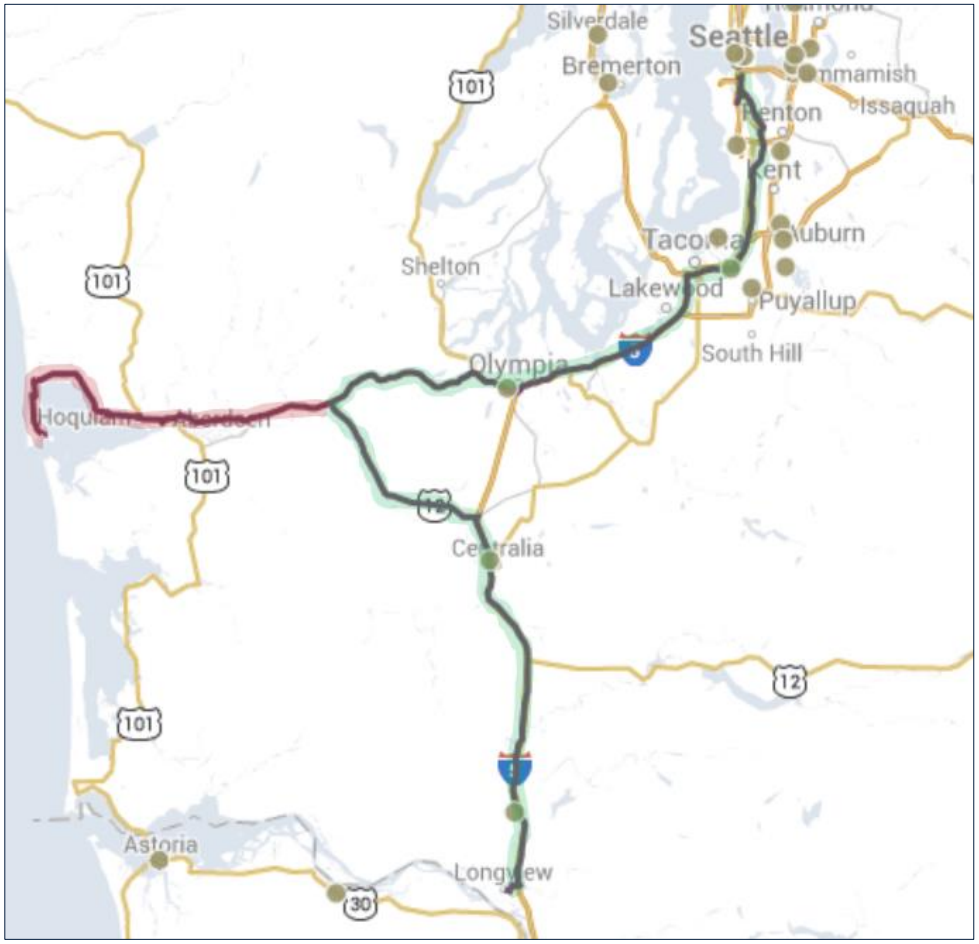
- **Conclusions**
  - Under base case assumptions, business model is not sustainable from owner operator perspective
  - Without significantly higher station utilization, higher energy-based user fees, or additional interventions by third parties, business model will not have a positive NPV
  - If charging station utilization is significantly higher then business model can be sustainable for owner operator
  - Viability of business model is conditional on funding partner participation, which itself is highly dependent on level of indirect value that funding partner expects to gain from charging stations

Discussion

- **Are these results expected? Surprising?**
- **Which assumptions seem realistic? Optimistic? Pessimistic?**
- **What alternative assumptions or scenarios could be informative to test?**
  - Utilization
    - Initial utilization
    - Utilization growth rate
  - Energy-based user fee amount
  - Subsidy level
  - Amount spent retail
    - Amount per minute
    - Cap on amount
  - Others?
    - Equipment costs?
    - Price of electricity?
    - Revenue
      - Per charge fee?
      - Ad revenue?
      - Subscription fees?

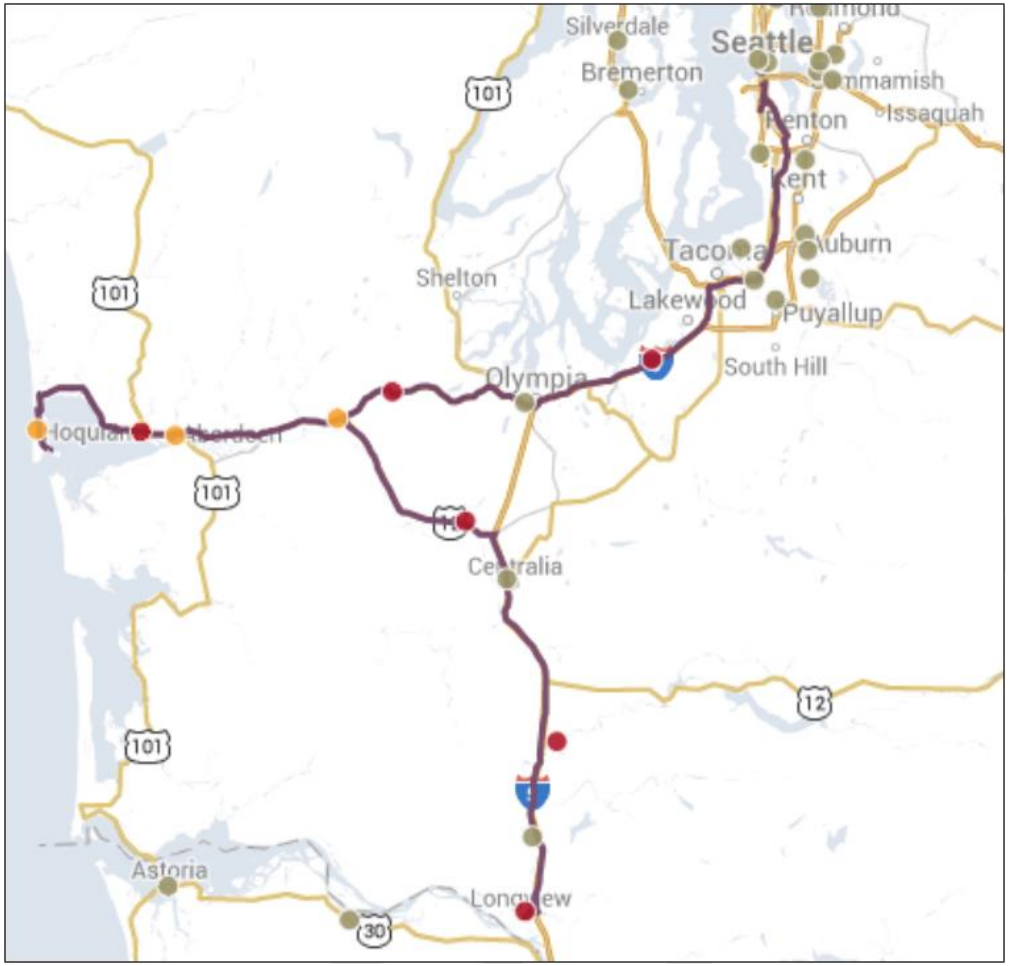
Applying Business Model 2 to Enable EV Travel to and within Ocean Shores (1 of 5)

- 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



Applying Business Model 2 to Enable EV Travel to and within Ocean Shores (2 of 5)

- **Minimum charging station deployment scenario (only scenario analyzed)**
  - 3 total DC fast charging stations: 2 sited along major roadways near commercial locations and 1 sited in Ocean Shores
  - 25 Level 2 stations (5 stations each at 5 sites in Ocean Shores)



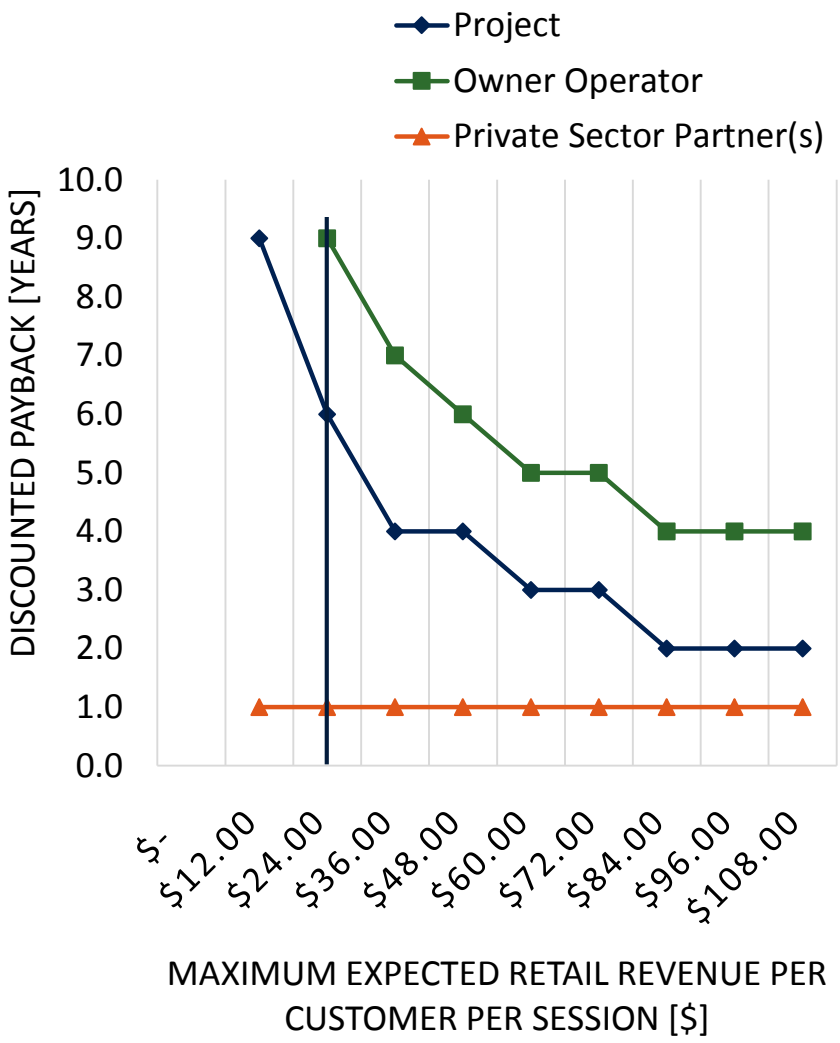
Applying Business Model 2 to Enable EV Travel to and within Ocean Shores (3 of 5)

- **Financial analysis results**
  - Station deployment costs a total of $501,500
  - Owner operator
    - Funds project with a mix of equity and debt and receives annual cash payments from the funding pool
    - Business model sustainable but still may not attract owner operators because 9 years may be too long for some businesses
  - Funding pool (6 local businesses)
    - Local businesses realize instant payback because they simply pay a percentage of their estimated revenues and do not contribute upfront funds towards capital investment

	RESULT
OWNER OPERATOR	
NPV	+$49k
Payback	9 years
FUNDING POOL	
Cash transfer to owner operator	Between $28k and $84k annually
NPV	+$207k
Payback	Within 1 year

Applying Business Model 2 to Enable EV Travel to and within Ocean Shores (4 of 5)

- **Greater revenue per customer decreases payback period from owner operator perspective**
  - Base model assumes a maximum revenue increase per charging event of $25
  - If maximum revenue increase per charging event is 50% higher ($36) then payback period for owner operator is 7 years
  - For owner operator to reach payback within 5 years, estimated maximum revenue per charging event must be greater than $60



Applying Business Model 2 to Enable EV Travel to and within Ocean Shores (5 of 5)

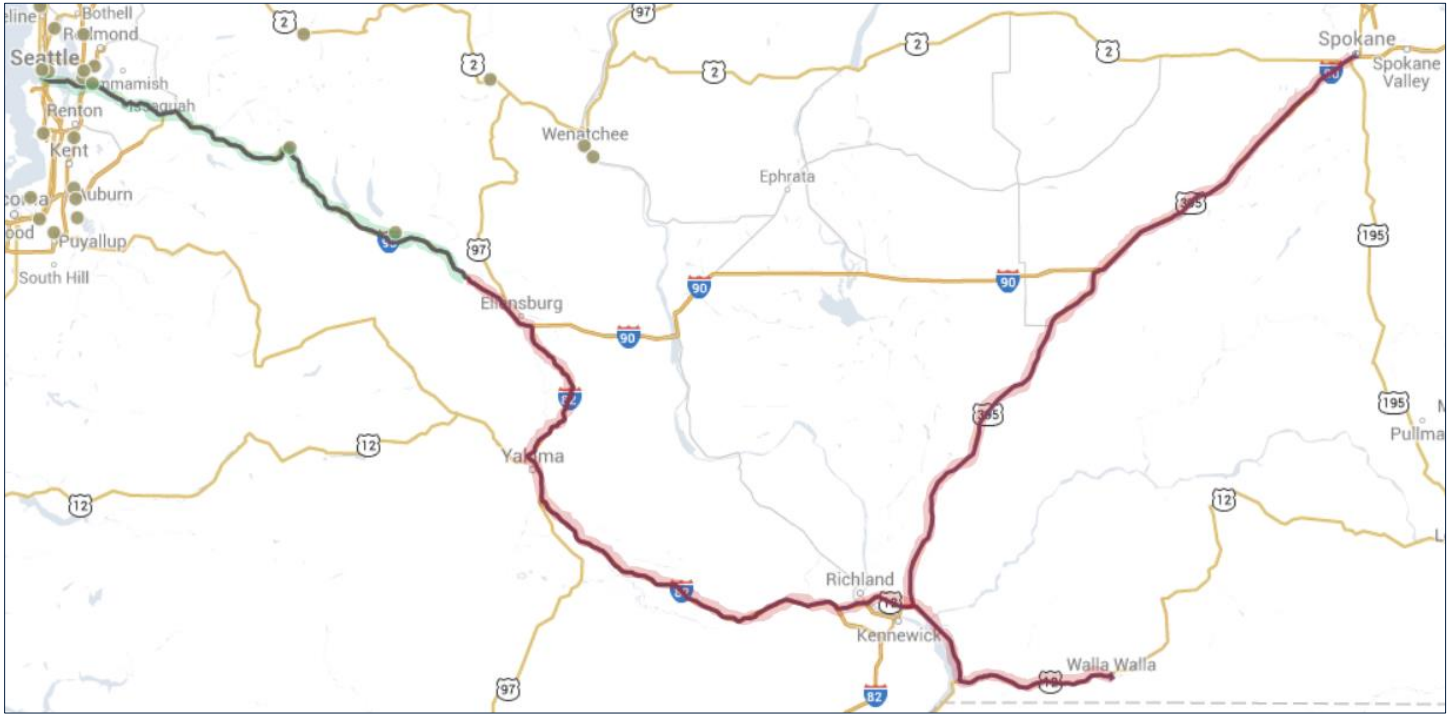
- **Conclusions**
  - Under base case assumptions, business model is sustainable from owner operator perspective, but 9-year payback period may be too long to be compelling for some businesses
  - Owner operator payback is sensitive to amount of indirect revenues realized by local businesses and percentage of those revenues that they share with owner operator
  - Local businesses realize instant payback because they simply pay a percentage of their estimated revenues and do not contribute upfront funds towards capital investment
  - However, if real or perceived indirect value of charging stations is low, then local businesses may not participate in this business model

Discussion

- **Are these results expected? Surprising?**
- **Which assumptions seem realistic? Optimistic? Pessimistic?**
- **What alternative assumptions or scenarios could be informative to test?**
  - Utilization
    - Initial utilization
    - Utilization growth rate
  - Energy use fee amount
  - Subsidy level
  - Amount spent retail
    - Amount per minute
    - Cap on amount
  - Others?
    - Equipment costs?
    - Price of electricity?
    - Revenue
      - Per charge fee?
      - Ad revenue?
      - Subscription fees?

Applying Business Models 1 & 2 to Enable EV Travel to and within Tri-Cities and Walla Walla (1 of 5)

- **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**



Applying Business Models 1 & 2 to Enable EV Travel to and within Tri-Cities and Walla Walla (2 of 5)

- **Charging station deployment scenario**

- Minimum deployment scenario (only scenario analyzed):
  - 10 DC fast charging stations: 8 sited along major roadways in commercial locations, 1 sited in the Tri-Cities area and 1 sited in Walla Walla
  - 50 Level 2 stations (5 stations each at 10 total sites in the Tri-Cities and Walla Walla areas)

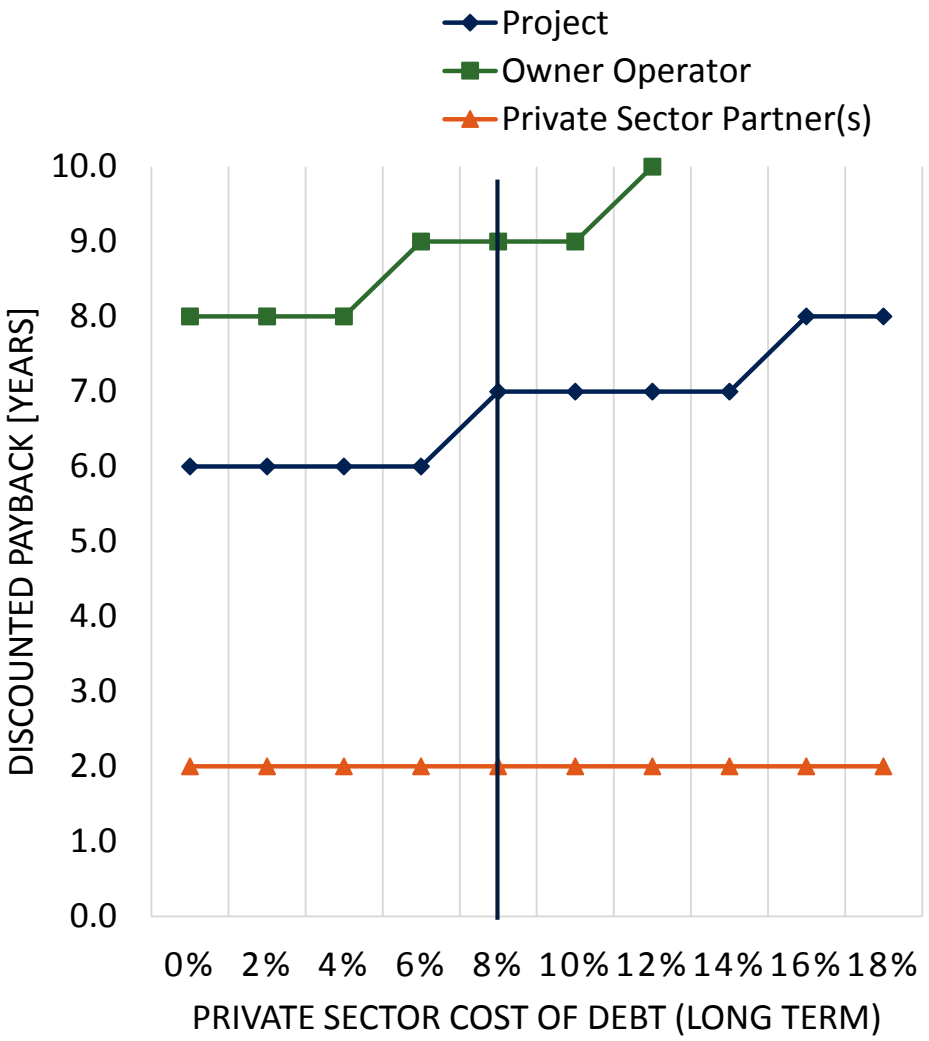
Applying Business Models 1 & 2 to Enable EV Travel to and within Tri-Cities and Walla Walla (3 of 5)

- **Financial analysis results**
  - Station deployment costs a total of $1,385,185
  - Owner operator
    - Funds project with a mix of equity and debt and receives $95k initially and between $67k-$179k annually from the funding partner and funding pool respectively
    - Business model is sustainable but still may not attract owner operators because 9 years may be too long for some businesses
  - Funding partner and funding pool (12 local businesses)
    - Local businesses realize instant payback since they simply pay a percentage of their estimated revenues and do not contribute upfront funds towards capital investment

	RESULT
OWNER OPERATOR	
NPV	+$96k
Payback	9 years
FUNDING PARTNER / POOL	
Cash transfer to owner operator	$95k at start of project plus between $67k and $179k annually
NPV	+$399k
Payback	Within 1 year

Applying Business Models 1 & 2 to Enable EV Travel to and within Tri-Cities and Walla Walla (4 of 5)

- **Payback for owner operator is somewhat sensitive to interest rate on private-sector loans**
  - Base model assumes interest rate of 8%
  - If interest rate is lowered to 2%, then owner operator could realize payback within 8 years
  - If the owner operator cannot obtain loans at an interest rate at or below 10%, then the project is not financially sustainable



Applying Business Models 1 & 2 to Enable EV Travel to and within Tri-Cities and Walla Walla (5 of 5)

Conclusions

- Under the base case assumptions, is sustainable from owner operator perspective, but 9-year payback period may be too long to be compelling for some businesses
- Payback for owner operator is highly sensitive to station utilization.
  - If initial station utilization is greater than 8.2 sessions per day, then owner operator realizes a payback within five years.
  - If initial utilization is below 2.7 sessions per day, then project is not financially sustainable for owner operator
- Payback for owner operator is also somewhat sensitive to the cost of debt
- As noted in previous business models, viability of business model depends on real and perceived amount of indirect value gained by funding partners and local businesses

Discussion

- **Are these results expected? Surprising?**
- **Which assumptions seem realistic? Optimistic? Pessimistic?**
- **What alternative assumptions or scenarios could be informative to test?**
  - Utilization
    - Initial utilization
    - Utilization growth rate
  - Energy use fee amount
  - Subsidy level
  - Amount spent retail
    - Amount per minute
    - Cap on amount
  - Others?
    - Equipment costs?
    - Price of electricity?
    - Revenue
      - Per charge fee?
      - Ad revenue?
      - Subscription fees?

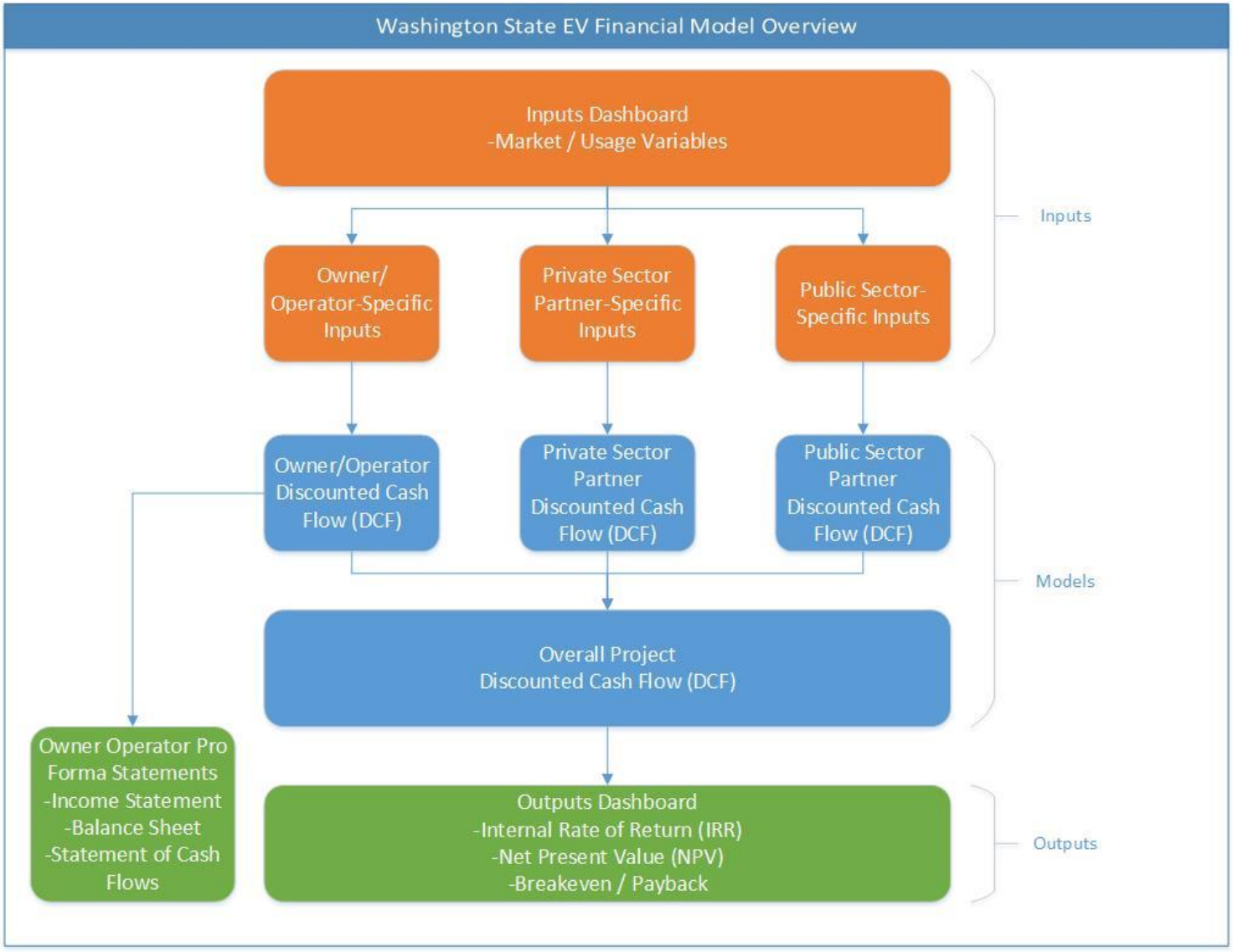
Task 2: Financial Analysis for Business Models

Matt Frades, C2ES and Phillip Quebe, Cadmus Group

Goals of this Session

- **Goals**
  - Walk through Financial Analysis Tool
  - Analyze business models with tool (with inputs gathered before the break)
  - Solicit feedback on financial model inputs and outputs
- **Outline**
  1. Overview of financial analysis approach
  2. Live walkthrough of Financial Analysis Tool (in Excel)
  3. Overview of Business Model 1 (in Excel)
  4. Overview of Business Model 2 (in Excel)
  5. Overview of Business Model 1 & 2 Combination (in Excel)

Financial Analysis Tool - Model Structure



Financial Analysis Tool– Inputs

Charging Station Inputs

Expected equipment lifespan [years] - All equipment types	10

Charging Station Assumptions - Type 1

Charging station type	DC fast charging (highway)
Charging Station Capital Cost [Gross Fixed Assets / Plant, Prop. & Equip.]	
Equipment costs	
Charging station equipment cost (per station) [$]	$ 35,000.00
Installation and siting costs	
Construction and equipment installation cost (per station) [$]	$ 26,000.00
Electric utility upgrades and grid interconnection cost (per site) [$]	$ 20,000.00
Lease and property transaction costs (per site – one-time fee) [$]	$ 6,000.00
Host site identification and screening (per site) [$]	$ 5,000.00
Total number of stations [#]	6
Total number of sites [#]	6
Total initial Type 1 station capital required [$]	**$ 552,000.00**
Annual depreciation	$ 55,200.00

Financial Analysis Tool – DCF

Private Sector Discounted Cash Flow Model

			2015	2016	2017	2018	2019	2020
Revenue				$ 49,467	$ 49,467	$ 49,467	$ 49,467	$ 49,467
Operating Costs				$ (88,174)	$ (25,174)	$ (25,174)	$ (25,174)	$ (25,174)
EBITDA				$ (38,707)	$ 24,293	$ 24,293	$ 24,293	$ 24,293
Dep & Amortization								
Operating Income (EBIT)				$ (38,707)	$ 24,293	$ 24,293	$ 24,293	$ 24,293
Interest Expense								
Income Before Taxes (EBT)				$ (38,707)	$ 24,293	$ 24,293	$ 24,293	$ 24,293
Taxes				$ 12,231	$ (7,677)	$ (7,677)	$ (7,677)	$ (7,677)
Cash Flow from Operations				$ (26,475)	$ 16,617	$ 16,617	$ 16,617	$ 16,617
Change in Non-cash Assets								
Change in Liabilities								
Free Cash Flow				$ (26,475)	$ 16,617	$ 16,617	$ 16,617	$ 16,617
Terminal Value								
Total Free Cash Flow		$	-	$ (26,475)	$ 16,617	$ 16,617	$ 16,617	$ 16,617
Discount Factor (WACC)	10.33%		1.000	0.906	0.822	0.745	0.675	0.612
Discounted Cash Flows		**$**	-	**$ (23,996)**	**$ 13,651**	**$ 12,373**	**$ 11,214**	**$ 10,164**
Cumulative Discounted Cash Flows		**$**	-	**$ (23,996)**	**$ (10,346)**	**$ 2,027**	**$ 13,241**	**$ 23,405**
Net Present Value		$	61,613					
Internal Rate of Return			46.8%					
Discounted Payback			3					

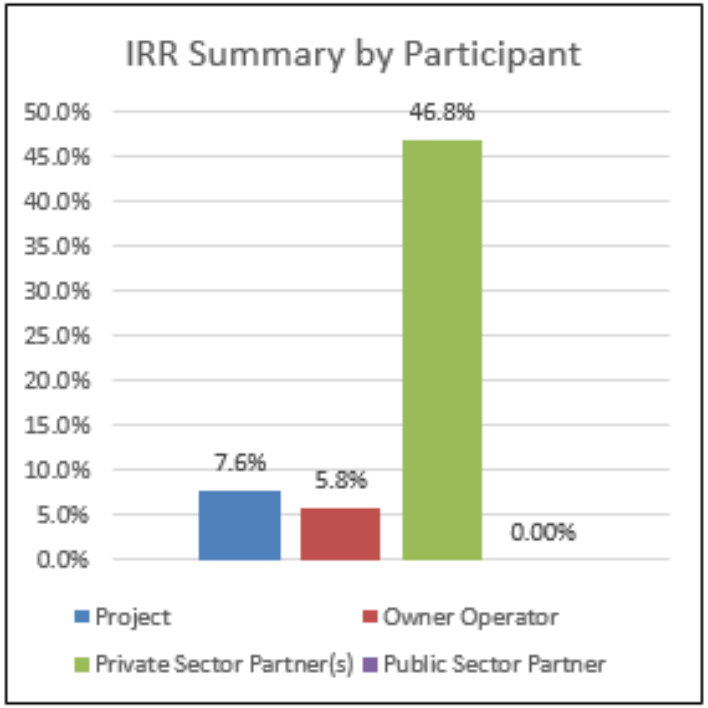
Financial Analysis Tool – Outputs

Financial Performance Statistics

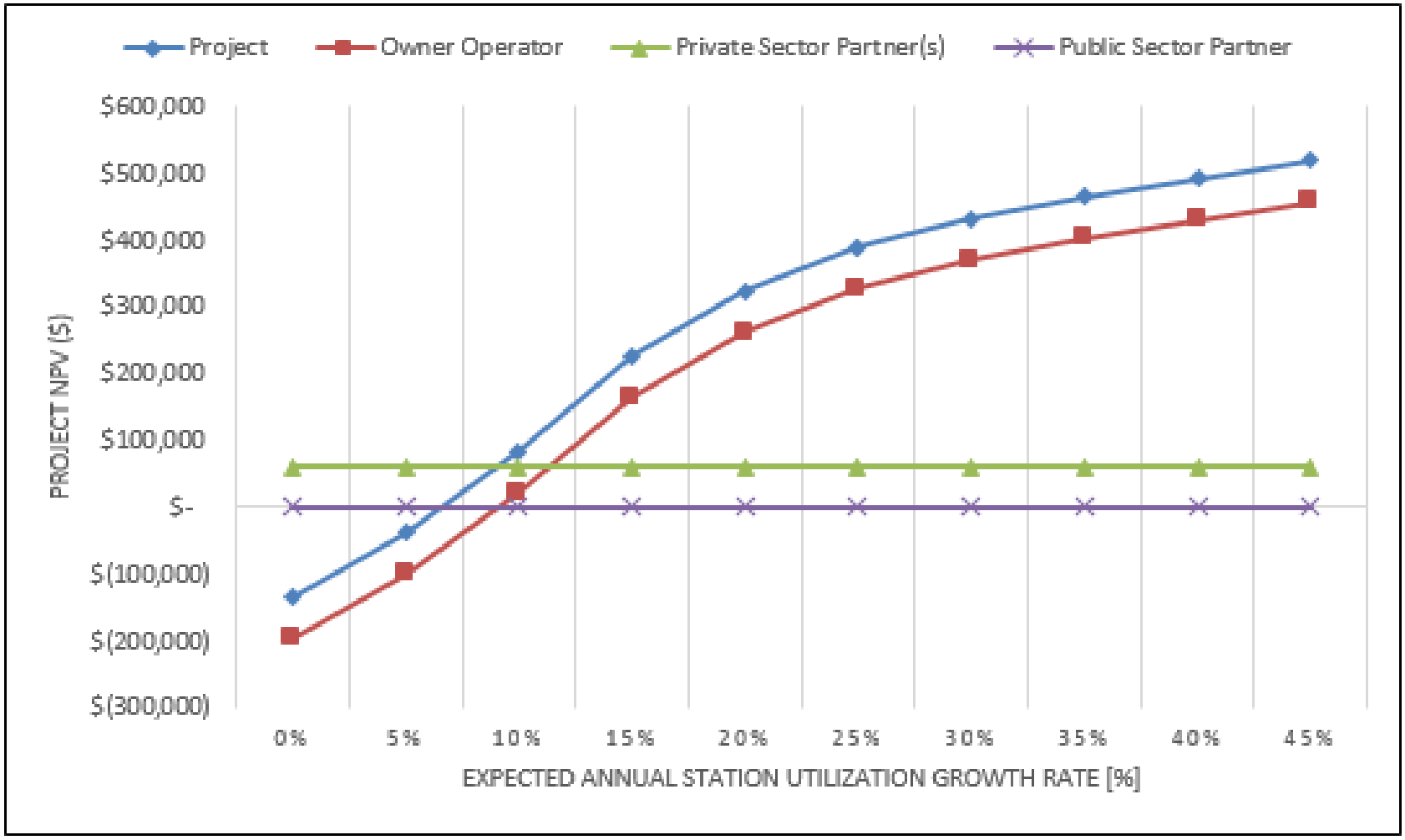
Project		
Total Capital Investment	$	789,955
Total Net Present Value	$	227,675
Total Internal Rate of Return (IRR)		7.6%
Discounted Payback (Years)		8.0
Owner Operator		
Total Capital Investment (Equity)	$	315,982
Total Net Present Value	$	165,747
Total Internal Rate of Return (IRR)		5.8%
Discounted Payback (Years)		9.0
Private Sector Partner(s)		
Total Capital Investment	$	-
Total Other Contributions	$	63,000
Total Net Present Value	$	61,613
Total Internal Rate of Return (IRR)		46.8%
Discounted Payback (Years)		3.0
Public Sector Partner		
Total Capital Investment	$	-
Total Other Contributions	$	-
Total Net Present Value	$	-
Total Internal Rate of Return (IRR)		N/A
Discounted Payback (Years)		N/A
Other Non-Partner Private Sector		
Total Capital Investment (Loans)	$	473,973

Charging Infrastructure Statistics

Total New Sites
15
Total New Stations
6
Number of Charging Sessions Provided
48,545
kWh of Charging Provided
728,175



Financial Analysis Tool – Outputs



Financial Analysis Tool - Walkthrough

[MODEL WALKTHROUGH EXCEL]

Discussion Scenario 1

- **Business Model 1 - Interregional travel on I-90 between Seattle and Spokane**

Input	Original Value	Test Values
[Variable 1]		
[Variable 2]		
[Variable 3]		
[Variable 4]		
[Variable 5]		
[Variable 6]		
[Variable 7]		

To Be Completed Live During Workshop

Discussion Scenario 2

- **Business Model 2 - Travel to Ocean Shores (from Longview and the Puget Sound region) and within the destination region**

Input	Original Value	Test Values
[Variable 1]		
[Variable 2]		
[Variable 3]		
[Variable 4]		
[Variable 5]		
[Variable 6]		
[Variable 7]		

To Be Completed Live During Workshop

Discussion Scenario 3

- **Business Models 1 & 2 (Combination) - Travel to Tri-Cities and Walla Walla (from Spokane and the Puget Sound region) and within the destination regions**

Input	Original Value	Test Values
[Variable 1]		
[Variable 2]		
[Variable 3]		
[Variable 4]		
[Variable 5]		
[Variable 6]		
[Variable 7]		

To Be Completed Live During Workshop

Task 3 Preview: Identifying the Role of Public and Private Stakeholders

Nick Nigro, C2ES

Task 3 Overview

- **Builds off Task 2**
  - Task 2 illustrated how to capture value of EV charging services and increase private investment in publicly available charging network
  - Task 2 analysis assumed no public sector role
- **Task 3 objective**
  - Identify roles of public and private sector partners in implementing two charging station business models
  - Offer recommendations for how to implement business models
- **Scenario analysis for each private and public sector partner**
  - Low, medium, and high to show NPV and payback for each charging gap and Business Model 1, Business Model 2, and Business Models 1 and 2 (Combination)

Intervention Summary

- **Roles are interventions because they deliberately influence financial performance of a charging station project**
- **Private sector interventions**
  - Explore role of automaker, electric utility, and retailer effect on each charging gap
  - Interventions: subsidize upfront cost of charging equipment and share portion of indirect revenue from EV charging use with owner operator
  - Remove interventions from Task 2 except specific intervention being analyzed to see effects in isolation; use all other assumptions from Task 2
- **Public sector interventions**
  - Explore role of state and local government in facilitating business models
  - Use all assumptions from Task 2 analysis
  - Interventions: Low-interest loan, public-private partnership, grant, ZEV program, and consumer education

Private Sector Intervention Summary

Partner Description	Example	Equipment Subsidy (Medium Scenario)	Indirect Revenue Sharing (Medium Scenario)
Non-Regulated Businesses that Directly Benefit from Increased EV Sales	Automaker, Battery Supplier	$7,000 for DC fast charging station; $500 for Level 2 station	N/A
Investor-Owned Utilities or Private Power Generators	Puget Sound Energy	$1,400 for DC fast charging station; $300 for Level 2 station	N/A
Non-Regulated Businesses that Indirectly Benefit from Charging Station Use	Restaurants, Hotels, Convention Centers	N/A	10% of attributable sales revenue

Automaker or Other Non-Regulated Businesses that Directly Benefit from Increased EV Sales

- **Strong connection exists between increased publicly available charging infrastructure and EV sales**
- **Relevant to I-90 and Tri Cities/Walla Charging Gaps**
- **Medium Scenario Explanation**
  - $Charging\ Station\ Value\ =\ EV\ to\ Charging\ Station\ Ratio\ \times\ Marketing\ Funds\ Per\ EV\ \times\ Charging\ Allocation$
  - Auto dealers commonly spend up to 1% of total sales on marketing, or $300 for a $30,000 EV
  - Ratio of 9:1 for Level 2 charging stations and 135:1 for DC fast charging stations
  - Assumes an automaker allocates only 18% of its marketing budget to charging stations
  - Subsidize up to 20% of cost for each DC fast charging station ($7,000) and Level 2 charging station ($500)
- **Legal/Regulatory Barriers**
  - No known legal or regulatory barriers prevent a non-regulated business from investing in a project that implements these business models

Automaker Subsidy Financial Performance (NPV and Payback in Years)

Charging Gap		Base	Low	Medium	High
Intervention Summary		No Subsidy	½ Equipment Cost Subsidy	Equipment Cost Subsidy	2x Equipment Cost Subsidy
I-90	Project	-$99,667	-$102,007	-$104,346	-$109,025
	Owner Operator	-$139,585	-$128,896	-$118,207	-$96,829
	Private Sector Partner(s)	$39,782 (1)	$26,763 (3)	$13,744 (6)	-$12,294
Tri Cities/Walla Walla	Project	$535,228 (6)	$529,937 (6)	$524,645 (6)	$514,062 (7)
	Owner Operator	-$384,729	-$360,551	-$336,374	-$288,018
	Private Sector Partner(s)	$916,188 (1)	$886,740 (1)	$857,293 (1)	$798,397 (2)

Automaker Subsidy Financial Performance Takeaways

- **Payback is beyond expected life of charging equipment for owner operator in all cases**
- **Interstate 90 Charging Gap**
  - Project NPV is negative in all three scenarios.
  - Owner operator's NPV increased by 30% from base case to scenario with largest equipment cost subsidy
  - Automaker has positive NPV except in high scenario where the equipment cost subsidy outweighs the expected value to the automaker
- **Tri Cities/Walla Charging Gap**
  - A positive NPV is a result of retail sales at host sites, not value to the automaker
  - Owner operator's NPV increased by 25% from base case to scenario with largest equipment cost subsidy
  - Positive NPV for project in all scenarios because site hosts are not contributing to project funding and all additional sales indirect revenue from charging stations goes to business

Investor-Owned Utility (IOU) and Private Power Generator

- **EV charging presents a unique opportunity for these entities to increase revenue through increased load**
- **Relevant to I-90 and Tri Cities/Walla Charging Gaps**
- **Medium Scenario Explanation**
  - $Charging\ Station\ Value\ =\ NPV(Total\ Kilowatt\ Hours\ Per\ Station\ \times$

IOU and Power Generator Subsidy Financial Performance (NPV and Payback in Years)

Charging Gaps		Base	Low	Medium	High
Intervention Summary		No Subsidy	½ Equipment Cost Subsidy	Equipment Cost Subsidy	2x Equipment Cost Subsidy
I-90	Project	-$99,667	-$138,866	-$139,535	-$140,871
	Owner Operator	-$139,585	-$136,531	-$133,477	-$127,369
	Private Sector Partner(s)	$39,782 (1)	-$2,337	-$6,057	-$13,496
Tri Cities/Walla Walla	Project	$535,228 (6)	$447,494 (7)	$445,127 (7)	$440,392 (7)
	Owner Operator	-$384,729	-$373,913	-$363,096	-$341,464
	Private Sector Partner(s)	$916,188 (1)	$817,938 (1)	$804,764 (1)	$778,416 (1)

IOU and Power Generator Subsidy Financial Performance Takeaways

- **No payback for owner operator in all cases**
- **I-90 Charging Gap**
  - Project NPV is negative in all three scenarios
  - Owner operator's NPV increased by only 9% from base case to scenario with largest equipment cost subsidy
  - IOUs and power generators have negative NPV in all scenarios because equipment cost subsidy outweighs expected value to the business
- **Tri-Cities/Walla Walla Charging Gap**
  - A positive NPV is a result of retail sales at host sites, not value to the IOU or power generator
  - Owner operator's NPV increased by only 11% from base case to scenario with largest equipment cost subsidy
  - Positive NPV for project in all scenarios because site hosts are not contributing to project funding and all additional sales indirect revenue from charging stations goes to business

Non-Regulated Businesses that Indirectly Benefit from Charging Station Use

- **Retailers and other businesses can benefit through increased sales by offering EV charging services.**
- **Relevant to Ocean Cities and Tri Cities/Walla Walla Charging Gaps**
- **Medium Scenario Explanation**
  - $Annual\ Charging\ Station\ Value\ = Max(\$1\ \times$

Retailer Subsidy Financial Performance (NPV and Payback in Years)

Charging Gaps		Base	Low	Medium	High
Intervention Summary		No Subsidy	5% Revenue Sharing	10% Revenue Sharing	15% Revenue Sharing
Ocean Cities	Project	$269,032 (6)	$262,951 (6)	$256,870 (6)	$250,790 (6)
	Owner Operator	-$145,830	-$48,195	$49,439 (9)	$147,074 (7)
	Private Sector Partner(s)	$413,131 (1)	$309,849 (1)	$206,566 (1)	$103,283 (1)
Tri Cities/Walla Walla	Project	$452,898 (7)	$437,621 (7)	$425,382 (7)	$413,142 (7)
	Owner Operator	-$384,729	-$188,321	$8,086 (10)	$204,494 (8)
	Private Sector Partner(s)	$834,138 (1)	$623,334 (1)	$415,556 (1)	$207,778 (1)

Retailer Subsidy Financial Performance Takeaways

- **NPV from project, owner operator, and private sector partner perspectives is positive in several cases for Business Model 2 and Business Models 1 and 2 Combination**
- **Ocean Cities Charging Gap**
  - Positive NPV realized in all scenarios except for owner operator under low revenue sharing scenario
  - Owner operator's NPV increased by 200% from base case to scenario with largest equipment cost subsidy
  - Retailer has positive NPV in all scenarios since only up to 15% of perceived value is provided as a subsidy
- **Tri Cities/Walla Walla Charging Gap**
  - Positive NPV realized in all scenarios except for owner operator under low revenue sharing scenario
  - Owner operator's NPV increased by 150% from base case to scenario with largest equipment cost subsidy
  - Indirect revenue from EV charging services that a private sector partner receives unrelated to time spent charging (e.g., vehicle sales) is not included in subsidy to owner operator

Public Sector Intervention Summary (1 of 2)

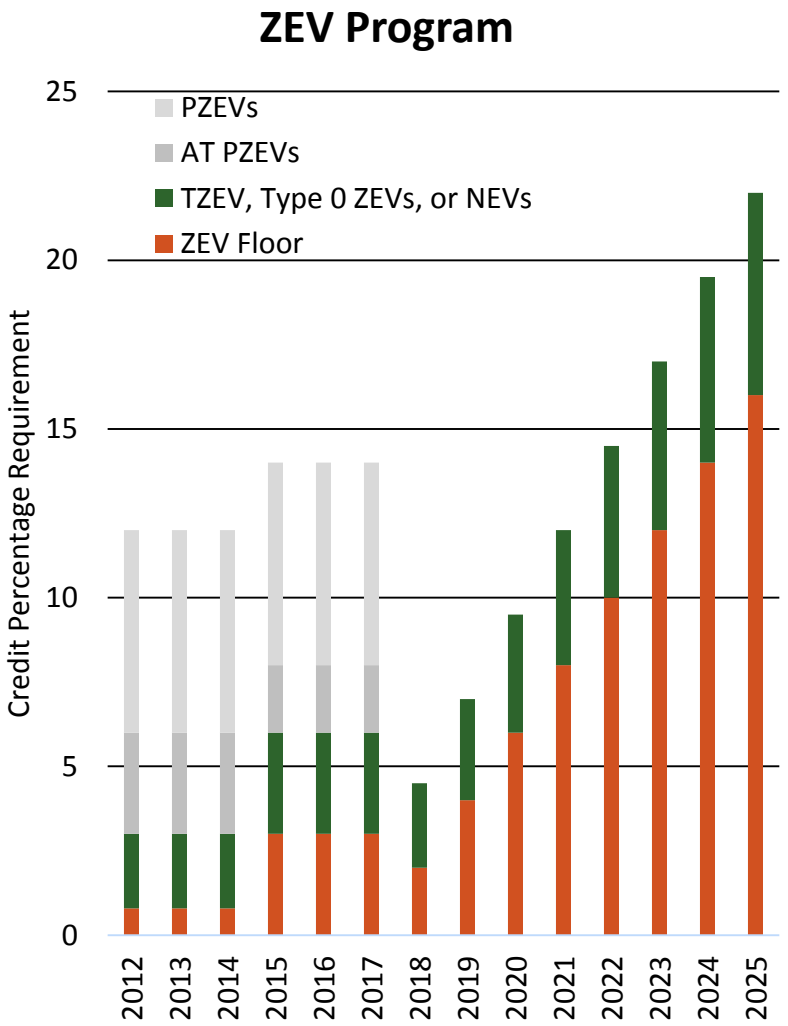
- **Direct funding interventions**
  - Public-private partnerships, grants, and loans
- **Other interventions**
  - ZEV program, building codes, consumer education
- **Public sector interventions analyze effect on financial performance of all business models**
  - Relies on Task 2 assumptions for each business model
  - E.g., Charging equipment funded with 60% debt and 40% equity. Project equity intervention could only affect 40% of capital costs
  - Three scenarios (low, medium, high) analyzed, where low is half amount of medium and high is twice amount of medium

Public Sector Intervention Summary (2 of 2)

Intervention	Financial Performance Impact (Medium Scenario)
Public-Private Partnership	Take a 50% equity stake in the project or 20% of the total project capital costs.
Low-Interest Loan	Finance 50% of project debt at a 5.4% interest rate (equal to cost of funds) or 30% of the total project capital costs.
Grant	Subsidize cost of charging station equipment by 50%.
ZEV Program	Increase charging station utilization growth rate to 15% to 30%.
Building Codes	Subsidize 50% of cost of electric utility upgrades and grid interconnection for DC fast charging sites ($10,000); subsidize 50% cost of construction and equipment installation cost ($13,000 for DC fast charging sites and $2,000 for Level 2 charging sites).
Consumer Education	Increase charging station utilization growth rate from 15% to 20%

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



Public Sector Interventions can Improve Business Case for All Business Models (SAMPLE)

- **Profitable business models can shift cost/benefit to public sector**
- **Public sector loans at its cost of funds can break even for public sector but greatly improve private sector financial performance**
  - E.g., Business Models 1 and 2: 75% debt case improves NPV for owner operator by over 40%
- **Equity stake in project increases risk and reward for public sector**
  - E.g., Business Model 2: 50% equity scenario decreases NPV for owner operator by 50%. Public sector has a positive NPV of $66,187
- **Combination of interventions can overcome challenging business cases**
  - E.g., Business Model 1: ZEV Program + 25% grant results in a positive NPV for owner operator and private sector partner with a payback of 9 years

Next Steps for Tasks 2 and 3

- **Adjust assumptions for Task 2 and re-run analyses as necessary**
- **Define 2-3 valuable combinations of interventions for each business model**
  - Consider public and private sector perspective
  - Illustrate key dependencies and risks
  - Highlight sensitivities that could affect intervention

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