Unlocking Private Sector Financing for Alternative Fuel Vehicles and Fueling Infrastructure

Nick Nigro, Atlas Public Policy

Findings Workshop

C2ES.ORG
Project Overview

• Partners: NASEO, C2ES, Transportation Energy Partners, and VEIC collaboration

• Funder: U.S. Department of Energy’s Clean Cities Program

• Goal: develop innovative finance mechanisms to accelerate AFV deployment

- Alternative Fuel Vehicle & Fueling Infrastructure Deployment Barriers
  - Barriers to deployment of electric, natural gas, and hydrogen fuel cell vehicles and fueling infrastructure
  - Potential role of private sector financial solutions

- Case Studies on Natural Gas Vehicle Fleets and Electric Vehicle Charging
  - Applying the energy service company model to advance deployment of fleet natural gas vehicles and fueling infrastructure
  - The role of clean energy banks in increasing private investment in electric vehicle charging infrastructure

- Strategic Planning Guides
  - Electric vehicle charging and natural gas vehicle fleets
  - Key factors that affect financial performance
  - Business model application to a particular market
  - Implementation guidance for policymakers and businesses

• Findings indicate greater private investment is possible with near-term public support

• Key Strategic Questions to Assess the Financial Viability of EV Charging

1. What are the key market factors that could affect an EV charging project’s financial viability?

2. How do upfront costs and uncertainty about station utilization impact project viability and investor decisions?

3. Are there business models that can improve the financial viability of publicly available charging projects?

4. Can the federal, state, and local government sectors improve the financial viability of publicly available charging stations in the near term, resulting in more private investment in the medium term?
Installing DC fast charging stations along travel corridors could enable all-electric vehicle drivers to expand travel ranges and access tourist destinations.

Market opportunity could exist for Level 2 charging stations to serve neighborhoods with higher EV populations.
Public Charging Equipment Has High Upfront Costs

- **Public charging costs more than residential charging**
  - Can require trenching, extensive wiring, or pavement replacement
  - Must comply with regulations to serve public
  - Often provide access to a charging network
  - Must be designed and manufactured to withstand significant wear and tear

- **DC fast charging costs can include:**
  - Labor, electric-panel upgrades, host-site identification, analysis, and screening; negotiation, legal review, permitting, and execution of lease; and electric utility interconnection fee

<table>
<thead>
<tr>
<th>Project Description</th>
<th>DC Fast Charging Installation Cost per Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington West Coast Electric Highway</td>
<td>$49,000 to $61,500</td>
</tr>
<tr>
<td>EV Project (average)</td>
<td>$20,848</td>
</tr>
<tr>
<td>EV Project (median)</td>
<td>$20,188</td>
</tr>
<tr>
<td>EV Project (highest)</td>
<td>Over $45,000</td>
</tr>
<tr>
<td>Orlando Utilities Commission</td>
<td>$6,939 to $8,928</td>
</tr>
</tbody>
</table>

*Source: Idaho National Laboratory and Washington State Department of Transportation, Orlando Utilities Commission, 2014.*
DC Fast Charging use on West Coast Electric Highway in WA Before/After Pricing was Introduced (April 2014)

More Private Investment Requires Capturing Indirect Value of Charging Services

**Business models based solely on direct revenues from EV charging services are currently financially infeasible**

- **Direct Revenue**
  - Energy use fee
  - Per-use user fee
  - Subscription fee
  - Onsite Advertising

- **Indirect Value**
  - Increased EV sales
  - Increased retail sales for site host
  - Increased tourism

**Business models that capture the indirect value the private sector gains from EV charging services will increase private sector investment**

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

  - These partners could share some of the indirect value they derive from EV charging stations by contributing funds to the charging service provider to help deploy stations
Business Models that Capture Indirect Value of EV Charging Services

Sales Boost Business Model Example: Automaker Invests in a Charging Network

- **Value Proposition**
  - Automaker benefits from expanded access to EV charging infrastructure through increased EV sales

- **Form of funding**
  - Automaker directly transfers funds upfront to the charging station owner-operator

- **Target market for charging services**
  - All-electrics taking interregional trips that are longer than the expected range of their vehicles

Revenue Share Business Model Example: Local Businesses Pool Funds to Invest in a Charging Network

- **Value Proposition**
  - Businesses value increased sales from on-site charging
  - Clean energy marketing opportunities

- **Form of funding**
  - Local business funding pool
  - Annually transfer to owner-operator

- **Target market for charging services**
  - All-electric vehicles taking trips to tourism destinations
  - Plug-in hybrids at tourism destinations
• Private sector entities that gain indirect value from EV charging station deployment can play a critical role in improving the financial performance of EV charging stations

• 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
  • 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 could be scaled down to virtually nothing in 5 years
• Findings indicate many opportunities for applying ESCO-like model in public and private fleets

• Key Strategic Questions to Assess the Benefits and Viability of NGV Fleets

1. What is the potential to reduce petroleum use and emissions by incorporating NGVs into fleets?

2. What key factors affect the financial performance of NGV fleets?

3. Under what conditions will NGV fleet projects result in net cost savings and is there value to having energy service provider help with the transition?

4. What is the role of an energy service provider in facilitating NGV deployment?
Per-Vehicle Lifetime Average Petroleum Use Displacement (2012)

- Private Tractor-Trailer: 91 Thousands
- Public Car: 3 Gallons of Gasoline Equivalent
- Public Light Truck: 5 Gallons of Gasoline Equivalent
- Public Delivery Truck: 13 Gallons of Gasoline Equivalent
- Public School Bus: 29 Gallons of Gasoline Equivalent

Source: American School Bus Council, U.S. EIA, FHWA, FHWA, VICE Model
Diesel-CNG Fuel Price Difference per Gallon from January 2012 to January 2015

[Chart showing the fuel price difference per gasoline-gallon for different regions over time.]

Source: Alternative Fuel Data Center
Price Volatility of CNG, Gasoline, and Diesel from January 2012 to January 2015

Source: Alternative Fuel Data Center
Fueling Infrastructure Costs for School Buses and Tractor-Trailers

Cost for fueling infrastructure labeled in millions of U.S. dollars

- School Buses:
  - $0.41 at 0-10,000 VMT
  - $0.80 at 10-20,000 VMT
  - $1.58 at 20-30,000 VMT

- Tractor-Trailers:
  - $0.80 at 0-10,000 VMT
  - $2.87 at 10-20,000 VMT
  - $5.47 at 20-30,000 VMT
  - $17.64 at 30-40,000 VMT
  - $21.99 at 40-50,000 VMT
### Example Discounted Cash Flow for Tractor-Trailer Fleet Project with New Fueling Infrastructure

<table>
<thead>
<tr>
<th>Project Year</th>
<th>Annual Discounted Cash Flow</th>
<th>Fuel Cost Savings</th>
<th>Incremental Cost of Vehicles</th>
<th>Fueling Infrastructure Cost</th>
<th>Cumulative Discounted Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$60</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>$50</td>
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<tr>
<td>2</td>
<td>$40</td>
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<tr>
<td>3</td>
<td>$30</td>
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<td>4</td>
<td>$20</td>
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<td>5</td>
<td>$10</td>
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<td>6</td>
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<td>7</td>
<td>$10</td>
<td></td>
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</tr>
</tbody>
</table>

**Total Fuel Cost Savings:** $71,077,890  
**Total Upfront Costs:** -$54,485,432  
**Project NPV:** +$16,592,459
5 Factors that Affect Financial Performance of Converting to NGVs

Price difference between diesel/gas and CNG
- Single most important factor
- Large price differential can greatly improve financial performance

Fuel economy
- Low fuel economy vehicles are opportunity to reduce fuel costs
- Some NGVs have relatively low fuel economy compared to conventional vehicle counterparts

Total average annual fleet VMT
- Fleets with a higher average annual VMT present a greater opportunity for fuel cost savings

Vehicle lifetime
- Long life expectancies have more time to accumulate fuel cost savings

Fueling infrastructure
- Dedicated refueling infrastructure provide lower net savings
- Fleet ownership of fueling infrastructure enable acquisition of natural gas fuel for less than retail prices
Issues and Options for Energy Service Providers

1. Identification and evaluation of project opportunities

- **Barrier: Lack of Experience**
  - Leverage extensive experience with scope of technological solutions. Provide authoritative assessments on suitability of new technologies.

2. Management of technology transition

- **Barriers: Project Risk, Limited Resources**
  - Manage technology transition to address fleet resource constraints. Especially useful for fleets that already lease vehicles.

3. Alternatives to equipment ownership

- **Barriers: Budget Constraints, Public Fueling Dependency**
  - Help public fleets avoid upfront capital outlays. Construct contracts that prioritize fueling station access over ownership.

4. Performance guarantees and fuel cost savings

- **Barrier: Project Risk**
  - Use scenario analysis to reduce risk and provide fleet manager an understanding of project’s financial viability. Construct contracts to account for cost savings approach of NGV conversion projects and provide cost protection for both parties.

5. Bundling projects into a portfolio

- **Barrier: Project Risk**
  - Bundle fleet NGV conversion projects with more profitable building energy efficiency projects to (MAKE) vehicle projects more attractive to investors.

6. Partnership facilitation

- **Barrier: Financial Performance**
  - Leverage public-private partnerships that encourage shared use of fueling stations to improve financial performance.
Part 1 Demonstration: Capturing Indirect Revenue Sources for Publicly Available Charging Infrastructure

Demonstrate the EV Charging Financial Analysis Tool and its application in sample use cases
Financial Analysis Approach

• Define contributions from private sector partners who stand to benefit from an EV charging network
  • Subsidize upfront cost of charging equipment
  • Share portion of indirect revenue from EV charging use with owner-operator

• Evaluate charging station project financial performance after private sector partners share value with owner-operator of charging services

• EV Charging Financial Analysis Tool
  • Developed by C2ES and Cadmus Group for financial analysis (download for free at www.c2es.org)
  • Empowers businesses and policymakers to evaluate various financial arrangements for EV charging projects
  • Provides perspectives of owner-operator, private sector partners, and public sector
  • Use cases can be imported and exported so you only need one copy of the tool
  • Microsoft Excel-based – unprotected and publicly available
Financial Analysis Tool – Model Structure

Washington State EV Financial Model Overview

Inputs Dashboard - Market / Usage Variables

Owner/Operator Specific Inputs

Private Sector Partner Specific Inputs

Public Sector Specific Inputs

Owner/Operator Discounted Cash Flow (DCF)

Private Sector Partner Discounted Cash Flow (DCF)

Public Sector Partner Discounted Cash Flow (DCF)

Overall Project Discounted Cash Flow (DCF)

Outputs Dashboard
- Internal Rate of Return (IRR)
- Net Present Value (NPV)
- Breakeven / Payback

Owner Operator Pro Forma Statements
- Income Statement
- Balance Sheet
- Statement of Cash Flows
## 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.]**

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charging station equipment cost (per station) [$]</td>
<td>$35,000.00</td>
</tr>
<tr>
<td>Installation and sitting costs</td>
<td></td>
</tr>
<tr>
<td>Construction and equipment installation cost (per station) [$]</td>
<td>$26,000.00</td>
</tr>
<tr>
<td>Electric utility upgrades and grid interconnection cost (per site) [$]</td>
<td>$20,000.00</td>
</tr>
<tr>
<td>Lease and property transaction costs (per site – one-time fee) [$]</td>
<td>$6,000.00</td>
</tr>
<tr>
<td>Host site identification and screening (per site) [$]</td>
<td>$5,000.00</td>
</tr>
</tbody>
</table>

**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
### Private Sector Discounted Cash Flow Model

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>$49,467</td>
<td>$49,467</td>
<td>$49,467</td>
<td>$49,467</td>
<td>$49,467</td>
<td>$49,467</td>
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<tr>
<td><strong>EBITDA</strong></td>
<td>($38,707)</td>
<td>24,293</td>
<td>24,293</td>
<td>24,293</td>
<td>24,293</td>
<td>24,293</td>
</tr>
<tr>
<td><strong>Dep &amp; Amortization</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Operating Income (EBIT)</strong></td>
<td>($38,707)</td>
<td>24,293</td>
<td>24,293</td>
<td>24,293</td>
<td>24,293</td>
<td>24,293</td>
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<tr>
<td><strong>Interest Expense</strong></td>
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<tr>
<td><strong>Income Before Taxes (EBT)</strong></td>
<td>($38,707)</td>
<td>24,293</td>
<td>24,293</td>
<td>24,293</td>
<td>24,293</td>
<td>24,293</td>
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<tr>
<td><strong>Taxes</strong></td>
<td>$12,231</td>
<td>($7,677)</td>
<td>($7,677)</td>
<td>($7,677)</td>
<td>($7,677)</td>
<td>($7,677)</td>
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<tr>
<td><strong>Cash Flow from Operations</strong></td>
<td>($26,475)</td>
<td>16,617</td>
<td>16,617</td>
<td>16,617</td>
<td>16,617</td>
<td>16,617</td>
</tr>
<tr>
<td><strong>Change in Non-cash Assets</strong></td>
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<tr>
<td><strong>Change in Liabilities</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>Free Cash Flow</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Terminal Value</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Free Cash Flow</strong></td>
<td></td>
<td>($26,475)</td>
<td>16,617</td>
<td>16,617</td>
<td>16,617</td>
<td>16,617</td>
</tr>
<tr>
<td><strong>Discount Factor (WACC)</strong></td>
<td>10.33%</td>
<td>1.000</td>
<td>0.906</td>
<td>0.822</td>
<td>0.745</td>
<td>0.675</td>
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<tr>
<td><strong>Discounted Cash Flows</strong></td>
<td></td>
<td>($23,996)</td>
<td>13,651</td>
<td>12,373</td>
<td>11,214</td>
<td>10,164</td>
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<tr>
<td><strong>Cumulative Discounted Cash Flows</strong></td>
<td></td>
<td>($23,996)</td>
<td>(10,346)</td>
<td>2,027</td>
<td>13,241</td>
<td>23,405</td>
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<tr>
<td><strong>Net Present Value</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Internal Rate of Return</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Discounted Payback</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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## Financial Analysis Tool – Outputs

### Financial Performance Statistics

<table>
<thead>
<tr>
<th>Project</th>
<th>$ 789,955</th>
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</thead>
<tbody>
<tr>
<td>Total Capital Investment</td>
<td>$ 789,955</td>
</tr>
<tr>
<td>Total Net Present Value</td>
<td>$ 227,675</td>
</tr>
<tr>
<td>Total Internal Rate of Return (IRR)</td>
<td>7.6%</td>
</tr>
<tr>
<td>Discounted Payback (Years)</td>
<td>8.0</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Owner Operator</th>
<th>$ 315,982</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Capital Investment (Equity)</td>
<td>$ 315,982</td>
</tr>
<tr>
<td>Total Net Present Value</td>
<td>$ 165,747</td>
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<tr>
<td>Total Internal Rate of Return (IRR)</td>
<td>5.8%</td>
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<tr>
<td>Discounted Payback (Years)</td>
<td>9.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Private Sector Partner(s)</th>
<th>$ 63,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Capital Investment</td>
<td>$ 63,000</td>
</tr>
<tr>
<td>Total Other Contributions</td>
<td>$ 63,000</td>
</tr>
<tr>
<td>Total Net Present Value</td>
<td>$ 61,613</td>
</tr>
<tr>
<td>Total Internal Rate of Return (IRR)</td>
<td>46.8%</td>
</tr>
<tr>
<td>Discounted Payback (Years)</td>
<td>3.0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Public Sector Partner</th>
<th>$ 0.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Capital Investment</td>
<td>$ 0.00</td>
</tr>
<tr>
<td>Total Other Contributions</td>
<td>$ 0.00</td>
</tr>
<tr>
<td>Total Net Present Value</td>
<td>$ 0.00</td>
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<tr>
<td>Total Internal Rate of Return (IRR)</td>
<td>N/A</td>
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<tr>
<td>Discounted Payback (Years)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Non-Partner Private Sector</th>
<th>$ 473,973</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Capital Investment (Loans)</td>
<td>$ 473,973</td>
</tr>
</tbody>
</table>

### Charging Infrastructure Statistics

<table>
<thead>
<tr>
<th>Total New Sites</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total New Stations</td>
<td>6</td>
</tr>
<tr>
<td>Number of Charging Sessions Provided</td>
<td>48,545</td>
</tr>
<tr>
<td>kWh of Charging Provided</td>
<td>728,175</td>
</tr>
</tbody>
</table>

### IRR Summary by Participant

- **Project**: 7.6%
- **Owner Operator**: 5.8%
- **Private Sector Partner(s)**: 46.8%
- **Public Sector Partner**: 0.00%

Unlocking Private Sector Financing for AFVs and Fueling Infrastructure

July 1, 2015
Financial Analysis Tool – Outputs

*Sensitivity Analysis #1*

![Graph showing the relationship between Project NPV and Expected Annual Station Utilization Growth Rate for different partners: Project, Owner Operator, Private Sector Partner(s), and Public Sector Partner.](image)

Unlocking Private Sector Financing for AFVs and Fueling Infrastructure

July 1, 2015
Example in NY: 10 DC Fast Charging Stations and 50 Level 2 Stations with Automaker Subsidy

- Even with a $130,000 subsidy from an automaker, project still loses money

<table>
<thead>
<tr>
<th>Total project level perspective</th>
<th>No Subsidy</th>
<th>With Automaker Subsidy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total capital investment (spent on charging station deployment)</td>
<td>$1,373,436</td>
<td>$1,386,436</td>
</tr>
<tr>
<td>NPV</td>
<td>–$452,961</td>
<td>–$317,930</td>
</tr>
<tr>
<td>Payback period</td>
<td>No payback</td>
<td>No payback</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner-operator perspective</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Funds spent on stations (equity)</td>
<td>$549,375</td>
<td>$554,575</td>
</tr>
<tr>
<td>Funds spent on stations (debt)</td>
<td>$824,062</td>
<td>$831,862</td>
</tr>
<tr>
<td>NPV</td>
<td>–$465,977</td>
<td>–$399,807</td>
</tr>
<tr>
<td>Payback period</td>
<td>No payback</td>
<td>No payback</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Automaker perspective</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Funds transferred to owner operator initially</td>
<td>N/A</td>
<td>$130,000</td>
</tr>
<tr>
<td>Funds transferred to owner operator annually</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>NPV</td>
<td>N/A</td>
<td>+$60,456</td>
</tr>
<tr>
<td>Payback period</td>
<td>N/A</td>
<td>5 years</td>
</tr>
</tbody>
</table>
**Public Sector Interventions**

- Low-Interest Loan: $582,303 at 3%, 10 year term
- Grant: $443,660
- Institute a rebate for EVs up to $1,500 for plug-in hybrid electric vehicles and $2,500 for all-electric vehicles; the rebate would last for five years.

**Project Capitalization**

- Total project cost = $1,386,436
  - 8% owner-operator equity
  - 30% private loans
  - 30% public loans
  - 32% public grant
- Private sector partner (automaker) contributes $130,000 up front

### Financial Performance

<table>
<thead>
<tr>
<th></th>
<th>Owner-operator</th>
<th>Automaker</th>
<th>Public sector</th>
<th>Total project level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NPV</strong></td>
<td>+$226,457</td>
<td>+$60,456</td>
<td>−$443,660</td>
<td>−$161,640</td>
</tr>
<tr>
<td><strong>Payback</strong></td>
<td>5 years</td>
<td>5 years</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

July 1, 2015
Same Example in NY without Public Sector Interventions (Medium Term: 2021-2030)

- **No public subsidies are needed**
  - Larger EV market
  - Lower equipment costs

- **Public Sector Interventions**
  - Vehicle rebate ends in 2020
  - No loans or grants are issued for this project

- **Project Capitalization**
  - Total project cost = $1,275,258
    - 40% owner-operator equity
    - 60% private loans
  - Private sector partner (automaker) contributes $130,000 up front

### Financial Performance

<table>
<thead>
<tr>
<th></th>
<th>Owner-operator</th>
<th>Automaker</th>
<th>Public sector</th>
<th>Total project level</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV</td>
<td>+$210,056</td>
<td>+$60,456</td>
<td>N/A</td>
<td>+$315,843</td>
</tr>
<tr>
<td>Payback</td>
<td>6 years</td>
<td>5 years</td>
<td>N/A</td>
<td>5 years</td>
</tr>
</tbody>
</table>

Unlocking Private Sector Financing for AFVs and Fueling Infrastructure
Part 2 Demonstration: Applying the ESCO Model to Public and Private Fleet Natural Gas Vehicles

Demonstrate the U.S. Department of Energy’s VICE Model and showcase its application to support decision making for natural gas vehicle fleets.
Fleet Sizes

• Fleets consisting of 50, 250, and 500 vehicles

Annual VMT

• Fleets with 5, 10, 15, and 20 thousand annual VMT for school bus and public light-duty fleets
• For tractor-trailer fleets, scenarios were analyzed for 60, 65, 70, and 75 thousand annual VMT

Fueling Infrastructure

• Projects with and without new fueling infrastructure costs
### Vehicle Performance and Use Assumptions

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Base fuel Used</th>
<th>2012 Average VMT (Miles/Year)</th>
<th>Fuel Economy (MPG)</th>
<th>Reduced CNG Fuel Economy (%)</th>
<th>Expected Life (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractor Trailer</td>
<td>Diesel</td>
<td>66,161</td>
<td>5.8</td>
<td>5.3%</td>
<td>7</td>
</tr>
<tr>
<td>School bus</td>
<td>Diesel</td>
<td>12,000</td>
<td>7</td>
<td>12.5%</td>
<td>15</td>
</tr>
<tr>
<td>Delivery Truck</td>
<td>Gasoline</td>
<td>13,469</td>
<td>6.6</td>
<td>5.3%</td>
<td>7.4</td>
</tr>
<tr>
<td>Light Truck</td>
<td>Gasoline</td>
<td>11,882</td>
<td>18.5</td>
<td>5.3%</td>
<td>6.5</td>
</tr>
<tr>
<td>Passenger Car</td>
<td>Gasoline</td>
<td>11,265</td>
<td>24.9</td>
<td>5.3%</td>
<td>6.5</td>
</tr>
</tbody>
</table>
• **Vehicle and Infrastructure Cash-Flow Evaluation (VICE) tool**

  • Developed by National Renewable Energy Laboratory

  • Features cost calculator that demonstrates ways net savings are sensitive to various assumptions such as fleet characteristics, fuel price, equipment costs, and operation and maintenance costs

  • Download at: [http://www.afdc.energy.gov/fuels/natural_gas_infrastructure.html](http://www.afdc.energy.gov/fuels/natural_gas_infrastructure.html)

• **C2ES modified the VICE tool to allow for automated testing of scenarios for different VMT, fleet size, infrastructure needs, and fuel prices**

  • Automation allowed C2ES to run > 100 scenarios very easily

  • Other customizations allowed for unique outputs, such as share of savings for energy service provider
Tractor-Trailer Fleet without Fueling Infrastructure Scenario Analysis Results

Unlocking Private Sector Financing for AFVs and Fueling Infrastructure

Annual VMT: 75,000 70,000 65,000 60,000

Project NPV

 Millions

$0 $5 $10 $15 $20 $25 $30

Fleet Size

500

250

50
Unlocking Private Sector Financing for AFVs and Fueling Infrastructure

Tractor-Trailer Fleet with Fueling Infrastructure Scenario Analysis Results

Project NPV

-3 $3 $8 $13 $18 $23

Millions

Fleet Size

500

250

50

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[CELLRANGE]

[CELLRANGE]

Annual VMT: 75,000 70,000 65,000 60,000

Unlocking Private Sector Financing for AFVs and Fueling Infrastructure

July 1, 2015 34
## Project NPV

<table>
<thead>
<tr>
<th>Fleet Size</th>
<th>Project NPV (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>-$15</td>
</tr>
<tr>
<td>250</td>
<td>-$10</td>
</tr>
<tr>
<td>50</td>
<td>-$5</td>
</tr>
<tr>
<td>15,000 VMT</td>
<td>$0</td>
</tr>
<tr>
<td>20,000 VMT</td>
<td>$5</td>
</tr>
</tbody>
</table>

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**Annual VMT:**
- 20,000
- 15,000
- 10,000
- 5,000
Available Net Fuel Cost Savings for Tractor-Trailer Fleet Operators to Purchase Services from an Energy Service Provider

Unlocking Private Sector Financing for AFVs and Fueling Infrastructure

July 1, 2015