



New Business Models to Expand EV Charging

Value capture for public charging
services

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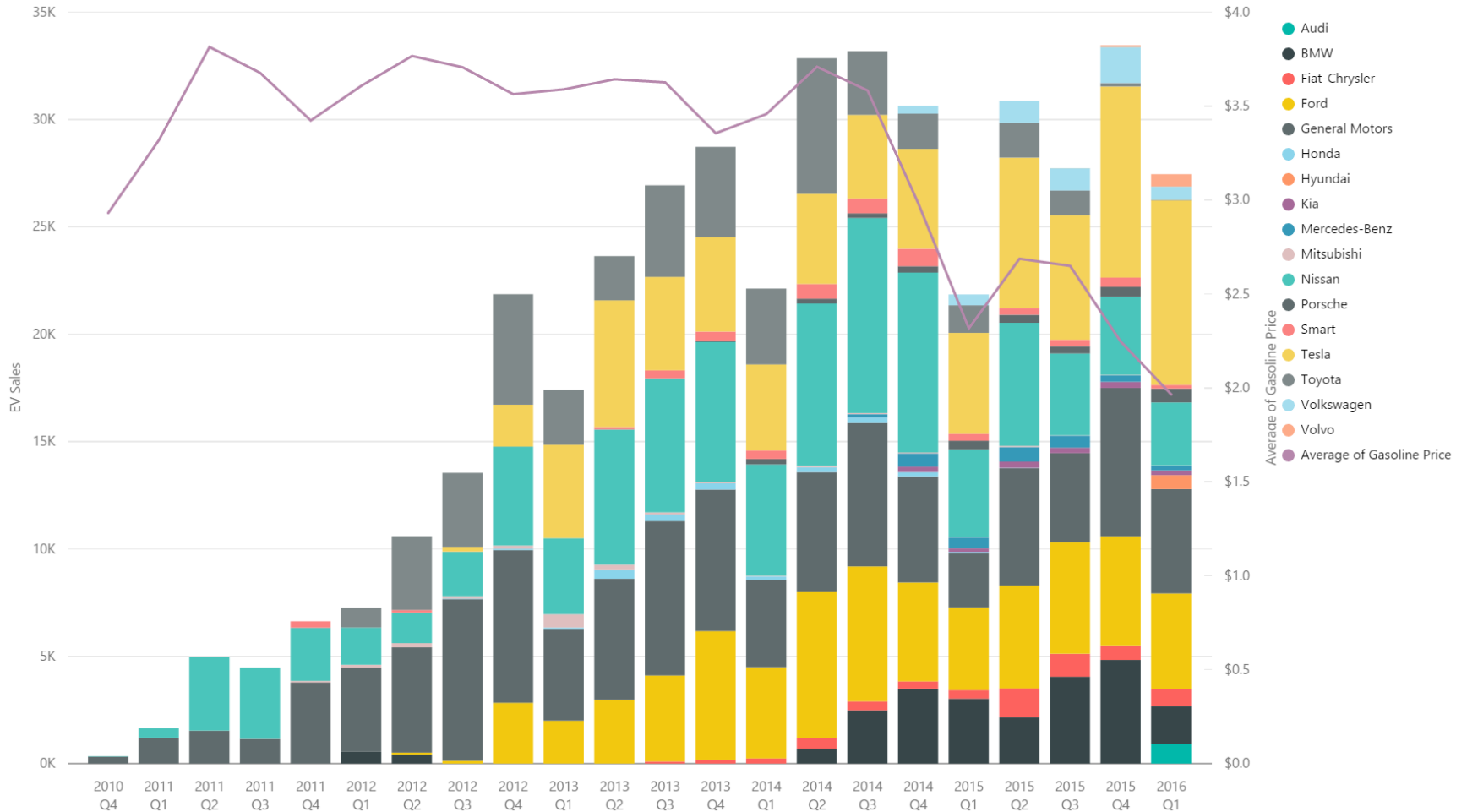


Key Challenges through 2020

- 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



440,000 EVs Sold Since 2010



Source: Atlas Public Policy analysis of data from hybridcars.com, U.S. EIA



Public Charging Costs More than Residential Charging

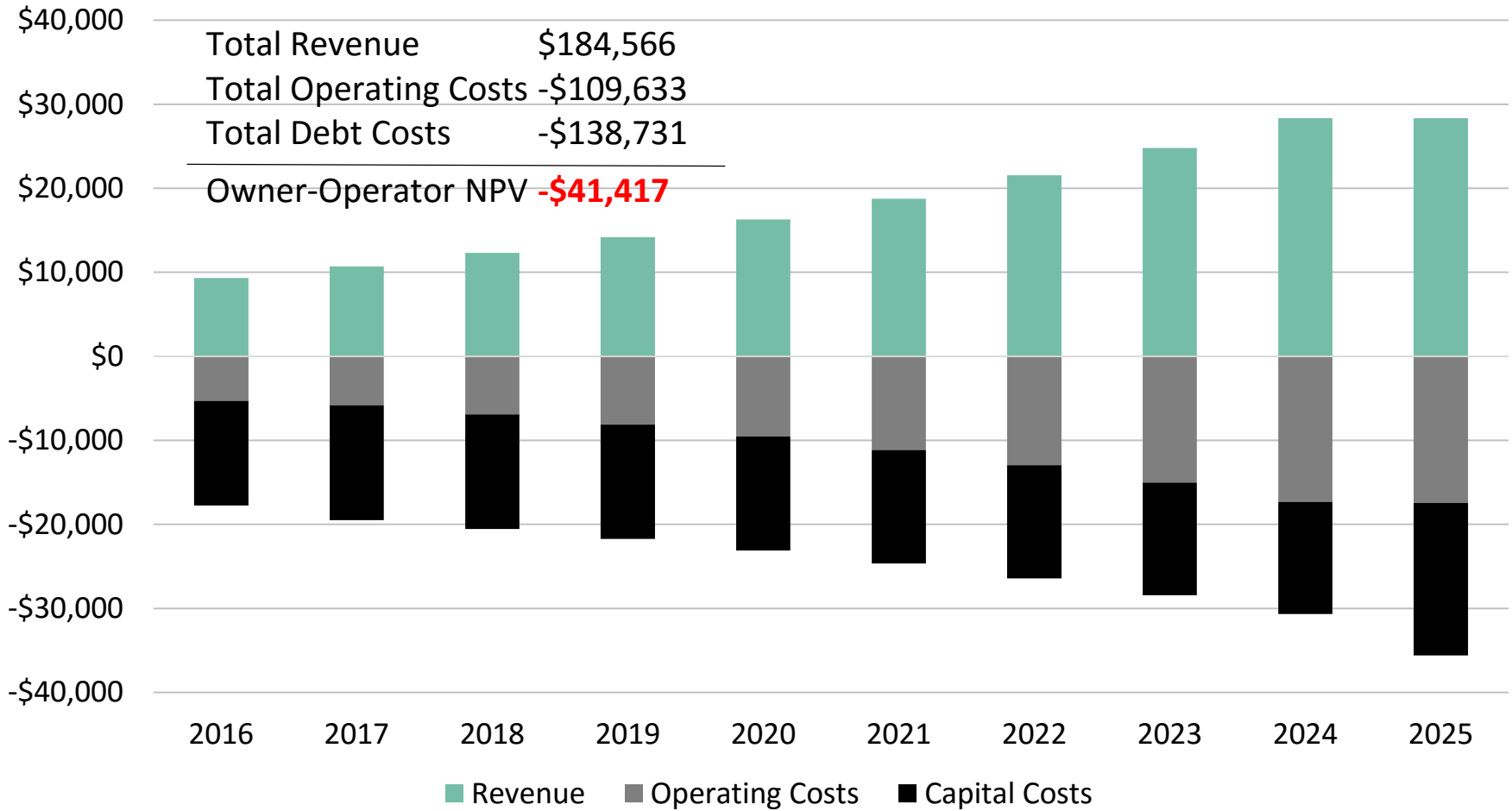
- Key Cost Drivers Compared to Residential Charging
 - Can require trenching, extensive wiring, or pavement replacement
 - Must comply with regulations to serve public
 - Often requires charging network access
 - Must be designed and manufactured to withstand significant wear and tear
- DC Fast Charging 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 New York

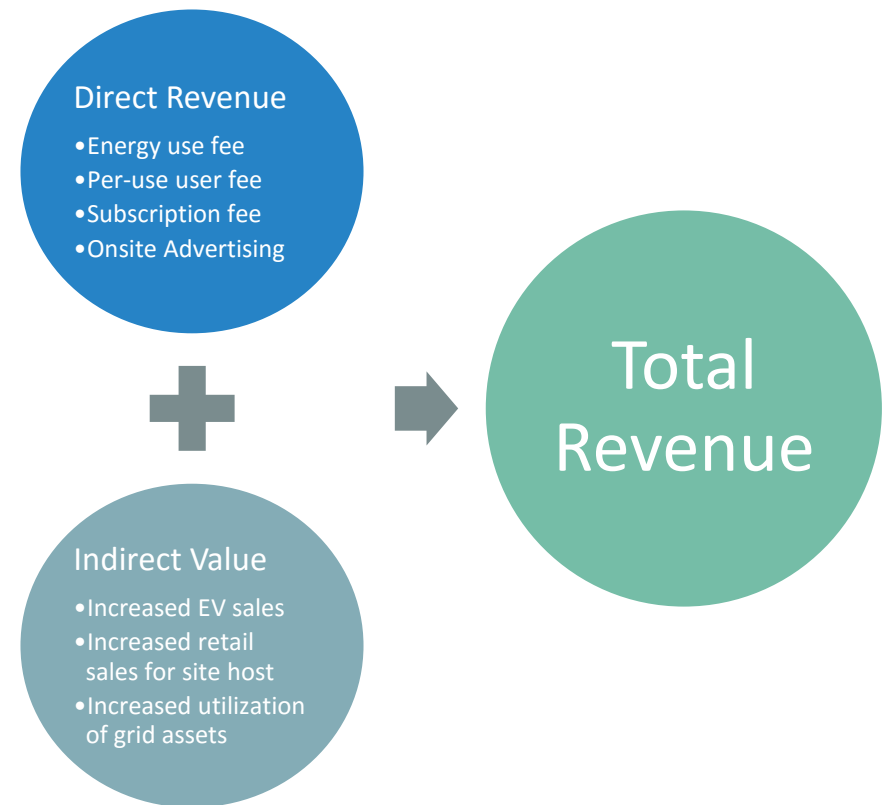


Source: C2ES 2015



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



Research on Value Capture Business Models for 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

Key findings from 2015 research by Atlas Public Policy and Center for Climate and Energy Solutions

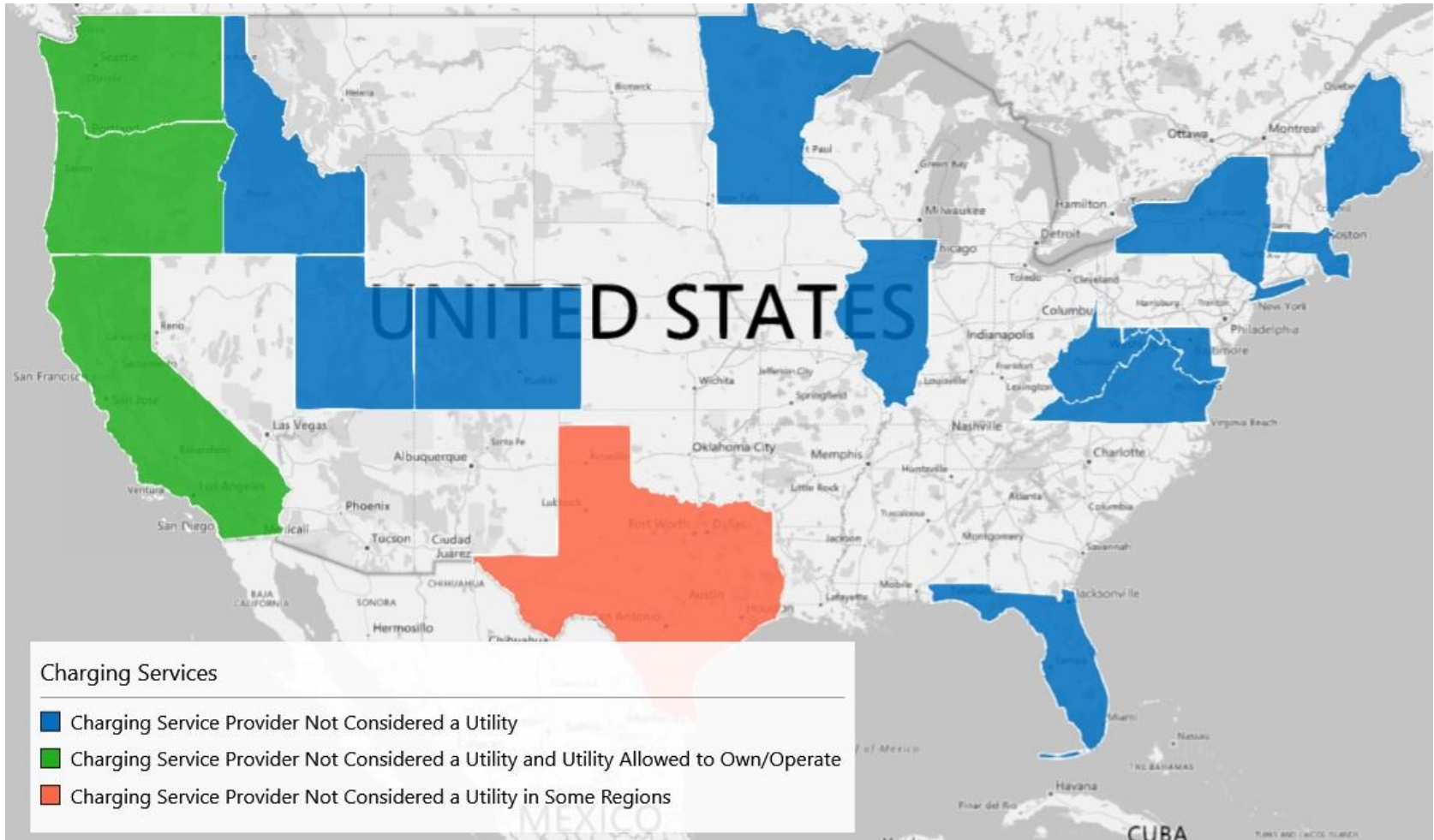


Key State Regulations to Encourage New EV Charging Business Models

- Provide certainty on regulatory treatment of EV charging service providers
- Allow utilities to engage in EV charging market
- Offer time-of-use rates for EV drivers to encourage off-peak charging



Regulatory Treatment of Charging Service Providers and Utilities



Source: Atlas Public Policy analysis of data from U.S. Department of Energy



Two Approaches to Encourage New Business Models

- **Innovative finance mechanisms:** leverage public funds to encourage private investment in charging projects
 - Captures public benefits (air quality improvements, greenhouse gas reductions, enhanced energy security, and economic development)
- **Electric utility projects:** use ratepayer funds to lower cost of installing and operating charging equipment
 - Captures ratepayer benefits such as increased utilization of existing grid assets



Examples of Using Innovative Finance for EV Charging

- Washington state created EV infrastructure bank to pilot indirect revenue business models for publicly available charging
 - Held listening sessions across state in early 2016
 - Engaging with local businesses and government, automakers, electric utilities, and large retailers
- Vermont using State Infrastructure Bank to offer low-interest loans for EV charging
- Connecticut Green Bank actively exploring new approaches to leverage public funds to encourage private investment in EVs and EV charging
 - Leveraging experience from using innovative finance to encourage building energy efficiency upgrades and solar PV deployment



Investor-Owned Utility Regulatory Proceedings for EV Charging

State	Utility	Ratepayer Cost (million \$)	Level 2 Charging Stations	DC Fast Charging Stations	Proceeding Status
CA	Pacific Gas & Electric	\$160	7,500	0	Pending
CA	Southern California Edison	\$22	1,500	0	Approved
CA	San Diego Gas & Electric	\$45	3,500	0	Approved
GA	Georgia Power	\$12	100	50	Pending
MO/KS	Kansas City Power & Light	\$20	1,000	15	Pending
IN	Indiana Power & Light	\$3.7	200	0	Approved
KY	Louisville Gas & Electric Company & Kentucky Utilities Company	\$0.5	0	20	Approved
WA	Avista Utilities	\$3.1	265	7	Approved
WA	Puget Sound Energy	\$2.5	5,000	0	Approved



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