Fleet Electrification: Challenges and Opportunities Faced by Utilities and Fleet Operators

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Overview of Presentation

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About Us

- Team of 5 graduate students from the George Washington University (3 M.A. in Environmental Resources Policy and 2 M.P.P.)
- Presentation is part of our Capstone Project in which we conducted a pro-bono consulting project for a client

Project Objective: To assess the actions and resources required by utilities to support fleet operators that seek to electrify their fleets.

Research Questions

- ***Status Quo:*** What level of fleet electrification can be accommodated today?
- ***Looking Forward:*** What level of investment is required beyond the status quo?
- ***Who*** is going to ***pay*** for this?
- Can funds from the ***2021 Infrastructure Investment and Jobs Act*** help cover costs?
- ***Broader Lessons:*** What can future fleet electrifiers learn from early adopters?

Background

The Environment and Fleet Electrification

- Limiting warming to 2 degrees C requires immediate, substantial GHG reductions
- Transportation accounts for highest proportion of U.S. GHG emissions (29%)
- Medium- and heavy-duty vehicles (MHDV) = 4% of total vehicles, but 29% of sector GHG emissions and >32% NO_x

Economics: EV Fleet Pros and Cons

- Electric MHDV cost more upfront than internal combustion engine (ICE) counterparts
  - Electric transit bus costs ***$750,000*** compared to diesel bus that costs ***$315,000***
  - Battery cost ARE on the decline
- Cost of ownership including maintenance and midlife costs are lower than ICE
- Generally lower charging cost v. conventional fuel

IIJA EV Charging Infrastructure Incentive Programs

Infrastructure Investment and Jobs Act					
Programs	Grants for Charging and Fueling Infrastructure	National Electric Vehicle Formula Program (NEVI)	Advanced Energy Manufacturing and Recycling Grant Program	Consideration of Measures to Promote Greater Electrification of the Transportation Sector	Grants for Energy Efficiency Improvements and Renewable Energy Improvements at Public School Facilities.
Funding	$2.5 billion	$5 billion	$750 million	TBD (State)	$500 million

Methodology

Semi-Structured Interviews (SSIs)

- Used semi-structured interviews
  - Flexibility
  - Reproducible script for interviews
  - Qualitative data
- Worked with GridWise network to get variety in geography, size, ownership structure
- Interview Structure:
  - 1 lead interviewer and 2 note takers
- Team interviewed 18 entities
  - 11 utilities (servicing 28 states + D.C.)
  - 3 government entities (State Energy Offices and Public Utility Commission)
  - 3 third-parties (Two consulting firms and a global research non-profit)
  - 1 fleet operator (Walmart)

Entities Interviewed

Utilities

- American Electric Power
- Arizona Public Service Co.
- Dominion Energy
- Duke Energy
- Exelon Corporation
- National Grid
- New York Power Authority
- Platte River Power Authority
- Portland General Electric
- Rappahannock Electric Cooperative
- United Power

Consulting Companies

- DNV
- Guidehouse Consulting

Global Research Organization

- World Resources Institute

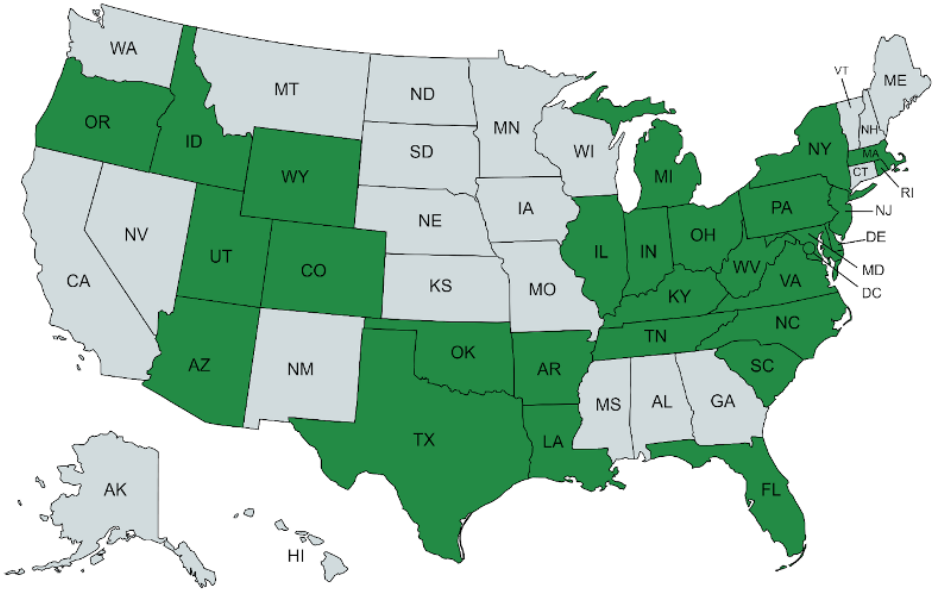
Government Entities

- California Energy Commission
- Colorado Energy Office
- Oregon Public Utility Commission

Fleet Operator

- Walmart

Map of the States in which the Utilities Interviewed Provide Service



Findings

Research Question 1

Status Quo: What level of fleet electrification can be accommodated today?

Q1 Findings

- Fleet charging can increase grid capacity needs dramatically
- It is difficult to predict these local impacts without operator participation
- Some utilities are starting to look past traditional hosting capacity with advanced software tools.
- The more information a fleet operator can provide to a utility the faster and more efficient a utility can respond to the fleet's needs. This data includes:
  - Charger type and charging patterns
  - Fleet size, vehicle type, mileage
  - Location
  - Procurement timeline

Research Question 2

Looking Forward: What level of investment is required beyond the status quo?

Q2 Findings

- Investments to support fleet electrification in the U.S. will be in the billions of dollars focused on four areas:

  (1) grid upgrades & new construction
  (2) grid resiliency
  (3) clean energy generation
  (4) human capital

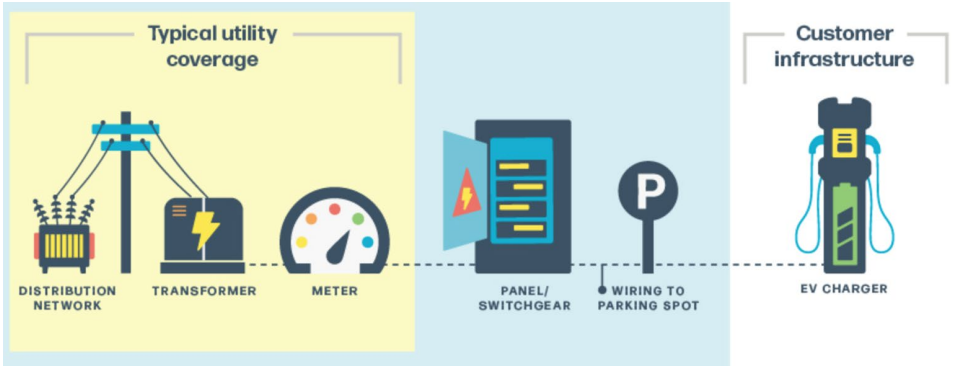
- Processes for early engagement on fleet electrification between fleet operators and utilities need to improve
- Rate design and technology are the most effective at reducing peak demand for electricity

Research Question 3:

Who is going to pay for all of this?

Q3 Findings

The Spectrum of Rate Basing Reg's



Most Conservative (Yellow) : Only rate base "behind the meter" investments, such as distribution upgrades

Moderate (Yellow and Blue) : May include some "beyond the meter" investments, such as cabling and trenching costs, but not the chargers

Most Expansive (all): May rate base all costs associated with the project, up to and including the chargers

Q3 Findings

Fleet Partner Project Summary					
Site	Make-Ready Ports	Energy Commitment	Infrastructure Cost	Fleet Partner Incentive	Net Customer Cost
Building 1	10 Level 2	300,000 kWh	$75,000	-$62,400	$12,600
Building 2	40 Level 2 2 DCFC	2,400,000 kWh	$417,000	-$335,400	$81,600

- Portland General Electric in the "most expansive" regulatory regime
- Offers robust make-ready incentives to facilitate electrification
- Does NOT expect these incentives to put upward pressure on rates

Research Question 4

Can funds from the 2021 Infrastructure Investment and Jobs Act help cover costs?

Q4 Findings

- Indirect funding opportunities open to utilities through public-private partnerships
- Utilities must work with state governments to get access to funding
- NEVI funding disbursed from state DOTs and SEP funding disbursed from SEOs
  - PUCs not involved with distribution of funds
- Supply chain issues
  - “Buy America” requirement presents supply issues
  - Nationwide deployment of funds will increase demand

Research Question 5

What broader lessons can be learned for entities seeking to electrify their fleets?

Q5 Findings

- Most utilities interviewed mentioned ***early engagement*** was critical in electrification planning

Planning component	Timeline estimate
Substation upgrade	*18-36 months*
DC fast charger order	*1+ years*
Electric vehicle order	*1-2 years*
Grant applications	*1+ years*

Q5 Findings

- Multi-stakeholder engagement
  - Electric vehicle charging companies
  - Individuals familiar with charging technologies
  - Fleet operators that have successfully electrified fleets
- Identify hurdles for electrification planning
  - Grant applications
  - Regulatory requirements
  - Permits for charging stations
  - Forecasting data issues

Recommendations

Recommendation 1: Engage with utilities early

- Every utility varies in **grid capacity, electric vehicle charging program,** and **rate structures**
- Provide ample time for **substation upgrades** if required
  - Communicate service request timelines to internal stakeholders
- Factor in ***supply chain issues*** that could impact timeline
  - Electric vehicle batteries
  - DC fast chargers

Recommendation 2: Utilities need more data from fleet operators

- Operators need to be willing to share relevant information
- Dealing with fleet requests piecemeal is not the best way help support electrification.
- Utilities need to know fleet location, fleet size, vehicle type, charging patterns
- More information allows utilities to accommodate service requests efficiently.

Recommendation 3: Fleet operators need more information from utilities

- Operators need to be aware of the need to provide information in order to provide it
- Utilities may benefit from including employees that speak a “common language” with operators
- Hosting capacity not a major driver for early adopters

Recommendation 4: Expand utility rate basing regulations

- Strong public policy justifications
- PGE able to rate base costs without putting upward pressure on rates
- Anti-competitive concerns are weak
- More efficient than utilities "testing the waters" with state regulators

Acknowledgements

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Questions?