Overcoming Barriers to Fleet Electrification

County of Alameda

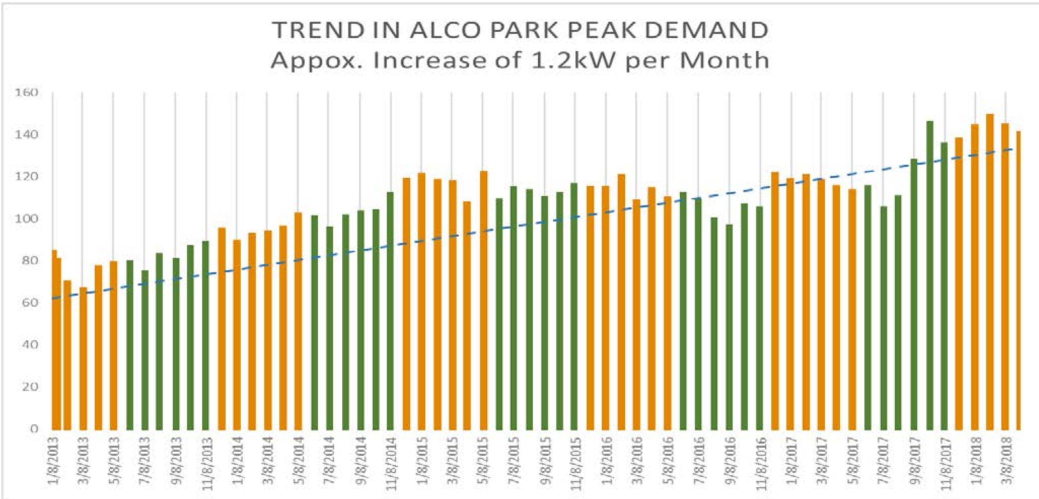
Climate Corps 17-18

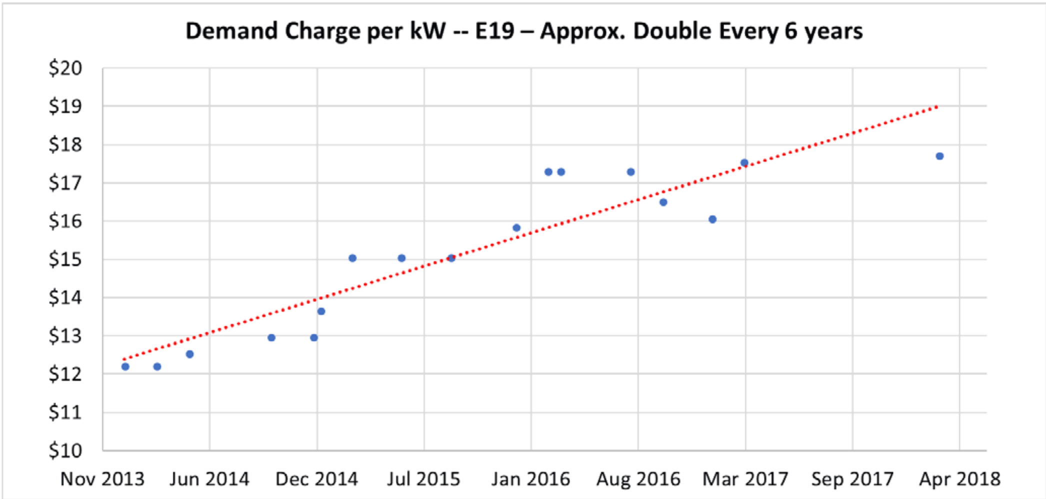
Maintaining the EV Cost Advantage

The Economics Behind Fleet Electrification

Using total cost of ownership, electric vehicles (EVs) are cheaper than traditional vehicles. This is due to cheaper maintenance costs – up to 50% less – and cheaper fuel costs. For Alameda County, EV fuel costs per mile could be as much as 80% less. This metric, however, does not tell the full story. EV fuel costs vary by time of day, time of year, and location, meaning that this 80% savings is far from a guarantee. Additionally, many EV charging facilities face demand charges that drastically increase electricity costs, eroding the EV fuel cost advantage. Finally, the cost of building and maintaining charging infrastructure further complicates the cost of EV fleet operations. My fellowship focused on strategies to maintain the EV cost advantage, while also expanding charging infrastructure at the County's main fleet facility. The broad goal is to overcome barriers to fleet electrification and enable mass deployment of EVs.

The Challenge: Demand Charges





Demand charges are fixed per kilowatt fees multiplied by a facility's energy demand for each billing cycle. PG&E charges the County multiple demand charges: max-demand, max-peak demand, max part-peak demand. Demand – and demand charge rates – are rising, leading to steady demand charge increases at the County's Oakland fleet facility.

Smart Charging

Working with local partners Kisensum, Lawrence Berkeley Labs, and ChargePoint on a California Energy Commission project, the County implemented three strategies (at right) aimed at maintaining the EV fuel cost advantage. The overall approach was "smart charging," charging vehicles at times when energy is cheapest in order to reduce energy costs and mitigate demand charges. I assessed the project's success for the County and determined that our strategies reduced energy cost, though demand charge reduction was not guaranteed.

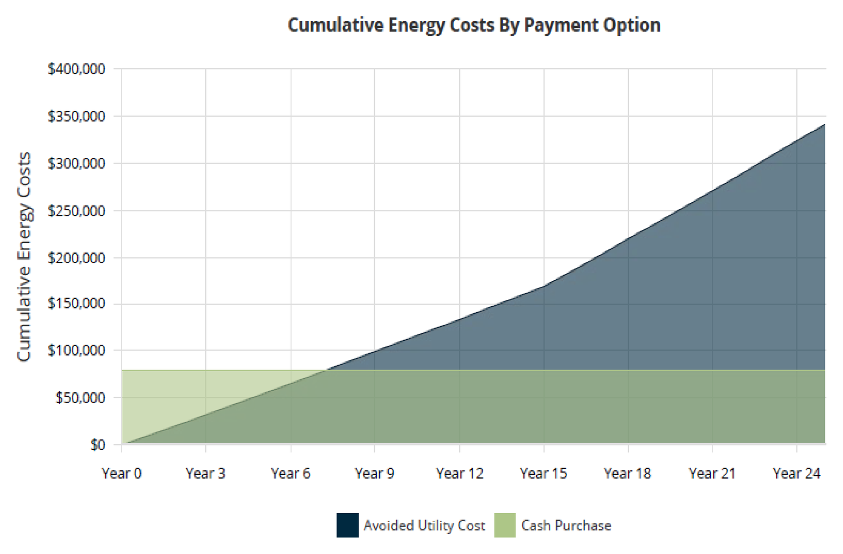
Smart Charging Strategies

- *Staggered or overnight fleet charging*
- *Dynamic scheduled public charging*
- *DC Fast Charger to other fleet charger communication protocol*

EV Fuel Cost Per Mile at AlCoPark

ICE Fuel Cost per Mile:	*Before Smart Charging*	*After Smart Charging*
15 cents/mile	9.8 cents/mile	7 cents/mile
	35% savings	54% savings

Battery Storage Feasibility



This graph shows a payback time of 7.3 years for a BSS bought using a cash purchase under future time-of-use rates. *Source: Optony USA*

Battery storage systems (BSS's) can guarantee demand charge savings by predicting demand and using BSS capacity to "cut the top off" peaks. Before deciding whether to install a BSS at the County's fleet facility, we needed to assess financial and technical feasibility. Working with Optony, I assessed:

- *Proper BSS sizing & payback period, based on future charging scenarios & utility tariffs*
- *Feasibility and cost of grid & building interconnection*
- *How charger revenues can be used to support a BSS purchase*

STRATEGIC ENERGY INNOVATIONS

Sam Hill-Cristol

After writing his senior honors thesis about utility scale battery storage in New England, Sam joined Alameda County GSA as the Sustainable Energy Associate in the Logistics Services Department. Sam focused on tackling cost and infrastructure challenges hindering the electrification of the County fleet. He is looking to continue his career in distributed and clean energy, working to de-carbonize our energy and transportation sectors.

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