

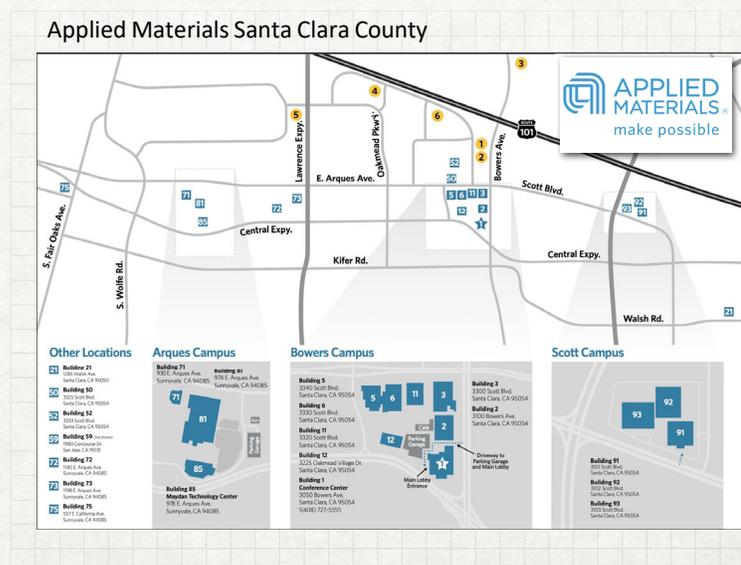
REDUCING EMISSIONS: MAKING THE CASE FOR EV FLEETS

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APPLIED MATERIALS

- Applied Materials is a semiconductor and solar R&D firm.
- The growing Bay Area footprint is predominantly located in Santa Clara County (Silicon Valley).
- In the 1990s, Applied Materials funded the TDM program standards for the City of Sunnyvale (where the Arques Campus is located). Basically, developing the first version of that region's TDM program standards.



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APPLIED MATERIALS TRANSPORTATION PROGRAM

- Pre-COVID
 - Inter campus scheduled shuttle service serving key facilities
 - On-demand shuttles serving all facilities and last mile connectivity (arrangements mostly by phone, limited app adoption)
 - Employer transit subsidy (check) via Edenred
 - Waze ride sharing
 - Preferred Carpool parking
 - Emergency ride home
 - Bike storage and showers
 - Commute calendar & weekly gift card incentives for frequent commuters

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DURING COVID

- RFP for new shuttle service provider. Service to include shuttle app as proposed by vendor
 - All three vendors proposed the same app
- Started implementation of Luum, including commuter benefits via Luum Card
 - Discontinued incentive program
 - Increased transit subsidy in lieu of incentive program

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POST COVID - SHUTTLE SERVICE

- Restarted scheduled service June 2021.
 - Very low ridership
- After launching Tripshot for on-demand service, service was converted to exclusively on-demand.
 - With shuttle running only when in demand, we cut back on gas consumption and emissions.
- One EV vehicle on account as an opportunity to try how it would work for Applied Materials
 - Lessons learned – considerable charge remained at end of day
 - In service for 6 years
 - Required the least amount of maintenance
 - Had windows open and air condition on full blast per COVID requirements and still were able to run all day without recharging.



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MAKING THE CASE FOR EV: UNDERSTANDING THE BENEFITS

KEY TO BUY IN

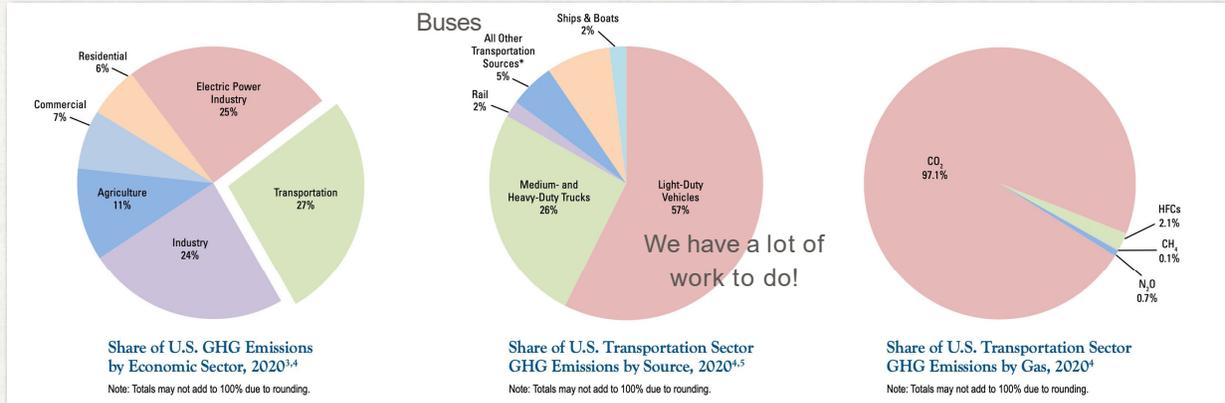
Understand the benefits that come from electrification:

- whether that's broad emissions reduction goals, or
- the cost effectiveness of an all-EV fleet.

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TRANSPORTATION RELATED EMISSIONS



Source: EPA, May 2022

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THE ENVIRONMENTAL CASE FOR EVS

- One gallon of diesel fuel produces 22.44 pounds of carbon dioxide
- One gallon of gasoline produces 19.59 pounds of carbon dioxide
- CNG produces approximately 5-10% less carbon dioxide compared to gasoline
- Electricity as a fuel source does not produce any carbon dioxide.

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THE BUSINESS CASE FOR EVS

- Vehicle costs approximately 40% higher
 - Keep eye out for incentives to help with costs
- Expect to save about 50% over the cost of gasoline for fuel
 - Negotiate the rates
- Maintenance cost is 30% lower on electric vehicles
- Lessons learned at Applied Materials - vehicle maintenance and fuel cost less than the gasoline shuttle. Outlived expectations

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THE FUTURE OF EV

- Legislation pushing towards EV
- The future is EV
 - In 2021, auto industry giant, General Motors, announced plans to end production of all diesel and gasoline powered vehicles by 2035, and to become carbon-neutral by 2040. Other companies have followed.
 - Matter of time before all vehicles are EV

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HAVE YOU MADE YOUR CASE?

- The information thus far makes a compelling case.
- However...
 - Take the dialog further to understand the scale
 - Allow for time to experiment and learn.
 - Appreciate the learning curve.

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RESEARCH & COLLECT DATA

- Bring key stakeholders to the table and consider what EV deployment could look like and should look like
- Commuters will be driving more EVs and you may find yourselves short on charging infrastructure
- Fleets transitioning to EV: Shuttles, on-site operations (commercial) vehicles, vendors etc. There already is a growing demand.
- Use this data to understand a big picture and timeline in support of employees, shuttles, operational support vehicles
- Let's talk about the big picture - beyond purchasing and installing chargers, consider whether your facilities have the overall capacity to support the electrical draw.
- Consider order lead times, supply chain, installation/construction etc.

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DEVELOPING A STRATEGY

- Understand infrastructure needed to support the program
 - electricity, permitting process, other constraints
- Define all use cases/scenarios (employee vehicles, shuttles, stationary engineers trucks, custodians' golf cart, etc)
- Understand your options
 - EV charging options
 - Vehicle charge times
 - Charge on campus or outsource service
 - Types of vehicles
 - Charge at night? Is charging required during the day?
 - And more....

Use cases

1. Commuters - 5000 employees, some driving long distances, some may opt to charge vehicle at work.
2. Custodians replacing trucks with EV golf carts. Range of charge unknown. Looking at 6 carts
3. Stationary engineer fleet at end of life in 1 year. Replace with EV? 15 vehicles.
4. Catering service wants to upgrade to EV now.
5. 8 shuttles - currently under contract with WDU - use WDU to implement EV.
6. Garage needs 150 EV bike chargers.

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PILOT PROGRAM

- Start small
- Pick a use case (shuttle service, employees)
- Implement pilot & collect data.
- Repeat pilot on other use cases.
- What have you learned? Ruled out? Narrowed down? What did the employees say?

There is no one solution for everyone



On average, an ambient temperature of **20 °F** can result in a **12% decrease** of driving range.

Running the in-car heater (when it's below 20 °F) can **reduce** the range of a fully charged vehicle by **41%**



Charging time is significantly impacted by winter weather. One study showed a **36%** decrease in final charge

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OUTLINE A PLAN FOR FULL SCALE DEPLOYMENT

- Extrapolate data as appropriate to understand how this would work on scale and what build out is needed to support the program.
- Develop timeline that accounts for infrastructure augmentation.
- Take on bite size projects - you may not have the expertise in-house to make this happen.
- Start today!

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THANK YOU

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