Going electric:
What you need to know about EV fleet management

GEOTAB®
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Preparation for a greener future

Fleet adoption of electric vehicles (EVs) is on the rise. With government targets to cut carbon emissions, the continued push to reduce fleet costs, and the increasing choice and affordability of EVs, this trend will only continue.

The State of California is leading the way in electrification. A California executive order in 2018 mandated a new electric vehicle sales goal of 5 million electric vehicles in California by 2030. Senate Bill No. 498 Vehicle fleets: zero-emission vehicles states:

“This bill would require the Department of General Services, beginning no later than the 2024–25 fiscal year, to ensure at least 50% of the light-duty vehicles purchased for the state vehicle fleet each fiscal year are zero-emission vehicles, except as specified.”

The California Air Resources Board (CARB) has also declared it will transition to a 100% zero-emission bus fleet. This bill would require the Department of General Services, beginning no later than the 2024–25 fiscal year, to ensure at least 50% of the light-duty vehicles purchased for the state vehicle fleet each fiscal year are zero-emission vehicles, except as specified.

Now, more than ever is the time for fleets to implement an EV strategy.

Making the switch to electric vehicles

What does all this mean for fleets? As the move to zero-emissions gains traction at every level of government, private fleets will start to feel the pressure to also switch to EVs when their current fleet reaches the end of its service life.

Before switching over to electric vehicles, there are a number of important questions to consider:

+ How do you transition a fleet to electric?
+ Do all fleet vehicles need to be fully electric?
+ How many electric vehicles should you buy, and when?
+ Once you've completed the switch, how do you apply traditional fleet management techniques?
EVs also introduce new challenges to the fleet such as adding new metrics they have to monitor. Often, the biggest challenge is the increased complexity of billing and vehicle reporting for state of charge (SOC).

Telematics can help provide a solution. From selecting the best fit electric vehicle for your fleet needs, to providing an open platform for monitoring both electric and conventional vehicles in one place, Geotab is supporting fleet managers in adapting to this new vehicle type.

**EV adoption: Where to start**

Let’s say your fleet is looking to switch one vehicle to electric. When beginning your EV adoption journey, it is important to answer three things about your current vehicle:

1. What is the maximum range that the vehicle completes?
2. What are my current costs for running the vehicle?
3. Where to dwell, and for how long?

By answering these three questions, you will have a clear understanding of the requirements for the new EV, beyond just matching a vehicle size.

**Key factors to consider in an EV adoption strategy**

**Maximum range**

Through looking at the maximum range a vehicle completes in one day, you are able to choose what kind of EV you require. Do you need a long-range battery EV, with a range over 200 miles? Or will a short-range battery do the job? Is partial electrification with a plug-in hybrid best, given that you are driving 400 miles regularly in one day?
Range anxiety is often cited as one of the main reasons fleets have not yet switched to EVs, as they do not want their drivers to be stranded without access to charging facilities. Analyzing the maximum distance driven by a vehicle provides an immediate pass/fail gate when considering an electric vehicle.

**Current running costs**

Understanding the current costs associated with the vehicle you are looking to replace can help facilitate choosing an EV that will save you money in the future. The manufacturer’s suggested retail price (MSRP) and bid prices of electric vehicles are often higher than that of a conventional internal combustion engine vehicle. The higher price tag of an EV is often the second objection fleets have to adopting this technology.

However, this difference in price can often be overcome through the operational savings on the vehicle. It costs less to run an EV than it does to run a conventional vehicle. Understanding your expenses today, and comparing that to the future costs of the electric vehicle can help you understand if you will break even, or even reduce the fleet budget by switching to electric vehicles.

**Vehicle dwell**

The final question — “Where does your vehicle dwell, and for how long?” — helps answer the third objection to electric vehicle adoption, which is charging. How many charging stations are required and where should they be placed? The purchase and implementation of charging infrastructure is often difficult to assess at the outset, with early adopters of EVs learning some valuable lessons.

It is important to implement an infrastructure strategy that ensures your fleet vehicles are able to charge to 100% during their dwell time, so your drivers can start every day with a full battery and a good understanding of their vehicle’s range. This may mean that for your first few EVs, you are able to charge them directly from a normal wall outlet. Or, you might want to install a dedicated charging station for each EV, with an understanding of how this infrastructure will be grown as you continue greening the fleet.

Since each fleet’s dwell time and location are unique, it’s critical to use your own fleet’s data when planning the infrastructure component of your EV adoption strategy.

**Introducing the electric vehicle suitability assessment**

Geotab helps you answer all three of these questions using your own fleet’s data in a simple to use report. The electric vehicle suitability assessment (EVSA) evaluates your current fleet and creates a multi-year procurement plan to help you electrify it. An EVSA provides all the information required to help ensure you are putting the best-fit EVs into your fleet — so you don’t end up adopting a vehicle that does not work for you.
Electric vehicle fleet management

Electric fleet management and traditional fleet management have many similarities, but also a few differences. While you will want to continue monitoring traditional fleet metrics such as utilization, there are brand new metrics to monitor with EVs, such as SOC, charging session details and for plug-in hybrids electric miles versus gasoline miles.

Geotab provides a platform where you can monitor your EVs and conventional vehicles together. There are four distinct benefits to having everything under one roof:

1. Optimizing electric range through fuel efficiency measurement
2. Reporting on charging activities
3. Using real-time information to make decisions about your fleet
4. EV Diagnostics

Let’s take a closer look at how monitoring your EVs in this manner is key to fleet management today.

Optimizing electric range through fuel efficiency measurement

The Geotab platform can help in many ways to optimize the range of your electric fleet. The first way is through reporting of kilowatt-hours per mile (kWh per mile), or alternatively, the fuel efficiency of your EVs. This allows you to compare the efficiencies of each vehicle, and help adjust operational behaviour to increase this efficiency. Safe driving practices, such as smooth braking and smooth acceleration can help increase the electric range of the vehicle. The larger the range of the vehicle, the less time that vehicle has to spend charging.

This kWh per mile reporting makes it easy to measure fuel consumption by the electric vehicles as well. The Geotab platform reports this not only as kWh/mile, but also a MPGe. For your plug-in hybrids, a blended MPGe is reported in addition to the electric kWh/mile and conventional MPG. Being able to capture this fuel efficiency is key to understanding how your plug-in hybrids are being driven. Are they being driven as electric vehicles or as conventional vehicles?

To capture the true savings on carbon emissions and lower fueling costs, your plug-in hybrids have to be maximizing the electric distances that they are driving. Reporting on fuel efficiency is integral for hitting carbon reduction targets. See the following table as an illustration.
Comparison of a Mitsubishi Outlander PHEV (plug-in hybrid)
Driven without charging vs. electric range maximized.

<table>
<thead>
<tr>
<th></th>
<th>PHEV (driven without charging)</th>
<th>PHEV (maximizes its electric range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage (assumed 180 driving days in a year)</td>
<td>30 miles per driving day</td>
<td>30 miles per driving day</td>
</tr>
<tr>
<td>Fuel efficiency</td>
<td>25 mpg</td>
<td>74 MPGe (or 22 all-electric miles and 8 miles on gasoline)</td>
</tr>
<tr>
<td>Carbon emissions (tailpipe) per year</td>
<td>4.2 tons</td>
<td>1.1 tons</td>
</tr>
<tr>
<td>Vehicle running cost (gas at $2.75 per gallon)</td>
<td>$594.00</td>
<td>$324.72 (12kWh nightly, at $0.077 per kWh)</td>
</tr>
</tbody>
</table>

In this example, maximizing the electric range of the fleet vehicle results in:

1. 45% reduction in run costs
2. 73% less gasoline used every day
3. 73% reduction in CO₂ emissions

Reporting on charging activities

One of the biggest challenges fleet managers face with electric vehicles is reporting on charging activities. Currently, there is a mix of way that fleets can do this through charging station providers and electricity bills. However, this is only a partial solution.

For a true equivalency to conventional assets you need to be able to account for each kWh charged for each vehicle, same as you would with the number of gallons of gasoline or diesel. The Geotab platform reports this for each vehicle as a record from a charging session, along with the location of that charging session, the length of charging session, the kw rate of the charging session, the starting SOC, the end of SOC, and the time of the session. This allows a fleet to be able to fully allocate the costs of charging per vehicle, instead of per facility as with an electric bill.
In addition to knowing the electricity usage by asset, tracking the location of each charge will help understand how the vehicles charging are contributing to overall building load. With a record of charging events (by vehicle and at what kw rate), you can start to optimize charging to help lessen the building load during peak time.

A record of charging by asset shows you charging patterns for different vehicles and lets you measure plug-in compliance — another charging optimization strategy. Using telematics data, you can understand when vehicles are charging and ensure that they are charging every day to maximize the electric range available to the driver. Plug-in compliance is one of the largest issues facing fleets, and can be obscured if charging is not recorded on a by-asset basis.

**Using real-time information to make decisions about your fleet**

The third benefit of having an all-in-one telematics solution for your electric and conventional vehicles is the ability to leverage real-time information on your electric vehicles to help optimize your fleet's operating abilities. Geotab reports the live SOC of a vehicle, which can be partnered with the powerful MyGeotab rules engine to aid with plug-in compliance and charging optimization.

Using the rules engine and real-time SOC, you are able to ensure plug-in compliance based on SOC. If the vehicles have a consistent route and use, you can set a rule to ensure it is charging when it is below the SOC required to complete their route the next day. This can help minimize vehicle downtime due to charging.

The live SOC also gives an indication of the range available on the vehicle, so an operation is able to react in real-time to developing situations and respond with a vehicle that has an appropriate level of charge.

The SOC also supports fleet pool management by giving an indication of vehicles that need to be charged. This ensures that a vehicle has enough charge when it is booked for a journey. Similar to the application of the rules engine above, if the vehicle is returned to a home base, using the SOC reading, a Geotab alert can be sent out to ensure the vehicle is plugged in and charging for the next user. This helps ensure that the EVs in a shared fleet pool application will have a high utilization.

**EV diagnostics**

Diagnostic codes are key for monitoring a vehicle's health. Although EVs have longer maintenance cycles, thereby reducing the general maintenance costs for the fleet, it is still important to monitor overall vehicle health and leverage warranty repairs where applicable. Geotab’s electric vehicle monitoring platform will present the EV diagnostics alongside your conventional vehicles diagnostic codes, providing an easy solution for applying a traditional fleet management responsibility to your new electric fleet.

**Advanced EV adoption**

Once you have your electric fleet up and running, new challenges will reveal themselves. For example, how do you manage your EV fleet’s charging so that you are minimizing your fleet expenses? Geotab can help with this through a charging station-agnostic, SOC-based smart-charging product. As your EV fleet grows, you will want to maximize the use of your charging infrastructure while minimizing the expense of your electricity bill.

A non SOC-based smart-charging solution charges the vehicles that are plugged in first, which are not always the vehicles that need the longest amount of time to charge. This runs the risk that your drivers will not have enough energy in their vehicles to complete their journey the next day. By implementing a smart-charging solution that is based on the vehicle SOC, you can prioritize charging and avoid delay or downtime, by ensuring that the vehicles needing to be charged the longest to reach their target SOC are charged first.
Conclusion

As electrification continues to become a priority to save fleets on fuel costs, and reduce carbon emissions, it is key to have a telematics platform that can provide all the necessary tooling to monitor your conventional vehicles and your electric vehicles. By having all your information in one place, you are empowering your fleet managers to optimize the fleet usage, and ensure that you are getting the maximum return on investment from your electric fleet.

Geotab offers this platform to help you, and your fleet continue adapting to the changing fleet world, and make the transition from conventional to electric smoother than ever before.

For more information on EV fleet management, please visit: www.geotab.com
Glossary

**EV Diagnostics** — Vehicle system information and fault codes which can be collected via telematics and used to monitor the health of an EV as part of a vehicle maintenance program.

**EVSA** — An electric vehicle suitability assessment (EVSA) is a customized Geotab report for fleet and sustainability managers providing a multi-year procurement plan for EVs including ROI and a forecast of emissions reduction.

**kWh per mile** — The kilowatt-hours per mile (kWh per mile) represents how much electricity an EV uses in one mile driven, indicating its fuel efficiency.

**Maximum Range** — The total number of miles an EV can be driven before it needs to stop and recharge.

**MPGe** — Miles per gallon of gasoline-equivalent (MPGe) is a metric used by the Environmental Protection Agency (EPA) to compare the fuel economy of EVs and other alternative fuel vehicles with gas-powered vehicles.

**MyGeotab Rules Engine** — A feature of the Geotab telematics platform that allows users to set fleet management rules for drivers such as for maximum speed limit, idling time, or EV charging, then monitor compliance in MyGeotab.

**Plug-in Hybrid** — A plug-in hybrid electric vehicle (PHEV) has a two-part drive system, including an electric drive and a small internal combustion engine running on fuel. The two main other types of EVs are hybrid electric vehicles (HEV) and battery electric vehicles (BEV).

**Range Anxiety** — An EV driver’s fear of running out of electricity before the end of a trip.

**State of Charge (SOC)** — The amount of battery power left in an EV, as measured in percentage.

**Vehicle Dwell** — Where a fleet vehicle resides when it is not in use.

**Zero-Emissions** — A global movement towards sustainability based on EVs generating lower or zero greenhouse gas emissions and use of other clean, sustainable technology.

About Geotab

Geotab is advancing security, connecting commercial vehicles to the internet and providing web-based analytics to help customers better manage their fleets. Geotab’s open platform and Marketplace, offering hundreds of third-party solution options, allows both small and large businesses to automate operations by integrating vehicle data with their other data assets. As an IoT hub, the in-vehicle device provides additional functionality through IOX Add-Ons. Processing billions of data points a day, Geotab leverages data analytics and machine learning to help customers improve productivity, optimize fleets through the reduction of fuel consumption, enhance driver safety, and achieve strong compliance to regulatory changes. Geotab’s products are represented and sold worldwide through Authorized Geotab Resellers. To learn more, please visit www.geotab.com and follow us @GEOTAB and on LinkedIn.

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