

**Model:** Model S

**Vehicle System:** 21 - Infotainment

**Region:** All

## Tech Note: Model S Energy Consumption

Tech Notes are internal announcements that help to communicate and track new information about Tesla Service concerns.

This Tech Note supersedes TN-14-21-003, dated 22-Jan-14. Each content change is marked by a vertical line in the left margin. Discard the previous version and replace it with this one.

The Energy App on the Model S touchscreen provides customers with several types of statistics and information about the vehicle's energy usage. This data is a valuable resource for tracking and minimizing the energy consumption of the vehicle as long as the customer understands how the energy graph is created.

Customers might have concerns about wide alterations or spikes in the energy graph that they feel do not correspond to their driving habits. Customers might also have concerns about similar alterations or spikes after their vehicle has been in for service or body repair. However, these spikes are expected under the conditions described below, and educating the customer on how to read the Energy App can help ease their concerns.

### Common Causes of Wh/Mi or Wh/Km Spikes

The unit of measurement used in the energy graph is Wh/mi or Wh/km, which measures the energy consumed (Wh or watt hour) per unit of distance traveled (mi or km). Based on the vehicle's recent driving behavior and the environmental conditions encountered, the energy graph varies and might result in spikes and valleys. However, certain situations contribute to spikes more than others:

- **Aggressive driving or driving up a hill:** This situation results in higher energy consumption because of increased acceleration or working against gravity. Most customers are familiar with the idea that harder driving tends to reduce energy efficiency.
- **Low number of miles driven with idle time:** This situation occurs when the vehicle is idle but still powering all systems (for example: sitting in heavy traffic). Relative to normal driving conditions, the vehicle is consuming the same amount of energy over a shorter distance, resulting in a Wh/mi spike on the graph. Although this low-efficiency situation is similar to that of internal combustion engines, it is often misunderstood by the customer.
- **Service or repair activities:** This situation occurs when a vehicle is serviced or repaired (either body repair or mechanical repair) for an extended period of time and a technician has to perform energy-intensive activities, such as running the A/C system or the heater, or discharging the HV battery. Because the vehicle is driven minimally during the service or repair process, the vehicle is consuming a large amount of energy relative to the distance traveled. This situation also might occur due to the need for a technician to aggressively road test the vehicle after the repair.
- **Viewing the 5 mile graph on the Energy App:** While this situation has no direct effect on energy consumption, the 5 mile graph calculates additional data points over a shorter distance, making Wh/mi spikes more visible to the customer.

### What the Customer Sees

The customer can choose from one of three Energy Consumption views in the Energy App: 5, 15, and 30 miles (or 10, 25, and 50 km).

## Customer Behavior

A typical 5 mile graph of a short trip with several idle times shows spikes of energy consumption and valleys of regenerative braking (Figure 1). These Wh/mi spikes might be a cause of concern for a customer.



Figure 1

The 15 and 30 mile graphs (Figures 2 and 3) show the same trip using a graph with a longer distance range, where the spikes and valleys are averaged out over longer distances and are less concerning to the customer.

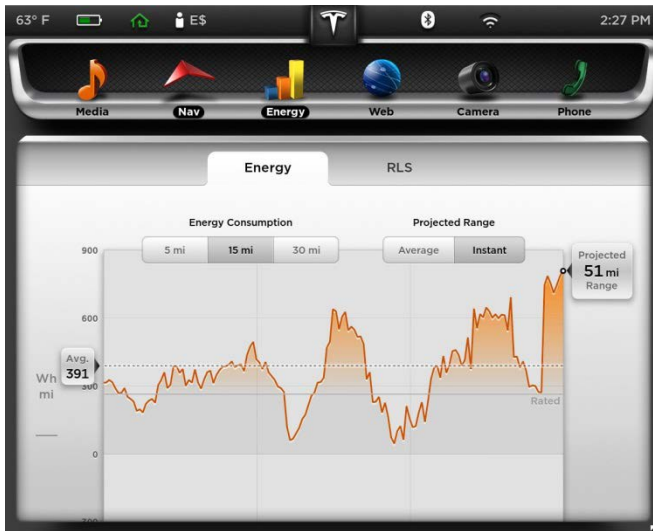


Figure 2 (15 mile graph)



Figure 3 (30 mile graph)

The customer can also view the remaining range in the vehicle through two Projected Range settings: "Average" and "Instant". The "Average" setting projects the range based on the average Wh/mi for the miles shown in the graph, while the "Instant" setting projects the range based on the most recent data point. If this recent data is artificially high from a Wh/mi spike, the projected range can be alarmingly low. For this reason, the "Average" setting is the more useful and less concerning of the two.

Figure 3 shows the 30 mile energy graph with the Projected Range set to “Instant”, resulting in a 64 mi projected range. Figure 4 shows the same graph with the Projected Range set to “Average”; the projected range is markedly different.



Figure 4

## After Service or Repair

After service or repair (either body repair or mechanical repair), a typical Energy App graph might show a spike of energy consumption similar to the type of spike seen in Figure 1 due to the need to run systems such as air conditioning or heating during the repair. This might cause a spike in the graph which reflects high energy consumption over a short driving distance. Although this Wh/mi spike has not been caused by aggressive driving, this might be a cause of concern for a customer.

A customer might also see this type of Wh/mi spike resulting from a technician road testing the vehicle to confirm that repairs have been fully completed. These road tests occasionally need to be aggressive depending on the nature of the repair. Viewing the 5 mile Energy App graph, especially with the Projected Range set to “Instant”, might be a cause of concern for a customer.

As with energy graphs resulting from customer behavior, the 15 and 30 mile graphs show the same data using a graph with a longer distance range and with Projected Range set to “Average”, where the spikes and valleys are averaged out over longer distances and are less concerning to the customer.

## What to Tell the Customer

It is important that the customer understands how driving situations affect energy consumption in their vehicle and how the Energy App reflects that consumption. When a customer brings their vehicle in for service or repair (whether body repair or mechanical repair), explaining what the Energy Apps might look like when the vehicle is returned can help ease any concerns they might have.

- The following activities can cause a Wh/mi spike:
  - a. Aggressive driving or driving up a hill
  - b. Trips that include idling or very low speeds (for example: while in traffic)
  - c. Using the HVAC or other onboard systems in the vehicle
  - d. Service or repair-related activities (for example: running the A/C or heater during the repair period, or road testing)

- Using the 15 or 30 mile (or 25 or 50 km) view, as well as the Average Projected Range in the Energy App, gives a more useful picture of the vehicle's energy consumption and expected range.
- Occasional Wh/mi spikes do not result in high total energy consumption, whereas high Wh/mi over prolonged distances does.
- Occasional Wh/mi spikes do not damage the vehicle.

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