Future Vehicles and the Future Interstate

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TOPICS

Electric vehicles

Highly automated vehicles

MODERN ELECTRIC VEHICLES

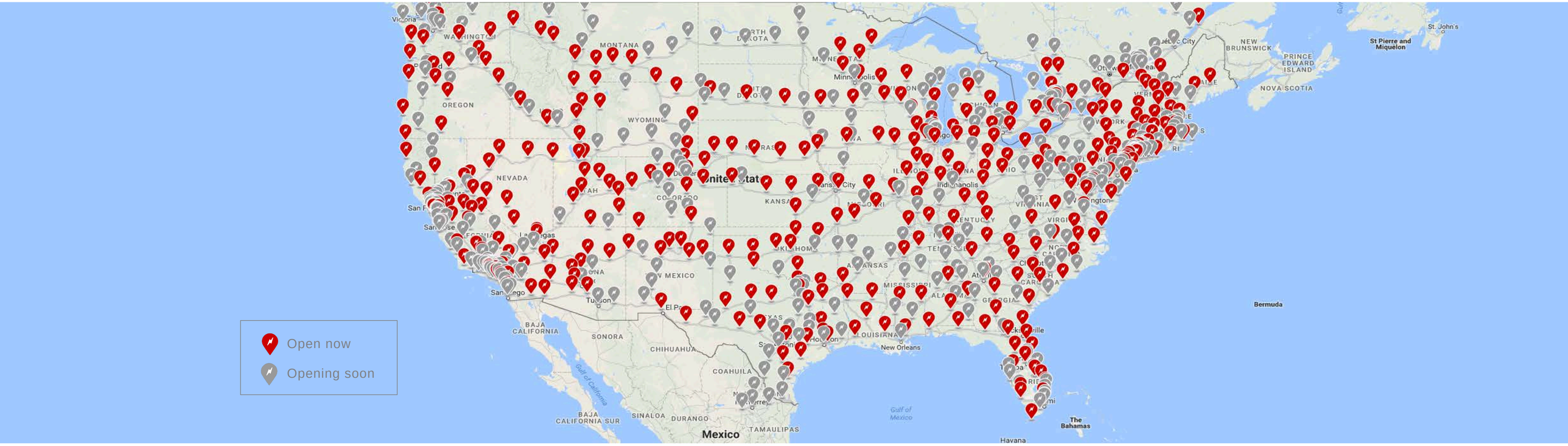
Range: Up to 335 miles
Primary energy source: Home charging

Trips longer than the vehicle’s range require charging on the road

SUPERCHARGING

DC fast charging (120kW): up to 170 miles range in 30 minutes

SUPERCHARGING NETWORK



SCALABILITY OF ON-THE-ROAD CHARGING

Energy consumption

Charging spaces

ENERGY CONSIDERATIONS

Daily vehicle traffic

Vehicle energy usage per mile

Fraction of energy obtained from on-the-road charging

Example Calculations

Assume:

- 30,000 vehicles per day
- 300 Watt-hours per mile
- 1/3 of energy from on-the-road charging

3 MWh per roadway mile per day

CHARGE SPACE CONSIDERATIONS

Average charge rate

Distance between charging stations

Average vs. peak usage

Example Calculations

Assume:

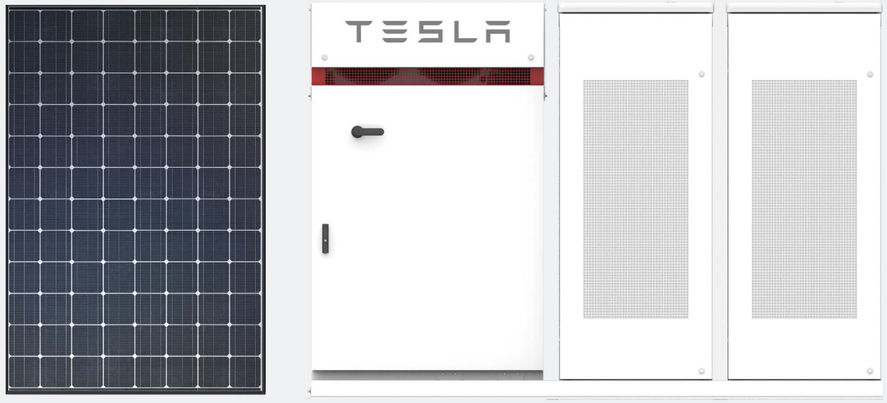
- 3 MWh per roadway mile per day
  (from previous slide)
- Average 100 kW charge rate
- Charging stations 50 miles apart

63 charging spaces in use 24 hours per day

CHARGE SPACE CONSIDERATIONS

SUSTAINABLE ENERGY

Solar Power + Energy Storage



Example Calculations

Assume:

- 3 MWh per roadway mile per day
  (from previous slide)
- Charging stations 50 miles apart
- 3.5 acres solar per GWh/yr [1]

190 acres solar

1. Land-Use Requirements for Solar Power Plants in the United States, NREL, NREL/TP-6A20-56290 (2013)

AUTOMATED VEHICLES

AVs HAVE SIMILAR BENEFITS TO INTERSTATES

Safer | More Enjoyable | Improved Traffic Flow

~~How can interstates facilitate automated vehicles?~~

How can automated vehicles facilitate interstates?

INTERSTATES FOR AUTOMATED VEHICLES

Narrower lanes

Smaller clear zones – Existing clear zones can be converted to AV-only lanes

Fewer lanes needed to carry the same number of vehicles

Do not need to be as straight

INTERSTATES FOR AUTOMATED VEHICLES

Image: Pixar Animation Studios, 2006

Less Expensive to Construct | Reduced Environmental Impact | Can Access New Routes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