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Energy Efficient Mobility Systems: The US DOE’s Research on SMART Mobility – Advanced Fueling Infrastructure Pillar
New Transportation Paradigms

Shared, electric, connected, automated

Source: www.mavendrive.com
Source: www.uber.com
Source: www.reachnow.com
Source: localmotors.com
New Approach to Fuel Selection

- **Automated**
  - 100% of miles for personal use
  - Mix of personal and shared-use miles
  - 100% of miles for shared use

- **Driver**
  - **Traditional Focus**
  - **SMART Mobility Focus**

- **Personal**
- **Shared**
Transportation Energy Impact

What percent of travel will be in shared vehicles?

What percent of travel will be powered by petroleum, electricity, hydrogen, and other fuels?
Ride Hailing in Columbus, OH

Compared travel in 5,000 real personal-use vehicles vs. same travel in simulated shared vehicles

Shared vehicles had:
- **29% higher** DVMT (37 mi)
- **24% lower** average trip distance (5.9 mi)
- Need **2x more** fast chargers
- Use fast chargers **3.5x more**

High fast charger utilization helps EV charger economics
Car Sharing in Seattle, WA

Free-floating model relies on fast charging network for BEVs

Source: www.reachnow.com

BEV parking density in Seattle

Source: INL

Installation cost

Fleet downtime for charging

# of new fast chargers

1 2 3 4 5 6 7 8 9 10
Faster EV Fast Charging

50-kW DC fast charger avg time at charger: 25 min\(^1\)
Gas station avg time at the pump: 6 min\(^2\)

Fast charging may reach 400 kW in the future to charge 100+ kWh batteries in 5 – 15 min

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\(^1\) from 100+ Blink DCFCs nationwide in 2015
\(^2\) from observations at 7 gas stations in urban and corridor locations in CA, ID, NC, SC in 2017
Systems Integration

Energy storage for peak shaving

Hydrogen production for valley filling

Source: www.fuelcellenergy.com

Source: NRG EVgo
Conclusion

• Advanced Fueling Infrastructure Pillar is focused on fuel selection and fueling infrastructure requirements for shared and shared-automated mobility
• First step in predicting future impacts is to understand differences in vehicle use patterns
• Preliminary findings show potential for high utilization of fueling infrastructure by shared mobility vehicles
• Sophisticated, system-wide analysis is required to understand opportunities for alternative fuel vehicles and fueling infrastructure