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**John Smart**

Idaho National Laboratory

# Energy Efficient Mobility Systems: The US DOE's Research on SMART Mobility – Advanced Fueling Infrastructure Pillar

INL/CON-17-43727

# New Transportation Paradigms

Shared, electric, connected, automated


Source: www.mavendrive.com


Source: www.uber.com

Source: www.reachnow.com


Source: localmotors.com

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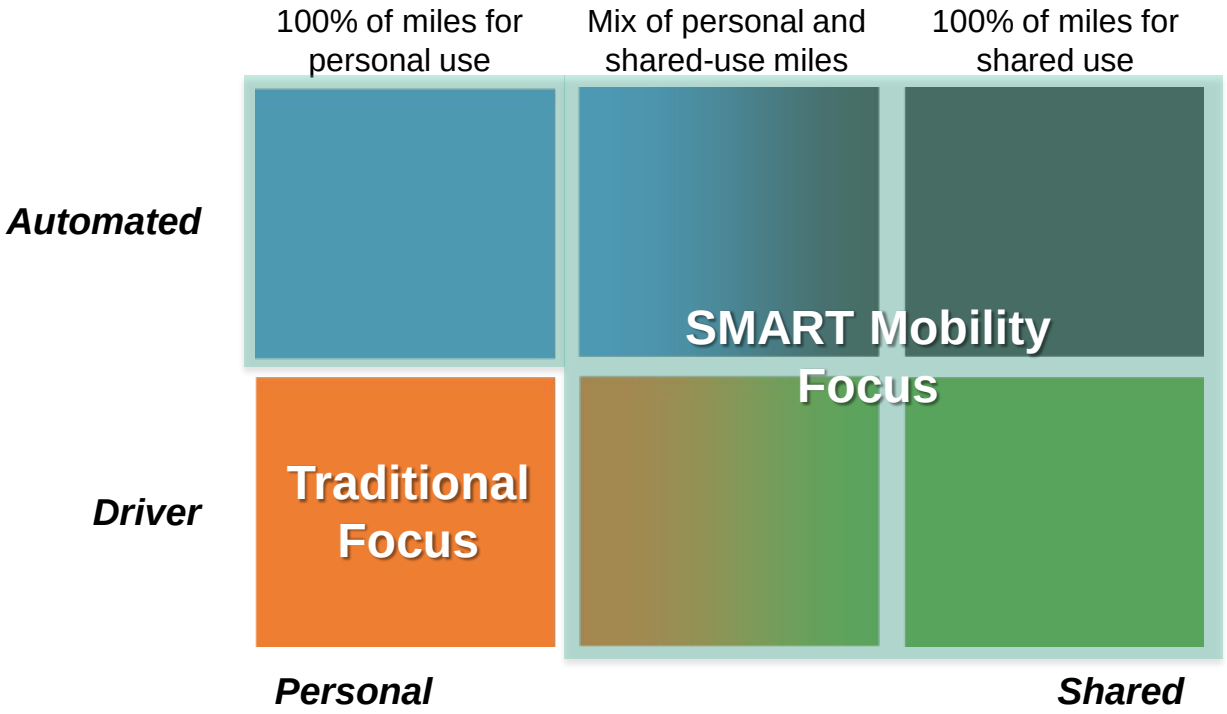
# New Approach to Fuel Selection

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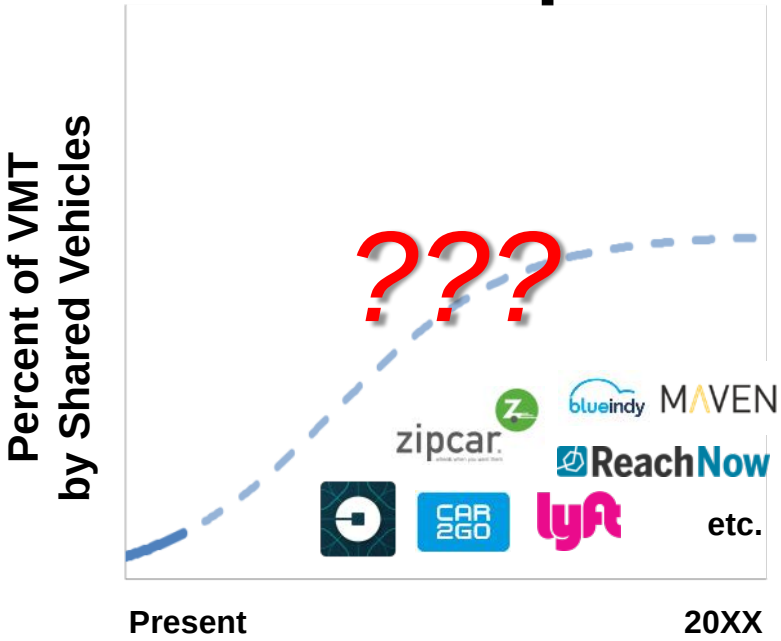
# Transportation Energy Impact




What percent of travel will be in shared vehicles?

What percent of travel will be powered by petroleum, electricity, hydrogen, and other fuels?

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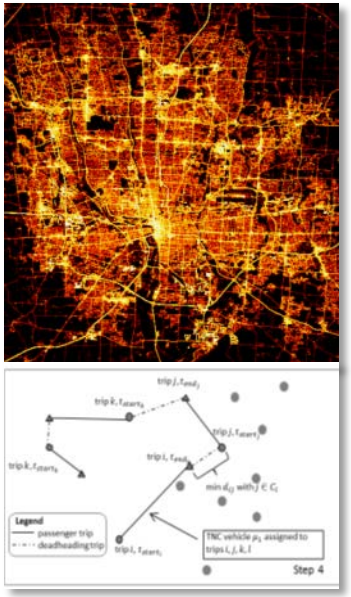
# Ride Hailing in Columbus, OH

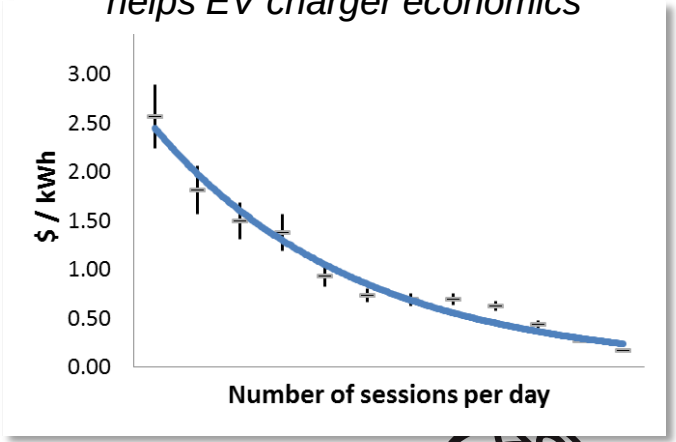


Compared travel in 5,000 real personal-use vehicles vs. same travel in simulated shared vehicles

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*

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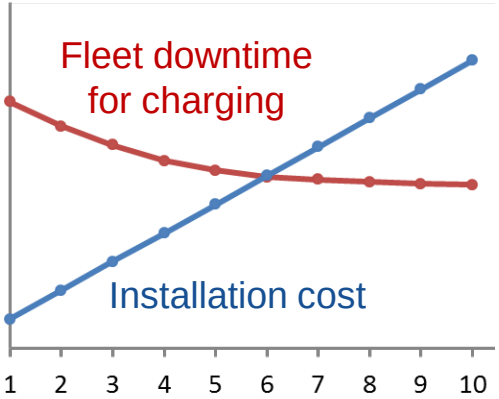
# Car Sharing in Seattle, WA

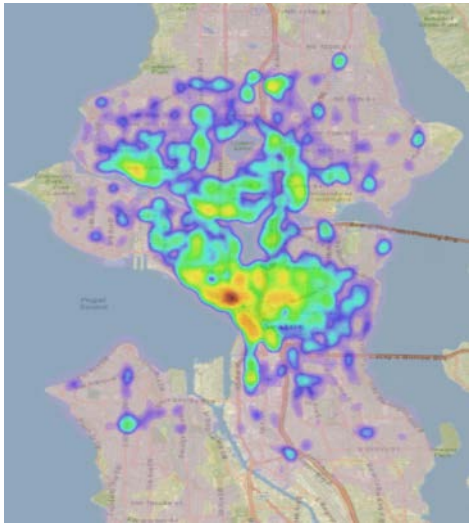
Source: www.reachnow.com

ReachNow

Free-floating model relies on fast charging network for BEVs




*BEV parking density in Seattle*



Source: INL

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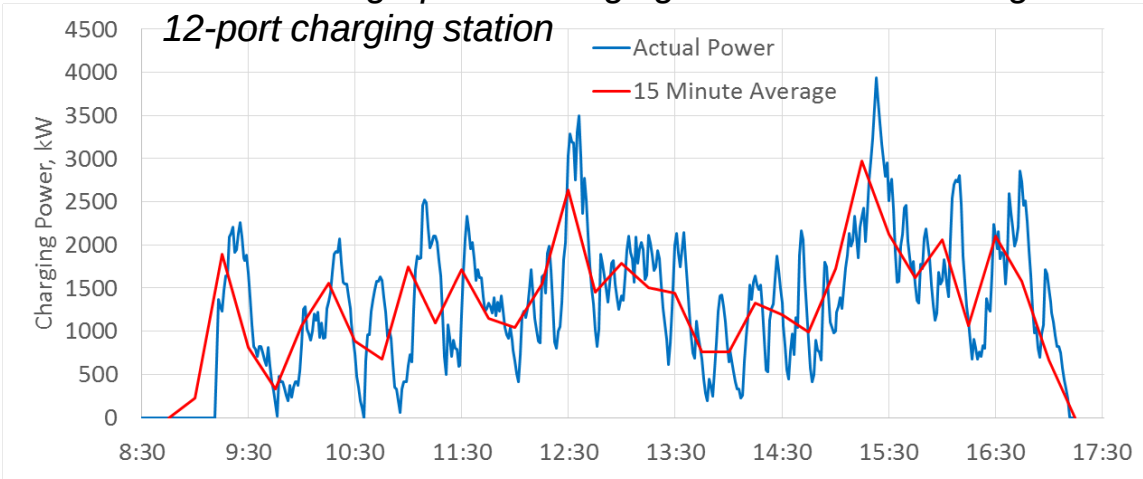
# Faster EV Fast Charging

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

*Simulated high-power charging demand on electric grid at 12-port charging station*

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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

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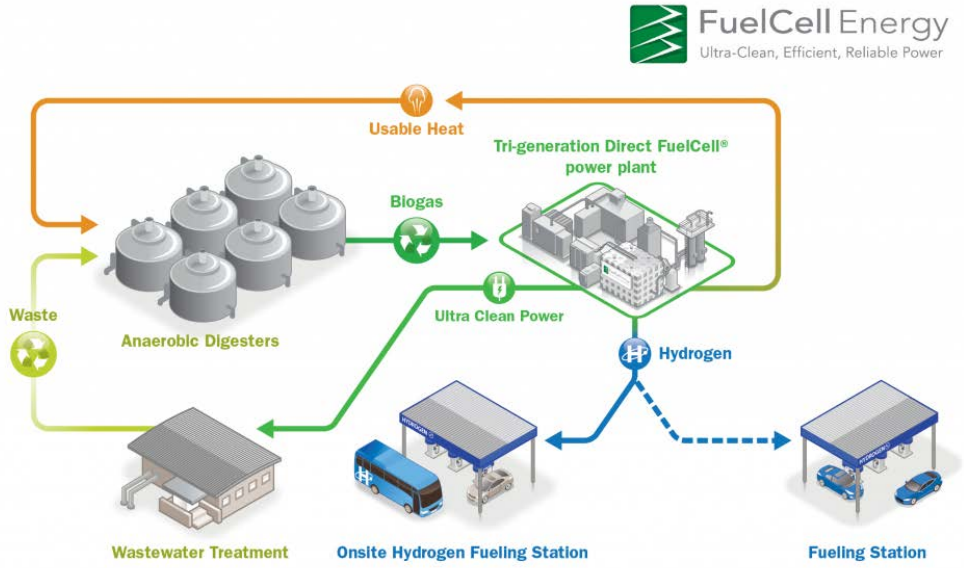
# Systems Integration

## Energy storage for peak shaving


Source: NRG EVgo

## Hydrogen production for valley filling




Source: www.fuelcellenergy.com

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# 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