INL Advanced Transportation Research and DOE SMART Mobility

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INL's Advanced Transportation Activities

- Attacking the key challenges of cost, consumer acceptance & infrastructure for alt-fuel vehicle mass-adoption

Performance & Life Testing

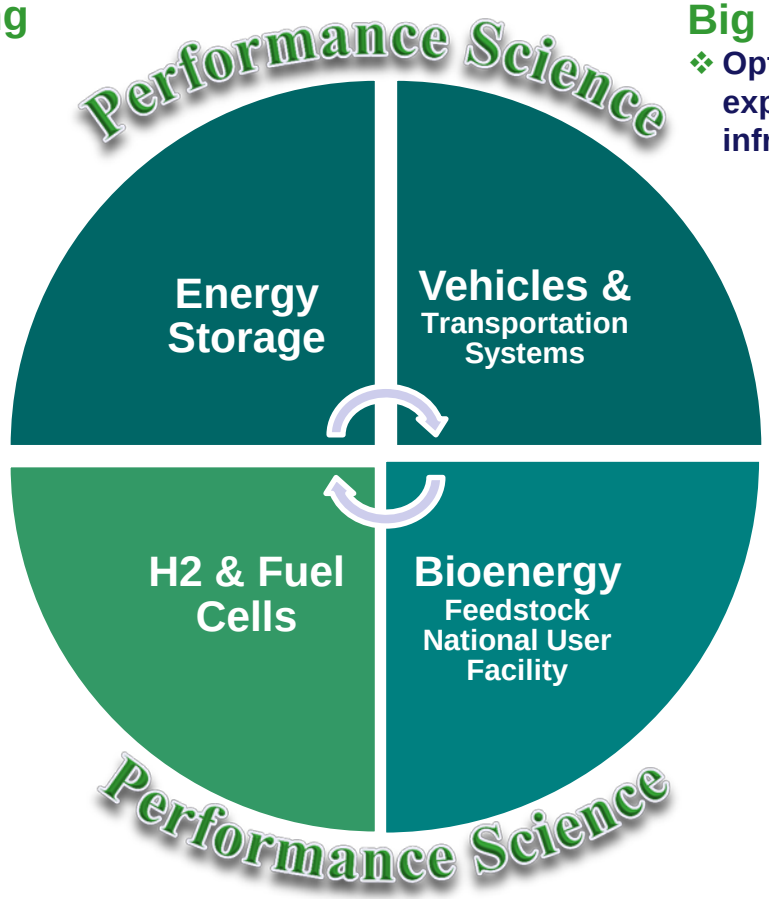
- Cost reduction
- Performance improvements

Big Data

- Optimizing consumer experience w/alt-vehicles & infrastructure

Infrastructure

- Development of global standards



Emulation & Simulation

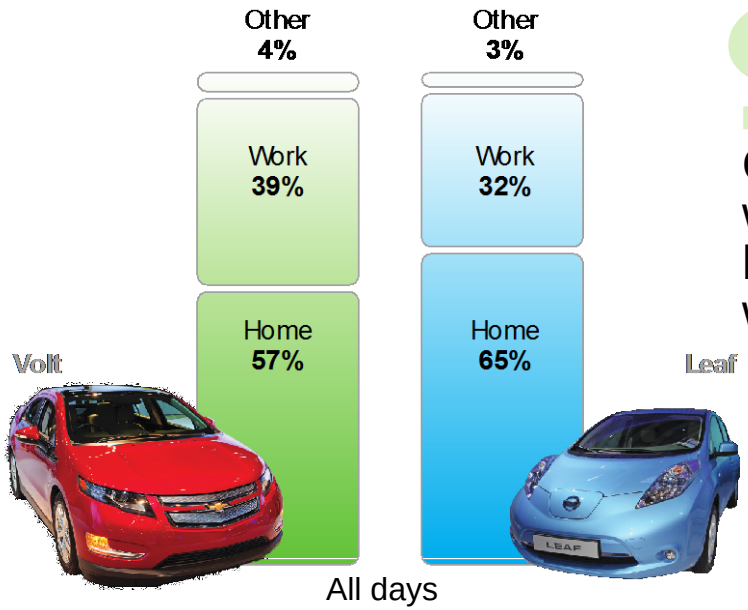
- Added value hydrogen production

Feedstocks

- Cost reduction
- Quality improvement
- Scale-up and integration

Advanced Transportation Research on the System Level

- Deployment of charging infrastructure that meets driver needs
  - Last September, INL released results from the largest collection of light-duty plug-in electric vehicle and charging infrastructure demonstrations in the world



98%

Of charging events were performed at home and work on work days.

Photo courtesy of ChargePoint

Advanced Transportation Research on the System Level

- Integration of PEVs with the electric grid
  - Kicking off 3-year vehicle/grid integration projects as part of DOE's Grid Modernization initiative

Advanced Transportation Research on the System Level

- Understanding the energy impact of connected & autonomous vehicles
  - Two projects began this year to estimate how this quickly emerging field will change driving behavior and resulting energy consumption

Photo courtesy of University of Michigan

USDOT

Advanced Transportation Research on the System Level

- Taking a holistic view to transportation
  - DOE SMART Mobility Big Idea

Systems and
Modeling for
Accelerated
Research in
Transportation

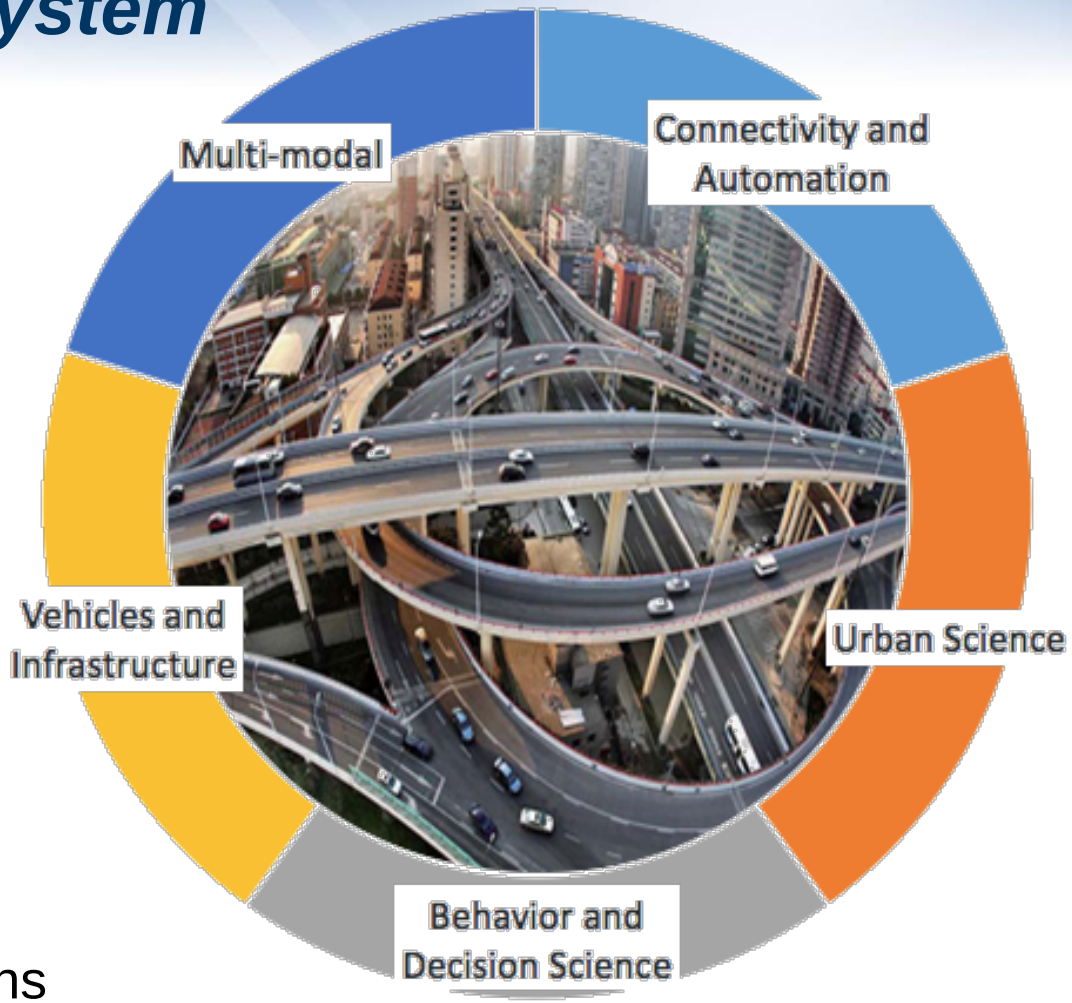
Focus on Energy & Mobility

National Labs
Federal Agencies
State & Local Governments
Universities
Industry

Transportation as a System

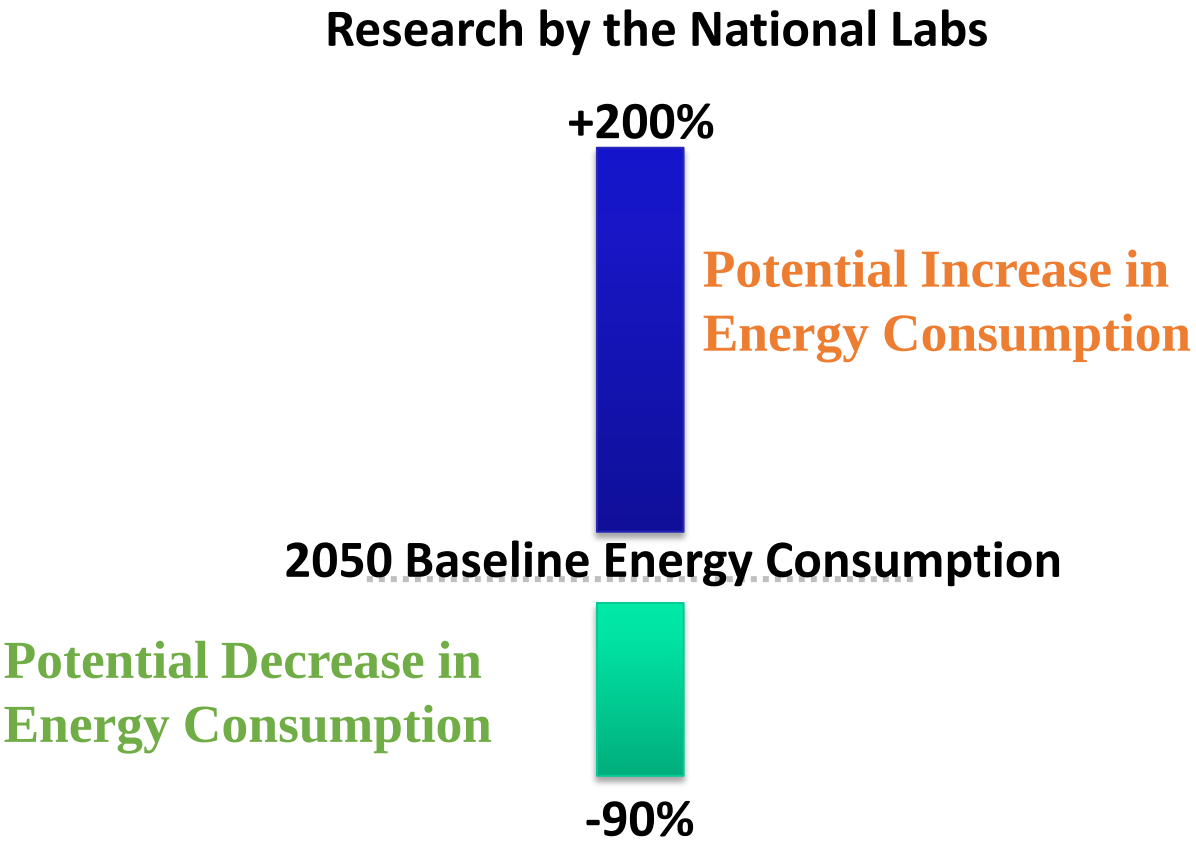
Today:
- Vehicle level focus
- Independent
- Unconnected
- Subject to behaviors & decisions

Tomorrow:
- System level focus
- Connected
- Automated
- In concert
- Across modes
- Managed behaviors & decisions



Exploring the untapped transportation system level efficiencies

Connectivity, Automation and Energy

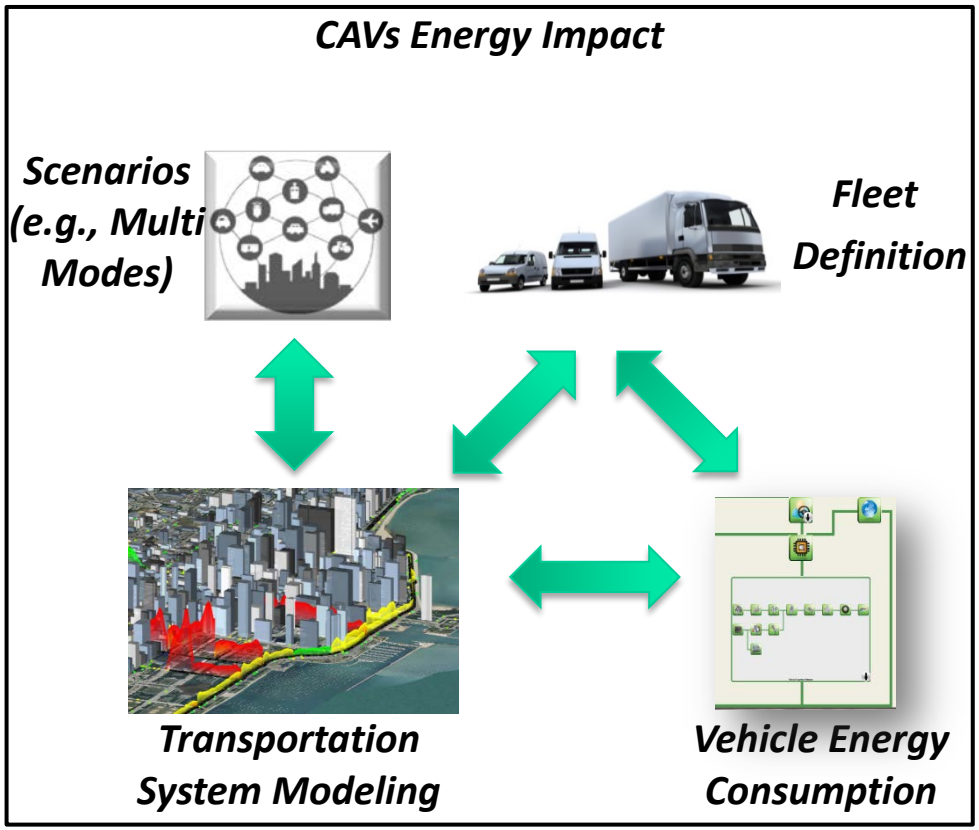


Vast range of energy implications … more research required

Connected & Automated Vehicles (CAVs)

Expected Outcomes:

- Quantify the energy impact of CAVs
  - Multi-scale
  - Multiple scenarios
  - Different technologies
- Identify CAV-enabled opportunities
  - Vehicle electrification
  - Lightweighting
  - Powertrain optimization
  - Vehicle utilization
  - Reduced VMT's
- Inform policy/research on CAV's
  - Maximize sustainability impacts



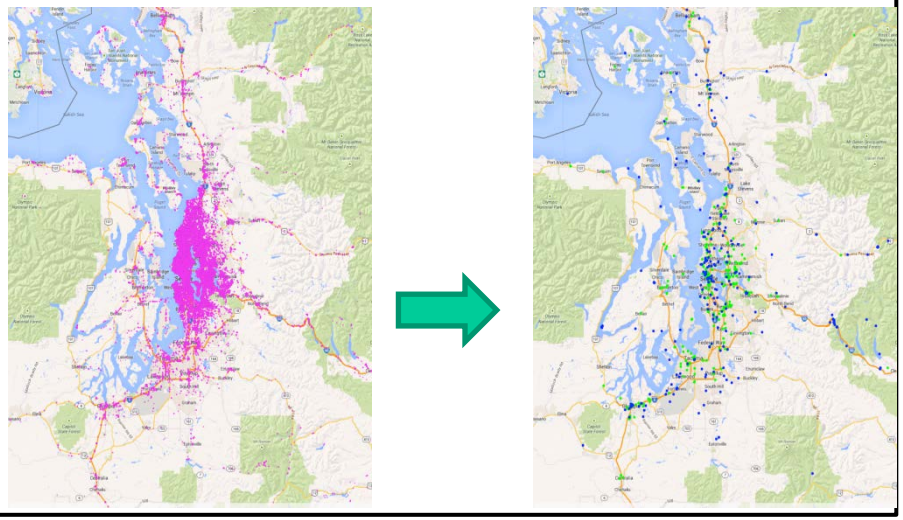
Designing for the nexus of safety, energy, and mobility

Vehicles and Infrastructure

Expected Outcomes:

- Integrated modeling of vehicle and fuel technologies with consumer preferences
- Best leverage public and private resources for EV/AFV fueling infrastructure

Mapping EV Technology with Travel Patterns Reduced EVSE Locations from 18,000+ to 281 in Seattle



Wood, E; Burton, E; and Neubauer, J. (2015). "*Measuring the Benefits of Public Chargers and Improving Infrastructure Deployments Using Advanced Simulation Tools".*

Informed infrastructure investments that drive consumer adoption

Multi-Modal

Expected Outcomes:

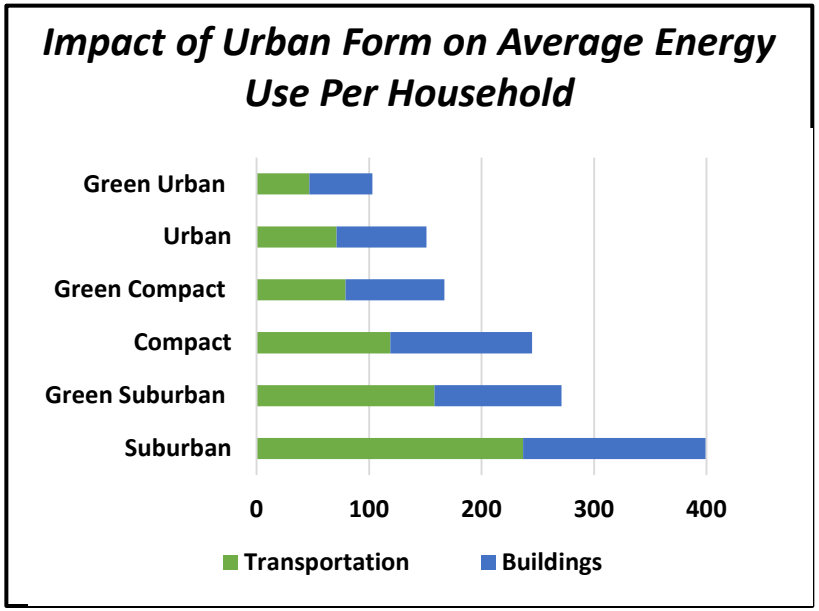
- Quantify potential energy savings and GHG reductions in urban areas
  - Diminished modal barriers
  - Passenger and freight
- Counteract projected growth of freight energy consumption (through 2040)
  - Leveraging of disparate modal energy intensities (i.e. streamline transfers, shift to new modes, etc.)

Energy-efficient, seamless multi-modal transport of people and goods

Urban Sciences

Expected Outcomes:

- New city-scale computational models
  - Calibrated and validated by large transportation data sets
  - Can inform local decisions
- Frameworks and analytical tools
  - Build and run composite models of urban components related to sustainable transportation



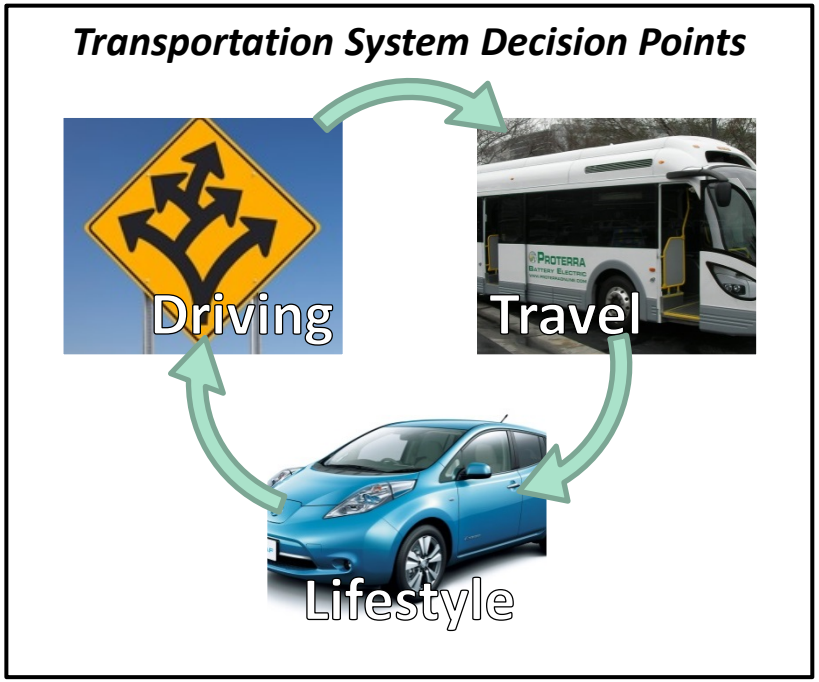
Calthorpe, P. Urbanism in the Age of Climate change. November 2010.

Aligning urban form with sustainable transportation

Behavioral and Decision Science

Expected Outcomes:

- Enhanced vehicle adoption and choice models
  - Inform holistic policy decisions, vehicle R&D, and infrastructure investments
  - Accelerate PEV adoption
- Understanding of individual and market behavior
  - Future technologies, policies, and transportation systems



Technology & policies that anticipate how decisions are really made