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NATIONAL RENEWABLE ENERGY LABORATORY

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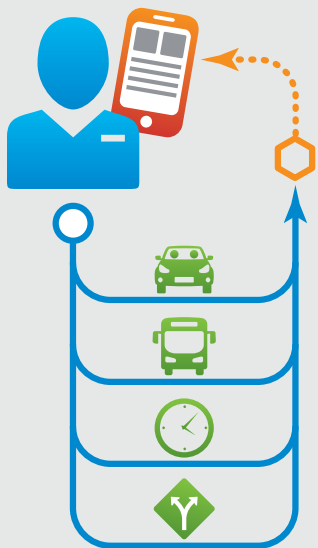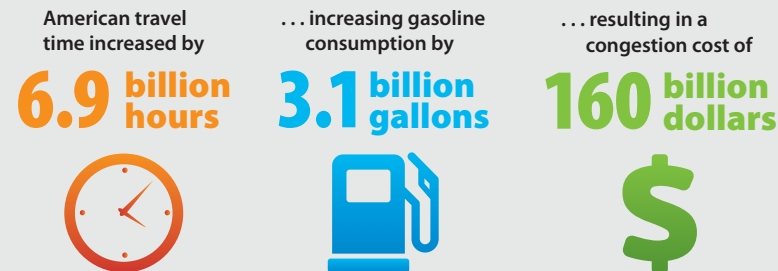
THE CONNECTED TRAVELER

Recent advances in information and vehicle technologies present an unprecedented opportunity to align the objectives of enhanced mobility and energy efficiency.

The Connected Traveler framework seeks to boost the energy efficiency of personal travel and the overall transportation system by maximizing the accuracy of predicted traveler behavior in response to real-time feedback and incentives. It is anticipated that this approach will establish a feedback loop that "learns" traveler preferences and customizes incentives to meet or exceed energy efficiency targets by empowering individual travelers with information needed to make energy-efficient choices and reducing the complexity required to validate transportation system energy savings.

The Connected Traveler framework will provide local transportation authorities and individual travelers with the first tool precise enough to pinpoint decisions that balance quality of service with energy efficiency. The framework will integrate transportation modeling with modern behavior theory to enable significant energy savings. Energy estimation tools will combine GPS data, network data layers, and vehicle simulation software to supply second-by-second estimates of vehicle energy consumption at multiple levels.

MARKET OPPORTUNITY
Increased Mobility Meets Emission Reductions

American travel time increased by
6.9 billion hours

. . . increasing gasoline consumption by
3.1 billion gallons

**. . . resulting in a congestion cost of**
160 billion dollars

Source: Texas A&M Transportation Institute, 2015 Urban Mobility Scorecard

TRANSNET anticipates a broader range of transportation options as our transportation system evolves toward a 'Mobility on Demand' framework. As additional ride/car sharing options proliferate and automation provides additional choices, there are substantial opportunities for system wide energy benefits as well as travel time efficiencies that previously were not realizable.

Starting with the Traveler

The Connected Traveler approach looks at sustainable transportation as a network of travelers, services, and decision points connected by communication technology and decision-making tools—rather than just by vehicles and roads—to significantly reduce related energy consumption and enhance personal mobility.

- Built Environment
- Transport System
- Vehicle
- Traveler
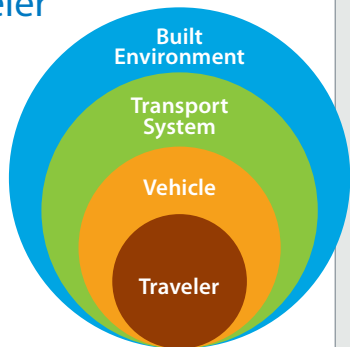
Understanding Traveler Behavior and Decision-Making

Framing and Refining Control Strategies

TRANSNET control strategies will represent the wide range of travel decisions that an individual may make on any given trip. Framing the effects of incentives and traveler choice benefits will be investigated and refined. Additional control strategies will be investigated to allow for additional savings opportunities and incorporation of new mobility opportunities.

Phase I
- Change in Departure Time
- Alternate Routing
- Alternate Destinations

Phase II
- Mode Choice
- Carpooling
- Elimination/ consolidation of Trips

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Validating and Optimizing Traveler Behavior

- Adaptive learning will be applied to refine control strategies based on energy savings potential and likelihood of adoption by traveler.

- Project will leverage Metropia platform to validate incentive effectiveness and hone control strategies.

RESERVE

VALIDATE
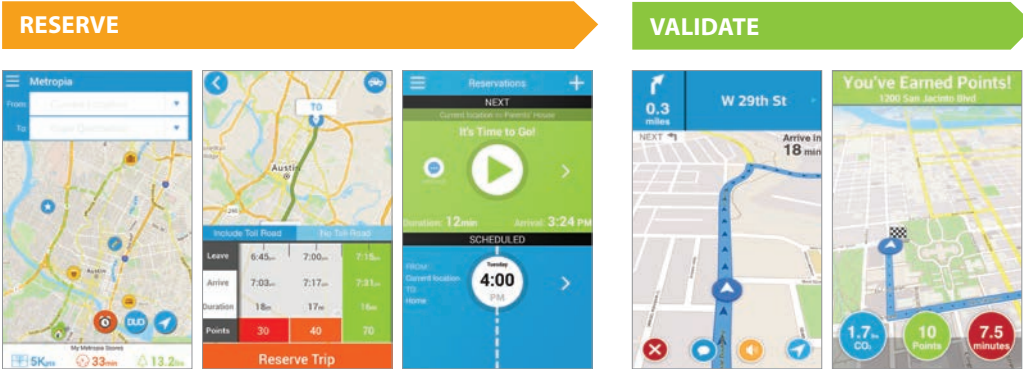
Source: Metropia

Iterating a Baseline for Energy Consumption

Accessing Diverse Transportation Data Sets

NREL's Transportation Secure Data Center (TSDC) houses data from travel surveys and studies conducted using GPS devices. It features millions of data points—second-by-second GPS readings, vehicle characteristics (if applicable), and demographics—for all modes of travel. Already in use to quantify nationwide energy impacts of various technologies, the TSDC will support the evaluation (and potential) of the TRANSNET concept to reduce energy and GHG emissions.

Leveraging Existing Tools to Estimate Energy Impact

- DRIVE
- FASTSim
- Fleet DNA
- TSDC

Project Timeline – Key Milestones

YEAR 1	
Q1	• Tech-to-Market Plan completed • Target city identified • Phase I control architecture development begins
Q4	• Energy estimation for Phase I control strategies completed

YEAR 2	
Q5	• Initial control strategies implemented in Metropia app • Phase II control architecture development begins
Q6	• Sensitivity analysis for control strategies completed
Q7	• Integrate Phase I/II control strategies and incentives into Metropia app • Energy estimation of all control strategies complete • System energy estimation performs within 10% accuracy
Q8	Development of learning algorithm completed

YEAR 3	
Q9	Updated Metropia application deployed to mobile app markets (e.g., iOS app store)
Q10	Project closeout

More Information

For more information on The Connected Traveler, visit us at www.nrel.gov/transportation.

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