# Traveler Response Architecture using Novel Signaling for Network Efficiency in Transportation (TRANSNET)

TRANSNET project teams will design and test new network optimization approaches, coupled with novel transportation and mobility simulations, to improve the energy efficiency of personal transportation. Project teams will each design a system model that dynamically simulates an urban transportation network and its energy use. To construct the system model, project teams will use data that can be measured and obtained from currently available sources. Each project team will also design a control architecture that combines wireless signals with personalized incentives to affect real-time energy use. These innovative teams will then use their model and control architecture to demonstrate the level of energy-efficiency gains that can be accomplished.

## PROJECT DESCRIPTIONS

### Georgia Tech Research Corporation – Atlanta, GA

*Network Performance Monitoring and Distributed Simulation to Improve Transportation Energy Efficiency - $2,981,746*

Researchers at the Georgia Institute of Technology will combine real-time analysis of transportation network data with distributed simulation modeling to provide drivers with information designed to reduce energy consumption as they travel. The team's system model will use a variety of data including: real-time traffic monitoring of the Atlanta metro area provided by regional transportation systems; origin-destination patterns and highway speeds collected from cellular networks and provided through a partnership with AirSage™; and real-time data on speed levels collected from 60,000 volunteers using a smartphone app. The researchers will use pattern recognition algorithms to identify traffic accidents and recurrent congestion and predict how traffic will respond. The team's control architecture will communicate with users via the app, providing suggestions for altering departure times, routes, and/or modes of transport to reduce energy consumption, without increasing the time or cost of the trip. The system will evaluate trips and provide travelers with useful information designed to incentivize energy efficiency.

### Massachusetts Institute of Technology – Cambridge, MA

*Mobility Electronic Market for Optimized Travel (MeMOT) - $3,990,128*

Massachusetts Institute of Technology (MIT) will develop and test a mobility market and information system to incentivize travelers to pursue specific routes, departure times, modes of travel, and vehicle types in order to reduce energy use. MIT researchers will develop a system model using real-world data obtained from existing resources to simulate the transportation network of the greater Boston area. A network simulator created by the team will be used to model a wide set of traveler behaviors, vehicles, and transportation services, and the team will adapt the simulator to dynamically measure energy use as changes to the transportation network and travelers' behavior occur. The system model will be linked with a control architecture that will evaluate energy savings and traveler satisfaction with different incentive structures. The control architecture will present users with personalized options via a smartphone app or a car's on-board computer, and will include a reward points system to incentivize users to adopt energy-efficient travel options.

## National Renewable Energy Laboratory – Golden, CO

*The Connected Traveler: A Framework to Reduce Energy Use in Transportation - $1,576,345*

The National Renewable Energy Laboratory (NREL) and its partners will create a network architecture that approaches sustainable transportation as a dynamic system of travelers and decision points, rather than one of vehicles and roads, in order to create personalized energy-saving opportunities. The project will use currently available transportation data from an urban U.S. city, such as Houston or San Francisco, as well as simulated data based on real-time and demographic information. To incentivize travelers to pursue energy-efficient routes, the control architecture will develop algorithms to understand a traveler's preferences, tailor recommendations to the user, and identify personal incentives that will enable transportation system energy benefits. The Connected Traveler framework will provide local transportation authorities and individual travelers with a tool to identify personal travel decisions that balance quality of service with energy efficiency.

## Palo Alto Research Center – Palo Alto, CA

*Collaborative Optimization and Planning for Transportation Energy Reduction (COPTER) - $2,177,718*

The Palo Alto Research Center (PARC) will develop a system that identifies the energy-efficient routes most likely to be adopted by a traveler. PARC's system model will use currently available data from navigation tools, public transit, and intelligent transportation systems to simulate the Los Angeles transportation network and its energy use. For its control architecture, PARC will leverage its expertise in behavioral modeling and use machine-learning algorithms to predict the near-time travel needs of users, their constraints, and how likely they are to respond to suggested travel options. PARC's technology will also evaluate multiple travelers at the same time, organized by their most likely corridors of travel, in order to create dynamic ride-sharing options. By improving travelers' quality of service, PARC believes no further incentives are needed to encourage users to adopt the suggestions pushed to their smartphone.

## University of Maryland at College Park – College Park, MD

*Integrated, Personalized, Real-Time Traveler Information and Incentive Technology for Optimizing Energy Efficiency in Multimodal Transportation Systems - $3,780,000*

The National Transportation Center at the University of Maryland (UMD) and its partners will develop a technology capable of delivering personalized, real-time travel information to users and incentivizing travelers to adopt more energy-efficient travel plans. The project team will use data from UMD's existing regional integrated transportation information system (RITIS) as well as other available resources to design its system model. This system model will integrate information on individual traveler behavior to simulate the effects of traffic and traveler choices on energy use in the Washington/Baltimore metro area. For its control architecture, UMD researchers will apply behavioral research to predict travelers' responses and identify appropriate, personalized incentives to encourage drivers to alter routes, departure times, and driving styles, or to take mass transit or ride-sharing services. The control architecture will incentivize users with monetary and non-monetary rewards, including social influence strategies that leverage social media to generate competition or rewards among social network users.