National-Level Energy Impacts of Cooperative Adaptive Cruise Control (CACC) Systems

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Research Objectives

- Powertrain Adoption Scenarios
  - Vehicle sales projected using NREL's ADOPT model, based on AEO 2017 fuel prices and different technology improvement trends over time.

Data Inputs

- CACC VMT share on highways and freeways, 3 scenarios of CACC adoption:
  - Low Case
  - Base Case
  - High Case

Methodology

The methodology proposed accounts for vehicle stock evolution, fuel consumption changes due to CACC adoption for different vehicle powertrains, and vehicle miles traveled (VMT) distribution changes as well as impacts of induced demand.

Impact of CACC Penetration Levels on VMT and Fuel Consumption

- National-Level VMT
  - Based on conflation of typical daily VMT from the Highway Performance Monitoring System (HPMS) with typical daily speed profiles from TomTom data.
  - Vehicle sales projected using NREL's ADOPT model, based on AEO 2017 fuel prices and different technology improvement trends over time.

Future Work

- Refine inputs and interactions with other tools
  - VMT transferability from ANL/UIUC (Chicago -> nation)
  - Microsimulation data outputs (trajectory data from local CACC implementation, automated mobility districts microsimulation, etc.)
- Sensitivity analysis to explore impact of several input parameters on the national-level fuel consumption results
- Add additional vehicle and CAV technology scenarios
  - Explore national-level fuel consumption impacts of eco-signal implementation
  - Explore national-level fuel consumption impacts of automated mobility districts and innovative mobility solutions
- Collaboration with other SMART Mobility pillars
  - e.g., Urban Science, Advanced Fueling Infrastructure, etc.