Use of National Household Travel Survey (NHTS) Data in Assessment of Impacts of PHEVs on Greenhouse Gas (GHG) Emissions and Electricity Demand

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According to the Energy Information Administration (EIA), transportation sector was responsible for 70% of petroleum consumption and 33% of GHG emissions in the U.S. in 2009. As a promising technology, Plug-in Hybrid Electric Vehicle (PHEV) has potential to reduce the U.S. transportation sector's dependence on petroleum and possibly reduce the GHG emissions. However, the likely significant growth in PHEV population will pose new challenges for the electric utilities because of the possibility of additional demand at unpredictable times. Assuming most people will charge their PHEVs at the end of their daily travel, the electricity demand and charging time will depend on the daily distance traveled and the ending time of the last trip. In order to assess the impacts of PHEVs on GHG emissions and electricity demand in different regions, estimation of PHEV stock by vehicle type and PHEV's all electric range (AER) is needed. This study employed a methodology of utilizing NHTS data to serve this purpose. The 2009 National Household Travel Survey (NHTS) was analyzed to determine the pattern of daily vehicle usage and the extent of travel that can potentially rely on electricity. The distributions of vehicles by the hour of day when the last vehicle trip ended within nine geographical regions were developed. Assuming PHEVs will be purchased by those who can fully utilize their AER, the travel data in the 2009 NHTS were also used to estimate the share of PHEVs with 10, 20, 30 and 40 mile AER. A market penetration model and the 2010 Annual Energy Outlook (AEO) projection of cars and light trucks were used to estimate the number of PHEVs on road in the future. In addition, 2008 Highway Statistics provides state level registration information by vehicle type. U.S. Census Bureau's projections provide population by age group for each state. Assuming that the state level propensity of ownership of each vehicle type per driving-age group remains the same in the future; the total PHEV stock of each vehicle type was allocated to each area of interest. These data will be used by electric utility demand modelers to assess impacts on generating capacity mix and GHG emissions.