



## **Economic, Environmental and Security Implications of Plug-in Vehicles**

**SUMMARY:** Plug-in hybrid electric vehicles (PHEVs) will likely play an important role in addressing oil dependency and global warming in the transportation sector. PHEVs use battery packs to store energy from the electricity grid and propel the vehicle partially on electricity instead of gasoline. The attached studies identify two important findings:

1. **ONLY AS GREEN AS THE GRID: Achieving substantial reductions in CO<sub>2</sub> emissions from adoption of PHEVs will depend on investments in low-carbon electricity generation.** The current U.S. electricity average mix can power vehicles with fewer full-supply-chain greenhouse gas (GHG) emissions per mile than gasoline. But PHEVs charged with electricity produced by coal without carbon capture and sequestration can have higher life cycle GHG emissions than gasoline.
2. **SMALL IS BEAUTIFUL: PHEVs with small battery packs will likely be most cost effective for the near future and play an important role in achieving the administration's target of 1 million PHEVs on the road by 2015.** Policy promoting small-capacity PHEVs for urban drivers with short commutes may be an opportunity to jump-start market-driven sustainable adoption of PHEV technology.
  - *Batteries are expensive and heavy.* More batteries allow drivers to travel greater distances on electricity alone and reduce oil consumption. But a heavy battery pack sized for 60 miles of electric-only travel could require 10% more electricity per mile in electric-mode than a pack sized for 7 miles of electric-only travel.
  - *For urban drivers who can charge frequently* – every 20 miles or less – PHEVs with small battery packs have the lowest lifetime vehicle cost, gasoline consumption and greenhouse gas emissions. Nearly 50% of U.S. passenger miles are traveled by vehicles driving less than 20 miles per day, so economic, environmental and oil independence objectives are well-aligned for this subset of drivers.
  - *For drivers who cannot charge frequently,* PHEVs with large battery packs reduce oil consumption and greenhouse gas emissions, and they can help shift air pollution away from population centers. But they are more costly without incentives, even in optimistic scenarios. Increased availability of charging infrastructure could increase the number of drivers who can charge frequently, but policy, pricing and planning should be employed to minimize negative impacts on the electricity grid.

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