

Reducing US Oil Consumption With Advanced Plug-in Hybrid Electric Vehicles (PHEVs)

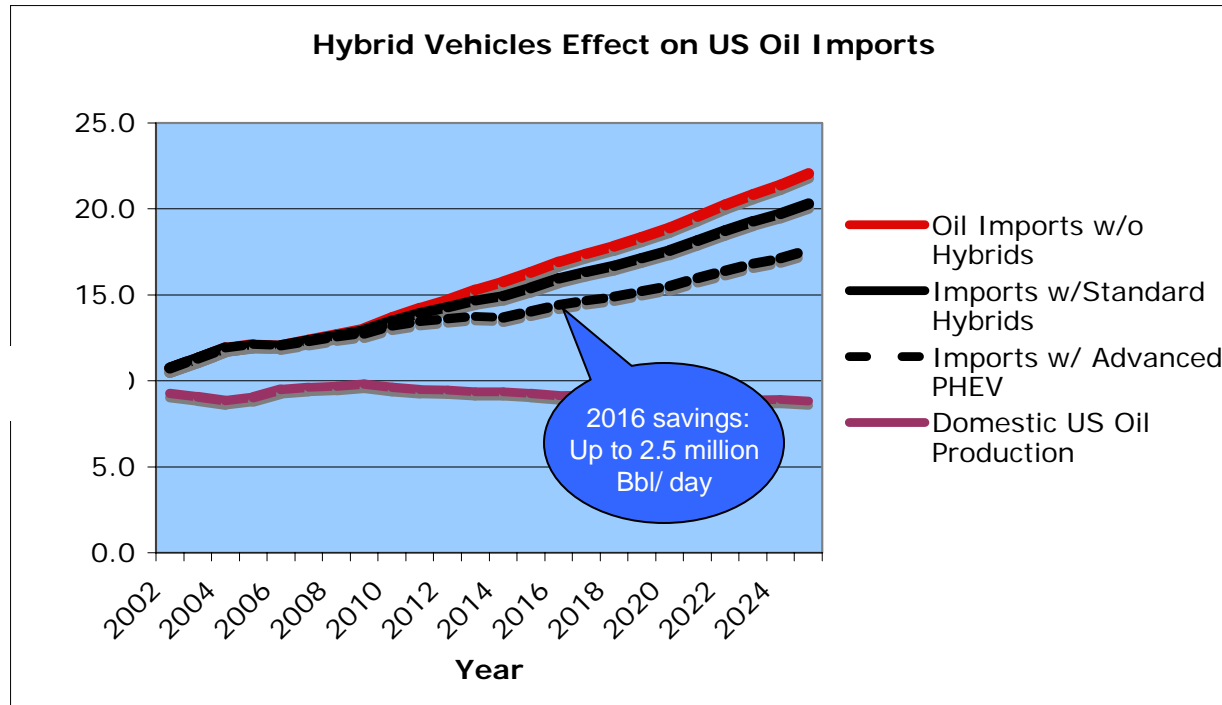
Analysis by **AFS Trinity Power
Corporation**

June 2006

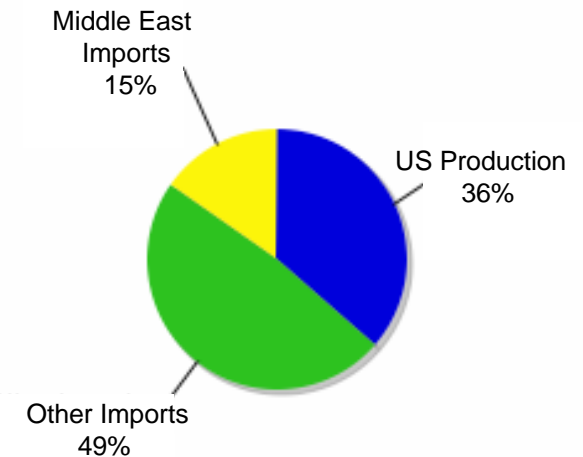
Oil Model: Base Case

30% hybrid market penetration in 2016

US Oil Consumption avg growth rate: 1.90% EIA High Growth Case
Hybrid Vehicle Penetration in 2016: 30.00% Low hybrid adoption
Hybrid Type: Std-2005 Conv. Hybrids 2005



2016 US Oil Sources



- The US is currently on track for standard hybrid technology to account for 30% of all vehicles by 2016 based on present market trends (red line).
- Our base case assumes oil prices will remain stable (growing slowly) suggesting modest hybrid and Advanced Plug-in Hybrid (PHEV) penetration of global auto markets.

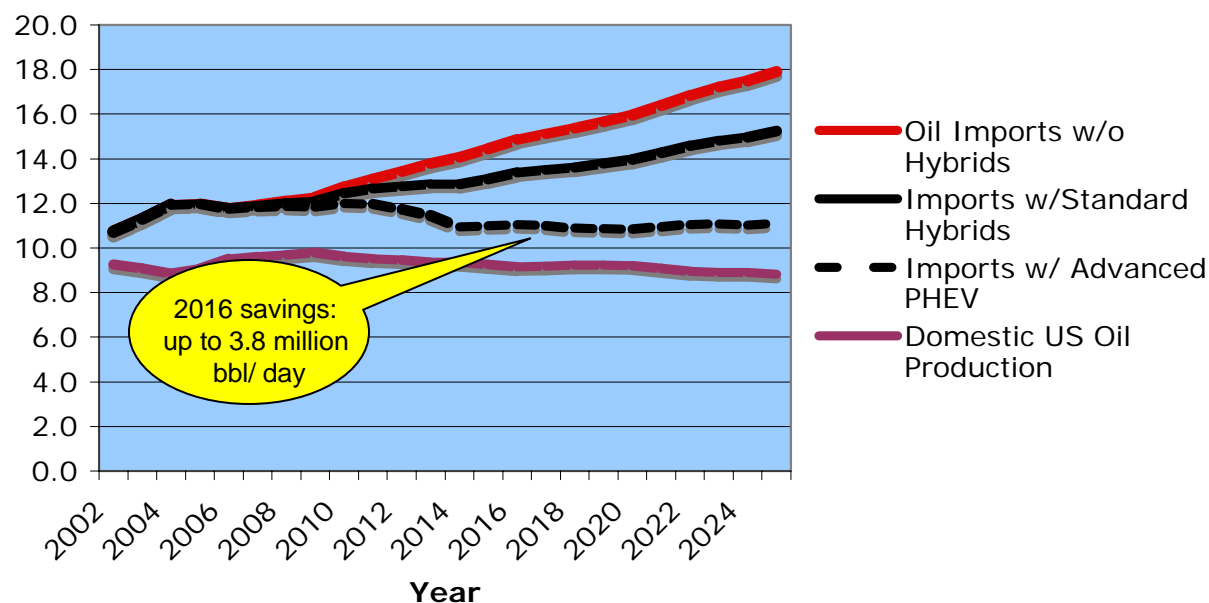
Note: The Advanced PHEV (dotted line above) does not require changes in infrastructure.

Oil Model: Moderate Case

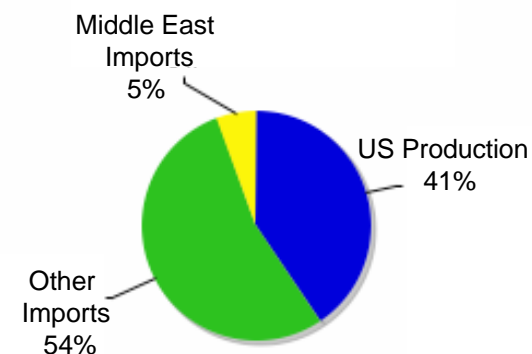
45% hybrid market penetration in 2016

US Oil Consumption avg growth rate: 1.20% EIA Low Growth Case
 Hybrid Vehicle Penetration in 2016: 45.00% Med hybrid adoption
 Hybrid Type: Std-2005 Conv. Hybrids 2005

Hybrid Vehicles Effect on US Oil Imports



2016 US Oil Sources



- This case assumes oil prices grow enough to cut growth in oil consumption from 1.9% per year to 1.2% per year. Hybrid vehicle penetration is 45% in 2016.
- US oil imports remain nearly flat with moderate adoption of conventional hybrids, but would actually drop with moderate rate of adoption of Advanced PHEV technology.

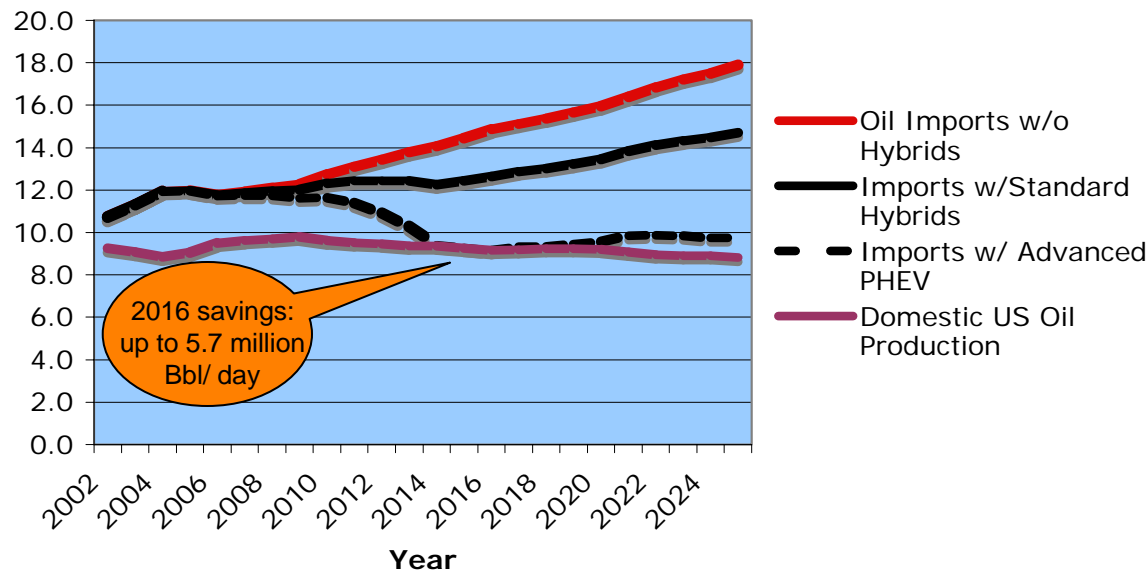
Note: Advanced PHEV technology (dotted line above), with no changes in infrastructure, would produce oil savings in 2016 of 3.8 Million bbl/day.

Oil Model: High Case

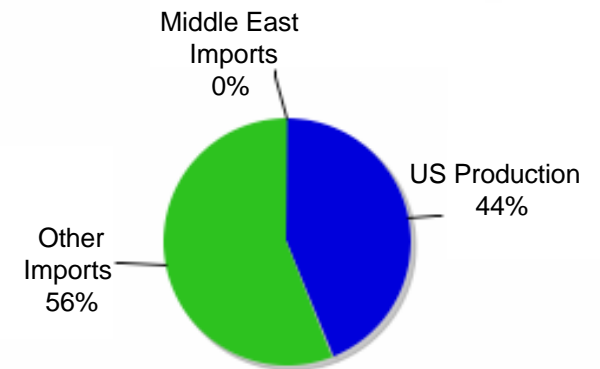
68% hybrid market penetration in 2016

US Oil Consumption avg growth rate:	1.20%	EIA Low Growth Case
Hybrid Vehicle Penetration in 2016:	68.00%	Hi hybrid adoption
Hybrid Type:	Std-2007	Conv. Hybrids 2007

Hybrid Vehicles Effect on US Oil Imports



2016 US Oil Sources



- Our high case assumes (1) oil prices grow enough to cut growth in oil consumption from 1.9% per year to 1.2% per year and (2) Hybrid vehicle prices are low enough to generate high penetration of 68% by 2016.
- US oil imports could drop below 2005 levels and stay there with high rates of adoption of Advanced PHEV technology.

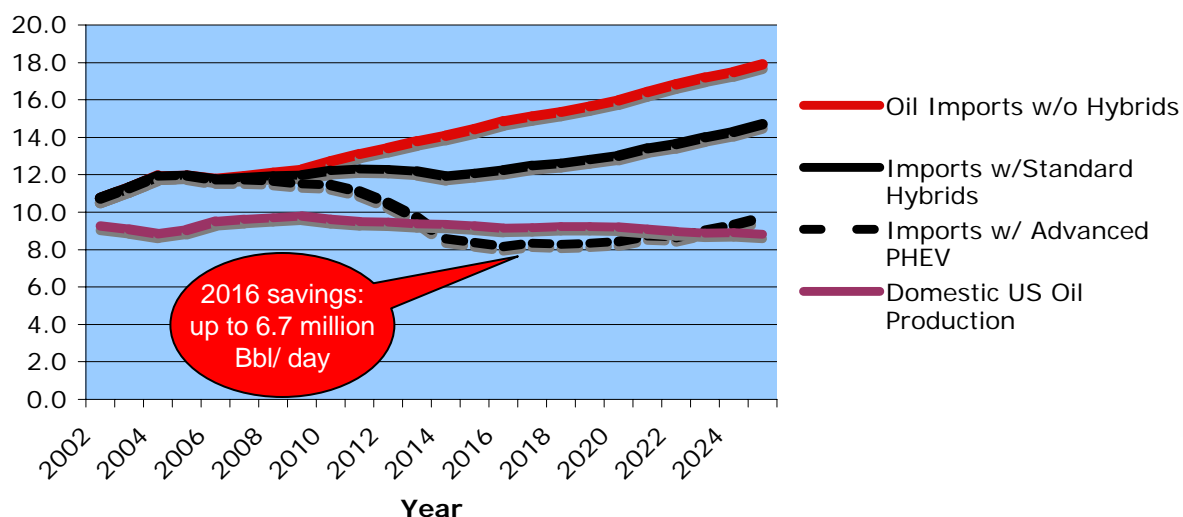
Note: Advanced PHEVs (dotted line above), with no infrastructure changes, would produce oil savings in 2016 of 5.7 Million bbl/day, more than enough to eliminate Middle East Oil imports, if that were necessary.

Oil Model: Hypothetical **Maximum** Case

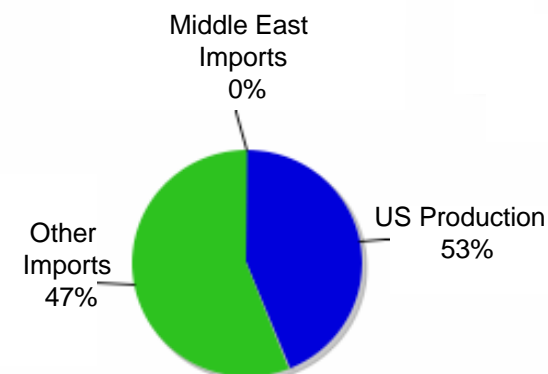
80% hybrid market penetration in 2016

US Oil Consumption avg growth rate: 1.20% EIA Low Growth Case
Hybrid Vehicle Penetration in 2016: 80.00% BAH Projection
Hybrid Type: A-PHEV Advanced PHEV

Hybrid Vehicles Effect on US Oil Imports



2016 US Oil Sources



- Our hypothetical maximum case assumes (1) oil prices will grow enough to cut growth in oil use from 1.9% per year to 1.2% per year and (2) Hybrid vehicle prices would be low enough to generate very high penetration of 80% by 2016.
- US oil imports could drop to three quarters of 2005 levels with highest projected rate of adoption of Advanced PHEV technology.

Note: Advanced PHEV technology (dotted line above), with no changes in infrastructure, would produce oil savings in 2016 of 6.7 Million bbl/day, more than enough to eliminate the need for Middle East Oil Imports.

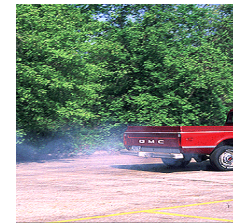
Implications of Saving 6.7 Million Bbl/ day by 2016*

It would

- *Eliminate* U.S. Need for Middle East Oil (4.5M Bbl/d)
 - Cut U.S. Highway Vehicle Oil Use *in Half*
 - Cut all U.S. Oil Imports *by 41%*
 - Cut Total U.S. Oil Use *by One Third*
- Cut U.S. Highway Vehicle CO₂ Emissions *in Half*



Photo credit: corbisimages.com



*Note: These savings are based on Booz Allen Hamilton's maximum forecast (which BAH made in 2004 when oil was at \$35/bbl) of 80% penetration of hybrids in 2016 (this assumes no changes in infrastructure).

Advanced PHEV Technology Will Enable Other Oil Conservation Measures

It supplements grid power
during peak periods

It makes future fuel cell
adoption more practical



It burns less fuel and thereby makes
alternative fuels more affordable

Appendix

Transportation Oil Math-1

oil consumption = vehicles X oil used per vehicle

oil used per vehicle = vehicle mpg X miles driven

If you want to reduce vehicle-related oil consumption you can:

- reduce the number of vehicles
- reduce the oil used per vehicle

If you want to reduce the oil used per vehicle you can:

- improve MPG
- Use fuels other than petroleum
- reduce miles driven
- All of the above