Perspectives on Energy Security and Transportation
The Intersection of American Economic and Foreign Policy Challenges
The U.S. is at a pivotal moment in energy policy. Oil prices are being rapidly driven up by market dynamics and geopolitical factors we do not control.

Oil price volatility is having a strong detrimental impact on the economy.

Energy Security is Again Front and Center

Volatile oil prices and geopolitical instability in oil-producing regions are moving energy security back to the forefront of the political dialogue.
The Economic Recovery is off the Tracks

High oil prices experienced throughout the first half of 2011 have derailed the recovery. Economic growth is paltry as consumer spending plummets.

› The oil intensity of the U.S. economy is about half of the 1974 level.

› However, while we may be more resilient to high oil prices, spikes are occurring more frequently at high levels. The more important data point is oil spending as a share of GDP.

› At between 4 and 5 percent of GDP, oil spending is again reaching levels typically associated with recession.

Global Oil Market Dynamics—Demand

The United States is the world’s largest oil consumer, accounting for one-fifth of global oil demand. The majority—70 percent—is used in transport.

At 19.1 million barrels per day, the U.S. was the world’s largest consumer of petroleum in 2010, using about three times as much as China. Between 2005 and 2009, U.S. oil demand averaged 20.1 million barrels per day.

The U.S. transport sector alone consumes more oil than any national economy in the world—13.0 mbd.

TOP WORLD OIL CONSUMERS, 2010

- U.S.
- China
- Japan
- India
- Russia
- Saudi Arabia
- Brazil
- Germany
- South Korea
- Canada
- Mexico
- Iran

Million Barrels per Day

Source: BP, plc., Statistical Review of World Energy 2011
Global Oil Market Dynamics—Demand

Oil consumption within the world’s most developed economies has peaked. Emerging markets account for 100 percent of demand growth going forward.

World oil demand is set to grow by about 22 percent over the next 20 years.

One hundred percent of that growth is in China, India, and other emerging economies. And 97 percent of it is in transportation.

Emerging markets are expected to account for 100 percent of future oil demand growth. This is largely driven by the transportation sector.

- In 2009, China surpassed the United States to become the largest auto market in the world.
- As vehicle sales increase exponentially, the number of cars on the road in China is soaring.

Source: Department of Energy, Office of Energy Efficiency and Renewable Energy

The United States is the world’s third largest producer of oil. However, domestic production has fallen sharply since its peak in 1970.

After decades of decline, U.S. field production of crude oil and natural gas liquids was up from 6.7 mbd in 2008 to 7.2 mbd in 2009. Production increased again in 2010 to 7.5 mbd.

Still, this level marks a sharp decline from the 1970 level of 11.3 mbd. Well productivity is also down from 18.1 barrels per day per well in 1970 to 10.1 barrels per day in 2009.

Source: BP, plc., Statistical Review of World Energy 2011
Global Oil Market Dynamics—Supply

Conventional oil production outside of OPEC is reaching a plateau. Increases in regions like North America are being offset elsewhere.

Going forward, most mainstream scenarios rely on increases in OPEC supplies to meet rising demand.

Two key questions illustrate the downside risk to growth in future liquid supplies:

1. Who will have access to low-cost conventional reserves?
2. What will reserves replacement cost for IOCs?

Source: IEA
Global Resource Base

Oil prices are set in an open market, but that does not mean there is a free market for oil supply.

More than 90 percent of global proved oil reserves are held by national oil companies (NOCs) that are either partially or fully controlled by governments.

While a handful of NOCs operate like private firms, many function essentially as a branch of the central government, depositing oil revenues in the treasury from which they are diverted to social programs instead of being reinvested in new projects.

Petroleum fuels account for approximately 40 percent of U.S. primary energy demand, more than any other fuel.

- Approximately 70 percent of U.S. oil consumption occurs in the transportation sector, with 40 percent in light-duty vehicles.
- Transportation is 94 percent reliant on oil-based fuel for energy, with no scaled substitutes.

**U.S. PRIMARY ENERGY DEMAND, 2009**

- 39% Oil
- 27% Natural Gas
- 23% Coal
- 9% Nuclear Energy
- 3% Hydro electric

**PETROLEUM FUEL DEMAND BY SECTOR, 2009**

- 20% Autos
- 24% Light-trucks
- 28% Other Transport
- 22% Industrial
- 2% Commercial
- 4% Residential
- 1% Electric Power

Source: BP, plc., Statistical Review of World Energy 2010
U.S. Oil Dependence: Economic Costs

On a month-to-month basis, petroleum imports have typically accounted for about half of the total U.S. trade deficit since the end of 2007.

The portion of the trade deficit driven by petroleum imports generally exceeds the imbalance we run in other goods and services with trade partners like China, NAFTA, and the EU.

A high trade deficit exerts downward pressure on the dollar, which in turn may be helping to prop up oil prices, resulting in a vicious circle.

Source: U.S. Census Bureau, Office of Foreign Trade Statistics

In addition to staggering wealth transfers, high and volatile oil prices generate significant uncertainty for households and businesses. The result is lost economic opportunity.

Source: DOE, EERE; ORNL
In 2001, the average household spent $1,517 on gasoline. By 2008, rising oil prices elevated average gasoline prices to $3.25/gal, and household fuel spending averaged $3,493—an increase of $1,977 from 2001.

The cumulative impact of changes to the tax code over the same period increased household income by $1,900. Thus, rising fuels prices acted as a tax increase that fully offset the benefit of tax cuts.

Source: DOE, EIA, Annual Energy Review 2009; ORNL, Transportation Energy Data Book; SAFE Analysis
Energy Policy Framework

Energy reform will require long-term investment in alternative technology and infrastructure. In the meantime, existing systems can be more efficient.

**Short Term (0–5 Years)**
Meaningful change infeasible; however, investment and policy choices made today establish a framework for the future.

**Medium Term (5–20 Years)**
Meaningful risk mitigation possible if policy choices made in the short-term promote aggressive implementation of proven solutions, including strong fuel-economy standards, increased access to conventional domestic energy resources, and responsible deployment of alternatives; RD&D must be ongoing to establish a technological foundation for the future.

**Long Term (20+ Years)**
The tipping point: sustained (short and medium term) investments in infrastructure, technology, and innovation pay off, creating a post-oil transportation sector through widespread electrification.
Electrification Overview

Electrification of transportation is the best solution for sharply reducing U.S. oil dependence.

› Electricity is generated from a diverse portfolio of domestic fuels.
› Electricity prices are stable.
› The power sector has substantial spare capacity.
› The network of infrastructure already exists.

U.S. ELECTRICITY GENERATION BY FUEL, 2010

49% COAL
22% NUCLEAR
17% NATURAL GAS
11% RENEWABLES
1% PETROLEUM

U.S. ELECTRICITY DEMAND BY SECTOR, 2010

38% RESIDENTIAL
37% COMMERCIAL/OTHER
24% INDUSTRIAL
1% TRANSPORTATION

Source: EIA, AEO 2010
Electrification Overview: Power Sector

A 2007 DOE study found that existing unused electrical generating capacity could power 158 million vehicles for up to 33 miles of driving per day.

- **PJM Interconnect:** The 61 gWh of excess available capacity in a typical summer week could charge 62 million Nissan Leafs each night.

- Petroleum prices have exhibited significant volatility for the past several years. In contrast, retail electricity prices have been generally stable.
Electrification Overview: Challenges

While electrification has promise as an energy strategy, it can only succeed if GEVs are attractive to the mass market and can integrate into the grid.

› Batteries and Vehicles
  With the advent of lithium-ion battery technology, the largest obstacle to widespread consumer adoption of these vehicles will be cost, though performance and raw material supply chains are also important to consider. Need innovative business models, manufacturing scale in gen-1/2, and R&D for Gen-3.

› Charging Infrastructure
  A profitable business model for public charging points has not been reliably demonstrated, and we do not yet know how much public charging will be needed.

› Electric Power Sector Interface
  While “smart” charging will make electric vehicles an asset to the grid, “dumb” charging will make them a liability.

› Consumer Acceptance
  GEVs represent a significant shift in technology. In order to change mainstream consumer attitudes, GEVs must offer a compelling alternative to conventional IC engines on either cost or performance grounds.
Key Policy: Deployment Communities

To overcome these challenges, lawmakers should initiate an ambitious program to support mass deployment in a limited number of communities.

FEATURES AND ADVANTAGES OF DEPLOYMENT COMMUNITY APPROACH

- Focusing on targeted regional deployment accomplishes at least three objectives:
  1. Demonstrate Proof of Concept for Consumers
  2. Facilitate Learning by Doing
  3. Maximize Investment Payoff

- Grid-enabled vehicles require a network built on public-private coordination in order to thrive. Technology promotion has to be about more than throwing money at a problem.

- The deployment community approach recognizes that a widespread national rollout without careful planning will reduce the likelihood that GEVs can penetrate the mass market, instead being relegated to niche market status (as has happened with hybrid vehicles, 1.6 million of which have been sold over the past 11 years out of a light-duty fleet of 250 million vehicles).
Securing America’s Future Energy (SAFE) is an action-oriented, nonpartisan organization founded to deliver an urgent call to action: our nation’s dependence on oil puts our economy and national security at risk. Since its founding in 2004, SAFE has enlisted the support of prominent business and retired senior military leaders and employed innovative strategies addressing business and technology, politics and advocacy, and public education and media to help reshape the debate on energy policy.