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Committee on Energy and Natural Resources
United States Senate

"Comments and Observations on the Topic of U.S. Energy Independence"

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A Statement by

FRANK VERRASTRO
Director and Senior Fellow, Energy Program

CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES, 1800 K STREET, NW, WASHINGTON, DC 20006
TELEPHONE: (202) 887-0200; FACSIMILE: (202) 775-3199 WWW.CSIS.ORG

Mr. Chairman, Members of the Committee, I appreciate the opportunity to appear before you today to discuss the broad ranging topic of America's energy independence. I currently serve as Energy Program Director and Senior Fellow at the Center for Strategic and International Studies (CSIS), but my professional background also includes a variety of energy policy positions in the White House, and the Departments of Interior and Energy, as well as senior executive positions dealing with both upstream and downstream issues in the energy sector, first as Director of Refinery Policy and Crude Oil Planning for TOSCO Corporation, and more recently as a Senior Vice President at Pennzoil Company.

Given the composition of this morning's panel, the bulk of my remarks will be directed at the issue of oil import dependence and prospects for replacing and reducing petroleum demand for transportation fuels, but more generally I will also touch on the U.S. energy balance and proffer the view that we would be well advised to pursue a broader array of options for ensuring that our energy needs are met. These options should include:

- stimulating additional supplies of conventional and traditionally non-conventional fuel sources, including renewables and alternatives;
- improving energy efficiency and conservation efforts;
- promoting research and technology development, and where applicable, accelerating the deployment of useful technologies;
- addressing infrastructure needs to facilitate the delivery of fuel choices;
- pursuing the development of a more comprehensive energy strategy that recognizes the potential for simultaneously introducing transformational policies while managing the realities of our existing energy interdependence in a global energy market, and
- performing the above activities consistent with current investment and market practices.

I would also add that focusing on Energy Independence, while politically attractive, may in fact be a misguided quest and that we would be better served by mapping out a strategy for managing the transition to a different energy future as our current path is clearly unsustainable.

Our Evolving Energy World

Mr. Chairman, the events of the past few years have served to refocus attention on the critical role which energy plays in our national and global economies. Rising global oil demand, concern over the adequacy, reliability, and pricing of energy supplies, the environmental implications of increased use of fossil fuels, the cost of those supplies for developed and developing economies alike, trade and capital flows, and global geopolitics are issues that preoccupy business and governments around the globe.

Faced with these evident realities, concern over the continued ability of this nation to secure energy supplies from an increasing list of inaccessible, high risk or less than reliable parts of the world has prompted policymakers to once again raise the issues of both the desirability and achievability of energy independence.

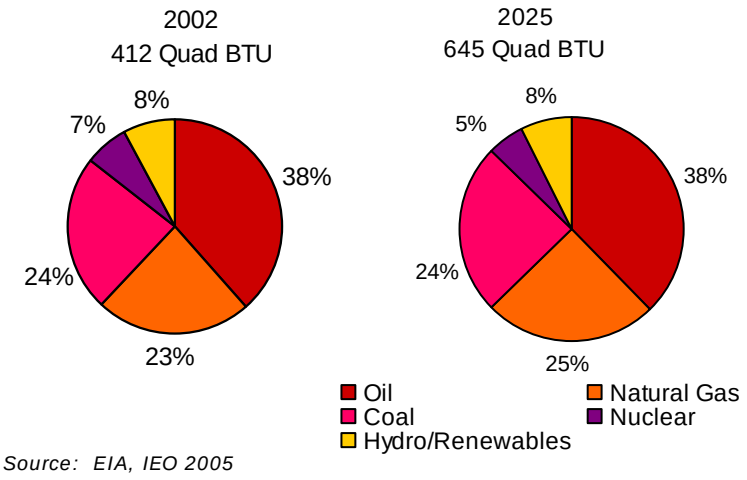
U.S. consumers have come to both enjoy and expect a healthy domestic economy, which is underpinned by an energy supply that is at once available, affordable, secure, and

environmentally benign. In this new world are those criteria able to be satisfied or are they just beyond the reach of current energy paradigms and policies?

Global energy demand is projected to increase by 50 percent over the next 25 years, yet the relative shares of the five major fuel groups – oil, natural gas, coal, nuclear and renewables – are expected to remain remarkably constant, with fossil fuel consumption still accounting for over 85 percent of total energy demand in 2025. In the developing world, that figure exceeds 90 percent (see figure below), carrying obvious consequences for consumer competition and the environment.

As we consider our energy options, I would strongly urge that we not forget the substantial contributions that conservation and improved efficiency can make to achieving our future energy goals. In the power generation sector, it currently takes three to four units of primary energy to produce one unit of delivered electricity. Conservation, efficiency and infrastructure delivery improvements coupled with additional contributions from renewable energy sources can obviate the need for additional, incremental production of fossil fuels for power generation purposes. Similarly, improving auto efficiency and accelerating the deployment of proven technologies into the auto fleet can, over time, make a substantial contribution to reducing transportation fuel demand.

World Energy Demand



Source: EIA, IEO 2005

Analyzing this forecasted future leads to two seemingly inescapable conclusions. The first is that absent major technological breakthroughs, significant changes in consumption patterns and policies, or massive dislocations that alter the course of events, the consumptions trends depicted by this chart are simply unsustainable for the long term. Secondly, even assuming a significant contribution from a wide range of alternative fuels, conventional energy sources will continue to dominate the landscape for at least the next several decades.

The Role of the United States in a Global Energy Marketplace

For the past thirty years, U.S. oil policy initiatives have centered around 4 major themes: increasing and diversifying sources of conventional and unconventional energy supplies both at home and abroad; encouraging, wherever practicable and politically achievable, the adoption of improvements in conservation and fuel efficiency; the expansion of the strategic petroleum reserve; and reliance on Saudi Arabia to balance oil markets and moderate prices.

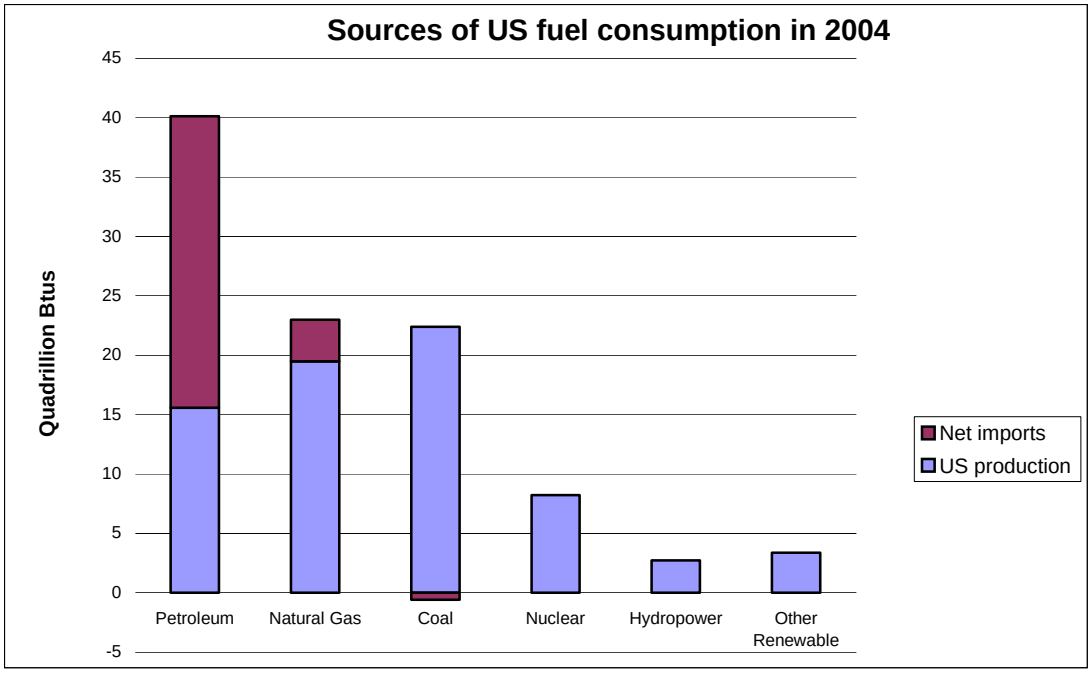
For the most part, in an era of surplus supply, this strategy has largely worked. Times and market conditions, however, may well be changing. Global demand for all energy forms is accelerating, and resources are increasingly controlled by national players, whose primary national objectives may not conform to traditional market practices or concerns.

It took the world 18 years (from 1977-1995) to grow global oil demand from 60 to 70 million barrels per day (mmb/d); eight years to grow from 70 to 80 mmb/d; and if current projections are correct, global oil demand will exceed 90 mmb/d by 2010. Forecasts for oil consumption in 2030 approximate 115-120 mmb/d – roughly half again as much as we currently consume. Setting aside the debate about resource availability or so called "peak oil," market growth of that magnitude will require huge investments, place enormous strains on transportation and infrastructure needs, and carry significant implications for security, global geopolitics and the environment.

In addition, the entry of new market players, like China and India, with growing energy appetites and expanding economies may pose competitive threats to America's market dominance. Added to that are heightened security concerns about threats to infrastructure and facilities posed by terrorist groups and insurgents. Taken together, these changing circumstances have the potential to re-order the marketplace and fundamentally alter the geopolitical balance that has governed the past half century. Such changes may also warrant a thoughtful recalibration of our economic, security, environmental, energy and foreign policy calculations and policy choices.

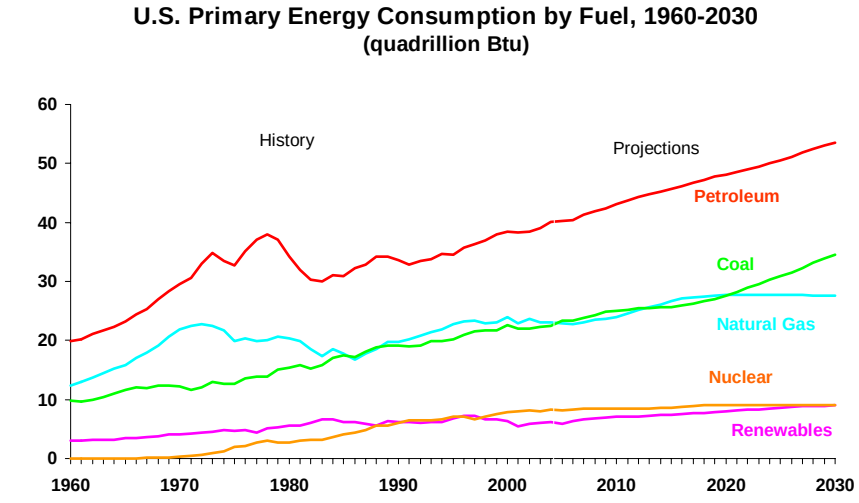
The United States is currently the world's largest producer, consumer, and net importer of energy. We are home to roughly 5 percent of the world's population and produce 17 percent of the total energy supplied. Yet in the process of generating some 30 percent of global GDP, America consumes nearly a quarter of the world's energy.

In terms of energy self-sufficiency, the United States in 2004 produced (domestically) roughly 71 percent of the total energy it consumed. Today, the United States remains self-sufficient in meeting virtually all of its energy needs with the exception of two key energy forms – petroleum, and increasingly, natural gas – both of which are critical commodities.



Source: U.S. Energy Administration, Monthly Energy Report, April 2005

In its recently released 2006 Annual Energy Outlook, the U.S. Energy Information Administration (EIA) forecasts that overall energy usage in the United States will continue to increase at an annual growth rate of 1.2 percent for the next 25 years. U.S. energy demand for all fuels is projected to increase from roughly 100 quadrillion Btus (Quads) to over 127 quads by 2030 with oil, gas and coal leading the way. Projected incremental growth for non-hydro renewables will also be substantial, but starting from such a small base, is expected to account for about 7 percent of total domestic energy demand by 2025, with 60 percent of that amount devoted to grid-related electricity generation.



Source: EIA, Annual Energy Outlook 2006

In contrast, total U.S. demand for petroleum products, largely driven by increases in transportation fuel needs, is projected to increase by over 30 percent from current levels (slightly below 21 mmb/d in 2005) to just over 27.5 mmb/d in 2030. Demand for all forms of petroleum fuels except for the bottom of the barrel increase, and total gasoline demand increases to about 12.5 mmb/d. Petroleum fuels currently supply 97 percent of all domestic transportation needs.

After a brief period of increased output (from 2006-2015, largely as a result of additional production from the deep water of the Gulf of Mexico) domestic crude oil production is expected to resume its gradual decline. And with U.S. refineries running at or near capacity, absent substantial new investment, increased domestic demand means expanding reliance on imported petroleum, both for crude oil and, increasingly, refined petroleum products.

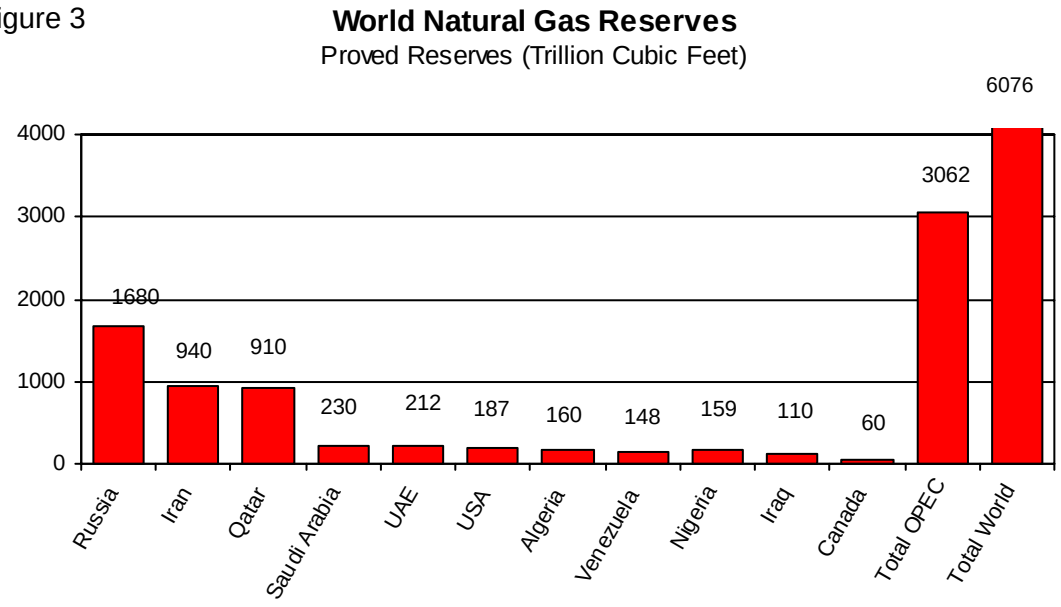
In 2025, net petroleum imports are expected to account for 60 percent of demand (up from 58 percent in 2004), although that figure could increase to almost 70 percent depending on assumptions about price and economic activity. Net imports of refined petroleum products increase from 17 to 22 percent of total oil imports by 2030.

The rise in oil import levels, both in absolute and relative terms, carries important infrastructure, logistical, environmental, financial, trade, security, and foreign policy implications. Assuming investment continues to lag in the creation of additional domestic refining capacity, the projected rise in imports of refined petroleum product increases U.S. vulnerability to supply disruptions and potentially undermines the value of the Strategic Petroleum Reserve (SPR).

A similar picture emerges for domestic natural gas, although demand continues to grow between now and 2015 before leveling off as coal demand for power generation accelerates. As demand for natural gas increases, the United States will increasingly rely on nonconventional domestic production (e.g., tight sands and coal seam gas), gas from Alaska, on increased imports of pipeline gas from Canada (to the extent they are available), and on LNG from sources in Latin America, the Caribbean, Africa, the Middle East, Australia, and Russia.

Projected supplies of LNG imports assume that additional regasification capacity will be permitted and constructed either within the United States or in areas proximate to U.S. borders – an uncertain assumption. In addition to environmental, safety, competition, and siting issues, opponents of additional LNG regas projects increasingly cite security and foreign policy concerns about exposing the U.S. electric grid system to reliance on imports from countries, many of which are oil exporters found in troubled regions of the world. (Global gas reserves data is shown in the next figure.)

Figure 3



An Increasing Role for Alternative Fuels

Rising oil prices in recent years have heightened interest in a variety of alternative sources of liquid fuels. At present, two biologically derived fuel forms, ethanol and biodiesel, are used in the United States to supplement supplies of conventional gasoline and diesel. In principle, biodiesel can be blended into conventional diesel or heating oil in fractions compatible with the fuel system and/or its construction materials. On the plus side, biodiesel's blending promotes flexibility and reduces carbon monoxide emissions. Unfortunately, depending on the precise chemical composition of the solvent, too high a concentration can damage certain plastics and rubber (system) components and may contribute to increased emissions of nitrogen oxide.

Ethanol can be readily blended into gasoline. Since the late 1970s, cars and light trucks built for the U.S. market are capable of running on a 10 percent ethanol blend. A limited number (roughly 5 million) of the 220 million vehicles currently on the road are also capable of running on blends of up to 85 percent ethanol. Most fuel ethanol currently produced in the United States is distilled from corn. Since corn is also a food crop, however, there are questions related to the volume of ethanol that can be readily produced from corn without affecting crop prices, as well as limitations on the amount of acreage available to dedicate to fuel crop planting.

In addition, since only a portion of the plant material can be used to produce ethanol, issues have been raised about how to handle the residual waste material – e.g., stalks, leaves and husks. A partial answer to this dilemma has resulted in research into what is called cellulosic ethanol, but transportation and energy content issues still remain to be resolved. For example, since a gallon of ethanol contains less energy than a comparable gallon of gasoline, poorer mileage ratings and more frequent fuel stops are impediments that need to be overcome. Additionally, cold weather start problems and transport in carriers other than pipelines may complicate gasoline substitution on a national scale.

There have also been promising breakthroughs in creating other forms of fuels from a wide variety of sources, including biomass, agricultural, industrial and municipal waste streams, coal to liquids (CTLs), gas to liquids (GTLs), "synfuels" made from oil sands, shale and extra heavy crudes, and biomass to liquids (BTLs) processes that derive fuels from waste wood and other non-food plant sources.

Biorefineries, digesters and other waste to energy process facilities are clearly in the sights of investors, although their most significant supply impacts may be felt on a regional rather than national basis, at least until expanded distribution and delivery infrastructure comes on line. In this regard, better data collection would be most helpful. The National Renewable Fuels Laboratory (NREL) and EIA have been discussing data improvements to better capture a more complete picture of how biofuels activity is developing within the U.S., but resource limitations affecting data collection and modeling have limited that effort.

It is worth noting, however, that based on current government data, the capital investment costs for most, if not all, of these synthetic fuel technologies is considerably more than that required for a traditional crude oil refinery (see page 57, of EIA's 2006 Annual Energy Outlook). Further, for purposes of comparison, EIA estimates that there is currently some 300,000 b/d of installed corn ethanol capacity in the United States and an additional 12,000 b/d of biodiesel capacity. Additionally, excluding "pilot" facilities, the latest EIA statistics indicate that there are currently no commercial BTL, GTL or CTL plants in the United States. In contrast, U.S. refining capacity currently exceeds 17 million barrels per day and domestic gasoline demand averages over 9 million barrels per day.

The mandated target of producing 7.5 billion gallons of ethanol (fuel) by 2012 translates into roughly 490,000 b/d, representing approximately 3 percent of projected domestic transportation fuel needs in 2012 and less than 5 percent of total gasoline demand. Analyses performed by EIA and NREL estimate that even under optimistic assumptions, alternative transport fuels (excluding electric hybrid plug-ins) can be expected to displace/replace a maximum of 10 percent of conventional liquid transport fuels by 2030, leaving petroleum based fuels, conservation and improved efficiency gains to deal with the remaining 90 percent.

A 2004 report prepared by the bi-partisan National Commission on Energy Policy came up with similar results, projecting a 10-15 percent reduction in U.S. oil consumption in 2025 by substituting non-petroleum transportation fuel alternatives in combination with the adoption of more stringent CAFÉ standards for cars and light trucks and providing incentives to encourage the production and purchase of fuel efficient vehicles. In reaction to the Commission's report, EIA analysis attributed a 7.3 percent reduction in petroleum fuel usage to the adoption of tougher fuel efficiency and CAFÉ standards.

In short, while contributions from alternative fuels will be helpful as a component in meeting increased consumer demand for transport fuels, for at least the mid-term, absent significant policy and regulatory changes to promote increased fuel efficiency, major technological breakthroughs, and substantial changes in consumer/driver behavior (based on environmental, security or foreign policy considerations), petroleum based fuels will remain the overwhelming fuel of choice for at least the next 20-30 years.

Given projections for increasing fuel demand, the inescapable conclusion is that oil imports will also be with us for decades to come. In that context, we would do well to ratchet down the political rhetoric surrounding the notion of achieving energy independence and instead refocus our efforts to deal with an inter-dependent energy future and simultaneously prepare for the (longer term) transition to a post-oil world, a transition which former Energy and Defense Secretary James Schlesinger has characterized as "…the greatest challenge this country and the world will face – outside of war."

U.S. Oil Imports – Sources and Concerns

In his State of the Union address, President Bush advanced the challenge of reducing this nation's "addiction to oil" and reducing by 75 percent our reliance on oil imports from the Middle East. At best, this line was a thinly veiled attempt to drum up domestic political support for a valiant yet difficult effort to reduce petroleum consumption. At worst, it showed a decided lack of understanding of U.S. import sources, global oil markets and reserve holders.

In 2005, the primary oil suppliers (crude oil and refined product) to the United States were, in volumetric order, Canada, Mexico, Venezuela, Saudi Arabia and Nigeria. Imports from Iraq ranked a distant sixth. The top 5 suppliers provide over 60 percent of total U.S. oil imports. The entire Middle East, by contrast, accounted for roughly 17 percent of last year's imports (representing about 11 percent of total domestic petroleum consumption).

Looking forward, imports of Canadian and Mexican oil are expected to decline as their respective production levels decline and/or domestic requirements increase. In contrast, imports from the Middle East and OPEC sources generally (in part because these countries represent the several of the largest reserve holders in the world, both for oil and gas) are expected to increase. Managing relationships with these suppliers should be a priority under any policy the U.S devises for dealing with future energy requirements.

Pitfalls and Warnings

As with any transformational change, issues surrounding the approach, time horizon and levers designed to accomplish the objective remain keys to success. Dealing with an energy transition is no less daunting. To the extent practicable, every effort should be made to pursue policies and changes that fully take into account investment and market practices and utilize as much as possible existing infrastructure and currently available technologies. Minimizing uncertainty, avoiding conflicting or contradictory policy signals, and evaluating/selecting options based on economic efficiency and merit rather than political efficacy are also are highly recommended.

A few examples:

Less than eight months ago, the Congress adopted the Energy Policy act of 2005. The Act was notable in many respects, but when read against the oil reduction challenges laid out by the President in the State of the Union address may unintentionally lead to uncertainty and paralysis in terms of energy investment. The energy legislation specifically included provisions designed

to encourage additional refinery capacity construction within the United States, yet the President's challenge to displace petroleum usage could likely have a chilling impact on both international upstream investments and domestic refining additions, both expensive and long-lived investments.

Similarly, after much debate and deliberation and for a wide variety of reasons, the single MTBE-related provision (repeal of the oxygenate mandate) that survived the energy conference has resulted in a reduction in available octane enhancing components and will likely produce higher ethanol and gasoline prices while reducing gasoline availability.

A third example relates to the permitting of additional LNG regasification facilities in the United States to handle increased volumes of imported natural gas. As indicated earlier, as we strive to reduce reliance on imported oil, we appear to be simultaneously encouraging increased import dependence of natural gas – the bulk of which may come from similar import sources.

And finally, at a time when policymakers are intent upon encouraging specific types of large scale energy investments, does it really make sense to hamstring major industry players by proposing tax changes that ultimately reduce their ability to pursue those investments?

Altering the trajectory of future demand for petroleum based fuels is prudent policy for a wide variety of reasons. But in doing so, we should not confuse displacing oil with the larger objective of tempering overall consumption and improving efficiency as the main priorities. Crop growing also requires energy. Plug in vehicles that run on electricity require energy sources to generate that power – the bulk of which currently comes from coal, although nuclear, natural gas and renewables also play significant roles.

The oil market is a truly global market. Reducing America's oil consumption can potentially have a dampening effect on prices, but it will not completely insulate us from supply or price volatility. We frequently speak about "politically unstable" sources of oil supplies around the globe, but the largest protracted losses of global oil and gas output in both 2004 and 2005 were the result of hurricanes in the U.S. Gulf of Mexico.

The Stone Age did not end because we ran out of rocks – something better came along. The Oil Age will similarly be overtaken when a better solution or a series of component solutions emerge. We can and should accelerate that process, but need to do so carefully and prudently – by introducing cost effective substitutes, while employing (insofar as possible) existing infrastructure and delivery systems, minimizing uncertainty, using available market mechanisms and educating the public on the need for change.

Conclusion

Over the past 50 years, U.S. energy policy has been faithfully diverse, often internally inconsistent, amazingly flexible in adjusting to public, market and commercial pressures, and incomprehensible to most observers. It is likely to retain many of these unique elements.

The 1970s provided the last clear articulation of an attempted national energy strategy – and this was largely in response to global energy events. The 1973 Arab Oil Embargo prompted the development of the SPR, the adoption of CAFÉ (Corporate Average Fuel Efficiency) standards, and the formation of the International Energy Agency (IEA). Domestic natural gas shortages and the prospects for declining oil supplies prompted President Carter's decision to lift oil price regulation and pursue energy sector transformation, ushering in a new era in U.S. policy driven by the market.

In short, economics has prevailed over the past 25 years. Until recently, oil prices have remained relatively low and U.S. energy efficiency has increased. However, changing market and political conditions may complicate America's policy agenda going forward, and these include:

- Energy security, broadly defined in terms of attacks on infrastructure, and greater vulnerability to imported energy supply threats, either physical or financial, due to growing production concentration;
- Market developments, particularly in alternative fuels and with respect to climate change. In the future, markets may drive policy more than policy drives markets;
- Less multilateral cooperation in the international oil trading and investment market places as governments pursue specific narrow interests;
- Increased vulnerability to supply disruptions due to growing natural gas import dependence in the power sector; and
- Political hostility to U.S. policy in specific regions as allies and friends abandon the United States to ensure their own political survival.

The role of the United States as an energy producer, consumer, and importer has already been noted in some detail. The energy future of the country seems at once very clear but very worrisome: declining domestic production and rising domestic demand, with the gap to be covered by imports from suppliers whose national interests may not and historically have not coincided with our own.

This almost inevitable growth in reliance on foreign supplies would, to the casual observer, seem to be a call to action, to define and implement policies that would concomitantly expand domestic supplies while setting demand management efforts in motion. To do so, however, requires a certain political will on the part of both the U.S. consumer and the government. And, to date, despite higher energy prices, real and threatened interruptions in supply, environmental damage, hurricanes and blackouts, that critical ingredient remains lacking.

All energy producer/exporters and consumer/importers are bound together by a mutual interdependency. All are vulnerable to any event, anywhere, at any time, which impacts on supply or demand. This means that the U.S. energy future likely will be shaped, at least in part, by events outside of our control and beyond our influence. Calls for energy independence, absent major technological breakthroughs and a national commitment, ring hollow, and in the near term are both unrealistic and unachievable. In the absence of decisive political will to undertake those steps necessary to improve efficiency, promote conservation, encourage the

development of domestic energy resources and renewable energy forms, learning to manage the risks accompanying import dependency may be the only reasonable course of action.

It is against this backdrop that future U.S. environmental, economic, foreign, energy and security policies must be fashioned.

Thank you.