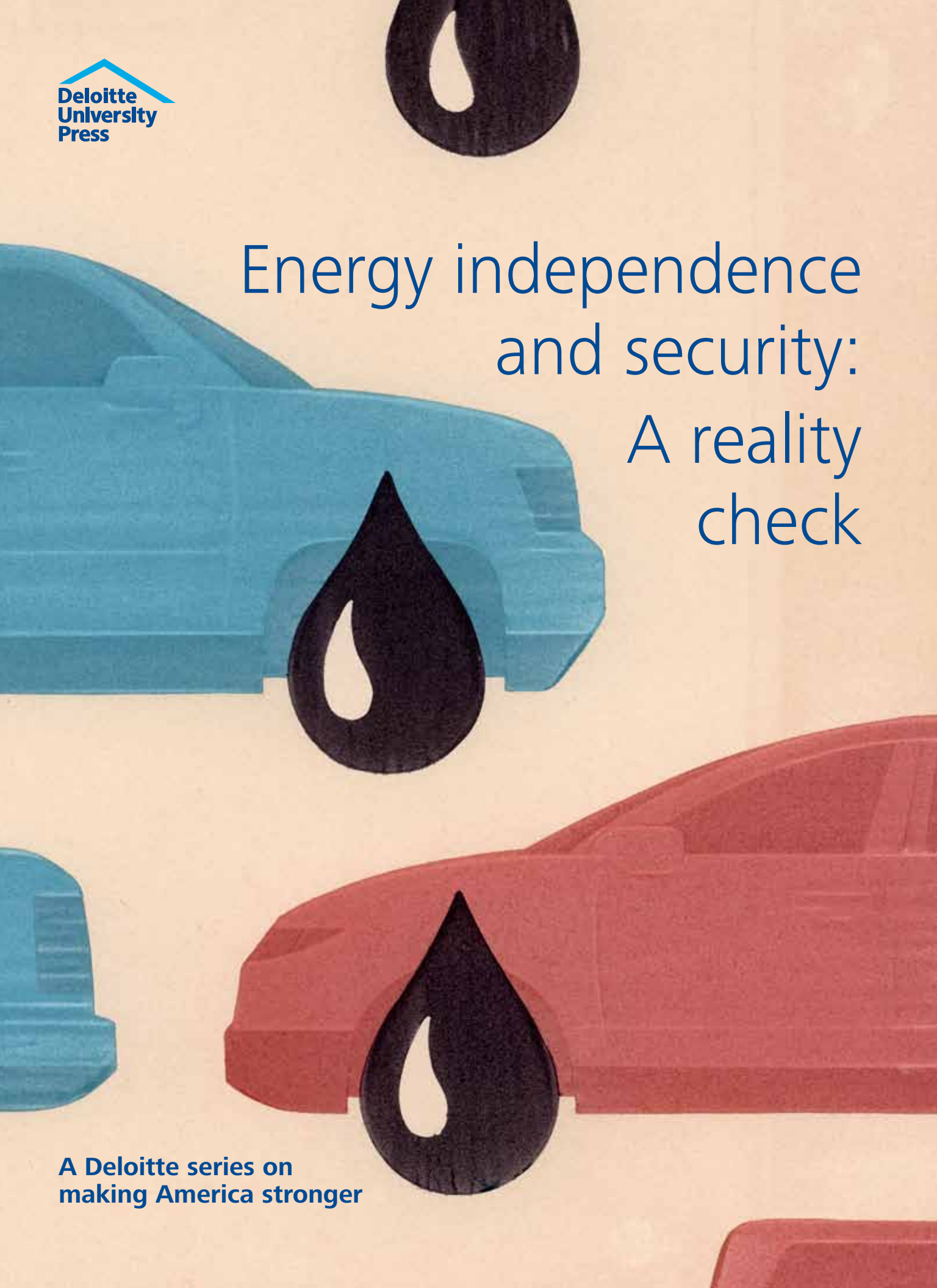
Deloitte University Press

Energy independence and security: A reality check



A Deloitte series on making America stronger

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In his role as Executive Director of the Deloitte Center for Energy Solutions, **Branko Terzic** is responsible for defining and guiding the center's strategic platforms and key activities in the energy marketplace. Branko's focus is on leveraging both intellectual capital and service innovation to solve energy industry issues. Branko is a former commissioner on the U.S. Federal Energy Regulatory Commission, a former Wisconsin Public Service commissioner and the former chief executive of a natural gas company. In addition to his current role as executive director, he serves as regulatory policy leader in Energy & Resources, Deloitte Services LP.

Acknowledgements

A number of Deloitte colleagues contributed new ideas, opinions, research and—most importantly—time to this study.

William Eggers of Deloitte Services LP edited the study and offered helpful suggestions in his role overseeing the thought leadership for Deloitte's Making America Stronger initiative.

A number of Deloitte colleagues served as primary reviewers, providing extensive feedback and encouragement throughout the drafting process. They include **John McCue** and **Roger Ihne** of Deloitte Consulting LLP as well as **Dan Melvin** of Deloitte Services LP. They, along with **Gary Adams** of Deloitte Consulting LLP and **Gregg Aliff** of Deloitte LLP, should be applauded for their support of the study and expert guidance.

Thanks must also be extended to **Owen Sanderson** of Deloitte Consulting LLP and **Troy Bishop** of Deloitte Services LP for lending their creative minds to framing the report's infographics and for their extensive copy-editing during the final review phase.

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Introduction

While U.S. energy independence may be unattainable in the foreseeable future, energy security is a realistic and achievable goal.

MOST proposed national energy policies have shared goals concerning adequate supplies, reliable service and affordability. Every president since Richard Nixon has explicitly called for either "energy independence" or, at least, increased "energy security."

Policymakers, however, should consider whether energy "independence" is really necessary to achieve these goals, including security. In fact, the answer is probably no. The real issue is not independence from all foreign oil, but reducing oil imports from unfriendly nations, diversifying our supply of energy sources and ensuring that no nation can effectively manipulate markets against our national interests.

While U.S. energy independence may be unattainable in the foreseeable future, energy security is a realistic and achievable goal. Understanding how to reach it, however, requires us to know more about our sources and uses of energy—and the realities of energy supply and demand.

National energy policy

IDEALLY, Americans want energy policies that provide adequate, reliable and secure energy supplies at a reasonable cost. At the same time, however, energy prices must be sufficient to encourage investment, exploration and production, to ensure constant supplies in the future.

It may come as a surprise to some, but historically, policy has largely succeeded in providing us with energy as required. This is because our national policy, as expressed in cumulative legislative and administrative decisions, has supported concepts such as:

- private investment in the energy sector
- market pricing of and competition among fuels
- consumer choice in appliances and vehicles
- appropriate economic and environmental regulation

More recently, however, the notion of a national energy policy has been affected by the issue of climate change, which many believe is significantly influenced by atmospheric carbon dioxide produced by fossil fuels. The specter of climate change has spurred the creation of state and federal programs supporting the use of non-polluting fuel sources for electricity production, such as wind, solar and other renewable energy sources. The U.S. Environmental Protection Agency (EPA) reports that as of July 25, 2011, 37 states as well as the District of Columbia and Puerto Rico had enacted a renewable portfolio standard (generally requiring that a specified percentage of a state's electricity supply come from renewable sources) or a renewable portfolio goal.[1]

The cultivation of renewable energy for electricity production has not been without controversy, as these energy sources are both intermittent (e.g. producing electricity when the wind blows or the sun shines) and generally more costly than conventional fuels, besides having other unique drawbacks. Even so, the greenhouse gas avoidance that renewables offer constitutes a benefit that can be considered to offset these drawbacks.

American public opinion concerning global warming has varied considerably over time. In June 2012, just 18 percent of respondents in a *Washington Post*/Stanford University poll ranked global warming as their top environmental concern.[2] Nonetheless, the EPA has determined that greenhouse gas emissions "result in dangerous effects to human health and welfare," and thus energy policies are beginning to address greenhouse gas emissions as well as the traditional goals of adequate supplies at the lowest possible price.[3]

Defining energy independence

ENERGY independence has been defined in numerous ways. In his November 1973 introduction of a "Project Independence" plan, President Richard Nixon defined it as a situation in which domestic energy production is adequate to "meet our own energy needs without depending on any foreign sources."[4] To others, however, it simply means "that oil becomes much less relevant to global affairs, that it becomes another commodity,"[5] ensuring that the actions of foreign governments cannot cause major disruptions in energy prices or supplies.

Both definitions include the notion that the United States should reduce its reliance on oil from unfriendly sources. In Nixon's case, the goal would be to need no oil from any foreign source, while the second definition implies that a large diversity of suppliers would provide us with effective independence from unfriendly nations. Either definition, however, raises the question of whether the American public would support "independence" if it pushes energy prices too high.

Winston Churchill faced the question of energy dependence and national security when, as Britain's Lord of the Admiralty, he began switching the formidable British navy from coal to oil on the eve of World War I.[6] Oil offered distinct advantages over coal as a fuel for warships, including higher speeds, easier storage and quicker refueling. Britain then was a major coal producer and maintained a worldwide infrastructure of coaling stations but had no oil production, meaning that the navy would be dependent on oil producers, primarily in what was then Persia. Some were skeptical about the ability of oil producers to meet the necessary supply. William Palmer, the First Sea Lord, asserted that "[t]he substitution of oil for coal is impossible, because oil does not exist in this world in sufficient quantities."[7]

Churchill acknowledged the risks in relying on a fuel not produced at home, saying that, "On no one quality, on no one process, on no one country, on no one route, and on no one field must we be dependent. Safety and certainty in oil lie in variety and variety alone."[8] Churchill recognized that Britain could not allow itself to rely on any single nation or region for vital energy supplies.

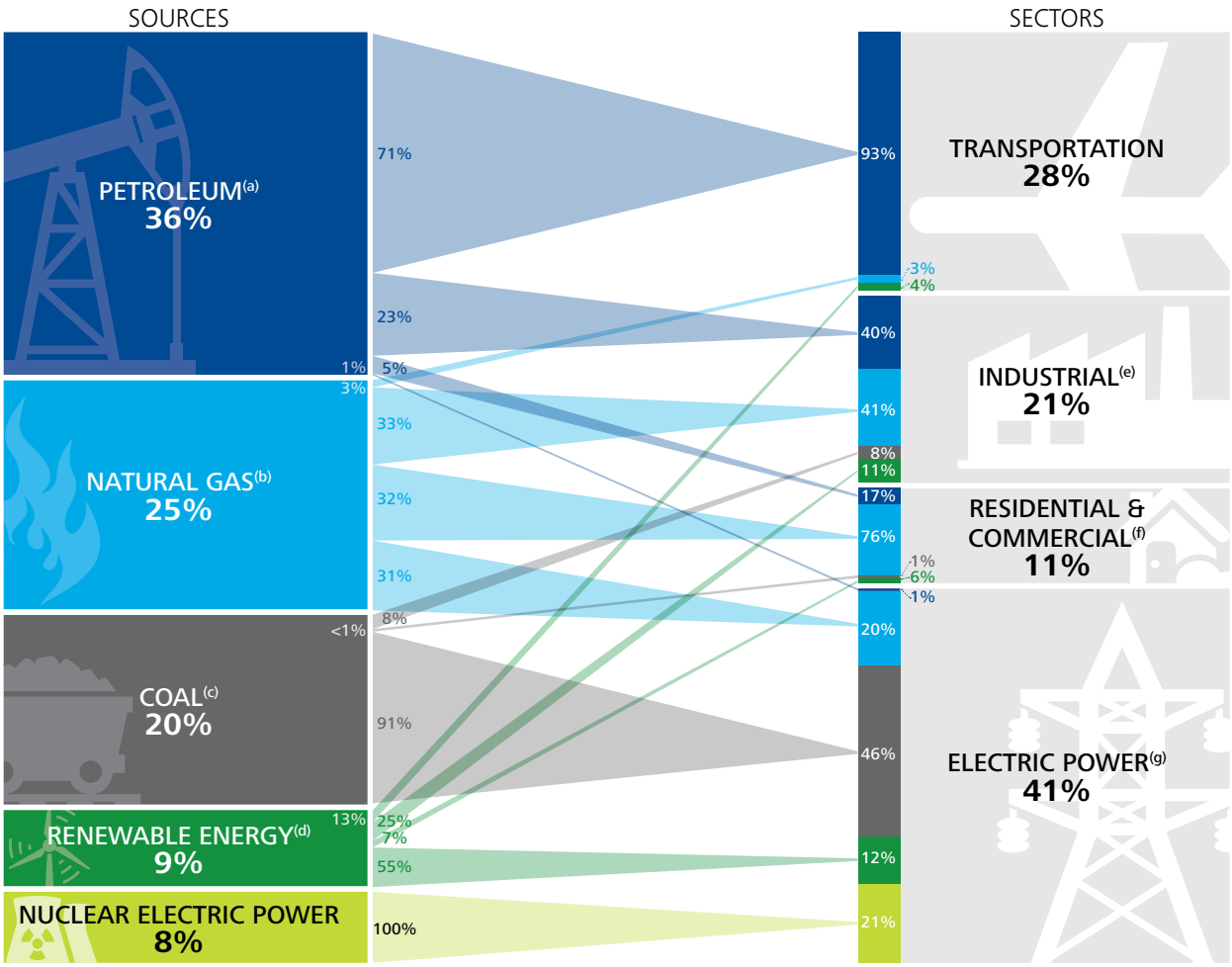
His conclusion that energy security could be maintained only through the existence of a highly diverse energy supply remains valid today.

ENERGY SOURCES

Our energy comes from a variety of sources. The U.S. Energy Information Administration (EIA) releases an annual report listing these sources and their contributions to our total energy supply (see below).[9]

Primary Energy Consumption by Source and Sector, 2011, reminds us that the nation's economy consumes fuel both directly, as in the case of cooking with natural gas or filling the gasoline tank, and indirectly with electricity generation, so that energy can be delivered in a useful and convenient form.

Primary Energy Consumption by Source and Sector, 2011 (% of total energy use)[10]



Notes:
(a) Does not include biofuels that have been blended with petroleum—biofules are included in "Renewable Energy."
(b) Excludes supplemental gaseous fuels.
(c) Includes less than 0.1 quadrillion Btu of coal coke net exports.
(d) Conventional hydroelectric power, geothermal, solar/PV, wind and biomass.
(e) Includes industrial combined-heat-and-power (CHP) and industrial electricity-only plants.
(f) Includes commercial combined-heat-and-power (CHP) and commercial electricity-only plants.
(g) Electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public. Includes 0.1 quadrillion Btu of electricity net imports not shown under "Source."

Primary energy in the form that it is first accounted for in a statistical energy balance, before any transformation to secondary or tertiary forms of energy (for example, coal is used to generate electricity).

*Sum of components may not equal total due to independent rounding.

Sources: U.S. Energy Information Administration, Monthly Energy Review (April 2012), Tables 1.3, 2.1-2.5, preliminary 2011 data.

How we use energy

Transportation

IN 2011, the transportation sector consumed 28 percent of all energy used in the United States, the vast majority (93 percent) of it in the form of gasoline, diesel and aviation fuel.[11] Transportation used about 13 million barrels of petroleum fuels each day last year.[12]

Some repetitive-use transportation fleets (e.g., buses, delivery, maintenance and warehousing vehicles) are fueled by natural gas, providing 3 percent of the energy used for transportation in 2010, all in the form of compressed natural gas (CNG).[13] Various groups have called for federal assistance to expand the use of natural gas for transportation, in the form of CNG or liquefied natural gas (LNG), but significant new infrastructural construction is required to support the wider use of these fuels. In particular, compressors are required either at gas stations or at home, to fill CNG tanks adequately. Similarly, LNG would require significant investments in refrigeration and storage equipment to make it widely available. Finally, without CNG- and LNG-ready vehicles from manufacturers, conversion costs can run to $1,500 or more per vehicle.[14] In all, these factors continue to constrain the wider use of natural gas for transportation.

In recent years, federal legislation has spurred greater use of biofuels (primarily ethanol) for transportation, accounting for 4 percent of the total consumption in 2011 (in the chart on page 5, Primary Energy Consumption by Source and Sector, 2011, ethanol is included under renewable energy).[15] In the United States, ethanol is most often produced from corn, and its use as a transportation fuel competes with its use as food—an increasingly controversial issue, given the escalation of food prices due to the 2012 drought.[16]

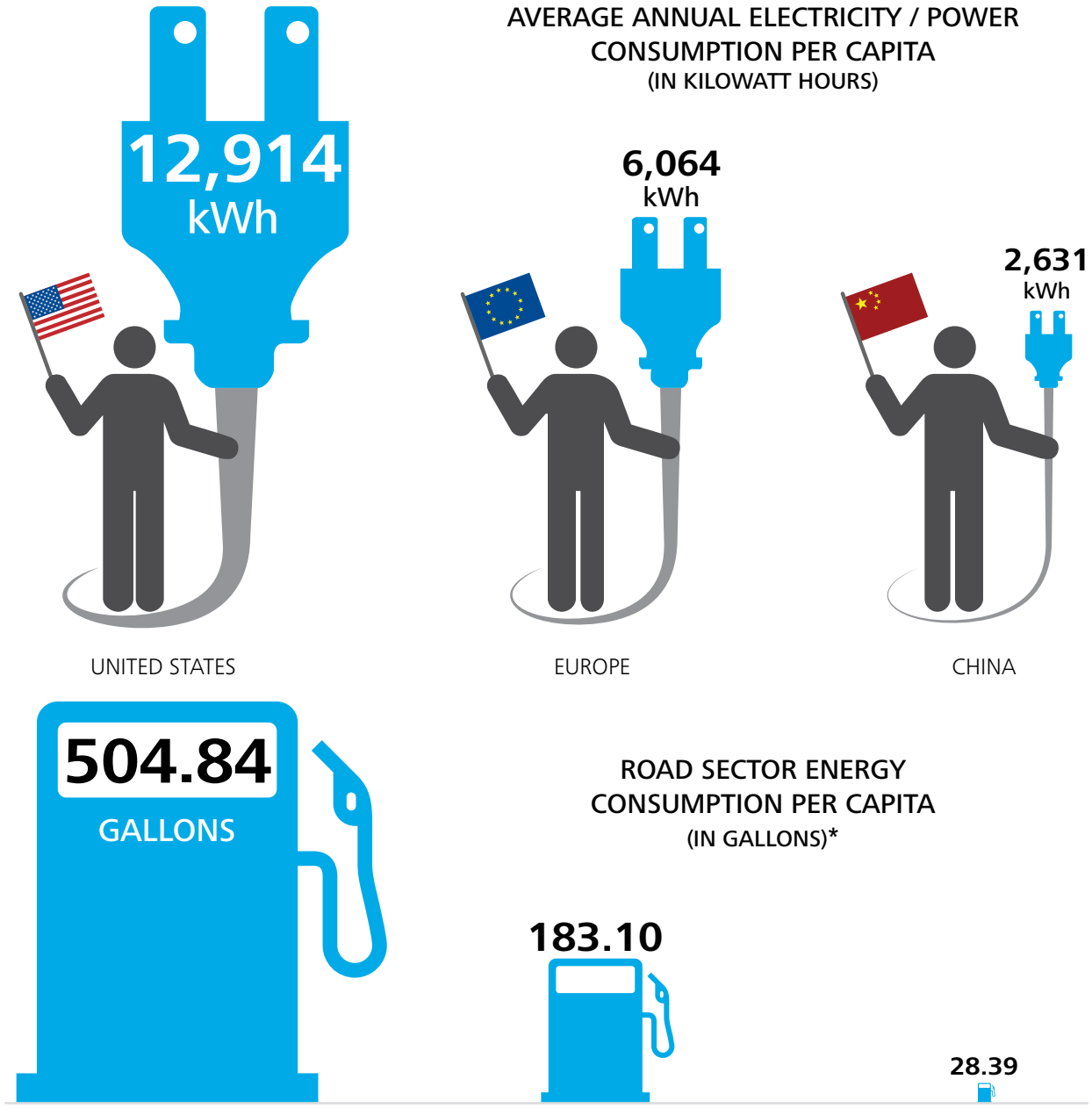
In addition, "plug-in" electric vehicles powered by the local electric grid are being added to the transportation mix, but this form of transportation is still in a nascent state.

Electricity Production

ELECTRICITY, in contrast to transportation's 93 percent reliance on oil, is produced from more varied fuel sources—according to 2011 data: coal (46 percent), nuclear power (21 percent), natural gas (20 percent) and renewable energy (12 percent, with most of that from hydroelectric dams). However, the share of electricity produced by natural gas is growing rapidly. During the week of July 9, 2012, electricity produced from natural gas exceeded the amount produced by coal. America's electric power industry is the nation's largest single and fastest-growing consumer of energy, accounting for 41 percent in 2011, as more and more devices are added to the national grid.[17]

Electricity use had been rising annually until the recent recession, during which it declined slightly for two years. Electricity production increased slightly in 2011, however,

The energy intensive American



*Note: Road sector energy consumption is the total energy used in the road sector including petroleum products, natural gas, electricity, and combustible renewable and waste.
Sources: www.google.com/publicdata (World Development Indicators), http://data.worldbank.org/data-catalog/world-development-indicators?cid=GPD_WDI

and is expected to continue increasing at modest rates.[18]

Today, the average U.S. family has more than 24 electric devices.[19] In the last half of the 20th century, annual U.S. electricity consumption rose exponentially.[20] Thus, electricity consumption is a significant factor in any discussion of total energy supply and demand.

Given the enormous importance of the electricity and transportation sectors, any discussion of future energy policy must address two interrelated questions:

1. What fuels will we use to make electricity?

2. How will we fuel automobiles in the future?

Our energy supplies

AN Aspen Strategy Group study has described America's energy challenge and issue of "energy security" as "…depending chiefly upon whether a country has at its disposal an internal supply of energy or rather is reliant on imports to meet energy needs."[21] This reflects an important national concern about where our fuels originate. To consider this issue, we examine each energy source in turn.

Nuclear Power

Nuclear power is produced by the fission of enriched uranium. This uranium is obtained from mines in the United States and elsewhere; today, about half of the enriched uranium powering U.S. nuclear reactors comes from an international agreement to recycle the nuclear material from former Soviet weapons into fuel.[22] That agreement expires in 2013, after which the US will return to relying on uranium from secure sources, including Australia and Canada, which hold 40 percent of global reserves.[23] Since fuel costs represent a very small portion of the total cost of electricity produced from nuclear power plants, the origin of the uranium we use is not generally considered a significant issue.

Nuclear power plants do not produce greenhouse gases. That single factor may ensure continued nuclear expansion in the United States and around the world. In the United States an unresolved issue—and one often cited as a reason to delay the creation of additional nuclear power plants—is the safe storage of nuclear waste. The January 2012 report of the President's Blue Ribbon Commission on America's Nuclear Future recommends the creation of a new organization solely devoted to nuclear waste management, and the establishment of consolidated storage and disposal facilities.[24]

Renewable Energy

Renewable energy provided about 9 percent of our total energy needs in 2011, largely from hydroelectric power produced by the nation's federal dam systems, such as the Tennessee Valley Authority and the Bonneville Power Administration.[25] The United States purchases some hydroelectric power from dams in Canada, but in general the nation is self-sufficient in this arena. The remaining renewable energy used to produce electricity, in the form of wind, solar and geothermal energy, is domestically sourced. The use of these renewables has increased greatly in recent years, especially in electricity production, where energy produced increased to 4.8 percent of the total production last year.[26]

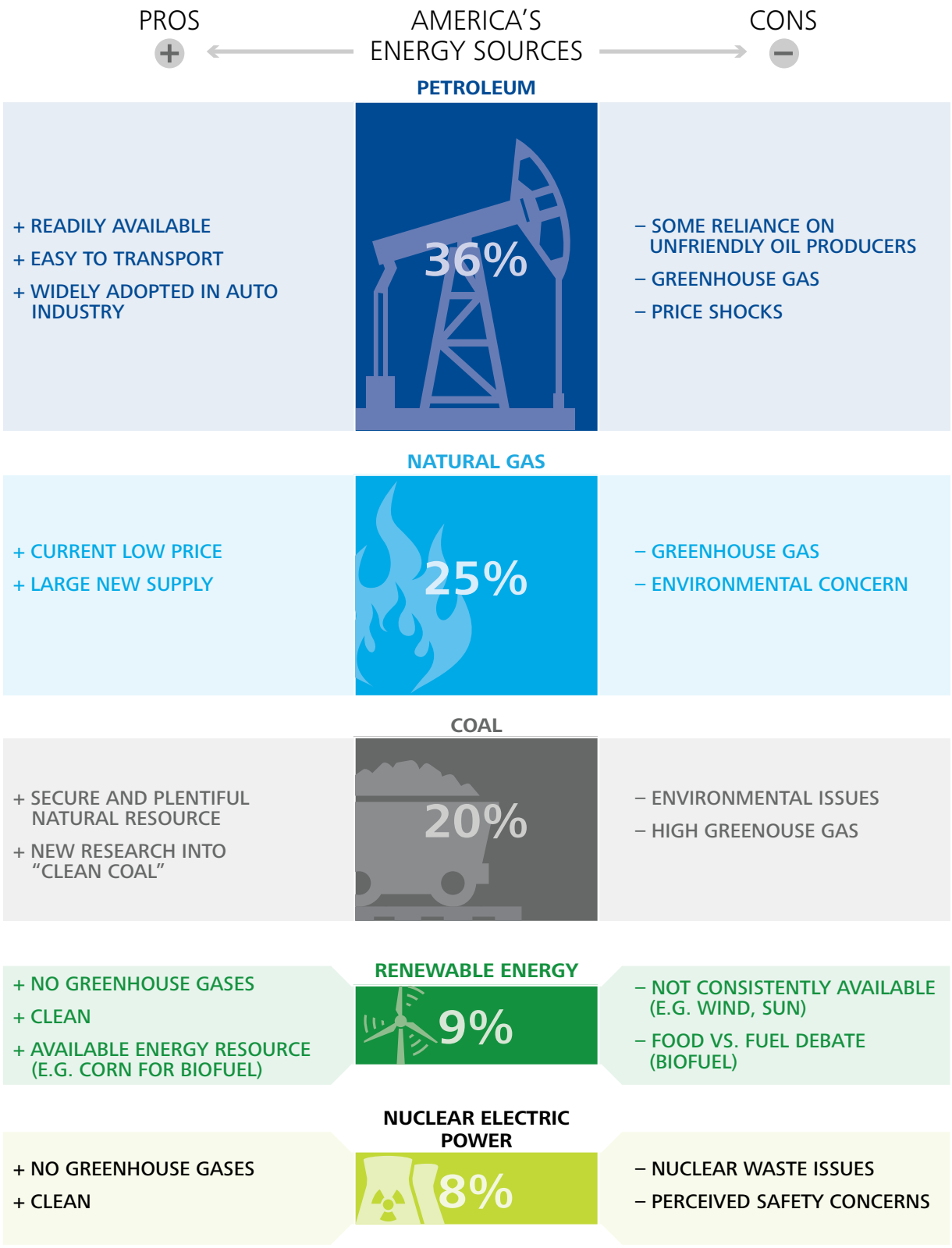
However the intermittent nature of wind and solar power requires fossil or nuclear fuel as backup until new storage technologies are developed.

The Renewable Fuel Standard included in the Energy Policy Act of 2005 requires the use of renewable fuels in transportation. Ethanol, a domestically produced biofuel, fills this requirement. Ethanol is currently the predominent biofuel in the United States and is produced from corn; but future supplies may come from some non-food plant sources and could, under some estimates, meet up to 20 percent of global motor fuel demand.[27]

Coal

Coal produced 20 percent of the nation's total energy in 2011, most of it through electricity production; it accounted for almost half of all electricity produced.[28] The United States

Our energy supplies: A balancing act



Note: 2% unaccounted for due to rounding.
Sources: U.S. Energy Information Administration, Monthly Energy Review (April 2012), Tables 1.3, 2.1-2.5, preliminary 2011 data

has an estimated 28 percent of the world's coal deposits, about a 200-year supply at current consumption rates.[29] The United States is a net exporter of coal. World coal demand is driven primarily by China and India, which together have built more than 800 new coal-fired electrical power plants in the past six years, with China averaging two new plants each week.[30]

American coal is already heading to these markets in small quantities, and many industry observers predict much greater coal exports in the future. Thus, the United States is secure in coal. Its future use, however, is tied to concerns about greenhouse gas emissions. Prospects for "clean coal" technologies depend on continued and expanded industry research and development, as well as government funding for carbon capture and sequestration technology research. If successful, commercialization of these technologies would allow the continued use of the globe's vast coal supplies without increased emissions.

Natural Gas

Consumers and industry use natural gas for cooking, space heating, in various manufacturing processes and as a chemical feedstock. Natural gas is also used in increasing quantities for electricity production—this represents the most dramatic shift in energy use in recent history.

In the 1970s, natural gas was considered a dwindling resource, and a 1978 federal law attempted to limit its consumption.[31] Sustained imbalances of natural gas supply and demand, accompanied by high prices in the 1970s and 1980s, were largely the result of the government's over-management of natural gas pricing, which was subsequently addressed by Congress in 1989 with the passage of legislation deregulating the price of natural gas at the wellhead.[32] This helped bring supply, demand and pricing more into balance, utilizing market forces, instead of direct government intervention.

Today, U.S. natural gas is in plentiful supply at low prices due to the application of new technologies to extract gas from shale rock formations. These include horizontal drilling and the fracturing of rock formations with a liquid mix of chemicals and water under pressure. Some of the largest new shale-gas plays are located in the eastern and mid-western United States as well as Texas (see map on page 17).

This new, low-cost natural gas supply has made a significant impact. Coal-fueled electricity production has declined, while natural gas-fueled power plants have increased their activity. During the summer of 2012, natural gas surpassed coal as the primary fuel for power generation for the first time on record, according to the EIA.

The current low U.S. price of natural gas (recently as low as $2 per MCF, compared to $8 in Europe and $14 in Asia) and the nation's large reserves have prompted applications for 15 LNG export licenses with a combined volume that, if all licenses were granted, would exceed that of Qatar, currently the largest gas-exporting country.[33] The bottom line is that America is today almost completely "independent" in natural gas, and even has the potential to become the world's largest exporter.

Petroleum

Petroleum accounted for 36 percent of the nation's energy needs in 2011. The transportation sector consumed 71 percent of our oil supplies, while industry, as defined by the EIA, used most of the remainder (23 percent), with a relatively small amount (5 percent) of heating oil used by residential and commercial customers and the rest for electricity production.[34]

Unlike the other sources of energy profiled above, the United States is not self-sufficient in crude oil, and hasn't been for decades. Our need to import crude oil is the single most important factor behind all policy discussions of energy security and "independence."

Every president since Richard Nixon has faced the problem of declining U.S. oil production and increased reliance on imports. The situation reached crisis levels in the early 1970s, when production cuts by members of the Organization of Petroleum Exporting

Countries (OPEC), a cartel mostly of Middle Eastern oil producers, led to rapid increases in the price of gasoline and shortages in supply.

President Jimmy Carter told the nation, in his proposed energy policy statement of 1977, that:

> The oil and natural gas we rely on for 75 percent of our energy are running out. In spite of increased effort, domestic production has been dropping steadily at about 6 percent a year. Imports have doubled in the last five years.… [W]e now believe that early in the 1980s the world will be demanding more oil that it can produce.[35]

As we now know, of course, the world did not run out of oil or natural gas in the years following the first OPEC price shocks.

But oil imports increased throughout the 1970s, as Middle Eastern oil entered global markets in huge quantities and U.S. oil production continued to decline. U.S. oil imports rose to 60 percent of total supply a few years ago.[36]

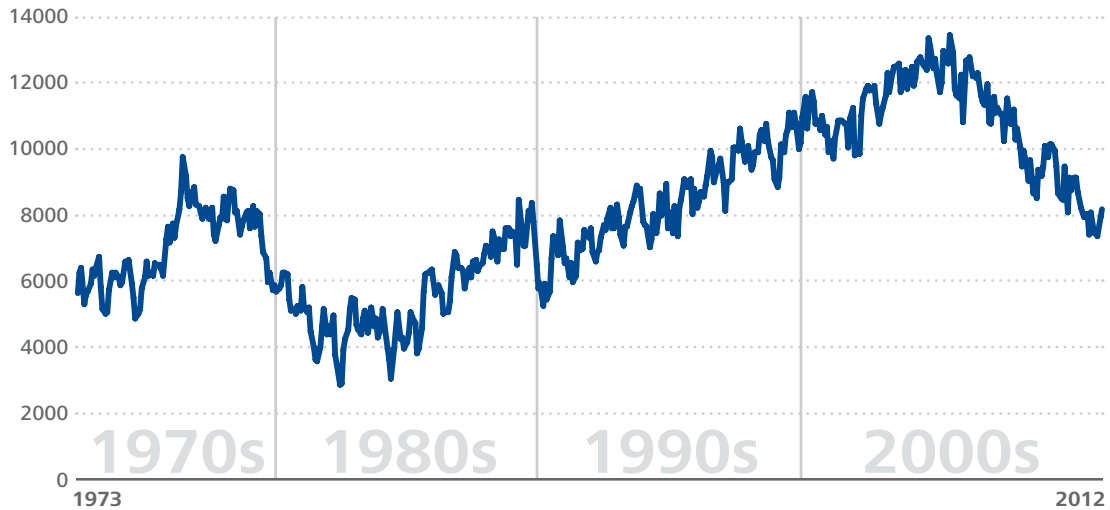
Today, however, a combination of technological improvements and policy factors has increased U.S. oil production and greatly improved automobile mileage. The most recent reported figures have imports' share of our total oil usage falling to 45 percent in 2011, with further declines expected in the future.[37] Recent high global oil prices have helped support exploration for and investment in higher production from unconventional sources.

In North America, for example, the exploitation of Alberta's oil sands and the application of horizontal drilling and hydraulic fracturing techniques to oil-bearing shale in North Dakota have resulted in large increases in North American oil production. North Dakota's oil production leaped from just 31 million barrels of oil in 2001 to 152 million barrels in 2011, 80 percent of it from the giant Bakken field. North Dakota is now the fourth-largest oil producing state in the United States, and in 2012 could leap to the second position after Texas.[38] Additional oil shale plays are being developed in Colorado and Utah.

If one excludes oil imported from Canada—our largest and arguably most stable trading partner, which provided 25 percent of America's imported oil in 2011—the situation looks even more positive.[39] Imports may fall even further if the federal government opens more restricted areas to domestic exploration and production.

Oil import trends, 1973–2012

U.S. net imports of crude oil and petroleum products (thousand barrels per day)



Source: U.S. Energy Information Administration, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mttntus2&f=mhttp://www.eia.gov/pub/oil_gas/petroleum/data_publications/com

The implications of oil imports

FOR most Americans, the terms energy independence and security are tied to the twin issues of reliable supply and the stability or "reasonableness" of the price of oil or, more specifically, the price of gasoline at the pump.

Of all energy sources, the American consumer is most sensitive to the price of gasoline. Gasoline is the only energy price consumers see changing from week to week. The family gasoline tab is often higher than the bill for electricity or natural gas. Monthly electricity and natural gas bills, moreover, come as much as two months after the period of use. Thus consumers don't see their total bill until much later, and are often unaware of the unit cost of electricity (cents per kilowatt hour) or natural gas (dollars per million British Thermal Units mmBTU or thousand cubic feet MCF).

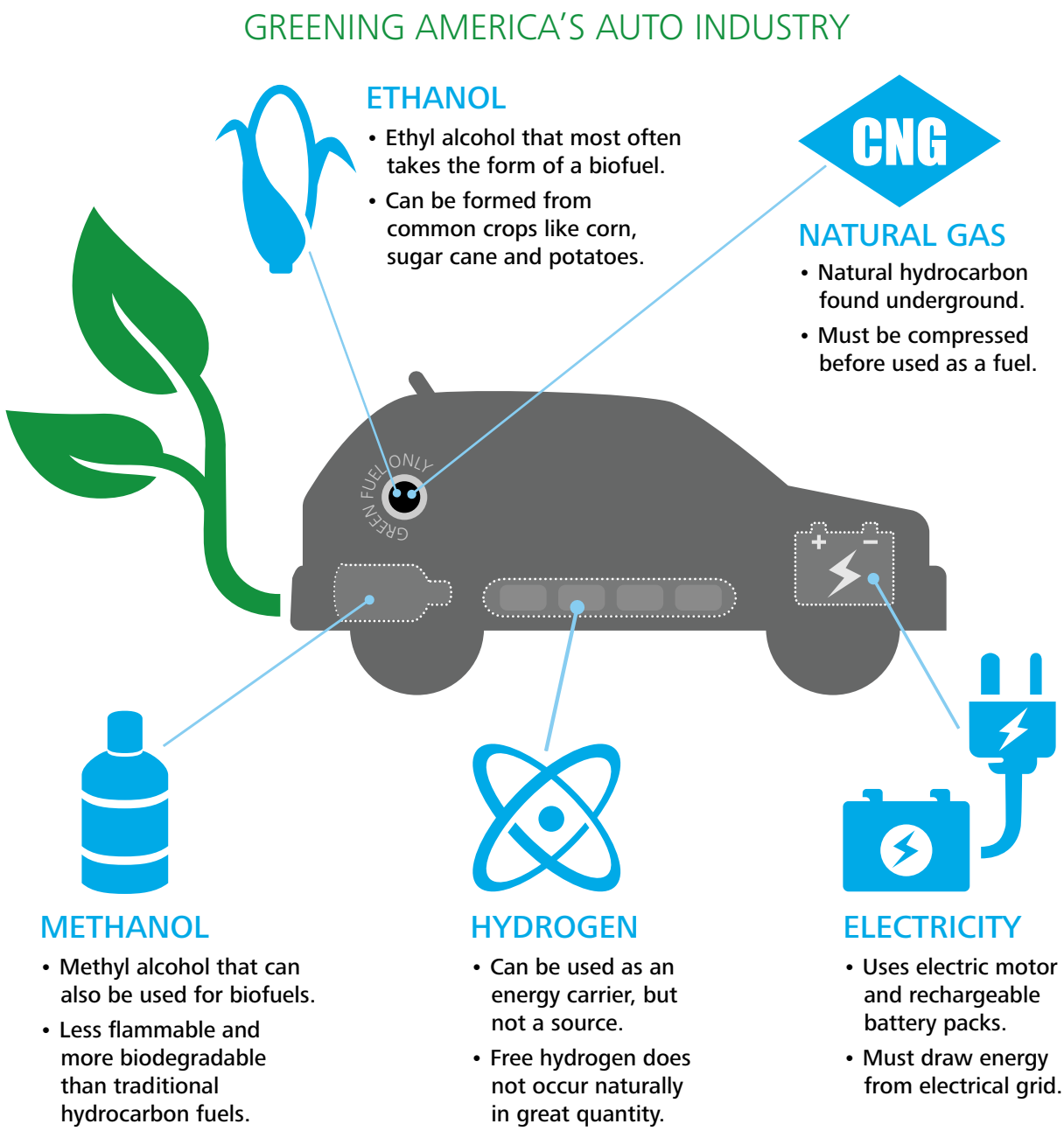
But the unit price of gasoline appears on the sign at the station and on the pump, and is tracked in the popular press.

Oil imports did not cause significant political problems in the United States until the Arab oil embargo of 1973, when OPEC deliberately curtailed supply to punish the United States for its support of Israel. After the

Crude oil prices, 1986–2012
Cushing, OK WTI Spot Price FOB (Dollars per Barrel)

Source: U.S. Energy Information Administration, http://www.eia.gov/dnav/pet/hist/leafhandler.ashx?n=pet&s=rwtc&f=d

Potential ways to power the car of the future



1973 oil shocks, however, imports were solidly linked with high prices in public perception, and given that a large portion of the world's current production is still centered in the Middle East, that perception is still prevalent.

The truth is, however, that only a small share of U.S. oil imports comes from that region; the nation's largest sources of oil are Canada and Mexico, which together supply more than a third of our oil, with another 24 percent coming from OPEC member countries not in the Middle East, such as Nigeria and Venezuela.[40] Oil is sold in a global market, however, and disruptions in the Middle East inevitably affect the world price of oil—and, eventually, the price of gasoline at the neighborhood convenience store.

Refineries purchase crude oil at world prices. From crude oil they distill a variety of liquid products, including gasoline, kerosene/jet fuel, diesel/heating oil, residual fuel, propane, petcoke and other products. The final gasoline price includes the cost of crude oil and taxes (which together accounted for 71 percent of the final price in July 2012)[41] and the refining, transportation and retailing costs (29 percent).

Crude oil prices in world markets trend lower when global supply exceeds global demand sufficiently to make up for disruptions in any one producing region. Crude prices also head downward in the short run when the global perception of possible supply disruptions is low. Thus, increasing supply or decreasing demand anywhere reduces crude oil prices.

One caveat to this basic principle, however, is the existence of OPEC, and its ability to intervene in global markets by adjusting available crude oil supplies. Controlling more than 80 percent of the world's current reserves and currently accounting for about 35 percent of global supply, OPEC can put a floor on prices by withdrawing supplies from the market or limit upward price movements by releasing greater supplies.[42]

At one time, U.S. demand for gasoline was the biggest factor influencing global demand for crude oil. In 2008, the United States had the world's highest annual per capita oil usage, at 26 barrels annually per person versus Europe's 12 barrels.[43] Until 2010, the United States was the world's largest single consumer of all forms of energy. Today it is the largest user of crude oil, consuming about 15 million barrels a day out of a global daily demand of around 86 million barrels.[44]

In 2010, however, China surged ahead of the United States in total energy demand after years of remarkable growth; China is now the second-largest oil consumer in the world. In 2011, China was also the world's second-largest oil importer after the United States (5.1 million barrels per day versus 8.9 million).[45]

Absent some major disruption in the country's economy, Chinese demand for all forms of energy will only increase; the average Chinese citizen today consumes just one-sixth as much energy as the average U.S. citizen (see chart on page 7).[46] Note also that in 2009, China had just 34 passenger vehicles per thousand people, compared to 439 per thousand in the United States.[47] Many more Chinese citizens will be able to purchase automobiles as China's economy continues to grow, ensuring an increase in the global demand for oil.

So, while demand is expected to fall in western oil markets such as America and Europe, due to higher mileage standards, the increased popularity of smaller vehicles and the use of alternative fuels and hybrid and electric vehicles, continued economic expansion in China, India and other developing countries will almost certainly push up global demand for crude oil.

While rising global demand is likely to keep oil prices relatively high, it will also provide a continuing stimulus for increased domestic production in the United States, benefiting domestic companies, their employees and suppliers, increasing tax revenues and improving our international balance of payments, while reducing (but not eliminating) our dependence on foreign sources.

"Independence" and imported oil

As we have seen, the American economy runs on a combination of domestic and imported energy supplies. For most energy-consuming sectors of our economy, our supply is predominately domestic, with only transportation remaining more heavily dependent on imports. Thus, the United States already has significant "energy independence," at least in terms of exclusive reliance on domestic production, for much of its economy. The remaining question is how to make the transportation sector more independent of sharp disruptions and "unfriendly" sources.

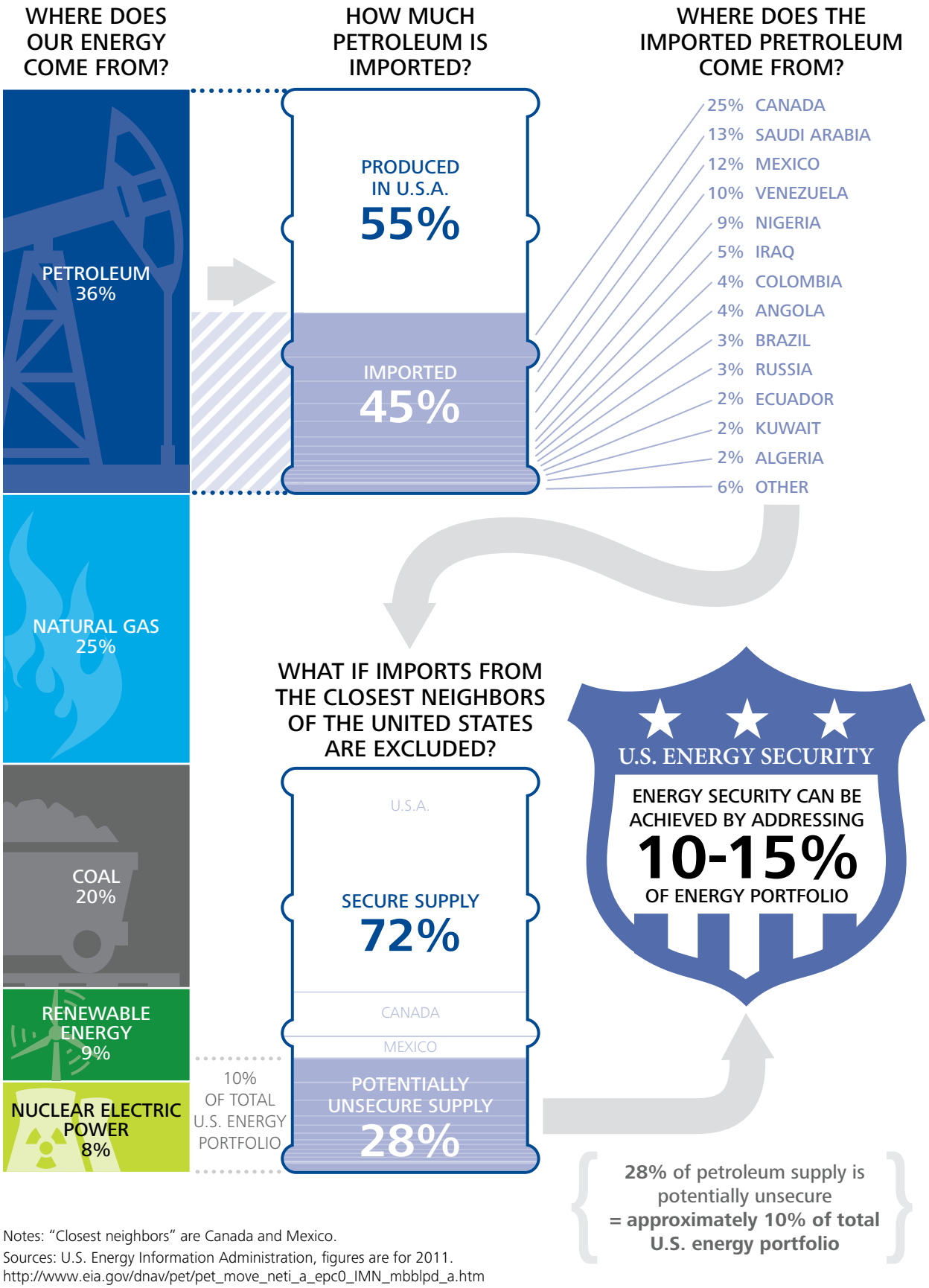
With that in mind, we can return to and refine the two questions we posed earlier:

1. **What fuels should we use to produce electricity, given EPA requirements concerning the release of greenhouse gases?**
2. **How do we meet our need for secure, reliable and economic energy for transportation?**

As to the first question, the United States has reliable, secure and adequate supplies of fuel for electricity production. In most cases, either the fuel supply is predominately domestic, as in the case of coal and natural gas; is sourced domestically or from secure international trading partners, as with nuclear power; or is not a factor, as with wind and hydroelectric energy. (One crossover consideration concerns the fact that the introduction of more electric vehicles will shift demand from oil toward electricity consumption.)

The real challenges to energy independence and security lie in the second question. To say that the United States needs a secure supply of energy really means a secure supply of petroleum, which currently makes up approximately 36 percent of the overall U.S. energy supply portfolio, less than half of which is imported. When imports from Canada and Mexico are subtracted, the real major energy independence and security challenges of the U.S. energy portfolio amount to between 10 and 15 percent of our overall energy supplies—a challenge that is well within the economic, industrial and policy capabilities of the United States to tackle. And, upon assuring energy security for this portion of the portfolio, complete energy independence is largely unnecessary.

The path to energy security



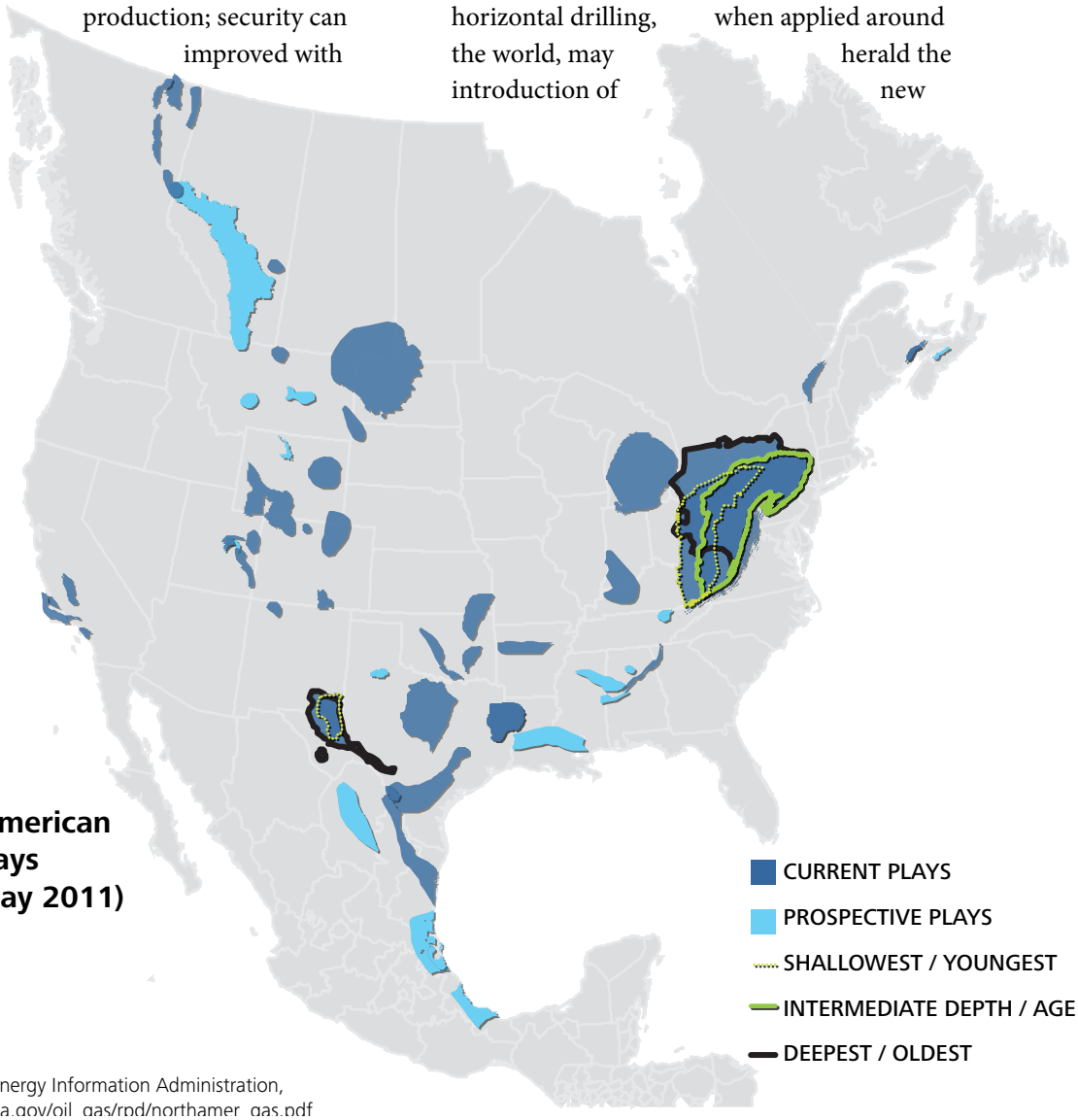
Notes: "Closest neighbors" are Canada and Mexico.
Sources: U.S. Energy Information Administration, figures are for 2011.
http://www.eia.gov/dnav/pet/pet_move_neti_a_epc0_IMN_mbblpd_a.htm

A focus on energy security

IT is the diversity, breadth and depth of the U.S. energy supply portfolio that currently "secures" over 85 percent of our energy supplies. How do we enhance the security of the entire portfolio and extend this security to the remaining 10 to 15 percent? Using those same principles: diversity, breadth and depth.

A starting point is a continued focus on improved energy efficiency and increased domestic production; security can also be improved with increased production from existing suppliers such as Canada and Mexico and the addition of more numerous foreign suppliers selling at market prices.

The revolution in shale energy production highlights what the energy industry has long known: the United States still has major, untapped domestic sources of oil. Technologies such as hydraulic fracturing and horizontal drilling, when applied around the world, may herald the introduction of new



North American shale plays (as of May 2011)

Source: U.S. Energy Information Administration, http://www.eia.gov/oil_gas/rpd/northamer_gas.pdf

Developing and exploiting our remaining oil and gas resources, investigating next-generation nuclear power and continuing to expand renewable energy sources, all make good sense from a variety of economic and policy perspectives.

countries as oil suppliers, and increase potential supplies from existing friendly sources.[49]

Lowering the demand for transportation fuels also can enhance global energy supplies. This can be accomplished through the prudent expansion of the use of alternative fuels such as methanol, ethanol and natural gas and the expansion of the electric vehicle fleet. Increased vehicle efficiency—through improved vehicle mileage or higher capacity utilization such as greater use of ridesharing and carsharing and high-efficiency mass transportation—can also reduce demand.

Some of these options, of course, also imply the construction of new networks and infrastructure, such as CNG or LNG refueling stations, electricity recharging facilities and new mass transit systems. Policies that encourage such developments benefit both price and supply security.

Developing and exploiting our remaining oil and gas resources, investigating next-generation nuclear power and continuing to expand renewable energy sources, all make good sense from a variety of economic and policy perspectives. This was the conclusion of the 2007 report *Hard Truths: Facing the Hard Truths about Energy*, a major study of our energy resources and policies by the National Petroleum Council.[48] The report pointed to the need to move ahead with developing all sources of energy, a conclusion recently endorsed, at least in theory, by President Obama as an "all of the above" energy policy.[50]

Any "all of the above" policy must include a healthy dose of energy efficiency as well as support for alternative and renewable energy sources. Improved fuel efficiency lowers demand, increases the supply margin and contributes to lower prices and smaller consumer bills. And since a major portion of our energy supply is provided by CO2-emitting petroleum, coal and natural gas, greater efficiency also reduces greenhouse gas emissions.

Continuing and expanding on our traditional policies of market pricing and consumer choice, while pursuing measured and effective environmental and efficiency regulations, are aspects of an energy policy that truly supports national energy security.

Recommendations

To ensure the availability of secure supplies of affordable energy, the United States should:

- **Support the prudent exploration and development of our abundant domestic energy sources**, opening additional onshore and offshore areas to oil and gas exploration.
- **Support our North American allies in the prudent exploration and development of their abundant domestic energy sources**, thus adding security to the import portion of the U.S. energy portfolio.
- **Support government policies that encourage greater energy efficiency** in all sectors, including transportation, industrial, commercial and residential applications.
- **Support legislation that encourages multi-fuel, natural gas, electric and other alternative fuel vehicle programs** to continue diversifying the U.S. base of transportation fuels and alternatives.
- **Continue to support the prudent and cost-effective deployment of alternative and renewable energy sources** into the energy portfolio, most notably wind and solar, in order to continue to diversify the U.S. base of electricity generation.
- **Support research and development of clean coal and clean gas technologies** to help ensure that these domestically abundant and secure fuels remain part of the U.S. energy portfolio well into the future.
- **Increase research into and development of next-generation nuclear reactors**, which promise to be safer and more fuel-efficient than previous models.
- **Develop and enact a new national nuclear fuel storage and disposal plan** to help secure nuclear power as a long-term component of our domestic energy supply.
- **Support open markets and free trade in energy products and their derivatives**, allowing markets to predominate in directing investments to balance energy supply, demand and pricing.

And, perhaps most importantly, pursue "all of the above" in a balanced, thoughtfully considered and prudent fashion, understanding that America today already has a diverse, broad and deep energy supply portfolio—with the majority of it having a high level of energy security and independence. These recommendations are focused on continuing to enhance the long-term security of that portfolio, as well as to extend the same level of security across the entire U.S. energy portfolio.

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