America's Energy Future

15 PDH

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FDA, Inc.

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ENERGY IS GOOD

Energy is good. Energy provides the basis for advanced civilization and improved standards of living. It allows us to live comfortably in climates that would otherwise be too hot or too cold. It allows us to transport ourselves and cargo around our neighborhood or around the world. It allows us to produce food in the quantities necessary to feed the world's population. It allows us to manufacture and communicate and enables every aspect of modern life. America has tremendous potential to produce energy and create good jobs. And these good jobs are not only in energy production – although the people of Alaska, Louisiana, North Dakota, Pennsylvania and Texas, to name a few examples, will attest to their importance. These jobs extend beyond energy production, flowing directly from the economic growth made possible by it. We have the resources, the capacity, and the technological know-how to lead on energy production and benefit our economy, our security, and our environment.

Since the moment humans first harnessed fire, energy, along with its benefits, has posed risks and has had costs. Centuries ago, energy policy was simple – have fire or freeze. Today energy policy is more complex. Along with its benefits, energy has risks and both direct and indirect costs. To minimize those risks and costs, we need to develop and use it wisely. We need to be more efficient in our energy production and use while seeking to reduce energy's impact on the environment.

As we rethink our nation's energy policy, it is important to face questions about the risks of energy and resource development including questions about climate change. We need to discuss these questions openly and find common ground on prudent steps to take in the face of uncertainty. What is certain is that we can best address environmental challenges if we are prosperous and secure. Affordable, abundant, secure energy is not the problem; it is part of the answer.

It is in our national interest to make energy abundant, affordable, clean, diverse, and secure. These five principles are discussed below:

Abundant – As the standard of living rises around the world, demand for energy will continue to grow. Anyone who has lived through a blackout or gasoline shortage or spent time in a less developed country doesn't need much explanation of the value of energy abundance. We should aim to use energy more wisely, and some of our habits deserve constructive criticism, but few want to go back to pounding clothes clean on rocks in the stream. The simple reality is that we use a lot of energy because we have a high (and improving) standard of living, and we live in a big country where transportation costs are high. Using energy efficiently is part of, not in conflict with, abundant and affordable energy. Energy consumption per unit of gross domestic product (GDP) has fallen from 17.35 thousand British thermal units (Btu) in 1949 to 7.31 thousand Btu in 2011, a drop of nearly 60 percent.[1] We need to continue to do better, however, and find new and creative ways to encourage energy efficiency. Reliability is also part of abundance. The truth is that we need our energy and the systems that deliver it to be reliable. Blackouts, shortages, and system failures are dangerous – sometimes even life-threatening – and are also costly. The nation's energy policy ought to place a high value on reliability of energy service as an element of abundance.

Affordable – The direct cost of energy affects the cost of everything. There is nothing else that impacts our economy so directly, but is so within our control. From individuals struggling to fill up their gas tanks or pay their electric bills, to business leaders making investment decisions based on the cost of powering server farms or smelters, lower cost is better. There are those who believe the best way to reduce the indirect costs of energy to our society is to raise direct costs to discourage use, but this is a self-defeating policy. Lowering the direct cost of energy is key to helping the U.S. economy recover and prosper.

Clean – Attempting to minimize indirect costs (also known as "externalities") by driving up prices is a policy doomed to economic and practical failure. Instead, we need to be cognizant of environmental impacts of every type of energy production and make rational, informed decisions on what is acceptable, what needs to be mitigated, and how to do it. Our challenge is to reduce the cost of "cleaner" sources of energy, not raise the cost of existing sources. Too often, "clean" is treated as an absolute, but it is better regarded as a comparison. A better definition of clean is: "*less intensive in global lifecycle impacts on human health and the environment than its likeliest alternative.*"

Diverse – Every type of energy has its own sets of advantages and disadvantages. Overall, however, the more diverse our sources of energy, the more robust and secure our national energy grids and fuel supplies. Almost more importantly, the more diverse our energy supply, the greater chance we have of game-changing breakthroughs. At least in words, there is consensus that America needs an "all of the above" energy policy.

Secure – The United States produces approximately 80 percent of its own energy.[2] Within that figure, however, is a significant disparity. We supply virtually all of our nation's electric power needs from coal, gas, nuclear, and renewables.[3] The transportation sector, however, is almost all oil dependent, and we import over 40 percent of our petroleum at tremendous cost. In 2011 alone, the United States sent more than $330 billion overseas to purchase foreign oil.[4] Too many of these dollars go to governments that are not our friends and do not enforce environmental or safety standards. We should continue to steadily reduce the percentage of oil in our energy mix, but for the sake of our nation's economy and for the sake of the world's environment, we should strive to produce the largest possible percentage of our oil needs domestically, and to obtain any imports from geographic neighbors and strong allies. Tapping our potential and restoring trust in our people will be a breakthrough in itself that will enable a brighter future.

PRODUCING MORE

Energy production supplies good jobs for millions of our citizens and provides security and prosperity for many more. Abundant and affordable energy is a core foundation for our way of life. In recent years, however, we have taken energy production for granted, or in many cases, restricted our domestic production. We must produce more energy here at home. We can do so, and in doing so continue to make American energy production safer and with fewer environmental impacts than anywhere else in the world. We should place confidence in American ingenuity to balance both increased and responsible domestic production.

By producing more, the policies advocated in this document will pay for themselves while advancing our national energy goals.

OIL AND NATURAL GAS

New technologies and studies continue to prove that North America has a vast hydrocarbon base, with the potential to substantially affect supply in world markets. The Energy Information Administration (EIA) – an independent and impartial institution within the Department of Energy (DOE) that collects, analyzes, and disseminates energy information – reported in 2012 that the U.S. holds 220.2 billion barrels of technically recoverable oil, or more than a century's worth of projected imports from the Organization of the Petroleum Exporting Countries (OPEC).[5] This figure does not include the vast supply of unconventional oil resources that will become commercially viable in the future. The National Petroleum Council in a fall 2011 study affirmed that the U.S. has far more recoverable oil than many have acknowledged, thanks in part to the directional drilling and hydraulic fracturing technologies ("fracking") that are dramatically increasing oil and natural gas reserves.[6] We are increasing oil and gas production on private and state lands; it is critical that we allow the same to occur on federal lands.

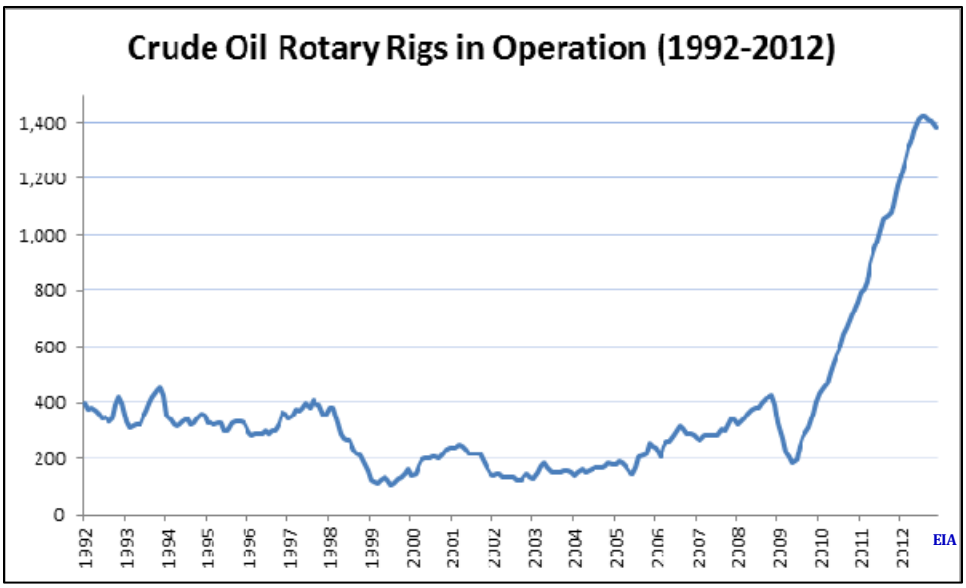
The United States should establish a national goal to produce enough additional oil, biofuels, and synthetic fuels to become independent of OPEC imports by 2020. The fulfillment of this commitment would support the creation of millions of well-paying jobs, increase federal revenues, reduce our budget and trade deficits, and help maintain affordable world energy prices.

Some Americans may view energy policy from a perspective of scarcity, oriented by the oil price shocks of 1973. But the energy market and policy landscape is vastly different today, especially in America. Over the past five to seven years, domestic oil production has dramatically increased, and forecasts for the future are very promising.

By 2020, achieve independence from OPEC imports.

Due to significant production increases on state and private lands:

- Primary energy production in fossil fuels is at its highest point since DOE's records began in 1973.[7]
- The number of exploratory crude oil wells more than doubled from 2000 to 2010.[8]
- There were on average more rotary rigs in operation in 2012 than in any year since 1985.[9]
- Domestic crude oil production is higher now than at any point since 1997.[10]



While trends on state and private lands are quite positive, oil production on federal lands remained largely flat from 2003-2011, and sales of natural gas from federal lands fell by 31 percent.[11] Of equal concern, the number of permits issued for onshore and offshore production on federal lands – a key indicator of future production – has also dropped significantly since the preceding administration.[12]

Claims that very recent federal policies have had a significant role in the increase in domestic oil production are therefore deeply misleading. About 96 percent of the increase in domestic oil production is attributable to growth on state and private land.[13] Indeed, the overall domestic increase is *in spite of* federal policies that stymie production. We should reverse this trend and develop federal lands.

The ongoing boom in American oil and gas production must be fundamental to our national energy policy. We no longer should view energy policy from a perspective of scarcity, but rather, from a perspective of increasing abundance. With the right policies, abundant and affordable energy is achievable.

The economic well-being and security of this nation depend on maintaining guaranteed and affordable access to a diverse array of stable energy supplies. To effectively reduce our reliance on imported petroleum, we need to accelerate the development of our domestic resources in the safest, most efficient, and most environmentally sound way possible.

Booming domestic oil and natural gas production can help pave the way to energy independence from OPEC.

Source: Ohio EPA

ENERGY INDEPENDENCE FROM OPEC IMPORTS BY 2020

The United States consumes approximately 97 quadrillion Btu[14] of energy each year to power all aspects of American life, from driving to cooking to using the internet.[15] Approximately four-fifths of that energy – 78 quadrillion Btu – is produced domestically. Domestic energy production includes coal, natural gas, nuclear, renewables, crude oil, and other types of energy.

The U.S. also exports a considerable amount of energy each year. In 2011, for example, the U.S. exported over two quadrillion Btu worth of coal and nearly six quadrillion Btu worth of petroleum products. Though engaging in world energy markets is a good thing, the current state of these trade flows is a net imports balance of 18 quadrillion Btu per year. In other words, we import nearly 20 percent of our nation's energy consumption.[16]

Crude oil imports, at nearly 20 quadrillion Btu, account for the vast majority of this deficit.[17] Excluding petroleum products, the U.S. imported roughly 8.5 million barrels of oil per day in 2011, in net terms. Just over half of this amount – 4.6 million barrels per day – was imported from members of OPEC.[18] This cartel, in which many Middle Eastern countries have a significant influence, is a powerful force in energy markets because it produces about 40 percent of global crude. Many of its members are friendly to the U.S., but several have been opposed to the U.S. over the years. Dictatorship, war, insurgency, terrorism, and political turmoil frequently come into play in the Middle East and other OPEC countries, and too frequently have the potential to affect the global marketplace. Our present dependence on OPEC makes it difficult for us to advance our values and defend our interests.

The idea of energy "independence" has caused a great deal of confusion in today's political rhetoric. Presidents and politicians have championed the idea since the 1973 OPEC oil embargo and ensuing energy shortages. In advocating energy independence from OPEC imports by 2020, it is important to clarify precisely what is meant by "independence."

Over the past three decades, advances in energy markets and infrastructure have created a truly global marketplace, where the price of oil is based on demand, supply, and the perceived future of both. Our new reality is that the price of oil is set on a global market. We must accept this reality and set our national policies accordingly. In today's world, isolation from this global market is neither possible nor desirable; "independence" can and should be defined differently. While the U.S. cannot reasonably expect to *control* the global price of oil or OPEC-driven price shocks, we can certainly have a meaningful effect on prices and minimize our exposure to international volatility. We can further protect and advance our interests by eliminating our dependence on OPEC imports.

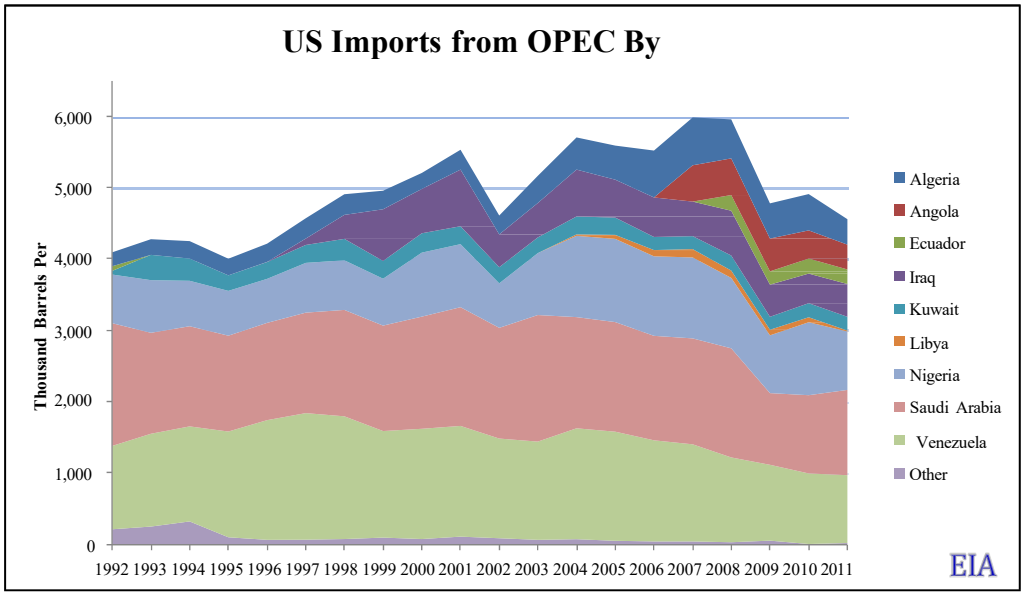
Skeptics who say this is impossible are needlessly pessimistic and simply basing their conclusions on outdated information. First, the U.S. has seen its reserve portfolio grow substantially in the past decade. The U.S. intelligence community assessed in its long-range forecasting that the nation "could emerge as a major energy exporter" by 2020.[19] This is due in large part to previously subeconomic resources, like shale oil, becoming economic on private and state lands. Technology is likely to allow for exponentially higher reserve growth in

coming years, and a modern seismic assessment would immediately expand the U.S. resource base by potentially huge margins.

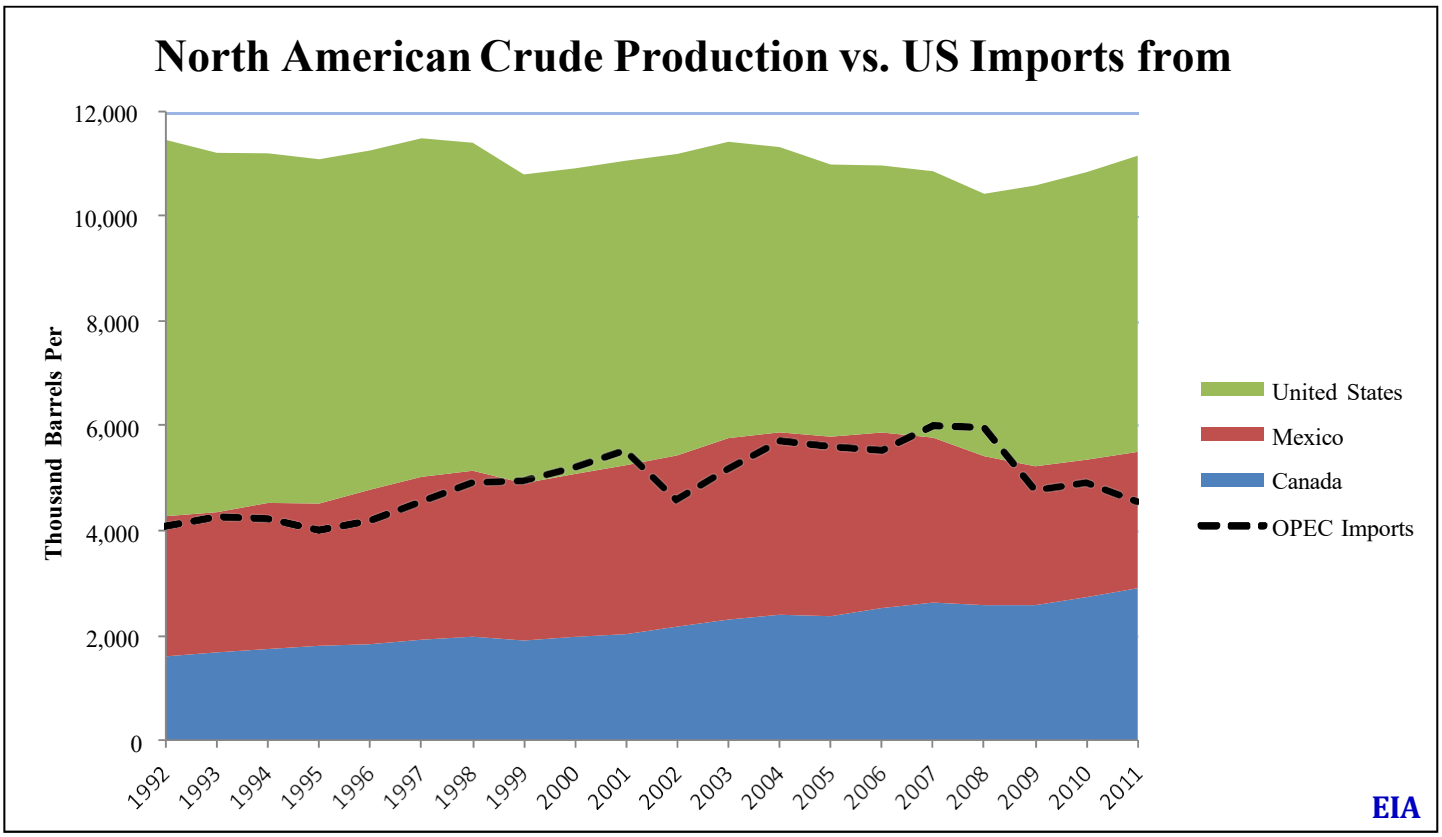
Second, the trends are already in our favor. Total domestic energy production is rising – by nearly 10 percent over the past 10 years – even as Americans become more energy efficient, technology improves, and exploration continues.[20] Crude oil production is at its highest peak in 15 years and exploration has doubled over the last decade.[21] There were on average more rotary rigs in operation in 2012 than in any year since 1985, despite regulatory uncertainty and restricted access on federal lands.[22] Based on these and other trends, the International Energy Agency recently predicted a bright future for American energy, including declining imports and rising exports.[23]

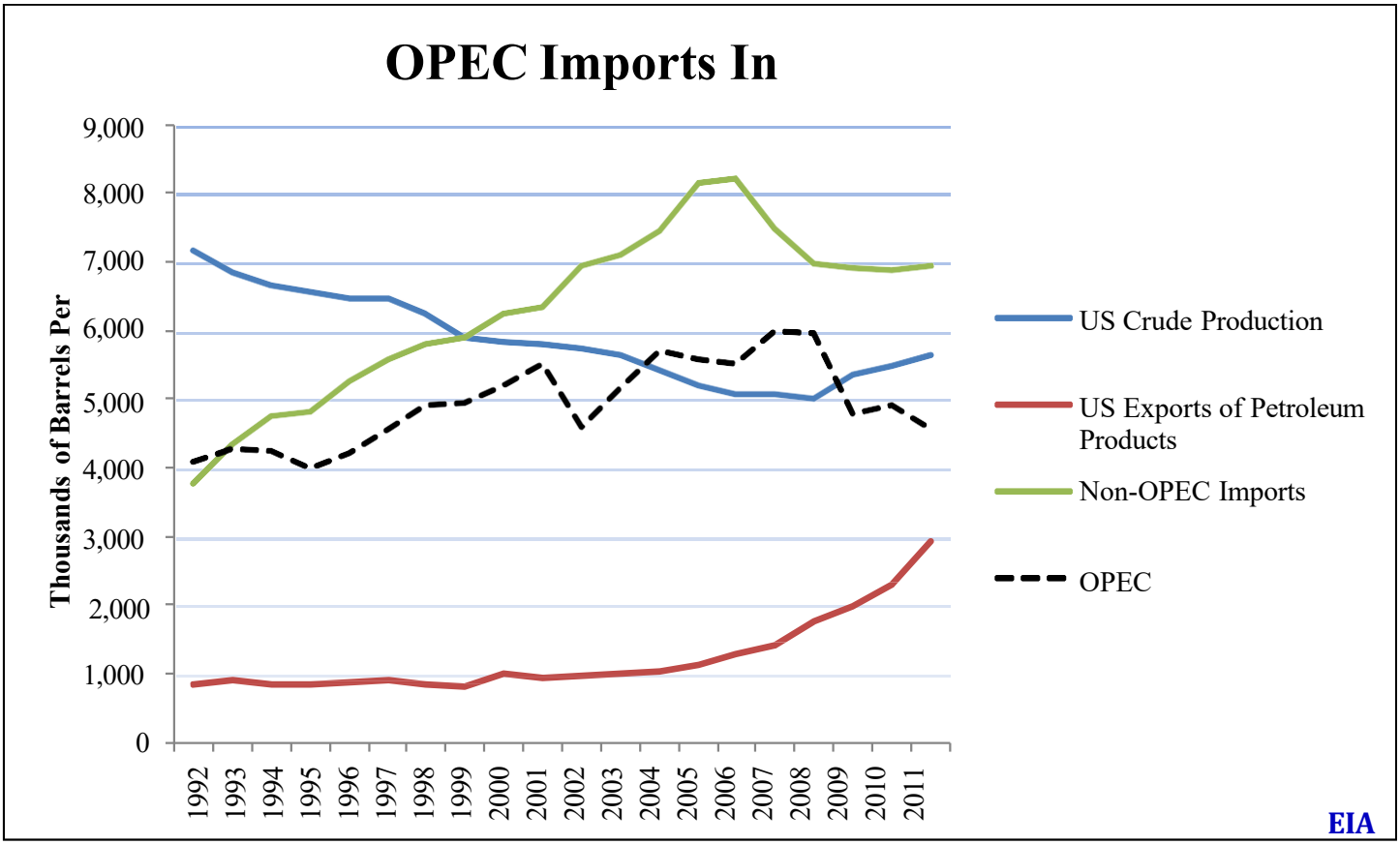
Third, the U.S. stands to benefit from greater energy production in both Canada and Mexico. Both nations have significant resources and are eager to commercialize them in trade and partnership with the United States. Energy resources are natural phenomena irrespective of political borders. In 2011, Canada produced roughly 2.9 million barrels of crude oil per day, while Mexico produced 2.6 million.[24] When added to the approximately six million barrels that the U.S. produces each day, total North American production (11.5 million barrels) is far greater than the nation's net imports (8.5 million barrels in 2011) and more than double the imports from OPEC (4.6 million barrels). There is no scarcity of energy resources in North America. The only scarcity is in our resolve to take full advantage of our continent's tremendous resource base – to produce more oil within our own borders, and to ensure that Canadian and Mexican exports are brought here whenever the opportunity arises. If we accomplish that, we can displace our OPEC imports by 2020.

In sum, the United States has made tremendous gains in energy production and the outlook is promising for years to come. By isolating transportation as the critical sector for petroleum consumption, and by situating U.S. production in the context of a wider continental boom, energy independence from OPEC by 2020 becomes an imminently achievable goal. We are headed in the right direction, but this course must continue. We must pursue two critical changes to current energy policy: increased access to reasonably regulated federal resources, and more collaboration with Canada and Mexico.



The United States can displace OPEC imports by 2020 with North American petroleum production.





The federal government can help achieve energy independence from OPEC by 2020 by permitting oil and gas development offshore in a fair and responsible way.

Source: DOI

In order to reach this goal, the federal government needs to:

- Expedite federal permitting and review decisions for energy, natural resources, and related infrastructure projects.

- Permit the construction of the "Keystone XL" Pipeline and encourage the construction and full utilization of other pipelines to facilitate energy commerce among and between the U.S. and our North American neighbors.

- Require that the Department of the Interior (DOI) outline plans for development of Outer Continental Shelf (OCS) resources to more accurately estimate available resources and set minimum production targets taking into account necessary environmental requirements. Although these targets would be set administratively, they should be achievable and binding. If and when actual production is projected to fall short of such targets, additional leasing, onshore or offshore, should be made available to compensate for the shortfall.

- Streamline and simplify the federal permitting process to ensure that offshore leases are developed – specifically repealing many of the recent additional requirements on shallow water Gulf of Mexico drillers (predominantly involving natural gas development and production). Level the playing field for independent operators by reducing redundancies in paperwork and refraining from notice-to-lessee regulation instead of formal rulemaking.

- Expand OCS leasing to the Eastern Gulf of Mexico and parts of the Atlantic OCS (off the coasts of Virginia, North Carolina, South Carolina, and Georgia).

- Pass organic legislation for a consolidated offshore regulator, with a reaffirmed and strengthened statutory authority to develop offshore resources expeditiously through a certain and fair permitting process, while incentivizing safety and best environmental practices.

- Direct a share of revenues to participating offshore energy producing states – including offshore wind, tidal, and wave generation – and establish permanent revenue sharing (as is established for onshore development) from leasing, bonus bids, rents, and royalty receipts at 27.5 percent with provision for direct partial payments to affected coastal communities. Allow an additional 10 percent to be directed to state funds to support energy research and development (R&D), alternative and renewable energy, energy efficiency, and conservation. Expand state territorial limits mandated by the Submerged Lands Act to 12 miles offshore, reducing federal management burdens and allowing for state resource development.

- Amend law to provide for an updated liability regime to ensure that no oil spill victim ever goes uncompensated, that U.S. tax dollars are never required to compensate for a spill, and that operators face substantial consequences for major avoidable incidents, while ensuring the U.S. oil and gas industry remains competitive throughout the world.

- Establish parallel four or five-year programs for federal onshore leasing and development. Require administrative establishment of achievable, binding production targets to be reconciled with available resources and environmental considerations.

- Restore onshore revenue sharing from the current 52 percent to 48 percent federal-state split to an even 50 percent to 50 percent split.

- Provide regulatory certainty for the continued use of carbon dioxide as a commodity for enhancing oil and gas recovery by continuing to treat injection sites as Class II wells under the Underground Injection Control program.

- Direct the State Department to prioritize negotiation with the government of Mexico to allow for expanded foreign investment in Mexico's previously state-run oilfields, even as Mexico is already considering its own policy changes to enable such investment. Explore amending the North American Free Trade Agreement (NAFTA) to facilitate the free trade of goods and services to assist Mexico's petroleum revival.

USGS estimates show undiscovered, conventional oil and gas resources in 10 priority geologic provinces of Mexico, Guatemala, and Belize.

Source: USGS

A tanker docked at the Nikiski, Alaska LNG plant.

Source: Alaska Natural Gas Transportation Projects, Office of the Federal Coordinator.

- Carefully observe and evaluate DOE processing of applications for exports of Liquefied Natural Gas (LNG), and, as necessary, update and clarify LNG export rules to provide certainty both to gas-dependent industries and to potential investors in export facilities, ensuring that the U.S. moves toward improved trade balance and energy security. At the very least, expedite the process for Lower 48 LNG exports to allies of the United States that face emergency or chronic shortages but with whom we do not have free trade agreements.

- Reinstate the DOI Royalty-in-Kind (RiK) program with improved management and oversight.[25] This would parallel practices of oil-producing states and create a more efficient means for federal taxpayers to benefit by their resources, including the fulfillment of the SPR to its statutory and international mandates.

- Include provisions to streamline approvals, improve exploration and help fund improved economic and environmental planning to increase energy production from Indian reservations and Native-owned lands nationwide. Aid should also be provided to help Indian Tribes and Native Corporations partner with firms and benefit from energy developments on their lands. This is important because the 44.5 million acres owned by Indian tribes in the Lower 48 and the additional 44 million acres owned by Native Corporations in Alaska[26] represent some of America's best prospects for coal, oil and natural gas discoveries. By some estimates, these lands hold up to a fifth of the nation's unutilized energy potential. Indian and Native lands also contain top prospects for renewable energy development, ranging from Apache biomass prospects, to Blackfeet wind resources, to Ute and Pueblo solar prospects, to dozens of hydroelectric sites in Alaska owned by Native Corporations.

- Open 2,000 acres in the non-wilderness portion of the Arctic National Wildlife Refuge (ANWR) coastal plain (1002 area) to exploration and production. (The 1002 area is outlined in red in the adjoining figure.) To do this, we need to:

  - Require timely lease sales
  - Streamline and simplify the permitting process
  - Designate a fund, in cooperation with the North Slope Borough and derived from a fraction of the statutory revenue share, to mitigate the effects of exploration and development
  - Provide for a 50 percent to 50 percent federal-state revenue sharing split rather than the 10 percent to 90 percent federal-state split as provided for under current law

- The National Petroleum Reserve-Alaska (NPR-A) must be immediately placed into full availability for oil and natural gas leasing, consistent with its statutory designation. The reserve must be thoughtfully developed with roads, bridges, and pipeline facilities to promote broad onshore development of the diffuse resource base, while simultaneously accommodating the transportation of oil and natural gas from offshore fields in the Chukchi Sea to the Trans-Alaska Pipeline System (TAPS). "Roadless" options for the NPR-A should be expressly withdrawn from consideration. The leasing deferral in and around Teshekpuk Lake through 2018 should be honored.

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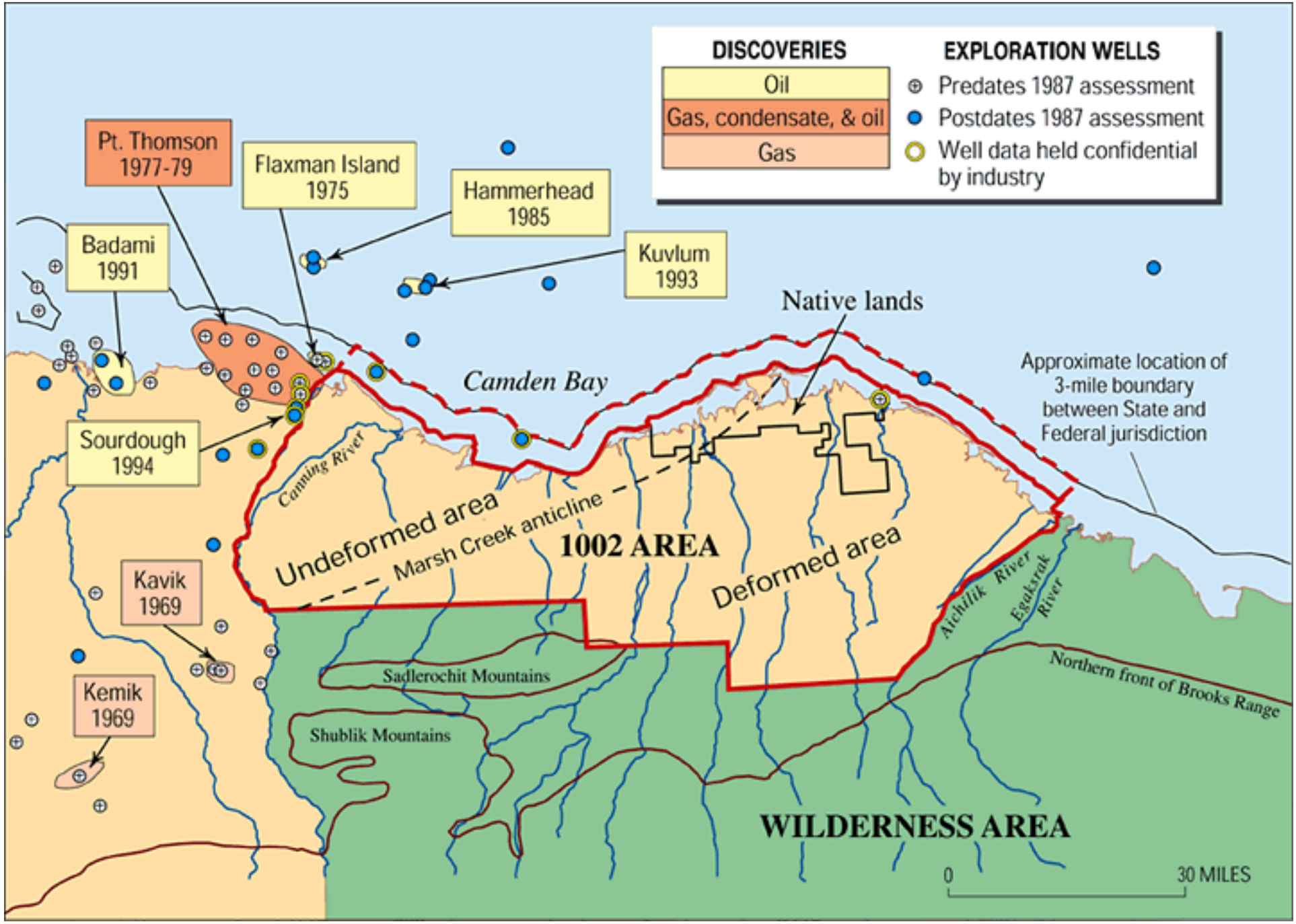
Congress should act to keep the promises contained in legislation decades ago authorizing the development of oil and gas resources on the coastal plain of ANWR and in NPR-A. The responsible development of the oil and gas resources contained in these basins is important to achieving energy independence from OPEC by 2020.

Arctic National Wildlife Refuge (ANWR) Coastal Plain (1002 area), Northern Alaska

Source: USGS



Source: USGS


Exploration Wells
• NPRA 2000-2001
• Other
Known Accumulations
Oil
Gas
Announced Oil Discovery
Three-mile boundary between State and Federal jurisdiction
National Petroleum Reserve - Alaska
USGS Seismic Grid
Native Lands
0 50 MILES
0 50 KILOMETERS
71°
70°
69°
68°
160°
155°
150°
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STRATEGIC PETROLEUM RESERVE

The Strategic Petroleum Reserve (SPR) was established in 1975 by the Energy Policy and Conservation Act. Its purpose is to provide the nation with an emergency stockpile of crude oil in case of serious supply disruptions and emergencies. Housed in enormous caverns along the Gulf Coast, the SPR's 700 million barrels constitute enough oil for approximately 80 days of "import protection" or 35 days of total consumption.

The SPR's comparatively short intervals of supply highlight why it can and should be tapped only rarely. In fact, coordinated releases with the International Energy Agency (IEA) have been ordered by the president on only three occasions: during the Operation Desert Storm (1991), after Hurricane Katrina (2005), and during the Libyan civil war (2011). This latter release was particularly controversial.

The SPR is the largest emergency stockpile of oil around the globe. The SPR is not an ATM. It is therefore imperative that the federal government review SPR release criteria and clarify that the release of SPR oil shall occur only when there is a significant supply disruption, and not simply an increase in energy prices. For example, after Hurricane Sandy, DOE released a small portion of the Northeast Home Heating Oil Reserve, a specialized supply of distillate heating oil stocks also managed by DOE, to offset genuine fuel supply disruptions in hard-hit areas.

Even as domestic oil production rises, the SPR's strategic importance for mitigating risk is just as relevant. Geopolitical instability, particularly in the Middle East and Africa, present the risk of a severe and prolonged oil supply disruption. The far higher oil prices that are likely to result from such a disruption argue for the preservation of the SPR at its current level, at least in the near future. While price spikes to $100 a barrel were once unheard of, today a severe disruption could yield prices far above that level. Should that ever come to pass, the SPR will be one of the few options available to help mitigate short-term economic damage.

In the absence of a supply disruption, it is short sighted to treat the SPR as a mechanism for lowering gas prices, especially given the size and complexity of global oil markets. If we become accustomed to releasing oil for temporary potential price relief at the pump, we may be caught unprepared when the SPR is truly necessary.

Strategic Petroleum Reserve crude oil pipelines, Bryan Mound, Texas

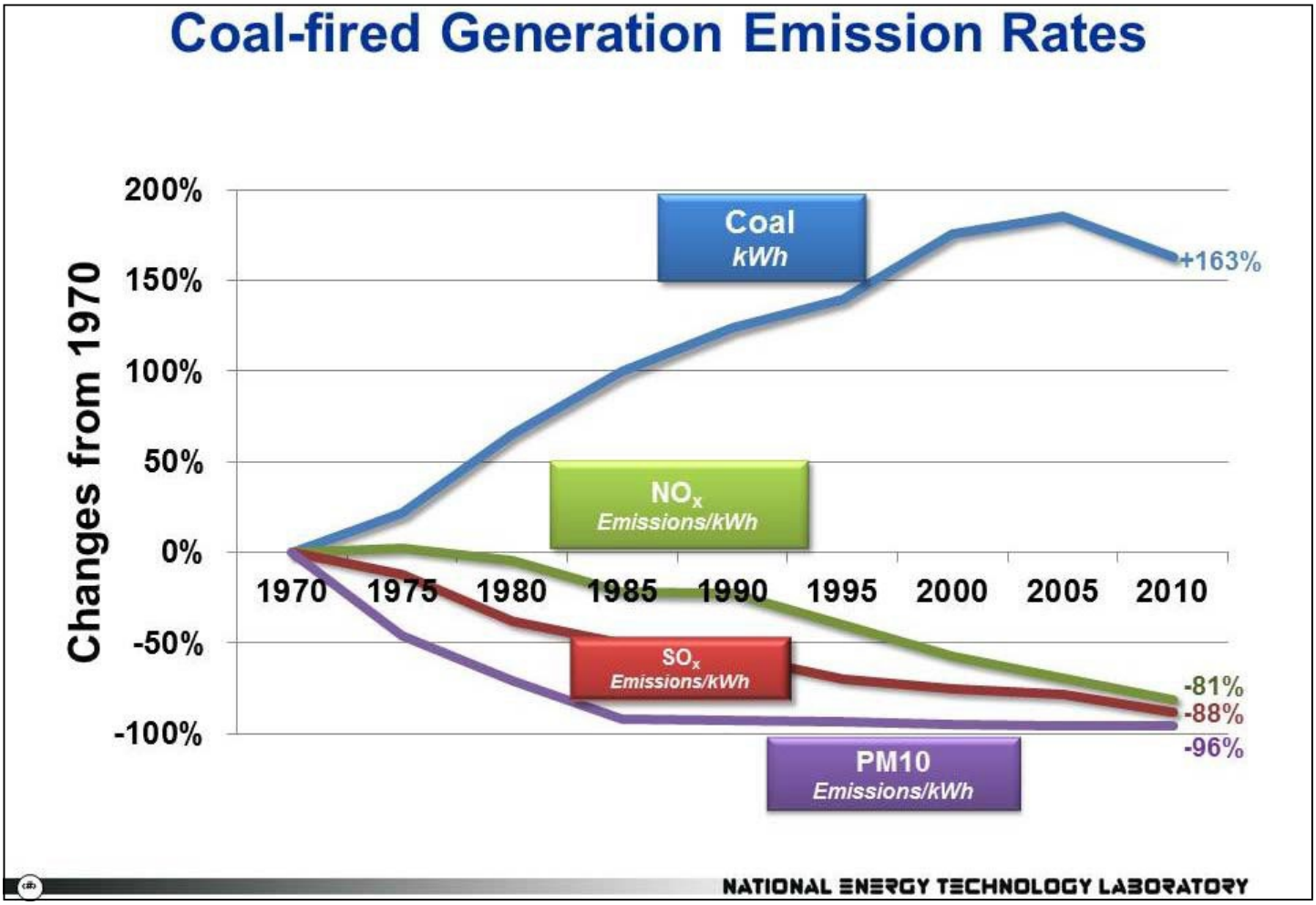
Source: DOE

COAL

Coal is an abundant, secure, and affordable energy resource. For more than a century, coal has allowed our families and businesses access to energy and – at current levels of consumption – domestic coal reserves promise a stable supply of energy for 200 or more additional years.[27] As a direct result of this abundance, coal has remained one of the most affordable fossil fuels on the market and avoided the price volatility associated with so many other commodities.

Over time, coal has also become a cleaner energy resource as its environmental performance has demonstrated substantial improvement. The rate of emissions per unit of output for nitrogen oxide and sulfur dioxide from coal-fired electric generation have dropped approximately 78 percent each since 1990, and further reductions are possible.[28]

Because of coal's domestic abundance, relative affordability, and increasing cleanliness, it will remain a cornerstone of energy supply in the U.S. In the years ahead, the opportunities for coal are significant. The diversification of its use includes not only electric power generation but also synthetic gas, chemical, fertilizer and liquid fuel production.



Pollution emissions have decreased even as total coal-fired plant power generation has increased at about twice the rate.

Sources: NETL, EIA, *Annual Energy Review, EPA National Air Pollutant Emission Trends.* Percent change on a relative basis (1,000 ton/ Billion kWh) for emissions.

By 2020, diversify coal utilization while continuing to improve its environmental performance.

The United States needs to establish long-term policies to promote the continued, responsible production of coal, improve its environmental impact, diversify its use, and ensure robust access to export markets.

By 2020, we must diversify coal utilization while continuing to improve its environmental performance. To reach this goal, balance must be restored between coal's role in providing affordable energy for robust economic growth and the environmental standards we rightly expect from the producers and users of this resource. These efforts will help to ensure that coal remains a contributor to the reliability of our nation's electric grids, an improvement to our balance of trade, and a creator of jobs in the mining sector and elsewhere. In order to accomplish this goal, policies must be put into place to:

- Repeal prohibitions on the federal government, and the DOD in particular, procuring certain coal-derived fuels.
- Establish long-term procurement contracting authority for the federal government, which will facilitate private-sector confidence in the existence of markets for alternative, coal-derived fuels.
- Support utilization of captured carbon dioxide as a commodity for enhanced oil recovery.
- Prohibit preemptive and retroactive vetoes of mining project permits.[29]
- Reform DOE's coal-related R&D programs, which have become narrowly focused on carbon dioxide emission reductions to the exclusion of other opportunities. These programs would benefit from renewed emphasis on broader environmental, gasification, and liquefaction technology development opportunities, in addition to carbon capture, utilization, and sequestration.
- Enable efficiency improvements at coal-fired power plants by reforming regulations that discourage investments in such upgrades. Specifically, this should include reforms to the New Source Review (NSR) Program that might narrowly exempt efficiency improvements from triggering NSR.
- Ensure that new regulations do not jeopardize the reliability or affordability of electricity, both of which rely heavily upon coal for baseload power generation.
- Provide regulatory certainty regarding the definition of streams and the circumstances under which coal production can and should take place near them.
- Prevent attempts to merge the substantive work of agencies like the Bureau of Land Management and the Office of Surface Mining Reclamation and Enforcement, which serve fundamentally different missions that are equally important.

- Pursue permitting reform across the board, but for coal in particular focus on eliminating duplicative requirements under the Surface Mining Control and Reclamation Act and the National Environmental Policy Act (NEPA) in a way that consolidates, but does not deteriorate, the input of the various federal agencies.

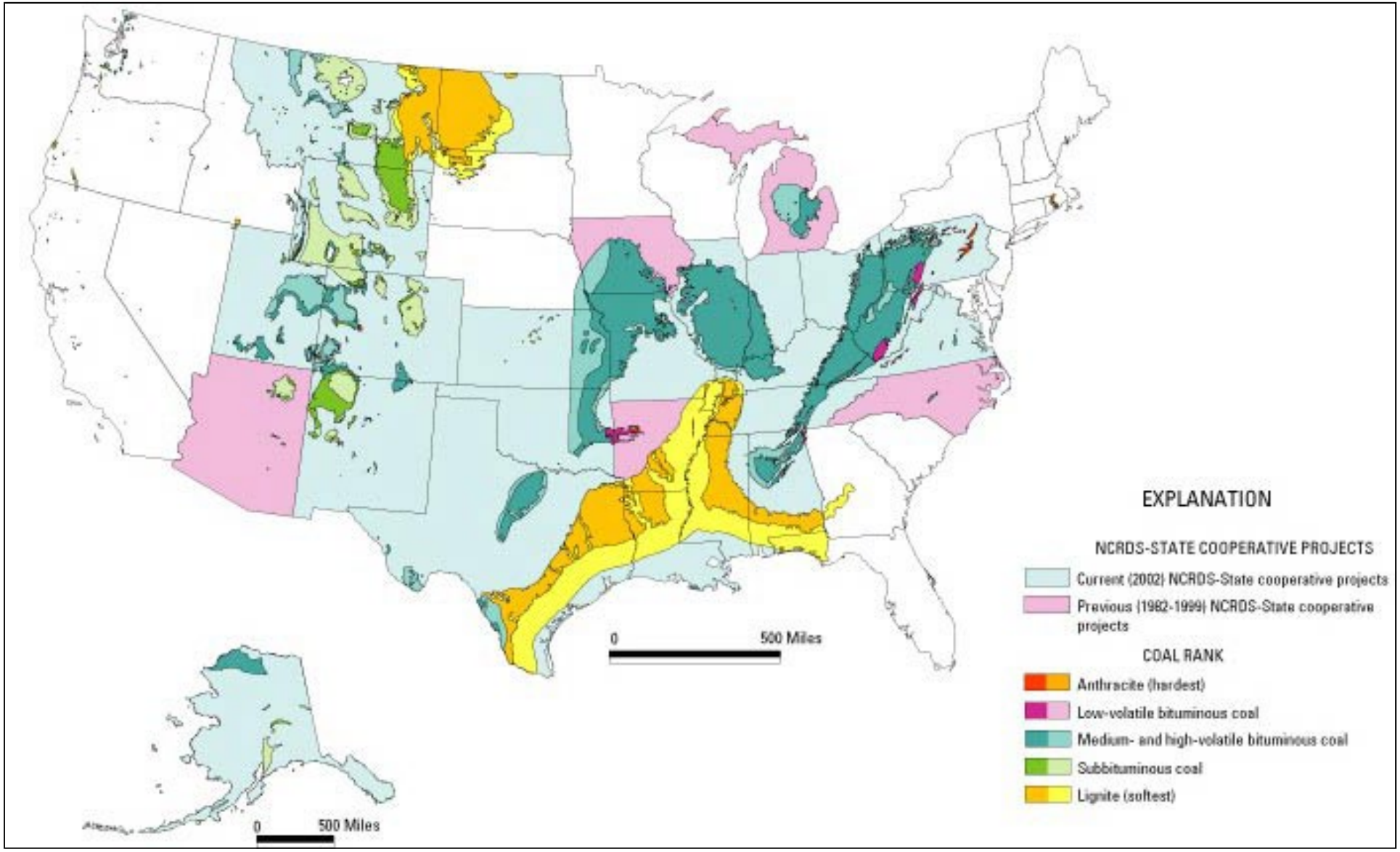
- Encourage coal exports, which will benefit the U.S. balance of trade, create jobs in the sector, and ensure that global supplies of this valuable energy resource are responsibly mined here at home.

Polk Power Station in Tampa, Florida
Integrated Gasification, Combined-Cycle (IGCC) plants use gas and steam turbines to generate electricity. Integration of the gasifier, gas turbine, and steam turbine (for reclaiming lost heat in the exhaust) allows for high efficiencies while also reducing environmental impacts. IGCC is one of many technologies referred to as "clean coal."

Source: DOE

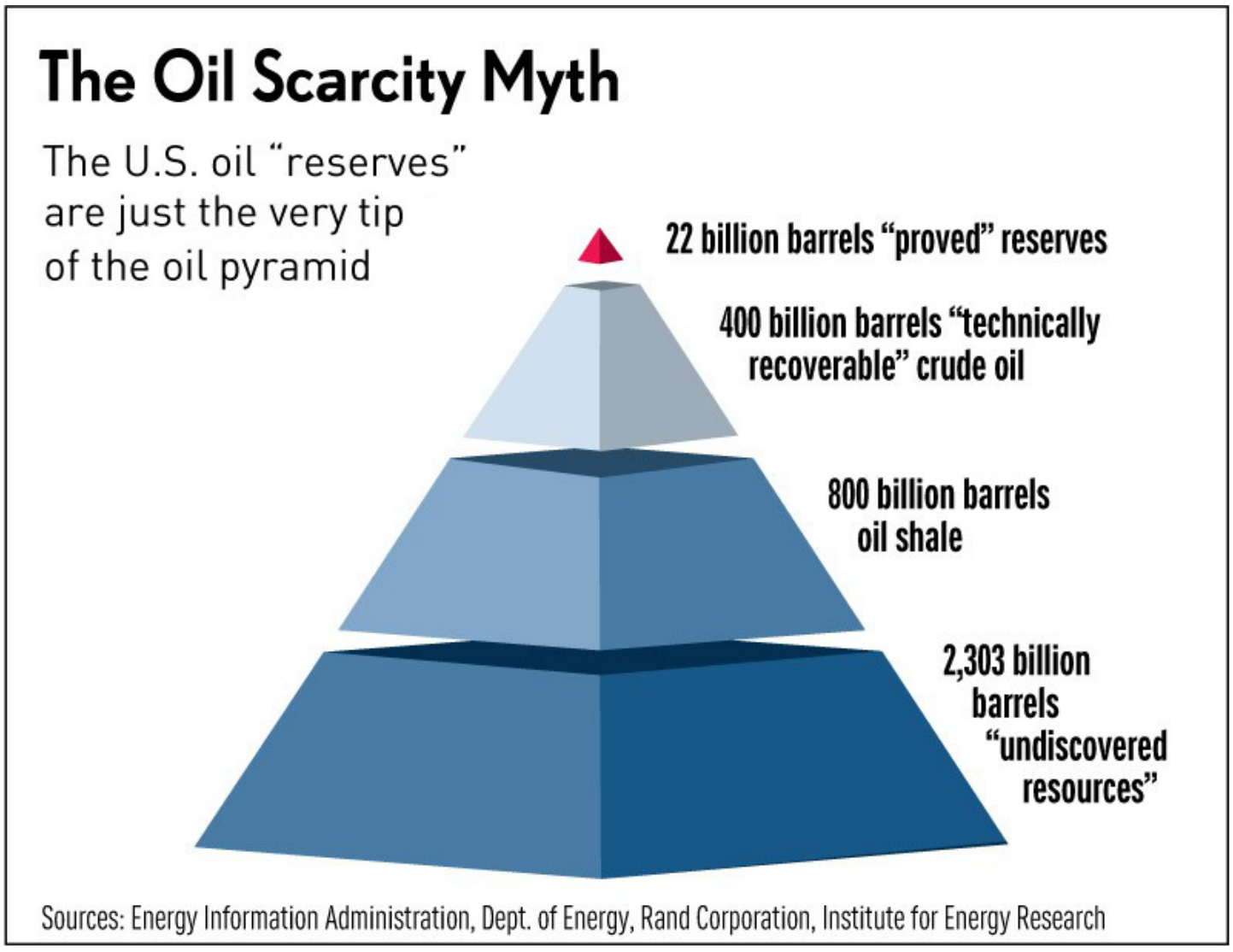
Map shows coal fields of the U.S. classified by coal rank and areas of cooperative study of coal resources and quality. For each category of coal rank, darker color indicates area of coal outcroppings and lighter color indicates area of subsurface coal. Also shown are states with long-term, current (light blue) or previous (light pink) cooperative relationships with the U.S. Geological Survey in the National Coal Resources Data System for the long-term study of coal resources and quality. Modified from Tully (1996) and M.D. Carter (U.S. Geological Survey, written commun., 2002). (Some States contain coal fields that are too small to show rank colors.)

Source: USGS



UNCONVENTIONAL FOSSIL FUELS

The United States will never run out of energy. The best evidence of this is our unconventional energy base. Oil scarcity is a myth. Inaccessible and sub-economic resources continually become accessible and economic over time. We have always found more energy as we need it because rising global demand and improving technology enable explorers and producers to unlock access to new resources. Practical oil scarcities do occur, are *created*, and can happen again as a result of government policies – especially those that impede development – as well as geopolitical events and natural disasters that remove supply from the market.[30] Notwithstanding market disruptions, the oil resource base is in no danger of running out, as depicted below.



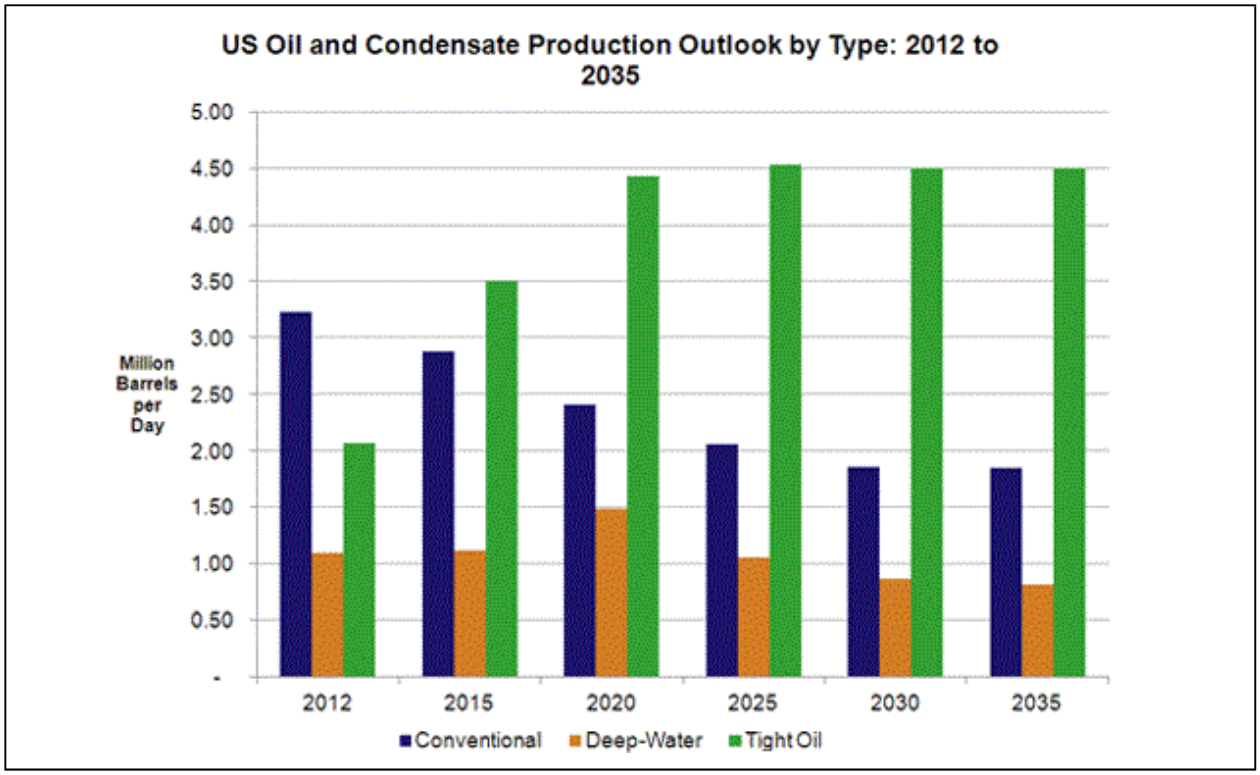
Opponents of oil production often cite proved reserves – colored red at the top of the pyramid – to propagate the myth that oil is scarce. "Proved" or "proven" is a technical term referring to actual assets owned by companies that are economically recoverable. As global demand increases and technology advances, the universe of economically recoverable energy resources expands down the pyramid. The oft-cited "two percent of the world's reserves" factoid compares the tiny red pyramid to other claimed proven reserves globally, but neglects the vast resources comprising the base of the pyramid.

Source: *Investor's Business Daily*

The history of the Bakken Shale oil resource demonstrates this phenomenon. From the 1980s through the early 2000s, the presence of this huge unconventional oil resource was known but largely ignored in energy policy discussions. Neither the price of oil nor the most advanced technologies were sufficient to develop the resource economically – and the Bakken was therefore classified as "sub-economic" under these conditions. Since then, however, prices have risen and technology has advanced, making the Bakken economic and recoverable. As a direct result of this formation, North Dakota's oil production has grown dramatically in recent years, and it recently surpassed Alaska as the second largest oil-producing state.

With virtually every serious energy forecast projecting that oil will be used long into the future, it is critical that our unconventional resources be assessed and taken seriously, not just as potential solutions but as likely solutions to our future energy needs. A recent report by IHS, Inc. (IHS) found that unconventional oil and gas development will contribute mightily to our economy in the years ahead. By 2020, the firm forecasts that their production will generate three million jobs throughout our economy; $111 billion in yearly revenues for federal, state, and local governments; and $172 billion in yearly capital expenditures. These benefits continue to expand through 2035.[31]

It is time to reconcile the reality of our resource base with misleading political statements of energy scarcity, the most egregious of which is the oft-repeated line: "America uses 20 percent of the world's oil but has only two percent of the world's reserves." This assessment does not account for energy resources that have not been drilled; such statements distract from a meaningful energy policy discussion.



Private sector estimates project unconventional fossil fuel production to far surpass conventional fossil fuel production in the near future. This rapid growth will create jobs and fuel our economy.

Source: IHS

Bakken Shale Production -- Canada

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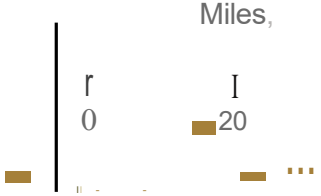

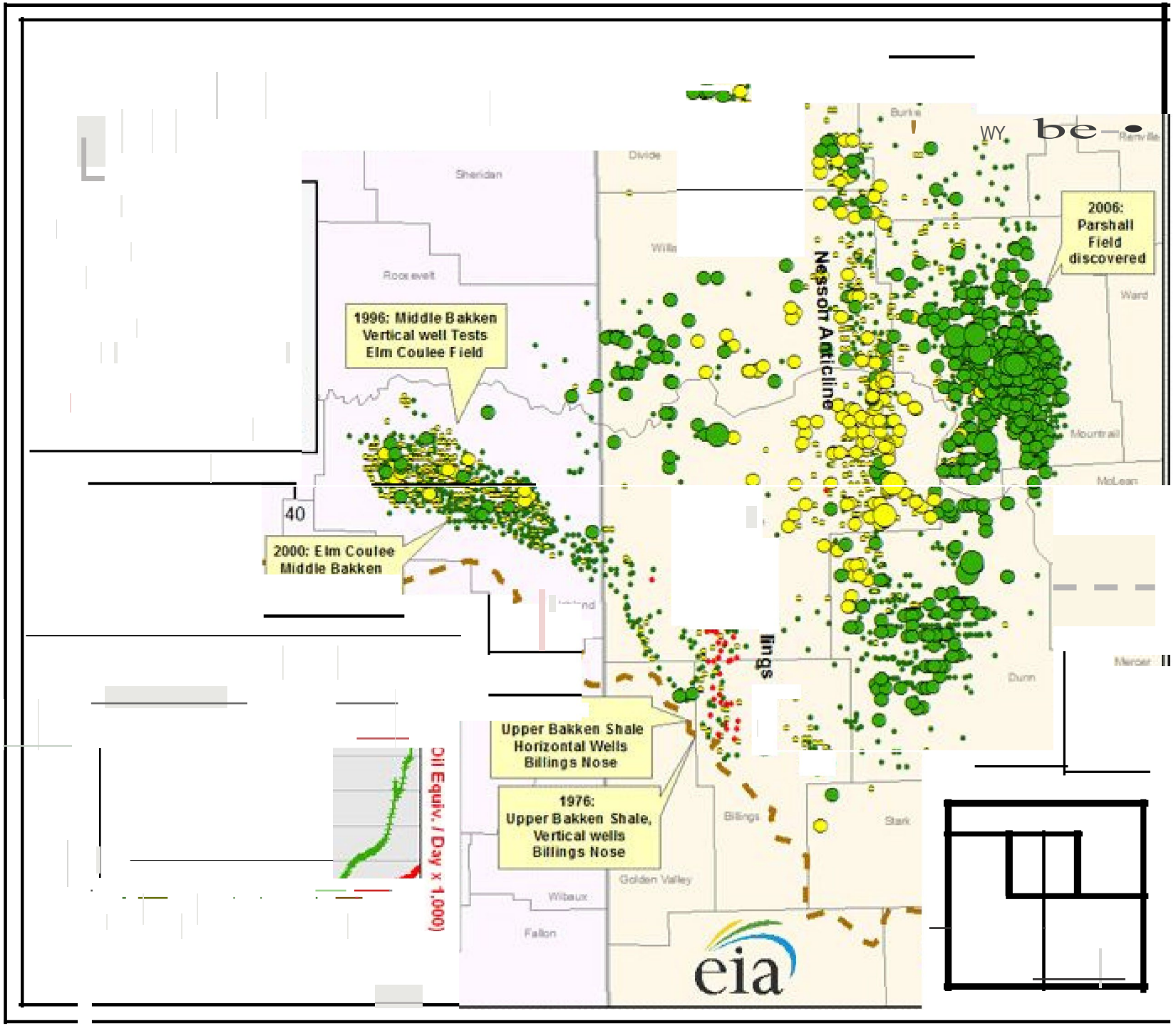
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2000: Elm Coulee Middle Bakken
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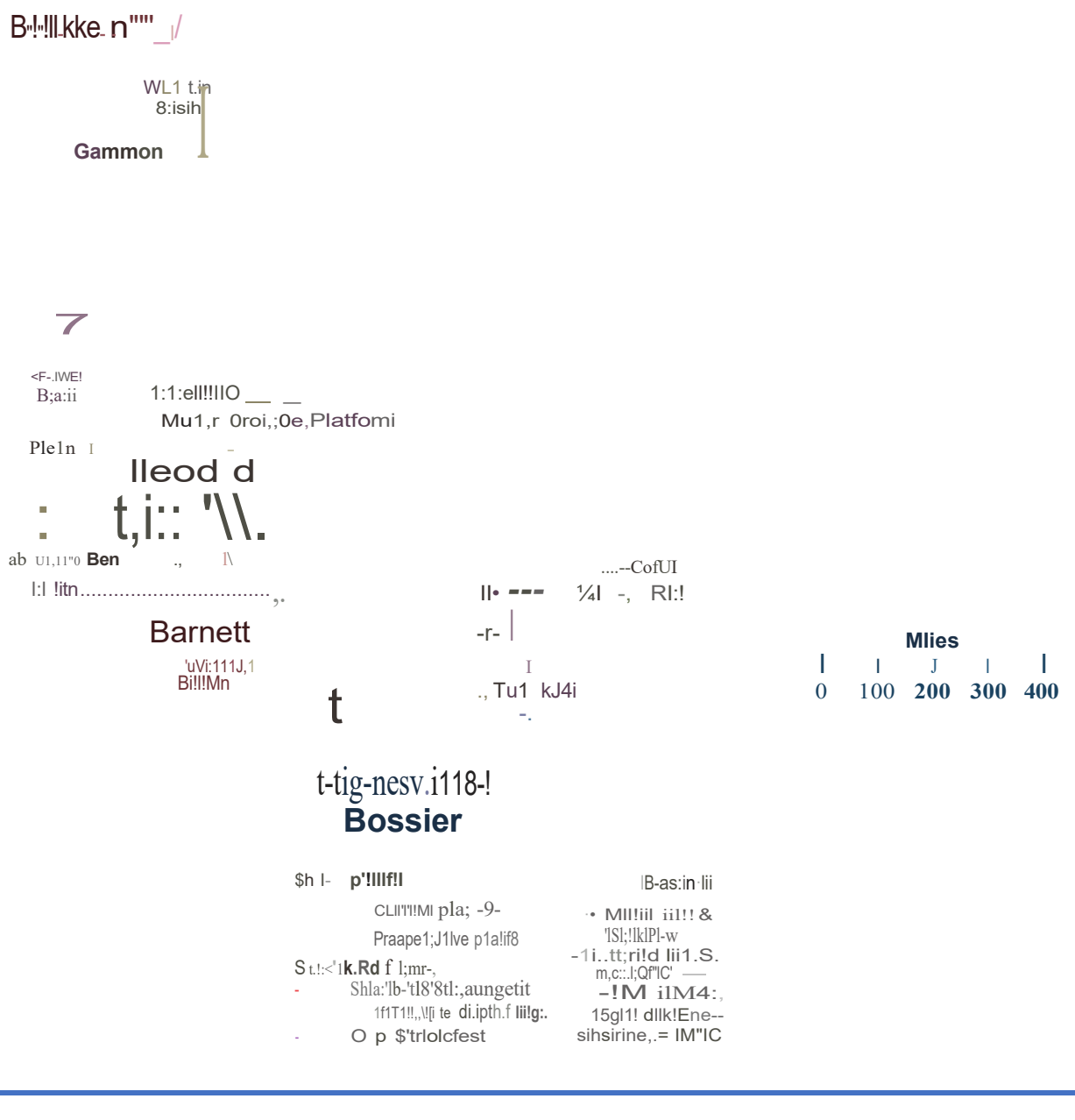

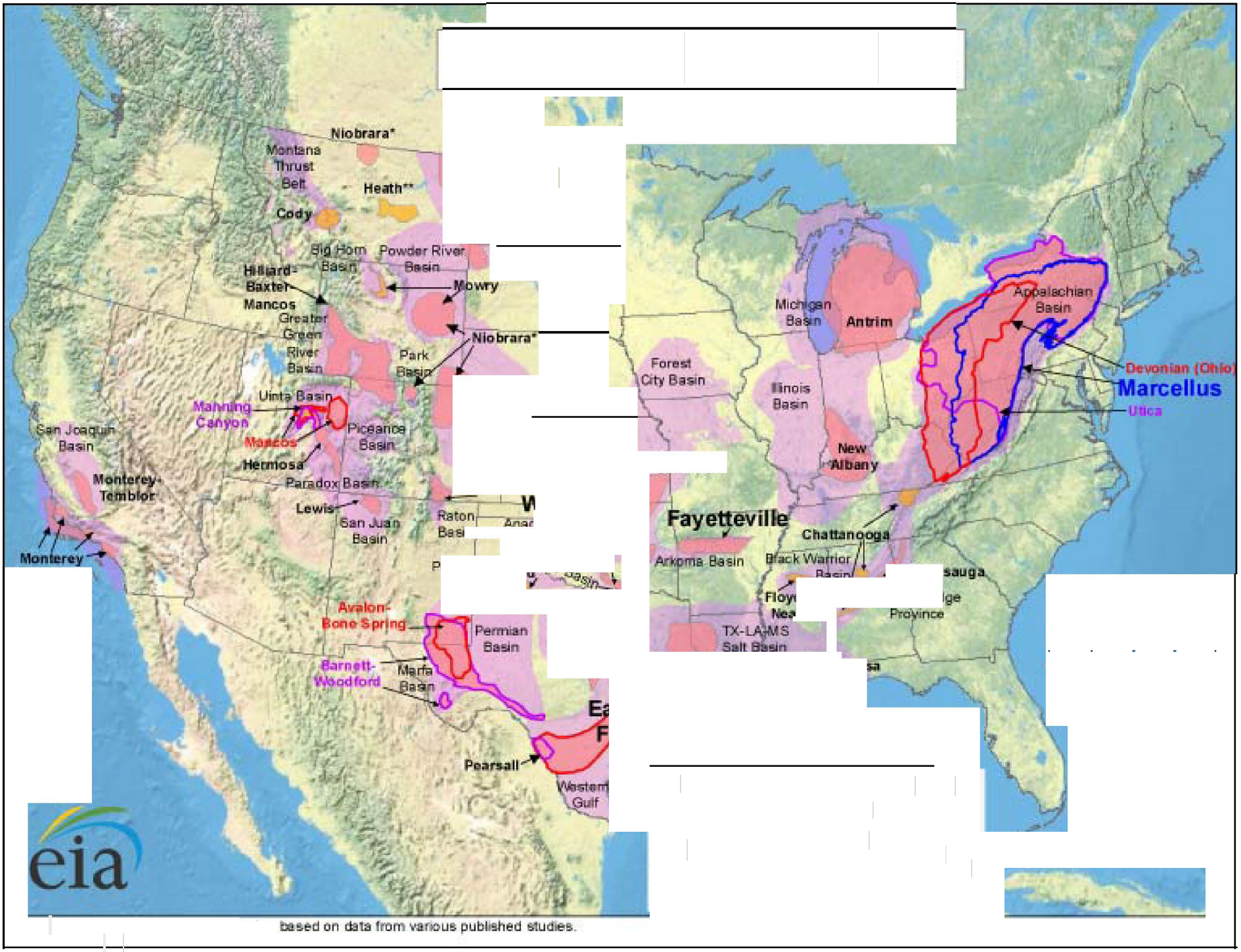
Niobrara*
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Heath**
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Park Basin
Uinta Basin
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Piceance Basin
Hermosa
San Joaquin Basin
Monterey-Temblor
Paradox Basin
Lewis
San Juan Basin
Raton Basi
Monterey
Avalon-Bone Spring
Permian Basin
Barnett-Woodford
Marfa Basin
Pearsall
Western Gulf
Forest City Basin
Michigan Basin
Antrim
Illinois Basin
Appalachian Basin
Devonian (Ohio)
Marcellus
Utica
New Albany
Fayetteville
Chattanooga
Arkoma Basin
Black Warrior
Province
TX-LA-MS Salt Basin
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based on data from various published studies.

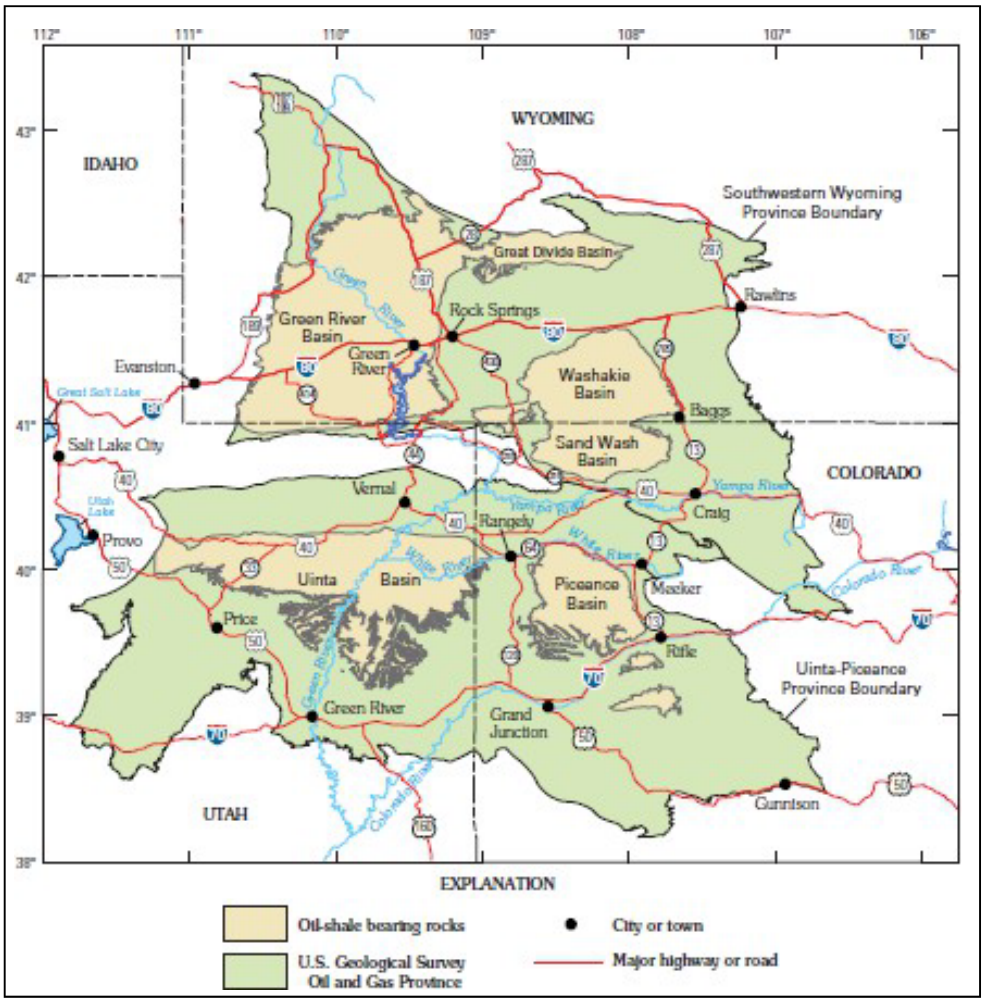
OIL SHALE

Our nation contains the largest deposits of oil shale in the world. The Green River Formation's 11 million acres in Colorado, Utah, and Wyoming contain the equivalent of more than one trillion barrels in oil.[32] Assessments fluctuate, but DOE estimates that combined U.S. oil shale deposits may hold as much as six trillion barrels of oil equivalent.[33] While most of these are non-recoverable, the fact that global proven crude reserves amount to a mere 1.5 trillion barrels should give us pause.[34] Whether recoverable barrels from these deposits stand at 800 billion or 1.8 trillion, America truly is the Saudi Arabia of oil shale.[35] For our country to take advantage of these resources we need to:

- Codify the oil shale lease program and restore leasing activities that were underway prior to being halted in February 2009.

- Accelerate oil shale permitting/leasing in the west – Utah, Colorado and Wyoming – with a comprehensive plan for addressing water scarcity risks and impacts.

- Renew R&D funding for viscous (heavy) oil technology/production research at the Department of Energy.



The Greater Green River Basin in Colorado, Utah, and Wyoming contains oil shale deposits greater than one trillion barrels of oil.

Source: USGS

METHANE HYDRATES AND OTHER UNCONVENTIONAL GAS RESOURCES

The U.S. contains an estimated 200,000 trillion cubic feet (TCF) of methane hydrates – methane natural gas locked in solid, ice-like structures, underground or under the sea floor.[36] According to the USGS, Alaska alone contains between 560 and 600 trillion cubic feet of methane hydrate onshore[37] and approximately 160,000 TCF offshore.[38] Once safely unlocked, Alaska's methane hydrate resources could power America for nearly 1,000 years at current rates of gas consumption, according to the Alaska Division of Geological and Geophysical Surveys (ADGGS).[39] Important steps we need to take to access these resources include:

- Expedite research on methane hydrate well flows to prove that methane will continue to "flow" to the surface after drilling efforts. Increase funding for environmental reviews of the effects of liberating methane hydrates, the resulting land impacts, and for research already underway by the DOE National Energy Technology Laboratory (NETL).

- Renew the hydrogen fuels research program to gauge the economic feasibility of powering America by hydrogen fuels.

- Fund greater research into the use of ammonia as a power-fuel source of the future.

- Provide royalty relief from drilling on federal lands for the first five projects until a total of 25 TCF of gas is produced from federal resources.

National Oceanic and Atmospheric Administration (NOAA) photographs of methane gas hydrate forming below a rock overhang at the sea floor on the Blake Ridge diapir, off the coast of South Carolina. This image marked the first discovery of gas hydrate at the sea floor on the Blake Ridge.

Source: NOAA

USGS: Assessment of Gas Hydrate Resources on the North Slope, Alaska, 2008

Source: USGS

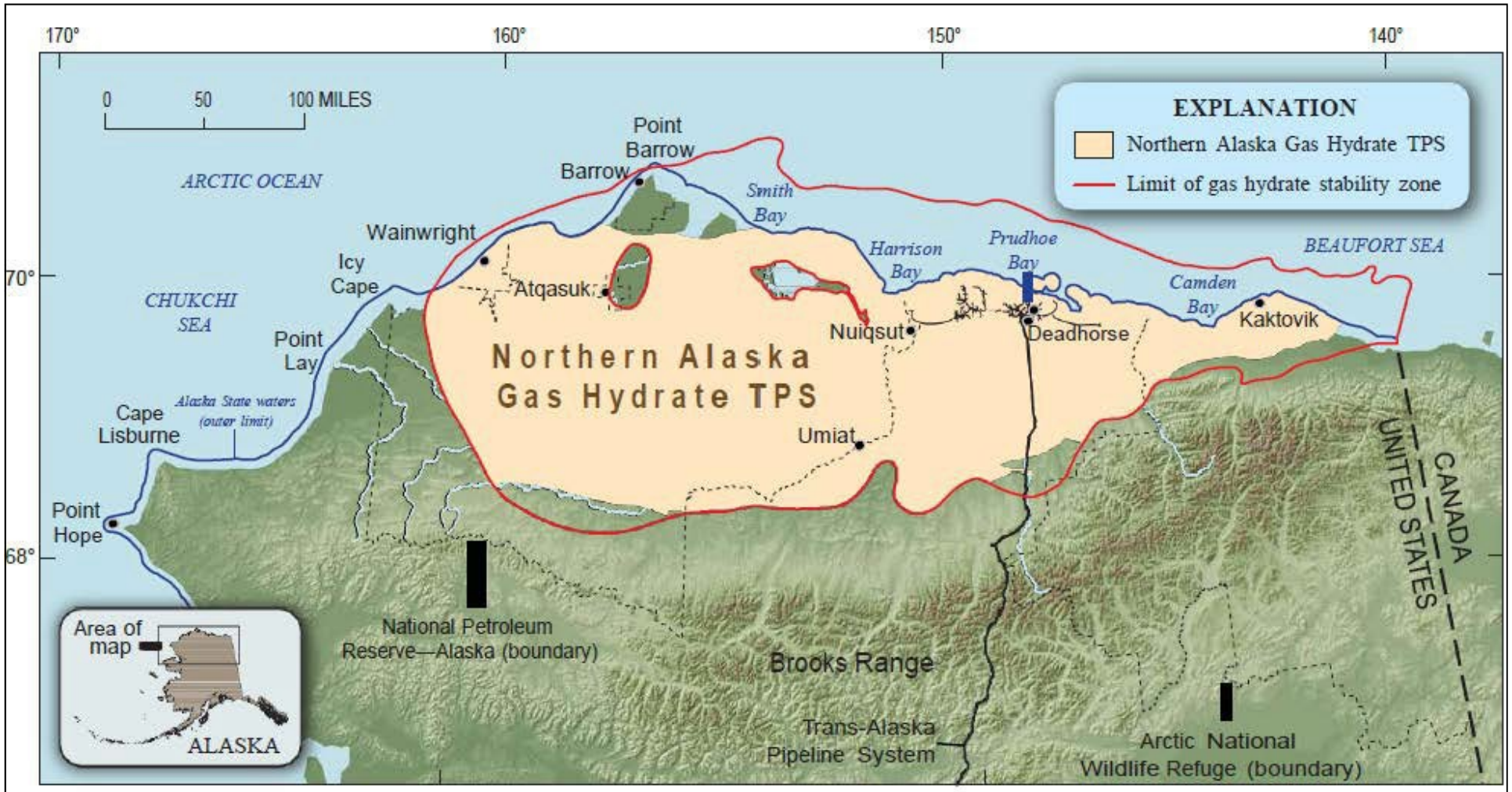


Figure 1. The Northern Alaska Gas Hydrate Total Petroleum System (TPS) (shaded in tan), and the limit of gas hydrate stability zone in northern Alaska (red outline).

RENEWABLE RESOURCES

"Clean energy" is a term that is widely used, but not well-defined. Too often, "clean" is applied to whatever resource or technology is politically favored, or is treated as an absolute when it should be a comparative term.

"Clean energy" should have a specific, verifiable definition based on actual impacts. "Clean" should be defined as "*less intensive in global lifecycle impacts on human health and the environment than its likeliest alternative.*"[40] By 2020, the federal government should implement this definition of clean energy across all its programs and policies.

By 2020, implement this definition of clean energy across all federal programs and policies.

After establishing a more appropriate definition for "clean energy," we should develop more efficient and less invasive ways to promote it – specifically, by avoiding federal mandates. In order for new clean technologies to succeed, their costs must fall and they must be allowed to mature in a way that enables sustained private investment. They must be freed from "boom-and-bust" cycles caused by changes in government policy or the unintended consequences of government spending.

Perpetual reliance on production and deployment subsidies can actually inhibit the long-term growth and development of new energy modes. Instead, the federal government should focus its attention and limited resources on R&D for clean energy. Deployment assistance should be primarily technical in nature. Financial assistance should be allowed only for compelling applications that make the most commercial sense, such as when the cost of competing energy is higher than the new technology, yet some other barrier still inhibits its adoption.

Finally, we must leave room for new and big ideas, products, and services to come forward and take hold so that the cost of new energy technology can naturally decline. By 2020, the federal government needs to supplant its renewable resources programs and policies with a new system that is more cost-effective and technology neutral.

By 2020, supplant federal renewable resources programs and policies with a new system that is more cost-effective and technology-neutral.

Getting the definitions right and reforming the federal government's role in supporting clean energy technologies is critical to a national energy policy. Recommendations for reform are discussed at length below and under *Clean Energy Technology*.

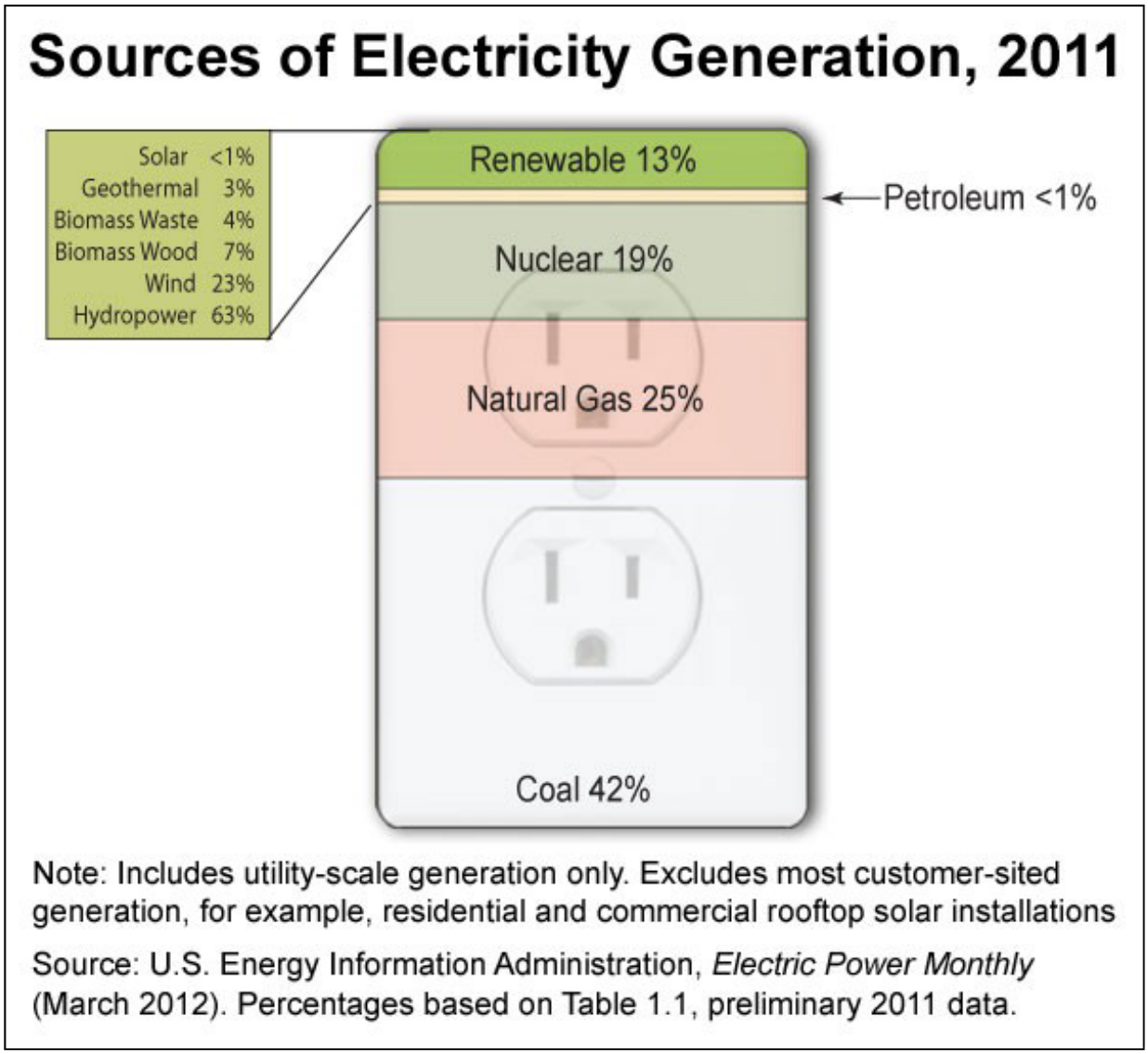
To accomplish these goals by 2020, the government should:

- Identify and remove barriers in federal law and policy that are hindering rapid and competitive deployment of clean energy. For example, provide for swift and certain leasing and permitting structures for wind, solar, and geothermal leases. Create fair and competitive royalty systems for these energy sources on public lands.

- Establish a program of highly-expedited permitting of renewable energy projects on reclaimed mine lands (abandoned and otherwise).

- Establish – through legislation, as necessary – an accelerated permitting process for offshore wind and marine hydrokinetics, including an Environmental Impact Statement (EIS) for such projects.

- Identify financing challenges for renewable energy and efficiency initiatives and subsequently develop institutions and means to lower their financing costs.



HYDROPOWER

Hydropower is often excluded from consideration as a renewable resource because it has been politically controversial. Political considerations should not be used to exclude a particular resource from the definition of "clean" or "renewable." Hydropower is the largest source of clean, renewable electricity in the United States. Today, we have over 100 gigawatts of hydroelectric capacity,[41] providing about eight percent of the nation's electricity needs and generating electricity without any emissions into the air.[42] Further development of this cost-effective, clean energy option will support economic development and local job creation.

Some overlook the tremendous potential of hydropower under the mistaken assumption that the resource is tapped out. To the contrary, hydropower is an under-developed resource. DOE's estimates indicate that there could be an additional 300 gigawatts of hydropower through efficiency and capacity upgrades at existing facilities, powering non-powered dams, new small hydro development and pumped storage hydropower.[43] This estimate is equal to almost 30 percent of *total* U.S. capacity – from every resource, not just hydropower.[44] Only three percent of the country's existing dams are electrified and between 20,000 and 60,000 megawatts of new capacity can be derived from efficiency improvements or capacity additions.[45] Additional hydropower can be captured through existing conduits and new small hydro development, and hydroelectric -pumped storage projects can help integrate intermittent renewable resources, such as wind. To advance and capitalize on hydropower's potential, we need to:

- Recognize hydropower as a renewable resource for purposes of any federal program or standard.

- Federal Energy Regulatory Commission (FERC): Explore a potential two-year licensing process for hydropower development at existing non-powered dams and closed-loop pumped storage projects.

- Allow the consideration of conduit hydropower projects (man-made water conveyances such as tunnels, canals, or pipelines that are operated for water distribution and not electricity generation) on federal lands. Direct FERC and the relevant federal agencies to develop a coordinated and more efficient approach to environmental review of these types of projects.

- Increase FERC's rated capacity for small projects from five to 10 megawatts.

- Provide FERC with the authority to extend its three-year preliminary permit terms for up to two additional years in order to allow a permittee sufficient time to develop and file a license application.

- FERC and the Bureau of Reclamation: Complete a new interagency Memorandum of Understanding to improve the coordination and timeliness of non-federal hydropower development at Reclamation projects.

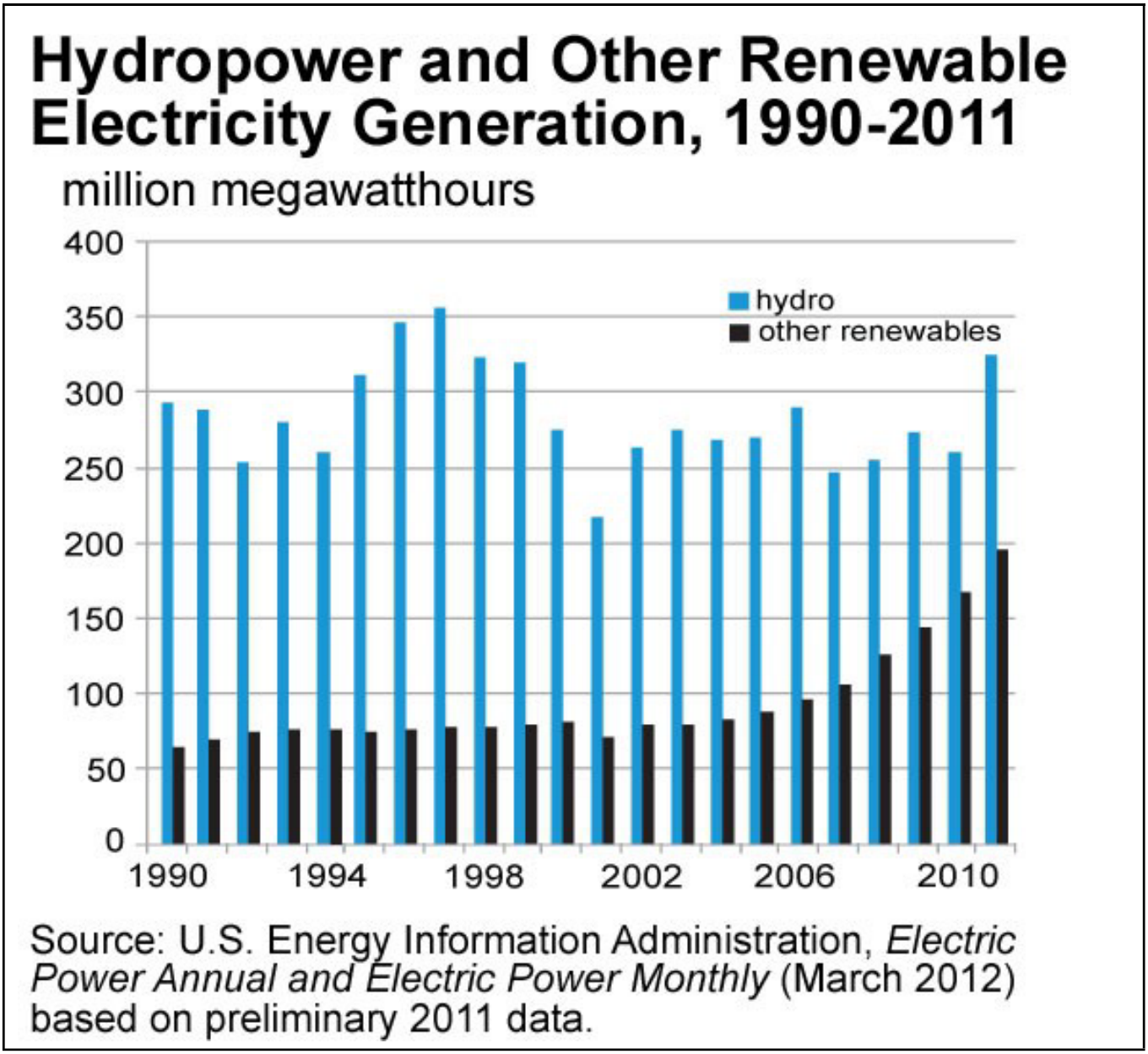
- Prohibit FERC from assessing federal land-use fees on hydropower projects when the land at issue is no longer owned by the federal government.

- Authorize FERC to set timelines for agency submissions in the hydropower licensing process.

- DOE: Develop and implement a plan to increase the nation's use of renewable hydropower through R&D, and provide technical assistance on applicable environmental analyses.

- DOE: Study the potential quantity of hydropower that may be derived from existing conduits.

- DOE: Study and identify federal and non-federal lands, in consultation with USGS, that are located near existing or potential sites of intermittent renewable resource development and are well-suited for pumped storage sites.



MARINE HYDROKINETIC POWER

The Electric Power Research Institute has estimated that our nation's ocean resources contain enough energy to produce 2,640 million megawatt hours of electricity per year (TWh/yr).[46] Of this available energy, 1,170 million megawatt hours per year are recoverable, equivalent to 30 percent of our annual electricity generation.[47] To reach this potential we must accelerate the development of renewable wave, current, and tidal energy across the nation. To move toward that goal, we should:

- Promote increased research into marine hydrokinetic devices and grid integration. Authorize the transfer of environmental data developed during research to other interested entities, and assist industry with environmental standard compliance.

- Develop or support up to four testing facilities for marine hydrokinetic technologies.

- Establish a marine-based energy device verification program.

- Develop thematic environmental impact statements to cover marine hydrokinetic projects to expedite permitting and reduce the cost of NEPA review.

Wave current marine hydrokinetic device, Maine

SOLAR POWER

Solar power has many advantages. Solar energy production meets the highest environmental standards while producing negligible emissions. Solar energy is among the most abundant of renewable energy sources. Solar energy can be used for electricity, light, or heat; providing a plethora of options for residential, commercial, and industrial sectors. Its challenges have been related to costs and intermittency, and, to an extent in some applications, water use.

Different technologies are used to convert solar energy into other usable forms of energy: photovoltaics (i.e. solar electric), solar heating and cooling, and concentrated solar power. These technologies can be used in myriad ways. Photovoltaics can be deployed locally (e.g. on a rooftop), or even directly connected to a device or appliance. Concentrated solar power can be built as a central utility station, in the manner of a traditional power plant. Utility-scale solar plants in the future may employ energy storage devices to supply energy even after the sun sets. The flexibility, abundance, and low environmental impact of solar energy production make it an attractive power supply. Moreover, diversifying our energy supply through solar power is an important goal for our nation.

When solar power is a source for generation of electricity, the challenge of its intermittent nature is manifest. As a practical matter, electricity cannot be stored the same way as other commodities. Electric supply and demand must be matched instantaneously. Electrons travel at the speed of light across networks of wires to power our homes, buildings, stores, and factories. We value the on-demand nature of electricity; we need our electronics and appliances to be highly reliable, and operable 'at the flick of a switch.' Likewise, the failure of electricity to operate consistently and on demand – such as during a blackout or brownout – is simply unacceptable in modern life.

Solar power is abundant and produces zero carbon dioxide emissions at the source.

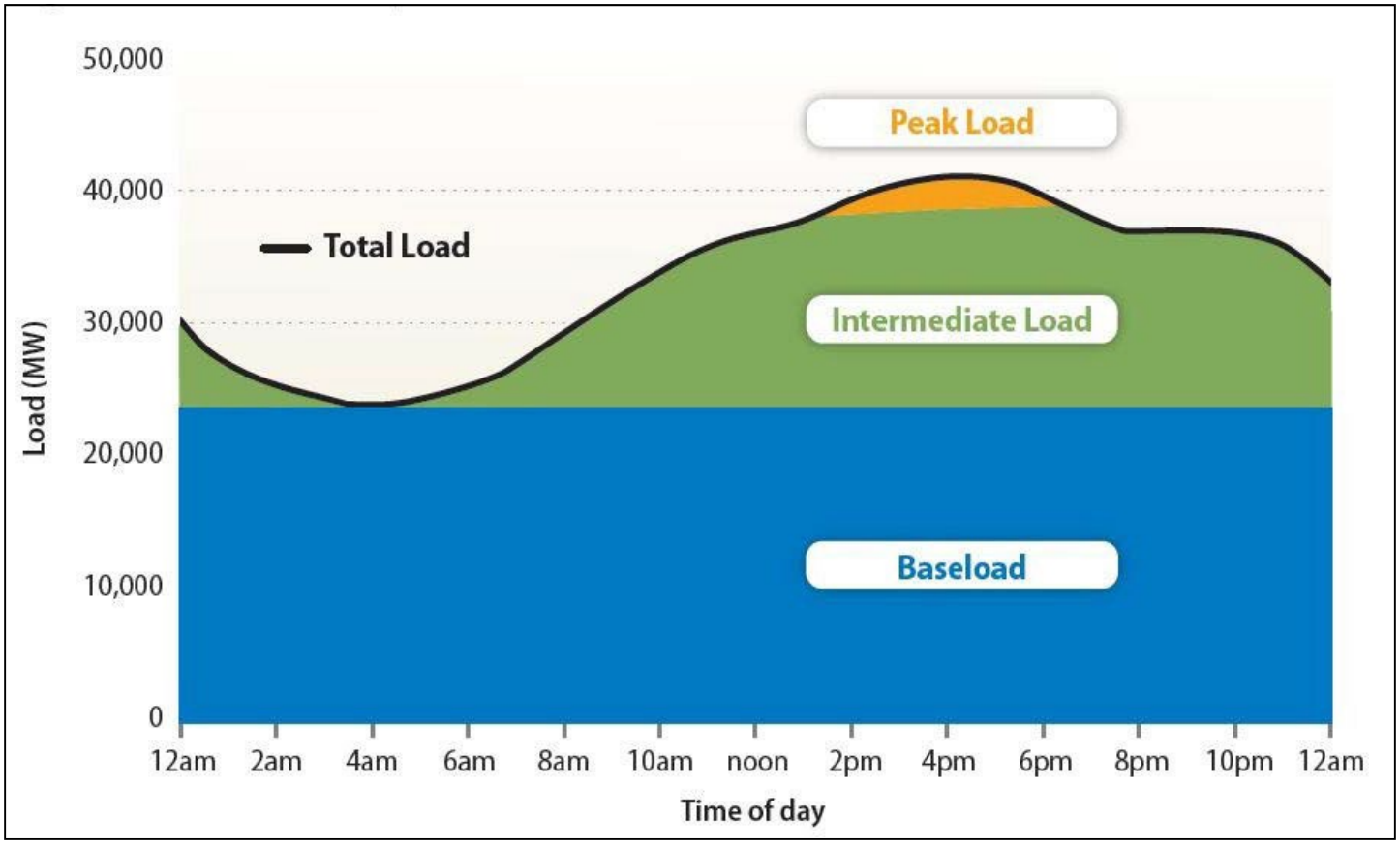
Source: Nevada State Office of Energy

The electric grids operate by the same laws. Elaborate networks of electricity grids work to meet constantly fluctuating real-time demand for electricity. In order to meet demand, this system needs to be able to count on electricity supply being ready instantaneously. As aggregate demand – or electricity "load" – fluctuates, the systems adjust to meet that demand.

Unfortunately, today electricity grids cannot readily integrate solar power to support the instantaneous demand for power. If there were more effective and economic ways to store electricity, solar power could better overcome its intermittency and would be more competitive. Today, however, electricity storage or backup power supply come at a significant cost. Due to this cost, solar power (and other intermittent sources such as wind) are better utilized as a compliment to other, more consistent power sources.

Technologies that bring down the cost of storing solar energy are needed. Cost-effective energy storage will likely unlock the full potential of solar power. Rather than force solar power into the electricity supply through mandates or quotas, we should endeavor to use solar power where it naturally fits: in remote applications, to complement baseload and intermediate supply, and to diversify our energy portfolio. Meanwhile, we should continue to fund R&D to discover and develop tomorrow's solar technologies.

By 2020, energy storage should be a cost-effective means for leveling demand.



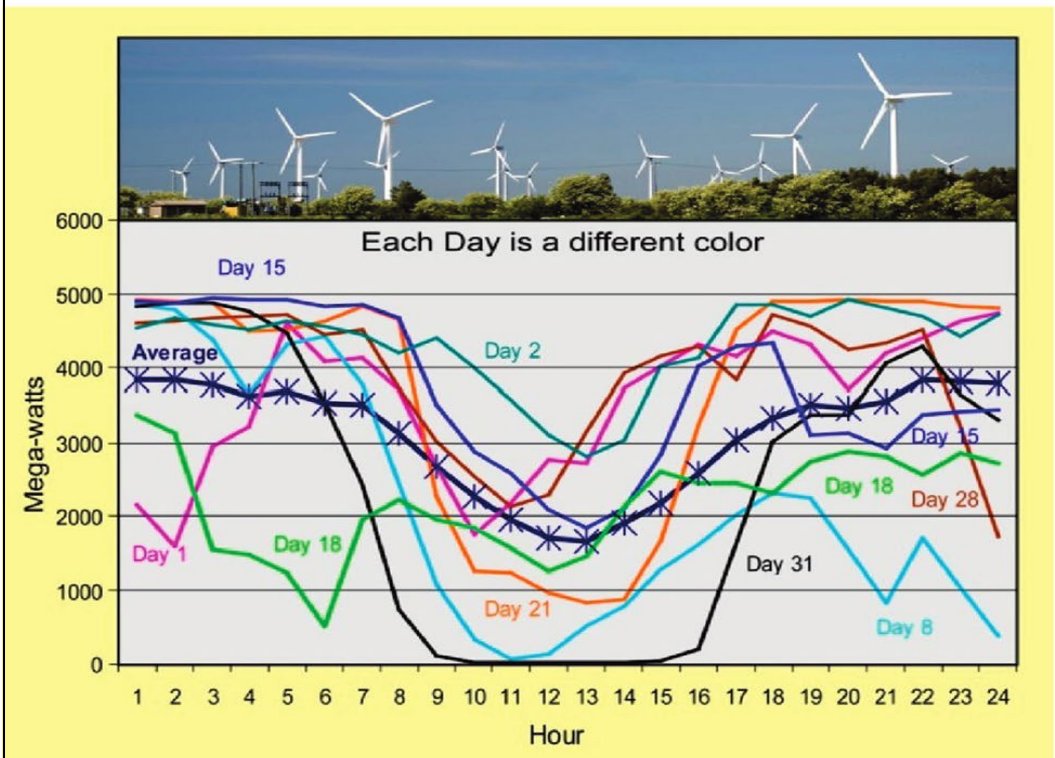
Typical summer day electricity load, California 2009

Source: National Renewable Energy Laboratory

DOE researchers demonstrate the intermittency in power output from solar and wind resources.

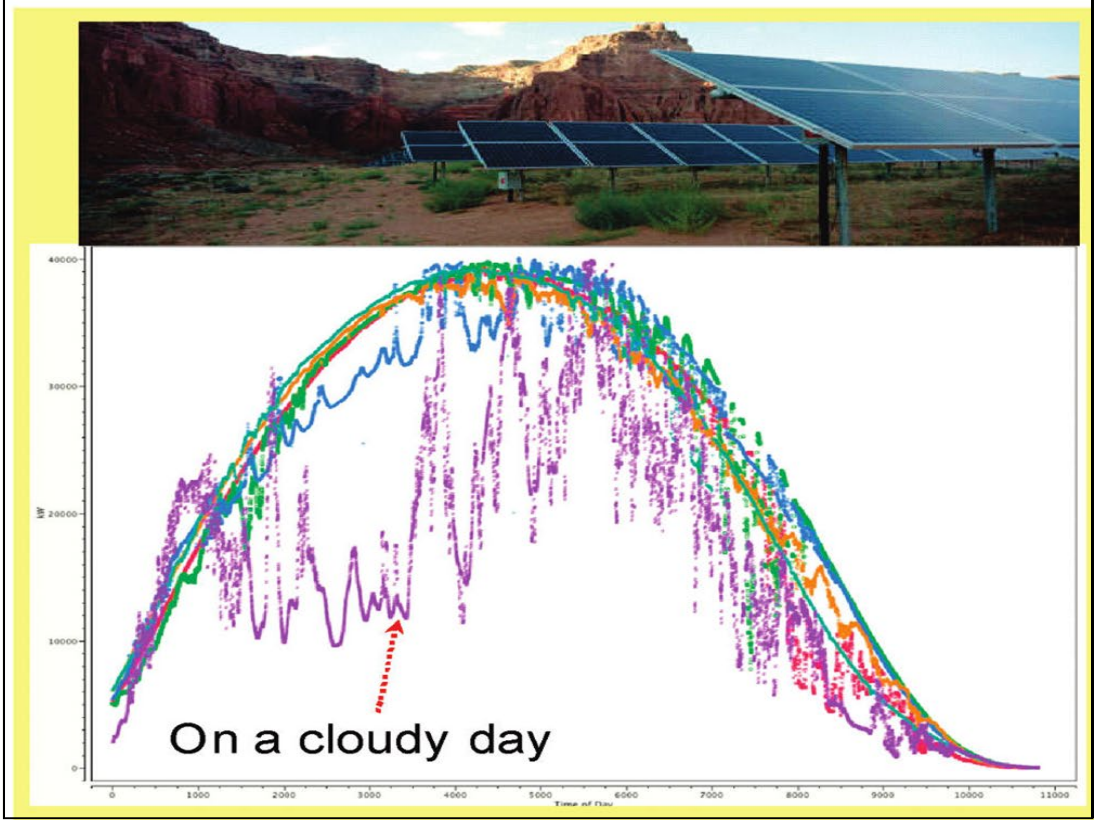
Source: Pacific Northwest National Laboratory[48]

(a)



Daily profiles of wind power projected by 7X output in April 2005 for the year 2011 in Tehachapi, California (Courtesy of ISO California).

(b)



5 MW photovoltaic power over a span of six days in Spain (Courtesy of AES).

WIND POWER

Wind power is abundant and renewable. Further, wind turbines do not produce air pollution when they generate electricity. On land, turbines grouped in "wind farms" turn wind energy into electricity. Wind farms present unique environmental footprint challenges due to the height and placement of turbines. Offshore wind farms can harness even stronger winds while presenting different environmental challenges, and higher fixed costs. Wind power is usually less cost-competitive than traditional generation, but all forms of wind power are useful tools for meeting environmental standards. Developing technology to make wind power more cost-competitive has been a national goal for decades.

Wind power is intermittent. The winds are unpredictable. Moreover, wind speed fluctuates on multiple timescales: hourly, daily, and seasonally. Due to this unpredictable variability, wind power must be stored in order to meet electricity demand. As previously noted, storing electricity is very challenging today. To make wind power cost-competitive we should focus on R&D for energy storage technologies.

By 2020, energy storage should be a cost-effective means for leveling demand.

Searsburg wind farm, Vermont.
Source: EPA

ENERGY STORAGE

Broadly considered, batteries store energy in one form – chemical, mechanical, electrostatic, or thermal – then convert that energy into electricity. A typical lead-acid battery stores energy in chemical form, then transforms it into electrical energy through electrochemical processes. Capacitors and flywheels can also store energy for later use. Capacitors store energy in electrostatic form and release the energy as electrical power. Flywheels store energy in mechanical form using a spinning wheel or tube, and then convert the energy to electrical power via a generator. Batteries and other energy storage technologies have myriad uses, including the possibility of large-scale power storage technology that would help to lower the cost – and overcome the intermittency – of wind and solar power.

Many federal programs supporting battery technology and research already exist. Currently, six agencies support 39 programs that the Government Accountability Office (GAO) categorized as follows:[49]

- Basic research to explore and define scientific or engineering concepts, or investigate the nature of a subject without targeting any specific technology.
- Applied research to develop new knowledge to create new and improved technologies.
- Demonstrations to operate new or improved technologies to collect information on their performance and assess readiness for widespread use.

These programs should be consolidated and our government's support should be concentrated behind basic research. Basic research ensures a technology-neutral approach to federal programs, and shifts the burden of commercialization to the private sector. By 2020, we should direct federal funding of energy storage projects toward basic research. Prioritizing basic research provides the best opportunity to develop the long-

Sandia National Laboratories advanced sodium-sulfur battery energy storage system

Source: Sandia National Laboratories

awaited breakthroughs desired to make wind and solar power cost-competitive. The basic research need not be directly tied to energy storage; physical chemistry, polymer chemistry, nanotechnology research, and related fields also have the potential to transform energy storage technology.

Better energy storage technologies are key to the future of solar and wind energy. But there is a solution at present for the variability and intermittency of these sources. Intermittent resources can be mixed with controllable, reliable resources to form a diverse energy portfolio. Some technologies are better suited to supply baseload electricity, while others are better used to complement baseload supply. Indeed, solar and wind can complement hydropower well – a reliable, affordable, controllable, and renewable resource.

By 2020, federal funding should be directed to technology-neutral basic research supporting energy storage.

Xcel Energy wind-to-battery project, Minnesota

Source: EIA

GEOTHERMAL POWER

Geothermal power is an emerging factor in the diversification of U.S. energy supply. Geothermal provides electricity, heating, and cooling for millions of Americans – and its use is expanding. U.S. geothermal net electricity generation totaled 10.9 Gigawatthours (GWh) during the first eight months of 2011, up 10 percent from the same period in 2008.[50] Although it may not be as well-known as other resources, geothermal power is indeed one of the main renewable energy sources to generate electricity in the U.S.

Current geothermal technology limits commercial power plants to areas with accessible deposits of high temperature and relatively shallow ground water. However, new enhanced geothermal systems (EGS) technology promises to expand power generation beyond natural geothermal locations. Now in early development, EGS allows water to be pumped underground to be heated by the earth and then used to generate steam-generated turbine electricity upon recovery. Current cost estimates for EGS are higher than for conventional geothermal plants and other more mature renewable technologies like hydropower and wind power. To potentially bring geothermal in line with the costs of fossil fuels in the future, the federal government can fund more research to pursue these supporting objectives:

- Map subsurface heat zones and locating the resourceful “hot rocks.”
- Understand the seismic impacts of geothermal projects to promote environmental stewardship.
- Reduce the risk of drilling non-performing wells.
- Reduce drilling, fracturing, and water retrieval costs with technology.
- Expand the use of geothermal heat “pumps” for heating and cooling in both commercial buildings and homes.
- Streamline land-leasing and permitting via statutory changes.

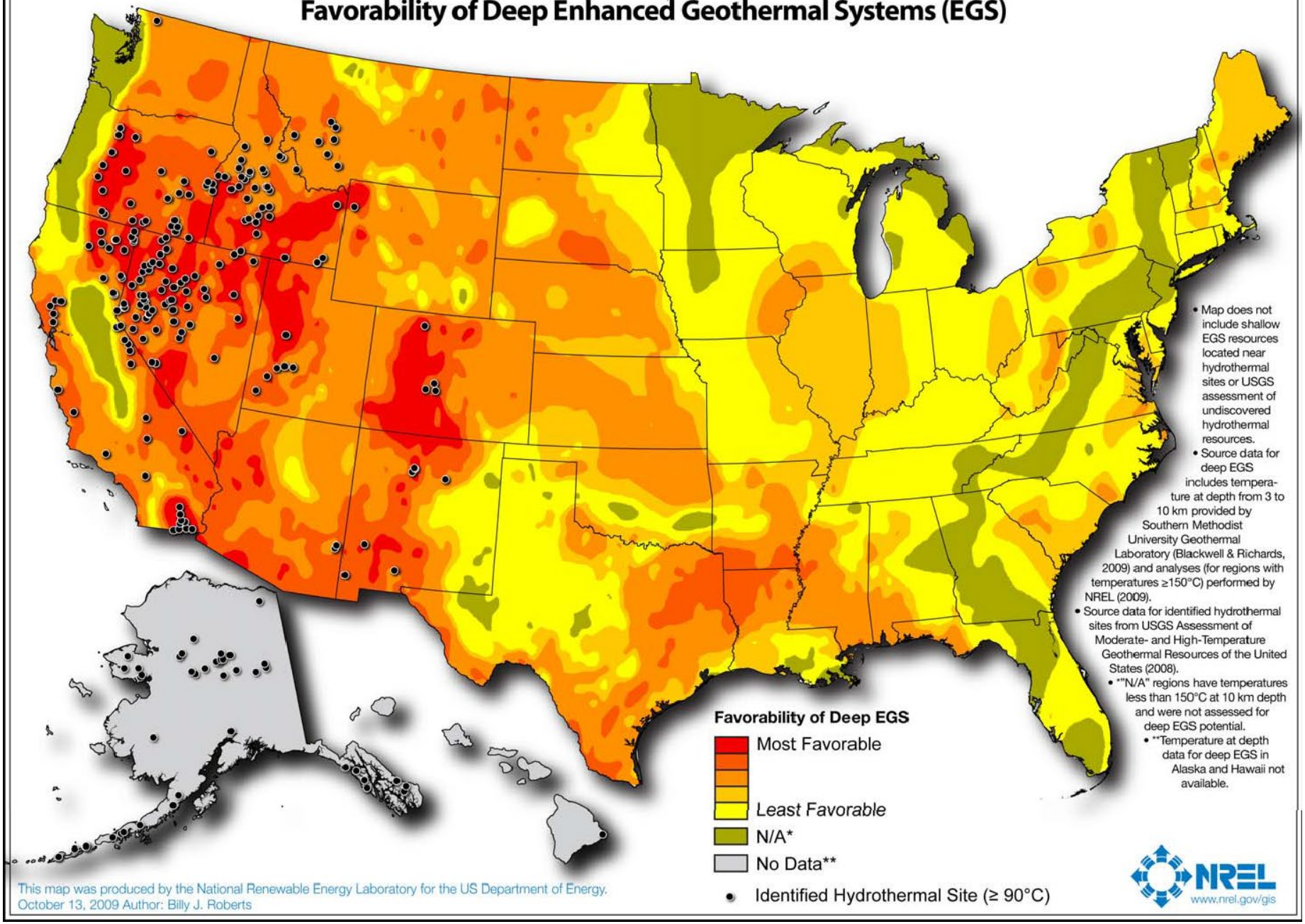
By 2020, increase access to federal lands for geothermal power development, especially in the West.

World's largest electricity-generating geothermal plant, The Geysers, California

Source: NREL

Geothermal Resource of the United States

Locations of Identified Hydrothermal Sites and Favorability of Deep Enhanced Geothermal Systems (EGS)



- Map does not include shallow EGS resources located near hydrothermal sites or USGS assessment of undiscovered hydrothermal resources.
- Source data for deep EGS includes temperature at depth from 3 to 10 km provided by Southern Methodist University Geothermal Laboratory (Blackwell & Richards, 2009) and analyses (for regions with temperatures ≥150°C) performed by NREL (2009).
- Source data for identified hydrothermal sites from USGS Assessment of Moderate- and High-Temperature Geothermal Resources of the United States (2008).
- *"N/A" regions have temperatures less than 150°C at 10 km depth and were not assessed for deep EGS potential.
- **Temperature at depth data for deep EGS in Alaska and Hawaii not available.

NREL
www.nrel.gov/gis

This map was produced by the National Renewable Energy Laboratory for the US Department of Energy.
October 13, 2009 Author: Billy J. Roberts

BIOMASS

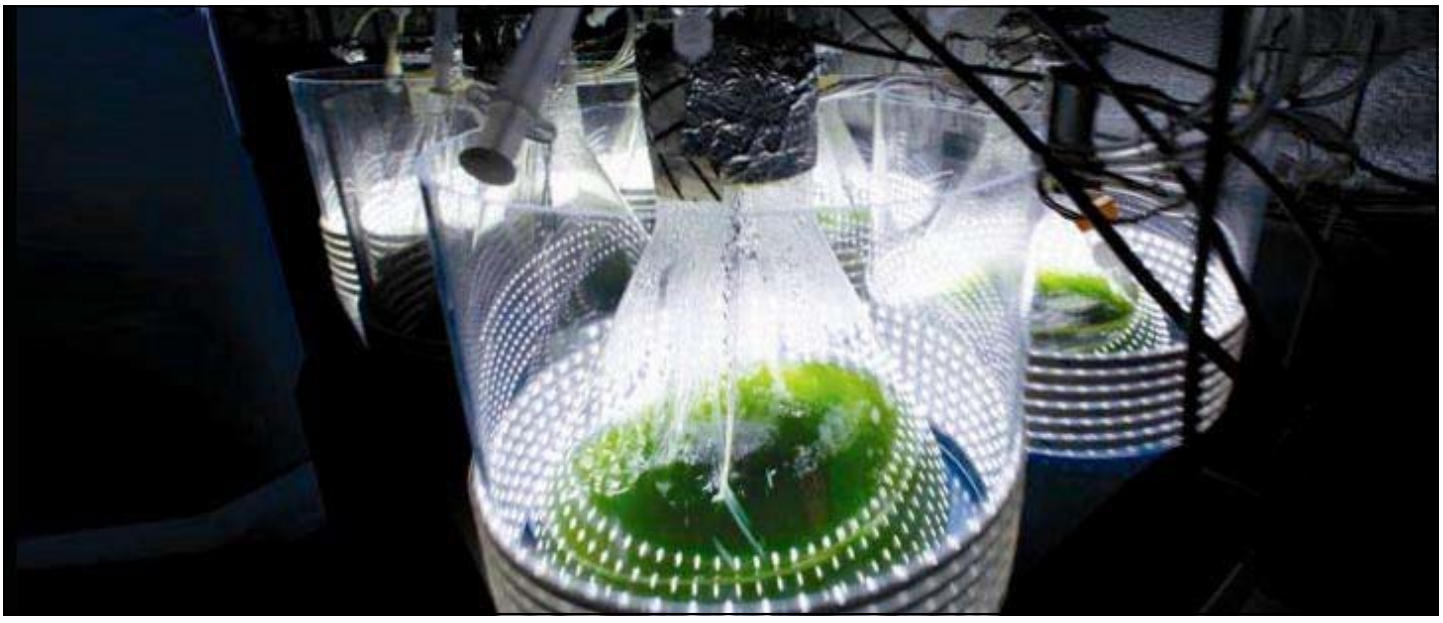
Biomass is organic matter that can be processed into transportation fuel, used to generate electricity, or harnessed in other ways to provide energy. Innovative technologies are starting to allow biomass to emerge as a viable source of renewable chemicals as well, further extending its range of potential applications.

Biomass has been an important resource for centuries and has accounted for roughly 49 percent of the renewable energy consumed in the United States in 2011.[51] While 'biomass' itself may not be a familiar term, its uses almost certainly are. For example, anyone who uses a wood stove to keep warm is using biomass for energy.

Beyond wood, biomass includes wood waste, planted crops, crop residues, and food and animal wastes. Everything from tree bark and switchgrass to landfill gas counts as biomass – and could be cultivated to help meet our nation's energy needs.

Biomass has many benefits as an energy resource. It is renewable and abundant throughout the United States. It is often a low-cost source of energy, particularly for rural communities. In the transportation sector, it is helping to diminish our damaging dependence on foreign oil.

Most biomass-based transportation fuel is currently made from corn and converted into ethanol, an alcohol that can be mixed into gasoline. Soybean oil, vegetable oil, fish oil, and animal fats can all be converted into biodiesel. Cutting-edge feedstocks such as algae hold significant promise as well, and could ultimately yield nearly identical replacements ("drop-ins") for today's liquid fuels.



Scientists at Los Alamos National Laboratory (LANL) have used genetic engineering to develop cutting-edge algae technology. Algal fuels are a potential drop-in fuel of the future.

Source: LANL

There are a variety of federal programs and regulatory regimes designed to increase the use of biomass. In the 113th Congress, we should continue to find cost-effective ways to utilize this resource, while also making several common sense reforms to existing policies.

- Include biomass as part of an 'all of the above' strategy. Many in Congress would define renewable energy as wind, solar, and geothermal exclusively. But biomass is at least equally capable of providing more renewable energy for our country. The federal government should ensure that biomass is part of an 'all of the above' energy policy to the greatest possible extent across all its programs and regulations.

- Standardize the definition of "biomass." While it is easy to understand biomass as a concept, defining the term in federal legislation has proven far more difficult. A report by the Congressional Research Service found that "a total of 14 biomass definitions have been included in legislation and the tax code since 2004."[52] Congress should standardize those definitions to be broad, inclusive, and consistent with one another. This would help ensure that a greater amount of biomass is eligible for projects, increase the options available to project developers, and minimize complications within federal regulations governing its use.

- Encourage co-firing for power generation. Biomass is often used as a stand-alone energy source, for example in the form of wood pellets. It can also be used in conjunction with other resources such as coal, and co-fired to provide electricity. This approach offers the potential to reduce certain emissions while also increasing our nation's renewable energy generation. Congress and federal agencies should encourage co-firing through all relevant legislation, programs, incentives, and regulations.

Wood pellets are one example of biomass used for energy.

Source: Tennessee Valley Authority (TVA)

NUCLEAR ENERGY

With 104 nuclear power plants in 31 states, nuclear energy accounts for nearly 20 percent of our nation's electricity. Nuclear power supplies 13.5 percent of the world's electricity and 66 new nuclear power plants are under construction in 14 countries.

Nuclear power is one of the most reliable sources of baseload electricity, one of the lowest-cost producers of electricity at an average of 2.19 cents per kilowatt hour, and one of the cleanest sources of energy, emitting no pollutants or greenhouse gases in electricity generation and with lifecycle emissions comparable to wind and hydropower. In addition, the nuclear industry is a source of good-paying jobs and large-scale job creation. Nuclear energy must remain a viable contributor to America's power supply.

At the same time, we need to advance the next generation (and beyond) of robust nuclear technologies, including small modular reactors, Generation IV type reactors and future fusion reactors. We also need to address the back-end of the nuclear fuel cycle and fulfill the federal government's responsibility to take title to used commercial nuclear fuel and highly radioactive waste.

Steam emissions from Vogtle nuclear plant, Georgia

Source: DOE

The government needs to take the following steps to achieve these objectives:

- Authorize a quasi-federal entity to manage the back-end of the fuel cycle (e.g., Fed-Corp or an Independent Government Agency (IGA)).

- DOE: Continue to conduct nuclear energy research programs with emphasis on the following:

  - Reduce the costs of nuclear reactor systems
  - Reduce used nuclear fuel and nuclear waste products generated by civilian nuclear energy
  - Support R&D for reactor life extension for continued safe and robust operation
  - Support technological advances in areas that industry would not undertake by itself because of technical or financial uncertainty (e.g., waste fuel reprocessing and fast reactor technologies)
  - Develop guidelines for advanced fuel reprocessing and recycling for used nuclear fuel

- Promote new technologies used in Small Modular Reactors (SMRs) and support the eventual deployment of SMRs. These reactors have the potential to replace aging power plants that are near retirement, incrementally add generating capacity as needed, provide strong export potential to foreign markets, and provide reliable off-grid power supply. SMRs could also be utilized by the military and other government installations as a secure and reliable backup or baseload power supply with the potential of providing electricity needs for the surrounding communities (this application could also accelerate overall deployment and commercialization of these reactors). The modularity of design and the ability to construct all aspects of an SMR in the United States also means more jobs here at home. Light water SMR concepts build on existing light water reactor technology while others (future concepts, such as gas-cooled reactors) employ very different technologies. Thus, beyond funding for R&D, we always must ensure that today's regulations evolve to meet tomorrow's technologies. As the nascent SMR industry develops, it needs to comply with safety regulations while striving to minimize plant lifecycle costs. Agencies should closely monitor how regulations affect operating costs and safety margins.

- Explore nuclear power plants that employ high temperature reactor concepts (e.g., Next Generation Nuclear Power Plants). Amend the Energy Policy Act of 2005 to remove the locational requirement for the Next Generation Nuclear Plant project and allow it to be built wherever it can be put to use.

- Preserve the Integrated University Program that trains engineers and scientists in nuclear engineering, nonproliferation, nuclear forensics, and nuclear safeguard missions.

- Revise the loan guarantee program to require the Office of Management and Budget (OMB) to take each nuclear loan guarantee application on a case-by-case basis to determine the credit subsidy cost. Assumed default rates, used to determine the credit subsidy cost, should be realistic and tailored to match the circumstances of each specific applicant.

- Continue supporting both domestic and international efforts to realize commercial scale power from fusion energy. Promote the transitioning of the domestic fusion program from its science focus (how do we achieve fusion) to a more energy-focused program (fusion materials and technology) with a strong science component. Support continued financial investment into fusion energy that will make fusion a viable and efficient energy source in the future.

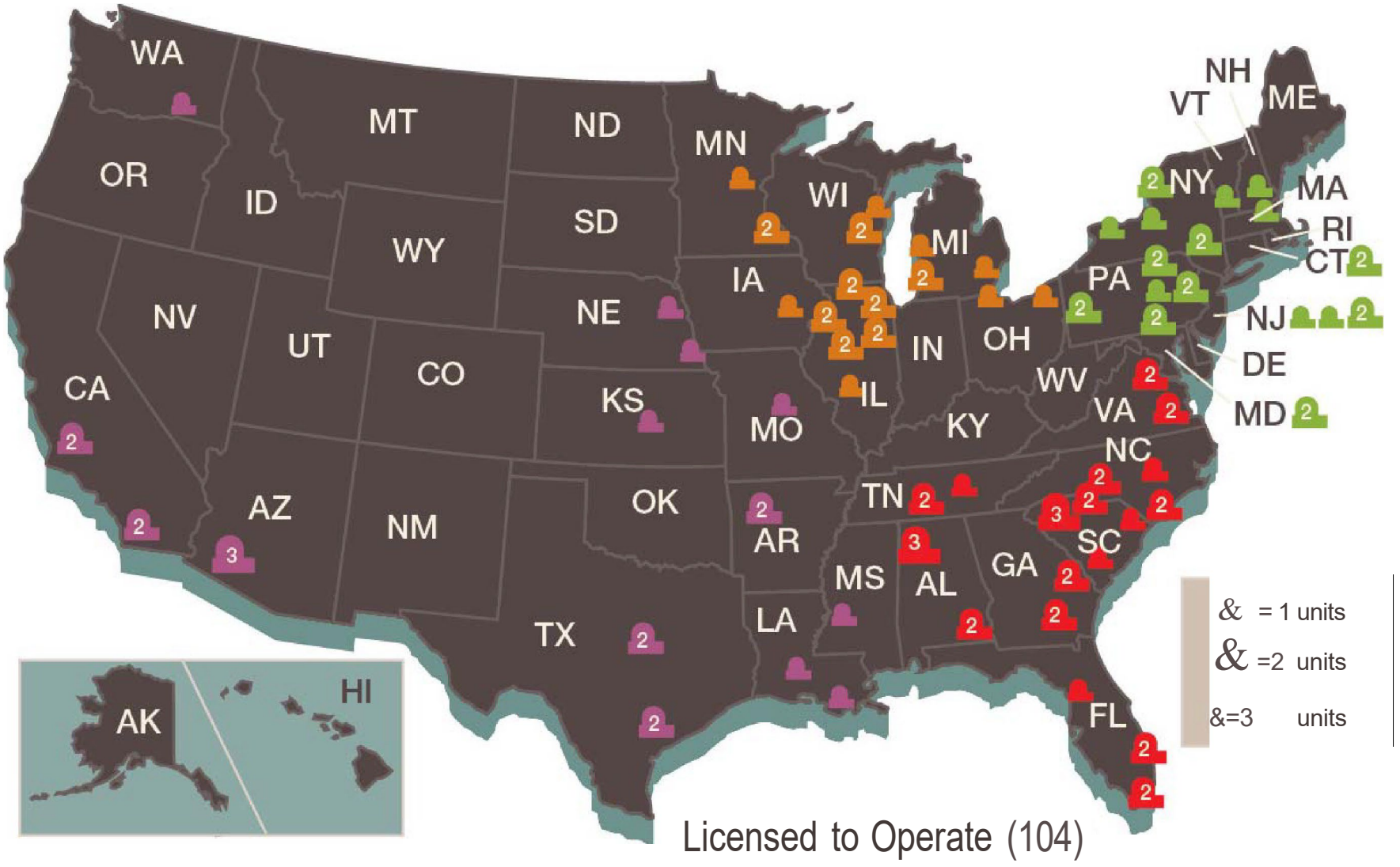
- Support international collaborations to promote the safety of, and technological advancements in, nuclear energy and power production. These include activities at the International Atomic Energy Agency and the Nuclear Energy Agency that foster SMR design and licensing, advanced reactor technology R&D, and safe and efficient continued operation of current reactors.

- Explore the potential for U.S. participation in domestic and international nuclear energy markets. Identify and conduct government and industry dialogue regarding inherent issues of safety, security, intellectual property, treaties and economic stability and growth, in order to achieve the greatest contribution to national security through development and deployment of versatile technology.

Bellefonte Nuclear Plant Unit 1, Alabama

Source: TVA

U.S. Operating Commercial Nuclear Power Reactors



Source: Nuclear Regulatory Commission

ALTERNATIVE FUELS

With petroleum accounting for over 90 percent of the energy consumed in the transportation sector each year,[53] the diversification of our fuel mix has been a national priority. In recent years, however, the alternative fuels policies of the U.S. have come to rely on burdensome mandates, inappropriate restrictions, and erratic subsidization. Implementation of federal biofuel mandates has likely contributed to higher food prices; fraudulent activity that has harmed both those seeking to comply with federal rules and those attempting to commercialize new fuels; and potential and uncertain liabilities for fuel retailers and vehicle manufacturers. These difficulties are compounded by the absence of an effective definition for the feedstocks upon which alternative fuels production relies. This is an unworkable situation that will ultimately harm consumers throughout the country if it is not reformed.

There are, however, many opportunities remaining for alternative fuels. From algal biofuels to natural gas and coal-derived products, as well as combinations of these and other feedstocks, the potential options for diversification of our transportation sector's energy supply have perhaps never been greater. These opportunities can all be pursued in conjunction with efforts to remedy the problems created by current policies. To ensure continued growth in the alternative fuels market, the government needs to:

- Reform the Renewable Fuels Standard (RFS), as expanded by the Energy Independence and Security Act of 2007, to ensure more equitable treatment of the various feedstocks. While the RFS has increased the usage of biofuel in the United States, it has also led to a number of unintended consequences. Congress should reform the standard to ensure that these problems are resolved – instead of worsened – in the years ahead.

- Increase R&D for "drop-in" replacement fuels, which are still largely in the pre-commercial phase of development. The advantages of these fuels – particularly their compatibility with the current vehicle fleet and existing fueling infrastructure – merit a much larger share of federal biofuel R&D.

- Facilitate demonstrations of cutting-edge, alternative fuels in a variety of geographical settings and climates.

- Authorize entry into long-term contracts for the federal procurement of new, alternative fuels in order to create a reliable market for sale and certification of fuels.

- Repeal Section 526 of the Energy Independence and Security Act of 2007, as this provision has proven unworkable and cannot be squared with an 'all of the above' energy policy.

- Establish metrics for evaluating progress and performance at federal agencies. Achieving the deployment of cost-competitive alternative fuels is a good goal to have, but actual measurement of any progress being made by the Department of Energy, the Department of Defense, and others has proven elusive. Congress should develop and implement milestones against which the effectiveness of federal programs can be judged. Specifically, whether or not alternative fuel prices have reached parity with conventional options by a future date should be monitored.

Pearson Fuels station offering alternative fuels, California

Source: DOE

CRITICAL MINERALS

Minerals are the building blocks of our nation's economy. From rare earth elements to molybdenum, we rely on minerals for everything from the smallest computer chips to the tallest skyscrapers. Minerals make it possible for us to innovate and invent – and in the process they shape our daily lives, our standard of living, and our ability to prosper.

There is no question that an abundant and affordable supply of domestic minerals is critical to America's future. And yet, despite that, our mineral-related capabilities have been slipping for decades. Rare earth elements garner most of the headlines, but according to the USGS, the United States was 100 percent dependent on foreign suppliers for 19 minerals in 2011 – and more than 50 percent dependent on foreign sources for some 24 more.[54]

For the most part, this is not because the U.S. lacks reserves of these minerals that are capable of being developed. It is because our minerals policies have failed to keep up with the rest of the world, and those investing in production of these resources have decided to look elsewhere. According to the Metals Economics Group, the U.S. attracted 20 percent of the worldwide exploration investment dollars in 1993.[55] Today, that has eroded to just eight percent.

This trend can and should be reversed through clear programmatic direction to revitalize the domestic critical mineral supply chain. Such action is needed to keep the U.S. competitive and ensure that the federal government's mineral policies – some of which have not been updated since the 1980s – are brought into the 21st century.

The reestablishment of critical mineral designation, assessment, production, manufacturing, recycling, analysis, forecasting, workforce, education, research, and international capabilities within the United States is essential for economic prosperity and resource security. To accomplish these objectives, the government needs to:

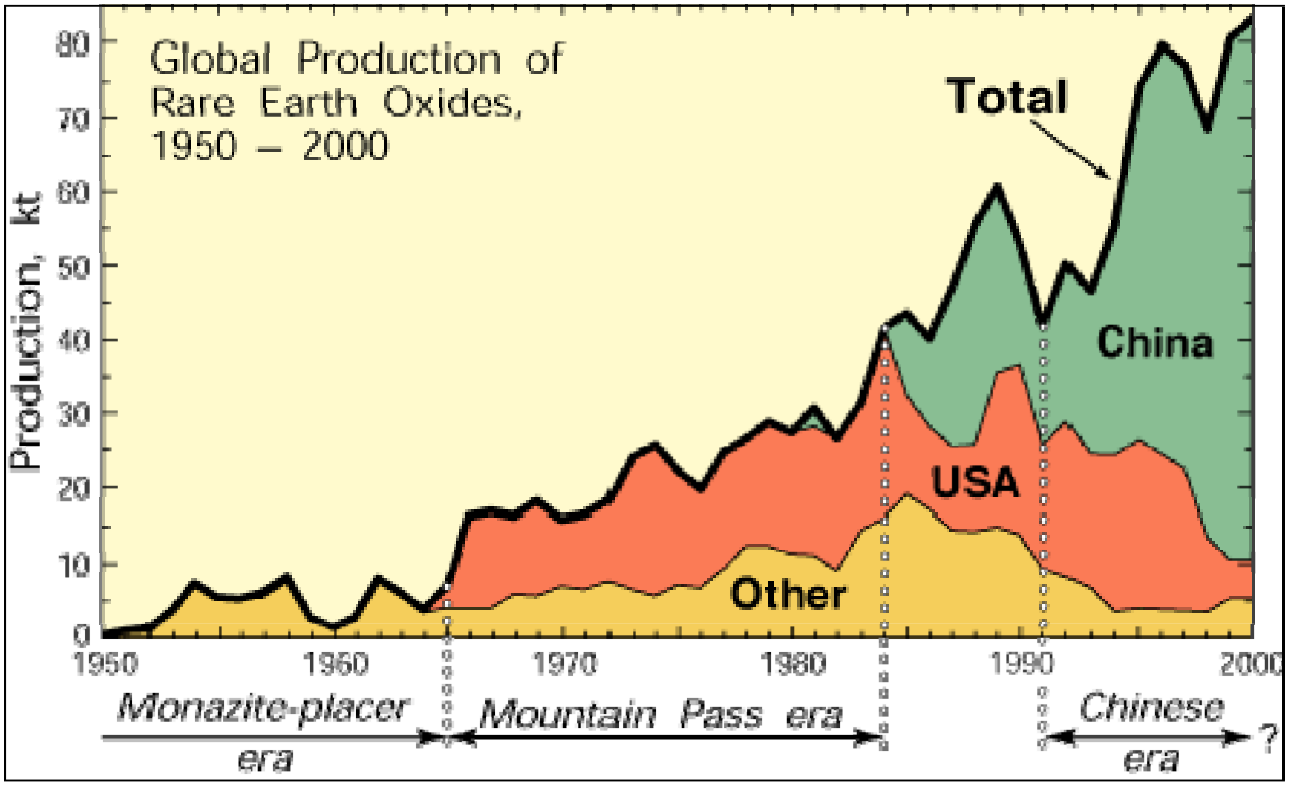
- Develop a rigorous methodology for determining which minerals are critical, and then use that methodology to designate critical minerals, monitor their status, and update designations in a timely manner.

- Establish as the policy of the United States the promotion of an adequate, reliable, domestic, and stable supply of critical minerals, produced in an environmentally responsible manner, to strengthen and sustain our nation's economic security.

- Complete a comprehensive national resource assessment within four years for each designated critical mineral, including field work.

U.S. Now Reliant Upon China For Rare Earth Supply

Source: USGS



- Optimize the efficiency of permitting – without reducing the environmental standards that must be adhered to – in order to facilitate increased exploration for and production of critical minerals by reviewing requirements, quantifying delays, recommending improvements, and developing a performance metric for evaluating progress.

- Conduct R&D to facilitate the efficient use and recycling of critical minerals, as well as alternatives that can reduce the demand for them.

- Undertake annual reviews of domestic mineral trends as well as forward-looking analyses of critical mineral production, consumption, and recycling patterns.

- Provide for workforce assessments, curriculum development, worker training, and associated grants to academic institutions.

- Promote international cooperation with allies on critical mineral supply chain issues and provide an avenue for technology and information transfer via diplomatic channels.

USGS Mineral Commodity Summaries 2012

Source: http://minerals.usgs.gov/minerals/pubs/mcs/2012/mcs2012.pdf

2011 U.S. NET IMPORT RELIANCE FOR SELECTED NONFUEL MINERAL MATERIALS

Commodity	Percent	Major Import Sources (2007–10)[1]
ARSENIC (trioxide)	100	Morocco, China, Belgium
ASBESTOS	100	Canada, Zimbabwe
BAUXITE and ALUMINA	100	Jamaica, Brazil, Guinea, Australia
CESIUM	100	Canada
FLUORSPAR	100	Mexico, China, South Africa, Mongolia
GRAPHITE (natural)	100	China, Mexico, Canada, Brazil
INDIUM	100	China, Canada, Japan, Belgium
MANGANESE	100	South Africa, Gabon, China, Australia
MICA, sheet (natural)	100	China, Brazil, Belgium, India
NIOBIUM (columbium)	100	Brazil, Canada, Germany, Russia
QUARTZ CRYSTAL (industrial)	100	China, Japan, Russia
RARE EARTHS	100	China, France, Estonia, Japan
RUBIDIUM	100	Canada
SCANDIUM	100	China
STRONTIUM	100	Mexico, Germany
TANTALUM	100	China, Germany, Kazakhstan, Australia
THALLIUM	100	Russia, Germany, Kazakhstan
THORIUM	100	France, India, Canada, United Kingdom
YTTRIUM	100	China, Japan, France, United Kingdom
GALLIUM	99	Germany, Canada, United Kingdom, China
IODINE	99	Chile, Japan
GEMSTONES	98	Israel, India, Belgium, South Africa
GERMANIUM	90	China, Belgium, Russia, Germany
BISMUTH	89	China, Belgium, United Kingdom,
DIAMOND (dust, grit and powder)	89	China, Ireland, Republic of Korea, Russia
PLATINUM	88	Germany, South Africa, United Kingdom, Canada
ANTIMONY	87	China, Mexico, Belgium
RHENIUM	87	Chile, Netherlands, Germany
STONE (dimension)	85	Brazil, China, Italy, Turkey
POTASH	83	Canada, Belarus, Russia
VANADIUM	80	Rep. of Korea, Canada, Austria, Czech Republic
BARITE	78	China, India
SILICON CARBIDE	76	China, Brazil, Vietnam, Norway
TIN	76	Peru, Bolivia, Indonesia, China
COBALT	75	China, Norway, Russia, Canada
SILVER	75	Mexico, Canada, Peru, Chile
ZINC	73	Canada, Peru, Mexico, Ireland
TITANIUM (sponge)	69	Kazakhstan, Japan, China, Russia
TITANIUM MINERAL CONCENTRATES	68	South Africa, Australia, Canada, Mozambique
PEAT	63	Canada
CHROMIUM	60	South Africa, Kazakhstan, Russia, China
PALLADIUM	56	Russia, South Africa, United Kingdom, Norway
MAGNESIUM COMPOUNDS	53	China, Canada, Brazil, Austria
NICKEL	47	Canada, Russia, Australia, Norway
SILICON (ferrosilicon)	42	China, Russia, Venezuela, Canada
NITROGEN (fixed), AMMONIA	41	Trinidad and Tobago, Russia, Canada, Ukraine
GARNET (industrial)	39	India, Australia, China, Canada
GOLD	36	Mexico, Canada, Colombia, Peru
TUNGSTEN	36	China, Bolivia, Canada, Germany
COPPER	35	Chile, Canada, Peru, Mexico
MAGNESIUM METAL	35	Israel, Canada, China
PERLITE	27	Greece
SULFUR	24	Canada, Mexico, Venezuela
SALT	22	Canada, Chile, Mexico, The Bahamas
BERYLLIUM	21	Russia, Kazakhstan, Japan, Russia
MICA, scrap and flake (natural)	20	Canada, China, India
VERMICULITE	20	China, South Africa, Australia, Brazil
ALUMINUM	13	Canada, Russia, China, Mexico
GYPSUM	13	Canada, Mexico, Spain
PHOSPHATE ROCK	13	Morocco, Peru
IRON and STEEL	9	Canada, European Union, China, Mexico
IRON and STEEL SLAG	8	Japan, Canada, South Africa, Italy
CEMENT	6	Canada, China, Republic of Korea, Mexico
PUMICE	5	Greece, Mexico, Iceland, Montserrat
DIAMOND (natural industrial stone)	3	Botswana, South Africa, Russia, Namibia
LIME	1	Canada, Mexico
STONE (crushed)	1	Canada, Mexico, The Bahamas

[1]In descending order of import share.

PRODUCING MORE ON NATIVE LANDS

The federal government should remove unnecessary burdens and obstacles for Native groups seeking to develop natural resources on Native Corporation or Indian Reservation lands across the nation.

There are 5.35 billion barrels of oil, 37.7 trillion million cubic feet (mcf) of conventional natural gas, and more than 53 billion tons of potential coal reserves on Native Lands in the continental U.S.[56] The combined value of these resources is over $875 billion.[57] On Alaskan Native Lands, the 92,000 acres on the Arctic coastal plain likely contain a mean estimate of another 2.67 billion barrels of oil and hundreds of mcf of natural gas.[58]

Tribal lands are also rich with renewable resources. They likely contain more than 4.9 percent of the country's total renewable resources, potentially producing 23.3 billion megawatt hours of electricity. Tribal lands are likely to hold 19 percent of the nation's geothermal energy resources, five percent of its future solar, 3.2 percent of its wind and conventional hydropower, and about 1.1 percent of its biomass.[59]

For decades, tribes have faced delays and red tape seeking federal approval to enter into agreements to explore for and develop their own energy sources. They are challenged by substantial capital shortages for energy development and transmission infrastructure, and they have faced regulatory and permitting delays.

DOE and DOI are now providing better technical assistance to help Native energy planning, but far more is needed to sufficiently support energy development on Native Lands. Congress for several years has been considering a series of amendments to Indian energy tribal statutes and policies to speed such development. To promote energy production on Native Lands, the federal government should:

- Provide more assistance to Natives and Native corporations to plan oil and gas, renewable energy, and electricity generation and transmission facilities on and across Native Lands.

- Allow tribes to more easily enter into Tribal Energy Resource Agreements, envisioned by the Energy Policy Act of 1992. These agreements hasten the approval of rights-of-way across energy lands as well as energy projects. Moreover, they create tribal energy development organizations when needed.

- Speed the approval of preliminary permits and licenses for exploration and development for tribes.

- Permit tribes and Native corporations to conduct demonstration projects to develop biomass resources on tribal lands.

- Provide R&D funding for less conventional renewable resources and fossil fuels – such as methane hydrates, shale oil and gas, and subsurface coal gasification – on Native Lands.

MAPPING AMERICA'S RESOURCE BASE

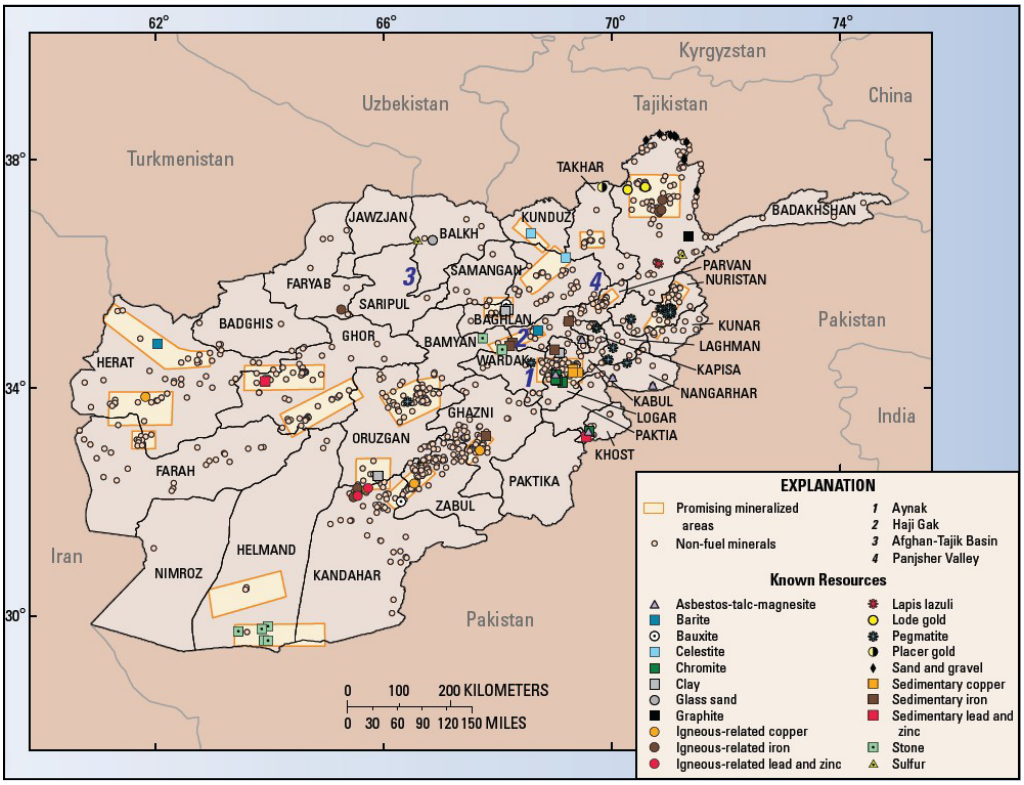
Our nation has been blessed with abundant resources, and the drive to survey our natural resource base must be recaptured. Until we employ the latest techniques to determine the extent of the nation's holdings, our natural resource policy cannot be comprehensive. Understanding the facts is the foundation of sound policy. To provide a foundation for future policy prescriptions, the following inventory steps must be taken:

- Reform USGS programs to restore the agency's focus on geological surveying and require that the agency implement more robust, comprehensive inventorying of all technically recoverable U.S. energy and mineral resources, with updates every five to seven years. Resources surveyed in this inventory should include all oil, shale oil, oil shale, natural gas, shale gas, natural gas liquids, coal, methane hydrates, other leasable minerals, saleable minerals, hardrock minerals, and others. All BLM and other federal lands, as well as all Native Lands, should be fully surveyed.

- Employ third party contractors to undertake seismic data acquisition and obtain the core samples for the USGS inventory.

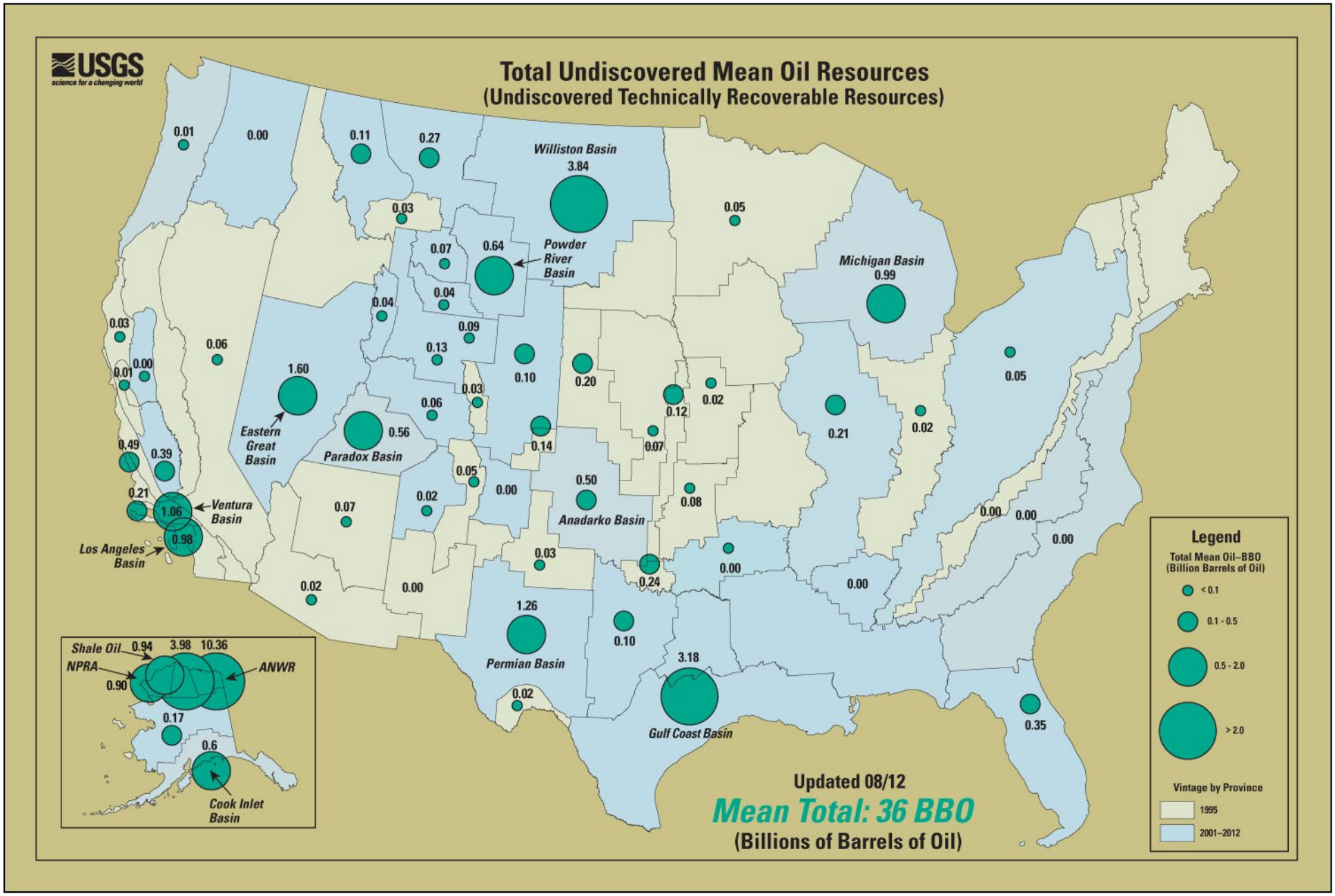
- Create a renewed, robust, and efficient storage and cataloguing system for the geological and geophysical samples and data needed for the USGS inventory.

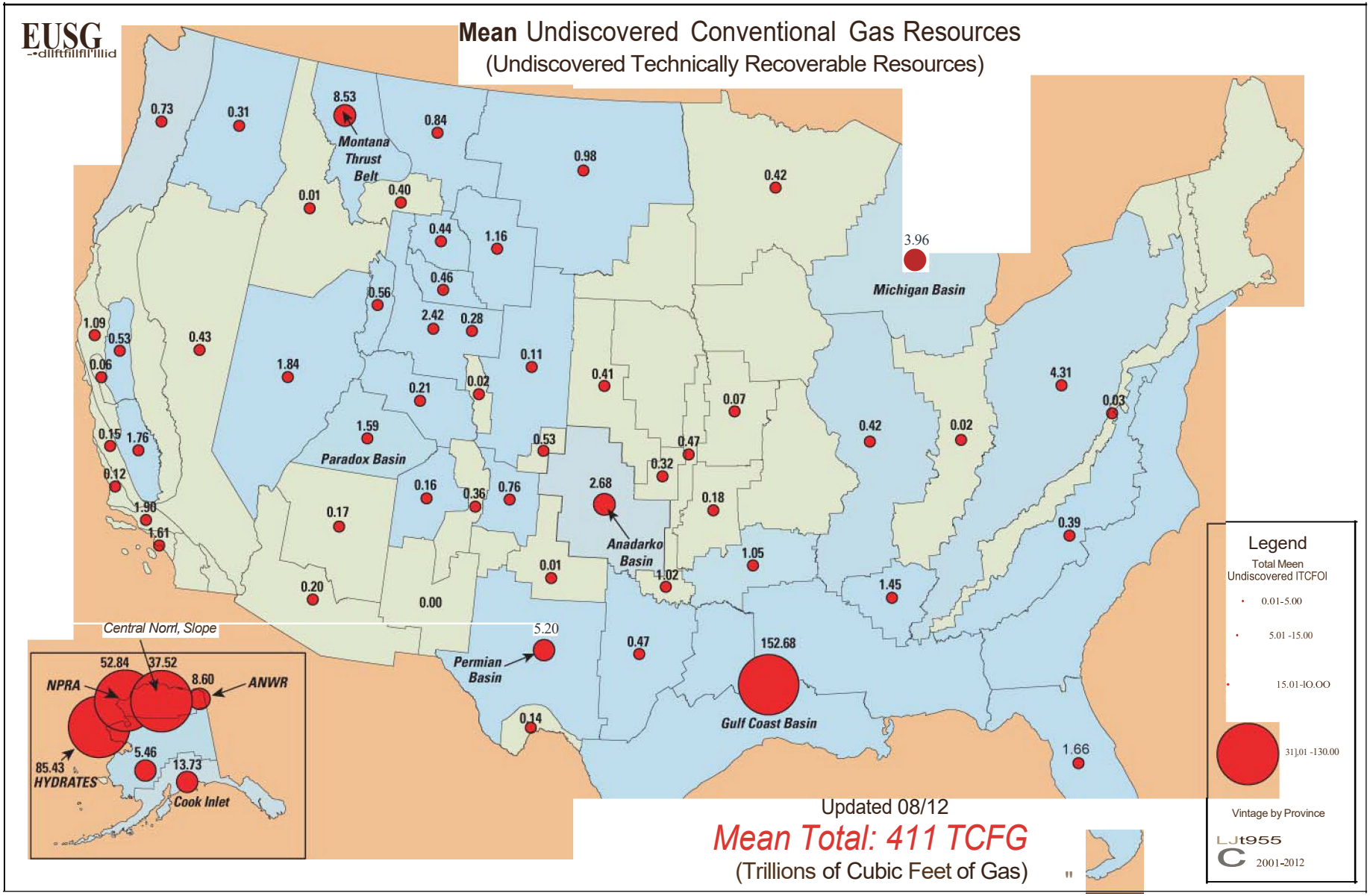
- Create measures to inventory existing data and uniformly publish information on resources on state and private lands in the following regions: Marcellus, Eagle Ford, Fayetteville, and Barnett Shales; the Bakken formation; and enhanced oil recovery in producing states such as Texas, Louisiana, California, Oklahama, Kansas, Arkansas, New Mexico and Colorado.



The USGS has mapped 96 percent of Afghanistan using hyperspectral imaging, but only five percent of the U.S. has been mapped using the same technologies. A similar effort should be undertaken domestically.

Source: USGS

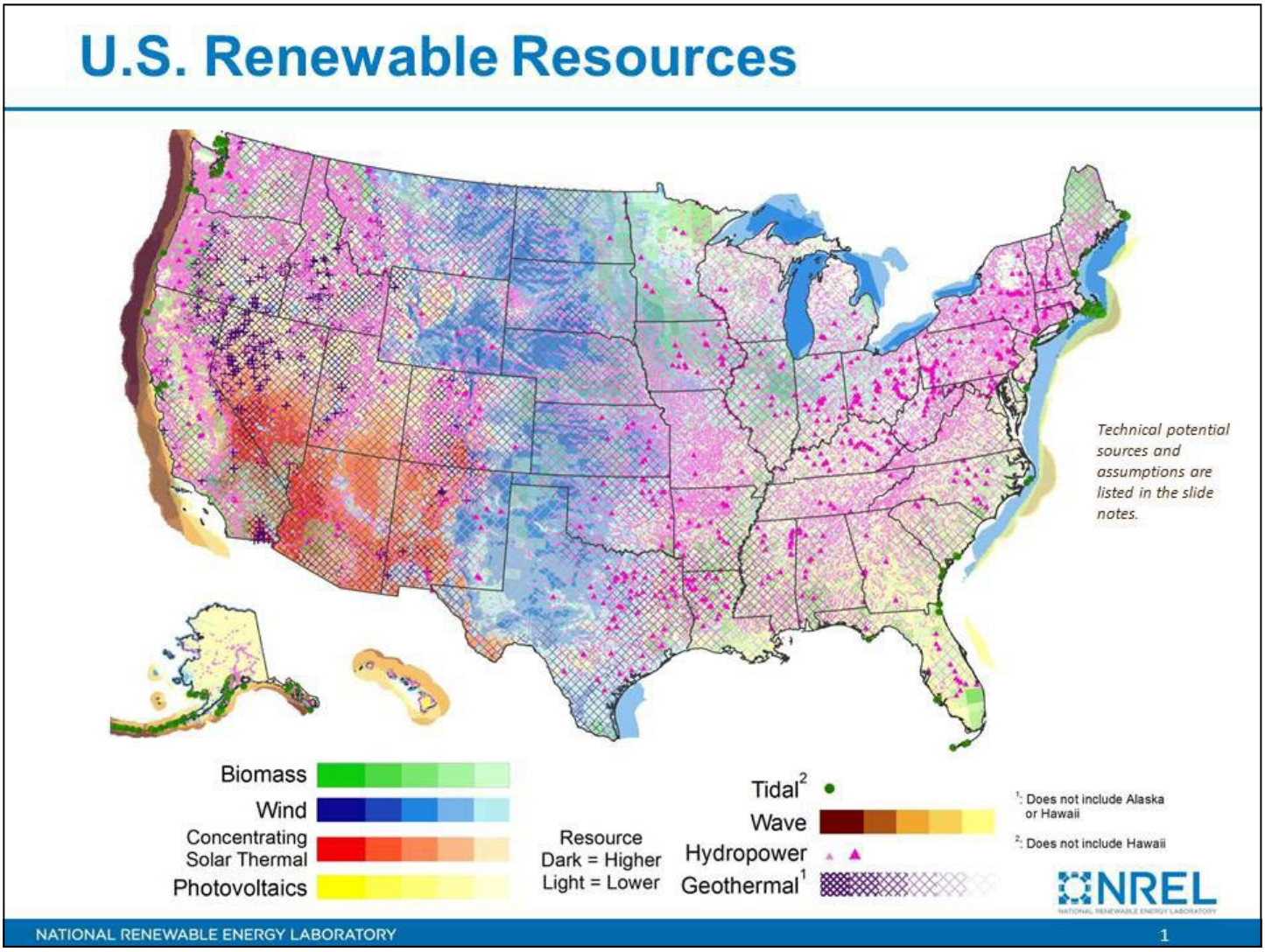

USGS
science for a changing world
Total Undiscovered Mean Oil Resources
(Undiscovered Technically Recoverable Resources)
Williston Basin
3.84
Powder River Basin
0.64
Michigan Basin
0.99
Eastern Great Basin
1.60
Paradox Basin
0.56
Ventura Basin
1.06
Los Angeles Basin
0.98
Anadarko Basin
0.50
Permian Basin
1.26
Gulf Coast Basin
3.18
Shale Oil
0.94
NPRA
0.90
3.98
10.36
ANWR
0.17
0.6
Cook Inlet Basin
Updated 08/12
Mean Total: 36 BBO
(Billions of Barrels of Oil)
Legend
Total Mean Oil–BBO
(Billion Barrels of Oil)
< 0.1
0.1 - 0.5
0.5 - 2.0
> 2.0
Vintage by Province
1995
2001–2012


EUSG
Mean Undiscovered Conventional Gas Resources
(Undiscovered Technically Recoverable Resources)
0.73
0.31
8.53
Montana Thrust Belt
0.84
0.98
0.42
0.01
0.40
0.44
1.16
3.96
Michigan Basin
0.46
0.56
2.42
0.28
1.09
0.53
0.43
0.06
1.84
0.11
0.41
4.31
0.03
0.21
0.02
0.07
0.42
0.02
1.59
Paradox Basin
0.53
0.47
0.15
1.76
0.32
0.12
2.68
0.16
0.36
0.76
0.18
1.90
0.17
Anadarko Basin
0.39
1.61
1.05
0.01
1.02
1.45
0.20
0.00
Central Norrl, Slope
5.20
0.47
152.68
Permian Basin
52.84
37.52
8.60
NPRA
ANWR
Gulf Coast Basin
0.14
1.66
5.46
13.73
85.43
HYDRATES
Cook Inlet
Updated 08/12
Mean Total: 411 TCFG
(Trillions of Cubic Feet of Gas)
Legend
Total Meen
Undiscovered ITCFOI
0.01-5.00
5.01 -15.00
15.01-IO.OO
31.01 -130.00
Vintage by Province
2001-2012

NATIONAL ENERGY ATLAS

The EIA should refine its existing work to produce and maintain an up-to-date, comprehensive National Energy Atlas. This readily-accessible project would build on existing reports assessing hydrocarbons, critical minerals, and renewable resources.[60] Leveraging the full power of our imaging and surveying capabilities, it would build upon work already completed by the National Renewable Energy Laboratory, the Idaho National Engineering and Environmental Laboratory, DOI, other federal agencies, and state agencies.

More data will better inform the public discourse. We know that solar resources are most heavily concentrated in the American southwest in states like Arizona and New Mexico, while geothermal potential is concentrated in the west and northwest in states like Alaska, Oregon, and Hawaii. The Great Plains dominate wind potential, while many promising shale gas plays are found in Appalachia. An all-inclusive atlas providing a total picture of potential resources would inform and strengthen the nation's energy discussion.



CONSUMING LESS

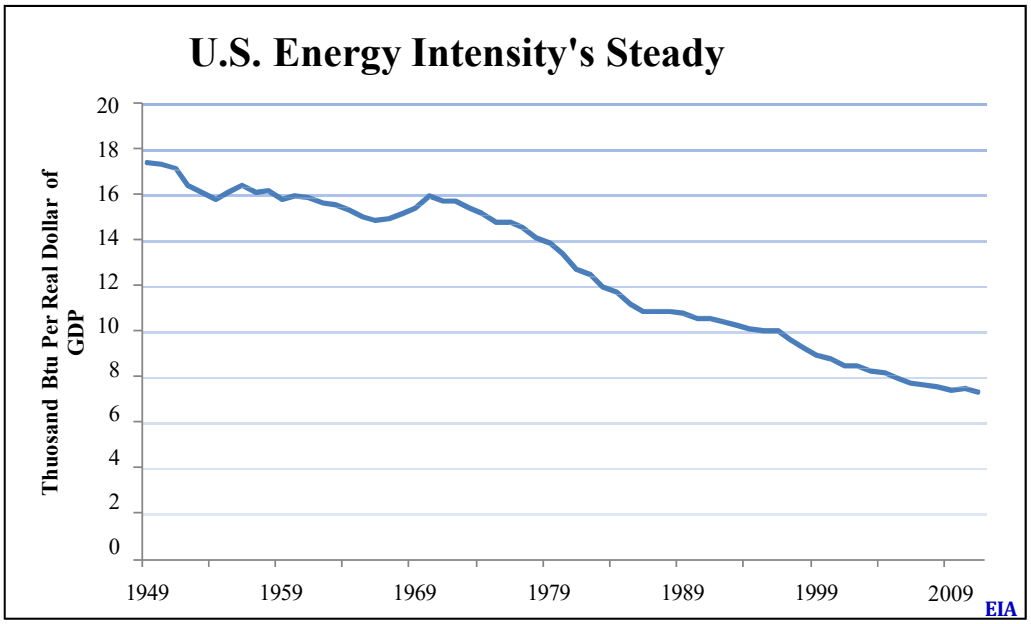
"Waste not, want not" is an expression many Americans have heard at home from a young age. Due to our nation's size and high standard of living, we must be conscious of our energy consumption. As our standard of living rises, energy demand will intensify. We use a lot of energy because we have a high and improving standard of living, and we live in a big country where transportation consumes a great deal of energy. Thus, we should aim to use energy more wisely – by using less and less energy *per capita* and *per unit of gross domestic product*.

Using energy efficiently is part of, not in conflict with, abundant and affordable energy. Energy experts have correctly called energy efficiency "the fifth fuel."[61] Using energy more efficiently is akin to developing more fuel.

Successes thus far should be celebrated. U.S. energy consumption per unit of gross domestic product has fallen from 17.35 thousand British thermal units (Btu) in 1949 to 7.31 thousand Btu in 2011, a drop of nearly 60 percent.[62] We must give credit where credit is due, including to successful government programs that have spurred efficiency upgrades nationwide.

Still, it should be noted that a large part of the drop in overall energy consumption is an effect of the recent economic recession, from which we are still recovering. We need to continue to do better and find new and creative ways to encourage energy efficiency.

The prospect of even greater efficiency is bright, and its benefits are clear for the economy and the environment. The challenge is doing so in a non-invasive manner. Energy policy should drive conservation without detracting from our standard of living. Efficiency innovations that prove themselves to buyers will prosper, just as innovations in other endeavors have become part of our everyday lives.



Although many things come to mind when we think of "efficiency," a common sense definition is "getting more from less" – a relationship between inputs and outputs. There are as many ways to accomplish this result as there are creative people working together accumulating knowledge and enabled by prosperity and technology.[63] Efficiency is a multisided coin and should not be reduced to a slogan.

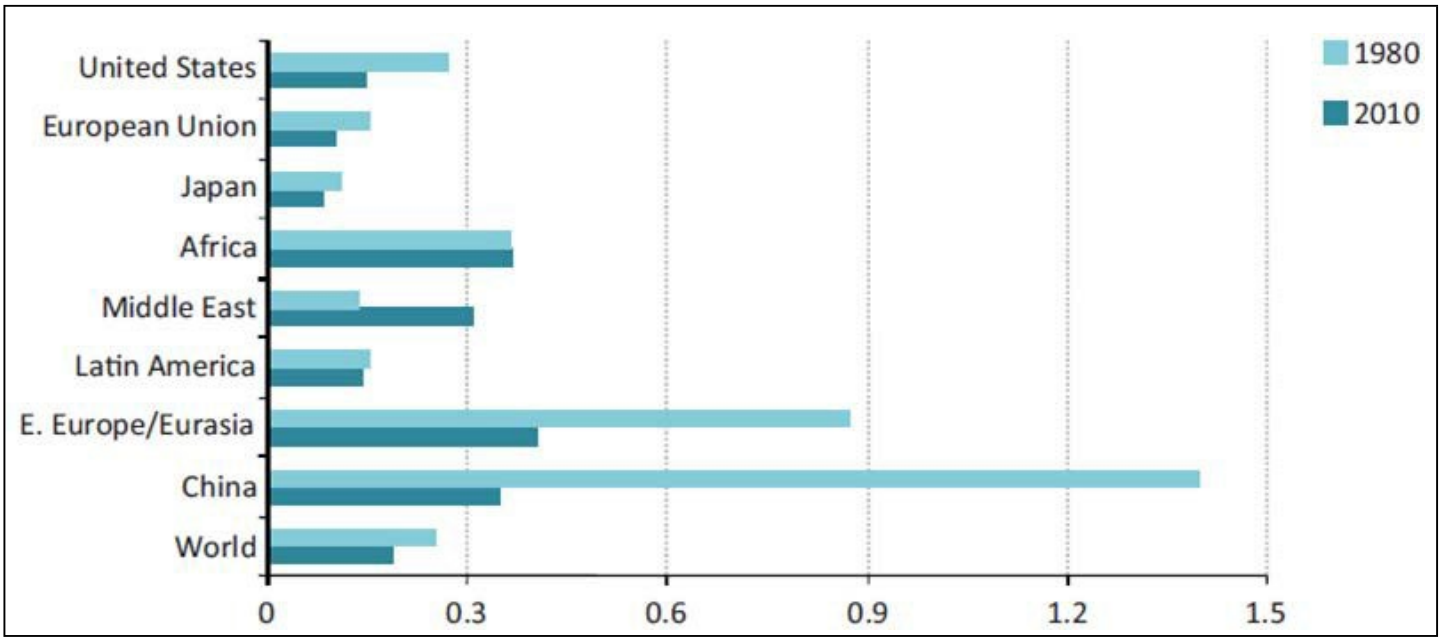
There is one definition of "efficiency" that must be rejected: the misguided idea that reducing overall energy consumption in absolute terms necessarily enhances the nation's efficiency. A household that cuts its usage of gasoline is certainly conserving energy, but if the members of that household are spending more time taking alternative travel, or simply taking fewer trips, then they also may be accomplishing less in their lives. Americans are and should be free to "pursue happiness," after all.

Energy consumption and the direction of the nation's economy are typically correlated in positive terms. The nation's total energy consumption declined from 101.3 quadrillion Btu in 2007 to 94.6 quadrillion Btu in 2009, for example, coinciding with a period of extraordinary international economic weakness. As the marketplace recovered, however, consumption rose to 97.3 quadrillion Btu in 2011.[64]

This makes sense, intuitively. A growing economy uses more energy; a slowing or shrinking economy uses less. Wasting energy, certainly, is never desirable.

International Energy Agency Assessments of Global Energy Intensity By Country (1980 vs. 2010)

Source: IEA, World Energy Outlook 2012, Figure 9.2. *See also*: p. 273.



Tonne of Oil Equivalent per thousand dollars of GDP (2011 dollars, market exchange rate)

ENERGY INTENSITY

One common measure of energy efficiency is attained by dividing energy consumption by the Gross Domestic Product (GDP). This is also known as energy intensity and enables us to determine how much energy is required to generate one dollar in the economy, broadly speaking. Less is more. Although it is an imperfect measurement – as with all indicators, there are limitations to the analysis – it is nonetheless highly useful and instructive.[65]

As technology improves and our workforce becomes more educated, the economy's productivity rises, and more goods and services are produced for less. The less energy required to add one dollar to the economy, the more the economy is able to grow. Even in times of economic hardship, efficiency can still increase. In fact, scarcity can drive efficiency even further as firms adapt to new challenges and circumstances.

The American story on energy consumption and economic vitality is a model for the rest of the world. Energy efficiency, measured as thousand Btu per real (2005) dollars, has improved in virtually every year since 1949, when the records begin. The amount of energy required to produce one dollar has steadily fallen, even as consumption has more than tripled. Energy consumption per unit of GDP has fallen from 17.35 thousand Btu in 1949 to 7.31 thousand Btu in 2011, a drop of nearly 60 percent.[66]

It is for this reason that the International Energy Agency (IEA) recently singled out the United States for our advancements in this area. In its latest World Energy Outlook, the IEA notes: "Among OECD [Organisation for Economic Co-operation and Development] countries, the United States has achieved the biggest improvement in energy intensity in recent decades, albeit from relatively high levels. Its energy intensity declined at an average rate of 2 percent per year from 1980 to 2010."[67] Incremental improvements have produced profound change over time.

According to the latest domestic projections from the Energy Information Administration, energy intensity will continue trending downward. (Carbon dioxide emissions per dollar of GDP are closely linked to energy intensity and will also continue to decline.) Even energy use per capita, which had long been relatively stable, will also accelerate its milder decline. Gains in efficiency accrue despite economic growth and the expansion of the U.S. population.[68]

This is something of which we can all be proud, but there is still a long way to go. Other nations, such as the European Union and Japan, report lower energy intensities. There are several reasons that this is the case. Overseas governments are often more willing to intervene in the economy and impose stricter mandates that make energy more expensive for consumers. This approach can lead to distortions and negative externalities. In its report, the IEA also discusses a series of barriers to greater efficiency gains, including the difficulties associated with measuring efficiency, low levels of awareness, the problem of split incentives, risk perception and aversion, and others.[69]

Policymakers can help remove or manage these barriers – charting a course to an even more efficient economy that preserves the American free enterprise system and utilizes, rather than abandons, the free-market approach that has made us so strong.

THE WAY FORWARD ON EFFICIENCY

The drive toward increasing efficiency is an American success story. We see this across sectors in a variety of ways:

- The Next Generation Nuclear Plant holds tremendous promise and is a testament to the ingenuity of 21st century engineering. This design remains operational for a longer period of time and also produces hydrogen, in addition to its highly efficient electricity production. So-called "Generation IV" plants are an international endeavor, in which the U.S. is a leader.[70] More broadly, as nuclear power has increased its share of total U.S. generation, its capacity factor – a measurement of efficiency – has also substantially increased.[71]

- The recent drought and spate of wildfires has brought water efficiency to the forefront. As we explore elsewhere in this document, understanding the energy-water nexus is key: water is used in some form or method in the production of all energy sources. Upgraded faucets, pipes, toilets, and other fixtures have saved over 250 billion gallons of water, according to the EPA.[72]

- In the natural gas area, "combined cycle" units have greatly increased the efficiency of electricity production. From 2005 to 2010, the capacity factor for these kinds of plants increased from about 40 percent to 50 percent during peak hours.[73]

- The building sector uses more than a quarter of U.S. energy each year. Technological improvements can enhance the efficiency of residential and commercial buildings, particularly in the space heating, cooling, and ventilation areas.[74] Mandates are not a panacea, however, and typically have negative externalities.

- Technology provides numerous pathways toward greater gains in efficiency. Hydroelectric plants can be modernized with more efficient turbines, for example. The Advanced Energy Trust Fund – described in the section below, *An Energy Policy That Pays For Itself* – can contribute to the nation's R&D potential.

ADVANCED VEHICLES

So much of America's energy consumption occurs in the transportation sector. Cars, trucks, airplanes, and other means of travel consume roughly 71 percent of the nation's petroleum, including imports. No other sector even comes close.[75] Approximately 13.3 million barrels of transportation fuel – primarily motor gasoline, distillate fuel oil, and jet fuel – were consumed each day in 2011.[76]

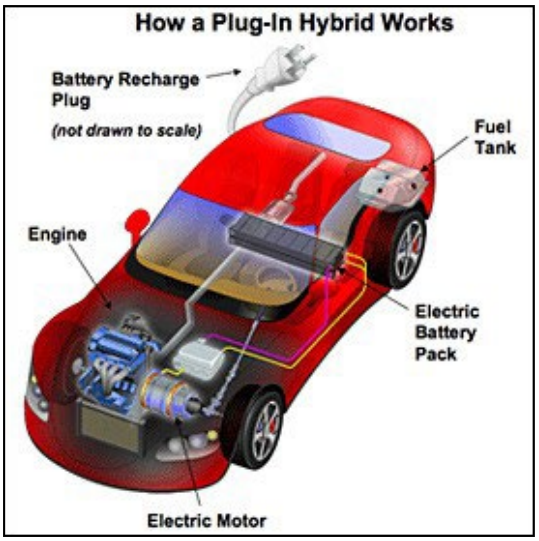
There are significant opportunities in the transportation sector to improve upon efficiency and environmental performance while providing more – not less – choices for consumers. Already, and without government intervention, the adoption of alternative fuel and advanced vehicle technologies within company fleets has resulted in notable progress. One example is the increasing use of natural gas by long-haul truckers.

Alternative fuel vehicles offer a chance for our country to diversify our fuel mix and break our dependence on foreign oil – and achieve energy independence from OPEC imports by 2020. Some of the most promising approaches for continued advancement in this sector include:

- DOE: Reform the Vehicle Technologies Program, which should focus on a range of advanced vehicle technologies, systems, and components. These activities should be limited to pre-commercial R&D, where the government's role is appropriate and most beneficial. Existing authorities should be repealed and consolidated to provide this program with clear and consistent congressional direction.

- DOE: Refine existing programs including the Title 17 loan guarantee program, to allow a wider range of vehicle technologies and projects to qualify.

- Terminate the Advanced Technology Vehicles Manufacturing (ATVM) incentive program, which has awarded only five loans since its inception and just one small loan since March 2011. The program has not been effective, and today, because of rising fuel economy standards, it has also outlived its usefulness. All unobligated funds that have been appropriated to ATVM should be rescinded and returned to the Treasury.



Plug-in hybrid vehicles have an engine powered by liquid fuel and an electric motor powered by a rechargeable battery pack.

Source: NREL

- Congress should consider reform of the current, up to $7,500 tax credit for electric vehicles to make it more technology neutral. Modifications should not add to the deficit. The credit should also ramp down and sunset by 2020.

- Modify current fuel economy statutes and regulations to provide parity for alternative fuel technologies, including natural gas vehicles. Current statutes and regulations favor electric vehicles, but the more proper focus is overall vehicle efficiency and environmental performance.

- A full review of the current fuel economy regime should be completed by mid-2015, and be updated every two years thereafter. It should evaluate the costs and benefits of standards for recent Model Years – including any impacts on safety, new and used vehicle prices, new and used vehicle sales, consumer choice, actual consumer fuel expenditure savings, and industry employment – and be used to inform the stringency of future standards.

Solar powered electric vehicle charging station at Argonne National Laboratory (ANL)

Source: ANL

ENERGY CONSERVATION AND EFFICIENCY

The energy we don't use is another untapped resource at our disposal, as noted above. Achievements in energy efficiency are fundamentally the result of the accumulation of knowledge and technological progress, both of which are enabled by greater prosperity and security in a free market economy. We must not take energy efficiency for granted; energy efficiency's vast potential for savings demands our attention, and efficiency gains should be celebrated much as we would a new energy project.

Energy efficiency faces the problem that it can be difficult or impossible to quantify its benefits – the costs avoided and energy saved due to increased efficiency. How can and should we measure activity that did not occur? This task is less difficult when there are adequate data, but what if the data are incomplete or otherwise inadequate? Data collection and benchmarking are especially crucial pieces of the efficiency puzzle when addressing the energy consumption of buildings, for example.

There is also much debate about the federal government's role in energy efficiency. Many believe that the government should lead by example and continue to focus on making its own buildings more efficient, thereby providing a large market and opportunities for us to innovate and learn. Others place their support behind mandates to drive the behavior of citizens or private sector institutions, although those often prove unpopular and give rise to many challenges.

Moreover, we know that there are first-cost barriers to be overcome, and we have only just begun to explore the ways that 'smart' systems can work to save energy. Building codes are and should be part of the discussion, but codes are only as good as their enforcement, which drops off when state and local budgets are squeezed by a weak economy.

One thing is certain: efficiency and conservation across all sectors must be part of an all-of-the-above solution. By 2020, the federal government should shift to a wholesale efficiency approach that would integrate existing 'silos' of efficiency measures such as building codes, lighting, and appliances so that they work as a system to increase the overall efficiency of buildings.

By 2020, shift to a wholesale efficiency approach that encourages integrated systems rather than silos of efficiency.

To achieve this progress, the government should:

- Commission a review by the GAO, followed by formal hearings (or a less formal process involving citizens and institutional stakeholders) of current funding and past performance of residential, commercial and industrial energy efficiency programs at DOE and propose appropriate authorization levels based on this review. Wherever appropriate, a major priority should be streamlining and consolidating these programs and leveraging the work of public-private partnerships.

- Encourage energy efficiency upgrades, via public-private partnerships or other financing mechanisms, for both residential and commercial buildings. New home construction is only now showing some signs of life; indeed, recent years have seen new construction come almost to a halt. Prospects for newly constructed, energy efficient commercial buildings are slightly better than for residential buildings, but, between now and 2020, the most cost effective approach will likely be in retrofitting our existing building stock.

- While energy efficiency upgrades are a valuable endeavor, a persistent disconnect remains in some areas of the market when it comes to deployment of these upgrades. This applies specifically to energy efficient appliances and equipment. A number of barriers exist that discourage decision-makers and purchasers from procuring efficient systems that are initially more expensive. This is sometimes referred to as a "split incentive," and arises when there is difficulty motivating one party to act in the best interest of another when upfront costs are an issue.[77] For example, landlords may have little incentive to purchase energy efficient but costly appliances for a new tenant who pays the utility bills. We should address these difficulties and see how we might better encourage informed decision-making, reduce risk, and decrease payback periods for those who are responsible for purchasing efficient equipment.

- Energy efficiency tax extenders should be considered as part of a broader overall tax reform effort. There are several tax incentives for upgrades ranging from new energy efficient home appliances to major commercial renovations. However, the legislative process provides little certainty as to whether these programs will continue from year to year. It may be worthwhile to continue tax incentives for energy efficiency upgrades, but they should be addressed as part of a fiscally responsible path forward and in the context of other subsidies.

ENERGY AND WATER

Together, energy and water resources are the foundation of our nation's economy and are essential to our nation's future and international security. All forms of energy production, energy distribution, fuel extraction, and fuel refinement require water or affect water resources in some way. Every aspect of extraction, treatment, conveyance, and use of water, as well as the treatment of wastewater, is dependent on sufficient and reliable energy. Moreover, energy use by these systems is significant regionally.

To improve the fundamental relationship between energy use and water use, the government should:

- Identify all existing federal research authorities and activities that are currently authorized to address the interdependency of energy and water systems but are not actively doing so.

- Ensure that DOE and DOI have the authority to facilitate multi-agency efforts to develop energy and water interdependency R&D.

- DOE and DOI: Develop planning tools to avoid multi-use water conflicts and to ensure that energy and water interdependencies are coordinated.

- Modify existing federal programs or regulations to incorporate embedded energy efficiency.

- Research water waste and consumption challenges for hydraulic fracturing, and provide safety and environmental regulations that properly balance water waste and safety concerns with benefits and economic prosperity. As this technology evolves, regulations need to adapt accordingly. Some areas without water resources are of particular concern.

- Develop incentives for water utilities and water users to capture water-efficiency energy savings.

- Encourage the use of energy-related equipment and buildings standards that address embedded energy in water.

- Authorize a coordinated research investment by multiple federal agencies in the development and implementation of certain energy-water technologies. These technologies should address the interdependency of energy and water systems and multi-purpose water and energy system planning.

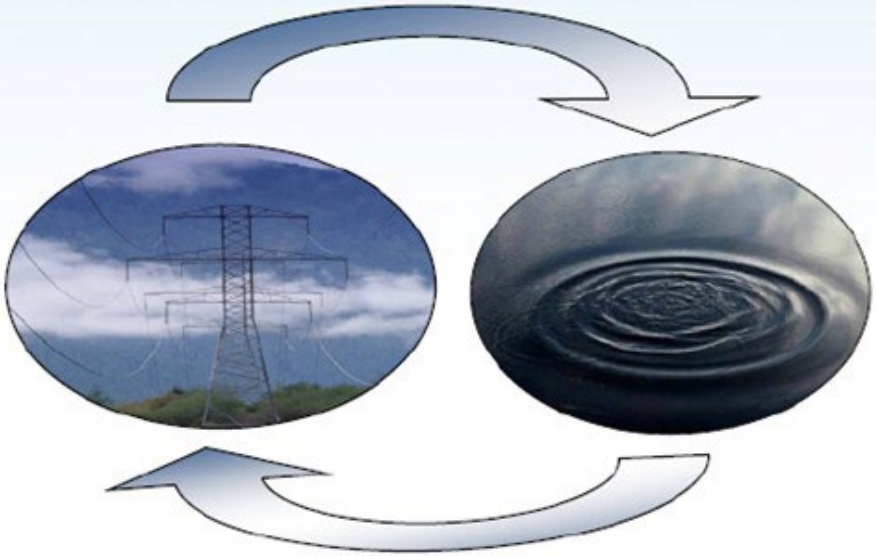
Energy-Water Nexus

Energy and Water are ... Inextricably linked

Water for Energy and ***Energy for Water***

Energy and power production requires water:

- Thermoelectric cooling
- Hydropower
- Energy minerals extraction / mining
- Fuel Production (fossil fuels, H_2, biofuels/ethanol)
- Emission controls



Water production, processing, distribution, and end-use requires energy:

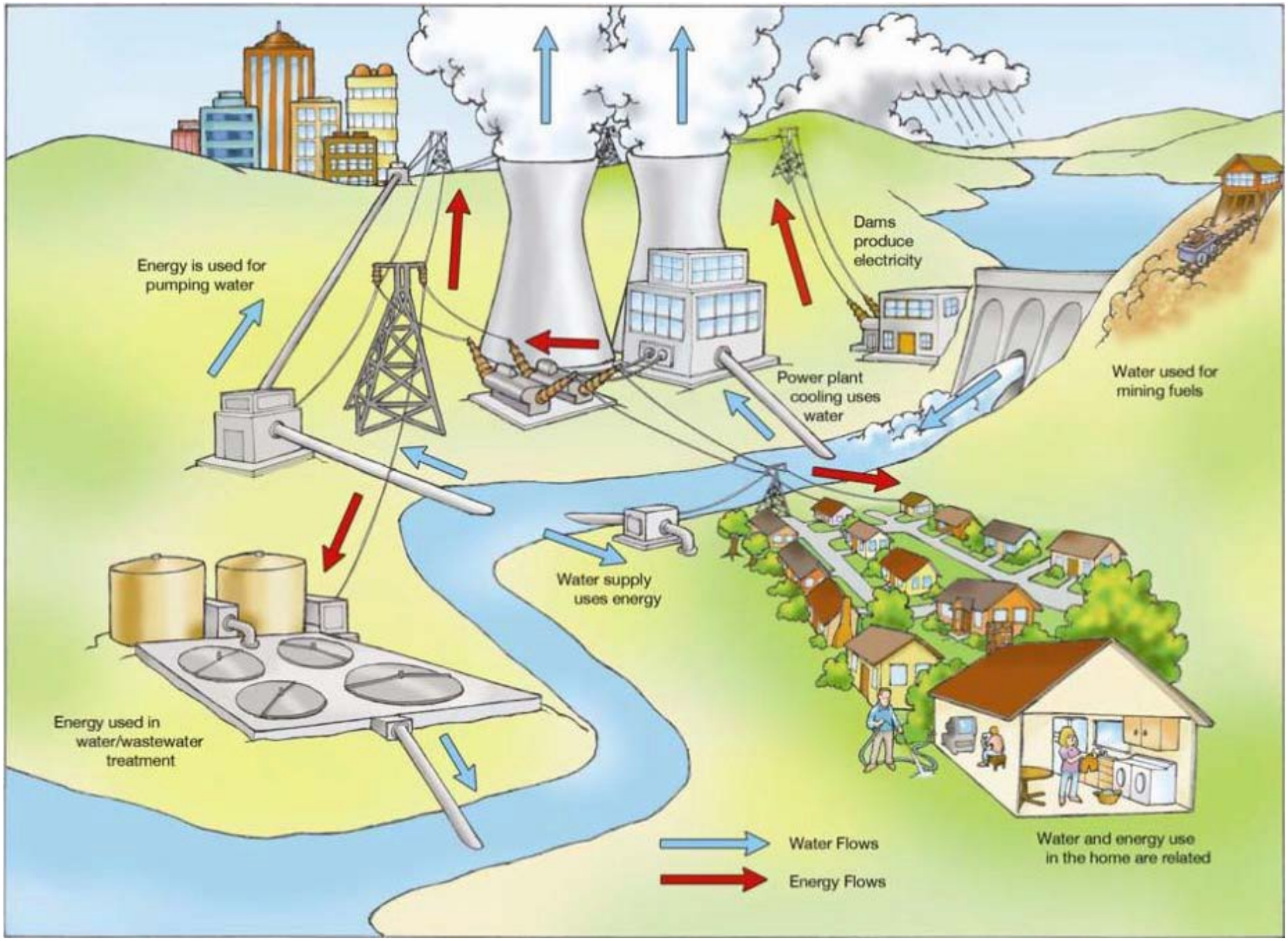
- Pumping
- Conveyance and Transport
- Treatment
- Use conditioning
- Surface and Ground water

ENERGY and WATER

Source: http://www.sandia.gov/energy-water/docs/EW_RoadmapSum_Solar8-06.pdf

Examples of Interrelationships Between Water and Energy

Source: DOE Report to Congress on the Interdependency of Energy and Water, December 2006



CLEAN ENERGY TECHNOLOGY

America has led the world in scientific advancement and innovation for the past century. We must build on this foundation by supporting the next generation of energy research and technology.

One of the most promising agencies to support energy-related R&D is the Advanced Research Projects Agency – Energy. Known as ARPA-E, it is located within DOE, and is now funding potentially transformational energy technologies.

Government programs supporting clean energy have had mixed success. While DOE's Loan Guarantee Program was originally well-constructed, recent changes to its design have led to failures that left taxpayers on the hook for hundreds of millions of dollars in losses.

In order for new clean[78] technologies to succeed, their costs must fall and they must be allowed to mature in a way that enables sustained private investment. Government programs, and the unintended consequences of their spending, cause "boom-and-bust" cycles in emerging technologies. While emerging technologies can prosper by relying on government-provided finance for set periods of time, *perpetual* reliance on subsidies can actually inhibit the growth and development of new technologies. By 2020, we need to eliminate most of the government's current subsidies and implement a new system of clean energy finance that is cost-effective, technology-neutral, and conducive to private investment.

In this section, reforms for existing finance mechanisms are discussed, and newer, more cost-effective mechanisms are proposed. Over the next decade, as new methods are developed, they should be considered with the same goals in mind: to spur growth, to fund basic research, to rein in government spending, to remain technology neutral, and to avoid stymieing private-sector investment.

By 2020, eliminate the dependency on government subsidies and implement a new system of clean energy finance that is cost-effective, technology-neutral, and conducive to private investment.

FEDERAL RESEARCH AND DEVELOPMENT

Advancing long-term basic research must be a pillar of any energy policy. Long-term basic research provides the foundation upon which future innovation is built. The epicenter of this effort should be in America's universities, in the national laboratories, and then in some form for private industries willing and able to invest in research. By 2020, the federal government should significantly increase many of its basic research budgets. Given federal budget constraints, new appropriations should be fully offset by reducing spending elsewhere or by dedicating a portion of new energy production revenues for this purpose.[79]

As critically important as research funding is to a national energy policy, it is equally important to avoid overly prescriptive directions or limitations. To the greatest extent possible, decisions on the merits of research proposals should be left to the universities, laboratories, and government program offices with expertise.

A number of recent reports have stressed the importance of an expanded federal commitment to energy-related R&D. One example is the 2010 American Energy Innovation Council report entitled, "A Business Plan for America's Energy Future."[80] Within the parameters described above, we should increase funding for energy R&D as proposed in this report.

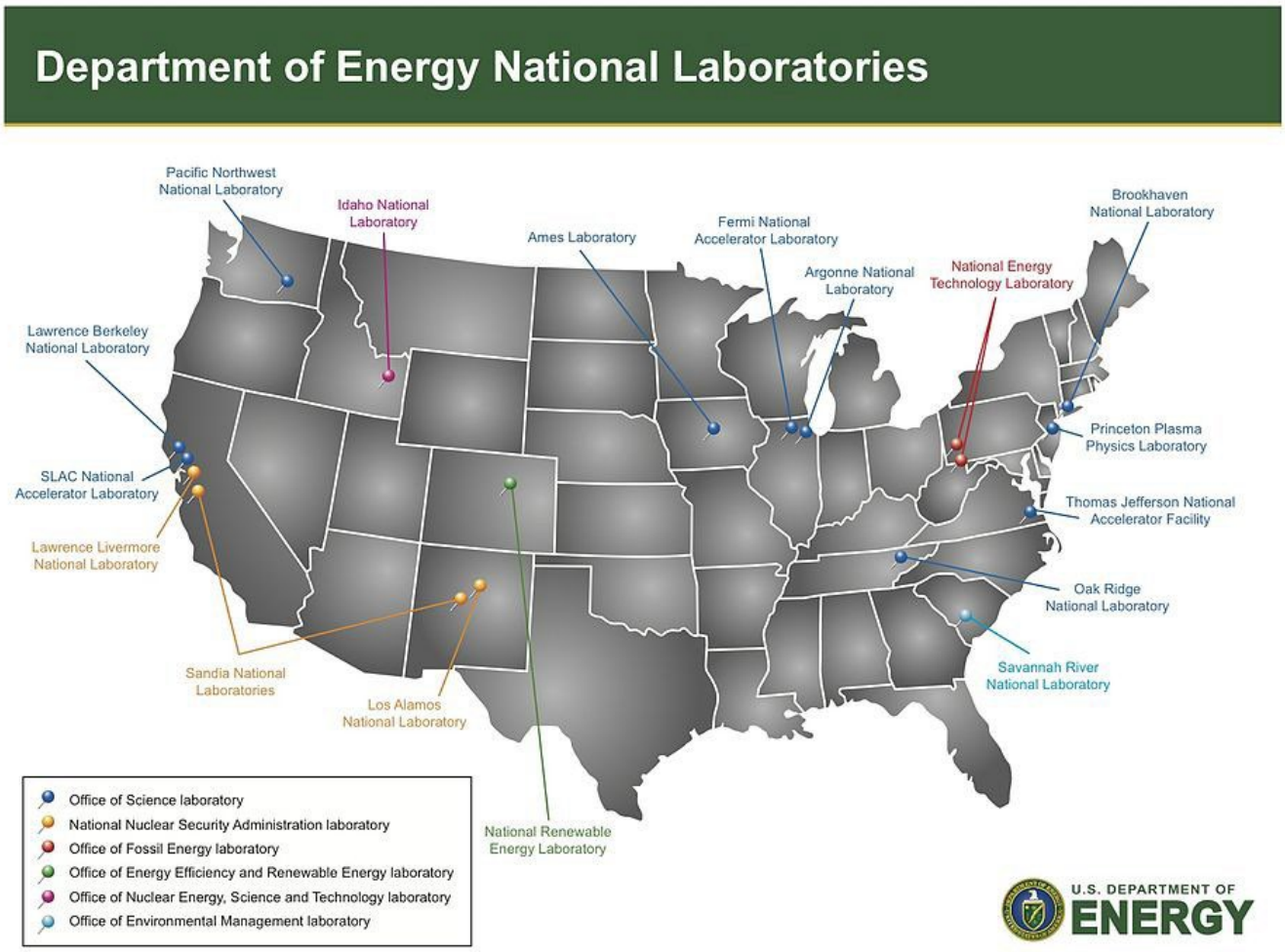
The development path for innovative and transformational energy technologies typically consists of several enabling stages: basic and applied R&D, demonstration, and final commercialization. A collaborative effort between industry, academia, national labs, other R&D institutions, and federal and state agencies has often proven effective in the past. Initially, expenditures by federal and/or state government agencies are often required for successful collaborative efforts by any combination of the aforementioned entities.

Industry should play – and indeed has been playing – a key role in sponsoring these R&D efforts as part of their own business development and opportunities. Collaborative demonstration projects have frequently led to dramatic reduction in technology development costs and the eventual, successful scale-up and commercialization of new and innovative technology concepts. Previous and ongoing collaborative R&D efforts have led to notable successes in deploying new energy storage (e.g., advanced batteries), an array of the existing efficient renewable energy technologies (e.g., advanced photovoltaic solar energy cells) and other clean energy technologies (e.g., safer and more efficient nuclear power plants).

The federal government is heavily engaged in fundamental research, particularly through its system of National Laboratories. These efforts are often world-class and laudable, but we must do a better job of finding mechanisms to identify and disseminate the promising results – in terms of both knowledge and technology – to the private sector for commercialization. Federal policies focus on federal R&D programs and institutions; we need to expand our focus to include technology transfer from those institutions to the private sector.

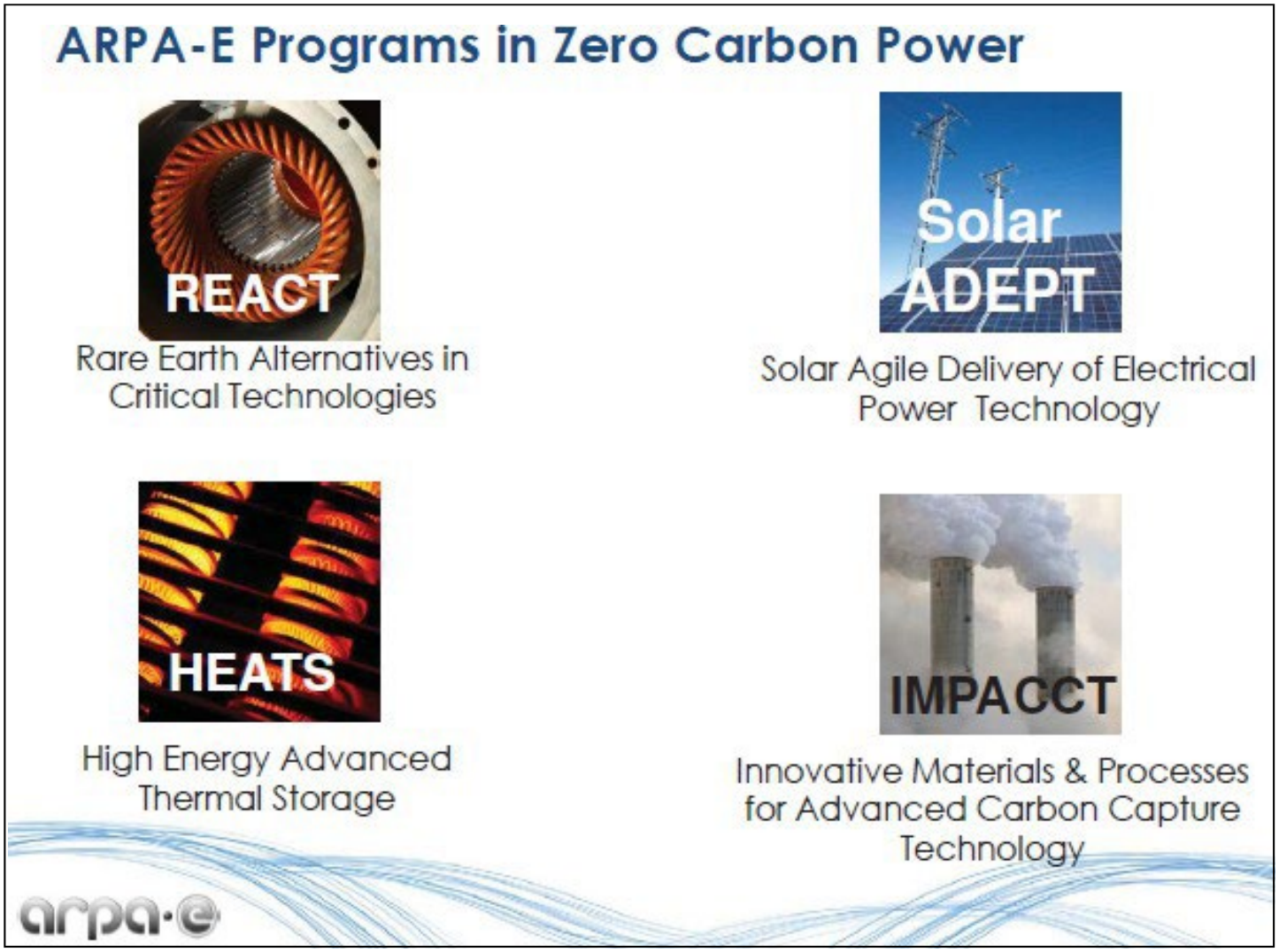
We need both a thorough review of how the federal government is transferring ideas to the private sector for broader development, and how federal R&D institutions collaborate between and amongst themselves. We should explore all ideas for bringing proven commercial expertise and practical knowledge to bear, including ideas on how to enlist as volunteers some of the nation's best and brightest technologists and entrepreneurs to assist these federal efforts.

By 2020, significantly increase funding for basic science research as well as transformational research, development, and demonstration programs.



ARPA-E

Established as part of the 2007 America COMPETES Act, ARPA-E is modeled after the Defense Advanced Research Projects Agency (DARPA) and focuses on transformational energy technologies. These are high-risk technologies that industry is less willing to invest in on its own. ARPA-E is designed to be more nimble than normal governmental operations in where and how it provides support for projects, including greater flexibility in the hiring and retention of the brightest minds as program managers. The United States remains a global leader because of our ability to innovate – not simply improving someone else's idea – and ARPA-E has shown early promise for spurring innovation and incentivizing research. Government funding of ARPA-E's programs should continue.



LOAN GUARANTEE PROGRAM

DOE's loan guarantee authorities – and the use of them – span different Administrations, different Congresses, and include two separate programs, each with their own unique attributes. Specifically, DOE has overseen implementation of the original program, known as Section 1703, and the "stimulus" program, known as Section 1705. The former was created by the Energy Policy Act of 2005. The latter was created by the American Recovery and Reinvestment Act of 2009. Beyond the political parentage of these two programs, the two primary distinctions between 1703 and 1705 are related to eligibility of applicants and payment of credit subsidy.

Regarding eligibility, 1703 is available to all innovative technologies that reduce greenhouse gas emissions, while 1705 is available to renewable and electric transmission projects only. Regarding credit subsidy, 1703 allows appropriations to cover credit subsidy costs, but in practice applicants have largely decided to self-pay these amounts. Conversely, when 1705 was created, a $6 billion appropriation was included to pay for applicants' credit subsidy costs, though $2 billion and $1.5 billion were subsequently diverted to cash-for-clunkers and a state bailout, respectively. The most important difference between the two programs is that not a single loan guarantee has been closed under 1703. The 1705 program, on the other hand, has guaranteed $16 billion in loans with hundreds of millions in defaults already.

Simply put, working under 1705, the DOE Loan Programs Office had too little time, too much money, and too few eligible applicants.

These factors, especially in combination with one another, explain why the 1705 program has already seen several high-profile failures. These defaults have given rise to calls for the wholesale repeal of DOE's loan guarantee authorities, including the original 1703 program. These reactions are understandable, particularly given questions about whether underlying terms and conditions – applicable to both 1703 and 1705 loan guarantees – were followed. It should be recognized, however, that these loan programs have an important role in federal energy policy, particularly one committed to newer and cleaner resources, but only if they are implemented in a way that better protects taxpayers from unwise or poorly-structured investments.

Loan programs have an important role in federal energy policy, but only when implemented to protect taxpayers from unwise or poorly-structured investments.

The existing loan guarantee program needs to be reformed and its recent failures provide several unfortunate lessons that can serve as the basis for such reforms. These changes would ensure the development of a stable and diverse portfolio of commercially viable technologies, which would in turn allow expedited deployment and lower costs for consumers. In addition to remedying the mistakes made, a number of reforms should be pursued to prevent similar situations in the future:

- Management of the loan guarantee program would benefit from establishing risk profiles for different categories of projects. These categories could look at whether or not off-take agreements are in place, the credit rating of the applicants, and other factors, which would allow for different levels of scrutiny as applications for support are considered.

- More robust due diligence and monitoring mechanisms should be put in place.

- Applicants' credit subsidy costs should be self-paid and never covered by taxpayers.

- Early warning systems, consistent with the recommendation contained in The Independent Consultant's Audit of the DOE loan programs,[81] should be implemented.

- Concentration risk should be mitigated by resisting efforts to deviate from the broader eligibility criteria contained in the original loan guarantee program from the 2005 Energy Policy Act (the 1703 program).

- Transparency should be restored to the processes for soliciting, evaluating, and assigning risk profiles to projects seeking support.

- A chief risk officer should be appointed to objectively oversee all programmatic activities involving the commitment of taxpayer dollars.

- An emphasis on lowering the cost of capital for already viable projects, rather than forcing unproven and risky technologies into the marketplace, should be restored.

Agua Caliente Solar Project, California. Supported by the DOE LPO, the project has installed nearly 3 million solar panels.

Source: DOE

MASTER LIMITED PARTNERSHIPS

Easy and affordable access to capital is critical for any sustainable industry in the free market. Large corporations with established track records, including many energy companies, are able to tap these sources of funds. The task is much harder for smaller companies with unproven technology and unsteady cash flows. Such can be the plight of renewable energy. The challenges of capital formation are also a factor for highly regulated companies, such as energy pipelines. The United States should do what it can – especially within the context of free markets and private investment – to help companies that are developing alternative sources of energy.

The master limited partnership (MLP) is a special business structure that permits a company to raise capital like a corporation but pay taxes like a partnership. Instead of paying corporate income tax, a company distributes its cash flow on a quarterly basis to its investors, who can buy in on the public market and pay their own taxes on these distributions. Companies that have the steady cash flows of pipelines and similar operations have found MLP status to be helpful.

Renewable energy companies, with a few exceptions, are not eligible for the MLP structure and are not able to take advantage of a business framework that holds advantages in both capital-raising and taxation. In order to offer MLPs to renewable energy companies, Congress should:

- Consider wholesale reform of the Internal Revenue Code as part of a broader approach to resolve inconsistent tax characteristics within the energy sector.

- Make MLPs more widely available by amending the Internal Revenue Code of 1986 to extend the MLP structure to include biodiesel, biomass, hydropower, solar, wind, and virtually every other kind of alternative energy source, with the exception of nuclear energy.

REVERSE AUCTIONS

Clean energy technologies as defined above[82] deserve support from our federal government, and since the 1970s they have received it. Unfortunately, our fiscal circumstances have changed. Moreover, new technologies such as wind and solar have not enjoyed the market penetration many predicted. It is prudent to use public resources to support clean energy development, but only when our resources serve as a catalyst for nascent but potentially transformative technologies. Perpetual subsidies are simply impossible in today's fiscal environment.

As we approach a crossroads of our energy future, we must comprehensively evaluate existing and proposed clean energy subsidy programs in light of these questions: can the program "jump-start" a transformative technology? From its inception, can the program lead to its own phase-out? Will subsidy costs inexorably decline over the life of the program? An idea that deserves further review and promises positive answers to these questions is the 'reverse auction.'

Reverse auctions feature multiple sellers competing to be selected by one buyer, in contrast to a traditional auction where multiple buyers bid for acceptance by a single seller. They are roughly analogous to contracting's competitive bidding process. The contractor uses competition amongst potential suppliers to draw out the lowest price or best value. In the context of clean energy supply, bidders are often generators of renewable electricity, and they compete to receive the smallest subsidy from the government.

This approach has been used in several countries to assist clean energy. And reverse auctions are a widely-used commercial tool in a number of contexts. The idea deserves serious consideration, and DOE could be empowered to lead the way. In order to properly consider this idea, the government should:

- Task the Congressional Budget Office and EIA with determining the cost of supplanting existing finance mechanisms with reverse auctions.

- Make all existing federal energy programs subject to a potential shift to the reverse auction mechanism, within initial reviews and forecasts.

- Investigate how reverse auctions could positively affect the quality or speed of technology development within the energy sector.

MODERNIZING ENERGY DELIVERY INFRASTRUCTURE

The nation's energy delivery infrastructure has not been renewed at the rate that it is aging. We are now living on prudent infrastructure investments, too many of which were made generations ago, but this situation cannot and will not continue indefinitely. Our energy delivery networks, especially electric transmission lines and gas and oil pipelines, require continuously intensive capital investment to ensure unfaltering reliability and operational readiness. Reliable energy delivery – itself a major contributor to energy security – requires abundant and affordable energy from a diversity of sources. It also benefits from and must have steadily increasing investment in cutting edge information technology that enables reliability and efficiency.[83] Today's challenges for energy delivery are considerable.

New patterns of energy discovery and use are requiring new infrastructure. At the same time, existing infrastructure must be maintained and expanded. For example, the welcome new oil and gas production in the Bakken Formation requires new pipelines. And increasing reliance on natural gas for power generation and as a transportation fuel also means a heightened interdependency between natural gas delivery and power generation.

These circumstances likely impact the reliability as well as the affordability of energy. Very often the up-front costs of new or improved delivery facilities are more than offset by savings on the commodity delivered. Electric transmission service, for instance, contributes just a fraction of the delivered cost of electricity, on average 10 percent and frequently less. More dependable and robust delivery networks expand geographic markets for commodity supply, and this resulting competition frequently reduces costs.

Finally, while energy delivery networks at the distribution level are historically subject primarily to state law and regulation, increasingly regional markets for energy commodities and the heightened sensitivity of the economy to supply disruptions (as evidenced during the aftermath of Hurricane Sandy) underscore that the federal role must be prudently and faithfully executed. Now more than ever, the federal government must partner with rather than dictate to the states and private sector to encourage and enable strong and durable energy delivery networks.

Despite this changing landscape, however, federal regulatory decisions too often fall short of supporting the nation's energy delivery networks and can even obstruct the investments needed to maintain them. The national importance of energy delivery networks requires efficient private investment and demands government's policy support. We need new approaches that unleash investment and reward innovation, and we must enact laws that enable the federal government to make a stronger contribution to the security and reliability of the nation's grid networks.

PROMOTING DELIVERY INFRASTRUCTURE

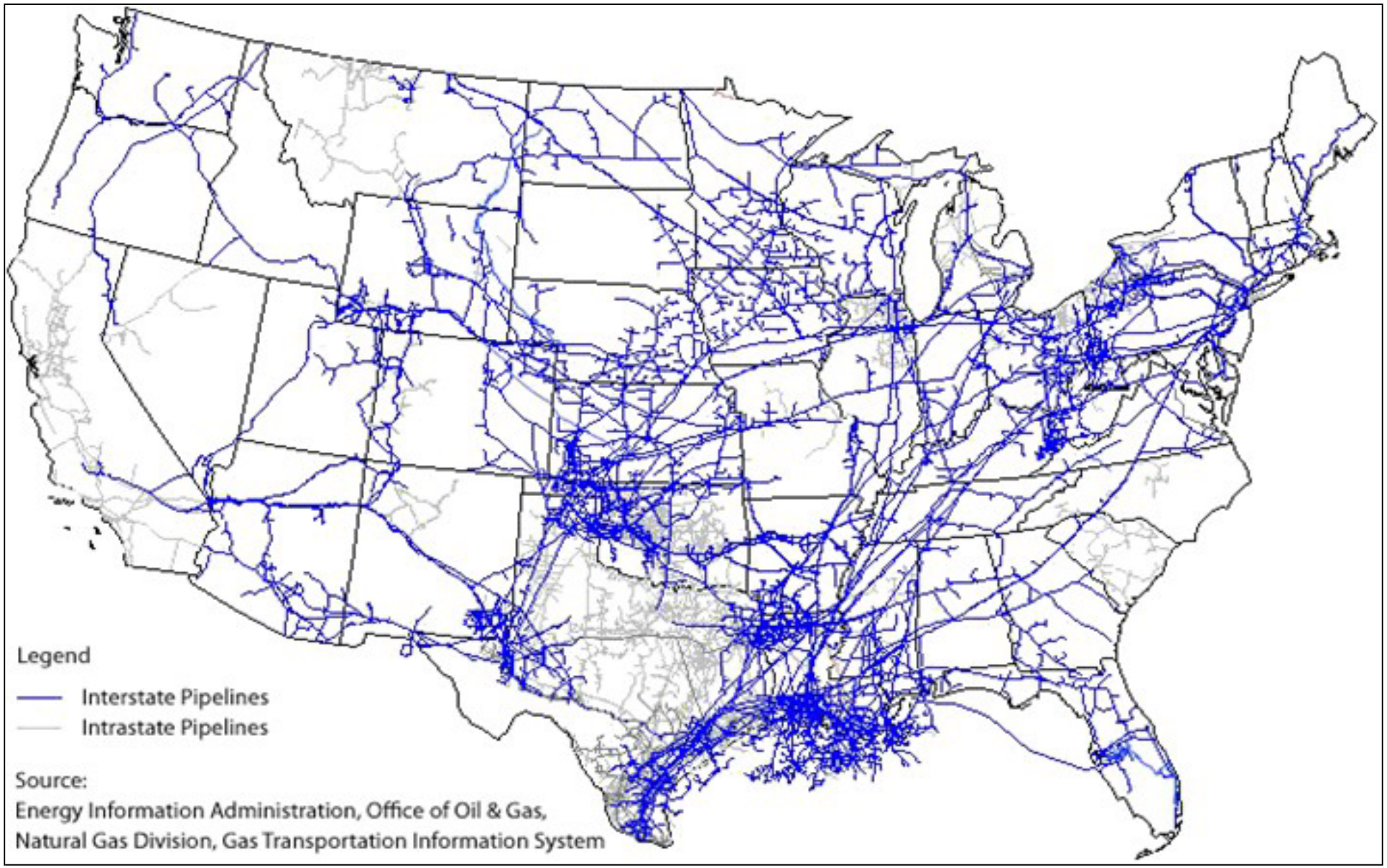
Electric transmission lines and natural gas and oil pipelines must be upgraded and improved. The benefits of more modern and robust transmission systems for strengthening the reliability of service and diversifying the sources of energy supply would be notable. With better infrastructure, more people would have access to more power that is more reliable and on demand. New, alternative transmission paths reduce the risk of disruption. Accordingly, people get energy at lower costs and with greater reliability. Government must do its part to promote energy delivery infrastructure and show its value. By 2020, the federal government must take clear and decisive steps to enable greater levels of investment to upgrade energy delivery infrastructure and mitigate risk from degradation. This will mean a greater level of partnership with the private sector and states to identify and remove barriers to energy delivery infrastructure improvements.

With respect to electric transmission in particular, although efficiency and demand response have an important role to play in the electric supply balance, by their nature they cannot substitute for physical infrastructure – at least not indefinitely. In recent years, growth in demand for electricity has been suppressed by the poor performance of our economy. With the right overall economic policies we can expect the economy to improve – ideally sooner rather than later, but certainly by 2020. As our economic recovery continues and energy needs correspondingly intensify, the federal government must encourage and not impede energy delivery infrastructure.

Transmission infrastructure is sorely needed.

Source: Lawrence Berkeley National Laboratory, DOE

By 2020, upgrade energy delivery infrastructure to mitigate risk from degradation.


Legend
Interstate Pipelines
Intrastate Pipelines
Source:
Energy Information Administration, Office of Oil & Gas,
Natural Gas Division, Gas Transportation Information System

ELECTRIC AND GAS TRANSMISSION

Congress should clarify and reaffirm that FERC has crucial roles to play in encouraging and enabling electric and gas transmission. FERC should work appropriately with the states and regulated entities to strengthen energy delivery networks across our nation. Congress should:

- Establish a policy (or policies) that sets out goals for and calls attention to the benefits of interstate transmission, such as: diversification of risk; enhancement of competition consistent with existing state and regional regulatory frameworks and mitigation of market power; ability to co-locate facilities on existing rights-of-way; competing land use priorities; the needs of load-serving entities; and the contribution of demand response, energy efficiency, and distributed generation.

- Highlight the need for electric market participants to find common ground on policy and cost allocation; recognize that costs must be reasonably proportionate to measureable economic and reliability benefits; and accord due deference to cost allocation proposals supported by broad agreement among affected states.

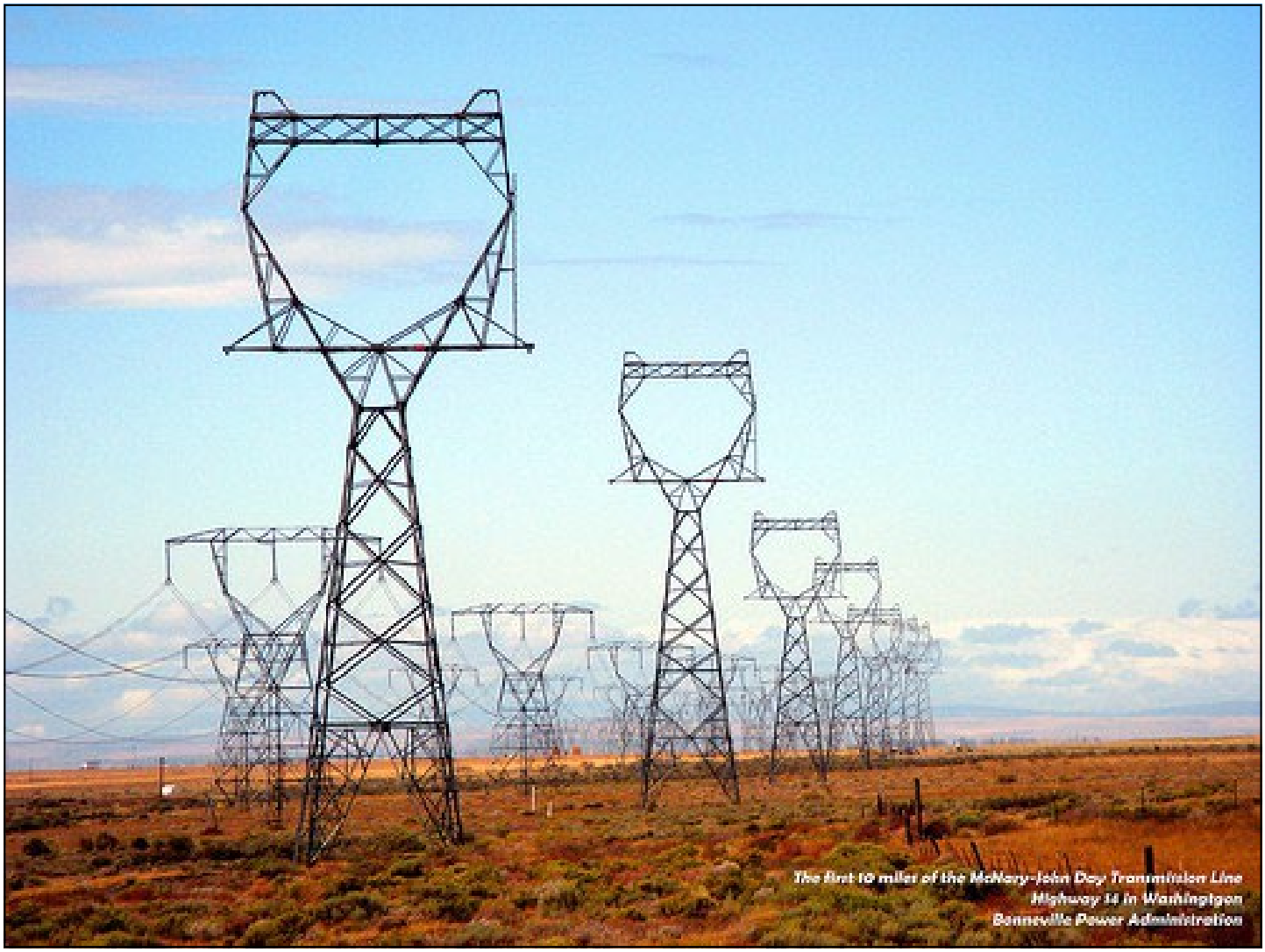
- Encourage FERC to spur the development of new delivery infrastructure, and reaffirm its obligations under Section 219 of the Federal Power Act.

- Develop a program to help upgrade natural gas and liquid fuel pipeline networks, given the nation's aging infrastructure and rising explosion risk.

- Encourage DOE and FERC to identify impediments in and barriers presented by federal law and policy to actions that states and interested parties desire to take to protect and enhance energy delivery networks that are rightfully under state jurisdiction. This would include, for example, hardening transmission and distribution assets in anticipation of storms and efforts to recover service after storms.

FEDERAL COORDINATOR

Too often the federal government itself stands in the way of crucial "linear" energy delivery facilities such as pipelines and electric transmission facilities. Although federal agencies must continue to meet their responsibilities under the statutes they administer, Congress must bring order to the various transmission project review processes. To begin, Congress should authorize FERC as the lead federal coordinator for electric transmission and pipeline infrastructure to help maintain reliability, alleviate congestion and enable stranded resources to supply demand. Congress should allow FERC to establish binding deadlines on other federal agencies and to require a single environmental review document.



McNary-John Day Transmission Line, Washington

Source: DOE

CYBERSECURITY PROTECTIONS

Americans share the same goals when it comes to cybersecurity: keep our computer systems and our nation safe from cyber intrusions. The nation needs private companies – which own most of the critical infrastructure in our country – to talk with each other and with the government about the cyber challenges they face as well as the potential strategies and solutions to combat threats. To that end, the federal government must form a partnership with the private sector. Federal law should encourage the voluntary sharing of much-needed information by removing legal barriers to its use and disclosure. At the same time, the law must also safeguard privacy and prohibit the information from being used for competitive advantage.

It is equally important to decide what the federal government can and must do, as well as what the federal government cannot and should not do. We need to avoid new layers of bureaucracy and regulation that will serve little purpose and achieve meager results. Four crucial areas for attention are: information sharing, reform of the Federal Information Security Management Act (FISMA), criminal penalties, and additional research. In that spirit, there are commonsense approaches to address our ever-increasing cyber threats:

- Improve cybersecurity by collaborating with private owners of critical infrastructure and eliminating barriers to enhanced information sharing.

- Create expedited information sharing for the private sector using existing structures and reporting relationships.

- Strengthen criminal statutes for cyber crimes.

- Update the FISMA. Preserve the roles of the National Institute of Standards and Technology in disseminating security standards for the federal government.

- Leverage and strengthen existing programs in cybersecurity R&D.

- FERC: Produce an estimate of the costs and benefits of options to harden the infrastructure and report to Congress. Consult with the Electric Reliability Organization (ERO), DOE, and electric utilities.

EFFECTIVE GOVERNMENT

The system of energy laws and regulations is complicated. Rules are constantly adopted and updated and new laws are regularly passed. Amidst all this incremental action, it is necessary to take a step back from time to time and review whether the system as a whole is working properly. Unfortunately today's federal government, on the whole, too often stymies much-needed progress.

We need to put the federal government's house in order so that urgently needed new energy projects can proceed. Today's all-too-common cycle of red tape, uncertainty, and delay must be broken.

The government needs to do a better job of striking a prudential balance between energy requirements and environmental concerns. Too often energy and resource projects become ensnared in the administrative state, and a thicket of rules so comprehensive it is unintelligible. Proper stewardship of federal public land is a fundamental part of responsible energy and resource development. More robust partnerships with the states are necessary to ensure balance. We need to modernize regulatory and permitting laws and restore accountability. We need to work to empower rural communities through partnership with the states. Only when the government and states solidify a cohesive, efficient relationship will our citizens reap the full potential of our national resources.

Described below are ways the federal government can and should improve its performance with respect to energy policy.

EXECUTIVE BRANCH ACTIONS

Congress cannot reform energy policy alone – the executive branch implements the law. Moreover, the courts have underscored the considerable power previously delegated to executive and independent agencies. The Administration, and its departments and agencies, should take steps to reform its methods and processes through which energy policy is implemented and administered in order to achieve our nation's energy potential. The executive branch needs to:

- DOE & DOI: Promote enhanced oil and gas recovery from existing wells through new technology by offering abbreviated leasing and permitting processes for previously explored or developed fields where enhanced oil recovery is applicable.

- DOI: Examine the status of public lands and leases to identify impediments to federal oil and gas leasing and production. Current policies must be modified to remove those impediments, consistent with established law and good environmental practice. Specifically, DOI must establish a review program and an accelerated auction schedule for previously and consistently nominated lease parcels that have yet to be put up for sale.

- Commerce: Cede all authority over OCS issues to the DOI. This must include a full transfer of the National Oceanic and Atmospheric Administration (NOAA) and its functions to DOI.

- DOE: Conduct a review of progress toward implementation of prior energy plans and omnibus energy legislation, such as the Energy Policy Act of 2005.

- Across the executive branch, there must be more transparency from Federal Advisory Committees and their subcommittees. The use of the Federal Advisory Committee Act (FACA) must be reformed.

- The President's budget must cite the Congressional authority behind all DOE funding priorities. Congress should also review for duplicative budgetary authorities.

- The National Petroleum Reserve-Alaska (NPR-A) must be immediately placed into full availability for oil and natural gas leasing, consistent with its statutory designation. The reserve must be thoughtfully developed with roads, bridges, and pipeline facilities to promote broad onshore development of the diffuse resource base, while simultaneously accommodating the transportation of oil and natural gas from offshore fields in the Chukchi Sea to the Trans-Alaska Pipeline System (TAPS). "Roadless" options for the NPR-A should be expressly withdrawn from consideration. The leasing deferral in and around Teshekpuk Lake through 2018 should be honored.

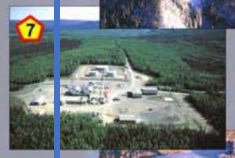
Trans-Alaska Pipeline System

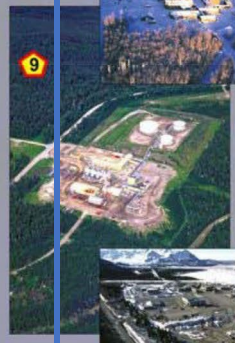
Alaska
Bureau of Land Management

Legend

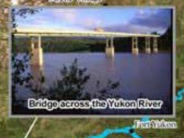
- Valdez Marine Terminal
- Pump Stations
- Town &Cities
- Trans Alaska Oil Pipeline
- Alaska / Canada Border
- Main Roads
- Major Rivers

N
A

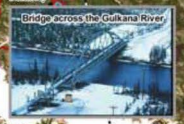


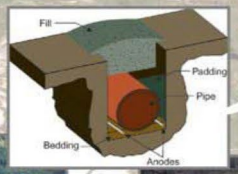


Pump Station	Milepost
1	0
2	55
3	104
4	144
5	275
6	350
7	414
8	489
9	548
10	586
11	609
12	735
Valdez Terminal	800


Bridge across the Yukon River


Pipeline across the Tanana River


Bridge across the Gulkana River



Schematic of the Pipeline when it is underground.

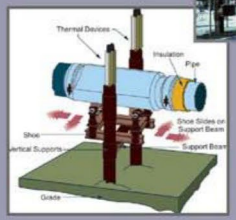

Pipeline Showing Elevated to Buried.
420 miles of the Pipeline is above ground and 380 miles is buried underground.

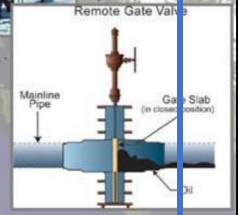

Construction of Buried Pipeline


Pipeline Crosses the Denali Earthquake Fault, near Pump Station 10
Notice the width of the teflon 'shoes' and the zig-zag pattern of the pipeline. These allow the pipeline lateral movement in case of an earthquake.


Shipping Lane


Clapper Style Valve






Valdez Marine Terminal

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- DOD: Reduce fuel and energy intake.

  - Create directives within acquisition contracts to permit the use of award fee clauses. These clauses would allow contractors to share in government savings if the contractor exceeds contract requirements for fuel efficiency in a manner that results in provable life-cycle cost savings to the government.
  - Continue to improve energy efficiency at defense installations.
  - Codify sections of the DOD/DOE inter-agency memo on energy.[84]
  - Develop a hierarchy of goals for energy policy at DOD. Identify and coordinate the roles and responsibilities of each military service that will achieve these goals. The overarching strategy must focus on supporting DOD's mission.

- DOD: Apply Operational Energy concepts throughout DOD where practical. Operational Energy is an approach to energy efficiency and "greening." Military operations involve diverse capabilities that depend upon a variety of energy attributes – ranging from power and speed for vehicles and aircraft, to size and weight of soldier equipment and power supplies. Not only are the energy needs diverse, but the right balance of capabilities can vary with mission and circumstances. For example, fuel delivery can be very difficult and hazardous to forward locations, therefore increasing the value of energy alternatives and energy-efficient systems. Combat platforms carry an ever-expanding array of sensors, computers, weapons and communication systems, raising the importance of energy networking and control. The military challenge is to optimize these combined energy considerations in a given circumstance to achieve the greatest net operational benefit. An Operational Energy approach recognizes that the solution is not as simple as minimizing consumption or unit energy cost. Instead, Operational Energy solutions require significant analysis, planning and common understanding about how energy factors into any endeavor.

- All agencies should review policies affecting energy exports and remove unnecessary impediments. Energy exports are good for our economy.[85]

- Across the federal government, defer to state agencies for energy project licensing authority when possible and when federal and state regulations exhibit similar or overlapping objectives.[86]

- BLM: fulfill the federal government's responsibility to clean up legacy wells in Alaska and reclaim these sites.

HYDRAULIC FRACTURING

The combined use of horizontal drilling and hydraulic fracturing ("fracking") techniques has allowed the oil and gas industry to develop and produce resources that were unrecoverable less than 10 years ago. From 2007 through 2011, shale oil production increased more than fivefold, from 39 million to approximately 217 million barrels, and shale gas production increased more than fourfold, from about 1.6 trillion to 7.2 trillion cubic feet.[87]

Fracking has been used by the oil and gas industry for decades. For example, fracking has been used on Alaska's North Slope since the 1970s, without incident, as a tool to aid in the recovery of oil.[88] As fracking has become more widespread as a means to produce shale resources in the continental U.S., criticism from various groups has led to calls for regulation by the federal government. However, states already have statutory and regulatory regimes in place that effectively manage and oversee fracking operations. Indeed, states have modernized laws and tightened regulations since the 2007 production boom. Blanket rules imposed by the federal government may not address well construction or environmental concerns across all the states and geographic areas where shale development is occurring.

Existing state regimes should be reviewed to determine if there is any need for federal regulation. States have successful regulatory regimes. Particularly given the federal deficit, agencies should focus on directing limited resources where they are most needed and warranted, not where states are already effectively regulating and policing their activities.

To date, 22 states, representing 94 percent of domestic onshore oil and gas production, have voluntarily submitted their oil and gas regulatory programs (including six state regulatory regimes specific to hydraulic fracturing) for review by the State Review of Oil and Natural Gas Environmental Regulations ("STRONGER"). STRONGER is a non-profit, multi-stakeholder organization supported by the Interstate Oil and Gas Compact Commission, Groundwater Protection Council, American Petroleum Institute , the U.S. Environmental Protection Agency, and U.S. Department of Energy. The STRONGER review process involves the evaluation of state regulatory programs against guidelines developed through a multi-stakeholder collaborative effort.

The federal government should consider the efficacy of this type of self-policing process before mandating new blanket regulations that may not work in every state. The economic benefits associated with the "shale boom" in the U.S. are clear: more jobs, higher wages, and increased revenues to federal, state and local governments. Instead of importing greater amounts of natural gas, we are now on the verge of being able to export some of our surplus – in exchange for even more jobs and even more revenues. Industrial consumers are benefiting from greatly reduced energy costs, and natural gas has become increasingly viable as a transportation fuel. These benefits should not be taken for granted – or put at risk under a new federal regime that only makes it harder or impossible to produce our nation's abundant shale resources.

PUBLIC LANDS

Economic uses of federal lands are now heavily restricted by regulation (regulatory takings), which has caused significant harm to many rural communities. At the same time, many of these communities are watching forests on public lands be destroyed by wildfires, insect epidemics, and outbreaks of forest disease. This causes the public to question if state or county governments wouldn't be better stewards of the land.

It is imperative that DOI partner with states to achieve the best possible use of public lands. Current federal regulations pit DOI against the states in never-ending legal and political battles over land use. This arrangement is wasteful and contrary to DOI's mission.

DOI should develop agreements with state and local governments to determine the best management practices to improve economic activity and development, where acceptable, in and around federal land units.

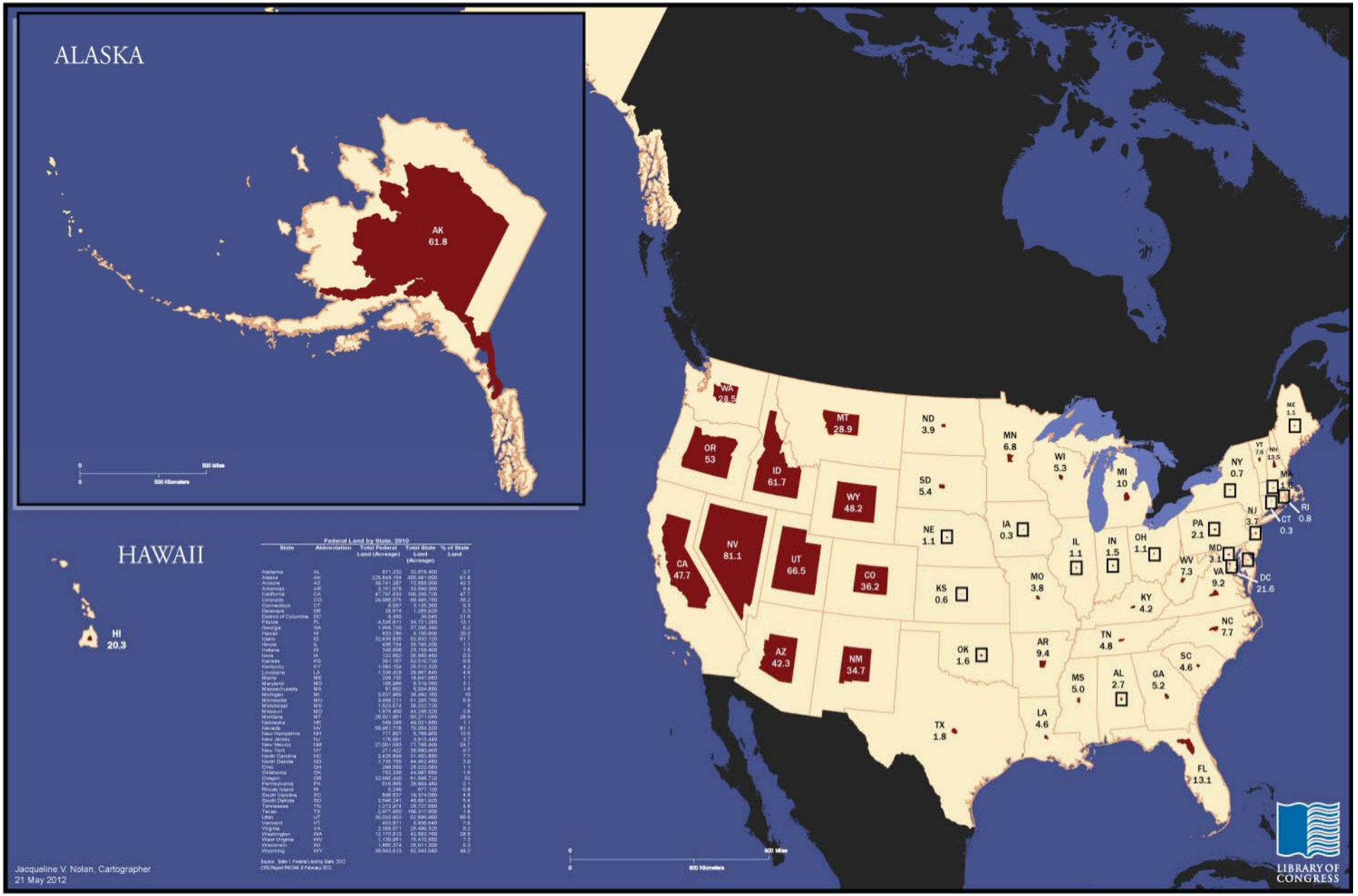
The U.S. Forest Service (USFS) should be transferred from the Department of Agriculture (USDA) to DOI which would allow the Federal Land Management Agencies to be under the jurisdiction of one department. DOI's experience in land management would provide an improvement over the USDA, which has proven wholly inadequate. This transfer should be authorized by Congress and implemented immediately.

DOI has a clear legal obligation to convey lands to the State and Natives of Alaska. Alaska entered the union in 1959, but the State is still 5.13 million acres short of even tentative conveyance of land, having received just 59.3 percent of its lands by final patent promised 54 years ago. At this rate, the State likely won't gain final conveyance of all its land until it celebrates its Centennial. Alaska Native corporations also still await tentative conveyance of 1.97 million acres, having received final patent to just 32.3 million acres of the 45.7 million granted Natives largely through the Alaska Native Claims Settlement when they settled their aboriginal land claims in 1971. In 2004, Congress passed the Alaska Land Conveyance Acceleration Act to speed up such conveyances. The current budget, as did last year's proposal, however, would defeat the purpose of the Act.[89]

The federal government must fulfill its land conveyance obligations immediately. Not only is this an unfulfilled promise, but the federal government cannot actually pay for and manage the land it currently oversees. By conveying the land, the government will satisfy its debts and discharge property it cannot afford to properly protect and supervise.

Percentage of Federal Land Ownership By State

Source: Library of Congress



Federal Land by State, 2010

State	Abbreviation	Total Federal Land (Acreage)	Total State Land (Acreage)	% of State Land
Alabama	AL	871,232	32,678,400	2.7
Alaska	AK	225,848,164	365,481,600	61.8
Arizona	AZ	30,741,287	72,688,000	42.3
Arkansas	AR	3,161,978	33,599,360	9.4
California	CA	47,797,633	100,206,720	47.7
Colorado	CO	24,091,275	66,485,760	36.2
Connecticut	CT	8,557	3,135,360	0.3
Delaware	DE	38,614	1,265,920	3.1
District of Columbia	DC	6,450	39,040	21.6
Florida	FL	4,538,811	34,721,280	13.1
Georgia	GA	1,966,789	37,295,360	5.2
Hawaii	HI	633,746	4,199,680	20.3
Idaho	ID	63,636,935	52,933,120	61.7
Illinois	IL	406,734	35,793,200	1.1
Indiana	IN	346,898	23,158,400	1.5
Iowa	IA	122,852	35,660,480	0.3
Kansas	KS	391,161	52,510,720	0.6
Kentucky	KY	1,060,104	25,612,800	4.2
Louisiana	LA	1,530,439	28,997,840	4.6
Maine	ME	289,795	19,847,680	1.1
Maryland	MD	195,986	6,319,360	3.1
Massachusetts	MA	81,882	5,034,880	1.6
Michigan	MI	3,837,985	36,482,160	10
Minnesota	MN	3,466,211	51,395,760	6.8
Mississippi	MS	1,519,874	30,222,720	5
Missouri	MO	1,679,400	44,248,320	3.8
Montana	MT	26,927,887	95,211,040	28.9
Nebraska	NE	549,345	49,031,680	1.1
Nevada	NV	58,061,775	70,264,320	81.1
New Hampshire	NH	777,907	5,768,960	13.5
New Jersey	NJ	178,091	4,813,440	3.7
New Mexico	NM	27,001,083	77,766,400	34.7
New York	NY	211,422	30,680,960	0.7
North Carolina	NC	3,426,859	31,402,880	7.7
North Dakota	ND	1,735,755	44,452,480	3.9
Ohio	OH	296,502	26,222,080	1.1
Oklahoma	OK	783,336	44,087,680	1.8
Oregon	OR	53,565,493	61,598,720	53
Pennsylvania	PA	616,995	28,804,480	2.1
Rhode Island	RI	5,248	677,120	0.8
South Carolina	SC	868,251	19,374,080	4.5
South Dakota	SD	2,946,241	48,681,920	5.4
Tennessee	TN	1,273,274	26,727,680	4.8
Texas	TX	2,977,950	166,317,600	1.8
Utah	UT	36,030,953	52,696,960	68.5
Vermont	VT	469,971	5,936,640	7.8
Virginia	VA	3,598,071	25,496,320	9.2
Washington	WA	12,173,815	42,693,760	28.5
West Virginia	WV	1,130,951	15,410,560	7.3
Wisconsin	WI	1,865,374	35,011,200	5.3
Wyoming	WY	30,043,615	62,343,040	48.2

Source: Table 1, Federal Lands by State, 2012
CRS Report R42346, 8 February 2012

REGULATORY REFORM

Thought leaders from across the spectrum have decried the regulatory morass and called for reform. As noted legal scholar Richard Epstein has observed, laws and regulations must be "internally consistent, prospective in application, and simple in form." However, "procedures themselves often become both so rigid and interminable that endless time is lost in nonstop maneuvering, which invites massive judicial appeals that [can] result in remands for yet another round" of administrative proceedings. Too often, "litigation only compounds the initial delay, and exposes [a] firm to tacit retaliation in some unrelated proceeding over which the agency also has vast discretion on how to proceed."[90]

President Clinton rebuffed an overbearing regulatory system in his introduction to Executive Order 12866, an order designed to reform the regulatory regime. His words, written in 1993, still apply today:[91]

> *The American people deserve a regulatory system that works for them, not against them, a regulatory system that protects and improves their health, safety, environ- ment, and well-being and improves the performance of the economy without imposing unacceptable or unreasonable costs on society; regulatory policies that recognize that the private sector and private markets are the best engine for economic growth; regu- latory approaches that respect the role of State, local, and tribal governments; and regulations that are effective, consistent, sensible, and understandable. We do not have such a regulatory system today.*

It has been reported that Jack Ward Thomas, 13th Chief of the USFS under President Clinton, noted a few years ago that court battles have tied that agency in a "Gordian knot" creating a "vicious cycle of increasing costs, time delays, and inability to carry out management actions."[92] This observation applies all too well to federal agencies with responsibilities in the arena of energy and natural resources.

The federal government needs to enact meaningful and measured regulatory reform. In so doing, we should also reform the convoluted, de facto climate policy of the United States, as established through litigation under the Clean Air Act, the Endangered Species Act, NEPA, and other statutes. We should facilitate more transparent debate on and development of policies to address the emissions blamed for global climate change.

There is a great deal of work to be done. All of the following reforms can and should be executed by 2020:

ENHANCEMENT OF REGULATORY REVIEW AND ANALYSIS

- Initiate a regulatory moratorium across the board for a reasonable time to assess the impact of regulations on the economy generally and energy security specifically. During the moratorium, agencies should identify duplicative or burdensome regulations that should be removed.

- Require a comprehensive review of all federal regulations overseen by a bipartisan committee of Members of Congress, as selected by Congress.

- Promote agency analysis of the cumulative effects of regulations and closely associated regulations.

- Require robust Statements of Energy Effects (Executive Order 13211) for significant regulatory actions (Executive Order 12866) and for the cumulative effects of closely related regulations.

- Require the functional equivalent of a NEPA analysis to measure the cumulative affordability, employment, and reliability impacts of agency rulemakings. Make that process part of the administrative record so that it provides more robust, legal recourse for those adversely impacted by agency rulemakings. Alternatively, require a statement of energy impacts subject to judicial review to accompany decisions and regulations affecting the development of energy infrastructure.

- Ensure that Agencies undertake and publish balanced, transparent and fully-substantiated analysis of the costs versus the benefits of regulations. In assessing benefits of rules, agencies must focus on measurable benefits and avoid speculative assessments based on the “non-use” of resources or opinion surveys.

PERMITTING REFORM

- Expedite federal permitting and review decisions for energy, natural resources, and related infrastructure projects.

    - Direct agencies to expedite high priority infrastructure projects.
    - Develop a federal government-wide plan delineating clear deliverables and timelines to reduce the time it takes to make permitting and review decisions.
    - Establish specific and measurable actions.
    - Require transparency and accountability.
    - Modernize and expedite environmental reviews.
    - Coordinate safe and responsible energy development on public lands.
    - Limit the time during which lawsuits can be filed against projects.
    - Limit the ability of plaintiffs to have their attorney’s fees paid by the federal government.

Environmental permitting has become unnecessarily difficult, time-consuming, expensive, and uncertain. It must be reformed.

- Reform environmental permitting, which has become unnecessarily difficult, time consuming, expensive and uncertain.[93] To improve this process:
  - Expedite permits and other federal actions necessary for energy-related projects that have national significance.
  - Designate projects of imminent national interest, for which excessive or repetitive judicial review would be curtailed.
  - Form an interagency task force chaired by the White House Council on Environmental Quality to ensure that federal agencies responsible for permitting energy-related facilities are coordinating their efforts. This task force would ensure that federal agencies set up appropriate mechanisms to coordinate federal, state, tribal and local permitting activity in particular regions, such as Alaska, where increased activity might be expected.[94]

- Establish an expedited permitting process for clean energy development on reclaimed Abandoned Mine Land (AML) sites.

"…Federal rules [result] in a 7- to 10-year waiting period before mine development can begin."

The United States is tied "for last place with Papua New Guinea."

– Behre Dolbear Group, 2012 Ranking of Countries for Mining Investment

MINING REFORM

- Prevent Environmental Protection Agency (EPA) efforts to take over bonding of hardrock mining operations under Section 108(b) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), because BLM, USFS, and many of the states already administer sufficient programs in this area.

- Establish a 'Good Samaritan' program for qualified groups (e.g. environmental nongovernmental organizations, local citizens, and others) to reclaim AML sites as a public service and avoid the creation of liabilities for those undertaking such efforts. These groups would be expressly exempt from any liability under CERCLA. To avoid undue risk, robust standards would be set for oversight of reclamation activities.

- Codify modern standards to ensure the availability of domestic coal supplies, clarify standards for impacts on waterways, and seek to remedy the confusion created by decades of litigation, rulemaking, and other activities regarding implementation of the Surface Mining Control and Reclamation Act.

- Evaluate the impact on small miners of certain Mine Safety and Health Administration regulations that may be more appropriately imposed upon large operations, and consider providing for different treatment of such operations – while continuing to ensure safety and health of all involved – depending on their scale and the resources available to the operators for compliance.

LAND USE REFORM

- Prevent wild lands and roadless policies from stopping access to natural resources on federal lands.

- Limit future federal administrative land removals to areas less than 5,000 acres and require Congressional ratification within a brief time, such as 90 days. To administer this program:

    - Create a land swap system whereby lands removed from productive use must be replaced by ceding federal lands to state or private ownership.
    - Study interest in federal land sales to states or private bidders.

NEPA REFORM

- Simplify the judicial review process to limit frivolous environmental litigation on leases and permits that cause lengthy, costly delays for energy and natural resource production.

- Provide mandatory timelines for completion of the NEPA process and establish a 60-day deadline on legal challenges.

- Require appeals from actions of United States District Courts around the nation to be filed in the United States Court of Appeals for the D.C. Circuit, with the expectation that that Court will bring a consistent, expert analysis to NEPA appeals.

- Currently, there is a six-year federal statute of limitations for civil suits, which applies to NEPA challenges. This was narrowly reformed for transportation projects in Section 6002 of the so-called SAFE-TEA-LU Act (23 USC § 139) during the 109th Congress. As a result, the practice of waiting to file lawsuits has been curtailed and the ability to impose delays through last-minute litigation reduced. This policy could be replicated for development of, and infrastructure projects related to, energy and other natural resources.

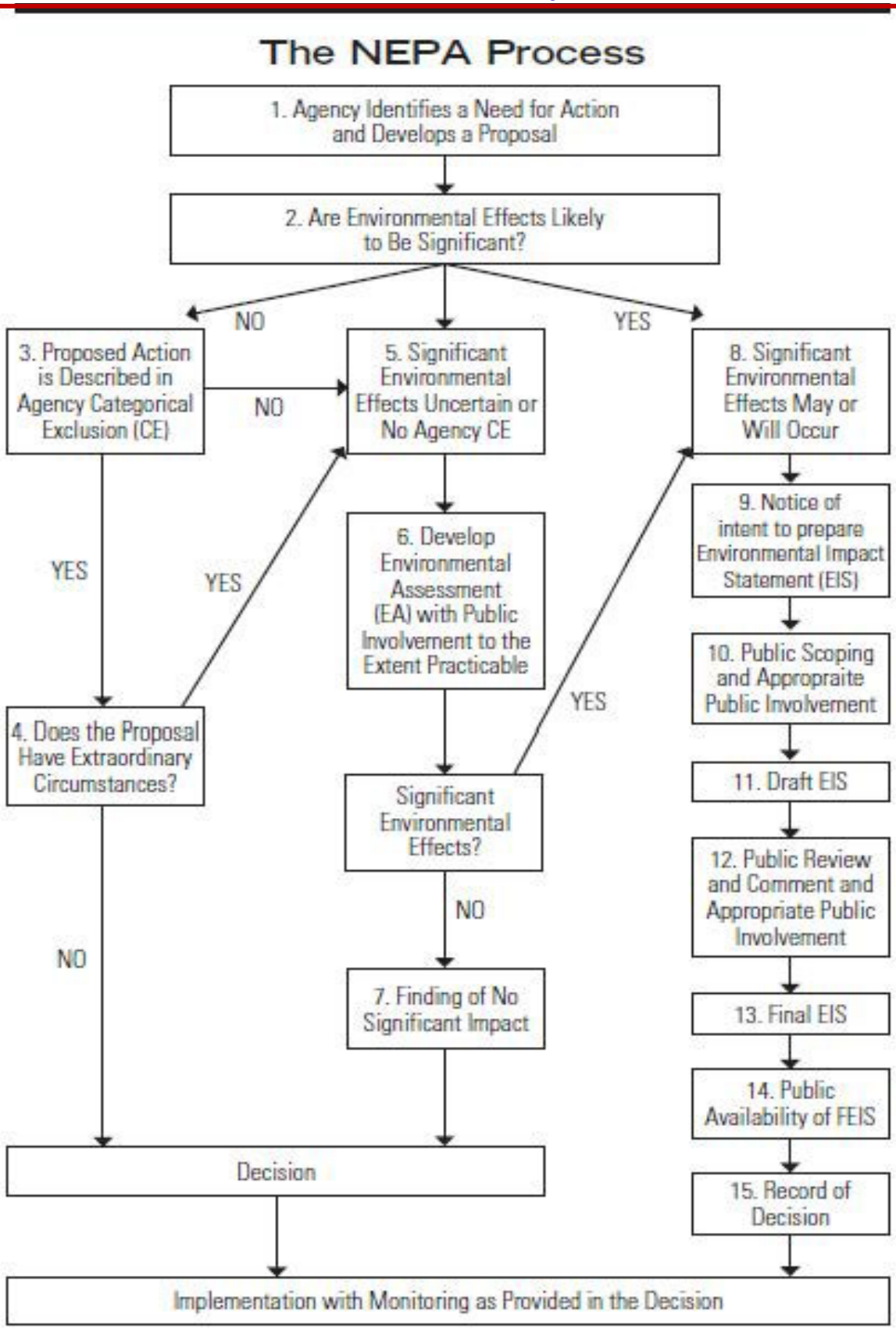
- The interagency process associated with completion of NEPA analyses can be cumbersome and time-consuming. This was narrowly reformed for transportation projects in Section 6002 of the so-called SAFETEA-LU Act (23 USC § 139) during the 109th Congress. Specifically, that legislation designated a lead agency and required early consultation with other participants in order to speed up the process without harming it. According to a September 2010 report by the Federal Highway Administration, this change has cut the time to complete NEPA reviews for affected projects nearly in half, from 73 to just under 37 months. This policy could be replicated for development of, and infrastructure projects related to, energy and other natural resources.

- Require bonds to be posted by those filing administrative and judicial appeals of 'records of decision' on plans of operation and authorizations for development. These bonds could be used to pay damages to project developers for delays caused by unsuccessful appeals.

- While the process of review established by NEPA is essential to the development of responsible development plans, in many ways the statute's implementation has been used to delay rather than improve outcomes. These reforms could benefit efforts to reestablish a balance between timely energy and natural resource development and a continued commitment to ensuring responsible behavior:

    - Strengthen the role of land management agencies as the lead agencies for management of environmental reviews.
    - Direct agencies to work concurrently to complete NEPA review in as coordinated and efficient a manner as possible.
    - Require coordination among federal, state, and tribal authorities.
    - In judicial review, deference should be given to state cooperating agencies to the same extent that it is accorded to federal agencies.
    - Give greater weight in NEPA documents to comments from directly affected parties and communities.
    - Require NEPA documents to disclose and quantify how proposed actions decrease or increase reliance on foreign sources of energy, natural resources, or other national needs. For projects that increase the country's reliance on foreign oil and minerals, require mitigation measures to offset the increased reliance.
    - Integrate land disposal actions into the Proposed Action for certain projects. Previously mined areas are better disposed of by exchanging with the private sector for lands with high value (habitat, recreational potential, or scenic areas, etc).
    - Establish specific and mandatory timelines for consideration of permits.

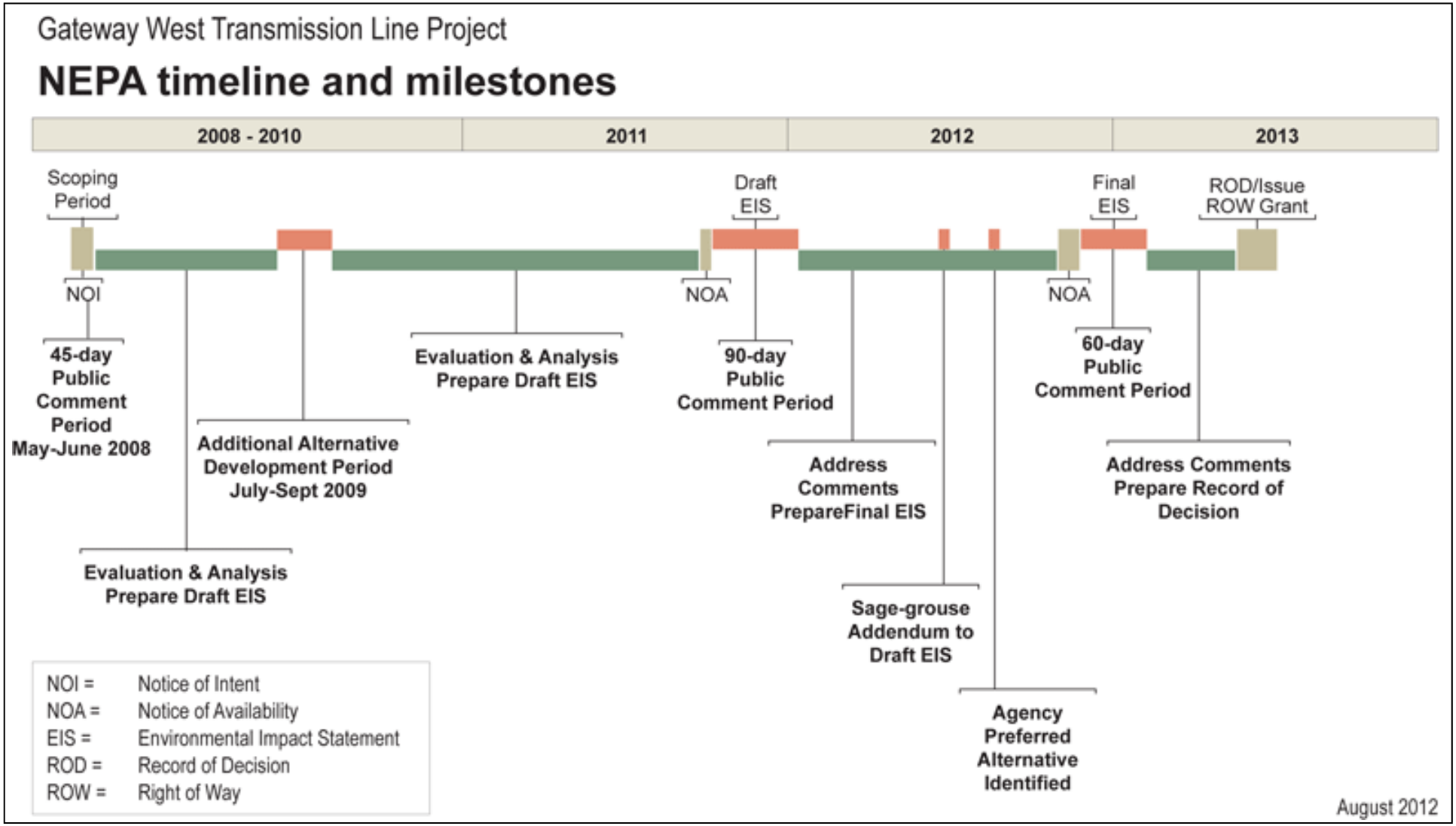
White House Council on Environmental Quality: A Citizen's Guide to the NEPA

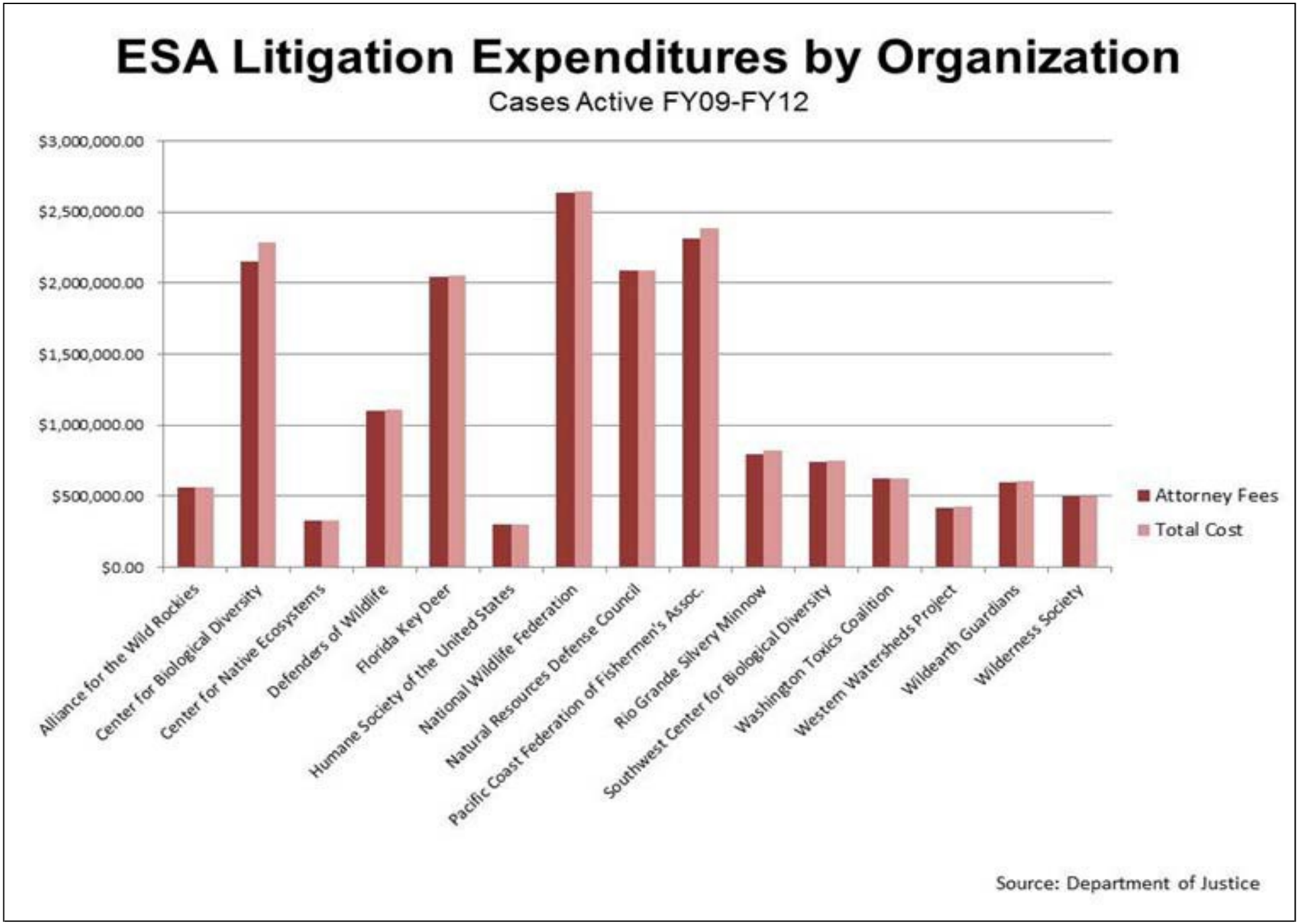


"Significant new circumstances or information relevant to environmental concerns or substantial changes in the proposed action that are relevant to environmental concerns may necessitate preparation of a supplemental EIS following either the draft or final EIS or the Record of Decision (CEQ NEPA Regulations, 40 C.F.R. § 1502.9(c)).

Sample NEPA Timeline for BLM-Managed Transmission Line Project

Source: BLM - Wyoming





Source: U.S. House Committee on Natural Resources

OTHER JUDICIAL PROCESS REFORM

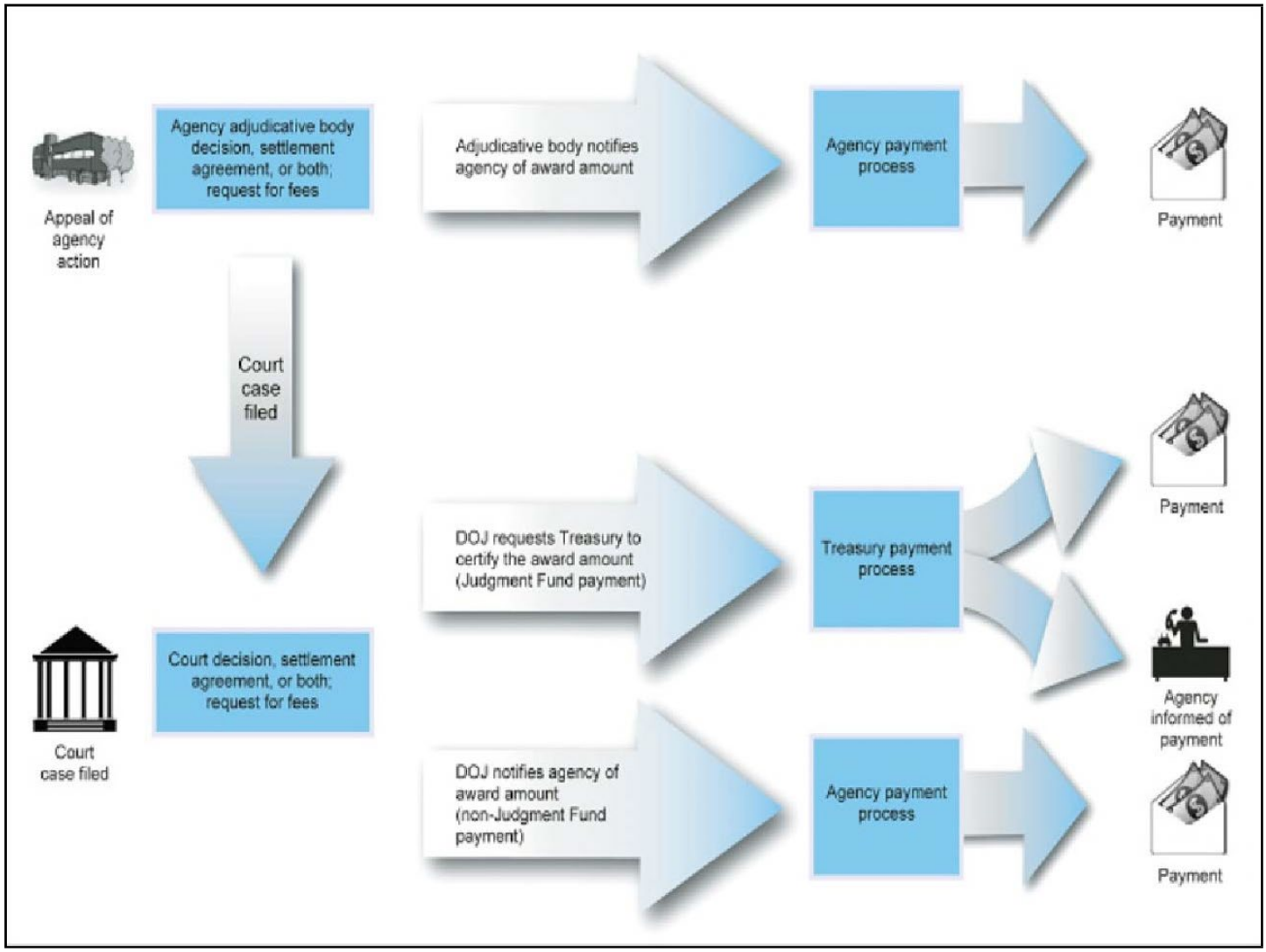
- Amend the Endangered Species Act (ESA) to limit citizen suit provisions; require that species be in actual and imminent danger of decline due to direct effects of human activity; and require stronger economic analysis.

- Amend the Equal Access to Justice Act (EAJA) to:

  - Limit taxpayer funded fee recovery for suits on NEPA, ESA, the CWA, and the Clean Air Act (CAA).
  - Issue Congressional findings that the purpose of EAJA as well as environmental law is public interest, not funding the growth of environmental nongovernmental organizations (ENGOs) for their own sake.

Equal Access to Justice Act Flow Chart

Source: GAO analysis of DOJ, Treasury, USDA, and DOI information



ADDITIONAL REFORM

- Prohibit the Fish and Wildlife Service's (FWS) new "voluntary" guidelines for land-based wind turbines that would inject the agency into the review of projects. These guidelines would retroactively apply to all wind projects and result in three years of pre-construction studies and two to five years of post-construction studies for each project. This new insertion of FWS into the review process is unnecessary and burdensome.

- Curtail the use of guidance documents and their role in establishing regulatory policy without accountability and other provisions of standard rulemaking established by the Administrative Procedure Act. In particular, EPA's Clean Water Act (CWA) "guidance"[94] should be overturned, as it would vastly expand the regulatory burdens confronting everything from agriculture to construction to mining.

- The President should direct federal agencies to apply the laws even-handedly with respect to all means of energy production.

    - Although it is appropriate to encourage new technologies that deliver demonstrable environmental benefits, it is not appropriate to discriminate against legal and established fuels.
    - In this regard, the President should direct agencies to enable established fuels to continue to provide for the generation of electricity. For example: reform rules governing NSR under the CAA, and promote exploration and development of natural gas supplies through the use of new technologies such as hydraulic fracturing.

- Promote continued beneficial uses and recycling of coal combustion byproducts while ensuring responsible handling and disposal.

- Reform the process for EPA vetoes of dredge or fill permits (Section 404(c) of the CWA) to clarify that vetoes are impermissible. Reform the Aquatic Resource of National Importance designation process to prevent EPA from making such designations unless an aquatic resource of genuine, quantifiably *national* importance is truly jeopardized.

- Amend the Federal Power Act to include a "reliability safety-valve" that empowers FERC or its designated electric reliability organization to ensure that reliability concerns are addressed by agencies when they develop or modify their rules.

CONSOLIDATE ENERGY PROGRAMS, AVOID DUPLICATION, AND SPEND WISELY

The GAO has issued a number of reports showing significant redundancy among federal energy programs. GAO's most recent annual duplication and overlap report identified 94 federal initiatives for "green building" across 11 agencies; 37 environmental laboratories located in 170 buildings across 30 cities; and 14 diesel emission reductions programs across three agencies.[96] A report focused on renewable energy found that 23 agencies and 130 sub-agencies implemented "nearly 700 renewable energy initiatives in Fiscal Year 2010."[97]

There is a role for the federal government to play in the promotion of alternative forms of energy. However, to maximize the effectiveness of that role and to safeguard taxpayer dollars, it is important for policymakers to consolidate these programs to the greatest possible extent. Given the emerging sprawl that GAO and others are already identifying, Congress should provide statutory direction requiring many of these programs to be merged or terminated.

DOE should develop better mechanisms for setting objective, long-term strategic goals and evaluating progress toward them. Today's evaluations are too often sporadic and narrow. Although outside evaluations are valuable, inside DOE there should be an enduring top-level planning, evaluation, and technical assessment function, insulated from political influence.

GAO should be tasked with reviewing how much of DOE's expenditure to promote promising new energy technologies is actually making it 'to the bench' – that is, to the efforts of researchers and technologists developing breakthroughs rather than administrative charges and overheads. By 2020, significant, measurable progress should be made to ensure that expenditures make it to the bench, following recommendations made by GAO.

GAO should also examine the level, appropriateness and effectiveness of DOE's expenditures for promotional and educational activities.

Number of Initiatives That Foster Green Building in the Nonfederal Sector, by Federal Agency

Agency	Number of initiatives
HUD	29
EPA	18
Energy	17
U.S. Department of Agriculture	8
Department of the Treasury	8
Department of Transportation	5
National Institute of Standards and Technology	3
Department of Education	2
Small Business Administration	2
Department of Defense	1
Department of Health and Human Services	1
Total	**94**

Source: GAO analysis of agency information and questionnaire responses.

ENVIRONMENTAL RESPONSIBILITY

Everything we do has environmental consequences. We never notice nor consider most of these. Everything we do also uses energy, and the environmental consequences of energy development tend to be more visible than the consequences of many of our other actions.

Efforts to increase domestic energy production almost universally draw concerns about environmental impacts. We have some of the highest environmental standards in the world and others look to us for best practices. We should be proud of this, and strive to continue to have the best environmental standards. We absolutely should pay close attention to the environmental consequences of energy development. In doing so, however, we need to make our evaluations fairly in respect to actual impact per unit of energy produced, the practicality and cost of alternatives, and the effect of not having sufficient affordable energy.

ENVIRONMENTAL IMPACTS

Even casual observers are by now familiar with the environmental impacts of oil, gas, and coal development. But while "greener" resources are often presented as the solution for every environmental challenge that we confront, the reality is that no form of energy – especially when scaled to meet the United States' significant energy demand – is perfect.

Wind farms result in the death of birds and bats, and can create noise and visual impacts. Biofuels have seen opposition grow over the conversion of food crops into transportation fuel and the conversion of wild lands to cropland. The *Los Angeles Times* has published a number of articles about solar development in California, including one entitled "The Solar Compromise: Sacrificing Desert to Save the Earth." Many renewables require significant amounts of land to develop, and some have proposed putting large swaths of places like the Mojave Desert off-limits to their development.

The point here is not to disparage any resource, but simply to point out that there never has been, and may never be, a perfect form of energy. In recognition of this, our objective for all forms of energy development should be improved environmental performance while ensuring that supplies are adequate to meet demand and support continued economic growth. To balance these objectives, development must be allowed to proceed, though not without sensible regulations in place to guard against accidents and environmental degradation. Our goal should be to meet any and all demand for energy through production that meets the strongest practicable environmental standards.

Many industries have made significant progress over time. Oil is an example. The surface footprint of oil development has dramatically declined, even as subsurface drillable areas have greatly expanded. The size of drilling pads has decreased markedly, and today it is possible to drill multiple wells per pad. Advances in seismic technology allow a better focus on a targeted area, further shrinking surface impacts.

Alaska's North Slope demonstrates the reduced impacts of development. In the 1970s, a typical pad at Prudhoe Bay was 65 acres in size, with wells spaced 160 feet apart and a 2-mile subsurface drillable area.[98] By 1999, when the Alpine field came online, pad sizes were down to 13 acres, wells could be spaced just 10 feet apart, and the subsurface drillable area had expanded to eight miles.[99] Ice roads and seasonal closures are common standard to protect sensitive areas, while pipelines are built to avoid impact on wildlife crossings and subsistence hunters. After four decades of development, it is a testament to these advances that the North Slope is still a magnificent area that teems with wildlife.

Additional progress can be made, not just in the oil industry, but in every energy sector. Continued attempts to kill projects without having alternate sources of abundant, affordable energy, however, is as irresponsible as it would be to proceed without attention to minimization of adverse impacts. The effects can be economic – in the form of jobs never created, revenues never generated, security gains never realized, and levels of prosperity never reached. Ultimately a bad economy is bad for the environment. When people's first concern is finding a job or providing for the family, they are not going to worry about marginal environmental impacts. According to a poll released in November 2012, just one percent of respondents listed the environment and pollution as the United States' top non-economic problem.[100]

The best way to make environmental progress is not to deny access and needed permits, or to launch countless lawsuits, but instead to set reasonable performance standards and ensure industries comply. In recent years, too many have lost sight of this approach, prompting companies to leave our shores and produce resources in other countries, with the associated economic benefits accruing abroad rather than here at home.

The United States should be proud of its record on the environment, because it is a record of tremendous progress most often forged through bipartisan legislation and sensible regulation. Rivers no longer catch fire because of the waste dumped into them. Our skies are blue – less often clouded by particulate matter or haze. Emissions from power plants have declined considerably, and vehicle efficiency has been increasing since 2005.[101] The air in America is dramatically cleaner than it was thirty years ago, while the air pollution in China, a country so often cited as a model, has become a major health hazard. Still, there is more work we can do, and the key to success will be striking the right balance between the need for energy production and the desire for environmental standards.

Transportation across the tundra of Alaska's North Slope is limited to ice roads in the winter months. The use of ice roads, which melt in the summer, minimizes environmental impacts.

Source: USGS

CLIMATE CHANGE

At the forefront of many conversations about environmental responsibility is climate change. Regrettably, in this conversation, ad hominem attacks and references to the latest instance of extreme weather too often replace what should be balanced evaluation and rational discourse informed by sound science. Additionally, the difference between facts and theories tends to be lost and, at the moment, the discussion is too poorly framed to allow meaningful political progress.

It is understandable that theories differ on what may happen in the future. The complexity of this problem is underscored by the fact that we haven't even reached a consensus on what has already happened, which greatly complicates attempts to predict the likely impacts of climate change.

Predictions rely on computer models, which depend on the accuracy of the data on which they are built and the assumptions of the models. The variables of climate change are far more complex than those used in models predicting commodity prices, natural disasters, or housing market risks, and computer models have been dramatically wrong on all of these and other issues. This does not mean that models are not extraordinarily valuable tools, but rather that it is reasonable to view predictions of complex matters, such as how climate change will impact our world, with caution.

There are many actions that we can take to mitigate greenhouse gas production and respond to a changing climate, particularly those with broad benefits like efficiency improvements, diversification of energy supplies, or increasing resilience to adverse weather. These 'no regrets' climate policies deserve more attention.

Because climate change is a global concern, however, if we pursue burdensome and costly legal and regulatory responses that are unlikely to be matched by other countries, we put ourselves at a competitive disadvantage without making a meaningful impact on global greenhouse gas emissions. We need to lead a continued and careful evaluation of all options to allow us to address climate change in ways that benefit both our environment and our economy.

Congress has already defeated proposals that would have increased the cost of energy, reduced consumer choice, or resulted in regressive burdens for American consumers. The EPA, however, continues to move forward with command-and-control regulations with costs that vastly outweigh their potential benefit. These activities have given rise to a *de facto* climate policy imposed by unelected bureaucrats. We can start to improve this situation by inventorying all initiatives that are already underway. Any measures developed by elected representatives to address climate change should also preempt unnecessary regulatory burdens.

The federal government has a role to play in advancing newer, cleaner sources of energy capable of reducing greenhouse gas emissions. In fact, many of the proposals contained in this document would expand that role in a constructive way while maintaining the equal goals of abundant, affordable, diverse, and secure energy. For example, significant progress can be made by funding early-stage R&D, lowering the cost of financing for especially promising new ventures, and, when there is strong agreement for doing so, providing prudent temporary subsidies that have associated revenue offsets. Reducing regulatory and other barriers to deploy-

ment, thereby enabling states to try new policies, and facilitating climate change adaption are also necessary components of any action plan. But these policies often cost money and require a strong economy – fueled by affordable energy – to undertake.

Such a balanced energy approach would avoid massive new regulatory burdens and rely instead on policies capable of attracting popular support. It would forgo the imposition of costly shifts in the energy market for which everyday consumers pay the price. It would shelve the reliance upon mandates, taxes, fees, and other blunt instruments. American private sector ingenuity and natural technology deployment would play a larger role than the government picking winners and losers.

The village of Kivalina, Alaska (population 386) lies on a narrow, 8-mile barrier reef in the Chukchi Sea, just north of the Arctic Circle. Kivalina is being forced to adapt to erosion.

Source: Alaska Department of Commerce

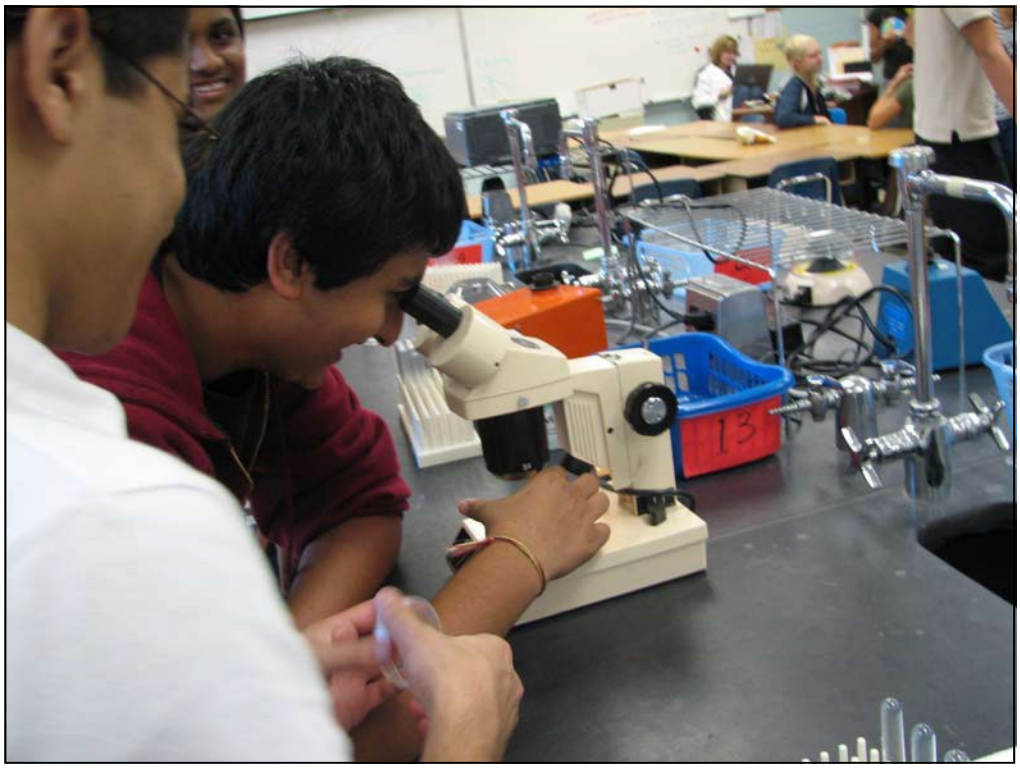
AN ENERGY POLICY THAT PAYS FOR ITSELF

The federal government accrues tens of billions of dollars from resource production each year in the form of rents, royalties, bonus bids, and corporate income taxes. Energy production's direct fiscal benefits should be recognized as a tremendous opportunity, especially while the government runs record deficits.

ADVANCED ENERGY TRUST FUND

Effective implementation of the policies outlined in this document will result in dramatic increases in domestic energy production. This, in turn, will create additional revenue for the Federal Treasury. The majority of this revenue should be applied to deficit reduction to ensure a sound financial footing for our nation, but a percentage should also be allocated to a new Advanced Energy Trust Fund.

The Trust Fund would be a separate Treasury account that is administered by the Department of Energy and used to pay for the provisions in this plan. Funds should be applied to the most promising and cost-effective proposals in many technology-neutral categories, including renewable energy, energy efficiency, alternative fuels, and advanced vehicles.

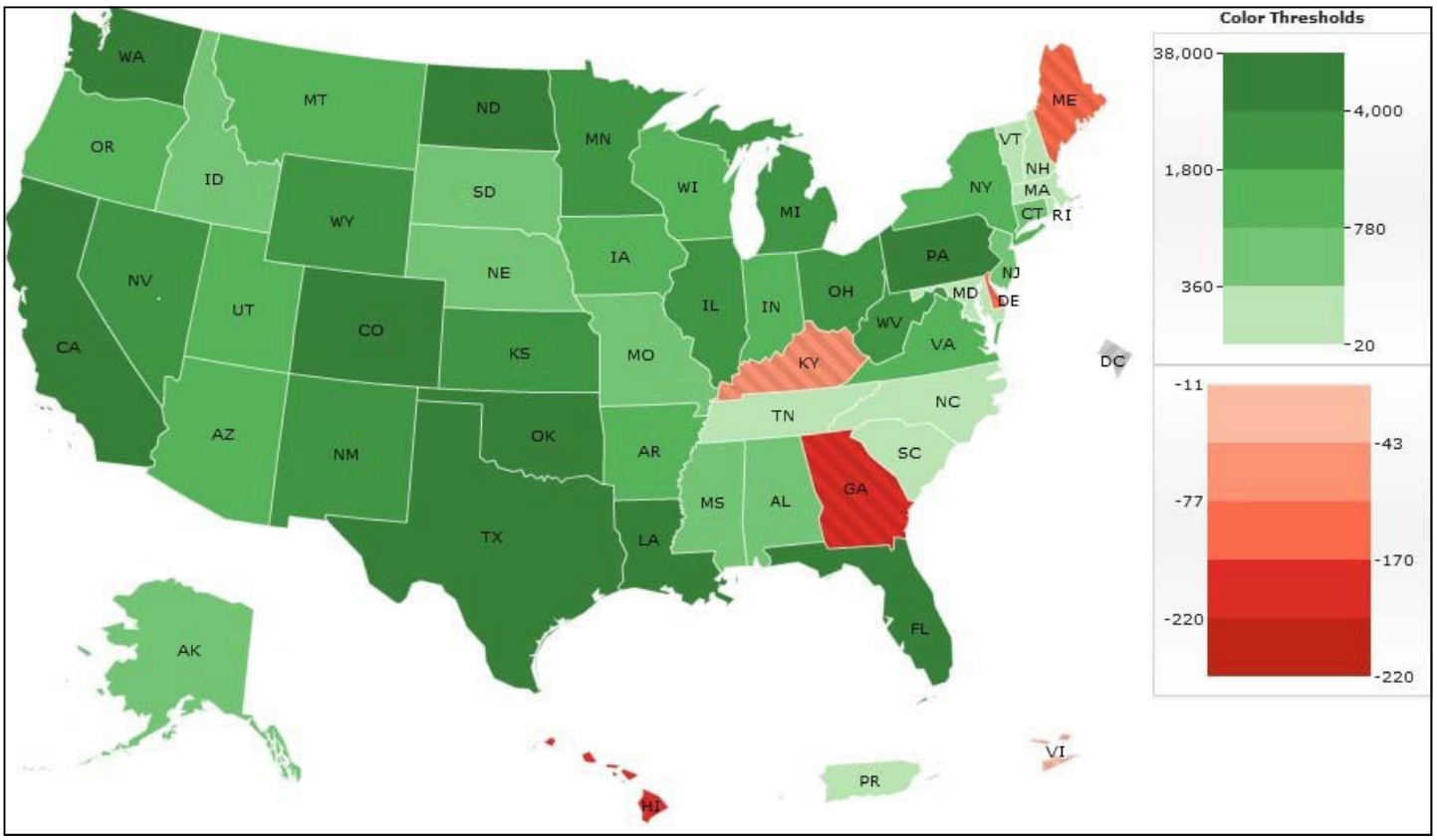


The Advanced Energy Trust Fund will promote innovation for the next generation. Today's youth, such as these students at The Thomas Jefferson High School for Science and Technology (TJHSST) in Virginia, will discover and create tomorrow's technologies with the support of the Fund.

Source: TJHSST

ENERGY ECONOMICS

The troubling fiscal and economic situation in the United States has drawn attention to the boom in the energy sector led by innovation, new technology, and risk-taking with private capital largely on state and private land. On one level, the industry is growing and supporting millions of jobs around the country. On another level, the various incentives provided by the federal government to energy-related industries – both those based in hydrocarbons and in renewables – have led to calls for cuts in order to reduce the budget deficit and derive more benefits in relation to the federal dollars spent and revenue forgone. Policymaking requires careful consideration of the facts and the totality of the economics at work.



Job growth from natural resources and mining development throughout the country.

Source: BLS, Beta Labs, Change in Employment, Natural Resources and Mining (March 2011 to March 2012)

EMPLOYMENT IMPACT

Energy plays a unique role in the U.S. economy. It is an input into every sector, including itself. Power generated from coal, natural gas, petroleum, wind, solar, and other sources is a component price in the vast array of products and services that comprise U.S. productive capacity. Because energy is an input into every sector, energy sector labor costs are transferred throughout the economy. The metric of success for an American energy boom should not be how many people it employs directly (although in many areas direct energy employment is a bright spot in an otherwise challenging economy). Instead, U.S. energy should be seen and valued in light of its effect on the nation's overall economic condition. Expanding U.S. energy should be considered for what it is, an engine of economic growth and not just another federal "jobs program."

Jobs are not created in isolation. When an oil and gas company begins exploration and production in a particular region, it directly employs people. But jobs in related industries are created or supported indirectly, such as manufacturing jobs for needed equipment or the advanced IT applications that are behind so much of the energy production boom. The indirectly supported workers then use their wages to purchase goods and services, which further contributes to jobs in other industries.

One way economists measure the impact of a particular industry is by estimating the "employment multiplier," or how many jobs are created elsewhere from a single job created in that industry. One prominent study recently examined these multipliers across the wider sector. It attributed a multiplier of 3.0 to the deepwater oil and gas sector and 4.1 to unconventional oil. This means that for each job created in these sectors, 3.0 and 4.1 *total* jobs, respectively, are created throughout the economy.[102]

We see a similar phenomenon in the renewables sector, though it is less pronounced. The multiplier for solar photovoltaic projects during construction is 3.3, but drops to a negligible amount during the operating phase. Once solar panels are installed, very few workers are needed for maintenance and operations. Wind projects have a multiplier of 2.0 during either phase. Multiplier estimates will vary, but the idea that jobs in energy production create more jobs in other fields is not in dispute.[103]

Jobs in the energy sector are lucrative for the labor force. Starting median salaries for graduates from top mining engineering schools are more than $10,000 higher than the national annual mean wage.[104] Moreover, the energy sector is an area where we can continue to lead and excel in the areas of science, technology, engineering and math (STEM). This is a major benefit in light of the broad consensus that exists in favor of boosting otherwise declining STEM capabilities relative to our international competitors.

FOSSIL FUEL TAXATION

Sir Winston Churchill once observed that some of his political opponents saw private enterprise as a "predatory tiger to be shot" or "a cow they can milk" rather than "what it really is – the strong and willing horse that pulls the whole cart along."[105] The famed Prime Minister made that statement decades ago, but his words could just as easily describe many contemporary policymakers' judgment of the fossil fuel industry – and, in particular, their views on how heavily it should be taxed.

Efforts to increase taxes on oil, gas, and coal producers have swelled in recent years. Most visible are policies such as cap-and-trade, which are explicitly designed to increase the cost of the vast majority of our nation's energy supply. Less familiar, but also of potentially significant consequence, are changes being pushed for various provisions of the Internal Revenue Code.

The President's Fiscal Year 2013 budget request seeks to terminate what it claims are several "fossil fuel subsidies" within the tax code. The budget states that these treatments are "inefficient" and yet somehow able to "impede investment in clean energy sources and undermine efforts to address the threat of climate change" at the same time. The White House estimates that, if enacted into law, its plan would raise federal revenue collections by "over $4 billion" per year[106] – enough to erase roughly 0.4 percent of the federal deficit for Fiscal Year 2012.[107]

In discussing tax treatments for the fossil fuel industry, we must keep in mind what is actually on the books, because the rhetoric in this debate is often detached from reality. Assertions that billions of taxpayer dollars are paid out in "subsidies" each year are false; there are typically no cash credits disbursed from the Treasury to individual companies, let alone the industry as a whole. Pejorative terms such as "handouts" and "corporate welfare" are routinely misapplied, as well, with no distinction drawn between private dollars not taken by the government and the public dollars annually distributed from it.

The reality is that fossil fuel producers are eligible for many of the same tax treatments available to other industries, or similar treatments that have a comparable effect. Some provisions, such as for enhanced oil recovery, are phased out at even moderate prices. The manufacturing deduction for oil and natural gas is actually less than the rate for many other industries, including those with higher profit margins. The so-called 'dual capacity' provision ensures that a company's post-tax earnings from activity in another country are not taxed again in the United States. Another alleged subsidy, percentage depletion, is equivalent to capital depreciation and available only to smaller-scale producers.

What all of these treatments have in common is their ability to slightly reduce the United States' corporate tax burden, which would otherwise be the highest in the developed world,[108] for an incredibly capital intensive industry. This, in turn, helps increase our competitiveness, our ability to attract investment, and our domestic energy production. Fossil fuel producers still ultimately pay billions of dollars in taxes each year, and the government receives additional billions in revenue from lease sales, royalties, and fuel taxes.

Economics also indicates that sizeable tax increases on fossil fuel producers are ill-advised, as higher taxes on a good or service will result in less of it – not more. It defies logic that tax hikes would spur new energy production or lower energy prices, which should be among the goals of any rational energy policy. In the case of fossil fuels, higher taxes would hurt marginal production, lowering output and increasing our dependence on foreign suppliers, and also reduce companies' ability to make the capital expenditures needed to bring resources to market.

Fortunately, there is a better path forward. If revenues are the question, the answer is increased domestic production, through the opening of new lands and reforms that make it easier to produce on lands already leased. Increased production will simultaneously create jobs and restrain world energy prices, while higher taxes would accomplish neither.

The next step will be to reform our tax code so it is competitive with other nations – including Canada, which recently cut its national corporate rate to just 15 percent.[109] The best approach would be to undertake comprehensive reform that begins to flatten the code in exchange for lower overall rates. In the meantime, it is simply not appropriate to punish a handful of companies in just one sector of our economy. To continue that would be the very definition of counterproductive – especially when it comes to energy.

CONCLUSION

America's energy policy must be re-imagined as we move toward the year 2020. Dramatic changes have taken place in global and national economic conditions. There's a heightened awareness toward our energy production and consumption, which moves us towards greater environmental responsibility. America's energy infrastructure has aged, the price of oil is high, and the challenges of reliable and secure energy supplies have never been greater.

Simultaneously, technological breakthroughs have vastly improved the cost of producing previously uneconomic forms of energy. Just as every president over the last 40 years has grappled with energy policy, so the president and Congress will be required to work together to renew energy policy for the nation.

Affordable energy is vital to our economic well-being: a prudent balancing of energy goals with the proper standards for environmental regulation is more pressing than ever. Yet our nation is too often hamstrung by regulatory overreach, permitting delays, and litigation that seeks to apply environmental laws well beyond their original intent. Too often, necessary and worthwhile projects are rendered uneconomic by attrition, and endless rounds of administrative disputes and lawsuits. These never-ending cycles stand in the way of timely, efficient, and urgently-needed investments in energy supply and conservation.

Nevertheless, the future is bright. We use energy more efficiently and we are witnessing gains in electricity and natural gas as transportation fuels. We must continue to fund and eventually increase funding for scientific research critical to continued progress. Only basic and rigorous research will produce the dramatic breakthroughs we need to reach a future in which "clean energy" and "energy independence" are more than just a slogan.

If we make the right energy choices today and accomplish the goals delineated herein by 2020, we can secure a future in which energy is affordable and abundant; the air and water are cleaner in our own country and around the world; and Americans enjoy a healthy economy and preserve their ability to live and "to pursue happiness."

The policy ideas in this document are intended to prompt thinking, engage a healthy dialogue, and outline ideas that may be executed first through discussion, then through legislation to reimagine and renew the energy policy of the United States.

ENDNOTES

1. EIA, Annual Energy Review 2012, Table 1.5. Energy Consumption, Expenditures, and Emissions Indicators Estimates, 1949–2011.

2. EIA, *Monthly Energy Review*, December 2012, Table 1.1 Primary Energy Overview.

3. EIA, *Electric Power Monthly*, March 2012, Table 1.1 Preliminary 2011 Data.

4. EIA, Annual Energy Review 2011, Table 5.20. Value of Crude Oil Imports from Selected Countries, 1973-2011.

5. This comparison measures 2011 US technically recoverable oil and the average of US imports from OPEC from 2007 through 2011. *See* EIA, Assumptions to the Annual Energy Outlook 2011, Table 9.1; EIA, U.S. Total Crude Oil and Products Imports, http://www.eia.gov/dnav/pet/xls/PET_MOVE_IMPCUS_A2_NUS_EP00_IM0_MBBL_A.xls, accessed October 25 2012.

6. National Petroleum Council, *Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources*. September, 2011.

7. EIA, *Monthly Energy Review* December 2012, Table 1.2. Primary Energy Production by Source.

8. *Id.*, Table 5.2. Crude Oil and Natural Gas Exploratory and Development Wells.

9. *Id.*, Table 5.1. Drilling Activity Measurements. Data for 2012 is limited to 11 months, using the latest data available at time of publication.

10. *Id.*, Table 3.1. Petroleum Overview.

11. EIA, *Sales of Fossil Fuels Produced from Federal and Indian Lands, FY 2003 through FY 2011*, March 2011.

12. BLM Oil & Gas Statistics http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/statistics/Table04.html (onshore); Bureau of Ocean Energy Management, Outer Continental Shelf Lease Sale Statistics, http://www.boem.gov/Oil-and-Gas-Energy-Program/Leasing/Regional-Leasing/OCS_Lease_Sale_Statistics.aspx (offshore). *See also* the Bureau of Safety and Environmental Enforcement, http://www.data.bsee.gov/homepg/data_center/plans/apdcombined/master.asp.

13. Humphries, Marc. *US Crude Oil Production in Federal and Non-Federal Areas*. Congressional Research Service report R42432. May 2012.

14. The British thermal unit (symbol Btu or sometimes BTU) is a traditional unit of energy equal to about 1.055 KJoules.

15. EIA, *Monthly Energy Review*, December 2012, Table 1.1. Primary Energy Overview.

16. *Id*., Table 1.4b. Primary Energy Exports by Source and Total Net Imports.

17. *Id*., Table 1.4a. Primary Energy Imports by Source.

18. *Id.*, Table 3.3a Petroleum Trade: Overview.

19. National Intelligence Council, Global Trends 2030: Alternative Worlds; p. 35.

20. EIA, Monthly Energy Review, December 2012, Table 1.2. Primary Energy Production by Source.

21. EIA, *Monthly Energy Review* December 2012, Table 5.2. Crude Oil and Natural Gas Exploratory and Development Wells; Table 3.1. Petroleum Overview.

22. EIA, *Monthly Energy Review* December 2012, Table 5.1. Drilling Activity Measurements. Data for 2012 is limited to 11 months, using the latest data available at time of publication.

23. International Energy Agency, World Energy Outlook 2012.

24. EIA, Monthly Energy Review, December 2012, Table 11.1b. World Crude Oil Production: Persian Gulf Nations, Non-OPEC, and World.

25. DOI's RiK program applies to oil owed to the U.S. government by producers leasing federally-owned land on the Outer Continental Shelf. RiK permits the government to obtain either the provided 12.5 to 16.7 percent of the oil produced or its equivalent dollar value.

26. "ANCSA - LAND." CIRI. N.p., n.d. Web. 11 July 2012. <http://www.ciri.com/content/history/ancsa_land.aspx>.

27. EIA, *Energy In Brief: What is the Role of Coal in the United States?* http://www.eia.gov/energy_in_brief/role_coal_us.cfm.

28. EPA, Table of National Aggregated Emissions, Emission Rates, Heat Input: 1990, 2000, 2005, 2010 and 2011. http://www.epa.gov/airmarkt/quarterlytracking.html

29. Such vetoes are outside the law, but an explicit prohibition would reinforce the illegality of preemptive and retroactive vetoes.

30. See *Energy Independence From OPEC Imports* for more discussion of commodities markets and price shocks.

31. IHS, *America's New Energy Future: The Unconventional Oil and Gas Revolution and the US Economy.* http://www.ihs.com/info/ecc/a/americas-new-energy-future.aspx

32. US Bureau of Land Management and Argonne National Laboratory, *Oil Shale and Tar Sands Guide*. http://ostseis.anl.gov/guide/index.cfm. Accessed 29 December 2012.

33. DOE Office of Petroleum Reserves, *Fact Sheet: U.S. Oil Shale Resources.* http://fossil.energy.gov/programs/reserves/npr/Oil_Shale_Resource_Fact_Sheet.pdf.

34. Central Intelligence Agency, *The World Factbook.* Country Comparison : Oil - proved reserves. https://www.cia.gov/library/publications/the-world-factbook/rankorder/2178rank.html

35. DOE Office of Petroleum Reserves, *Strategic Unconventional Fuels Fact Sheet: U.S. Oil Shale Resources*. http://www.unconventionalfuels.org/factsheets/Oil_Shale_Resource_Fact_Sheet.pdf.

36. Brad J. Tomer, *Methane Hydrates Interagency R&D Conference*. US Dept. of Energy, National Energy Technology Laboratory. http://www.netl.doe.gov/kmd/cds/disk10/tomer.pdf. Web. July 12, 2012.

37. USGS, Assessment of Gas Hydrate Resources on the North Slope, Alaska, 2008.

38. USGS, Natural Gas Hydrates– Vast Resource, Uncertain Future. http://pubs.usgs.gov/fs/fs021-01/fs021-01.pdf. Web. July 31, 2012.

39. ADGGS, *State of Alaska Briefing Document on Proposal to Reauthorize Methane Hydrate Research and Development Act of 2000, PL 103-193, 114 Stat.234,* Jan. 24, 2005, Executive Summary, page 1. EIA, *Annual Energy Outlook*, June 2012 Table 19, page 62. ADGGS estimates over 32,000 TCF in Alaskan resources, mostly offshore. EIA accounts total U.S. natural gas consumption in 2010 at 24.1 TCF a year, a level predicted to rise to 31.9 TCF a year by 2035 before perhaps leveling off. Using the 2035 EIA projection, dividing 32,000 TCF by 31.9 TCF of annual consumption yields a methane hydrate supply that would equal total U.S. natural gas consumption for 1,003 years. *See also* recent USGS estimates of onshore Alaska gas hydrate resources, that place the mean estimate of recoverable gas hydrates from on shore Alaska at 85.427 TCF (Table 1, page 3, Alaska North Slope-Gas hydrate assessment results, USGS Assessment of Gas Hydrate Resources on the North Slope of Alaska, 2008, Fact Sheet 2008-3073, October 2008).

40. For example, if fuel oil were more widely available and less expensive in remote rural areas for winter heating needs, families would be less likely to burn large amounts of wood. Burning wood results in worse particulate matter and attendant asthma and other health impacts than fuel oil. It also can denude forests, reducing species habitats and removing natural carbon capture. Under these circumstances, fuel oil would be a cleaner energy source. If fuel oil could be replaced by electricity brought to the area from an environmentally responsible hydroelectric generation project, that would be an even cleaner source of energy.

41. Conventional and pumped storage. EIA, *Annual Energy Review 2011,* p. 256. Figure 8.11a, Electric Net Summer Capacity, Total (All Sectors), 2003-2011. Release date: September 27, 2012.

42. *Id at p. 222.* Figure 8.2a. Electricity Net Generation, Total (All Sectors).

43. Steven G. Chalk*, Statement Before the Committee on Energy and Natural Resources, United States Senate*. U.S. Department Of Energy (DOE). March 31, 2011. Web. http://energy.gov/sites/prod/files/ciprod/documents/3-31-11_Final_Testimony_(Chalk).pdf.

44. EIA, Annual Energy Review: http://www.eia.gov/totalenergy/data/annual/pdf/sec8_42.pdf. Table 8.11a Electric Net Summer Capacity: Total (All Sectors), Selected Years, 1949-2011.

45. See: Hadjerioua et al., *An Assessment of Energy Potential at Non-Powered Dams in the United States*. DOE (April 2012); Hall et al., *Feasibility Assessment of the Water Energy Resources of the United States for New Low Power and Small Hydro Classes of Hydroelectric Plants*. DOE. (January 2006); U.S. Department of Interior (DOI) et al., *Potential Hydroelectric Development at Existing Federal Facilities* (2007); and U.S. Bureau of Reclamation, *Hydropower Resource Assessment at Existing Reclamation Facilities* (2011).

46. Steven G. Chalk*, Statement Before the Committee on Energy and Natural Resources, United States Senate*. U.S. Department Of Energy (DOE). March 31, 2011. Web. http://www1.eere.energy.gov/office_eere/m/testimony_20110331.html#references.

47. See: Hadjerioua et al., *An Assessment of Energy Potential at Non-Powered Dams in the United States*. DOE (April 2012); Hall et al., *Feasibility Assessment of the Water Energy Resources of the United States for New Low Power and Small Hydro Classes of Hydroelectric Plants*. DOE. (January 2006); U.S. Department of Interior (DOI) et al., *Potential Hydroelectric Development at Existing Federal Facilities* (2007); and U.S. Bureau of Reclamation, *Hydropower Resource Assessment at Existing Reclamation Facilities* (2011).

48. Zhenguo Yang, et al. *Electrochemical Energy Storage for Green Grid*. Pacific Northwest National Laboratory, Richland, Washington 99352, United States. http://energyenvironment.pnnl.gov/ei/pdf/chemical%20reviews.pdf

49. GAO, *Batteries and Energy Storage: Federal Initiatives Supported Similar Technologies and Goals But Had Key Differences*. August 2012. GAO-12-842. http://www.gao.gov/assets/650/647742.pdf.

50. EIA, Electric Power Monthly. September 2012. The data in the report reflects power generation facilities of 1 megawatt or larger.

51. EIA, Monthly Energy Review December 2012Table Renewable Energy Production and Consumption by Source. http://www.eia.gov/totalenergy/data/monthly/pdf/sec10_3.pdf.

52. Kelsi Bracmort, *Biomass: Comparison of Definitions in Legislation Through the 112th Congress*, Congressional Research Service, November 14, 2012.

53. EIA, Monthly Energy Review (October 2012), Table 2.5. "Transportation Sector Energy Consumption." http://www.eia.gov/totalenergy/data/monthly/pdf/sec2_11.pdf

54. See page 56.

55. *Metals Economics Group*, World Exploration Trends 2012. http://www.metalseconomics.com/sites/default/files/uploads/PDFs/wet2012english.pdf

56. DOE, Office of Indian Energy, "Briefing for the Senate Energy and Natural Resources Committee and the Senate Indian Affairs Committee," May 18, 2012. *See* chart: "Oil, Gas, And Coal Resources on Indian Lands" Lower 48, Indian Lands Undeveloped Reserves and Undiscovered Resources, 2012.

57. *Id.*

58. DOE, "Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge," updated assessment, Report SR/O&G/2000-02, page 1.

59. DOE, Office of Indian Energy, "Briefing for the Senate Energy and Natural Resources Committee and the Senate Indian Affairs Committee," May 18, 2012, pages 7-13.

60. For past efforts, see National Renewable Energy Laboratory's "United States Renewable Energy Technical Potential" (July 2012): http://www.nrel.gov/gis/docs/resource_maps_201207.pptx. "Renewable Energy Sources in the United States," The National Atlas of the United States, http://www.nationalatlas.gov/articles/people/a_energy.html. EIA, "Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays" (July 2011) ftp://ftp.eia.doe.gov/natgas/usshaleplays.pdf.

61. The other fuels are coal, oil, nuclear, and alternatives.

62. EIA, Annual Energy Review 2012, Table 1.5. Energy Consumption, Expenditures, and Emissions Indicators Estimates, 1949-2011.

63. *See: Principle V: Environmental Conservation: Eight Principles of the American Conservation Ethic*, The Heritage Foundation, Washington D.C. 2012, http://www.heritage.org/research/projects/environmental-conservation

64. EIA, Annual Energy Review 2012, Table 1.5. Energy Consumption, Expenditures, and Emissions Indicators Estimates, 1949–2011.

65. See the EIA's extended discussion of this topic here: http://www.eia.gov/emeu/efficiency/measure_discussion.htm

66. EIA, Annual Energy Review 2012, Table 1.5. Energy Consumption, Expenditures, and Emissions Indicators Estimates, 1949–2011.

67. IEA, World Energy Outlook 2012, p. 273.

68. EIA, Annual Energy Outlook 2013 (Early Release), http://www.eia.gov/forecasts/aeo/er/early_intensity.cfm

69. See Table 9.2, IEA, World Energy Outlook, p. 280.

70. Annual Report 2011, Generational IV International Forum: http://www.gen-4.org/PDFs/GIF_2011_annual_report.pdf

71. EIA, Annual Energy Review 2012, Table 9.2. Nuclear Power Plant Operations, 1957-2011.

72. WaterSense Accomplishments 2011, Environmental Protection Agency: http://www.epa.gov/owm/waterefficiency/docs/ws_accomplishments2011_508.pdf

73. EIA, "Average utilization of the nation's natural gas combined-cycle power plant fleet is rising," Today in Energy (June 9, 2011): http://www.eia.gov/todayinenergy/detail.cfm?id=1730.

74. EIA, Annual Energy Outlook 2012, pp. 25-28.

75. EIA, Annual Energy Review 2011, Figure 2.0. Primary Energy Consumption by Source and Sector, 2011.

76. EIA, Monthly Energy Review November 2012, Table 3.7c Petroleum Consumption: Transportation and Electric Power Sectors.

77. *See, e.g.,* IEA, *World Energy Outlook 2012*, p. 280.

78. Throughout this section, "clean" is defined as set forth under *Renewable Resources*.

79. *See* An Energy Policy That Pays For Itself.

80. Holliday et al., *A Business Plan for America's Energy Future*. American Energy Innovation Council. June 10, 2010.

81. Allison et al., *Report of the Independent Consultant's Review with Respect to the Department of Energy Loan and Loan Guarantee Portfolio*. January 2012.

82. See also *Renewable Resources*.

83. *See, e.g., Big Data Unleashes the Electric Equivalent of a Free Keystone Pipeline, http://www.forbes.com/sites/markpmills/2012/03/19/information-technology-unleashes-the-electric-equivalentof-a-free-keystone-pipeline/2/*

84. Assad et al., *Memorandum of Agreement Between the Department of Defense and the Department of Energy Governing Department of Defense Funded Work Performed at the Department of Energy Laboratories and Facilities.* DOD, DOE. September 2010.

85. For example, see EIA's 2012 report on LNG exports, *Effect of Increased Natural Gas Exports on Domestic Energy Markets*, January 2012. http://www.fossil.energy.gov/programs/gasregulation/reports/fe_eia_lng.pdf.

86. The cooperative federalism maintained in the federal-state collaboration for the federal roads system could be used as an example.

87. GAO, *Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks*, pp. 26, 29. September 2012.

88. Alaska Oil and Gas Conservation Commission, *Hydraulic Fracturing White Paper*. March 2011, Revised 06 Apr 2011. http://doa.alaska.gov/ogc/reports-studies/HydraulicFracWhitePaper.pdf

89. DOI, BLM Conveyance Summary. October 18, 2012

90. Epstein, Richard A. "Governement by 'Expert'" *Defining Ideas*. Hoover Institution, 6 Mar. 2012.

91. Clinton, William J. "Executive Order 12866." *Executive Order 12866: Regulatory Planning and Review*. The White House, 4 Oct. 1993.

92. Anderson, Terry. "Environmental Protection Up In Smoke." *The Wall Street Journal* 18 Sep. 2012: A15. Print. *See also* Business Roundtable, *Achieving Smarter Regulation* (September 2011).

93. Business Roundtable, *Permitting Jobs and Business Investment: Streamlining the Federal Permitting Process,* (April 2012) .

94. *See* April 13, 2012 Executive Order, *Supporting Safe and Responsible Development of Unconventional Domestic Natural Gas Resources.*

95. Environmental Protection Agency. *Draft Guidance on Identifying Waters Protected by the Clean Water Act*. N.p., Apr. 2011. Web. 18 July 2012.

96. GAO. *2012 Annual Report: Opportunities to Reduce Duplication, Overlap and Fragmentation, Achieve Savings, and Enhance Revenue*. N.p., 28 Feb. 2012. Web. <http://gao.gov/assets/590/588818.pdf>.

97. GAO. *Renewable Energy: Federal Agencies Implement Hundreds of Initiatives*. Feb. 2012. Web. http://www.gao.gov/assets/590/588876.pdf.

98. Sullivan, *Update on Alaska LNG Project and Opportunities*. Dec. 10, 2012, Slide 35. (Alaska DNR Commissioner Sullivan presentation to Korea Gas Corporation).

99. *Id.*

100. Gallup. Most Important Problem. *What do you think is the most important problem facing this country today?* Jan. 7-10, 2013; Dec. 14-17, 2012; Nov. 15-18, 2012; Oct. 15-16, 2012. http://www.gallup.com/poll/1675/most-important-problem.aspx

101. EPA. *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2011*. March 2012. http://www.epa.gov/otaq/cert/mpg/fetrends/2012/420s12001a.pdf

102. *Energy for Economic Growth: Energy Vision Update 2012*, World Economic Forum.

103. *Id.*

104. *See* 2011-2012 PayScale College Salary Report, PayScale, Inc.

105. National Churchill Museum. *Miscellaneous Wit & Wisdom*. http://www.nationalchurchillmuseum.org/wit-wisdom-quotes.html

106. Office of Management and Budget, *Fiscal Year 2013 Budget of the U.S. Government*, p. 103. http://www.whitehouse.gov/ sites/default/files/omb/budget/fy2013/assets/budget.pdf

107. Congressional Budget Office, *Monthly Budget Review Fiscal Year 2012, October 2012*. http://www.cbo.gov/publication/43656

108. Masters, Jonathan. *Renewing America: U.S. Corporate Tax Reform*. Council on Foreign Relations. April 5, 2012. http://www.cfr.org/united-states/us-corporate-tax-reform/p27860. *See also* http://www.reuters.com/article/2012/03/30/usa- tax-japan-idUSL2E8EU5VV20120330

109. Canada Revenue Agency. *Corporation tax rates.* Modified April 3, 2012. http://www.cra-arc.gc.ca/tx/bsnss/tpcs/crprtns/rts-eng.html