

OCTOBER 2016

PAPERS

FOR THE NEXT

PRESIDENT



Increasing Prosperity, Resource Stewardship, and National Security

AN ENERGY POLICY STRATEGY FOR THE NEXT PRESIDENT

David Goldwyn and Robert McNally
with Elizabeth Rosenberg



About the Authors



DAVID L. GOLDWYN, Chairman of the Atlantic Council's Energy Advisory Group, served as State Department Special Envoy and Coordinator for International Energy Affairs for Secretary of State Hillary Clinton and as an Assistant Secretary of Energy under President Bill Clinton.



ROBERT MCNALLY, a nonresident Senior Fellow at Columbia University's Center on Global Energy Policy, was Senior Director for International Energy on the National Security Council and Special Assistant to the President on the National Economic Council under President George W. Bush.



ELIZABETH ROSENBERG is Senior Fellow and Director of the Energy, Economics, and Security Program at the Center for a New American Security, and served formerly as the Senior Advisor to the Treasury Under Secretary for Terrorism and Financial Intelligence.

Acknowledgements

The authors would like to thank Leigh Livergood and Cory Gill for their extensive research, editorial, and analytical contributions to this paper. They also would like to acknowledge Ellie Maruyama, Loren DeJonge Schulman, Maura McCarthy, Melody Cook, and Kelsey Hallahan for their help in preparing this document for publication.

About the Series

The Papers for the Next President series is designed to assist the next president and his or her team in crafting a strong, pragmatic, and principled national security agenda. The series explores the most critical regions and topics that the next president will need to address early in his or her tenure and will include actionable recommendations designed to be implemented during the first few months of 2017.

Increasing Prosperity, Resource Stewardship, and National Security

AN ENERGY POLICY STRATEGY FOR THE NEXT PRESIDENT

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First 100 Days' Agenda

The policy recommendations offered in this report will take years for the next president to implement. During the first few months of the next administration he or she will have a unique opportunity to make progress on key energy priorities to establish a framework for further measures in the years to come.



Prioritize modernization of energy infrastructure as an urgent national policy.

The primary focus of this priority should be new regulatory efforts to promote accelerated siting and permitting of new and expanded pipeline, railway, inland waterways, port, and transmission line projects. These efforts should be shepherded by White House leadership, coordinating various federal agencies as well as interaction with state-level authorizers. The next administration should consider offering a one-time accelerated depreciation program for replacement of aging pipelines if launched within two years of enactment.



Reverse Congress' decision to draw down a substantial amount of emergency oil reserves to plug budget holes unrelated to energy security.

The new administration should identify alternate sources of funding for transportation needs and rescind Strategic Petroleum Reserve (SPR) sales for purposes other than SPR modernization. If necessary, the administration should review executive authority to suspend implementing this decision in the interest of national security. This recognizes Congress' error in reducing U.S. emergency response options despite ongoing economic vulnerability to oil price shocks. Pump prices are based largely on crude prices, which are set in a globally traded and fungible market. While U.S. oil imports have fallen sharply in recent years, the U.S. economy and national security are vulnerable to shocks arising from a global oil market featuring significant geopolitical disruptions and nearly no OPEC spare production capacity. It is appropriate to sell some SPR crude to finance much needed modernization of the facility, but doing so for other government expenditures would be reckless.



Create a formal Assistant Secretary of State position for the Bureau of Energy Resources.

This will elevate the current head of this bureau in stature, signaling a greater prioritization of international energy diplomacy by the next president. The incoming administration should also urge the Senate to quickly confirm the appointee to this post, to accelerate and make more effective diplomatic efforts to promote global energy security. A key task of such diplomacy will be signaling to Gulf partners a continued U.S. security commitment to the secure maritime shipment of energy, and coordination with European partners on regional supply diversification and energy transport policy.



Establish a high-level, White House-led, interagency coordinating mechanism to address energy policy issues.

Expand on the existing, though disparate, focus on these issues throughout various administration agencies by formalizing a body responsible for coordinating policy in this domain. This coordinating mechanism will evaluate the various energy-market and natural resource stewardship, economic, and security considerations of energy policy issues and develop policy options for the next president.



Increase federal investment in new and advanced energy technologies.

Through grant programs or, potentially, loan guarantees, the next administration should, in a fiscally sound manner, rapidly expand research, development, and deployment support for carbon capture and sequestration, battery storage, advanced nuclear technology, natural gas capture and monetization, and smart grid technology. Federal officials also should explore cost-effective strategies to signal and offer incentives for further private sector investment in these new energy technologies.



Signal strong support for the use of natural gas in new international power-generation projects.

Through leadership of international financial institutions and multilateral aid projects, the next president should promote this lower-carbon energy resource in electric power development. This will address energy poverty concerns abroad, have an emissions-reductions effect, and offer potential new export opportunities for U.S. gas producers.



Prioritize vastly improved collection and dissemination of global energy market data.

The United States leads the world in providing comprehensive and timely energy market data, but international partners can do better. The global nature of energy markets and associated security, environmental, and climate concerns make it imperative to rectify the often incomplete or time-lagged publication of data on energy production, consumption, and inventories. Building on efforts in the G7, International Energy Forum, and Joint Oil Data Initiative, the White House should lead an effort to improve international publication of energy data so as to better inform policy and private-sector understanding of markets, shape policymaking, and dampen volatility stemming from uncertainty.

Executive Summary

On January 20, 2017, a new U.S. president will take the oath of office. He or she will assume responsibility for assuring the safe, reliable, and affordable provision of energy for the country, a critical component of the economic health and security of the nation. This task will involve addressing a number of grave deficiencies in current energy policy and prioritizing several urgent energy initiatives. Laying a strong, early basis for new energy policy will enable the incoming administration to set the country on a path to aligning national energy capabilities and technological developments with economic and security needs, now and in the future.

Energy touches all facets of life. The next generation of federal leaders must prioritize a sober approach to the following fundamental realities of our national energy system:

- The national electricity grid will have to accommodate, in a safe and reliable manner, the integration of increasing renewable energy sources and new technologies.
- Oil and gas will remain the dominant fuel source to power the global economy.
- The rise in domestic energy production over the last decade presents economic, climatic, and security benefits on which the next president can build.
- Instability in key oil producing regions – primarily the Middle East, Africa, and Russia – will remain a significant source of economic and energy security concern for the United States.
- The aging domestic energy transportation system, including railways, pipelines, ports, and inland waterways, is in need of significant improvement and is vulnerable to critical infrastructure threats.
- Political leaders must continue to address environmental and community concerns about the impacts of oil and gas development in order to sustain this critical industry and economic input.
- Climate change cannot be ignored, and national leaders must directly address this topic through a focus on research, development, and deployment of new energy technologies.
- National leaders must advance a comprehensive view of energy security to encompass supply, trade, efficiency, infrastructure, development of technologies, resiliency, and emergency response.

Facing these structural elements of the energy system head-on in new policy will enable the next president to mitigate vulnerabilities that will continue to threaten U.S. prosperity and security: unrest and supply disruption in major producing countries, and the price shock–related consequences disruptions could pose to such countries and global consumers. At home, energy system vulnerabilities include aging and at-risk infrastructure, including transportation systems. They also include the deeply politicized public debates about energy production and natural resource stewardship.

This report outlines for the next administration a bipartisan agenda to advance sound energy policy in the first 100 days after inauguration and in the years ahead. Partisanship and local interests have created deep and difficult-to-surmount policy impediments. In many instances and forums, divisive debate about science, environmental effects of energy production, and how to monitor, permit, and regulate energy activities block progress toward creating more contemporary and cost-effective energy policy. A sustained effort at the executive level to forge common ground, building on some recent examples of success, can achieve progress. Indeed, this must be a priority for resilience, U.S. strength, and global leadership.

Among top energy policy initiatives, the next president should prioritize electricity grid upgrades, energy transport modernization, proactive energy diplomacy, a stronger federal central coordinating mechanism for

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energy and environmental issues, and enhanced support for research, development, and demonstration of new energy technologies. The challenge of addressing climate change is important, but will remain a source of deep

policy division. While a broad array of stakeholders and representatives of both political parties agree that the current policy and regulatory approach to climate change is not ideal and far from the most cost-effective, there is very limited common ground in this domain. Notwithstanding the difficulty of sustaining constructive public debate on climate change, this effort will be critically important for future leaders to advance a holistic treatment of energy interests and policy.

The next president will achieve energy-system and economic success if he or she can enact reasonable and depoliticized standards for energy production that are technology-neutral and cost-effective. Furthermore, a crucial measure of the next administration's contribution to U.S. national security will be the degree to which national leaders promulgate a broad formulation of energy security, including managing economic vulnerabilities, that permanently discards a narrow emphasis on domestic self-sufficiency. Instead, the next president and his or her team must advance energy policy at home and abroad by attending simultaneously to conventional production, trade, efficiency, renewables, new technology, cyber security, resiliency, and emergency preparedness. This approach will lay a strong foundation for U.S. energy policy going forward and affirm the status of the country as a clear global leader on energy.

Introduction

The top priorities of the next president – namely, assuring economic growth and prosperity, protecting our national security, strengthening our global alliances, and combating terrorism – will require policies that promote energy security at home and abroad. While some energy and environmental issues have been highly polarized in recent years, there have also been important areas of agreement. Looking forward, there is an important set of additional policies on which both parties can agree that will strengthen the robustness and resilience of the U.S. energy system. The need for such policies is acute, given the preponderance of geopolitical risk capable of interrupting global energy production and trade and causing economically damaging fuel price spikes. These policies include ensuring continued U.S. commitment to engagement on energy security with energy consumers and producers abroad, working collectively to reduce price volatility, spurring economic growth, and strengthening U.S. national security. On climate change, the authors agree that the issue must be addressed, and also that it has become extremely politicized. While the authors favor sharply different strategies, many of the energy policies on which they agree would have climate as well as economic and security benefits.

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This paper lays out key and pressing realities of the contemporary energy system, which must form the basis of energy policymaking for the next administration. In many instances, these realities constitute serious challenges to U.S. prosperity and security and require urgent and sustained action. The paper reviews such challenges at home and abroad and outlines a number of strategies to address them. Additionally, it comments on some of the more intractable energy policy matters, including resource stewardship and approaches to climate change, which national policymakers will inevitably continue to struggle over under the next president.

Eight Key Energy Realities

The U.S. energy system is undergoing major transformations that have brought the nation unprecedented abundance and diversification of energy supply, but also presented new challenges to the power grid, energy transportation, and energy security. The next president will be well served to understand these new realities in order to forge a bipartisan agenda on urgent issues that can win support, and to constructively navigate divisive issues. This paper assesses eight fundamental realities of the energy system on which policy and thought leaders from both sides of the aisle can agree.

These energy realities reflect the fundamental role the energy system plays in all facets of modern life, including functioning of the global economy. They account for the need to modernize aging infrastructure and to recognize rapid technological change not only in how energy is

that of its allies and partners in a volatile energy market fraught with risk. These eight pillars of understanding for our future energy policy are outlined below.

First, the electricity system is the circulatory system of the economy, and assurance of high quality transmission and distribution requires modernization and expansion of the transmission system. The rapid integration of renewables into the electricity mix and the increased digitization of the system, including smart grids and meters, pose opportunities for greater systemic resilience. However, they also present challenges to grid operability, stability, and security. Future leaders can and must address these challenges.

Second, oil and gas will remain the lifeblood of the domestic and international economy. They will remain strategic commodities through the next administration

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produced and consumed, but in how it is generated and distributed. They include the need to enforce standards to mitigate environmental impacts of energy development and leverage cost-efficient pathways to address climate change. They confirm the importance of U.S. global leadership through sustained diplomatic and military engagement to ensure the free flow of trade through sea lanes abroad. Finally, they reflect the need for robust collective emergency response, so the United States can better provide for its energy security and



The U.S. electricity grid requires modernization to safely and reliably accommodate demand and integrate renewable energy sources and emerging technologies. (Energy.gov/Flickr)

and, by most projections, through at least 2040.¹ Many are hopeful and enthusiastic that the U.S. economy will be able to quickly and cheaply shrink its heavy reliance on conventional energy sources. Yet with hydrocarbons forecast to provide 80 percent² of total U.S. energy consumption and 78 percent³ of total global energy consumption in 2040, U.S. leaders have no choice but to assure security of supply domestically and for allies and partners.

Third, the nation's vast natural resource endowment, and the dramatic recent rise in domestic oil and gas production, is an economic boon, a climate benefit, and a national security asset. Domestic oil and gas production creates jobs and lowers energy feedstock costs for industrial manufacturing and electricity generation. It also enhances self-sufficiency in physical fuel supply and diversifies global supply dependence away from Russia and the Middle East.

Fourth, oil's strategic nature, arising from its extensive global trade and pricing, and the concentration of reserves in the Middle East, North Africa, Russia, and the Southern Cone, leaves the United States and others vulnerable to instability in those areas. U.S. economic and national security vulnerability to geopolitical instability in key oil producing regions remains, regardless



The boom in domestic energy production over the last decade presents economic, climate, and security dividends on which the next president can expand. (Energy.gov/Flickr)

of the recent decline in U.S. oil imports. The reality of global pricing means that a supply disruption anywhere transmits a price shock to consumers and businesses everywhere, including in the United States. For allies and partners of the United States, disproportionate reliance on some unstable suppliers, and indeed on imported energy broadly, is a particularly acute source of political and economic vulnerability. Therefore, U.S. economic and national security interests require sustained diplomatic and military engagement and leadership in these areas.

Fifth, the U.S. energy transportation system, including inland waterways and ports, oil and gas pipelines, railways, and transmission lines, is aging. It is insufficient to meet rising demand, and has not adapted to new centers of production and demand. Modernization of this system and the construction of redundant infrastructure is essential for safety; productivity; and resilience to extreme weather, cyber attacks, and other potential hostile actions. Local opposition to siting energy infrastructure, from on- and offshore wind farms to new transmission lines, impedes energy source diversification and grid security.

Sixth, the energy industry's social license to operate, which refers to its acceptability to community and

environmental interests, depends on local perceptions of the safety and environmental impacts of oil and natural gas operations. This applies to all parts of the energy production chain, from extraction to waste disposal. Citizens are concerned about the impacts of oil and gas development on air quality, local water supply, and land use. They also voice concerns about land use and environmental impact related to the development of renewables, such as wind power and nuclear plants. Political leaders must effectively address these concerns, embracing reasonable, cost-effective standards that are high, transparent, and rigorously enforced.

Seventh, with respect to climate policy, there is a basic public consensus that humans are pumping carbon into the atmosphere at historical rates and that these emissions are affecting the composition of the atmosphere. Furthermore, there is broad agreement that increasing the concentration of greenhouse gases in the atmosphere will change the planet's climate. Climate change cannot be ignored. This report's authors, and the public at large, hold different views on addressing climate change, and on the level of scientific certainty required to take related policy action. Many agree, however, that any long-term climate solution should not foreclose, and indeed may require, an expansion of nuclear power generation, and commercial-scale deployment of carbon capture and sequestration (CCS) for fossil fuel power generation. Additionally, climate solutions should include a commitment to robust research, development, and demonstration (RD&D) for innovative technologies, from battery storage to proliferation-resistant modular nuclear reactors.

Political leaders must effectively embrace reasonable, cost-effective standards that are high, transparent, and rigorously enforced.

Eighth, a modern conception of energy security must include all of the following elements: security of supply through diversification of fuels and sources, open and competitive trade in energy, maximizing energy efficiency, interdependent infrastructure, RD&D of clean and sustainable energy technologies, resilient energy systems, and emergency response systems.⁴ The group of seven leading industrial nations, the G7, recognized

this new comprehensive conception of energy security in promulgating its Energy Security Core Principles.⁵ The Principles indicated endorsement of this view of energy security among the United States and its closest allies and partners, members of the G7. This approach also has taken hold in national policymaking efforts within the United States.⁶

These eight energy realities represent core focus areas for policy leaders to address in mitigating U.S. energy system vulnerabilities. The serious nature of the challenges inherent in these realities merits a commensurately determined policy effort. The imperative of addressing energy system vulnerabilities, detailed below, is not merely a “nice-to-have,” advisable action

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item. Instead, addressing these vulnerabilities is vital to assuring both the continued flow of commodities and the modernization of infrastructure essential to the functioning of the contemporary economy. The extent to which the United States makes progress in each of these areas has direct implications for U.S. economic prospects, national security, and global economic growth.

Addressing Energy System Vulnerabilities

A priority task for the next president will be addressing risks to the international energy system that impact national economic and security interests. A major supply disruption can still shock the U.S. and global economies, make U.S. partners vulnerable to coercion, and test U.S. systems of strategic and emergency response. No president has the luxury of complacency on this score. A stable Middle East and secure supply lines between the region and consuming countries, especially in the Asia-Pacific, will remain a vital national security interest of the United States. Security planners face choices in how to prioritize the safe transit of energy through key global shipping lanes. They also must decide how intensively to support political stability in the major energy producing countries or among the most energy-dependent U.S. partners abroad.

At home, politics and competing bureaucratic authorities hamper critically needed modernization and expansion of outdated and vulnerable energy infrastructure. A key part of this modernization includes protecting critical infrastructure from cyber attacks. For example, robust investment and improved policy coordination are required to ensure the continued provision of affordable electricity supplies, integrate lower carbon sources into the power grid, and enhance grid interoperability.

International Energy System Risks and Tools for Their Management

SURVEYING THE GEOPOLITICAL RISK LANDSCAPE

Consensus forecasts, including those published by the International Energy Agency (IEA) and U.S. Energy Information Administration (EIA), project that conventional hydrocarbons – oil, gas, and coal – will provide for an overwhelming share of global energy demand through at least 2040. Even the IEA’s New Policies Scenario and the 450 Scenario, which assume more aggressive global efforts to combat climate change, project that hydrocarbons will account for 75 percent and 60 percent of global energy demand by 2040, respectively.⁷ Therefore, the United States must continue to ensure access for itself and its allies and partners to secure diversified hydrocarbon supplies.

A survey of the world’s top ten proved reserve holders demonstrates the scale of the challenges inherent to ensuring security of supply. Nine either have experienced significant unrest in recent years and/or are located in

regions of the world where such unrest is common.⁸ The U.S. Intelligence Community's 2016 Annual Worldwide Threat Assessment identified many of the specific challenges these countries face. This document noted continued political instability in several major energy producing countries, the negative economic effects of recent low prices, and persistent vulnerabilities of strategic energy infrastructure to cyber or physical attacks.⁹ The Rapidan Group energy consultancy estimates that some 2.1 million barrels per day (mmbpd) of oil supply is currently disrupted and another 2.2 mmbpd is at risk of disruption amid extremely low OPEC spare production capacity. Were it not for large current commercial oil inventories, the combination of large disruptions and low OPEC spare capacity likely would trigger much higher oil prices.

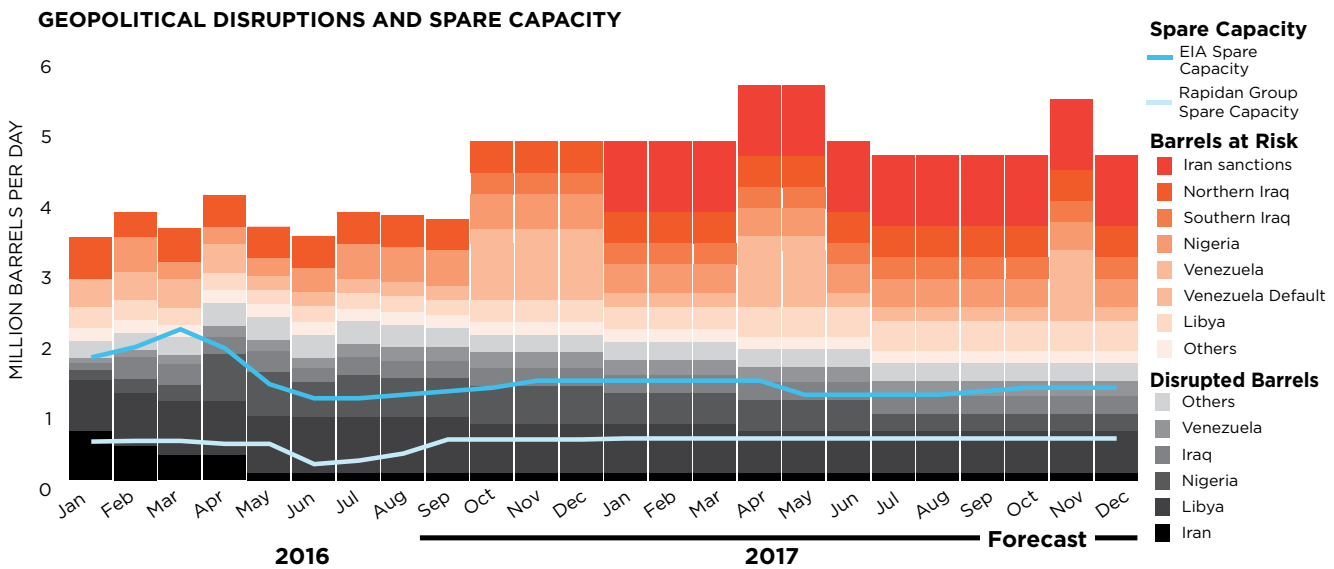
The next president is all but certain to face a price shock given the combination of global supply and demand imbalances, the absence of OPEC as a market balancer in the past ten years,¹⁰ and the multiple risks to energy production and trade. Boom-bust price cycles and high geopolitical risk place a premium on crisis prevention, active diplomacy, and bolstering the ability to draw on emergency stocks to address supply and price shocks. Today, oil seems plentiful and contingency planning may appear unnecessary. However, global spare capacity is extremely low by historical standards. A small buffer margin can magnify the price spike of a disruption anywhere in the world since the market will be less capable of producing more oil to meet demand.

A slowdown in energy projects due to the recently lower energy prices will result in supply gaps in a few years' time. This situation is sowing the seeds of the next price boom, likely during the next president's first term. Nearly half a trillion dollars in planned expenditures for new projects, which could expand global production capacity and buffer margins, has been shelved over the last two years as low energy prices made big new energy production projects uneconomical.¹¹ New oil discoveries

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are at record lows, totaling only 2.8 billion barrels of oil last year, the lowest annual volume since 1954.¹² The oil industry used to approve dozens of projects per year, but currently is approving only a handful.¹³

Major oil producers, from Iraq and Iran to Venezuela and Libya, that have deferred their long-term energy growth plans face an economic growth path fraught with difficulty and disarray. Among the regions where preventative diplomacy will be required to mitigate



Approximately 2.1 million barrels per day (mmbpd) of crude oil production is disrupted due to geopolitical events mainly in Venezuela, Nigeria, Iraq, and Libya. An additional 2.2 mmbpd remain under threat of disruption due to low OPEC spare production capacity. These factors significantly contribute to the difficulty of ensuring security of supply and will push oil prices higher as commercial inventories shrink. "Barrels at Risk Update: July 2016" [The Rapidan Group, July 22, 2016], 2.)





Venezuela has long been a source of heavy crude oil imports into the United States. However, ongoing domestic unrest over the economy and resource mismanagement by the government has put the future of Venezuelan oil exports in question. (Carlos Diaz/Flickr)

political instability in leaner economic times is the Western Hemisphere. Venezuela's economic crisis risks even more severe internal unrest, a humanitarian crisis in the Southern Cone, and a loss of around 37 percent of all heavy crude imports into the U.S. Gulf Coast.¹⁴ A Venezuelan economic collapse could deliver a credit shock to Central America and the Caribbean. Many of these governments acquire their crude and refined product exports through preferential Venezuelan financing. A loss of this credit could trigger major migration flows to the United States from Haiti or Cuba.¹⁵

Across the Atlantic, fraying European unity poses energy security challenges. Most notably, the recent UK vote to leave the European Union has thrown Europe's ability to coordinate energy policy in question. This makes deeper coordination on an integrated European energy market, free from Russian price discrimination or political coercion, more challenging. Additionally, the rise of popular parties with ties to Moscow in many European states will undermine European energy initiatives designed to shrink Russian influence in this market. The self-styled Coalition of Radical Left (Syriza) holds power in Greece and has developed close ties with Russia that worry some EU and NATO officials.¹⁶ Austria's constitutional court annulled the results of the May 2016 presidential election due to several irregularities, giving the popular far-right Freedom Party another opportunity to win the presidency later this year. Similar populist parties, many of which have allegedly received

Russian financing¹⁷ or otherwise maintain amiable ties with Moscow, are in ascendance in several other countries including Denmark, Hungary, France, Germany, Spain, and Sweden.

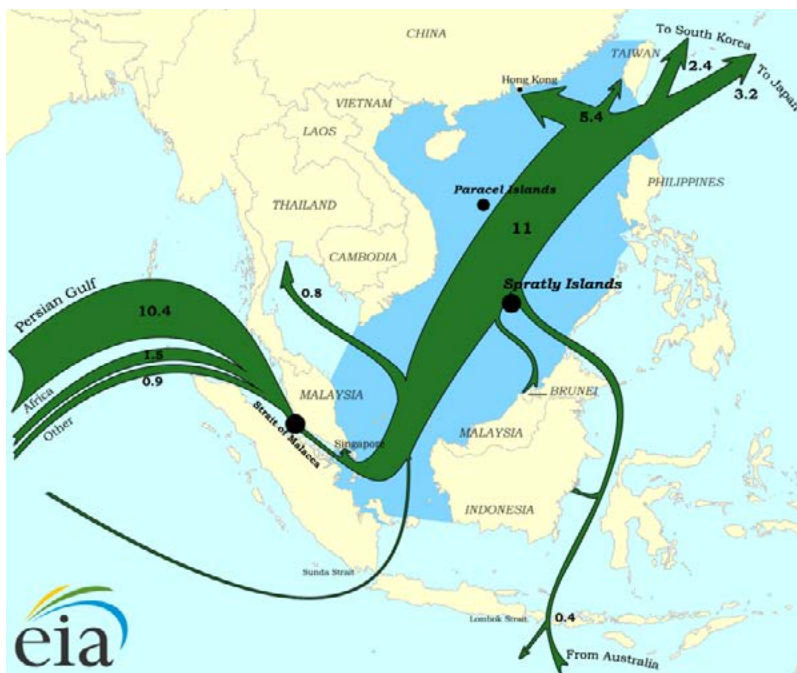
Another distraction from coordinated European energy policy is the necessity for leaders in the region to dedicate significant financial resources to managing both the massive refugee crisis originating in the Middle East and North Africa and ongoing economic difficulties at home. These policy priorities undermine the ability of Europe's public and private sectors to expend adequate capital to expand energy storage and interconnection infrastructure that can allow for a reduced reliance on Russian sources entering the region.

Russia itself is using energy to counter the efforts of the United States and the European Union to compel Russia's compliance with the Minsk Accords (the set of measures that Russia and Ukraine agreed to implement to restore Kiev's control of its eastern border). In April, the Yamal LNG project, whose primary shareholder OAO Novatek is subject to U.S. sanctions preventing it from raising long-term financing in Europe and the United States, secured a crucial \$12 billion in financing from Chinese banks.¹⁸ Russia also is selling shares of its national energy companies to Chinese and Indian investors, while retaining control to evade U.S. and European restrictions on new investment in parts of the Russian energy sector. In doing so, Moscow is binding itself closer to China and India.

In Asia, China's internationally rejected assertions of sovereignty over wide swaths of the South China Sea, along with its fortification of disputed islands, pose a clear threat to energy security. The South China Sea is a crucial route for the transit of crude oil worldwide, and



President Xi Jinping of China and President Vladimir Putin of Russia converse during the Moscow Victory Day Parade in May 2015. In reaction to tightening Western financial sanctions, Moscow has sought closer ties with Beijing. (Wikimedia Commons)



The South China Sea is a critical route for global energy trade. China's assertions of sovereignty over areas of the South China Sea pose a threat to energy security. (U.S. Energy Information Administration, "The South China Sea is an important world energy trade route," April 4, 2013.)

disputed areas are a potential source of large, commercial-grade hydrocarbons reserves in their own right. Approximately 14 million barrels of crude oil pass through the South China Sea and the Gulf of Thailand each day, while EIA estimates indicate that the South China Sea contains approximately 11 billion barrels of oil and 190 trillion cubic feet (Tcf) of natural gas in proved and probable reserves. However, EIA acknowledges that both under-exploration and territorial disputes bring the veracity of such estimates into question.¹⁹

Territorial disputes over South China Sea areas likely will serve as a touchstone for future diplomacy, and potentially conflict, in the years ahead.²⁰ China's provocations against U.S. ships and planes in the area as the United States seeks to assert the international norms of freedom of navigation and overflight have accelerated in intensity. Beijing deployed large numbers of fighter jets to disputed islands in April and responded provocatively to U.S. operations in the area the following month, scrambling fighter jets that flew within 50 feet of a U.S. surveillance plane.²¹ This poses security risks both to energy import-dependent U.S. allies, such as South Korea and Japan, and the desire of other countries like Vietnam, the Philippines, and Malaysia to increase their own energy self-sufficiency by exploring for energy resources off their respective coasts.

The Middle East and North Africa continue to see high levels of internal unrest that threaten their territorial integrity, economies, and their substantial contributions to world energy production. Libya's civil war continues, knocking nearly all of the country's oil production offline and exacerbating risks that the Islamic State terrorist group (IS) and al Qaeda in the Islamic Maghreb (AQIM) factions operating there will further threaten the stability of Tunisia and Algeria. Algeria is a major source of energy for Europe and is therefore crucial to its strategy for accruing diverse energy supplies. Border disputes in hydrocarbon-rich areas of Senegal and Mauritania risk undermining the ability of these countries to reduce their import dependency through increased domestic oil production. Egypt's fragile government and security threats from the Sinai Peninsula risk both its stability and its plans to develop domestic energy to repair its balance of payments and restore a major source of revenue to replace the deep losses it faces from reduced tourism revenues.

The crises in Syria and Iraq have precipitated profound unrest and black market activity that limits the ability of legitimate producers and marketers of energy to sell their products and collect revenue. Iraq's disunity and the drain of fighting IS have led to major budget cuts that will delay creation of the infrastructure it requires to sustain and eventually grow its production and earn the revenue needed to rehabilitate the country and maintain social peace. While Iraq's oil production reached a record 4.5 mmbpd this year, deferred maintenance needs and the lack of requisite investment to sustain production at current levels likely will contribute to a production decline that will start at the end of this year. This will no doubt have a significant effect on total global output.²² Syria's own modest production is lost to war, and what remains is often stolen and smuggled, marring local price signals and legitimate supply chains.

Iran, the world's foremost sponsor of terrorism, is actively destabilizing the Gulf, Levant, and Arabian Peninsula. Tensions between Saudi Arabia and its Sunni allies and Iran are also significant to global oil market stability, playing out through a war of words and a paralysis in their ability to agree on collaboration to manage the oil market. High and rising Gulf tensions pose major risks to global oil flows and potentially a natural gas price shock, since one third of global liquefied natural gas (LNG)

exports come from the Gulf. Indirectly, these tensions are demonstrated in Saudi Arabia's war in Yemen, its support for factions in Syria, and its support for Morocco in the Western Sahara as a means of punishing Algeria for not supporting its position in Yemen. Iran's proxies are deployed throughout the region, including in Iraq, Syria, and Lebanon.

In Sub-Saharan Africa, the fall in oil prices since 2014 has put enormous stress on oil producing nations such as Nigeria and Angola, as well as Ghana, Uganda, and Congo. It also has stalled the efforts of nations such as Senegal, Sierra Leone, Liberia, Mozambique, and Tanzania to leverage natural resource extraction for economic development. These countries are borrowing to meet basic needs, while investment has fallen off with the dipping energy prices. High debt levels could impede development and trigger financial crises in the future, as they have in the past. Nigeria has seen a resurgence of

The challenge for U.S. leaders is to ensure that policies keep pace with changing market realities and U.S. strategic interests. Over prior decades analysts have learned that security of supply comes from multiple strategies: preventing hostile domination of the Middle East and protecting energy supply lines from that region to consuming markets; flexible trading markets; effective price signals; diversity of suppliers; deterrence of concentration of market power; collective self-defense using strategic reserves and other policies; and reliable supply lines. U.S. engagement with Europe on that region's energy security provides one of the best historical examples of U.S. policy in bolstering the energy security of its allies and partners. Indeed, the United States has advocated strongly in recent decades for Europe to develop a more flexible, integrated gas market, greater diversity of both oil and gas supplies, and stronger anti-trust policies. These efforts played an important role in

In Sub-Saharan Africa, the fall in oil prices has put enormous stress on oil producing nations and stalled the efforts to leverage natural resource extraction for economic development.

Niger Delta militancy and attacks on energy infrastructure, which has taken several hundred thousand barrels per day of Nigerian crude production off the market. A persistently uncertain fiscal framework in Nigeria, which stems from years of contemplation of a controversial and highly disputed Petroleum Industry Bill meant to put a more permanent framework in place, has frozen new investment in Nigeria. Additionally, it puts Nigeria's economic future at risk, including its ability to provide electricity to its growing population.

In South Asia, energy poverty remains a drag on economic growth, and by consequence, leaves the governments of India and Pakistan vulnerable to angry disenfranchised factions. Geopolitics play a major role in the region, as Iran seeks to be a natural gas supplier to both India and Pakistan. Simultaneously, the United States seeks to promote alternative energy in South Asia, LNG, and indigenous production as a means to assure the energy autonomy of these key partner nations.

LEVERAGING THE U.S. POLICY TOOLKIT TO ENCOURAGE ENERGY SECURITY AND MITIGATE RISK

The United States has a long history of engagement and bipartisan support for policies designed to help promote the smooth functioning of global oil markets.

achieving milestones such as completion of the Baku-Tbilisi-Ceyhan oil pipeline, the European Union's Third Energy Package, subsequent EU proposals to create a single European energy market, and ongoing efforts to complete Southern Gas Corridor projects.

In recent years, the United States, along with Canada and Mexico, has accelerated efforts to promote a more interdependent and resilient North American energy market. In doing so, the sides have sought to take advantage of largely market-driven developments. These include increasing U.S. imports of Canadian crude over the past decade, the trebling of U.S. gas exports to Mexico over the past five years, and increased government-to-government cooperation. The three core areas of cooperation are public North American energy data, statistics, and mapping collaboration; crafting responsible and sustainable best practices for the development of unconventional oil and natural gas; and ensuring modern, resilient physical and institutional regional energy infrastructure.²³ At the June 2016 North American Leaders' Summit, the parties issued a target for renewables to generate 50 percent of North America's power by 2025.²⁴

Programs to strengthen the energy security of close U.S. allies and partners are essential. Yet the nature of



The U.S. ability to respond to oil supply disruptions hinges on maintaining a sizeable SPR stockpile. Congress undermined the ability of the United States to respond to oil supply and price shocks by approving measures to sell part of the reserve to generate revenue for unrelated federal programs. (Energy.gov/Flickr)

the global oil market necessitates complementary efforts to manage supply disruptions whenever, and wherever, they do surface. One key short-term ingredient to ameliorating price volatility is the availability of commercial storage and, if the cause of the volatility is a severe supply interruption, the possible use of strategic stocks. The United States has demonstrated essential global leadership in ensuring the availability of such stocks for decades. This began when then-Secretary of State Henry Kissinger helped bring about the creation of the International Energy Agency in 1974. The United States subsequently created and built up a domestic Strategic Petroleum Reserve (SPR) that now provides 132 days of net oil import cover.²⁵

However, changing global oil market realities compel the IEA, with U.S. leadership, to evolve in the coming years. Rapidly increasing non-OECD oil demand reduces the cushioning impact of commercial and strategic stocks held in IEA countries, all of which are members of the OECD. Significant non-OECD consumers such as China and India are now building up their own strategic stocks.²⁶ Unfortunately, these fast growing oil importers have not demonstrated a serious interest in coordinating a stock release in a time of market crisis with major energy consumers in the IEA. China has at least 190.5 million barrels in its own strategic reserves, which amounts to around a month's worth of import protection. Beijing is expected to add an additional 70–90 million

barrels into its strategic reserve this year²⁷ and aspires to eventually increase stockpiles to 90 days of import cover, equivalent to 600 million barrels.²⁸ India is in the early stages of bringing its first strategic reserve facilities online yet maintains plans to have adequate volumes in storage to reach 90 days of import cover by 2020.²⁹ With so much of Europe and Asia dependent on natural gas for heat as well as power generation, strategic gas stocks may play an important role for these regions. The IEA has been asked by the Group of Twenty (G20) nations to study this issue, and the United States may have a role to play if it has excess LNG export capacity.

Addressing Energy System Risks at Home

The geopolitical risks abroad are not the only energy system vulnerabilities that the new president will have to address. At home, the primary vulnerabilities of the U.S. energy system are: lagging transmission capacity for new sources of power generation, continuing exposure to oil price shocks, an aging energy transportation system, an inefficient system for permitting new infrastructure, cyber threats to critical infrastructure, and a lack of consensus on how to balance energy and environmental interests, which threatens energy security and the nation's pursuit of a strategy to address the risks of climate change.

MODERNIZING THE ELECTRICITY SYSTEM

The entire U.S. economy, from homes, hospitals, food supply, and defense crucially depends on access to high quality, reliable, and affordable electricity. The key challenge U.S. leaders face today is establishing clear policies to provide market-based, reliable, affordable electricity supply while promoting innovation, new technology, and the integration of lower carbon sources. The “utility of the future”³⁰ will soon be here, and the utilities of the present are not yet ready for it. The utility of the future will need to be prepared for higher volumes of renewable energy, flat to declining electricity demand growth, increased energy efficiency and smart meter technologies, growing distributed generation, and more severe resilience risks.³¹ The Department of Energy (DOE) reports “a high level of transmission investment is expected to replace aging infrastructure; maintain system reliability; facilitate wholesale power markets; and aid regions in meeting their public policy objectives, such as GHG reduction and renewable energy goals.”³² We have multiple power grids, with different energy supply sources, but limited interoperability. State and regional policies have profound impacts on the grid and the decisions of utilities. Yet these policies often are not coordinated across different jurisdictions.

Even without current federal requirements for clean power generation, such as the Clean Power Plan (now under judicial review), power producers rapidly are adding new renewable production volumes. This puts a strain on aging power systems that were not designed to incorporate such large loads of distributed power. As the grid is modernized, through the replacement and addition of new infrastructure and greater digitization, and the integration of new power sources and efficiency technologies into the system, policy leaders must put in place interoperability standards that make it easy for all types of customer devices and new inverters to connect to the grid.

Policy leaders must enhance the reliability and resilience of the electric system needs against changing threats and hazards,³³ including creating the equivalent of electricity reserves by stockpiling reserve transformers. The electricity system faces many vulnerabilities, from low-probability, high-impact risks such as physical or cyber attacks to higher-probability, if lower-impact, natural disasters. The public conception of such risks continues to change and evolve. The critical infrastructure section below offers greater detail on how the federal government is addressing, albeit insufficiently, risks such as cyber and physical threats.

RISKS TO OIL AND GAS SUPPLY

As noted previously, the next president likely will face major energy market convulsions. Specifically, this may resemble an oil price spike that will threaten U.S. economic growth and enrich some U.S. adversaries and competitors. Today nearly 4 mmbpd of global oil production is disrupted or threatened. In other market

circumstances the economy would be reeling from disruptions of this magnitude. As previously mentioned, however, relatively high inventories currently dampen upward price pressure from significant disruptions and low spare capacity. The nearly 58 percent fall in West Texas Intermediate oil prices since their peak in 2014³⁴ masks the threat of price spikes for now, but as demand and supply eventually respond to the low price, the inventory buffer will decrease and oil prices will become more sensitive to disruptions.

The oil market is in a new era of structural price volatility. OPEC has proved unwilling and unable to mitigate boom and bust oil prices since 2004, underscoring the reality that one of the few entities capable of mitigating such spikes cannot be expected to do so in the future.³⁵ Shale oil production, which has boomed in the United States, is relatively faster to respond to price changes than conventional oil production. However, it does not constitute a swing supply source that can prevent large and destabilizing oil price swings.³⁶ Unfortunately, despite the ongoing economic threat posed by significant geopolitical disruptions in key oil producing regions, Congress crippled the U.S. ability to respond to severe supply disruptions by mandating sales of oil from the SPR. This was done primarily to raise money for purposes unrelated to energy security, and such sales will reduce the reserve from 695 million to 531 million barrels.³⁷

ENERGY TRANSPORTATION

America's aging energy infrastructure, which includes pipelines, railways, ports, and inland waterways, poses risks to economic and community safety, resiliency,

THE DOMESTIC SHALE GAS AND OIL BOOM

This production phenomenon has created tremendous economic and national security benefits for the United States. It is enabled by the use of hydraulic fracturing technology, and as an extraction method is viewed as controversial by many environmental and community groups and stakeholders. Oil production has nearly doubled since 2010, rising from 5.4 million barrels per day (mmbpd) in 2010 to 9.4 mmbpd in 2015,³⁸ while natural gas has risen from 21.3 trillion cubic feet (Tcf) in 2010 to 27 Tcf in 2015.³⁹ Advances in technology have made drilling for oil and natural gas in shale rock formations more efficient, allowing operators to drill more wells, which extend farther horizontally than ever before, in less time and at lower cost. As a result, U.S. shale oil and natural gas production can be ramped up and down more quickly than other fields.

The U.S. economy and national security have benefited greatly from the tremendous domestic shale gas and oil boom. Federal and state-level standards for much of this new high-tech oil and gas production over the last decade, drilling from so-called tight rock formations, have evolved dramatically. The standards have become more nuanced and widespread, achieving considerable progress. They include requirements for greater transparency in disclosure of fluids used for drilling technology, enhanced standards for well bore integrity, piping and safer storage of produced water, increased recycling of waste water, and enhanced seismic testing for wastewater reinjection wells. The states that enjoy the highest production levels have taken the lead on regulating their particular geology, sources of water, and air impacts.⁴⁰ The federal government has supported the development and use of a chemical disclosure transparency platform⁴¹ and supported higher standards.

and productivity. Aging pipelines erode or decay, and damaged pipelines can cause spills. Inland waterways move goods, including energy, by barge through intracoastal waterways, but require upkeep, such as regular dredging and port maintenance, to support the flow of goods and are largely federally maintained.⁴³ Transportation of crude oil and other energy products by waterways, including inland waterways and coastal ports, is growing.⁴⁴ This infrastructure requires further investments to avoid or manage congestion, as well as to ensure that maintenance can keep pace with higher volumes of shipping. The nation's extensive rail system links the United States with energy producers and consumers in Canada. Aging railways and dated safety standards have resulted in a number of accidents and oil spills in recent years. With energy production now rising in the middle of the continent, specifically in Pennsylvania, the Ohio Valley, and Texas, new infrastructure is required to move energy to demand centers in the Northeast, Southeast, and West.

The next president should prioritize upgrading the U.S. energy transportation system. He or she must endorse the highest standards and the most modern technologies. This includes facilitating building and replacing pipelines and railways to connect new producing areas with demand centers, enhance safety, and lower the cost of energy to consumers. It also includes expanding inland waterways to add redundancy in the event of surface disruption or breakdown.⁴⁵ The next administration also should offer incentives to pipeline owners to replace aging pipes.

Unfortunately, it is increasingly difficult to replace old pipelines or site new ones. State-level permitting



Transporting increased volumes of energy produced in the United States puts an added strain on an aging railway system. The system requires investment to expand and function safely with new regulatory standards. (Bill Meier/Flickr)

U.S. ENERGY EXPORT POLICY

Promotion of energy exports bolsters U.S. energy security by providing allies with more diverse sources of supply, and thereby lessening their dependence on volatile, and in some cases, coercive suppliers in the Middle East and Russia. This has been an area of major recent bipartisan progress in energy policy, in an otherwise polarized debate. Restrictions on the exportation of crude oil and condensates were lifted in December 2015, opening the way for the United States to play a more prominent role in fostering a competitive and secure global market. In comparison to crude oil, exports of LNG require a permit from the DOE. The law currently stipulates that LNG exports to nations with which the United States has a free trade agreement are automatically deemed to be in the national interest and approved. LNG exports to nations without a free trade agreement, on the other hand, must receive a positive national interest determination from the DOE, a decision that takes into account economic, environmental, national security, and other factors. In 2014, the DOE improved its LNG permitting process, ensuring that projects that already have completed the required environmental assessments are considered for national-interest determination first. This resulted in rapid decisions on exports to countries that do not have a free trade agreement with the United States.⁴²

of replacement and additional pipelines is slow and unpredictable. It also is often subject to protest from those opposed to any energy transportation or the use of hydrocarbon energy broadly. As a result, older pipes remain in use longer. Additionally, energy transportation is pushed increasingly to road and rail, which can involve greater safety risks. Economic incentives to replace and modernize pipelines, such as by using higher-tensile steel capable of moving more volumes, are stifled by “keep it in the ground”-based opposition, in spite of the safety and efficiency benefits.

Moreover, the nation's pipeline regulator, the Pipeline and Hazardous Materials Safety Administration (PHMSA), is responsible for overseeing the 2.6 million-mile pipeline transportation system (in addition to nearly 1 million daily hazardous material shipments).⁴⁶ But PHMSA is thinly staffed, increasing the difficulty of keeping up with monitoring, inspections, and follow-up, making it clear that there needs to be a national policy to offer incentives to pipeline owners to modernize and replace aging lines.

Furthermore, while demand for new energy infrastructure has gone up, government capacity to approve new projects has gone down. At the federal level, the



Aging pipelines must be upgraded, replaced, and supplemented, but government capacity and coordination to approve new projects is insufficient. (National Park Conservation Association/Flickr)

agency commonly charged with lead responsibility to conduct such permitting, the Federal Energy Regulatory Commission (FERC), operates well, with predictability and efficiency. However, its staff is overwhelmed. For most long-distance energy transportation projects, multiple agencies must give approvals, in addition to multiple approvals required at the state and local levels. In the event of a pipeline application before FERC, the other federal agencies involved include the Army Corps of Engineers for river crossings and flood control and storage land, the Department of Interior for wildlife impacts, and the Environmental Protection Agency (EPA) for impacts to aquifers and wellheads. While there is usually a lead federal agency, efforts to coordinate competing agency time lines and agendas are ad hoc at best. Many permitting processes lack clear time lines to begin with, are opaque, and lack any identifiable basis for delay of standards of review. Additionally, review of permits at the state and local level is often the longest source of delay, and has become increasingly politicized. Without better intergovernmental coordination and efficiency, U.S. productivity and safety will be impaired.

In an attempt to improve transparency in approving new energy transportation projects, Congress enhanced reporting requirements to the Federal Permitting Infrastructure Dashboard⁴⁷ in the bipartisan Fixing America's Surface Transportation (FAST) Act.⁴⁸ This provided an online platform intended to allow the public to track and receive notices on infrastructure projects of interest. However in some cases, most notably the Department of State's (DOS) responsibility for permitting oil pipelines that cross national boundaries, the agency in charge nevertheless lacks the technical staff to

fulfill the mission. This leaves it vulnerable to charges of politicizing the decision by both proponents and opponents. The FAST Act also calls for the establishment of a Federal Permitting Improvement Council, a White House council that would oversee and make recommendations for streamlining the permitting of major infrastructure projects. However, this council has yet to be established or empowered to improve the permitting process by the executive branch.⁴⁹

Threats to Critical Infrastructure

A major risk to the domestic energy system is a potential physical or cyber attack, or a natural disaster that could disable the electrical grid, a nuclear power station, or the system for delivering oil, natural gas, or petroleum products. The consequences could spread quickly across the economy, with major and even catastrophic implications for public security. The capacity of hostile actors to threaten such systems already has been demonstrated. The digital security firm Tripwire carried out a survey this year in which roughly 75 percent of surveyed IT professionals in the oil, gas, and utilities sectors indicated that their company had endured an increasing number of successful cyber attacks over the past 12 months.⁵⁰ Unfortunately, government actors, including in Russia and China, as well as private actors in multiple jurisdictions, have repeatedly demonstrated an intent to attempt such attacks.⁵¹

While the U.S. government clearly recognizes this threat,⁵² its capacity to detect and defeat it is still nascent. It will have to do more to manage the current threat, and to develop new strategies to match the proliferating threats to our infrastructure that will result from the evolution of technology. Policy leaders lack a coordinated, multipronged response, including diplomatic, intelligence, and technical facets. Creating backup or redundant systems is an obvious, near-term, and relatively low-tech solution to this risk. A national plan, akin to a civil defense system, may be needed to assure that critical systems can survive a comprehensive or targeted cyber attack.

In 2013, the administration released a Presidential Policy Directive on Critical Infrastructure Security and Resilience (PPD-21), directing officials to identify baseline data and systems requirements for the federal government. It further called on them to implement an integration and analysis function to inform planning and operations decisions regarding critical infrastructure. PPD-21 puts the Secretary of the Department of Homeland Security (DHS), in coordination with the other federal agencies, in charge of identifying and

prioritizing critical infrastructure and identifying its vulnerabilities and consequences. Additionally, it calls on DHS to maintain centers to provide situational awareness, analysis, expertise, and other technical assistance to critical infrastructure owners and operators, along with other responsibilities.⁵³

In July 2016, President Obama issued Presidential Policy Directive 41, United States Cyber Incident Coordination (PPD-41), in an effort to further centralize federal government authority on cybersecurity. It also centralized coordination of responses to cyber incidents within the National Security Council.⁵⁴ PPD-41

concerns about water pollution, land use, noise, and local air pollutants, at the federal level debates about environmental protection generally revolve around the issue of climate change.

The debates over how to address climate change are intensely partisan and often detached from sober and reasonable analysis. Since 2010, with the failure of the Waxman-Markey cap-and-trade bill, the Obama administration shifted its policy emphasis in the area of climate change to executive action. While the administration has taken steps on a number of its goals, this has exacerbated divisions between parties and between the

A national plan, akin to a civil defense system, may be needed to assure that critical systems can survive a comprehensive or targeted cyber attack.

established a Cyber Response Group (CRG) and laid the groundwork for the formation of a Cyber Unified Coordination Group to respond to major cyber attacks when they occur. The Obama administration also established the Cybersecurity National Action Plan (CNAP) in February 2016. However, it will be up to the next president to ensure that the key components of CNAP, such as the Commission on Enhancing National Cybersecurity, successfully get off the ground.⁵⁵ This replicates the manner in which President George W. Bush's Comprehensive National Cybersecurity Initiative (CNCI) provided a framework for the current administration to expand cyber security defenses.

Balancing Energy and Environmental Interests

Environmental concerns are often at the center of local debates about energy development. This is true for the production of oil and natural gas, the development of a wind turbine farm or commercial solar power plant, or the construction of a new nuclear power facility. Concerns over water quality, air emissions, and community impacts from energy production have resulted in a ban on hydraulic fracturing technology in New York.⁵⁶ They also contribute to growing pressure for local control of oil and gas,⁵⁷ and denials of opportunities for oil and gas companies to site pipelines.⁵⁸ Citizen groups also have raised concerns with regards to non-fossil fuel development. Nuclear plants have long been subject to “not in my backyard” (NIMBY) efforts, and similar efforts recently have extended to the construction of wind turbines, criticizing their noisiness, disruption of the landscape, and potential to endanger birds and bats. While local stakeholders continue to voice

executive and legislative branches of government. At the state level there has been no shortage of debate as well, significantly over renewable energy standards and portfolios. In recent years, the primary area of bipartisan collaboration on energy issues, beyond liberalizing energy exports as noted above, has been on support of energy research and development.

The national debate on climate change remains fraught, and all sides are dissatisfied. The impasse stymies efforts to address climate change as well as development of clear regulatory policies the energy industry needs to make long-term investments. A prolonged standoff risks failure at both addressing climate change and sustaining the U.S. energy boom that has been so beneficial to the national economy and global energy market stability. There are risks of magical thinking and shortsightedness on all sides, from those who deny climate risks are real to those who demand immediate cessation of fossil fuel use.

Even those who agree that climate change risks are potentially severe and cannot be ignored are of different minds with regard to how to proceed. This includes the authors of this report. The next president will have to contend with these divisions, even if nearly all stakeholders would agree that the status quo is far from ideal.

Policy Responses to Climate Change: Two Views

The following exposition of views on climate change by the two lead authors of this report lays out two analytical frameworks on the issue, including a policy diagnosis and statement of policy principles for the next president.

MR. GOLDWYN believes that science demonstrating the rate of a warming climate, including anthropogenic contributions, presents risks that require U.S. policy to reduce emissions. This must occur both through domestic action and multilateral engagement.

The social consensus in favor of addressing climate change is growing, especially among younger generations, and the only politically viable path to a balanced energy and climate policy runs through a firm, enforceable policy on climate. The next president should focus on fostering a national conversation on the most cost-effective ways to determine how, not whether, to reduce emissions. This

more effective options for the future. Renewable energy alone will not enable the world to even stabilize greenhouse gas emissions with current technology. The nation and the planet will not reach de-carbonization without technological breakthroughs in energy storage and carbon sequestration.

A revenue-neutral carbon tax is widely believed to be the most efficient and effective policy choice for cutting emissions. It has supporters on both sides of the debate. An additional technology-neutral policy option is a clean energy standard, for which there also has been historical bipartisan support. The next president should both direct

The next president should pursue policies that will place a price on carbon without incentivizing any particular low-carbon technology.

will be crucial to sustain U.S. leadership in the world, to embrace a strategy to limit the Earth's temperature rise to 1.5 or 2 degrees, and to sustain the hydrocarbon industry's license to operate. Significant political conflict over climate and energy emerges from the use of second-best policy solutions that result from a failure to reach political consensus on technology-neutral carbon pricing.

The United States must sustain its participation in the Paris Agreement, which with 178 signatories represents a powerful and historic demonstration of international consensus on a policy to address climate change. Undoing or renouncing the agreement would damage U.S. efforts to promote democracy, rule of law, and security with other nations.

There is a direct link between public confidence that the government is addressing climate change and the intensity of opposition to energy production and permitting, including approval of pipelines. The energy industry is dependent on public support, but faces growing opposition from local stakeholders like Keep It in the Ground. This makes climate change and environmental issues of paramount importance for not only policy leaders, but also the energy industry broadly.

The next president should pursue policies that will place a price on carbon without incentivizing any particular low-carbon technology. This will allow the market to determine the solutions that will serve best. Further, technology-neutral policies ensure that new technologies can be integrated as they are developed, allowing U.S. innovators to continue to develop new, more advanced,

serious analyses of these options and whether they would need to add to or replace existing policies and regulations, and lead a national discussion on how, and how effectively, such policies would operate.

Finally, the next president should establish a White House Council on Energy and Climate Policy charged with coordinating energy policy with related national security, economic, environmental, and domestic issues. At least ten different departments now share responsibility on this issue with no senior official designated to coordinate broader energy policy. The broad scope of the council reflects the prominent role that climate policy plays in international and national energy policy, the enduring importance of hydrocarbons, and the geopolitical risks posed to the production and trade of these global strategic commodities. The council should be led by an assistant to the president at a level equivalent to the head of the National Economic Council.

MR. MCNALLY contends that climate change risks cannot and should not be dismissed or ignored. However, a sound approach to assessing and addressing the risks of climate change begins first with depoliticizing the debate over the science, data, and modeling pertaining to risks posed by anthropogenic greenhouse gas emissions. The next president should firmly reject recent efforts by some state attorneys general to criminalize scientific inquiry and debate, a recent development that threatens to worsen the nation's already deep impasse on climate. Depoliticization also requires recognizing and contending with large data and modeling uncertainties and challenges. As the Obama administration EPA noted "[s]cientists are certain that human activities are changing the composition of the atmosphere, and that increasing the concentration of greenhouse gases will change the planet's climate. *However, they are not sure by how much it will change, at what rate it will change, or what the exact effects will be* (emphasis added)."⁵⁹ These remaining uncertainties, alongside limitations of long-term climate models, must be evaluated more thoroughly and objectively before strategic responses ranging from national and/or multinational

The current swath of federal and state command-and-control policies and regulations to reduce greenhouse gas emission theoretically could be replaced with a less distorting, revenue-neutral tax on carbon. However, this would be a second-best solution and is very unlikely given the highly partisan debate. The one area of policy focus related to climate change that should and could find bipartisan agreement is to reform how the nation fosters scientific breakthroughs. After all, unlocking abundant, affordable, and clean energy technology, from primary energy sources through storage, transmission, conversion, and use, not only would open new pathways to addressing climate change but also vastly enhance our economic and national security. The next president should prioritize the cancellation of current subsidies or mandates for mature but uncompetitive energy sources, allocating part of the savings to basic scientific research and innovation. The proper role of government is to invest in technological breakthroughs that the private sector is unwilling or unable to support because of their commercial considerations and time frames.

The next president should firmly reject recent efforts by some state attorneys general to criminalize scientific inquiry and debate.

mitigation, abatement, and technological innovation and specific policy steps can be appropriately considered. This evaluation of scientific uncertainties and strategies must be (and be broadly perceived to be) objective and depoliticized. Afterward, if policy steps – especially any taxes, rationing, or subsidies entailing higher costs for consumers and budgetary resources – are to be considered they should enjoy clear public support and explicit approval of Congress.

To depoliticize and reboot our nation's approach to climate change, the next president should transfer lead responsibility on climate change from the EPA to a White House task force composed of the Department of Energy, State, EPA, and other agencies and Executive Office departments, coordinated by the Chairman of the White House Council on Environmental Quality. Moreover, the next president and Congress should recognize that our current environmental laws, in particular the Clean Air Act, were enacted to address pollution hazardous to human health, such as sulfur dioxide and nitrogen oxides, and not greenhouse gas emissions. Moreover, Congress repeatedly and on a bipartisan basis has explicitly rejected direct controls on greenhouse gasses.

STANCE ON:	MR. GOLDWYN	MR. MCNALLY
Climate Science, Data, and Modeling	The science is clear: The global climate is changing, and human activities are contributing to those changes. This results in higher average temperatures.	While some aspects of climate science are clear, others remain uncertain. Moreover, long-term climate models are limited. The current debate is highly politicized, most recently featuring attempts to criminalize scientific inquiry and debate, and does not provide a sound basis evaluating uncertainties and strategies, much less winning broad public support and congressional backing for taxes, subsidies, or rationing policies that would raise costs for consumers and businesses.
Appropriate Public Policy	Sufficient evidence exists to warrant urgent, responsive, and preventive policy action to address and mitigate emissions and the risks posed by climate change.	Recognizing some sound policies like boosting basic research or promoting gas exports will have climate benefits, the climate debate must be depoliticized and rebooted before implementing taxes, subsidies, or rationing. Should policy action become necessary, no strategy will be a priori excluded, including adaption, technological innovation, and mitigation.
Policy Instruments	The U.S. economy requires a price on carbon to encourage an adequate private-sector response to climate change. Technology-neutral policies will provide needed incentives with minimal market disruptions. Specific policy options leaders should consider include a clean energy standard or a revenue-neutral carbon tax, in addition to existing regulations on air pollutants beyond carbon dioxide.	The immediate policy priority should aim to depoliticize the debate. Furthermore, it should protect all scientific inquiry and free speech. The federal government should suspend or review climate regulation under the Clean Air Act and other statutes never intended to address the issue. Routine permitting of energy infrastructure should resume, free from climate-related obstruction.
Research, Development, and Demonstration (RD&D)	Continued RD&D is vital to the ability of the United States and its international partners to meet their long-term climate and environmental goals. Federal and private investment in new and advanced technologies, such as carbon capture and sequestration, advanced nuclear technologies, etc., should continue or possibly see increased support.	Policy leaders should end taxpayer-financed subsidies, including tax credits, loans, and other outlays and mandates, including at the Defense Department, benefiting mature but uncompetitive energy sources. They should use part of the savings to invest in RD&D on all energy resources to unlock technological learning and innovation. This can support improved energy storage. Further financial savings should support debt reduction.
Multilateral Climate Action	The United States must sustain its participation in the Paris Agreement and continue to engage internationally on climate issues, through forums like the United Nations Framework Convention on Climate Change and the Clean Energy Ministerial. It should also continue to lead international financial institutions' efforts on climate issues.	U.S. leaders should guide a fresh and depoliticized effort to evaluate remaining uncertainties, assess strategic options and trade-offs, and devise and implement any appropriate, equitable, and cost-effective measures that may need to be taken, to address climate change.
The Role of Natural Gas	Natural gas is a lower-carbon fuel compared to coal and oil-based fuels. The United States and international organizations should ensure that natural gas is considered as part of a low-cost package of solutions available to nations seeking to reduce emissions from the power sector while also cost-effectively increasing energy access.	Agreed.

Policy Recommendations

While the primary direction of U.S. energy and climate policy will be decided at the ballot box, there is a discrete set of policies that navigate a broad center. They include reasonable, depoliticized, bottom-up standards for oil and natural gas production, and technology-neutral, cost-effective ways to promote abundant, affordable energy supplies, including lower-carbon energy sources. At the heart of this policy approach is a robust, fiscally responsible RD&D strategy. Additionally, the United States needs a fundamental pathway that is both collaborative and reasonable to reduce methane emissions. Such new energy policies have many potential benefits, including enhancing safety and reducing environmental risks and pollution (with benefits for public health in addition to climate). Additionally, they can increase public confidence and help to secure a social license to operate.

The next president should lead an effort to address key energy-sector challenges through a variety of measures that will expand safety, security, and prosperity for U.S. interests. Key recommendations are outlined below.

Modernize and Expand the Electricity System. The electricity system requires significant levels of infrastructure investment through 2030 to account for growing electricity demand plus changes in the technology used by (and threats and hazards posed to) the system. The electricity sector must keep up with new energy sources and technologies.

- Federal agencies, particularly DHS and DOE, should work in tandem to understand and mitigate the risks posed by cyber and physical threats to electricity infrastructure.
- The federal government should support robust RD&D through the DOE's budget, including analytical support for grid modernization, grid operations, security, and management.
- A White House–led national strategy should be designed to maximize grid flexibility and electricity storage. FERC, DOE, the National Association of Regulatory Utility Commissioners, and industry should be at the table. It will be important to harmonize electricity standards and priorities among all jurisdictions: federal, state, and local.
- The DOE should, as recommended in the *Quadrennial Energy Review (QER)*, help to develop frameworks that value new grid services and technologies by convening stakeholders to collect input and then design pricing mechanisms for a “reliable, affordable, and environmentally sustainable electricity system.”⁶¹

- FERC should lead an effort to develop long-distance transmission lines and more broadly ensure that transmission capacity keeps up with generation. This is especially important as producers integrate more renewable energy into the grid, and increase utilization of natural gas–fired generation. FERC should also examine ways to maintain reliable backup power, even as there is more self-generation from individual consumers.
- The next president should direct the DOE to serve as a convener among state, local, and federal stakeholders, as recommended in the QER, to ensure coordination between grid systems. This will promote market integration and enhance the functioning and coordination of the electricity system while still respecting jurisdictional lines. The DOE should look into options for creating reserves of power transformers as a potential solution in the event of a major grid disruption. Additionally, the DOE should review, and offer analytical and technical support for, state and regional assurance plans. This will ensure that they can respond to cyber-based disruptions when they occur.

Protect Sea Lanes, Maintain Defense of Key Producers Against Threats, and Sustain U.S. Energy Diplomacy Abroad. With 80 percent of U.S. total energy demand projected to be derived from hydrocarbons through 2040, assuring stability of supply, ameliorating price shocks, and enhancing the resilience of the U.S. energy system is a primary objective. The U.S. DOS' Bureau of Energy Resources, as well as the DOE's Office of International Affairs, must engage in proactive diplomacy toward troubled oil-producing states to bolster security of supply.

- U.S. energy diplomacy must reflect the fact that the Middle East's role as a critical supply source for global oil and gas will remain and even grow in coming decades. The next president should clearly and unabashedly signal to allies and partners in the region, including Saudi Arabia and other Gulf States, that the United States is not withdrawing from the region. Furthermore, it should, where necessary, expand long-standing commitments to assist these allies in combating shared security threats and defending key strategic energy transit corridors. Diplomatic and military strategy should continue to be based on the reality that, despite lower U.S. oil imports, the United States has a vital

national security and economic interest in the stability of the Middle East, especially the Gulf region. Furthermore, U.S. interests squarely support the free flow of energy from the region to all consuming markets.

- To bolster its ability to lead energy diplomacy, the White House should prioritize the Senate confirmation of an Assistant Secretary of State for the Bureau of Energy Resources.
- The State and Energy Departments should expand collective energy security efforts through the International Energy Agency with the following measures:
 - » Support the accession of IEA candidate countries Chile and Mexico by providing both countries technical support, where appropriate, in meeting the requirements for membership.⁶² Full compliance on the part of both countries will benefit the resilience of global strategic reserves and support better quality energy data in the Western Hemisphere.
 - » Encourage negotiation of an emergency response accord with China, India, and future holders of strategic reserves.
 - » Enhance, through financial support, IEA engagement with major non-OECD consuming nations, such as China and India, on data collection and IEA analysis into new areas of study. This could include increased analysis of natural gas markets.
- The United States should pursue more open and transparent oil and natural gas trading globally to strengthen security of global supply. When negotiating trade agreements, the DOS and U.S. Trade Representative should seek national treatment⁶³ for U.S. oil and gas exports abroad as a way to enhance the resilience of major energy-consuming states and regions. Such policies, by assuring open trading markets and removing import duties imposed on foreign imports of U.S. oil and gas, will support the deployment of U.S. energy production and exports, particularly natural gas,⁶⁴ as a global buffer against supply disruptions.
- The United States should sustain its bilateral energy diplomacy and technical assistance programs, both independently and through participation in international financial institutions, to ensure safe and responsible energy production abroad as well as multi-lateral collaboration on development and deployment of CCS, battery storage, advanced nuclear technology, and natural gas as a clean power source.⁶⁵
- The United States, led by the DOS's Bureau of Energy Resources and the U.S. Mission to the European Union, should continue energy sector engagement with the European Union to ensure that the United Kingdom's exit from the body does not result in reduced European efforts on regional energy policy. The United States should support Europe's successful programs to bring about a more integrated, market-oriented, and flexible energy system, enjoying progressively improved diversity of supply.
- The United States should lead an international effort with the IEA and other partners to improve the quality of data collection on global energy markets. In doing so, it may be able to collaborate with fellow IEA member Canada, as similar trilateral, regional-level efforts are under way with Mexico under the framework of regular meetings of the North American Energy Ministers.⁶⁶ Poor data adds to uncertainty and therefore volatility and cost, and inhibits sound policy development.
- The United States should aggressively promote large, low-cost, liquid but also well-regulated financial markets and mechanisms for energy producers and consumers to hedge against oil price swings.

Improve U.S. Emergency Response Measures for Oil and Gas Disruptions. The Department of Energy should lead efforts to complete the modernization of the Strategic Petroleum Reserve and the infrastructure required to draw down and transport SPR oil, to assure that it can be used to supplement global oil supply in the event of a severe disruption.

- The president should reverse the decision to sell off more than 160 million barrels of oil from the SPR for budgetary purposes. He or she should do this by rescinding the sales if possible, reestablishing the royalty-in-kind program to replenish the reserve, or proposing to Congress to replace income from projected sales with another source of funds.
- The DOE should complete assessments of the benefits of establishing additional refined petroleum product reserves. If warranted, it should seek congressional approval and appropriation to construct them to ensure that petroleum products are available to primary demand centers in the event of a weather- or hostile action-related disruption.
- The DOE should also examine ways to ensure that national gas storage is safe and adequate to mitigate demand spikes.

Modernize Energy Transportation. The nation requires sufficient pipeline capacity to move natural gas to demand centers, and to provide multiple, safe means of transporting oil from producing areas to refining centers. Pipelines are the safest form of hydrocarbon transportation (relative to road and rail), and the next president must promote the approval and construction of new pipelines. He or she also must prioritize the modernization and expansion of the nation's inland waterways, to accommodate growing oil shipments, and its transmission infrastructure, to meet rising demand in a digital economy.

The White House should offer incentives for construction of new transportation infrastructure by proposing a short-term program of accelerated depreciation. This will mean that the cost of new infrastructure replacing pipes more than 20 years old could be written off over a ten-year period if replacement was launched within two years of the program's commencement.

Improve Infrastructure Permitting. One of the greatest impediments to infrastructure modernization is the uncertainty, politicization, and delay involved in permitting.

- The next administration should guarantee the success of the newly expanded online Federal Infrastructure Permitting Dashboard by ensuring that the Federal Permitting Improvement Council is established and sufficiently staffed. The next president should issue an executive order providing further guidance on time lines for all permitting to provide further clarity and accountability.
- The permitting of cross-border oil pipelines should be depoliticized by moving the environmental assessment of such pipelines from the DOS to FERC. The DOS should retain responsibility for issuing a national interest determination on foreign policy grounds, much as it does for licensing decisions made by Treasury's Office of Foreign Assets Control.

Prioritize Critical Infrastructure Protection. The U.S. electricity system, nuclear plants, and oil and gas production and refining infrastructure are at risk of cyber attack. The increased digitization of the electrical grid raises the risk of attack on businesses and residences as well. Current U.S. efforts to combat cyber attack are disaggregated and underfunded, and attempts to better coordinate them have had limited success in providing a unified government-wide approach.

- The United States should enhance DHS's National Infrastructure Protection Plan to ensure that it identifies critical areas, provides warning to infrastructure

owners, recommends protective measures, and considers backup systems to maintain civil defense.

- The United States should also consider having a public deterrence policy to warn transgressors of the consequences of attacking U.S. systems. This effort should be led by the White House and the DHS to maximize interagency coordination, with the DOE, including its national laboratories, the Director of National Intelligence, and the Department of Defense playing lead roles.

Encourage Constructive Engagement on Energy and Environment. Polarization between the energy industry on the one hand, and community and environmental interests on the other, over environmental and climate issues should not be interpreted to mean that solutions, even bipartisan ones, are unavailable. Even today, commonsense solutions are available to respond to some of the concerns that local stakeholders and policymakers have with regard to oil and gas development. In the case of methane emissions, numerous companies have chosen to participate in the EPA's Natural Gas Star Program, as well as the enhanced Natural Gas Star Challenge Program, an initiative that encourages oil and gas companies to use the best available technologies to reduce methane emissions throughout the natural gas value chain.

- The DOE could launch a research program, including collaboration with industry, to look at better ways to capture flared gas and utilize it for on-site power generation or transportation, which could monetize the resource and enhance sustainable production.
- The next president should promote voluntary initiatives by companies with the goal of demonstrating approaches to the management of methane emissions or other emissions or environmental issues. He or she should encourage such efforts with credible timetables, to maximize collaborative problem solving.

Conclusion

The cost, reliability, and availability of energy remain critical to the U.S. economy and national security. While the country's self-sufficiency has increased greatly in recent years with greater domestic supply of hydrocarbons and growing renewable energy resources, the nation faces new and continuing vulnerabilities that merit urgent attention. There are a core set of realities about the energy system that have earned bipartisan acceptance, and a small but important set of policies that should earn bipartisan support in new public policy. This paper outlines several such policy recommendations in the hope that whoever wins the 2016 presidential election can forge an energy agenda that fosters a modern conception of energy security. This approach will help to protect the nation from price shocks, potential energy supply disruptions, and other energy sector threats that are inevitable in the next administration and beyond.

Endnotes

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