PERSPECTIVE

Critical Energy Choices for the Next Administration

October 2012

Introduction

Energy is the lifeblood of a modern economy. How America uses, generates, and produces that energy is decided by a combination of economic and political choices that are made over the span of decades.

The questions the next President will face are more complex and difficult than we have ever faced: climate change, national security, prices, and new technologies all intersect to ensure there are very few "win-win" choices.

Congress and the Administration will have to craft compromises with the goal of ensuring a long-term energy system that is more secure, stable, and sustainable than today's.

Over the last four years, the United States has seen the beginning of a great change in how it uses and produces energy.

Part of this change is due to government policy, particularly the impact of the 2009 stimulus on accelerating clean energy. The other part, however, is due to the impacts of new technologies, especially hydraulic fracturing and horizontal drilling, which have expanded America's accessible fossil fuel resources.

Due to these changes, this report analyzes very different choices than what a similar analysis would have written in 2008.

In fossil fuels alone, the narrative has changed from being about rising oil imports, declining resources, and increased prices to questions about how to manage abundance.

Two things have not changed over the last four years

First, consumer energy prices, petroleum products particularly, have remained high. Second, the Middle East remains the most important center of energy affairs: small changes in the regional balance of power have caused two sustained oil price spikes in the past two years.

ASP American Security Project

Until the U.S. no longer depends solely on oil for transportation, questions of energy security will always begin with Middle Eastern oil.

Meanwhile, long term challenges remain.

Even though neither candidate has made it central to his campaign, climate change is an issue that will not go away: we cannot argue with chemistry and nature, and the longer we wait, the worse it will get.

Likewise, even though we suddenly have access to more oil and natural gas, the world's population continues to grow, and developing countries' economic growth is putting more pressure on energy than ever.

The world will need sustainable alternatives to fossil fuels – and America can lead in the research and development necessary to get there.

Critical Energy Choices

How to Use America's New-Found Fossil Fuel Abundance
How to Address Climate Change
Stability in the Middle East – Stemming Disaster
Renewable Energy
Scientific Research into Next Generation Energy

How to Use America's New-Found Fossil Fuel Abundance

America's domestic oil and natural gas industries have undergone a sea change over the last few years, with experts optimistic that the United States could become self-sufficient in both oil and gas production within a decade.

Natural Gas

Advances in hydraulic fracturing and horizontal drilling have revolutionized the natural gas industry. In 2011, the U.S. production of 28 trillion cubic feet of natural gas was the highest on record, and it makes America by far the largest producer of natural gas in the world.[1]

With the country awash in gas, prices have plummeted.

As a result, electric utilities are rapidly switching from burning coal to natural gas in order to generate electricity. In April 2012, natural gas generated 32% of the nation's electricity, equaling coal's share in electricity generation for the first time ever.[2]

The market determines this fuel switching, but the next administration still faces an important set of political choices: what should America do with the natural gas windfall? The answer to this question has sparked intense debate in recent months.

First, with natural gas prices fetching as much as $18 per million Btu (MMBtu) in Asia while prices in the U.S. hover in the $2-$3.50/MMBtu range, the natural gas industry wants federal regulators to allow the liquefaction and exportation of domestic natural gas. This requires licensing from the government.

The next administration will need to decide whether or not to license natural gas exports. The benefits are obvious: exporting LNG will improve the trade balance, create employment in natural gas production, and could create a geopolitical dividend by undercutting Russian influence over energy supplies to some of our key allies.

A second option would be to use natural gas to fuel our nation's transportation sector. Under current prices, using compressed natural gas in cars and trucks is considerably cheaper than gasoline.[3] While natural gas is used sparingly in some municipal bus fleets and trucks, the transportation sector is almost entirely dependent on petroleum fuels.

The next administration could implement policies to begin to use our natural gas bounty for our nation's automobiles by promoting refueling infrastructure and incentives to adopt natural gas vehicles.

A third option for natural gas would be to use it to help spark a manufacturing renaissance in the United States.

As a feedstock for a variety of industrial products, low natural gas prices are already bolstering the manufacturing sector. According to Dow Chemical, 91 new manufacturing projects have either begun or have been proposed within the U.S. because of cheap natural gas – projects that total over $70 billion in investment and may create three million jobs.[4]

In a globalized economy, low natural gas prices make America a much more competitive place for companies to operate.

Unconventional Oil Production

The same technological breakthroughs that underpinned the shale gas revolution are working their way through the domestic oil industry.

With huge increases in production from the Bakken formation in North Dakota and the Eagle Ford in Texas, U.S. oil production has reached its highest levels since the 1990s.[5] The surge in production has ignited optimism over America's ability to produce enough oil to meet all its energy needs by the end of the decade.

The next President will need to make a decision on the Keystone XL pipeline.

Canada holds the world's third largest reserves of oil,[6] but 98% of those reserves are in the form of viscous oil sands.[7] Oil sands are highly carbon-intensive, and the nature of its dirty production process has caused substantial opposition to the Keystone XL pipeline. The pipeline would carry oil sands from Canada to the Gulf Coast (the southern leg has already been approved). The next administration will need to decide whether the northern route will move forward.

While approving the Keystone XL will bring more oil sands to market, much of it could be re-exported from the Gulf to other countries.[8] Prices at the pump will not be significantly impacted. The next President will need to weigh these marginal benefits against the cost of increased greenhouse gas emissions from expanding oil sands production.

Reducing Oil Dependence

While the outlook for domestic oil production has dramatically improved over the last four years, oil demand still remains a key vulnerability for our economy. Every day, the United States burns over 18 million barrels of oil, by far the most in the world.[9]

The next administration faces several critical choices on how to diversify our fuel sources for the transportation sector.

First, the recent doubling of the corporate average fuel economy (CAFE) standards is a good example of a

policy that will reduce our dependence on oil, improve our economy, and reduce greenhouse gas emissions. More policies to improve efficiency in our nation's cars and trucks will make us more secure.

Second, the next administration could lay out policies to incentivize the use of alternative sources – biofuels, compressed natural gas, electric vehicles, and mass transit.

Third, a push for a price on carbon could cut into oil demand, while at the same time spur development in cleaner alternatives.

Conclusion

The boom in fossil fuel production over the last four years gives Americans the perception of greater energy security.

Moving forward, key decisions will need to be made on how to manage this new-found bounty, while at the same time protecting the environment.

In reality, however, American dependence on oil presents national security challenges.

It drains our economy by transferring hundreds of billions of dollars abroad each year,[10] it contributes to climate change, and it leaves us vulnerable to price volatility.

How to balance fossil fuel production while breaking our oil dependence will be a key challenge.

How to Address Climate Change

Climate change is scientific fact; it is real and poses a clear danger not only to the United States but to the entire world.

Climate change creates more than just new weather patterns; it also presents deep and broad challenges to U.S. security including unprecedented levels of drought, extreme flooding, wildfires, food security and water availability.

Its effects on our global allies as well as the direct effects it has on our domestic agriculture, infrastructure, economy and public health necessitate a strategic plan in response.

The next administration, whether Republican or Democratic, will face a global climate that is changing at a faster rate than ever before, threatening the stability and prosperity of the entire world.

However, certain measures can be taken to minimize the effects of climate change.

Measures to Reduce Emissions

As the world's second largest emitter – about 5,638 million metric tons of carbon emitted from energy generation in 2010 (18% of global emissions) [11] – the U.S. will play an important role in determining whether the world can successfully prevent dangerous climate change. The United States still gets about 83% of its energy from fossil fuels, the main drivers of climate change.[12]

Any plan that looks to reduce emissions will require either reducing the total amount of energy produced (either through gains in efficiency, or absolute declines in energy used) or replacing a large portion of energy production with emissions-free power.

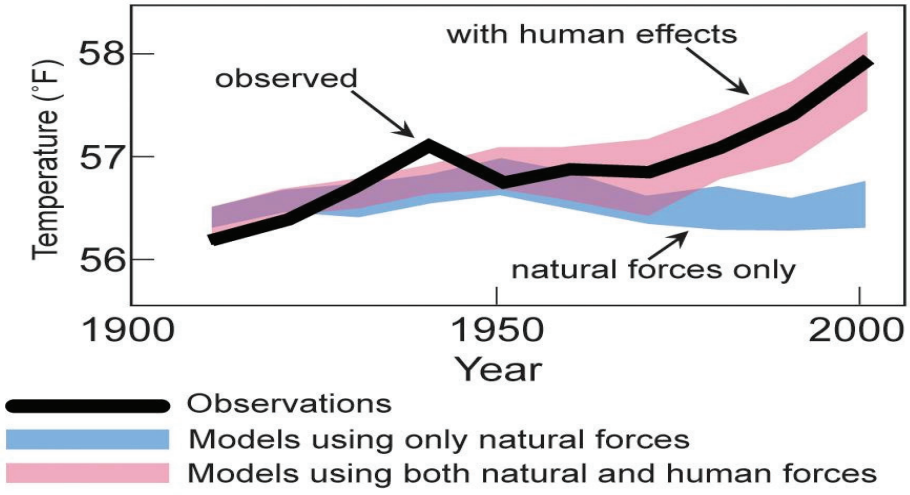
The next administration will have clear choices to make regarding the government's role in reducing national emissions.

Decisions on how strictly to legislate and enforce pollution limits have significant impacts on decisions about how to produce energy. For example, although the cap-and-trade program proposed in the American Clean Energy and Security Act of 2009, or "Waxman-Markey," died in the Senate, the next administration should consider other options to limit greenhouse gas emissions.

Earlier this year the Obama administration issued fuel economy car standards that will raise automobile fuel efficiency to the equivalent of 54.5 miles per gallon – on average – by 2025.[13] This type of action lowers greenhouse gas emissions, reduces American dependence on oil, and insulates consumers from gas price volatility.

Another major decision point focuses on the Environmental Protection Agency (EPA) and what role it will play in regulating the emissions of fossil fuels.
Under the legal requirements of the Clean Air Act and Supreme Court rulings, the EPA has increased its regulatory involvement over a range of issues including toxic air pollution from power plants and greenhouse gas emissions.

While much of the next President's authority over environmental protections is limited by previous judicial decisions, the rigor with which the administration exercises its authority through the EPA gives it significant influence.



International Negotiations

How to negotiate in international agreements designed to reduce the effects of climate change is another key decision-area for the next administration.

International climate change negotiations through the United Nations Framework Convention on Climate Change (UNFCCC) will continue, and the next administration will need to decide how aggressively it wants to pursue an international agreement.

The Copenhagen Accord, though not legally binding, commits the United States to a continuation of the Kyoto Protocol, a "Green Climate Fund" to combat climate change, technology transfer to developing nations, and emissions pledges.[14] These types of international agreements will require further commitment by the next administration if they are to remain in place.

The ongoing UNFCCC process, including the next Conference of the Parties meeting this coming November in Doha, is establishing new financial and emissions commitments that the United States will be asked to be a party to.

Most notable, however, is an international agreement committing nations to forge a binding international accord by 2015 for entry into force in 2020.

The next administration will be asked by international partners to lead in these negotiations, and take aggressive steps to complete an agreement.

Conclusion

Climate change presents serious national security risks to both global and domestic security. It will also exacerbate regional and local tensions in 'hot zones' around the world, likely drawing attention from the American military.

At home, climate change will cause great harm to America's infrastructure, agriculture and economy. It directly affects America's homeland security and the integrity of American military installations both at home and abroad.

Although international negotiations on mitigation efforts have proved intractable, steps need to be taken to deal with adaptation. Many of the effects of climate change are already set to occur, and American policymakers need to deal with those consequences.

The U.S. government has a variety of ways to prepare for climate change including greater collaboration with local agencies, strengthening energy and physical infrastructure, and promoting awareness of the effects of climate change.

It is dangerous to allow greenhouse gas emissions to grow unchecked.

To meet these challenges will require policymakers to make some decisions and set some priorities that will not always be popular. But, in the long-term, they are critical for national security.

Stability in the Middle East – Stemming Disaster

Gasoline prices in America have risen – and fluctuated wildly – in recent years.[15] While U.S. oil production continues to expand, oil is a global commodity.

Oil prices are set on the global market.

A supply disruption in the farthest corner of the world can cause prices to spike anywhere in America.

The Middle East still looms large in the energy world, comprising 30% of world oil production.[16]

With civil war still raging in Syria, ripples from the Arab Spring, the threat of war with Iran, civil strife in Yemen, terrorism, and a range of other issues, oil markets will remain volatile.[17]

Iran

Perhaps no issue is as pressing as the threat of armed conflict with Iran, which could cause dramatic economic disruptions in global oil markets.[18] The threat of war has already added a price premium to oil, a premium that could increase if Iran does acquire a nuclear weapon.[19] Nearly 35% of seaborne traded oil travels through the Straits of Hormuz, which Iran has threatened to cut off in the event of a conflict.[20]

The closing of the straits would send shockwaves through the oil markets, raising costs domestically and having dire effects on an already fragile global economy.

The next administration will need to carefully weigh the issues.

Arab Spring

The Arab Spring has put global oil markets at risk.

These uprisings have been unpredictable and had dramatic consequences on the region. Although the governments of several major oil and gas producers avoided losing control of their populaces during the height of the unrest, they were also affected by the region's turmoil. Saudi Arabia and Bahrain used a combination of fiscal stimulus, appeals to religious leaders, and violent policing to suppress uprisings within their borders.[21]

While the Arab Spring seems to have passed, the same conditions that led to popular revolt still exist. Analysts have seen Kuwait and Oman, both major oil producing countries, as being vulnerable to these uprisings.[22]

The question is how long can the current stability be maintained? Should another uprising occur, the United States must determine if it will continue to support the monarchs of these countries in the wake of human rights abuses and the absence of authentic democracy.

The next administration must also be prepared to navigate these relationships, seeking stability while at the same time promoting opportunities for millions of the disenchanted in the region.

Terrorism

Terrorist groups, including Al-Qaeda and its affiliates, have demonstrated their interest in disrupting oil flows in the past in order to inflict economic damage on its foes.[23] For example, in 2011, the number of attacks on energy related infrastructure peaked with 438 reported incidents.[24]

In 2002, Al Qaeda launched an attack against a French oil tanker, dumping 90,000 barrels of oil into the Gulf of Aden.[25] In a 2005 incident, Saudi police assaulted an Al Qaeda linked compound in the city of Ad Damman finding an arsenal of small arms and documents necessary for gaining access to a local gas and oil facility.[26]

In one of the most dramatic attacks on oil energy infrastructure, on February 24, 2006, suicide bombers attempted to detonate two vehicles filled with explosives at the Abqaiq oil facility. The attack was thwarted, but it roiled oil markets.[27] In another example, following the raid on Osama Bin Laden's Pakistani compound, Homeland Security officials announced that they had discovered intelligence that Al-Qaeda had an interest in targeting oil production sites and tankers across the Middle East and North Africa.[28]

The threat from terrorism against oil and gas is real and has been demonstrated.

Currently, instability in the Middle East adds a risk premium to the price of oil. Should a major attack succeed, that premium will skyrocket.

Conclusion

The fragile stability in the Middle East will continue to dominate American foreign policy in the next administration. The next president must recognize that war with Iran will have an adverse effect on the global energy market.

Additionally, major energy producers in the region are at risk from domestic upheaval and terrorism. It is unclear how long the monarchs of these countries will stay in power or if a new popular uprising will threaten their reign.

The U.S. should use diplomatic channels to ensure that human rights abuses are prevented, and that the leaders of these countries can meet the demands of their people.

Working with these Arab countries to maintain the security of oil production and transportation is vital for America's energy security.

Renewable Energy

Renewable energy is a crucial part of decreasing America's dependence on fossil fuels and improving its energy security.

An economy that relies on renewable power for its energy needs will be able to manage its foreign policy independently of how it utilizes energy.

Renewable energy has made significant progress in recent years.

From June 2011 to June 2012, electricity generation from solar grew by 94.7%.[29] Moreover, the share of electricity generated from non-hydro renewable energy doubled between 2008 and 2012, from 3% of the total to 6%.[30]

The Department of Defense (DOD) is also making headway in clean energy usage and investment. In 2009, the Secretary of the Navy, Ray Mabus announced the goal of supplying 50% of the Navy's energy needs from renewables.[31] Other services have similar goals.

Proof of progress for renewable energy can be seen in the dramatic declines in costs for manufacturing. The average price of solar panels has declined by about 75% in the last three years[32] and the costs of wind power have halved since 2009.[33]

As renewable energy continues to grow, the next administration will need to design policies to promote more renewable energy, but also policies to improve transmission capacity and to roll out smart grid technology to deal with variable output in power.

Increasing Renewable Energy

There are a variety of policies that the next administration could support to build on the gains that renewable energy has already made. First, a national renewable portfolio standard (RPS) or clean energy standard (which would include credits for nuclear power and natural gas) would create market demand for renewable energy.

There has been some semblance of bipartisan support for such a policy in the past.

Thirty three states plus the District of Columbia have an RPS; a federal RPS would create one national standard.[34]

Feed in Tariffs (FITs) – guaranteeing an elevated price for renewable energy – have proven successful in

Europe at installing renewable energy capacity.[35] Such a policy would likely work in the United States as well, but could prove contentious.

Implementing a price on carbon pollution, as discussed in the above section on climate change, would also stimulate demand for renewable energy as a lower cost alternative.

Interest in carbon pricing has ebbed in flowed in recent years, but cropped up recently as part of discussions over deficit reduction.

The next administration could pursue some version of carbon pricing to bolster renewable energy.

Conclusion

Renewable energy technology has improved and prices have fallen over the past four years, and the government has shown a greater dedication to advance renewables.

While subsidies for renewable energy are unlikely to continue beyond the expiration of key policies due to fiscal constraints, there remain several options to promote renewable energy.

Fossil fuels will remain a part of our energy mix for many years. However, renewable energy in both the transportation and electric power sectors will improve America's energy security, support economic growth, and reduce the threat of climate change.

Scientific Research into Next Generation Energy

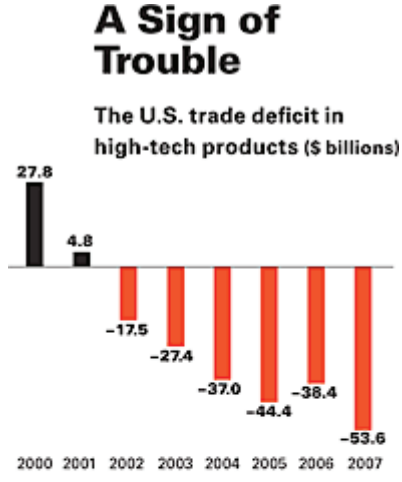
A true test of the next administration will be its approach to America's future energy choices.

While America's recent natural gas boom is a welcome development, long-term energy security challenges remain. First and foremost is America's position as a global leader in scientific research and innovation.

Recent data reveals a startling research and development (R&D) investment gap, indicating that America is falling behind.

America's future energy security depends upon developing next generation energy sources such as nuclear fusion, but to develop and commercialize these sources, proper scientific research is necessary.

The next administration has the opportunity to cement America's future growth and to ensure next generation energy security. To do so, the administration must properly invest in scientific research, it must take the lead in raising American competitiveness, and it must support next generation energy.



Note: Sectors included are: biotechnology, life sciences, optoelectronics, information and communications, electronics, flexible manufacturing, advanced materials, aerospace, weapons, nuclear technology, and computer software.

Source: National Science Board, "Science and Engineering Indicators 2008"

The Importance of Scientific Research for Economic Growth

The prosperity of America's economy depends upon its ability to innovate, and almost all innovation is a result of breakthroughs in fundamental science and research.[36]

Scientific research and innovation allow American companies to remain competitive in the international market while also spurring economic growth. Between 1998 and 2007, R&D accounted for roughly 6.3% of average annual growth in real GDP (GDP adjusted for inflation) and 6.6% between 2002 and 2007.[37]

The United States' total R&D spending (both public and private) is currently about 2.85% of GDP; which puts the U.S. in 9th place globally, behind countries like Japan, Korea, Sweden, and Denmark.[38]

The United States should invest more in scientific research in order to properly harness America's resources and capital, to create the jobs and industries of the future, and to ensure that America will remain competitive in the years to come.

The Risk to American Competitiveness due to a lack of Leadership

Recent data shows that the United States is losing its competitive edge in scientific innovation and R&D.

The United States dropped two places, from 5th to 7th, in the World Economic Forum's 2012-2013 "Global Competitiveness Report".[39] These numbers are reinforced by the fact that the U.S. ranks 27th among devel-

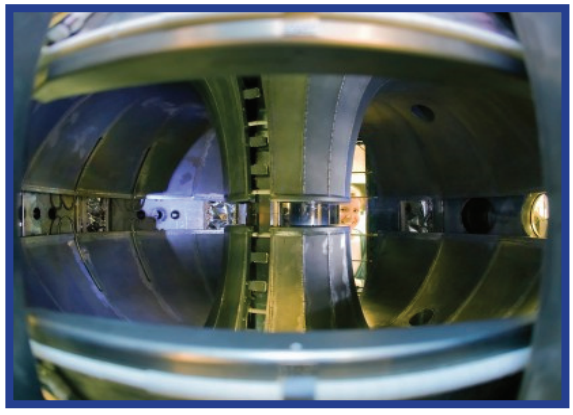
oped nations in the proportion of college students receiving undergraduate degrees in science and engineering.[40]

The United States achieved much of its economic success due to its ability to manufacture and trade high-tech products; however, as of 2002, America's trade balance in high-tech products became negative.[41]

It is clear that America is falling behind and most U.S. citizens agree. According to a 2011 Research!America poll, 77% of Americans agree that the U.S. losing its competitive edge in science, technology, and innovation.[42]

What is missing is decisive action from America's leadership.

The next administration will need to create an atmosphere hospitable to scientific research, to reinvest more in scientific innovation, and to reform American immigration policies that force some of the brightest scientists to seek work elsewhere.



PPPL LTX--A view through the Princeton Plasma Physics Laboratory's Lithium Tokamak Experiment (LTX) by Elle Starkman/Princeton Plasma Physics Laboratory Office of Communications

Next Generation Energy: Fusion Power

Over the long-term, the world will need to develop the next generation energy technologies that can produce power that is safe, clean, reliable and abundant.

Fusion energy holds this promise. Fusion energy is produced by forcing together the atomic nuclei of deuterium and tritium (two forms of hydrogen) to form helium.[43]

One gram of fusion fuel could yield 90,000 kilowatt hours of energy (it would take 10 million pounds of coal to match this energy yield).[44]

NIF Laser Bay--Seen from above, each of NIF's two identical laser bays has two clusters of 48 beamlines, one on either side of the utility spine running down the middle of the bay. Credit: Lawrence Livermore National Laboratory

Fusion reactions produce no greenhouse gases and minimal waste, making fusion energy environmentally safe. Fusion power plants also hold no risk of meltdown and, as the plants use no uranium or plutonium, there are minimal risks of weapons proliferation.

Although obstacles remain, scientists believe they are on the path to commercializing fusion energy. However, it is estimated that making fusion power commercially viable would require an investment of $35 billion over a 15 year period ($2.33 billion per year).[45]

This is no small sum of money, but as a comparison, the Apollo program cost $98 billion over 14 years and the Manhattan project required approximately $22 billion over 5 years.[46] Other countries, in particular China and South Korea, are eager to win the race to commercialize fusion.

Fusion is worth the investment, both to provide clean, safe, and efficient energy, and to ensure American energy security.

Conclusion

Scientific research is essential to America's economic growth and its future energy security.

There is a strong link between R&D spending and GDP growth, and scientific innovations allow America to remain competitive.

Decisive leadership is needed in order to ensure that scientific research receives sufficient investment.

The next administration will face many challenges, but perhaps none affects long-term energy security as much as choosing to invest in fusion energy.

Fusion energy may be criticized by some as being costly, but its potential reward is astounding.

With proper investment America could obtain a clean, safe, cheap, and energy independent future.

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FURTHER READING

Reports and Papers of the American Security Project about Energy Security

America's Energy Choices: 2012 Edition
March, 2012

The report sets out how a range of energy options for America's future contributes to U.S. energy make-up and how our business and political leaders should weigh the competing priorities of energy security, economic stability, and environmental sustainability when making decisions.

Pay Now, Pay Later: A State-by-State Assessment of the Costs of Climate Change
May, 2011

The American Security Project released a series of 50 reports which analyze and project possible economic losses—or in some cases, gains—on a state-by-state basis as a result of unmitigated climate change.

Ending Our Dependence on Oil
May, 2010

The report argues that to stop oil dependence, we must invest in infrastructure that gives Americans safe and convenient alternatives to driving, improve the fuel economy of our cars, and develop the next generation of

advanced biofuels.

Offshore Oil Drilling in the Arctic
August, 2012

This paper evaluates several reasons why the rush by oil companies into the Arctic should be considered more closely.

Counteracting Chinese Hegemony in the South China Sea
August, 2012

This ASP "Perspectives" paper highlights the reasons for increased Chinese involvement in the region, and the diplomatic and military strategies being implemented satiate its economic demands.

Cause and Effect: U.S. Gasoline Prices
April, 2012

This ASP "Perspectives" paper examines the causes of America's soaring gasoline prices and underscores that the price of gas is intimately interconnected with crude oil prices, which are set by global markets.

Climate Change and Immigration: Warnings for America's Southern Border
September, 2010

This ASP "Perspectives" paper highlights the likely effects of climate change on immigration along the US southern border.

FACT SHEETS

Arctic Climate and Energy
August, 2012

This Fact Sheet summarizes key developments in the Arctic, and discusses all aspects of Arctic energy development.

A New Discourse: Climate Change in the Face of a Shifting U.S. Energy Portfolio
August, 2012

This Fact Sheet summarizes key developments to the natural gas industry, and clarifies what they mean for climate change discourse and mitigation.

Bio Fuels and National Security
March, 2012

This Fact Sheet shows the importance of the U.S. Department of Defense's investment in developing a domestic biofuels industry that can compete with oil.

Endnotes

1. Energy Information Administration. (2012, September 28). Natural Gas. "U.S. Natural Gas Gross Withdrawals." Retrieved October 2012, from EIA web site: http://www.eia.gov/dnav/ng/hist/n9010us2a.htm
2. Energy Information Administration. (2012, July 6). Today In Energy. Retrieved October 2012, from EIA web site: http://www.eia.gov/todayinenergy/detail.cfm?id=6990
3. Siegel, J. (2012, June 4). Natural Gas Vehicles Will Kill the Electric Car. Retrieved October 2012, from Energy & Capital: http://www.energyandcapital.com/articles/natural-gas-vehicle-opportunities/2233
4. Krass, C., & Lipton, E. (2012, October 20). After the Boom in Natural Gas. The New York Times, p. BU1.
5. Energy Information Administration. (2012, September 28). Petroleum & Other Liquids. "U.S. Field Production of Crude Oil." Retrieved October 2012, from EIA web site:http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRFPUS1&f=M
6. Energy Information Administration. (2012, September 28). International Energy Statistics. "Petroleum Reserves." Retrieved October 2012, from EIA web site: http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=57&aid=6
7. Energy Information Administration. (2012, September 17). Country Analysis Brief: Canada. Retrieved October 2012, from EIA web site: http://www.eia.gov/countries/analysisbriefs/Canada/canada.pdf
8. Kretzmann, S. (2011, September). Report: Exporting Energy Security: Keystone XL Exposed. Retrieved October 2012, from The Price of Oil web site: http://priceofoil.org/2011/08/31/report-exporting-energy-security-keystone-xl-exposed/
9. Energy Information Administration. (2012, September). International Energy Statistics. "Petroleum Consumption." Retrieved October 2012, from EIA web site: http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=5&aid=2
10. Securing America's Future Energy. (2012). U.S. Oil Dependence. The 5th Annual Transportation & Infrastructure Convention. Washington DC: SAFE. http://www.transportationsummit.com/documents/c12-RonaldMinsk.pdf
11. US Energy Information Agency (EIA), Emissions of Greenhouse Gases in the United States 2009. Report available at http://www.eia.gov/environment/emissions/ghg_report/pdf/0573(2009).pdf .
12. For a full discussion on the main drivers of climate change, see Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, Working Group 1, The Physical Science Basis (2007).
13. The White House. (2012). Driving Efficiency: Cutting Costs for Families at the Pump and Slashing Dependence on Oil. Retrieved from White House web site: http://www.whitehouse.gov/sites/default/files/fuel_economy_report.pdf
14. The United Nations Framework Convention on Climate Change: The Copenhagen Accord. Retrieved October 2012, from the UNFCCC website: http://unfccc.int/meetings/copenhagen_dec_2009/items/5262.php
15. U.S. Energy Information Administration. (2012). U.S. All Grades Reformulated Retail Gasoline Prices. Retrieved October22 2012, from U.S. Energy Information Administration: http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0R_PTE_NUS_DPG&f=M
16. U.S. Energy Information Administration. (2012). International Energy Statistics. Retrieved October 23 2012, from http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=50&pid=53&aid=1&cid=regions,&syid=2012&eyid=2012&freq=Q&unit=TBPD
17. Reuters. (2012, October 22). Crude oil climbs towards $111 on Middle East tension. Retrieved October 22, 2012, from CNBC: http://www.cnbc.com/id/49501563
18. The Price of Inaction: An Analysis of Energy and Economic Effects of a Nuclear Iran. Bipartisan Policy Center. Retrieved October 22, 2012, from
19. Ibid
20. U.S. Energy Information Administration. (2012, August 22). World Oil Transit Chokepoints. Retrieved October 22, 2012, from http://www.eia.gov/countries/regions-topics.cfm?fips=WOTC
21. Cloud, D., & Banerjee, N. (2011, March 15). Saudi Arabian, gulf forces enter Bahrain. Retrieved October 22, 2012, from Los Angeles Times: http://articles.latimes.com/2011/mar/15/world/la-fg-bahrain-troops-20110315, See Also: Carey, G. (2012, February 23). The Saudis Need Those High Oil Prices. Retrieved October 22, 2012, from Bloomberg Businessweek: http://www.businessweek.com/articles/2012-02-23/the-saudis-need-those-high-oil-prices
22. The Economist. Waking up too. (2012, June 22). Retrieved October 22, 2012, from The Economist: http://www.economist.com/node/21557354, See Also: Reuters. (2012, October 21). Police in Kuwait teargas opposition protesters. Retrieved October 22, 2012,from Chicago Tribune: http://articles.chicagotribune.com/2012-10-21/news/sns-rt-us-kuwait-politics-protestbre89k-

0fj-20121021_1_teargas-sheikh-sabah-riot-police

23. Thomas, P. (2011, May 20). Osama Bin Laden Evidence: Al Qaeda 'Interest' in Targeting Oil, Gas Infrastructure. Retrieved October 22, 2012, from ABC News: http://abcnews.go.com/Blotter/osama-bin-laden-evidence-al-qaeda-interest-targeting/story?id=13647142#.UIbaQsXoQbo
24. National Counterterrorism Center. (2011). Report on Terrorism. National Counterterrorism Center.
25. BBC News. (2002, October 16). Yemen says tanker blast was terrorism. Retrieved October 22, 2012, from BBC News: http://news.bbc.co.uk/2/hi/middle_east/2334865.stm
26. Dickey, Christopher. Saudi Storms. Newsweek, October 3, 2005.
27. Fattah, H. (2006, February 24). Attack on Saudi Oil Facility Thwarted. Retrieved October 22, 2012, from The New York Times: http://www.nytimes.com/2006/02/24/international/middleeast/24cnd-saudi.html?_r=0
28. Henni, A. (2011, 16 September). Al-Qaeda plans to attack oil firms in North Africa. Retrieved October 22, 2012, from Arabian Business: http://www.arabianbusiness.com/al-qaeda-plans-attack-oil-firms-in-north-africa-420745.html
29. Energy Information Administration. Electric Power Monthly with Data for June 2012. Retrieved October 19, 2012, from http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_1_a
30. Energy Information Administration. Electric Power Monthly with Data for July 2012 Retrieved October 19, 2012, from http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_1
31. Mabus, R. (2012, September 9). U.S. Navy Continuing Its Long Tradition of Energy Transformation. U-T San Diego http://www.utsandiego.com/news/2012/sep/09/tp-us-navy-continuing-its-long-tradition-of/
32. Gerdes, J. (2012, May 24). Solar Power More Competitive Than Decision-Makers or Consumers Realize. Forbes, http://www.forbes.com/sites/justingerdes/2012/05/24/solar-power-more-competitive-than-decision-makers-or-consumers-realize/.
33. Kaften, C. (2012, August 15). As Wind Energy Whips Up U.S. Jobs, DOE and AWEA Back Production Tax Credit. Green Technology World, http://green.tmcnet.com/channels/wind-power/articles/303469-as-wind-energy-whips-up-us-jobs-doe.htm.
34. Environmental Protection Agency. Renewable Portfolio Standards Fact Sheet. Retrieved October 2012 from http://www.epa.gov/chp/state-policy/renewable_fs.html
35. Karlynn Cory, T. C. (2009). Feed-in Tariff Policy: Design, Implementation, and RPS Policy Interactions. National Renewable Energy Laboratory, 1.
36. (2011). A Strategy for American Innovation. Washington D.C.: National Economic Council, Council of Economic Advisers, and Office of Science and Technology Policy. Retrieved at: http://www.whitehouse.gov/sites/default/files/uploads/InnovationStrategy.pdf
37. American Security Project. (2012). Research and Development as a National Priority. Washington, D.C.: American Security Project. Retrieved from American Security Project: http://americansecurityproject.org/wp-content/uploads/2012/01/Ref-0043-RD-fact-Sheet-Jan-2012.pdf
38. Grueber, M. (2011, December 16). 2012 Global R&D Funding Forecast: R&D Spending Growth Continues While Globalization Accelerates. Retrieved from R&D: http://www.rdmag.com/Featured-Articles/2011/12/2012-Global-RD-Funding-Forecast-RD-Spending-Growth-Continues-While-Globalization-Accelerates/
39. Schwab, K. (2012). The Global Competitiveness Report 2012-2013. Geneva: World Economic Forum.
40. STEM Education in Washington State: The Facts of the Matter. (2011). Rising Above the Gathering Storm: STEM Education in Washington State (pp. 1-30). Seattle: Washington State Academy of Sciences.
41. Pisano, G. and Shih, W. (2009) Restoring American Competitiveness. Harvard Business Review. Retrieved at: http://hbr.org/2009/07/restoring-american-competitiveness/ar/1
42. (2012). America Speaks! Alexandria: Research!America. http://www.researchamerica.org/uploads/AmericaSpeaksV12.pdf
43. (2012) Americas Energy Choices 2012 Edition. Washington, D.C.: American Security Project. Retrieved from American Security Project: http://americansecurityproject.org/featured-items/2012/americas-energy-choices-2012-edition/
44. (2011) Fusion Fact Sheet. Washington, D.C.: American Security Project. Retrieved from American Security Project:http://americansecurityproject.org/wp-content/uploads/2011/05/Fusion-fact-sheet-FINAL.pdf
45. (2011) Fusion Energy: An Opportunity for American Leadership and Security. Washington, D.C.: American Security Project. Retrieved from American Security Project: http://americansecurityproject.org/wp-content/uploads/2011/01/White-Paper-on-Fusion-Final-21.pdf_
46. Stine, D. (2009) The Manhattan Project, the Apollo Program, and Federal Energy Technology R&D Programs: A comparative

Building a New American Arsenal

The American Security Project (ASP) is a nonpartisan initiative to educate the American public about the changing nature of national security in the 21st century.

Gone are the days when a nation's strength could be measured by bombers and battleships. Security in this new era requires a New American Arsenal harnessing all of America's strengths: the force of our diplomacy; the might of our military; the vigor of our economy; and the power of our ideals.

We believe that America must lead other nations in the pursuit of our common goals and shared security. We must confront international challenges with all the tools at our disposal. We must address emerging problems before they become security crises. And to do this, we must forge a new bipartisan consensus at home.

ASP brings together prominent American leaders, current and former members of Congress, retired military officers, and former government officials. Staff direct research on a broad range of issues and engages and empowers the American public by taking its findings directly to them.

We live in a time when the threats to our security are as complex and diverse as terrorism, the spread of weapons of mass destruction, climate change, failed and failing states, disease, and pandemics. The same-old solutions and partisan bickering won't do. America needs an honest dialogue about security that is as robust as it is realistic.

ASP exists to promote that dialogue, to forge consensus, and to spur constructive action so that America meets the challenges to its security while seizing the opportunities the new century offers.

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