### Plan

#### The United States federal government should reduce restrictions on offshore natural gas production in the United States.

### Prices

#### Advantage one is prices

#### Gas supply crunch coming now – shale production ceilings and economics

Nelder, 12 [Chris, Smart Planet, February, Everything you know about shale gas is wrong, <http://www.smartplanet.com/blog/energy-futurist/everything-you-know-about-shale-gas-is-wrong/341>]

But now there’s even more bad news: U.S. gas production appears to have hit a production ceiling, and is actually declining in major areas. The startling revelation comes from a new [paper](http://www.theoildrum.com/node/8914) published today by Houston-based petroleum geologist and energy sector consultant Arthur Berman. Berman reached this conclusion by compiling his own production history of U.S. shale gas from a massive data set licensed from data provider HPDI. His well-by-well analysis found that total U.S. gas production has been on an “undulating plateau” since the beginning of 2009, and showed declines in some areas in 2011. This stands in stark contrast to recent data provided by the EIA, which shows shale gas production rising steadily for the past two years, and well into the future. The EIA’s forecast is bullish because it’s **mainly a view of demand**, **without great regard for supply limits**. But their historical supply data differs for a reason that will be no surprise to experienced observers: the data is bad. The EIA gets its data on shale gas production by sampling the reports of major operators, then applying a formula to estimate how much gas is actually being produced, according to Berman. This may explain why they only have official monthly historical production data for the [two years](http://www.eia.gov/dnav/ng/hist/ngm_epg0_fgs_nus_mmcfm.htm) (unofficially, [three](http://www.eia.gov/dnav/ng/ng_prod_shalegas_s1_a.htm)) of 2008 and 2009, and only annual data for 2010 and 2011. This has been a big red flag to me in my recent work on shale gas, accustomed as I am to EIA’s far more detailed and up-to-date monthly and weekly data on oil, and has made it nearly impossible to verify the claim that we’ve had “booming” gas production over the past two years. Data is also available directly from the states, but some **states have flawed reporting processes,** the granularity and reporting frequency varies (as low as every six months, in the case of Pennsylvania), and ultimately the data **isn’t available in a usable format**. It’s also inaccurate and incomplete, as one Pittsburgh newspaper recently [found out](http://www.post-gazette.com/pg/12008/1202172-503-0.stm). Berman reached the same conclusion, noting in his paper that “the data that EIA makes available does not have sufficient resolution to evaluate individual plays or states.” So he had to build his own database. An unprofitable treadmill One reason for the recent slowdown in production growth is that “unconventional” shale gas wells have to make up for the decline of conventional gas wells, which has accelerated from 23 percent per year in 2001 to 32 percent per year today. The U.S. now needs to replace 22 billion cubic feet per day (Bcf/d) of production each year just to maintain flat supply. Currently, all shale gas plays together produce around 19 Bcf/d. The shift to unconventional gas has put us on a production treadmill: We have to keep drilling like mad to maintain output because unconventional wells are far less productive and shorter-lived than conventional gas wells. Berman observes that an average gas well in Texas in 2010 produces one-fifth as much gas as an average conventional gas well did in 1972. In 1972, 23,000 gas wells produced 7.5 trillion cubic feet in Texas; in 2010, it took 102,000 wells to produce 6.4 trillion cubic feet. Another reason was that the spurt of production created a gas glut and drove prices far below the level of profitability. Data from a January, 2012 [presentation](http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9NDUxNzk4fENoaWxkSUQ9NDc2OTUwfFR5cGU9MQ==&t=1) by the CEO of gas operator Range Resources showed that gas needs to sell for at least $4 per million BTU in order for operators to turn a profit. Source: Jonathan Callahan, [The Oil Drum](http://www.theoildrum.com/node/8900). Data from Range Resources. Berman is certain that the $4 threshold applies to new drilling on existing plays only; after accounting for land leasing, overhead and debt service, the threshold would be much higher. In any case, we can see that production flattened out when prices fell below $4 at the beginning of 2009. Source: Arthur Berman. Data from Natural Gas Intelligence. A gas price below $3 spells real trouble for operators, and flagging production is but the first effect. The next is debt: According to analysis by ARC Financial Research, the 34 top U.S. publicly traded shale gas producers are currently carrying a combined $10 billion quarterly cash flow deficit. And finally, **there will the destruction of forward supply, as new development grinds down.** Financing further development with debt in this environment will be extremely difficult, and eventually even the joint-venture sugar daddies that have sustained operators over the past few months will get cold feet. Without a reversal in price, gas production is guaranteed to decline. The gas gold rush is over Indeed, Berman concludes that “the gold rush is over at least for now with the less commercial shale plays.” Within the major producing areas of the U.S., which account for 75 percent of production, all except Louisiana have been either flat or declining in recent years. Overall, he sees evidence that 80 percent of existing U.S. shale gas plays are already approaching peak production. Rig counts have been falling, and major operators such as Chesapeake Energy and ConocoPhilips have announced slowdowns in drilling in the last month. The two major plays that do not show evidence of peaking yet are the newer ones: the Marcellus Shale in Pennsylvania and the Haynesville Shale in Louisiana. To see the influence of these two plays on overall production, compare the first chart below, which shows production from all shale plays, to the second, which removes production from those two plays: Source: Arthur Berman Source: Chart by Chris Nelder, from Arthur Berman’s worksheets The Haynesville surpassed the Barnett Shale in Texas last year as the top-producing shale play in the U.S., but it may be reaching a production plateau now. Worse, Berman’s analysis finds that despite its impressive production, the Haynesville is among the least economic of the shale plays, requiring gas prices above $7.00 per thousand cubic feet to sustain new drilling profitably, and nearly $9.00 per thousand cubic feet after accounting for leasing and other costs. (One thousand cubic feet is roughly equivalent to one million BTU.) A word of caution is in order here: A one-year decline in production in an unprofitable environment is not proof that shale gas has “peaked.” It’s certainly possible that renewed drilling could bring higher production when gas prices rise again. The operative question in that case is when. If gas prices recover within the next year or two, it will be relatively easy to bring new wells online rapidly. But if gas prices languish for longer than that, the most productive “core” areas of the plays could become exhausted because the wells deplete so quickly. Without sustained new drilling to replace their production, by the time producers begin drilling again in the remaining, less productive prospects, an air pocket could form in the supply line. Disinformation and diffusion theory Berman admits that it’s strange for his bottom-up analysis to produce results that are so wildly divergent from the claims of the operators and the data offered by the EIA. “I ask myself: Where could we be wrong?” he explained. “We’ve looked at the individual wells and it looks like they’ll produce less gas than the operators say, so where could we be wrong? Likewise on cost: There are no retained earnings, so how could they be saying they’re profitable?” Having scrutinized the financial reports of operators, Berman concludes that operators are being honest with the SEC, because if they aren’t, somebody will go to jail. But then they’re telling a very different story to the public, and to investors, particularly regarding their costs. This isn’t necessarily nefarious; it’s really just a way of working around the natural risks associated with new resource development. They’re playing for the future, not for immediate profitability. Early wildcatters gambled on debt-fueled drilling with the hope that they’d be able to hold the leases long enough to see prices rise again and put them nicely in the black, or flip them at a profit to someone who could. And the profit picture is substantial: according to the Range Resources presentation, when gas is $6, they’ll be realizing a 135 percent internal rate of return. “I think these companies realize—clearly—that the U.S. is moving toward a gas economy,” Berman observes. “The natural gas industry has been very successful at screwing up the coal industry. . . a huge part of the demand is from the power generation business. The President now thinks, incorrectly, that we’ve got 100 years of natural gas. [Op’erators think] ‘If we can just get all this land held, drilled, etc., then in a couple of years when the price recovers we’re going to make a fortune’. . . and they’re right!” I am inclined to agree. My own analysis suggests that [gas is trouncing coal](http://www.smartplanet.com/blog/energy-futurist/regulation-and-the-decline-of-coal-power/275) in the power generation sector. I am also strongly [against exporting LNG](http://www.smartplanet.com/blog/energy-futurist/the-siren-song-of-lng-exports/313), because it will increase domestic costs across the board, another point on which Berman and I agree. “If they go through with the permits to export LNG, then that’s gonna seal it,” he remarked. “All you have to do is commit to 20-year contracts to ship a few bcf per day. . . I fear what’s really going to happen is that we’re going to have to start importing LNG.” Ultimately, we have to ask why there seems to be such an enormous disconnect between the reality of the production and reserve data, and the wild-eyed claims of operators and politicians. Berman’s answer is blunt: “We’re in a weird place where it’s not in anybody’s vested interest to say that things aren’t wonderful,” he said, and went on to relate a few stories of his encounters with politicians. They admitted to him, straight-up, that they can’t tell the public the truth about energy issues like gas reserves and peak oil because nobody wants to hear it, and they’ll just wind up getting voted out of office. “This gets back to basic diffusion theory,” Berman muses, “where only 5 percent of people base their decisions on information, while the other 95 percent make decisions on what everybody else thinks.” That sounds right to me. It benefits everyone involved to tell happy lies, and benefits no one to own up to the current reality. That is true for everyone from the operators right on up to the President. Perhaps in the end—like government—we’ll simply get the energy policy we deserve.

#### And, shale industry unsustainability and high decline rates prove

Berman, 11/12/12 [Arthur, lecturer at Rice Graduate School of Management, geological consultant with 32 years of experience in petroleum exploration and production, M.S. Geology Colorado School of Mines, B.A Amherst College, published 50 articles on geology, member of the National Petroleum Council and on the Board of Directors of ASPO USA editorial board of The Oil Drum, and an associate editor of the AAPG (American Association of Petroleum Geologists) Bulletin, “Shale Gas Will be the Next Bubble to Pop - An Interview with Arthur Berman”, <http://oilprice.com/Interviews/Shale-Gas-Will-be-the-Next-Bubble-to-Pop-An-Interview-with-Arthur-Berman.html>]

A lot of investors from other parts of the world, particularly the oil-rich parts have been making somewhat high-risk investments in the United States for many years and, for a long time, those investments were in real estate. Now these people have shifted their focus and are putting cash into shale. There are two important things going on here, one is that the capital isn't going to last forever, especially since shale gas is a commercial failure. Shale gas has lost hundreds of billions of dollars and investors will not keep on pumping money into something that doesn’t generate a return. The second thing that nobody thinks very much about is the decline rates shale reservoirs experience. Well, I've looked at this. The decline rates are incredibly high. In the Eagleford shale, which is supposed to be the mother of all shale oil plays, the annual decline rate is higher than 42%. They're going to have to drill hundreds, almost 1000 wells in the Eagleford shale, every year, to keep production flat. Just for one play, we're talking about $10 or $12 billion a year just to replace supply. I add all these things up and it starts to approach the amount of money needed to bail out the banking industry. Where is that money going to come from? Do you see what I'm saying? Oilprice.com: You've been noted suggesting that shale gas will be the next bubble to collapse. How do you think this will occur and what will the effects be? Arthur Berman: Well, it depends, as with all collapses, on how quickly the collapse occurs. I guess the worst-case scenario would be that several large companies find themselves in financial distress. Chesapeake Energy recently had a very close call. They had to sell, I don't know how many, billions of dollars worth of assets just to maintain paying their obligations, and that's the kind of scenario I'm talking about. You may have a couple of big bankruptcies or takeovers and everybody pulls back, all the money evaporates, all the capital goes away. That's the worst-case scenario.

#### And, historical data proves the shale revolution is overblown – the 1ac’s Data is based on a “gold standard” of academic rigor

Hurdle, 12/3/12 [Jon, Citing Berman, qualls above, AOL Energy, “Are US Shale Gas Resources Overstated? Part 1”, <http://energy.aol.com/2012/12/03/are-us-shale-gas-resources-overstated-part-1/?icid=trending1>]

A forthcoming book argues that the country's [shale gas plays contain only about a quarter of the fuel that has been estimated](http://energy.aol.com/2011/06/29/finding-natural-gas-takes-science-and-luck/) by the US Energy Information Administration, and other widely used industry and academic assessments. "Cold, Hungry and in the Dark: Exploding the Natural Gas Supply Myth," by Bill Powers asserts that the quantity of unproved but technically recoverable natural gas in US shale plays is approximately 127 trillion cubic feet, or about a quarter of the 482 tcf estimated by the EIA in its Annual Energy Outlook for 2012. Powers, who publishes a newsletter for energy investors, argues that existing natural gas plays have not been nearly as productive as their backers predicted, and so cannot be expected to live up to expectations for future output. "Recent drilling success has been extrapolated into the future," said Powers, who also sits on the board of the Calgary oil and gas company Arsenal Energy. "That's not supported by drilling history." In Arkansas' Fayetteville Shale, 4,400 wells have produced 3.3 tcf since 2005, according to the Arkansas Oil & Gas Commission, or around a tenth of the 32 tcf that the EIA says is technically recoverable. In reality, Powers says, the Fayetteville contains a total recoverable resource (TRR) of just 10 tcf. In Louisiana, Arkansas and east Texas, the Haynesville Shale has produced around 5 tcf so far, Powers said. He predicted it has a total recoverable resource of 10-20 tcf, far short of the EIA's estimate of 75 tcf, a number Powers called "ridiculous." **Swimming Against the Current** He applies the same argument to Michigan's Antrim Shale, a play that has not been subject to the new wave of hydraulic fracturing and horizontal drilling that has made many shale beds economic, but whose long history since the mid-1980s shows production that he says has fallen short of expectations. The Antrim has so far produced 3 tcf from some 10,000 wells, and its output has been declining since 1998, according to the Michigan Public Service Commission. Powers predicted the shale contains a TRR of 2 tcf, sharply lower than the 20 tcf predicted by the EIA. Powers is the latest analyst to argue that the widely heralded shale-gas "revolution" may be overblown. Other skeptics include Houston-based petroleum consultant [Arthur Berman](http://energy.aol.com/tag/Arthur%2BBerman/) who has [long claimed that resource estimates are being overstated](http://energy.aol.com/2012/02/22/chesapeake-energy-steps-up-plans-to-boost-liquid-products-output/) by energy companies seeking to defend their stock prices. Berman, who writes the foreword to Powers's book, said the national gas resource, including proven reserves, is likely to equal about 22 years of consumption at the current rate, or less than a quarter of the [100 years' worth](http://energy.aol.com/2011/11/22/more-than-100-years-of-natural-gas/) that is often cited by analysts and policymakers including President Obama. Berman's forecast is based on an estimate of probable reserves published by the Potential Gas Committee at the [Colorado School of Mines](http://energy.aol.com/tag/Colorado%2BSchool%2Bof%2BMines/), a 100-strong panel of company representatives that Berman called the "gold standard" of natural gas resource estimation. "There is a great deal more uncertainty in this whole shale revolution than most people want to believe," Berman told AOL Energy. "There is definitely less gas than the propaganda says."

#### And, that ensures catastrophic price spikes

Maize, 12/1/12 [“Is Shale Gas Shallow or the Real Deal?”, Kennedy, Veteran Journalist Kennedy Maize has spent the past 40 years working as a journalist, analyst, and manager in the private sector and federal government, with over 35 years of that focused on energy and environmental topics. Over that time, he has seen myriad examples of how group think, policy fads, and bad judgment can result in colossal failures, particularly in the field of atomic energy. Maize has seen, up close and personal, the demise of the U.S. Atomic Energy Commission, the arrival of the U.S. Nuclear Regulatory Commission, the birth of the U.S. Department of Energy, the failures of nuclear flight, the hubris of atomic earthmoving, the boom and bust uranium market, the birth and death of breeder reactors, and the 60-year wandering in the wilderness of nuclear waste policy. After graduating from Penn State and graduate study at the University of Maryland, Kennedy Maize worked for newspapers in Pennsylvania, New York, and Virginia and the Associated Press in Baltimore. He then spent five years in management at the National Institute of Health and the U.S. Nuclear Regulatory Commission before taking a job covering energy, environment, and business topics for Editorial Research Reports, a division of Congressional Quarterly, where his work appeared in over 1,000 daily newspapers in the U.S. during the mid-to-late 1970s. Maize became a staff writer and editor at The Energy Daily, a preeminent energy trade paper, on March 28, 1979, the day the Three Mile Island accident began outside Harrisburg, Pa. Over more than 10 years at The Energy Daily, he covered the nuclear and coal industries, including stories involving the Clinch River Breeder Reactor, the U.S. Synthetic Fuels Corp., the Powder River Basin coal leasing scandal, and the Chernobyl explosion. In 1993, he founded The Electricity Daily, where he was the editor for 14 years, writing about changes in the electricity business, the rise and fall of Enron, the stagnation of the nuclear power business, and the arrival of market forces in the utility field. Since 2006, he has been an editor at POWER magazine, and the founder of MANAGING POWER magazine, where he has written about the Fukushima catastrophe, the emergence of shale gas and decline of coal, and the often ill-advised push for renewable electricity technologies <http://www.powermag.com/gas/Is-Shale-Gas-Shallow-or-the-Real-Deal_5188.html>]

In an interview with POWER, Berman argued that the boom in drilling shale gas wells has obscured a long-term decline in conventional gas supply. But a coming rapid decline in shale production, he said, will soon reveal the overall limits to the gas boom, and volatility and upward pressure could return to natural gas prices. “It’s not a problem for today or tomorrow,” Berman said, “but it is coming. Once we work through the current oversupply, if capital is not forthcoming,” prices will spike. The gas supply bubble will burst. Because of the current gas glut, with long prices in the range of $3 per million cubic feet (mcf), drilling shale gas wells has tanked, noted Berman. Chesapeake Energy, the most bullish of the shale gas players, is selling assets and shifting rigs to drilling for oil because the company just can’t make money on $3 gas. “I can see a time not too many months away when we could see gas supply in rather serious decline,” Berman said, noting that “there is plenty of gas, but it takes a long time to shift momentum back” to gas drilling. At a 2010 meeting in Washington, as low gas prices were resulting in a decline in new drilling, Berman commented, “Shale plays are marginally commercial at best.” Greatly complicating the supply equation, said Berman, is the nature of shale gas wells. “Shale wells decline 30 to 40% per year,” he said. “Conventional wells decline 20 to 25%. What most don’t grasp is how many wells it takes just to keep supply flat.” In the Barnett Shale in Texas, where Berman is most familiar with the geology, he calculates that the annual decline in the gas resource is 1.7 bcf/day. In order to add to the net Barnett production, Berman says, companies would have to drill 3,880 wells, at a cost of $12 billion. “We are setting ourselves up for a potential reduction in supply and price will go up,” said Berman. “I don’t know how much it will go up, and there is a check-and-balance with coal. There will be gas-coal switching if prices do go much higher than now.”

#### And, demand increases make a gas shock inevitable – corresponding supply increases key

Moors, 12/14/12 [Dr. Kent, Dr. Kent F. Moors is an internationally recognized expert in global risk management, oil/natural gas policy and finance, cross-border capital flows, emerging market economic and fiscal development, political, financial and market risk assessment. He is the executive managing partner of Risk Management Associates International LLP (RMAI), a full-service, global-management-consulting and executive training firm. Moors has been an advisor to the highest levels of the U.S., Russian, Kazakh, Bahamian, Iraqi and Kurdish governments, to the governors of several U.S. states, and to the premiers of two Canadian provinces. He’s served as a consultant to private companies, financial institutions and law firms in 25 countries and has appeared more than 1,400 times as a featured radio-and-television commentator in North America, Europe and Russia, appearing on ABC, BBC, Bloomberg TV, CBS, CNN, NBC, Russian RTV and regularly on Fox Business Network. A professor in the Graduate Center for Social and Public Policy at Duquesne University, where he also directs the Energy Policy Research Group, Moors has developed international educational programs and he runs training sessions for multiple U.S. government agencies. And until recent revisions in U.S. policy, Dr. Moors was slated to be the deputy director of the Iraq Reconstruction Management Office (IRMO) in Baghdad,

[http://moneymorning.com/2012/12/14/2013-natural-gas-forecast-six-bullish-reasons-why-now-is-the-time-to-buy/\](http://moneymorning.com/2012/12/14/2013-natural-gas-forecast-six-bullish-reasons-why-now-is-the-time-to-buy/%5C)]

A rise on the supply side would generally reduce prices, especially if the number of operators continues to increase. More gas moving on the market from more suppliers results in a downward pressure on prices. The second dynamic, however, is moving in the other direction, enticing the increase in drilling and expansion of infrastructure. This factor considers the demand side, and there are at least six major trends colliding to increase the prospects for gas usage as we move through 2013. As a result, I expect natural gas prices to see a 25% increase from current levels... here's why. 2013 Natural Gas Forecast 1) Winter Chill Increases Natural Gas Demand The first factor driving price increases will come from a colder winter throughout the United States. Traditionally, gas prices have been quite sensitive to seasonal shifts. The overly mild winter in the East last winter was enough to depress gas prices across the board. In 2011, NYMEX futures contracts declined to less than $2 per 1,000 cubic feet (or million BTUs). The price has recovered to as much as $3.90 recently, although it is currently down to about $3.50. Nonetheless, the recovery (largely a result of companies pulling drilling rigs out of service and reducing the number of new wells) combined with a colder winter, will provide a base pushing the price to $4 as we start the new year. The other five elements are more directly affecting demand increases moving forward. These will have primary effects on the gas balance between anticipated needs and drilling volume. 2/3) Industrial and Petrochemical Usage on the Rise The second and third elements are increasing industrial and petrochemical uses for gas. Industrial use has been building for a while, but it is one of the last demand factors to emerge during an economic recovery. That is now beginning to kick in. However, petrochemical usage is resulting in an appreciating demand situation. Gas, natural gas liquids, and byproducts are replacing crude oil and oil products as feeder stock for an entire range of petrochemicals - from solvents and polymers, to plastics and fibers. The intense competition over where the next "crackers" will be located in the U.S. is clear testimony to the added demand coming from petrochemicals. These facilities will break down gas flows, making the feeder stock ingredients more accessible. This development is also putting some additional weight on the processing of "wet" gas, raw material containing value-added byproducts. 4) Natural Gas Fleets Expand Across the U.S. The fourth demand factor is the increasing use of natural gas as a vehicle fuel. We have been witnessing a rise in interest here for several years, but the move to using liquefied natural gas (LNG) and compressed natural gas (CNG) to replace gasoline and diesel has been gaining strength. Entire fleets of heavy-duty trucks have been retrofitted across Canada, while refueling terminals have been popping up near interstates in the U.S. to service company-designated vehicles. The cost savings in fuel is significant, usually representing more than two dollars per gallon. The downside is on the infrastructure side. It will take several years of heavy capital investment to provide the network of transport pipelines, storage and terminal facilities, filling stations, and related requirements. And we must consider the cost of retrofitting engines. At an average of $35,000 per vehicle, it will remain an obstruction for some. I expect to see an increase in natural gas-as-fuel usage continuing, but remaining on the truck side for 2013. Personal autos will stay a niche market in the near-term. Still, this will comprise an improving demand area for natural gas. 5) Electricity Consumption from Gas Set to Spike Fifth is the massive transfer underway from coal to gas as the preferred fuel for generating electricity. Coal will remain a fuel of choice in several sectors of the world and will still be cost effective in certain regions in the U.S. But the days of "King Coal" in the generation of electricity are drawing to a close. The figures here are massive. The American market is replacing more than 90 gigawatts (GW) of generating capacity by 2020, virtually all of this coal-fired. In addition, the phasing in of non-carbon regulations (cutting mercury, sulfurous, and nitrous oxide emissions) will add another 20 GW to the retirement agenda, once again coming almost exclusively from coal. Each 10 GW transferred to natural gas will require an additional 1.2 billion cubic feet of gas per day. If only 50% of the expected transition from coal to gas occurs, the added demand will eliminate three times the current total gas in storage nationwide.

#### And, expanded supply locks in a manufacturing renaissance

Pirog and Ratner, 12 [November, Congressional Research Service, Natural Gas in the U.S. Economy: Opportunities for Growth Robert Pirog Specialist in Energy Economics Michael Ratner Specialist in Energy Policy, <http://www.fas.org/sgp/crs/misc/R42814.pdf>]

Expanded supply, coupled with low natural gas prices, has the potential to contribute to a transformation of important sectors of the U.S. economy. Increased output and employment, expanded investment, income growth, improved competitiveness, and a reduction in the foreign trade deficit are likely outcomes. These conditions in the natural gas markets are likely to benefit certain key industries directly, while many other industries could experience indirect benefits. direct beneficiaries are those industries that use natural gas as a raw material or as an important input in a production process. Industries whose output is directly related to the expansion of natural gas exploration, development and production are also direct beneficiaries. Examples of industries that use natural gas directly are petrochemicals and fertilizers. The steel industry is an example of an industry whose output is linked to the pace of natural gas resource development. Industries experiencing indirect benefits might include construction and capital goods producers that contribute to the supply chain for the investment projects undertaken by expanding natural gas consumers. In addition, more spending by workers in all of these industries could increase the growth of a wide variety of consumer goods and retail firms. The economic benefits of shale gas development and production will also open areas not recently accustomed to natural gas production, for example, the Marcellus field in parts of Pennsylvania, Ohio, West Virginia, Maryland, Virginia, and New York. In the international economy, those U.S. industries directly affected by expanded supply and low natural gas prices are likely to experience a competitive advantage over the producers of similar goods in other countries, resulting in increased exports from, and decreased imports to the United States. These effects would likely improve the U.S. trade deficit position. This advantage is likely to be maintained over time if the U.S. price of natural gas remains below those observed in other world regional markets (see Figure 5).13 U.S. industry’s advantage could be reduced through a process of world natural gas price convergence, especially in the three leading regional markets. However, for this to occur, traditional long-run contract terms, specifically linking natural gas prices to oil prices, would need to be changed to a more market-oriented method.

#### And, expectations of continued supply prevents economic collapse via a collapse of manufacturing

Carey, 12/13/12 [Julie M, Julie M. Carey is an energy economist with Navigant Economics who provides consulting and testifying services Navigant’s [unconventional oil and gas offerings](http://www.forbes.com/sites/energysource/2012/12/07/surprise-side-effect-of-shale-gas-boom-a-plunge-in-u-s-greenhouse-gas-emissions/www.navigant.com/shale) include advisory services for strategic business decision analysis, construction risk management, economic and antitrust analyses, investment banking and restructuring advisory services, and expert services for disputes and investigations, “How Unconventional Oil And Gas Is Supercharging The U.S. Economy”, <http://www.forbes.com/sites/energysource/2012/12/13/how-unconventional-oil-and-gas-is-transforming-the-u-s-economy/>]

It’s an exciting time to be in the energy industry in America. The impact of unconventional oil and gas development on the U.S. economy is considerable, with potentially hundreds of billions of dollars in investments, millions of new jobs, and a renaissance of American ingenuity and innovation. In thinking about what is to come, looking back five years helps set the stage. January 2008: The energy sector was facing the great recession, high current and future expected natural gas prices, and job losses to [China](http://www.forbes.com/places/china/). There was a generallypoor outlook for the energy industryand the economy. Few could have predicted the changes that were to come. Unforeseen happenings include the [North Dakota](http://www.forbes.com/places/nd/) oil rush, liquefied natural gas facilities being used as export facilities (instead of as import facilities as originally planned), railroads hauling crude oil, and jobs coming back from China. And, this is just the beginning. The commencement of the crude oil and natural gas revolution can be boiled down to one simple equation: [Surprise Side Effect Of Shale Gas Boom: A Plunge In U.S. Greenhouse Gas Emissions](http://www.forbes.com/sites/energysource/2012/12/07/surprise-side-effect-of-shale-gas-boom-a-plunge-in-u-s-greenhouse-gas-emissions/) [Forbes Staff Contributor](http://blogs.forbes.com/velocity/)  Abundant resources + cost effective extraction = high production levels of unconventional oil and gas. The net effect is a reshaping of the U.S. energy industry and our economy. Additionally, the country’s increased reliance on natural gas (displacing coal) has already benefited the environment, and will continue to do so in the future. [Carbon emissions hit a 20-year low](http://www.forbes.com/sites/energysource/2012/12/07/surprise-side-effect-of-shale-gas-boom-a-plunge-in-u-s-greenhouse-gas-emissions/) (in the first quarter 2012 according to EIA) and some industry observers believe that the U.S. could meet the Kyoto agreement standards by 2020 (even though the U.S. did not sign it). The emergence of unconventional oil and gas will have tremendous impacts on both the energy industry and the economy. The outlook for unconventional gas is exceptionally bright—with expectations for relatively low future natural gas prices, enough supply to meet domestic needs, and surplus enough to export to other countries. While the unconventional oil story continues to unfold and evolve, an abundance of domestic crude oil is expected. And, thus, an opportunity to not only significantly reduce the country’s dependence on oil imports, but to also increase energy security. Currently, crude oil prices are out of balance as new supply regions are isolated, making it difficult to get crude oil to market. That is expected to change once the necessary infrastructure is built to handle the new-found supply. As a result of these infrastructure needs, and the tremendous opportunities associated with unconventional oil and gas, U.S. economicactivity is rising. Rising levels of economic activity can be divided into three distinct but overlapping waves of capital investment. The first wave of capital investment targets new and expanding oil and gas production areas. Sustained investment in the upstream sector – including wellheads, drilling and production – will be required to keep pace with increases in demand for the foreseeable future. The second wave of investment will focus on infrastructure to address new supply locations, delivering the product to market, and capitalizing on the near term opportunities arising from lower energy costs. [Billions](http://blogs.forbes.com/billions/) of dollars of investments specifically targeting capital projects in this wave are being announced weekly. Substantial investment in crude oil, natural gas and natural gas liquids pipelines will be required in order to build, expand, and reverse pipelines to address the new supply source locations. Natural gas processing plants that separate natural gas liquids (NGL) from natural gas will be required to address the growing production levels and new supply regions. In addition, LNG facilities will begin to export natural gas, and there is a potential opportunity for natural gas-to-diesel plants. In addition to these traditional areas of investment, creative market solutions are also emerging, such as rail transportation of crude oil. While railroads may serve primarily as a near to mid-term solution in the wake of long-lead time pipeline solutions, they are nimble competitors with small capital requirements that can be quickly deployed to utilize the country’s far-reaching rail networks. With only a few years needed to recover capital costs on investment, the competitive landscape changes and rail transportation rates could be reduced after pipelines enter the market to keep railroads competitive and still profitable. These factors suggest that railroads could be in the crude oil transportation business for the long haul. During this second wave, there will be a manufacturing resurgence, in part because of lower expected energy costs. Other macroeconomic factors will also be at work—including relative improvement in U.S. labor rates as labor markets tighten in China and other countries. Petrochemical plants will become cost effective competitors in the worldwide market and will be a significant component of the manufacturing investment story. Manufacturing facilities will be built to manufacture pipes, drill bits, valves and other required infrastructure materials. In addition, other manufacturing plants will likely be built solely as a play on the expectation of relatively low energy costs into the future. Such suspects could include those whose energy costs are large portion of production costs: semiconductors, plastics, and LCD televisions. The trend includes linking production and energy resources in an efficient manner, and moving production closer to market demand in order to minimize transportation related costs. The last wave of investment – which won’t begin to heat up for a few years – focuses on the consumers segment. In this wave, additional natural gas-fired power plants will be built to replace retiring coal plants and meet future increases in demand. Of course, new gas fired power plants will initially be built in regions with less excess capacity (post coal plant retirement). Another impact of U.S. unconventional oil and gas development will be increased in electricity demand (occurring more dramatically in various localized pockets), directly resulting from investment in waves one and two. New production areas and locations for processing and manufacturing plants will observe higher load growth. For example, localized areas within the Bakken region expect energy demand to double in the next five years. As a result of very specific changes to the economic activity and corresponding energy consumption levels, a more granular analyses will be required than is previously provided by traditional load forecasting methods. This third wave will also see a significant number of new heavy-duty natural gas vehicles, including bus and truck fleets. Greater reliance on natural gas-fueled light duty vehicles is possible but will require more time due to greater infrastructure requirements and technological innovation. Other creative opportunities being explored include natural gas pumps (hooked up to the home) to fuel natural gas vehicles, and light duty vehicles relying on fuel cells (which manufacturers hope to begin building by 2015). While it’s not currently clear who the winners will be, it’s safe to say that positive market forces and ample opportunity will lead to innovative solutions. The near-term outlook for total capital investment (from primarily first and second wave projects) is immense. The table below provides a snapshot analysis of the short term outlook (through 2020) for domestic (lower 48 state) based capital investment. These estimates are conservative and based largely on publicly reported company business plans. For example, Table 1 includes only a portion of expected U.S. LNG projects going forward, as compared to the full list of DOE applications. The estimate also excludes the massive $65 billion proposed [Alaska](http://www.forbes.com/places/ak/) pipeline/export facility project and third wave investments targeting natural gas fired power plants and natural gas vehicles. Even with just a portion of total investment included, the conservative estimate of short term investment reaches more than $300 billion. **Estimate of U.S. Unconventional Oil and Gas Capital Expenditures and Job Creation**  **(Through 2020)** These investments have a huge economic impact on the U.S. economy—impacting jobs, economic growth and energy security. Some studies indicate that the U.S. has avoided retreating into an economic recession as a result of activity in the unconventional oil and gas sector. Production areas for unconventional oil and gas have observed very low unemployment and stronger GDP and tax revenues as compared to the rest of the U.S. As a result of the significant near term investments associated with unconventional oil and gas, it’s possible that up to 3.5 million jobs will be created from the infrastructure build out and related opportunities (including both direct and indirect jobs).

#### And, strong manufacturing ensures economic resilience – prevents disruptions from inevitable economic shocks

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Manufacturing is critically important to the American economy. For generations, the strength of our country rested on the power of our factory floors—both the machines and the men and women who worked them. We need manufacturing to continue to be a bedrock of strength for generations to come. Manufacturing is woven into the structure of our economy: Its importance goes far beyond what happens behind the factory gates. The strength or weakness of American manufacturing carries implications for the entire economy, our national security, and the well-being of all Americans. Manufacturing today accounts for 12 percent of the U.S. economy and about 11 percent of the private-sector workforce. But its significance is even greater than these numbers would suggest. The direct impact of manufacturing is only a part of the picture. First, jobs in the manufacturing sector are good middle-class jobs for millions of Americans. Those jobs serve an important role, offering economic opportunity to hard-working, middle-skill workers. This creates upward mobility and broadens and strengthens the middle class to the benefit of the entire economy. What’s more, U.S.-based manufacturing underpins a broad range of jobs that are quite different from the usual image of manufacturing. These are higher-skill service jobs that include the accountants, bankers, and lawyers that are associated with any industry, as well as a broad range of other jobs including basic research and technology development, product and process engineering and design, operations and maintenance, transportation, testing, and lab work. Many of these jobs are critical to American technology and innovation leadership. The problem today is this: Many multinational corporations may for a period keep these higher-skill jobs here at home while they move basic manufacturing elsewhere in response to other countries’ subsidies, the search for cheaper labor costs, and the desire for more direct access to overseas markets, but eventually many of these service jobs will follow. When the basic manufacturing leaves, the feedback loop from the manufacturing floor to the rest of a manufacturing operation—a critical element in the innovative process—is eventually broken. To maintain that feedback loop, companies need to move higher-skill jobs to where they do their manufacturing. And with those jobs goes American leadership in technology and innovation. This is why having a critical mass of both manufacturing and associated service jobs in the United States matters. The “industrial commons” that comes from the crossfertilization and engagement of a community of experts in industry, academia, and government is vital to our nation’s economic competitiveness. Manufacturing also is important for the nation’s economic stability. The experience of the Great Recession exemplifies this point. Although manufacturing plunged in 2008 and early 2009 along with the rest of the economy, it is on the rebound today while other key economic sectors, such as construction, still languish. Diversity in the economy is important—and manufacturing is a particularly important part of the mix. Although manufacturing is certainly affected by broader economic events, the sector’s internal diversity—supplying consumer goods as well as industrial goods, serving both domestic and external markets— gives it great potential resiliency. Finally, supplying our own needs through a strong domestic manufacturing sector protects us from international economic and political disruptions. This is most obviously important in the realm of national security, even narrowly defined as matters related to military strength, where the risk of a weak manufacturing capability is obvious. But overreliance on imports and substantial manufacturing trade deficits weaken us in many ways, making us vulnerable to everything from exchange rate fluctuations to trade embargoes to natural disasters.

#### Otherwise a complete collapse in domestic R&D is inevitable

Lind and Freedman 12 – Michael Lind (policy director of New America’s Economic Growth Program and a co-founder of the New America Foundation) and Joshua Freedman (program associate in New America’s Economic Growth Program) April 2012 “Value Added: America’s Manufacturing Future” [http://growth.newamerica.net/sites/newamerica.net/files/policydocs/Lind,%20Michael%20and%20Freedman,%20Joshua%20-%20NAF%20-%20Value%20Added%20America%27s%20Manufacturing%20Future.pdf](http://growth.newamerica.net/sites/newamerica.net/files/policydocs/Lind%2C%20Michael%20and%20Freedman%2C%20Joshua%20-%20NAF%20-%20Value%20Added%20America%27s%20Manufacturing%20Future.pdf)

Manufacturing, R&D and the U.S. Innovation Ecosystem Perhaps the greatest contribution of manufacturing to the U.S. economy as a whole involves the disproportionate role of the manufacturing sector in R&D. The expansion in the global market for high-value-added services has allowed the U.S. to play to its strengths by expanding its trade surplus in services, many of them linked to manufacturing, including R&D, engineering, software production and finance. Of these services, by far the most important is R&D. The United States has long led the world in R&D. In 1981, U.S. gross domestic expenditure on R&D was more than three times as large as that of any other country in the world. And the U.S. still leads: in 2009, the most recent year for which there is available data, the United States spent more than 400 billion dollars. European countries spent just under 300 billion dollars combined, while China spent about 150 billion dollars.14 In the United States, private sector manufacturing is the largest source of R&D. The private sector itself accounts for 71 percent of total R&D in the United States, and although U.S. manufacturing accounts for only 11.7 percent of GDP in 2012, the manufacturing sector accounts for 70 percent of all R&D spending by the private sector in the U.S.15 And R&D and innovation are inextricably connected: a National Science Foundation survey found that 22 percent of manufacturers had introduced product innovations and the same percentage introduced process innovations in the period 2006-2008, while only 8 percent of nonmanufacturers reported innovations of either kind.16 Even as the manufacturing industry in the United States underwent major changes and suffered severe job losses during the last decade, R&D spending continued to follow a general upward growth path. A disproportionate share of workers involved in R&D are employed directly or indirectly by manufacturing companies; for example, the US manufacturing sector employs more than a third of U.S. engineers.17 This means that manufacturing provides much of the demand for the U.S. innovation ecosystem, supporting large numbers of scientists and engineers who might not find employment if R&D were offshored along with production.

#### And, economic collapse causes nuclear war

Harris and Burrows, 9 – \*counselor in the National Intelligence Council, the principal drafter of Global Trends 2025, \*\*member of the NIC’s Long Range Analysis Unit “Revisiting the Future: Geopolitical Effects of the Financial Crisis”, Washington Quarterly, http://www.twq.com/09april/docs/09apr\_burrows.pdf)

Increased Potential for Global Conflict

Of course, the report encompasses more than economics and indeed believes the future is likely to be the result of a number of intersecting and interlocking forces. With so many possible permutations of outcomes, each with ample opportunity for unintended consequences, there is a growing sense of insecurity. Even so, history may be more instructive than ever. While we continue to believe that the Great Depression is not likely to be repeated, the lessons to be drawn from that period include the harmful effects on fledgling democracies and multiethnic societies (think Central Europe in 1920s and 1930s) and on the sustainability of multilateral institutions (think League of Nations in the same period). There is no reason to think that this would not be true in the twenty-first as much as in the twentieth century. For that reason, the ways in which the potential for greater conflict could grow would seem to be even more apt in a constantly volatile economic environment as they would be if change would be steadier.

In surveying those risks, the report stressed the likelihood that terrorism and nonproliferation will remain priorities even as resource issues move up on the international agenda. Terrorism’s appeal will decline if economic growth continues in the Middle East and youth unemployment is reduced. For those terrorist groups that remain active in 2025, however, the diffusion of technologies and scientific knowledge will place some of the world’s most dangerous capabilities within their reach. Terrorist groups in 2025 will likely be a combination of descendants of long established groups inheriting organizational structures, command and control processes, and training procedures necessary to conduct sophisticated attacks and newly emergent collections of the angry and disenfranchised that become self-radicalized, particularly in the absence of economic outlets that would become narrower in an economic downturn.

The most dangerous casualty of any economically-induced drawdown of U.S. military presence would almost certainly be the Middle East. Although Iran’s acquisition of nuclear weapons is not inevitable, worries about a nuclear-armed Iran could lead states in the region to develop new security arrangements with external powers, acquire additional weapons, and consider pursuing their own nuclear ambitions. It is not clear that the type of stable deterrent relationship that existed between the great powers for most of the Cold War would emerge naturally in the Middle East with a nuclear Iran. Episodes of low intensity conflict and terrorism taking place under a nuclear umbrella could lead to an unintended escalation and broader conflict if clear red lines between those states involved are not well established. The close proximity of potential nuclear rivals combined with underdeveloped surveillance capabilities and mobile dual-capable Iranian missile systems also will produce inherent difficulties in achieving reliable indications and warning of an impending nuclear attack. The lack of strategic depth in neighboring states like Israel, short warning and missile flight times, and uncertainty of Iranian intentions may place more focus on preemption rather than defense, potentially leading to escalating crises.

Types of conflict that the world continues to experience, such as over resources, could reemerge, particularly if protectionism grows and there is a resort to neo-mercantilist practices. Perceptions of renewed energy scarcity will drive countries to take actions to assure their future access to energy supplies. In the worst case, this could result in interstate conflicts if government leaders deem assured access to energy resources, for example, to be essential for maintaining domestic stability and the survival of their regime. Even actions short of war, however, will have important geopolitical implications. Maritime security concerns are providing a rationale for naval buildups and modernization efforts, such as China’s and India’s development of blue water naval capabilities. If the fiscal stimulus focus for these countries indeed turns inward, one of the most obvious funding targets may be military. Buildup of regional naval capabilities could lead to increased tensions, rivalries, and counterbalancing moves, but it also will create opportunities for multinational cooperation in protecting critical sea lanes. With water also becoming scarcer in Asia and the Middle East, cooperation to manage changing water resources is likely to be increasingly difficult both within and between states in a more dog-eat-dog world.

#### Economic decline causes war – strong statistical support

Royal 10 – Jedediah Royal, Director of Cooperative Threat Reduction at the U.S. Department of Defense, 2010, “Economic Integration, Economic Signaling and the Problem of Economic Crises,” in Economics of War and Peace: Economic, Legal and Political Perspectives, ed. Goldsmith and Brauer, p. 213-214

Less intuitive is how periods of economic decline may increase the likelihood of external conflict. Political science literature has contributed a moderate degree of attention to the impact of economic decline and the security and defence behaviour of interdependent states. Research in this vein has been considered at systemic, dyadic and national levels. Several notable contributions follow. First, on the systemic level, Pollins (2008) advances Modelski and Thompson's (1996) work on leadership cycle theory, finding that rhythms in the global economy are associated with the rise and fall of a pre-eminent power and the often bloody transition from one pre-eminent leader to the next. As such, exogenous shocks such as economic crises could usher in a redistribution of relative power (see also Gilpin. 1981) that leads to uncertainty about power balances, increasing the risk of miscalculation (Feaver, 1995). Alternatively, even a relatively certain redistribution of power could lead to a permissive environment for conflict as a rising power may seek to challenge a declining power (Werner. 1999). Separately, Pollins (1996) also shows that global economic cycles combined with parallel leadership cycles impact the likelihood of conflict among major, medium and small powers, although he suggests that the causes and connections between global economic conditions and security conditions remain unknown. Second, on a dyadic level, Copeland's (1996, 2000) theory of trade expectations suggests that 'future expectation of trade' is a significant variable in understanding economic conditions and security behaviour of states. He argues that interdependent states are likely to gain pacific benefits from trade so long as they have an optimistic view of future trade relations. However, if the expectations of future trade decline, particularly for difficult to replace items such as energy resources, the likelihood for conflict increases, as states will be inclined to use force to gain access to those resources. Crises could potentially be the trigger for decreased trade expectations either on its own or because it triggers protectionist moves by interdependent states.4 Third, others have considered the link between economic decline and external armed conflict at a national level. Blomberg and Hess (2002) find a strong correlation between internal conflict and external conflict, particularly during periods of economic downturn. They write: The linkages between internal and external conflict and prosperity are strong and mutually reinforcing. Economic conflict tends to spawn internal conflict, which in turn returns the favour. Moreover, the presence of a recession tends to amplify the extent to which international and external conflicts self-reinforce each other. (Blomberg & Hess, 2002. p. 89) Economic decline has also been linked with an increase in the likelihood of terrorism (Blomberg, Hess, & Weerapana, 2004), which has the capacity to spill across borders and lead to external tensions. Furthermore, crises generally reduce the popularity of a sitting government. "Diversionary theory" suggests that, when facing unpopularity arising from economic decline, sitting governments have increased incentives to fabricate external military conflicts to create a 'rally around the flag' effect. Wang (1996), DeRouen (1995). and Blomberg, Hess, and Thacker (2006) find supporting evidence showing that economic decline and use of force are at least indirectly correlated. Gelpi (1997), Miller (1999), and Kisangani and Pickering (2009) suggest that the tendency towards diversionary tactics are greater for democratic states than autocratic states, due to the fact that democratic leaders are generally more susceptible to being removed from office due to lack of domestic support. DeRouen (2000) has provided evidence showing that periods of weak economic performance in the United States, and thus weak Presidential popularity, are statistically linked to an increase in the use of force. In summary, recent economic scholarship positively correlates economic integration with an increase in the frequency of economic crises, whereas political science scholarship links economic decline with external conflict at systemic, dyadic and national levels.5 This implied connection between integration, crises and armed conflict has not featured prominently in the economic-security debate and deserves more attention.

#### Manufacturing key to overall military superiority and deterrence

Mackenzie Eaglen et al (American Enterprise Institute, Rebecca Grant, IRIS Research, Robert P. Haffa, Haffa Defense Consulting, Michael O'Hanlon, The Brookings Institution, Peter W. Singer, The Brookings Institution, Martin Sullivan, Commonwealth Consulting, Barry Watts, Center for Strategic and Budgetary Assessments) January 2012 “The Arsenal of Democracy and How to Preserve It: Key Issues in Defense Industrial Policy

Yet there are severe challenges that could result to the nation’s security interests even with 10 percent cutbacks. Despite the likely potential of lesser resources, the demand side of the equation does not seem likely to grow easier. The international security environment is challenging and complex. China’s economic, political and now military rise continues. Its direction is uncertain, but it has already raised tension, especially in the South China Sea. Iran’s ambitions and machinations remain foreboding, with its nuclear plans entering a new phase of both capability but also crisis. North Korea is all the more uncertain with a leadership transition, but has a history of brinkmanship and indeed even the occasional use of force against the South, not to mention nuclear weapons-related activities that raise deep concern. And the hopeful series of revolutions in the broader Arab world in 2011, while inspiring at many levels, also seem likely to raise uncertainty in the broader Middle East. Revolutions are inherently unpredictable and often messy geostrategic events. On top of these remain commitments in Afghanistan and beyond and the frequent U.S. military role in humanitarian disaster relief. Thus, there are broad challenges for American defense planners as they try to address this challenging world with fewer available resources. The current wave of defense cuts is also different than past defense budget reductions in their likely industrial impact, as the U.S. defense industrial base is in a much different place than it was in the past. Defense industrial issues are too often viewed through the lens of jobs and pet projects to protect in congressional districts. But the overall health of the firms that supply the technologies our armed forces utilize does have national security resonance. Qualitative superiority in weaponry and other key military technology has become an essential element of American military power in the modern era—not only for winning wars but for deterring them. That requires world-class scientific and manufacturing capabilities—which in turn can also generate civilian and military export opportunities for the United States in a globalized marketplace. While procurement budgets have finally, in recent years, reached their historic norms as a percent of the overall defense budget, the legacy of the 1990s procurement “holiday” remains real. In that period, the United States as a matter of policy bought much less equipment than it would normally, enjoying the fruits of the 1980s buildup as it sought to reduce defense spending. But Reagan-era weaponry is wearing out, and the recent increase in procurement spending has not lasted long enough to replenish the nation’s key weapons arsenals with new weaponry. The last decade of procurement policy focused more on filling certain gaps in counterinsurgency capabilities than replacing the mainline weapons programs that make up the bulk of conventional capabilities. Meanwhile, the main elements of DoD’s weapons inventories—fighter jets, armored vehicles, surface vessels and submarines—continue to age. We often say that, in today’s American armed forces, people are our most cherished commodity and greatest asset. That is certainly true at one level, through the dedication and excellence shown by our brave men and women in uniform. But it is also true that adjusting the personnel size of the military up or down has been done with success multiple times, and seems likely to happen again. By contrast, scientific and manufacturing excellence in the defense space is not something easily moved up and down. Today’s industrial capabilities took decades to build and would be hard to restore if lost (Great Britain’s difficulty restoring its ability to build nuclear submarines is a frequently cited example.). Unlike the period just after the Cold War, there are no obvious surpluses of defense firms, such that a natural paring process will find the fittest firms and ensure their survival. While there are roughly five major firms, there are often just one or two suppliers in any given major area of defense technology. Similar challenges exist within the subcontractor community, which has become highly specialized, with certain key components or capabilities similarly reflecting monopolies or oligopolies, or being acquired by the primes in a way that risks future competition. The defense economy is also experiencing meta-changes in everything from shifts in traditional sectors, such as the move from manned to unmanned planes, to new sectors arising like cybersesecurity, to a broader move from the exclusive production of goods to the growing provision of defense services. Such issues in the defense economy also touch on broader areas of national economic and geopolitical competitiveness. Top class American firms rely on top class scientists and engineers. At present, the United States ranks in the lower half of industrial countries for the average math and science scores of its public school students and graduates just a fraction as many scientists and engineers a year from university-level studies as does either China or India. These trends should not be overstated; the quality of American scientists and engineers remains world class. But the trends still pose deep worries in the American defense industrial field as its looks towards the future of its work force, which is aging rapidly in numerous sectors. Not only then are the U.S. military services, but also American defense industry at a crossroads. Normally, defense policy decisions in times of retrenchment begin with strategy, threats, missions, and force structure and only address defense industrial issues as an afterthought. In past days of flush budgets and numerous duplicative suppliers, this approach may have made sense. It makes sense no longer. Careless defense reductions or poor planning won’t just cost jobs or competitiveness, but could actually result in lost American military industrial capability in core areas. The Department of Defense has recently made some encouraging moves towards emphasizing the role of the industrial base in its strategic and budgetary planning. The 2010 Quadrennial Defense Review examined the subject, for example, and Secretary Panetta and his deputies have convened several meetings in recent months with industry leaders to discuss their concerns. But industrial base considerations remain little discussed outside the specialist community and too frequently take a short term or single interest approach, such as asking a candidate to weigh in on an individual product or firm. Rather, it is the overall state of the field and its future that should be of concern to all, regardless of where they stand on the political spectrum. Thus, as presidential candidates and other national leaders develop their platforms for the 2012 elections and beyond, any serious discussion of national security and the current state and future of the military must also give direct attention to matters of the American national security scientific and industrial base. This discussion should be direct and forthright, recognizing the context of severe budgetary dilemmas for the nation, the success and challenges of the defense economy, changing military demands, and the gradual erosion of American manufacturing in many sectors over the last several decades. Among the core questions for candidates to develop their policy answers around are: 4 1. Are there any sectors within American defense industry or types of technologies for the Department of Defense that should be prioritized? If this is the case, what should be prioritized and what are the areas that are not quite as important as others—or even over resourced at present? 2. The Department of Defense is likely to reduce the size of the nation’s ground forces considerably in the years ahead, as the war in Afghanistan gradually winds down. Does this imply prioritizing investment in Air-Sea battle capabilities at the expense of ground force capability, or should the United States try to do all with less? 3. Do the Pentagon and Congress have enough tools for evaluating the strength of the nation’s industrial base and its access to key raw materials and technologies? If not, what should be done to give this subject greater scrutiny and sustained attention? 4. Should the Department of Defense move to more fixed-price contracts in its procurement policies? Should private companies be allowed to compete for a higher share of maintenance contracts, even if that means downsizing government depots? 5. Is the Pentagon’s increased focus on enlarging its acquisition oversight workforce making the acquisition process more innovative, economical, and efficient or more burdensome and bureaucratic? 6. Are there tools of export and trade policy that need to be adjusted to strengthen the U.S. defense industrial base? If so, what? Is the FMS program basically sound? Does the consolidation of export control lists within Commerce bode well or are other steps needed? 7. Are there certain allies from which the United States should be willing to import more defense technology, especially if the improved trade opportunities are reciprocated? Should we explore pooling and joint production options with our close allies, along the lines of what Britain and France have recently launched? 8. How should the nation strengthen STEM education in the United States, in high schools and colleges, to encourage more Americans to pursue careers in science, technology, engineering, and math? Does the nation need to revise any of its immigration and green-card policies to increase the ability of foreign scientists to remain in this country after studying here and contribute to its scientific and industrial strength? 9. Do government regulations and requirements deter new and innovative firms from entering the defense market to the detriment of the nation’s military? If so, what should be done to induce their entry? 10. Are there any other policy interventions that might be needed to ensure American military technological preeminence in the years ahead? A certain floor under R&D budgets? Targeted sustainment funding for specific capabilities such as independent weapons design teams at numerous firms? Greater DoD contributions to research and prototyping by defense firms? The United States, and its civilian leaders, cannot afford to avoid the hard questions that now come with maintaining a strong successful military, a top flight defense industrial base, and a fiscally sound national economy. Our defense industrial base is certainly not broken, but there are clear, unavoidable challenges that loom, which might undercut broader national security, and the looming big budget cutbacks raise the stakes and heighten the sense of urgency in addressing the issue. In sum, the arsenal of democracy that arms the best military in the world, took decades to build. If allowed to atrophy, it would take decades to rebuild. Those who would seek to lead the U.S. armed forces must answer the key questions to ensure these capabilities are not lost in a matter of years.

#### Independently de-escalates conflict and deters balancing

Mark Zachary Taylor (Ph.D. candidate, lecturer, and research assistant in the Department of Political Science at Massachusetts Institute of Technology) 2004 “The Politics of Technological Change: International Relations versus Domestic Institutions” http://web.mit.edu/polisci/research/wip/Taylor.pdf

Technological innovation is of central importance to the study of international relations (IR), affecting almost every aspect of the sub-field.2 First and foremost, a nation’s technological capability has a significant effect on its economic growth, industrial might, and military prowess; therefore relative national technological capabilities necessarily influence the balance of power between states, and hence have a role in calculations of war and alliance formation. Second, technology and innovative capacity also determine a nation’s trade profile, affecting which products it will import and export, as well as where multinational corporations will base their production facilities.3 Third, insofar as innovation-driven economic growth both attracts investment and produces surplus capital, a nation’s technological ability will also affect international financial flows and who has power over them.4 Thus, in broad theoretical terms, technological change is important to the study of IR because of its overall implications for both the relative and absolute power of states. And if theory alone does not convince, then history also tells us that nations on the technological ascent generally experience a corresponding and dramatic change in their global stature and influence, such as Britain during the first industrial revolution, the United States and Germany during the second industrial revolution, and Japan during the twentieth century.5 Conversely, great powers which fail to maintain their place at the technological frontier generally drift and fade from influence on international scene.6 This is not to suggest that technological innovation alone determines international politics, but rather that shifts in both relative and absolute technological capability have a major impact on international relations, and therefore need to be better understood by IR scholars indirect source of military doctrine. And for some, like Gilpin quoted above, technology is the very cornerstone of great power domination, and its transfer the main vehicle by which war and change occur in world politics.8 Jervis tells us that the balance of offensive and defensive military technology affects the incentives for war.9 Walt agrees, arguing that technological change can alter a state’s aggregate power, and thereby affect both alliance formation and the international balance of threats.10 Liberals are less directly concerned with technological change, but they must admit that by raising or lowering the costs of using force, technological progress affects the rational attractiveness of international cooperation and regimes.11 Technology also lowers information & transactions costs and thus increases the applicability of international institutions, a cornerstone of Liberal IR theory.12 And in fostering flows of trade, finance, and information, technological change can lead to Keohane’s interdependence13 or Thomas Friedman et al’s globalization.14 Meanwhile, over at the “third debate”, Constructivists cover the causal spectrum on the issue, from Katzenstein’s “cultural norms” which shape security concerns and thereby affect technological innovation;15 to Wendt’s “stripped down technological determinism” in which technology inevitably drives nations to form a world state.16 However most Constructivists seem to favor Wendt, arguing that new technology changes people’s identities within society, and sometimes even creates new cross-national constituencies, thereby affecting international politics.17 Of course, Marxists tend to see technology as determining all social relations and the entire course of history, though they describe mankind’s major fault lines as running between economic classes rather than nation-states.18 Finally, Buzan & Little remind us that without advances in the technologies of transportation, communication, production, and war, international systems would not exist in the first place.19

#### Prefer our internal links – explains the last five centuries of global hegemons

Daniel Drezner (professor of international politics at The Fletcher School of Law and Diplomacy at Tufts University) 2001 “State structure, technological leadership and the maintenance of hegemony” http://www.danieldrezner.com/research/tech.pdf

In this decade, proponents of globalization argue that because information and capital are mobile, the location of innovation has been rendered unimportant.6 While this notion has some popular appeal, the globalization thesis lacks theoretical or empirical support. Theoretically, even in a world of perfect information and perfect capital mobility, economists have shown that the location of technological innovation matters.7 Empirically, the claims of globalization proponents have been far-fetched. Capital is not perfectly mobile, and increased economic exchange does not lead to a seamless transfer of technology from one country to another.8 The location of innovation still matters. Long-cycle theorists have paid the most attention to the link between technological innovation, economic growth, and the rise and fall of hegemons.9 They argue that the past five hundred years of the global political economy can be explained by the waxing and waning of hegemonic powers. Countries acquire hegemonic status because they are the first to develop a cluster of technologies in leading sectors. These innovations generate spillover effects to the rest of the lead economy, and then to the global economy. Over time, these ‘technological hegemons’ fail to maintain the rate of innovations, leading to a period of strife until a new hegemonic power is found.

**Decline causes every scenario for extinction
Brzezinski, 12** [1/24/12, Zbigniew, Former National Security Advisor to President of the Great United States Jimmy Carter, Professor of American Foreign Policyat [Johns Hopkins University](http://en.wikipedia.org/wiki/Johns_Hopkins_University)'s [School of Advanced International Studies](http://en.wikipedia.org/wiki/Johns_Hopkins_SAIS), scholar at the Center for Strategic and International Studies, Strategic Vision: America and the Crisis of Global Power (Kindle Locations 1476-1485). Perseus Books Group. Kindle Edition]

An American decline would impact the nuclear domain most profoundly by inciting a **crisis of confidence** in the credibility of the American nuclear umbrella. Countries like South Korea, Taiwan, Japan, Turkey, and even Israel, among others, rely on the United States’ extended nuclear deterrence for security. If they were to see the United States slowly retreat from certain regions, forced by circumstances to pull back its guarantees, or even if they were to lose confidence in standing US guarantees, because of the financial, political, military, and diplomatic consequences of an American decline, then they will have to seek security elsewhere. That “elsewhere” security could originate from only two sources: from nuclear weapons of one’s own or from the extended deterrence of another power—most likely Russia, China, or India. It is possible that countries that feel threatened by the ambition of existing nuclear weapon states, the addition of new nuclear weapon states, or the decline in the reliability of American power would develop their own nuclear capabilities. For crypto-nuclear powers like Germany and Japan, the path to nuclear weapons would be easy and fairly quick, given their extensive civilian nuclear industry, their financial success, and their technological acumen. Furthermore, the continued existence of nuclear weapons in North Korea and the potentiality of a nuclear-capable Iran could prompt American allies in the Persian Gulf or East Asia to build their own nuclear deterrents. Given North Korea’s increasingly aggressive and erratic behavior, the failure of the six-party talks, and the widely held distrust of Iran’s megalomaniacal leadership, the guarantees offered by a declining America’s nuclear umbrella might not stave off a regional nuclear arms race among smaller powers. Last but not least, even though China and India today maintain a responsible nuclear posture of minimal deterrence and “no first use,” the uncertainty of an increasingly nuclear world could force both states to reevaluate and escalate their nuclear posture. Indeed, they as well as Russia might even become inclined to extend nuclear assurances to their respective client states. Not only could this signal a renewed regional nuclear arms race between these three aspiring powers but it could also create new and antagonistic **spheres of influence** in Eurasia driven by competitive nuclear deterrence. The decline of the United States would thus precipitate drastic changes to the nuclear domain. An increase in proliferation among insecure American allies and/or an arms race between the emerging Asian powers are among the more likely outcomes. This ripple effect of proliferation would undermine the transparent management of the nuclear domain and increase the likelihood of **interstate rivalry, miscalc**ulation, and eventually even perhaps of international **nuclear terror**. In addition to the foregoing, in the course of this century the world will face a series of novel geopolitical challenges brought about by significant changes in the physical environment. The management of those changing environmental commons—the growing scarcity of fresh water, the opening of the Arctic, and global warming—will require global consensus and mutual sacrifice. American leadership alone is not enough to secure cooperation on all these issues, but a decline in American influence would reduce the likelihood of achieving cooperative agreements on environmental and resource management. America’s retirement from its role of global policeman could create greater opportunities for emerging powers to further exploit the environmental commons for their own economic gain, **increasing the chances of resource-driven conflict**, particularly in Asia. The latter is likely to be the case especially in regard to the increasingly scarce water resources in many countries. According to the United States Agency for International Development (USAID), by 2025 more than 2.8 billion people will be living in either water-scarce or water-stressed regions, as global demand for

water will double every twenty years.9 While much of the Southern Hemisphere is threatened by potential water scarcity, interstate conflicts—the geopolitical consequences of cross-border water scarcity—are most likely to occur in Central and South Asia, the Middle East, and northeastern Africa, regions where limited water resources are shared across borders and political stability is transient. The combination of political insecurity and resource scarcity is a menacing geopolitical combination. The threat of water conflicts is likely to intensify as the economic growth and increasing demand for water in emerging powers like Turkey and India collides with instability and resource scarcity in rival countries like Iraq and Pakistan. Water scarcity will also test China’s internal stability as its burgeoning population and growing industrial complex combine to increase demand for and decrease supply of usable water. In South Asia, the never-ending political tension between India and Pakistan combined with overcrowding and Pakistan’s heightening internal crises may put the Indus Water Treaty at risk, especially because the river basin originates in the long-disputed territory of Jammu and Kashmir, an area of ever-increasing political and military volatility. The lingering dispute between India and China over the status of Northeast India, an area through which the vital Brahmaputra River flows, also remains a serious concern. As American hegemony disappears and **regional competition intensifies**, disputes over natural resources like water have the potential to develop into **full-scale conflicts**. The slow thawing of the Arctic will also change the face of the international competition for important resources. With the Arctic becoming increasingly accessible to human endeavor, the five Arctic littoral states—the United States, Canada, Russia, Denmark, and Norway—may rush to lay claim to its bounty of oil, gas, and metals. This run on the Arctic has the potential to cause severe shifts in the geopolitical landscape, particularly to Russia’s advantage. As Vladimir Radyuhin points out in his article entitled “The Arctic’s Strategic Value for Russia,” Russia has the most to gain from access to the Arctic while simultaneously being the target of far north containment by the other four Arctic states, all of which are members of NATO. In many respects this new great game will be determined by who moves first with the most legitimacy, since very few agreements on the Arctic exist. The first Russian supertanker sailed from Europe to Asia via the North Sea in the summer of 2010.10 Russia has an immense amount of land and resource potential in the Arctic. Its territory within the Arctic Circle is 3.1 million square kilometers—around the size of India—and the Arctic accounts for 91% of Russia’s natural gas production, 80% of its explored natural gas reserves, 90% of its offshore hydrocarbon reserves, and a large store of metals.11 Russia is also attempting to increase its claim on the territory by asserting that its continental shelf continues deeper into the Arctic, which could qualify Russia for a 150-mile extension of its Exclusive Economic Zone and add another 1.2 million square kilometers of resource-rich territory. Its first attempt at this extension was denied by the UN Commission on the Continental Shelf, but it is planning to reapply in 2013. Russia considers the Arctic a true extension of its northern border and in a 2008 strategy paper President Medvedev stated that the Arctic would become Russia’s “main strategic resource base” by 2020.12 Despite recent conciliatory summits between Europe and Russia over European security architecture, a large amount of uncertainty and distrust stains the West’s relationship with Russia. The United States itself has always maintained a strong claim on the Arctic and has continued patrolling the area since the end of the Cold War. This was reinforced during the last month of President Bush’s second term when he released a national security directive stipulating that America should “preserve the global mobility of the United States military and civilian vessels and aircraft throughout the Arctic region.” The potentiality of an American decline could embolden Russia to more forcefully assert its control of the Arctic and over Europe via energy politics; though much depends on Russia’s political orientation after the 2012 presidential elections. All five Arctic littoral states will benefit from a peaceful and cooperative agreement on the Arctic—similar to Norway’s and Russia’s 2010 agreement over the Barents Strait—and the geopolitical stability it would provide. Nevertheless, political circumstances could rapidly change in an environment where control over energy remains Russia’s single greatest priority. Global climate change is the final component of the environmental commons and the one with the greatest potential geopolitical impact. Scientists and policy makers alike have projected catastrophic consequences for mankind and the planet if the world average temperature rises by more than two degrees over the next century. Plant and animal **species could grow extinct** at a rapid pace, large-scale **ecosystems** **could** **collapse**, human **migration** could increase to untenable levels, and global **economic development could be** categorically **reversed**. Changes in geography, forced migration, and global economic contraction layered on top of the perennial regional security challenges could create a geopolitical reality of **unmanageable** complexity and **conflict**, especially in the densely populated and politically unstable areas of Asia such as the Northeast and South. Furthermore, any legitimate action inhibiting global climate change will require unprecedented levels of self-sacrifice and international cooperation. The United States does consider climate change a serious concern, but its lack of both long-term strategy and political commitment, evidenced in its refusal to ratify the Kyoto Protocol of 1997 and the repeated defeat of climate-change legislation in Congress, deters other countries from participating in a global agreement. The United States is the second-largest global emitter of carbon dioxide, after China, with 20% of the world’s share. The United States is the number one per capita emitter of carbon dioxide and the global leader in per capita energy demand. Therefore, US leadership is essential in not only getting other countries to cooperate, but also in actually inhibiting climate change. Others around the world, including the European Union and Brazil, have attempted their own domestic reforms on carbon emissions and energy use, and committed themselves to pursuing renewable energy. Even China has made reducing emissions a goal, a fact it refuses to let the United States ignore. But none of those nations currently has the ability to lead a global initiative. President Obama committed the United States to energy and carbon reform at the Copenhagen Summit in 2009, but the increasingly polarized domestic political environment and the truculent American economic recovery are unlikely to inspire progress on costly energy issues. China is also critically important to any discussion of the management of climate change as it produces 21% of the world’s total carbon emissions, a percentage that will only increase as China develops the western regions of its territory and as its citizens experience a growth in their standard of living. China, however, has refused to take on a leadership role in climate change, as it has also done in the maritime, space, and cyberspace domains. China uses its designation as a developing country to shield itself from the demands of global stewardship. China’s tough stance at the 2009 Copenhagen Summit underscores the potential dangers of an American decline: no other country has the capacity and the desire to accept global stewardship over the environmental commons. Only a vigorous Unites States could lead on climate change, given Russia’s dependence on carbon-based energies for economic growth, India’s relatively low emissions rate, and China’s current reluctance to assume global responsibility. The protection and good faith management of the global commons—**sea**, **space**, **cyberspace**, nuclear **prolif**eration, **water** security, **the Arctic**, and **the environment** itself—**are imperative to** the long-term growth of the global economy and **the continuation of** basic geopolitical **stability**. But in almost every case, the potential absence of constructive and influential US leadership would fatally undermine the essential communality of the global commons.     The argument that America’s decline would generate global insecurity, endanger some vulnerable states, produce a more troubled North American neighborhood, and make cooperative management of the global commons more difficult is not an argument for US global supremacy. In fact, the strategic complexities of the world in the twenty-first century—resulting from the rise of a politically self-assertive global population and from the dispersal of global power—make such supremacy unattainable. But in this increasingly complicated geopolitical environment, an America in pursuit of a new, timely strategic vision is crucial to helping the world avoid a dangerous slide into international turmoil.

### Warming

#### CO2 emissions will run away in the status quo—natural gas is the only effective alternative to coal—U.S. development is modeled globally and prevents extinction

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The battle against runaway climate change is being lost. The green movement and the energy industry — while engaged in a furious debate on issues from nuclear power to oil sands — are missing the bigger picture.

There is little recognition by either side that current policies to reduce carbon dioxide emissions are inadequate for dealing with the threat that they pose. It is the coal-fueled growth of countries like China and India that generates much of these emissions. Unless a cheap, rapidly deployable substitute fuel is found for coal, then it will be next to impossible to safely rein in rising carbon dioxide levels around the world.

Although the green movement might at first see shale gas as an enemy in this fight, it may in fact turn out to be a friend. Broad development of shale gas resources — with proper ecological safeguards — could be the best way to achieve the quick cuts in carbon dioxide emissions that we need to maintain a habitable environment on Earth.

The International Energy Agency has made it clear that, under current energy policies, the door is closing on our attempts to contain the carbon-driven rise in global temperatures to within 2 degrees Celsius (3.6 Fahrenheit) by the middle of the century. In fact, worldwide carbon dioxide emissions from burning fossil fuels reached a record high of 31.6 gigatons in 2011. With emissions rising by one gigaton per year, it appears the temperature-increase target will most likely be missed.

The shale gas revolution could be the means of blunting the rise of carbon dioxide emissions and give new hope for staying within the 2 degrees Celsius scenario. This resource is widely dispersed across the planet, cheap to develop and offers many of the same energy benefits as coal. If exploited properly, it could replace coal within a couple of decades as a primary fuel.

By developing shale gas as a replacement fuel for coal we retrieve the prospect of blunting — and possibly reversing — the upward climb of carbon dioxide emissions. Shale gas emits 50 percent less carbon dioxide than coal, and so if countries like China and India made the switch on a large scale, then we have a chance to reset the trajectory of global carbon dioxide emissions.

A widespread turn to the use of shale gas would give the planet precious time to develop other, renewable solutions to further lower our output of carbon dioxide. Current renewable energy sources cannot in any way deliver the same savings in carbon emissions that we can achieve by replacing coal with shale gas.

One only has to look to China to see the strong potential of this solution. With the world’s largest shale gas resources, the country has set out a vast gas development program in its latest five-year economic plan. Output would rise from 6.5 billion cubic meters of shale gas by 2015 to 100 billion cubic meters by 2020. And if China can produce that much by 2020, is there any reason to think it cannot pump out 800 billion cubic meters by 2030?

Such a development program would be similar in scale to that undertaken in the United States, which has seen shale gas rise from 1 percent of gas production in 2001 to 37 percent last year.

China can surely achieve these goals, especially given all the new technology available to the shale gas industry, along with abundant state capital. That the government is focusing its efforts in this direction is another reason to believe that China can reach these production levels. An output of 800 billion cubic meters a year — combined with far-higher levels of energy efficiency — would allow China to slow, and then terminate, its coal-expansion plans and ultimately end its reliance on coal-fired energy altogether.

The United States could play a key role in encouraging China and other developing nations to switch from coal to shale gas. The State Department has launched a Global Shale Gas Initiative to facilitate the transfer of technical expertise to other countries to ensure safe development of this new resource. The United States could also lead the way in creating a credible, alternative climate change strategy in which the use of shale gas becomes the driver of radical cuts in carbon dioxide emissions over the short and medium term.

#### And, natural gas acts as a bridge fuel—spurring broad renewable development

Ju 12 – Anne Ju (senior science writer for the Cornell Chronicle) July 17, 2012 “Study Proves Natural Gas Can Bridge the Gap to a Clean Energy Economy” <http://oilprice.com/Energy/Natural-Gas/Study-Proves-Natural-Gas-Can-Bridge-the-Gap-to-a-Clean-Energy-Economy.html>

Natural gas is a good transition step on the road to greener energy sources like wind, solar, and nuclear power, says a new study. Lawrence M. Cathles, Cornell University professor of earth and atmospheric sciences, says natural gas is a smart move in the battle against global climate change. Published in the most recent edition of the journal Geochemistry, Geophysics and Geosystems, Cathles’ study reviews the most recent government and industry data on natural gas “leakage rates” during extraction, as well as recently developed climate models. He concludes that regardless of the time frame considered, substituting natural gas energy for all coal and some oil production provides about 40 percent of the global warming benefit that a complete switch to low-carbon sources would deliver. “From a greenhouse point of view, it would be better to replace coal electrical facilities with nuclear plants, wind farms, and solar panels, but replacing them with natural gas stations will be faster, cheaper, and achieve 40 percent of the low-carbon-fast benefit,” Cathles writes in the study. “Gas is a natural transition fuel that could represent the biggest stabilization wedge available to us.” Cathles’ study includes additional findings about expanding the use of natural gas as an energy source, as well as the climate impact of “unconventional” gas drilling methods, including hydraulic fracturing in shale formations. They include the following: • Although a more rapid transition to natural gas from coal and some oil produces a greater overall benefit for climate change, the 40 percent of low-carbon energy benefit remains no matter how quickly the transition is made, and no matter the effect of ocean modulation or other climate regulating forces. • Although some critics of natural gas as a transition fuel have cited leakage rates as high as 8 percent or more of total production during drilling—particularly hydraulic fracturing extraction—more recent industry data and a critical examination of Environmental Protection Agency data supports leakage rates closer to 1.5 percent for both conventional and hydrofractured wells. • Even at higher leakage rates, using natural gas as a transition to low-carbon energy sources is still a better policy than “business as usual” with coal and oil, due to the different rates of decay (and hence long-term global warming effect) of carbon dioxide released in greater amounts by burning coal and oil and any methane released during natural gas extraction. • Using natural gas as a transition fuel supports the push to low-carbon sources by providing the “surge capacity” when needed, or a buffer when solar and wind production wanes. “The most important message of the calculations reported here is that substituting natural gas for coal and oil is a significant way to reduce greenhouse forcing, regardless of how long the substitution takes,” Cathles writes. “A faster transition to low-carbon energy sources would decrease greenhouse warming further, but the substitution of natural gas for other fossil fuels is equally beneficial in percentage terms no matter how fast the transition.”

#### Second, the plan is key to extract methane hydrates—prevents leaks

US Chamber of Commerce 11 (Institute for 21st Century Energy, Chamber of Commerce, no date given (website registered 2011), “Immediately Expand Domestic Oil and Gas Exploration and Production,” [http://www.energyxxi.org/immediately-expand-domestic-oil-and-gas-exploration-and-production)//CC](http://www.energyxxi.org/immediately-expand-domestic-oil-and-gas-exploration-and-production%29//CC)

Another potential source of significant amounts of domestic natural gas is methane hydrates, an icelike substance containing natural gas, found beneath the ocean floor and in the Arctic permafrost. The United States Geological Survey estimates there are some 317 quadrillion cubic feet of methane gas stored in hydrates in the United States. This represents more than 1,600 times the amount of conventional natural gas reserves estimated in the United States. More R&D is necessary to more accurately locate this resource and economically produce it with **minimal** geologic impact or **release of GHG emissions**. However, the moratorium preventing exploration and production of traditional natural gas on the OCS also acts to thwart work to develop methane hydrates.

#### Methane hydrates will inevitably be released – tech developments key to solve runaway warming

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A chunk of methane ice exposed to the air and ignited will burn until all of the methane in that ice has been consumed. Methane hydrates, however, require specific conditions of temperature and pressure to keep them contained within their ice cage. Reduce the pressure - for example, by reducing the sea level and the pressure of water above the deposit - or increased the temperature and the methane hydrate deposit becomes unstable and begins to release the trapped methane into the atmosphere. That is a problem. Methane is a greenhouse gas. In fact, it is 21-23 times more powerful as a greenhouse gas than carbon dioxide. When the methane trapped in the hydrate is released it expands by about 170 times.[1] Methane is lighter than CO2, lighter than air. As a result it rises rapidly through the atmosphere up to the lower-density stratosphere. On the positive side methane remains in the atmosphere for only about 10-20 years. CO2 remains in the atmosphere for over 100 years. Scientists studying global warming have long been seriously concerned about the possibility of large scale methane hydrate destabilization and methane release into the atmosphere. The greatest concern is about the large volumes of methane hydrates under the Arctic sea floor and that trapped in the vast permafrost zone surrounding the Arctic Ocean. That concern has now been heightened by recent discoveries of hundreds of methane plumes on the floor of the Arctic Ocean north of Norway and Siberia. [2] There is also evidence in pock-marked sea floors of large releases of methane plumes in the geological past. [3] Paleoclimatologists now believe that large scale, natural methane hydrate releases have been partly but significantly responsible for short-cycle global warming and global cooling cycles in the past. The recent discoveries in the Arctic, in fact, are thought to suggest that methane releases have contributed to the global warming that has occurred since the last ice age 15,000 years ago. [2] The problem is that these methane releases have a strong positive feedback loop. As they increase the warming of the atmosphere that warming in turn increases methane release which in turn increases warming which in turn releases more...... You get the picture. Acceleration of global warming through this positive feedback loop, by increased methane concentration in the atmosphere, far more than CO2 concentrations, represents, to paleoclimatologists, a far greater risk of pushing us into the Venus effect, runaway global warming. When it comes to satisfying the world's energy lust, however, caution may be thrown to the wind. Powering down human society is never an option put on the table when politicians and other leaders discuss energy policies and strategies. We have proven over and over again that business as usual is the only model that will be considered. How else can we explain the tar sands, oil shale development, deepwater oil extraction, coal mines extending out under the sea floor, and more? There are various technologies under consideration for extracting methane from hydrate deposits. Most involve some form of heating the hydrate deposits - one, probably the dumbest and most dangerous, even goes so far as to suggest using nuclear explosions beneath the deposit to heat it, also suggested by some as a means of releasing oil from tar sands and oil shale - causing them to release the methane which is then collected and piped to a processing facility of holding tank. Proponents of methane hydrate exploitation, conscious of environmental concerns, are quick to offer reassurances like ".....tapping into the gas hydrates assessed in the study is not expected to affect global warming, said Brenda Pierce, coordinator for the USGS Energy Resources Program." [4] The louder and more frequent such reassurances are, of course, the more it suggests they are trying to cover up the probability that the result will be the opposite. There are many projects underway, funded by governments throughout the world (Japan, India, China, South Korea, Russia, Norway, Canada, the U.S.), aimed at developing commercially viable technologies for exploiting the planet's vast methane hydrate deposits. The selection of sites for these projects are, themselves, a clear indication of one of the primary roadblocks to using methane hydrates as a societal-supporting energy source. They have sought out test sites with high methane hydrate concentrations. Most hydrate deposits are too small or too dispersed to be commercially exploited. Also, unlike oil and natural gas, those deposits are generally not capped in such a way that the geology can be used to contain releases. Most of those deposits on the sea floor, in fact, exist in unconsolidated, sandy or silt sediment. The geology surrounding them is inherently unstable, difficult to contain. Once the deposit, or any large portion of it, is destabilized it is very difficult to prevent unintended, uncontrolled methane releases into the atmosphere. Okay. I very begrudgingly accept that our leaders are not going to consider powering down as a potential tactic in the face of our impending energy crisis. Sooner or later the human race is going to have to accept that reality but clearly society is not prepared to accept it now. But methane hydrates are not like the other fossil fuels. And our approach to exploiting them is going to have to be very different. The risk to the climate and the environment is so much greater than has ever been the case with other fossil fuels. Most importantly, methane hydrates are globally affected by exactly the same constrains; temperature and pressure. Global warming itself - it doesn't matter whether it is naturally occurring or caused by human combustion of fossil fuels - is the greatest threat of tipping methane releases into a runaway warming mechanism. Scientists do not know with any certainty yet how much of a global temperature rise is necessary to reach the tipping point where methane hydrate release into the atmosphere accelerates out of control. They do know that once that happens the acceleration will be self-sustaining and self-accelerating. If our leaders take the same cavalier approach with scientific warnings about runaway methane release that they have taken with warnings about CO2 buildup in the atmosphere, and the long-term, safe storage of spent nuclear fuel, we are headed toward a much more serious atmospheric and climatic disaster than global warming experts have thus far suggested. Methane releases from the ocean floors and from Arctic permafrost have not been built into any of the current global warming models as a factor, including those models supporting the IPCC reports. Considering that methane hydrate deposits exceed the total of all other fossil fuels by magnitudes and that methane is more than 20 times more powerful as a greenhouse gas than CO2, that should be extremely worrying to anyone who accepts the validity of the global warming theory.

#### And, methane hydrates make the difference between solving and runaway warming

RC 5 (RealClimate, Realclimate.org, 12 December 2005, “Methane hydrates and global warming,” http://www.realclimate.org/index.php/archives/2005/12/methane-hydrates-and-global-warming/)//CC

The other possibility for our future is an increase in the year-in, year-out chronic rate of methane emission to the atmosphere. The ongoing release of methane is what supplies, and determines the concentration of, the ongoing concentration of methane in the atmosphere. Double the source, and you’d double the concentration, more or less. (A little more, actually, because the methane lifetime increases.) The methane is oxidized to CO2, another greenhouse gas that accumulates for hundreds of thousands of years, same as fossil fuel CO2 does. Models of chronic methane release often show that the accumulating CO2 contributes as much to warming as does the transient methane concentration. Anthropogenic methane sources, such as rice paddies, the fossil fuel industry, and livestock, have already more than doubled the methane concentration in the atmosphere from pre-industrial levels. Currently methane levels appear stable, but the reasons for this relatively recent phenomena are not yet clear. The amount of permafrost hydrate methane is not known very well, but it would not take too much methane, say 60 Gton C released over 100 years, to double atmospheric methane yet again. Peat deposits may be a comparable methane source to melting permafrost hydrate. When peat that has been frozen for thousands of years thaws, it still contains viable populations of methanotrophic bacteria [Rivkina et al., 2004] that begin to convert the peat into CO2 and CH4. It’s not too difficult to imagine 60 Gton C over 100 years from peat, either. Changes in methane production in existing wetlands and swamps due to changes in rainfall and temperature could also be important. Ocean hydrates have also been forecast to melt, but only slowly [Harvey and Huang, 1995]. Places to watch would seem to be the Arctic and the Gulf of Mexico. So, in the end, not an obvious disaster-movie plot, but a potential positive feedback that could turn out to be the difference between success and failure in avoiding ‘dangerous’ anthropogenic climate change. That’s scary enough.

### Warming risks extinction, turns every impact

**Cummins and Allen 10** (Ronnie, Int’l. Dir. – Organic Consumers Association, and Will, Policy Advisor – Organic Consumers Association, “Climate Catastrophe: Surviving the 21st Century”, 2-14, http://www.commondreams.org/view/2010/02/14-6)

The hour is late. Leading climate scientists such as James Hansen are literally shouting at the top of their lungs that the world needs to reduce emissions by 20-40% as soon as possible, and 80-90% by the year 2050, if we are to avoid climate chaos, **crop failures, endless wars, melting of the polar icecaps, and a disastrous rise in ocean levels**. Either we radically reduce CO2 and carbon dioxide equivalent (CO2e, which includes all GHGs, not just CO2) pollutants (currently at 390 parts per million and rising 2 ppm per year) to 350 ppm, including agriculture-derived methane and nitrous oxide pollution, or else **survival for the present and future generations is in jeopardy**. As scientists warned at Copenhagen, business as usual and a corresponding 7-8.6 degree Fahrenheit rise in global temperatures means that the carrying capacity of the Earth in 2100 will be reduced to one billion people. **Under this hellish scenario, billions will die** of thirst, cold, heat, disease, war, and starvation. If the U.S. significantly reduces greenhouse gas emissions, other countries will follow. One hopeful sign is the recent EPA announcement that it intends to regulate greenhouse gases as pollutants under the Clean Air Act. Unfortunately we are going to have to put tremendous pressure on elected public officials to force the EPA to crack down on GHG polluters (including industrial farms and food processors). Public pressure is especially critical since "just say no" Congressmen-both Democrats and Republicans-along with agribusiness, real estate developers, the construction industry, and the fossil fuel lobby appear determined to maintain "business as usual."

### Warming is real and causes extinction

**Morgan 9 –** Professor of Current Affairs @ Hankuk University of Foreign Studies, South Korea(Dennis Ray, “World on fire: two scenarios of the destruction of human civilization and possible extinction of the human race”, Futures, Volume 41, Issue 10, December 2009, Pages 683-693, ScienceDirect)

As horrifying as the scenario of human extinction by sudden, fast-burning nuclear fire may seem, the one consolation is that this future can be avoided within a relatively short period of time if responsible world leaders change Cold War thinking to move away from aggressive wars over natural resources and towards the eventual dismantlement of most if not all nuclear weapons. On the other hand, another scenario of human extinction by fire is one that may not so easily be reversed within a short period of time because it is not a fast-burning fire; rather, a slow burning fire is gradually heating up the planet as industrial civilization progresses and develops globally. This gradual process and course is long-lasting; thus it cannot easily be changed, even if responsible world leaders change their thinking about ‘‘progress’’ and industrial development based on the burning of fossil fuels. The way that global warming will impact humanity in the future has often been depicted through the analogy of the proverbial frog in a pot of water who does not realize that the temperature of the water is gradually rising. Instead of trying to escape, the frog tries to adjust to the gradual temperature change; finally, the heat of the water sneaks up on it until it is debilitated. Though it finally realizes its predicament and attempts to escape, it is too late; its feeble attempt is to no avail— and the frog dies. Whether this fable can actually be applied to frogs in heated water or not is irrelevant; it still serves as a comparable scenario of how the slow burning fire of global warming may eventually lead to a runaway condition and take humanity by surprise. Unfortunately, by the time the politicians finally all agree with the scientific consensus that global warming is indeed human caused, its development could be too advanced to arrest; the poor frog has become too weak and enfeebled to get himself out of hot water. The Intergovernmental Panel of Climate Change (IPCC) was established in 1988 by the WorldMeteorological Organization (WMO) and the United Nations Environmental Programme to ‘‘assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of humaninduced climate change, its potential impacts and options for adaptation and mitigation.’’[16]. Since then, it has given assessments and reports every six or seven years. Thus far, it has given four assessments.13 With all prior assessments came attacks fromsome parts of the scientific community, especially by industry scientists, to attempt to prove that the theory had no basis in planetary history and present-day reality; nevertheless, as more andmore research continually provided concrete and empirical evidence to confirm the global warming hypothesis, that it is indeed human-caused, mostly due to the burning of fossil fuels, the scientific consensus grew stronger that human induced global warming is verifiable. As a matter of fact, according to Bill McKibben [17], 12 years of ‘‘impressive scientific research’’ strongly confirms the 1995 report ‘‘that humans had grown so large in numbers and especially in appetite for energy that they were now damaging the most basic of the earth’s systems—the balance between incoming and outgoing solar energy’’; ‘‘. . . their findings have essentially been complementary to the 1995 report – a constant strengthening of the simple basic truth that humans were burning too much fossil fuel.’’ [17]. Indeed, 12 years later, the 2007 report not only confirms global warming, with a stronger scientific consensus that the slow burn is ‘‘very likely’’ human caused, but it also finds that the ‘‘amount of carbon in the atmosphere is now increasing at a faster rate even than before’’ and the temperature increases would be ‘‘considerably higher than they have been so far were it not for the blanket of soot and other pollution that is temporarily helping to cool the planet.’’ [17]. Furthermore, almost ‘‘everything frozen on earth is melting. Heavy rainfalls are becoming more common since the air is warmer and therefore holds more water than cold air, and ‘cold days, cold nights and frost have become less frequent, while hot days, hot nights, and heat waves have become more frequent.’’ [17]. Unless drastic action is taken soon, the average global temperature is predicted to rise about 5 degrees this century, but it could rise as much as 8 degrees. As has already been evidenced in recent years, the rise in global temperature is melting the Arctic sheets. This runaway polar melting will inflict great damage upon coastal areas, which could be much greater than what has been previously forecasted. However, what is missing in the IPCC report, as dire as it may seem, is sufficient emphasis on the less likely but still plausible worst case scenarios, which could prove to have the most devastating, catastrophic consequences for the long-term future of human civilization. In other words, the IPCC report places too much emphasis on a linear progression that does not take sufficient account of the dynamics of systems theory, which leads to a fundamentally different premise regarding the relationship between industrial civilization and nature. As a matter of fact, as early as the 1950s, Hannah Arendt [18] observed this radical shift of emphasis in the human-nature relationship, which starkly contrasts with previous times because the very distinction between nature and man as ‘‘Homo faber’’ has become blurred, as man no longer merely takes from nature what is needed for fabrication; instead, he now acts into nature to augment and transform natural processes, which are then directed into the evolution of human civilization itself such that we become a part of the very processes that we make. The more human civilization becomes an integral part of this dynamic system, the more difficult it becomes to extricate ourselves from it. As Arendt pointed out, this dynamism is dangerous because of its unpredictability. Acting into nature to transform natural processes brings about an . . . endless new change of happenings whose eventual outcome the actor is entirely incapable of knowing or controlling beforehand. The moment we started natural processes of our own - and the splitting of the atom is precisely such a man-made natural process -we not only increased our power over nature, or became more aggressive in our dealings with the given forces of the earth, but for the first time have taken nature into the human world as such and obliterated the defensive boundaries between natural elements and the human artifice by which all previous civilizations were hedged in’’ [18]. So, in as much as we act into nature, we carry our own unpredictability into our world; thus, Nature can no longer be thought of as having absolute or iron-clad laws. We no longer know what the laws of nature are because the unpredictability of Nature increases in proportion to the degree by which industrial civilization injects its own processes into it; through selfcreated, dynamic, transformative processes, we carry human unpredictability into the future with a precarious recklessness that may indeed end in human catastrophe or extinction, for elemental forces that we have yet to understand may be unleashed upon us by the very environment that we experiment with. Nature may yet have her revenge and the last word, as the Earth and its delicate ecosystems, environment, and atmosphere reach a tipping point, which could turn out to be a point of no return. This is exactly the conclusion reached by the scientist, inventor, and author, James Lovelock. The creator of the wellknown yet controversial Gaia Theory, Lovelock has recently written that it may be already too late for humanity to change course since climate centers around the world, . . . which are the equivalent of the pathology lab of a hospital, have reported the Earth’s physical condition, and the climate specialists see it as seriously ill, and soon to pass into a morbid fever that may last as long as 100,000 years. I have to tell you, as members of the Earth’s family and an intimate part of it, that you and especially civilisation are in grave danger. It was ill luck that we started polluting at a time when the sun is too hot for comfort. We have given Gaia a fever and soon her condition will worsen to a state like a coma. She has been there before and recovered, but it took more than 100,000 years. We are responsible and will suffer the consequences: as the century progresses, the temperature will rise 8 degrees centigrade in temperate regions and 5 degrees in the tropics. Much of the tropical land mass will become scrub and desert, and will no longer serve for regulation; this adds to the 40 per cent of the Earth’s surface we have depleted to feed ourselves. . . . Curiously, aerosol pollution of the northern hemisphere reduces global warming by reflecting sunlight back to space. This ‘global dimming’ is transient and could disappear in a few days like the smoke that it is, leaving us fully exposed to the heat of the global greenhouse. We are in a fool’s climate, accidentally kept cool by smoke, and before this century is over billions of us will die and the few breeding pairs of people that survive will be in the Arctic where the climate remains tolerable. [19] Moreover, Lovelock states that the task of trying to correct our course is hopelessly impossible, for we are not in charge. It is foolish and arrogant to think that we can regulate the atmosphere, oceans and land surface in order to maintain the conditions right for life. It is as impossible as trying to regulate your own temperature and the composition of your blood, for those with ‘‘failing kidneys know the never-ending daily difficulty of adjusting water, salt and protein intake. The technological fix of dialysis helps, but is no replacement for living healthy kidneys’’ [19]. Lovelock concludes his analysis on the fate of human civilization and Gaia by saying that we will do ‘‘our best to survive, but sadly I cannot see the United States or the emerging economies of China and India cutting back in time, and they are the main source of emissions. The worst will happen and survivors will have to adapt to a hell of a climate’’ [19]. Lovelock’s forecast for climate change is based on a systems dynamics analysis of the interaction between humancreated processes and natural processes. It is a multidimensional model that appropriately reflects the dynamism of industrial civilization responsible for climate change. For one thing, it takes into account positive feedback loops that lead to ‘‘runaway’’ conditions. This mode of analysis is consistent  with recent research on how ecosystems suddenly disappear. A 2001 article in Nature, based on a scientific study by an international consortium, reported that changes in ecosystems are not just gradual but are often sudden and catastrophic [20]. Thus, a scientific consensus is emerging (after repeated studies of ecological change) that ‘‘stressed ecosystems, given the right nudge, are capable of slipping rapidly from a seemingly steady state to something entirely different,’’ according to Stephen Carpenter, a limnologist at the University of Wisconsin-Madison (who is also a co-author of the report). Carpenter continues, ‘‘We realize that there is a common pattern we’re seeing in ecosystems around the world, . . . Gradual changes in vulnerability accumulate and eventually you get a shock to the system - a flood or a drought - and, boom, you’re over into another regime. It becomes a self-sustaining collapse.’’ [20]. If ecosystems are in fact mini-models of the system of the Earth, as Lovelock maintains, then we can expect the same kind of behavior. As Jonathon Foley, a UW-Madison climatologist and another co-author of the Nature report, puts it, ‘‘Nature isn’t linear. Sometimes you can push on a system and push on a system and, finally, you have the straw that breaks the camel’s back.’’ Also, once the ‘‘flip’’ occurs, as Foley maintains, then the catastrophic change is ‘‘irreversible.’’ [20]. When we expand this analysis of ecosystems to the Earth itself, it’s frightening. What could be the final push on a stressed system that could ‘‘break the camel’s back?’’ Recently, another factor has been discovered in some areas of the arctic regions, which will surely compound the problem of global ‘‘heating’’ (as Lovelock calls it) in unpredictable and perhaps catastrophic ways. This disturbing development, also reported in Nature, concerns the permafrost that has locked up who knows how many tons of the greenhouse gasses, methane and carbon dioxide. Scientists are particularly worried about permafrost because, as it thaws, it releases these gases into the atmosphere, thus, contributing and accelerating global heating. It is a vicious positive feedback loop that compounds the prognosis of global warming in ways that could very well prove to be the tipping point of no return. Seth Borenstein of the Associated Press describes this disturbing positive feedback loop of permafrost greenhouse gasses, as when warming ‘‘. already under way thaws permafrost, soil that has been continuously frozen for thousands of years. Thawed permafrost releases methane and carbon dioxide. Those gases reach the atmosphere and help trap heat on Earth in the greenhouse effect. The trapped heat thaws more permafrost and so on.’’ [21]. The significance and severity of this problem cannot be understated since scientists have discovered that ‘‘the amount of carbon trapped in this type of permafrost called ‘‘yedoma’’ is much more prevalent than originally thought and may be 100 times [my emphasis] the amount of carbon released into the air each year by the burning of fossil fuels’’ [21]. Of course, it won’t come out all at once, at least by time as we commonly reckon it, but in terms of geological time, the ‘‘several decades’’ that scientists say it will probably take to come out can just as well be considered ‘‘all at once.’’ Surely, within the next 100 years, much of the world we live in will be quite hot and may be unlivable, as Lovelock has predicted. Professor Ted Schuur, a professor of ecosystem ecology at the University of Florida and co-author of the study that appeared in Science, describes it as a ‘‘slow motion time bomb.’’ [21]. Permafrost under lakes will be released as methane while that which is under dry ground will be released as carbon dioxide. Scientists aren’t sure which is worse. Whereas methane is a much more powerful agent to trap heat, it only lasts for about 10 years before it dissipates into carbon dioxide or other chemicals. The less powerful heat-trapping agent, carbon dioxide, lasts for 100 years [21]. Both of the greenhouse gasses present in permafrost represent a global dilemma and challenge that compounds the effects of global warming and runaway climate change. The scary thing about it, as one researcher put it, is that there are ‘‘lots of mechanisms that tend to be self-perpetuating and relatively few that tend to shut it off’’ [21].14 In an accompanying AP article, Katey Walters of the University of Alaska at Fairbanks describes the effects as ‘‘huge’’ and, unless we have a ‘‘major cooling,’’ - unstoppable [22]. Also, there’s so much more that has not even been discovered yet, she writes: ‘‘It’s coming out a lot and there’s a lot more to come out.’’ [22]. 4. Is it the end of human civilization and possible extinction of humankind? What Jonathon Schell wrote concerning death by the fire of nuclear holocaust also applies to the slow burning death of global warming: Once we learn that a holocaust might lead to extinction**, we have no right to gamble**, because if we lose, the game will be over, and neither we nor anyone else will ever get another chance. Therefore, although, scientifically speaking, there is all the difference in the world between the mere possibility that a holocaust will bring about extinction and the certainty of it, morally they are the same, and we have no choice but to address the issue of nuclear weapons as though we knew for a certainty that their use would put an end to our species [23].15 When we consider that beyond the horror of nuclear war, another horror is set into motion to interact with the subsequent nuclear winter to produce a poisonous and super heated planet, the chances of human survival seem even smaller. Who knows, even if some small remnant does manage to survive, what the poisonous environmental conditions would have on human evolution in the future. A remnant of mutated, sub-human creatures might survive such harsh conditions, but for all purposes, human civilization has been destroyed, and the question concerning human extinction becomes moot. Thus, **we have no other choice but to consider the finality of it all**, as Schell does: ‘‘Death lies at the core of each person’s private existence, but part of death’s meaning is to be found in the fact that it occurs in a biological and social world that survives.’’ [23].16 But what if the world itself were to perish, Schell asks. Would not it bring about a sort of ‘‘second death’’ – the death of the species – a possibility that the vast majority of the human race is in denial about? Talbot writes in the review of Schell’s book that it is not only the ‘‘death of the species, not just of the earth’s population on doomsday, but of countless unborn generations. They would be spared literal death but would nonetheless be victims . . .’’ [23]. That is the ‘‘second death’’ of humanity – the horrifying, unthinkable prospect that there are no prospects – that there will be no future. In the second chapter of Schell’s book, he writes that since we have not made a positive decision to exterminate ourselves but instead have ‘‘chosen to live on the edge of extinction, periodically lunging toward the abyss only to draw back at the last second, our situation is one of uncertainty and nervous insecurity rather than of absolute hopelessness.’’ [23].17 In other words, the fate of the Earth and its inhabitants has not yet been determined. Yet time is not on our side. Will we relinquish the fire and our use of it to dominate the Earth and each other, or will we continue to gamble with our future at this game of Russian roulette while **time** increasingly **stacks the cards against** our chances of **survival**?

### Solvency

#### Offshore gas resources are abundant

Luthi, 11/9/12 [Luthi is the president of the National Ocean Industry Association, representing more than 275 companies engaged in all aspects of the exploration and production of both traditional and renewable energy resources on the nation’s outer continental shelf, “Let's find agreement on new offshore access”, <http://thehill.com/blogs/congress-blog/energy-a-environment/267089-lets-find-agreement-on-new-offshore-access>]

Now that the election is (finally) behind us, President Obama has an opportunity to set the nation more forcefully on the road to energy independence. We’re well on our way thanks in large part to new techniques and technologies that have unlocked vast deposits of shale oil and natural gas. But we could and should be doing much more. Back in June, the Interior Department issued its five-year Outer Continental Shelf (OCS) oil and gas leasing plan. Despite high expectations encouraged by President Obama’s self-described “all-of-the-above” approach to the nation’s energy policy and the absence of long-standing Administrative and Congressional exploration bans that were lifted in 2008, the plan failed to open any new offshore areas to oil and natural gas exploration and production. The industry is still limited to the same 15 percent of the acreage on the OCS that’s been available for decades, leaving 85 percent untouchable. Don’t get me wrong. That 15 percent has been incredibly productive. In fact, the Gulf of Mexico region, which is the heart of America’s offshore oil and gas industry, has yielded six times more oil than 1980s resource estimates predicted it held. Production in the Gulf is finally ramping back up now that permitting rates are bouncing back from historic lows following the Macondo spill in 2010. We have every reason to believe that the areas where we can explore and produce will continue to support and create jobs and contribute to America’s energy security for years and even decades to come. For this reason, we will continue to advocate that the Obama Administration streamline and accelerate permitting on these acres of the OCS. We will also fight to put to rest once and for all the erroneous claims that the industry is “sitting on” offshore tracts, a red herring that surfaced again during the presidential debates. In fact, the success industry has crafted out of the 15 percent of the OCS currently open to exploration and production underscores why the Interior Department’s 5-Year Leasing Plan was so disappointing. Think of how much energy awaits us in the 85 percent of the offshore areas where we currently cannot explore or produce. One report by the Interstate Oil and Gas Compact Commission, conducted several years ago, estimates recoverable resources in “U.S. moratorium areas” of 19.29 billion barrels of oil and 83.5 trillion cubic feet of natural gas. If history is any guide, these estimates will prove to be very conservative. The frustrating truth is we have no idea how much is waiting for us there, because we’re not allowed to go look.

#### And, the plan strikes a balance between supply and demand – creates certain investment in offshore gas

Griles 3 [Lisa, Deputy Secretary, Department of the Interior, “Energy Production on Federal Lands,” Hearing before the Committee on Energy and Natural Resources, United States Senate]

Mr. GRILES. America’s public lands have an abundant opportunity for exploration and development of renewable and nonrenewable energy resources. Energy reserves contained on the Department of the Interior’s onshore and offshore Federal lands are very important to meeting our current and future estimates of what it is going to take to continue to supply America’s energy demand. Estimates suggest that these lands contain approximately 68 percent of the undiscovered U.S. oil resources and 74 percent of the undiscovered natural gas resources. President Bush has developed a national energy policy that laid out a comprehensive, long-term energy strategy for America’s future. That strategy recognizes we need to raise domestic production of energy, both renewable and nonrenewable, to meet our dependence for energy. For oil and gas, the United States uses about 7 billion barrels a year, of which about 4 billion are currently imported and 3 billion are domestically produced. The President proposed to open a small portion of the Arctic National Wildlife Refuge to environmentally responsible oil and gas exploration. Now there is a new and environmentally friendly technology, similar to directional drilling, with mobile platforms, self-containing drilling units. These things will allow producers to access large energy reserves with almost no footprint on the tundra. Each day, even since I have assumed this job, our ability to minimize our effect on the environment continues to improve to where it is almost nonexistent in such areas as even in Alaska. According to the latest oil and gas assessment, ANWR is the largest untapped source of domestic production available to us. The production for ANWR would equal about 60 years of imports from Iraq. The National Energy Policy also encourages development of cleaner, more diverse portfolios of domestic renewable energy sources. The renewable policy in areas cover geothermal, wind, solar, and biomass. And it urges research on hydrogen as an alternate energy source. To advance the National Energy Policy, the Bureau of Land Management and the DOE’s National Renewable Energy Lab last week announced the release of a renewable energy report. It identifies and evaluates renewable energy resources on public lands. Mr. Chairman, I would like to submit this for the record.\* This report, which has just come out, assess the potential for renewable energy on public lands. It is a very good report that we hope will allow for the private sector, after working with the various other agencies, to where can we best use renewable resource, and how do we take this assessment and put it into the land use planning that we are currently going, so that right-of-ways and understanding of what renewable resources can be done in the West can, in fact, have a better opportunity. The Department completed the first of an energy inventory this year. Now the EPCA report, which is laying here, also, Mr. Chairman, is an estimate of the undiscovered, technically recoverable oil and gas. Part one of that report covers five oil and gas basins. The second part of the report will be out later this year. Now this report, it is not—there are people who have different opinions of it. But the fact is we believe it will be a good guidance tool, as we look at where the oil and gas potential is and where we need to do land use planning. And as we update these land use plannings and do our EISs, that will help guide further the private sector, the public sector, and all stakeholders on how we can better do land use planning and develop oil and gas in a sound fashion. Also, I have laying here in front of me the two EISs that have been done on the two major coal methane basins in the United States, San Juan Basis and the Powder River Basin. Completing these reports, which are in draft, will increase and offer the opportunity for production of natural gas with coal bed methane. Now these reports are in draft and, once completed, will authorize and allow for additional exploration and development. It has taken 2 years to get these in place. It has taken 2 years to get some of these in place. This planning process that Congress has initiated under FLPMA and other statutes allows for a deliberative, conscious understanding of what the impacts are. We believe that when these are finalized, that is in fact what will occur. One of the areas which we believe that the Department of the Interior and the Bureau of Land Management is and is going to engage in is coordination with landowners. Mr. Chairman, the private sector in the oil and gas industry must be good neighbors with the ranchers in the West. The BLM is going to be addressing the issues of bonding requirements that will assure that landowners have their surface rights and their values protected. BLM is working to make the consultation process with the landowners, with the States and local governments and other Federal agencies more efficient and meaningful. But we must assure that the surface owners are protected and the values of their ranches are in fact assured. And by being good neighbors, we can do that. In the BLM land use planning process, we have priorities, ten current resource management planning areas that contain the major oil and gas reserves that are reported out in the EPCA study. Once this process is completed, then we can move forward with consideration of development of the natural gas. We are also working with the Western Governors’ Association and the Western Utilities Group. The purpose is to identify and designate right-of-way corridors on public lands. We would like to do it now as to where right-of-way corridors make sense and put those in our land use planning processes, so that when the need is truly identified, utilities, energy companies, and the public will know where they are Instead of taking two years to amend a land use plan, hopefully this will expedite and have future opportunity so that when the need is there, we can go ahead and make that investment through the private sector. It should speed up the process of right-of-way permits for both pipelines and electric transmission. Now let me switch to the offshore, the Outer Continental Shelf. It is a huge contributor to our Nation’s energy and economic security. The CHAIRMAN. Mr. Secretary, everything you have talked about so far is onshore. Mr. GRILES. That is correct. The CHAIRMAN. You now will speak to offshore. Mr. GRILES. Yes, sir, I will. Now we are keeping on schedule the holding lease sales in the areas that are available for leasing. In the past year, scheduled sales in several areas were either delayed, canceled, or put under moratoria, even though they were in the 5-year plan. It undermined certainty. It made investing, particularly in the Gulf, more risky. We have approved a 5-year oil and gas leasing program in July 2002 that calls for 20 new lease sales in the Gulf of Mexico and several other areas of the offshore, specifically in Alaska by 2007. Now our estimates indicate that these areas contain resources up to 22 billion barrels of oil and 61 trillion cubic feet of natural gas. We are also acting to raise energy production from these offshore areas by providing royalty relief on the OCS leases for new deep wells that are drilled in shallow water. These are at depths that heretofore were very and are very costly to produce from and costly to drill to. We need to encourage that exploration. These deep wells, which are greater than 15,000 feet in depth, are expected to access between 5 to 20 trillion cubic feet of natural gas and can be developed quickly due to existing infrastructure and the shallow water. We have also issued a final rule in July 2002 that allows companies to apply for a lease extension, giving them more time to analyze complex geological data that underlies salt domes. That is, where geologically salt overlays the geologically clay. And you try to do seismic, and the seismic just gets distorted. So we have extended the lease terms, so that hopefully those companies can figure out where and where to best drill. Vast resources of oil and natural gas lie, we hope, beneath these sheets of salt in the OCS in the Gulf of Mexico. But it is very difficult to get clear seismic images. We are also working to create a process of reviewing and permitting alternative energy sources on the OCS lands. We have sent legislation to Congress that would give the Minerals Management Service of the Department of the Interior clear authority to lease parts of the OCS for renewable energy. The renewables could be wind, wave, or solar energy, and related projects that are auxiliary to oil and gas development, such as offshore staging facilities and emergency medical facilities. We need this authority in order to be able to truly give the private sector what are the rules to play from and buy, so they can have certainty about where to go.

#### And, removing restrictions key – the plan alters market dynamics

Medlock, 08 [Medlock is a fellow in Energy Studies at [Rice University](http://www.chron.com/?controllerName=search&action=search&channel=opinion%2Foutlook&search=1&inlineLink=1&query=%22Rice+University%22)'s [James A Baker III Institute for Public Policy](http://www.chron.com/?controllerName=search&action=search&channel=opinion%2Foutlook&search=1&inlineLink=1&query=%22James+A+Baker+III+Institute+for+Public+Policy%22) and an adjunct assistant professor in the [Economics Department](http://www.chron.com/?controllerName=search&action=search&channel=opinion%2Foutlook&search=1&inlineLink=1&query=%22Economics+Department%22) at Rice, “Open outer continental shelf”, <http://www.chron.com/opinion/outlook/article/Open-outer-continental-shelf-1597898.php>]

A confluence of factors is responsible for the recent price run-up at the pump. One important factor behind the strength of oil prices is the expectation of inadequate oil supply in the future. This has led to a debate regarding the removal of drilling access restrictions in the U.S. Outer Continental Shelf (OCS). According to the [Department of Interior](http://www.chron.com/?controllerName=search&action=search&channel=opinion%2Foutlook&search=1&inlineLink=1&query=%22Department+of+Interior%22)'s [Minerals Management Service](http://www.chron.com/?controllerName=search&action=search&channel=opinion%2Foutlook&search=1&inlineLink=1&query=%22Minerals+Management+Service%22) (MMS), the OCS in the Lower 48 states currently under moratorium holds 19 billion barrels of technically recoverable oil. Some analysts claim that opening the OCS will not matter that much, as the quantity of oil is only about two years of U.S. consumption. But a more appropriate way to look at the issue is this: If the OCS could provide additional production of 1 million barrels per day of oil, our import dependence on Persian Gulf crude oil would be reduced by about 40 percent. Moreover, at 1 million barrels per day, the currently blocked OCS resource would last about 50 years. Of course, opening the OCS will not bring immediate supplies because it would take time to organize the lease sales and then develop the supply delivery infrastructure. However, as development progressed, the expected growth in supply would have an effect on market sentiment and eventually prices. Thus, opening the OCS should be viewed as a relevant part of a larger strategy to help ease prices over time because an increase in activity in the OCS wouldgenerally improve expectations about future oil supplies. Lifting the current moratorium in the OCS would also provide almost 80 trillion cubic feet of technically recoverable natural gas that is currently off-limits. A recent study by the [Baker Institute](http://www.chron.com/?controllerName=search&action=search&channel=opinion%2Foutlook&search=1&inlineLink=1&query=%22Baker+Institute%22) indicates that removing current restrictions on resource development in the OCS would reduce future liquefied natural gas import dependence of the United States and lessen the influence of any future gas producers' cartel.

#### And, that sustains low prices and ensures abundant supply

Hastings, 12 [House Representative Doc, Republican Washington, President Obama's offshore drilling plan must be replaced, <http://thehill.com/blogs/congress-blog/energy-a-environment/239529-president-obamas-offshore-drilling-plan-must-be-replaced>]

Though President Obama uses lofty rhetoric to claim support for American oil and natural gas production, the administration chose to bury the announcement of this plan under mountains of news coverage. It’s no surprise that during an election year the president doesn’t want to hype a plan that represents a giant step backwards for American energy production and keeps 85 percent of our offshore areas off-limits. Fortunately, Congress now has the responsibility to act and make clear that the president’s plan is inadequate to meet the United States’ energy needs. Under current law, the president must submit the five-year plan to Congress for a mandatory 60-day review before it goes into effect. While in the past, this 60-day review has been treated as just a formality, it is an opportunity to reject the president’s plan and offer a better alternative for job creation and energy production. H.R. 6082, the Congressional Replacement of President Obama’s Energy-Restricting and Job-Limiting Offshore Drilling Plan, would replace President Obama’s plan with an environmentally responsible, robust plan that supports new offshore drilling. This plan passed out of the House Natural Resources Committee with bipartisan support and will be considered by the full House this week. It sets up a clear choice between the president’s drill-nowhere-new plan and the Congressional replacement plan to responsibly expand offshore American energy production. President Obama’s plan doesn’t open one new area for leasing and energy production. The Atlantic Coast, the Pacific Coast and most of the water off Alaska are all placed off-limits. This is especially frustrating for Virginians who had a lease sale scheduled for 2011, only to have it canceled by President Obama. The president added further insult to injury by not including the Virginia lease sale in his final plan, meaning the earliest it could happen is late 2017. The president’s plan only offers 15 lease sales limited to the Gulf of Mexico and, very late in the plan, small parts of Alaska. It doesn’t open one new area for leasing and energy production. According to the non-partisan Congressional Research Service, President Obama’s 15 lease sales represent the lowest number ever included in an offshore leasing plan. President Obama rates worse than even Jimmy Carter. Thanks to President Obama, it’s as if the bipartisan steps to lift the drilling moratoria in 2008 never happened. Crippling $4 gasoline prices sparked Americans’ outrage and pressured the Democrat-controlled Congress to allow legislation to pass opening up new offshore areas to drilling. Unfortunately, four years later, American families and small businesses are experiencing the pain of higher gasoline prices and yet no progress has been made to expand production of our offshore resources. The Congressional moratorium on drilling has simply been replaced by the “Obama moratorium” on drilling. Gasoline prices were $1.89 when President Obama took office, and prices today are nearly double. Americans will continue to face volatile price spikes as long as we continue to keep the United States’ energy resources under lock-and-key. In stark contrast to the president, the Congressional replacement plan includes 29 lease sales and opens new areas previously under moratoria. It’s a targeted effort towards those areas where we know we have the most oil and natural gas resources – like the mid-Atlantic, the Southern California Coast and Alaska. This is a drill smart plan that would create thousands of new American jobs, help lower prices at the pump and strengthen our national and economic security. Congress has a choice – to either support the president’s plan that re-imposes the drilling moratorium and places the vast majority of offshore areas off-limits, or support using American energy to create American jobs and strengthen America’s economy.

#### And, unlocking offshore resources is necessary to keep the price low

Pirog, 12 [Robert Pirog Specialist in Energy Economics CRS, <http://assets.opencrs.com/rpts/R40645_20120210.pdf>]

Natural gas markets differ from the oil market in that they are not global, but regional. As shown in Table 6, above, virtually all U.S. natural gas consumption comes from U.S. or Canadian sources. The only link between regional natural gas markets is through LNG, but the rapidly growing market for LNG predicted earlier in this decade has failed to materialize. LNG is still largely characterized by long-term, two-party supply and purchase agreements. In the North American market, LNG plays the role of making up marginal short-falls in the demand and supply balance. As production from domestic onshore shale gas deposits increases, the role of LNG in the U.S. market will likely be small. In this regional market structure, the development of new, offshore U.S. supplies could have a significant impact on the domestic price of natural gas, as well as contributing to U.S. energy independence of this fuel. Although the price of natural gas has not shown the same degree of volatility as oil, the United States has been among the highest-priced regions in the world. High prices have caused residential consumers to allocate a greater portion of their budgets to home heating expenses. Industrial users either lose sales to overseas competitors, or cease U.S. production when domestic natural gas prices rise too much beyond those observed in other regions of the world. The development of offshore natural gas resources is likely to further retard the development of a growing LNG system in the United States. Terminals for the re-gasification of LNG have proven to be difficult to site and permit, and expensive to build. If domestic natural gas resources, close to existing collection and distribution systems, at least in the Gulf of Mexico, could be developed, the LNG terminals might prove to be redundant, depending on the volumes of natural gas that ultimately might be recovered. Offshore natural gas development, though commonly associated with offshore oil production, will likely be less competitive in a market environment dominated by onshore shale gas development.

#### Plan expands production – kick starts nearly 100 new projects

Paul Hillegeist et al (President and COO at Quest Offshore Resources, Inc, Sean Shafer, Project Director, Andrew Jackson, Project Manager, Leslie Cook , Senior Research Consultant) December 2011 “The State of the Offshore U.S. Oil and Gas Industry” http://energytomorrow.org/images/uploads/Quest\_2011\_December\_29\_Final.pdf

If drilling permits going forward were to be issued at pre‐moratorium rates, the number of shallow water projects delayed could be significantly reduced from 85 under the current path to 37 over the 2012 to 2015 period, and from 48 to 9 for the deepwater. The increased number of projects would increase investment in the Gulf of Mexico offshore oil and gas industry by over $15.6 billion dollars from 2012‐2015. This additional investment would increase average annual U.S. employment between 17,000 and 49,000 thousand jobs per year over that time period. Offshore oil production would be higher over the next decade, for example, by 2017 offshore oil production would rise by approximately 13 percent relative to its current projected path. A regulatory environment that eliminates unnecessary permitting delays and maintains competitiveness with development opportunities in other regions of the world would provide a first step to revitalizing the offshore oil and gas industry. Additional access to offshore areas currently off‐limits remains a key missing component of U.S. energy policy, and would provide substantial additional gains to the nation in terms of energy security, employment and government revenue.

#### That doubles production

Baker Institute, ‘8 (Baker Institute for Public Policy, Rice University, Baker Institute Policy Report, January 2008, “Natural Gas in North America: Markets and Security,” <http://connection.ebscohost.com/c/articles/30064519/study-lift-u-s-drilling-restrictions-avoid-international-lng-cartel>)//CC

As might be expected, the lower requirements for LNG under this scenario stem from larger, lowcost U.S. Lower 48 natural gas production. Modeling predicts that lifting access restrictions would lead to an increase overall in Lower 48 production of about 1.5 tcf in 2015 (or a 7.5 percent increase), increasing to 3.1 tcf greater production (or a 10.1 percent increase) in every year from 2015 through 2030. More specifically, OCS production would total 5.0 tcf in 2015 and 6.1 tcf in 2025 as compared to only 3.5 tcf in 2015 and 3.9 tcf in 2025 if the restrictions remain in place. Lifting restrictions in the Rocky Mountains adds another 0.10 tcf by 2015 and 0.93 tcf by 2025.

#### Otherwise, unpredictable regulatory shifts will crush predictability and timing of projects

Curry L. Hagerty (Specialist in Energy and Natural Resources Policy at the Congressional Research Service) June 15, 2010 “Outer Continental Shelf Moratoria on Oil and Gas Development” http://crs.ncseonline.org/nle/crsreports/10Jul/R41132.pdf

One legacy of congressional moratoria is their impact on the timing of possible OCS development. From a developer’s point of view, predictability in the pace, timing, and sequence of OCS development projects is key to strategic business decisions. From a regulator’s standpoint, agency discretion for OCS development is tied to program planning horizons set by statutory or regulatory timetables. Features of the annual congressional moratoria varied from year to year, and from region to region, as reflected in Table 1, and the resultant uncertainty had a disruptive effect on the pace of OCS activity, which was viewed negatively by those in favor of OCS drilling. Among those opposed to OCS drilling, the disruptive effect was considered a positive outcome.23 Changes to the specific provisions of annual moratoria measures created tensions due to the unpredictability of the bans on leasing activities, timeframes, and locations.24 It was not uncommon for developers to engage in litigation against the federal government and to claim damages related to reliance on leases and federal OCS policies that were disrupted by the annual congressional moratoria.25 Although observers agreed that appropriations measures were out of sync with the timetable used to coordinate federal OCS planning functions, proponents of annual congressional moratoria provisions countered that restrictions were defensible in the absence of more permanent alternatives for similar leasing prohibitions

# 2ac methane impact

# 2ac impact

#### Methane release outweighs nuclear war

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METASTABILITY AND ERUPTION A liquid subject to gravity and completely or partially saturated with dissolved gas is, thermodynamically, in a metastable state. Consider for clarity the case when the concentration of the dissolved gas is only slightly below saturation throughout, and thus increases downward in accordance with Henry’s law. Then locally there is no tendency for the dissolved gas to exsolve (to form bubbles), in spite of the fact that nuclei are abundant in seawater. (Exsolution would lead to a slight increase in free energy: below saturation, the chemical potential of the gas species is lower in solution than in the free gas phase.) At the same time, the free energy of the system as a whole would be greatly reduced if most of the dissolved gas were to somehow escape from solution and collect above the liquid. (This free energy reduction is due to the fast decrease of the chemical potential of gas with a drop in pressure.) Thus, the system is in a metastable state, albeit an unusual one. Strictly speaking, this state is not an equilibrium one even locally: the increase of the solute concentration with depth causes a diffusion flux directed upward, which, given sufficient time, could bring the system into the above state of minimum free energy. However, the continuous supply of methane by the rising bubbles from the seafloor ensures that the concentration profile will remain nonuniform, slowly approaching the saturation one. Even if that supply were to cease, the diffusion time scales are so long that this path toward the global energy minimum can be ignored. A very fast transition from this metastable state can be triggered by disturbances that displace fluid a finite distance in the vertical direction. Such disturbances may result from an earthquake, a seafloor volcano, convection currents due to geothermal heating, or an internal gravity wave. Consider a parcel of fluid that is displaced upward, and is now subject to lower hydrostatic pressure, to which corresponds a lower solubility value. As a result, the fluid in the parcel is now supersaturated with the dissolved gas, which must begin to exsolve, forming tiny gas bubbles. (If the fluid in its original position was only partially saturated, exsolution will begin after the parcel has risen through some significant distance, so in this case the initial disturbance must be sufficiently large.) The volume of the ascending parcel of fluid increases due to the formation of bubbles, making it more buoyant and accelerating its rise; this leads to further reduction in the ambient pressure, further exsolution of gas, and further increase in the volume of the parcel. This self-accelerating motion entrains the surrounding fluid; exsolution of the gas in the latter reinforces the motion. The result is a violent eruption (Kling et al., 1987; Zhang, 1996). From the initial eruption site, hydrodynamic disturbances propagate in all directions (via turbulent entrainment and/or internal gravity waves), triggering eruptions at other sites. Similarly to transitions from other metastable states (e.g., boiling of a superheated liquid), the eruption should spread quickly throughout the region of the ocean where the water column is saturated, or partially saturated, with gas. In spite of the low solubility of methane in seawater, the total possible increase in the buoyancy of the parcel can be large. Consider a parcel that started its rise at 4 km depth, where solubility of methane is ;4.3 3 1023. Then, if the parcel had a volume of 18 cm3 (1 mol of water) and was saturated with methane, it contained 4.3 3 1023 mol of dissolved methane. By the time this parcel has risen to the surface, essentially all the methane in the parcel has exsolved (solubility is ;2 3 1025 at the surface). At the surface conditions (T ø 25 8C, P 5 1 bar), 1 mol of any gas occupies 25 3 103 cm3, so the total volume of methane in the parcel is ;108 cm3, and the volume of the parcel, which now contains a mist of water droplets in gaseous methane, is 126 cm3. That is, the volume of the parcel has increased by a factor of seven. Concurrent exsolution of other dissolved gases (e.g., carbon dioxide CO2, hydrogen sulfide H2S) will add to the effect. A rather similar process is responsible for the most violent, explosive volcanic eruptions(called Plinian), such as eruptions of Mount Vesuvius in A.D. 79 or Mount St. Helens in 1980. These eruptions are driven by exsolution of gases (primarily water vapor) dissolved in the liquid magma. In Lake Nyos (Cameroon), CO2 of magmatic origin enters the water column from the bottom, at a depth of ;200 m. In 1986, the lake erupted, creating a gas-water fountain ;120 m in height (Zhang, 1996), and releasing a lethal cloud of CO2. A water surge washed up the shore to a height of ;25 m. The eruption continued for several hours (Kling et al., 1987). OCEANIC ERUPTION AS A CAUSE OF MASS EXTINCTION The consequences of a methane-driven oceanic eruption for marine and terrestrial life are likely to be catastrophic. Figuratively speaking, the erupting region ‘‘boils over,’’ ejecting a large amount of methane and other gases (e.g., CO2, H2S) into the atmosphere, and flooding large areas of land. Whereas pure methane is lighter than air, methane loaded with water droplets is much heavier, and thus spreads over the land, mixing with air in the process (and losing water as rain). The air-methane mixture is explosive at methane concentrations between 5% and 15%; as such mixtures form in different locations near the ground and are ignited by lightning, explosions 2 and conflagrations destroy most of the terrestrial life, and also produce great amounts of smoke and of carbon dioxide. Firestorms carry smoke and dust into the upper atmosphere, where they may remain for several years (Turco et al., 1991); the resulting darkness and global cooling may provide an additional kill mechanism. Conversely, carbon dioxide and the remaining methane create the greenhouse effect, which may lead to global warming. The outcome of the competition between the cooling and the warming tendencies is difficult to predict (Turco et al., 1991; Pierrehumbert, 2002). Upon release of a significant portion of the dissolved methane, the ocean settles down, and the entire sequence of events (i.e., development of anoxia, accumulation of dissolved methane, the metastable state, eruption) begins anew. No external cause is required to bring about a methane-driven eruption—its mechanism is self-contained, and implies that eruptions are likely to occur repeatedly at the same location. Because methane is isotopically light, its fast release must result in a negative carbon isotope excursion in the geological record. Knowing the magnitude of the excursion, one can estimate the amount of methane that could have produced it. Such calculations (prompted by the methane-hydrate-dissociation model, but equally applicable here) have been performed for several global events in the geological record; the results range from ;1018 to 1019 g of released methane (e.g., Katz et al., 1999; Kennedy et al., 2001; de Wit et al., 2002). These are very large amounts: the total carbon content of today’s terrestrial biomass is ;2 3 1018 g. Nevertheless, relatively small regions of the deep ocean could contain such amounts of dissolved methane; e.g., the Black Sea alone (volume ;0.4 3 1023 of the ocean total; maximum depth only 2.2 km) could hold, at saturation, ;0.5 3 1018 g. A similar region of the deep ocean could contain much more (the amount grows quadratically with depth3). Released in a geological instant (weeks, perhaps), 1018 to 1019 g of methane could destroy the terrestrial life almost entirely. Combustion and explosion of 0.75 3 1019 g of methane would liberate energy equivalent to 108 Mt of TNT,; 10,000 times greater than the world’s stockpile of nuclear weapons, implicated in the nuclear winter scenario (Turco et al., 1991).

# 1ar Warming

#### 2 C can still be achieved

ANI, 12/17/12 [“Action by 2020 key to keep global warming below 2 degrees”, <http://zeenews.india.com/news/eco-news/action-by-2020-key-to-keep-global-warming-below-2-degrees_817302.html>]

Washington: Limiting climate change to target levels will become much more difficult to achieve, and more expensive, if action is not taken soon, a new analysis has revealed. The study from IIASA, ETH Zurich, and NCAR explores technological, policy, and social changes that would need to take place in the near term in order to keep global average temperature from rising above 2 degree C, a target supported by more than 190 countries as a global limit to avoid dangerous climate change. This study for the first time comprehensively quantifies the costs and risks of greenhouse gas emissions surpassing critical thresholds by 2020. The findings of the study are particularly important given the failure of the recent climate negotiations in Doha to decide to increase mitigation action before 2020. The researchers revealed that the 2 degree C target could still be reached even if greenhouse gas emissions are not reduced before 2020, but only at very high cost, with higher climate risks, and under exceedingly optimistic assumptions about future technologies. The more emissions are reduced in the near term, the more options will be available in the long run and, by extension, the cheaper it will be to reach international climate targets. “We wanted to know what needs to be done by 2020 in order to be able to keep global warming below two degrees Celsius for the entire twenty-first century,” said Joeri Rogelj, lead author of the paper and researcher at ETH Zurich. The team of researchers analyzed a large array of potential scenarios for limiting global temperature rise to 2 degree C above preindustrial levels, a target set by international climate agreements. Projections based on current national emissions pledges suggest that global carbon dioxide equivalent (CO2e) emissions will reach 55 gigatons (billion metric tons, Gt) or more per year in 2020, up from approximately 50 Gt today. At such levels, it would still be possible to reach the 2 degree C target in the long term, though it would be more difficult and expensive than if near-term emissions were lower.

# 1ar Price

#### Surpluses will be zero in winter

**Greun 10/29** (Abby Greun, SNL Financial, 29 October 2012, “Natural gas price to rise as producers match demand better,” Lexis)//CC

More than 629 Bcf of surplus has been shed in the past six months, and with fewer injections over the summer, inventory surplus is now about 269 Bcf over the rolling five-year average, Weixel said. "We are anticipating over the next four weeks we are not going to inject nearly as much gas as we did last year and that surplus is going to go down to about 15 Bcf, basically to around zero as we head into winter," Weixel said.