Plan

#### The United States federal government should substantially increase funding for a competitive matching fund for airborne wind energy production in the United States. The United States federal government should reduce airspace restrictions on airborne wind energy production in the United States.

Advantage 1 – Warming

#### Its real and anthropogenic – *best climate data*, *models*, and *scientific consensus* prove.

Mueller, prof UCBerkely, ’12, The New York Times, Richard A. Mueller, July 28, 2012, “The Conversion of a Climate Change Skeptic” Richard A. Muller, a professor of physics at the University of California, Berkeley, and a former MacArthur Foundation fellow, is the author, most recently, of “Energy for Future Presidents: The Science Behind the Headlines.” http://www.nytimes.com/2012/07/30/opinion/the-conversion-of-a-climate-change-skeptic.html?\_r=1&pagewanted=all

CALL me a converted skeptic. Three years ago I identified problems in previous climate studies that, in my mind, threw doubt on the very existence of global warming. Last year, following an intensive research effort involving a dozen scientists, I concluded that global warming was real and that the prior estimates of the rate of warming were correct. I’m now going a step further: Humans are almost entirely the cause. My total turnaround, in such a short time is the result of careful and objective analysis by the Berkeley Earth Surface Temperature project, which I founded with my daughter Elizabeth. Our results show that the average temperature of the earth’s land has risen by two and a half degrees Fahrenheit over the past 250 years, including an increase of one and a half degrees over the most recent 50 years. Moreover, it appears likely that essentially all of this increase results from the human emission of greenhouse gases. These findings are stronger than those of the Intergovernmental Panel on Climate Change, the United Nations group that defines the scientific and diplomatic consensus on global warming. In its 2007 report, the I.P.C.C. concluded only that most of the warming of the prior 50 years could be attributed to humans. It was possible, according to the I.P.C.C. consensus statement, that the warming before 1956 could be because of changes in solar activity, and that even a substantial part of the more recent warming could be natural. Our Berkeley Earth approach used sophisticated statistical methods developed largely by our lead scientist, Robert Rohde, which allowed us to determine earth land temperature much further back in time. We carefully studied issues raised by skeptics: biases from urban heating (we duplicated our results using rural data alone), from data selection (prior groups selected fewer than 20 percent of the available temperature stations; we used virtually 100 percent), from poor station quality (we separately analyzed good stations and poor ones) and from human intervention and data adjustment (our work is completely automated and hands-off). In our papers we demonstrate that none of these potentially troublesome effects unduly biased our conclusions. The historic temperature pattern we observed has abrupt dips that match the emissions of known explosive volcanic eruptions; the particulates from such events reflect sunlight, make for beautiful sunsets and cool the earth’s surface for a few years. There are small, rapid variations attributable to El Niño and other ocean currents such as the Gulf Stream; because of such oscillations, the “flattening” of the recent temperature rise that some people claim is not, in our view, statistically significant. What has caused the gradual but systematic rise of two and a half degrees? We tried fitting the shape to simple math functions (exponentials, polynomials), to solar activity and even to rising functions like world population. By far the best match was to the record of atmospheric carbon dioxide, measured from atmospheric samples and air trapped in polar ice. Just as important, our record is long enough that we could search for the fingerprint of solar variability, based on the historical record of sunspots. That fingerprint is absent. Although the I.P.C.C. allowed for the possibility that variations in sunlight could have ended the “Little Ice Age,” a period of cooling from the 14th century to about 1850, our data argues strongly that the temperature rise of the past 250 years cannot be attributed to solar changes. This conclusion is, in retrospect, not too surprising; we’ve learned from satellite measurements that solar activity changes the brightness of the sun very little. How definite is the attribution to humans? The carbon dioxide curve gives a better match than anything else we’ve tried. Its magnitude is consistent with the calculated greenhouse effect — extra warming from trapped heat radiation. These facts don’t prove causality and they shouldn’t end skepticism, but they raise the bar: to be considered seriously, an alternative explanation must match the data at least as well as carbon dioxide does. Adding methane, a second greenhouse gas, to our analysis doesn’t change the results. Moreover, our analysis does not depend on large, complex global climate models, the huge computer programs that are notorious for their hidden assumptions and adjustable parameters. Our result is based simply on the close agreement between the shape of the observed temperature rise and the known greenhouse gas increase.

#### It’s not too late – curbing emissions halts warming.

Hansen, NASA scientist, et al 10 – Director of NASA/Goddard Institute for Space Studies [Dr. James Hansen, Dr. Makiko Sato (Physicist @ NASA/Goddard Institute for Space Studies), Dr. Pushker Kharecha (Researcher of earch sciences and astrobiology @ NASA/Goddard Institute for Space Studies), Dr. David Beerling (Professor of Animal and Plant Sciences @ University of Sheffield), Dr. Robert Berner (Professor Geology and Geophysics @ Yale University), Valerie Masson-Delmotte (Lab. Des Sciences du Climat et l’Environnement/Institut Pierre Simon Laplace, CEA-CNRS-Universite de Versailles Saint-Quentin en Yvelines), Dr. Mark Pagani (Professor of paleoceanography and paleoclimatology @ Yale University), Dr. Maureen Raymo (Paleoclimatologist/marine geologist @ Boston University), Dr. Dana L. Royer (Professor of Earth and Environmental Sciences @ Wesleyan University) & Dr. James C. Zachos ( Professor of Earth & Planetary Sciences @ University of California – Santa Cruzo) “Target atmospheric CO2: Where should humanity aim?” Open Atmos. Sci. J. (2008), vol. 2, pp. 217-231

Realization that today’s climate is far out of equilibrium with current climate forcings raises the specter of ‘tipping points’, the concept that climate can reach a point where, without additional forcing, rapid changes proceed practically out of our control [2, 7, 63, 64]. Arctic sea ice and the West Antarctic Ice Sheet are examples of potential tipping points. Arctic sea ice loss is magnified by the positive feedback of increased absorption of sunlight as global warming initiates sea ice retreat [65]. West Antarctic ice loss can be accelerated by several feedbacks, once ice loss is substantial [39].

We define: (1) the tipping level, the global climate forcing that, if long maintained, gives rise to a specific consequence, and (2) the point of no return, a climate state beyond which the consequence is inevitable, even if climate forcings are reduced. A point of no return can be avoided, even if the tipping level is temporarily exceeded. Ocean and ice sheet inertia permit overshoot, provided the climate forcing is returned below the tipping level before initiating irreversible dynamic change.

Points of no return are inherently difficult to define, because the dynamical problems are nonlinear. Existing models are more lethargic than the real world for phenomena now unfolding, including changes of sea ice [65], ice streams [66], ice shelves [36], and expansion of the subtropics [67, 68].

The tipping level is easier to assess, because the paleoclimate quasi-equilibrium response to known climate forcing is relevant. The tipping level is a measure of the long-term climate forcing that humanity must aim to stay beneath to avoid large climate impacts. The tipping level does not define the magnitude or period of tolerable overshoot. However, if overshoot is in place for centuries, the thermal perturbation will so penetrate the ocean [10] that recovery without dramatic effects, such as ice sheet disintegration, becomes unlikely.

4.2. Target CO2

Combined, GHGs other than CO2 cause climate forcing comparable to that of CO2 [2, 6], but growth of non-CO2 GHGs is falling below IPCC [2] scenarios. Thus total GHG climate forcing change is now determined mainly by CO2 [69]. Coincidentally, CO2 forcing is similar to the net human-made forcing, because non-CO2 GHGs tend to offset negative aerosol forcing [2, 5].

Thus we take future CO2 change as approximating the net human-made forcing change, with two caveats. First, special effort to reduce non-CO2 GHGs could alleviate the CO2 requirement, allowing up to about +25 ppm CO2 for the same climate effect, while resurgent growth of nonCO2 GHGs could reduce allowed CO2 a similar amount [6]. Second, reduction of human-made aerosols, which have a net cooling effect, could force stricter GHG requirements. However, an emphasis on reducing black soot could largely off-set reductions of high albedo aerosols [20].

Our estimated history of CO2 through the Cenozoic Era provides a sobering perspective for assessing an appropriate target for future CO2 levels. A CO2 amount of order 450 ppm or larger, if long maintained, would push Earth toward the ice-free state. Although ocean and ice sheet inertia limit the rate of climate change, such a CO2 level likely would cause the passing of climate tipping points and initiate dynamic responses that could be out of humanity’s control.

#### Airborne wind is the only solution to warming.

Fagiano, PhD engineering, ’09

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The dependance of the global energy system on fossil sources owned by few producer countries leads to economical instability, prevents millions of people from having access to energy and gives rise to delicate geopolitical equilibria. Non–OECD countries growing at fast rates like China and India will account for a 50% increase of energy demand in the next two decades. Such an increment has to be covered by an increase of energy supply: considering the current situation, fossil sources are the ﬁrst candidates to fuel the growth of non–OECD world. As a consequence, the present problems of high concentration of fossil sources in few countries will be more acute, energy costs will continuously increase on average and pronounced short–term swings of oil price will remain the norm in the next 20 years.¶ The issue of climate change due to excessive concentration of greenhouse gases in the atmosphere, that is clearly related to the predominance of fossil sources in the global energy mix, may be even more serious than geopolitics. In fact, if no measure is undertaken to contain the emissions of carbon dioxide, a doubling of CO2 concentration is expected to be reached by 2100, with a consequent global average temperature increase of up to 6 ± C [1, 21, 22, 23]. Almost all of the increase of emissions in the next twenty years is accounted for by non–OECD countries. In [1], two alternative climate–policy scenarios are considered (in addition to the reference one), in which the undertaking of political measures and investments aimed at reducing CO2 emissions is assumed. Both scenarios lead to a long–term stabilization of carbon– dioxide emissions and they differ on the basis of the amount of efforts and investments employed to reach such a goal. Without entering into details (the interested reader is referred to [1]), the alternative scenarios clearly indicate two key points: ² power generation is a critical sector since it is the less expensive ﬁeld for CO2 reduction. As showed in Section 1.1, power generation accounts for 45% of energy– related CO2 emissions. A shift to carbon–free electricity and heat generation would signiﬁcantly contribute to reduce the emissions of greenhouse gases with relatively low costs and timings as compared to those needed to renew the transportation system, which is heavily oil dependent and would require expensive and slow transformation. Moreover, electricity is the most reﬁned form of energy and it can be used to replace the use of fossil sources in every sector.¶ Given the actual situation, policy intervention will be necessary, through appropriate ﬁnancial incentives and regulatory frameworks, to foster the development of renewable and carbon–free electricity generation. One of the key points to reduce the dependance on fossil fuels is the use of a suitable combination of alternative energy sources. Nuclear energy actually represents the fourth contribution to the world’s power generation sector (with a 15% share, see Section 1.1) and it avoids the problems related to carbon dioxide emissions. However, the issues related to safe nuclear waste management have not been solved yet, despite the employed strong efforts. Moreover, the cost of nuclear energy is likely to increase, due to massive investments of emerging countries [35, 36] and uranium shortage [37]. Renewable energy sources like hydropower, biomass, wind, solar and geothermal actually cover 19% of global electricity generation (with hydro alone accounting for 16%), but they could meet the whole global needs, without the issues related to pollution and global warming. However, the present cost of renewable energies is not competitive without incentives, mainly due to the high costs of the related technologies, their discontinuous and non–uniform availability and the low generated power density per km2 . The use of hydroelectric power is not likely to increase substantially in the future, because most major sites are already being exploited or are unavailable for technological and/or environmental reasons. Biomass and geothermal power have to be managed carefully to avoid local depletion, so they are not able to meet a high percentage of the global consumption. Solar energy has been growing fast during the last years (35% average growth in the U.S. in the last few years, [38]), however it has high costs and requires large land occupation.¶ Focusing the attention on wind energy, in Section 1.2 it has been noted that there is enough potential in global wind power to sustain the world needs [6]. However, the technical and economical limitations to build larger turbines and to deploy wind towers in “good” sites, that are often difﬁcult to reach, the low average power density per km2 and the environmental impact of large wind farms hinder the potential of the actual technology to increase its share of global electric energy generation above the actual 1%. The expected technological improvements in the next decade are not enough to make the cost of wind energy competitive against that of fossil energy, without the need of incentives. As is is stated in [7], “There is no “big breakthrough” on the horizon for wind technology”. The major contribution of Part I of this dissertation is to demonstrate that a real revolution of wind energy can be achieved with the innovative KiteGen technology. It will be showed that high–altitude wind power generation using controlled airfoils has the potential to overcome most of the main limits of the present wind energy technology, thus providing renewable energy, available in large quantities everywhere in the world, at lower costs with respect to fossil energy and without the need for ad–hoc policies and incentives. Moreover, it will be showed that such a breakthrough can be realized in a relatively short time, of the order of few years, with relatively small efforts in research and development. Indeed, the idea of harvesting high–altitude wind energy introduced in the early ’80s (see [8]) can be fully developed nowadays thanks to recent advances in several engineering ﬁelds like aerodynamics, materials, mechatronics and control theory. In particular, the advanced control techniques investigated in Part II of this dissertation play a role of fundamental importance, since they allow to control and maximize the performance of complex systems like KiteGen, while satisfying demanding operational constraints, at the relatively fast adopted sampling rate. In order to support these claims, the original results of the research activity performed in the last three years are organized in the next Chapters as follows.

#### Warming causes a planetary die-off – Geological history, positive feedback and ocean acidification

Bushnell, NASA scientist, 10 – Dennis, Chief scientist at the NASA Langley Research Center [Dennis Bushnell (MS in mechanical engineering. He won the Lawrence A. Sperry Award, AIAA Fluid and Plasma Dynamics Award, the AIAA Dryden Lectureship, and is the recipient of many NASA Medals for outstanding Scientific Achievement and Leadership.) “Conquering Climate Change,” The Futurist, May-June, 2010

During the Permian extinction, a number of chain reaction events, or “positive feedbacks,” resulted in oxygen-depleted oceans, enabling overgrowth of certain bacteria, producing copious amounts of hydrogen sulfide, making the atmosphere toxic, and decimating the ozone layer, all producing species die-off. The positive feedbacks not yet fully included in the IPCC projections include the release of the massive amounts of fossil methane, some 20 times worse than CO2 as an accelerator of warming, fossil CO2 from the tundra and oceans, reduced oceanic CO2 uptake due to higher temperatures, acidification and algae changes, changes in the earth’s ability to reflect the sun’s light back into space due to loss of glacier ice, changes in land use, and extensive water evaporation (a greenhouse gas) from temperature increases.¶ The additional effects of these feedbacks increase the projections from a 4°C–6°C temperature rise by 2100 to a 10°C–12°C rise, according to some estimates. At those temperatures, beyond 2100, essentially all the ice would melt and the ocean would rise by as much as 75 meters, flooding the homes of one-third of the global population. Between now and then, ocean methane hydrate release could cause major tidal waves, and glacier melting could affect major rivers upon which a large percentage of the population depends. We’ll see increases in flooding, storms, disease, droughts, species extinctions, ocean acidification, and a litany of other impacts, all as a consequence of man-made climate change. Arctic ice melting, CO2 increases, and ocean warming are all occurring much faster than previous IPCC forecasts, so, as dire as the forecasts sound, they’re actually conservative.

#### Even 1% risk justifies action ---- the consequences are too big

Strom, prof UArizona, ‘7 (Robert, Prof. Emeritus Planetary Sciences @ U. Arizona and Former Dir. Space Imagery Center of NASA, “Hot House: Global Climate Change and the Human Condition”, Online: SpringerLink, p. 246)

Keep in mind that the current consequences of global warming discussed in previous chapters are the result of a global average temperature increase of only 0.5 'C above the 1951-1980 average, and these consequences are beginning to accelerate. Think about what is in store for us when the average global temperature is 1 °C higher than today. That is already in the pipeline, and there is nothing we can do to prevent it. We can only plan strategies for dealing with the expected consequences, and reduce our greenhouse gas emissions by about 60% as soon as possible to ensure that we don't experience even higher temperatures. There is also the danger of eventually triggering an abrupt climate change that would accelerate global warming to a catastrophic level in a short period of time. If that were to happen we would not stand a chance. Even if that possibility had only a 1% chance of occurring, the consequences are so dire that it would be insane not to act. Clearly we cannot afford to delay taking action by waiting for additional research to more clearly define what awaits us. The time for action is now.

### Advantage 2 – National Defense

### Scenario 1 is the Grid

#### Grid disruptions inevitable – accidents, storms, energy trading, and cyber terror.

Hildyard et al 12

(Nicholas, The Corner House - U.K. research and advocacy group focusing on human rights, the environment, and development, Larry Lohmann and Sarah Sexton.12 Energy Security For Whom? For What? February 2012, http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/Energy%20Security%20For%20Whom%20For%20What.pdf)

By the same token, the more that an energy system is subjected to centralised control – that is, the more Securely it is placed in the hands of a few corporations or ministries – the more openings there are for accidents, storms 78 or the activities of energy traders or saboteurs to wreak havoc on giant generation plants, interconnected transmission lines, pipelines and waterways. “Risk spreading” through increased interconnection and “tight coupling” among elements of the system paradoxically opens yet more vulnerabilities. 79As geographer Mazen Labban explains: “the vulnerability of the network derives not only from its vastness . . . of the (physical) concentration of the infrastructure, but also from its connectivity: disruption of supply in one place might create shocks at the regional, or even global scale.” 80 One insecurity recently talked up involves the potentially “catastrophic consequences” of a cyber-attack on power plants and the electricity grid. The effects, it is said, would be equivalent to “the cumulative toll of 50 major hurricanes ripping into the nation simultaneously”. 81 Proposed European Union “smart grids” with “intelligent metering and monitoring systems” 82 making possible instant feedback between consumers’ energy use rates and the actions of generators magnify such “cyber-security” and data protection challenges.

#### Imminent cyberattacks devastate the grid—state funded programs and exponential tech innovation have changed the game.

Clayton 1/9/13, Mark Clayton, CSM staff writer, won an honorable mention at the 2005 Best Energy Writing from the National Press Foundation, resident expert in cyber security 2008-present, 1/9/13, “How vulnerable is US to cyberattack in 2013?” <http://www.alaskadispatch.com/article/how-vulnerable-us-cyberattack-2013>

The phalanx of cyberthreats aimed squarely at Americans' livelihood became startlingly clear in 2012 – and appears poised to proliferate in 2013 and beyond as government officials, corporate leaders, security experts, and ordinary citizens scramble to devise protections from attackers in cyberspace. Some Americans came screen to screen with such threats via their smart phones, discovering malicious software (malware) designed to steal their credit-card numbers, account passwords, and even the answers to their secret security questions. Others were temporarily blocked from accessing their bank accounts online, as US bank websites came under major attack at least twice in 2012 by a hacker group with possible ties to Iran. Some citizens learned that their home PCs had become infected by "ransomware," which locks up a computer's operating system until the bad guys get paid – and often even afterward. But personal inconvenience is only the beginning. Homeland security is also at stake. The US government in 2012 learned that companies operating natural gas pipelines were under cyberattack, citing evidence that cyberspies, possibly linked to China, were infiltrating the companies' business networks. Those networks, in turn, are linked to industrial systems that control valves, switches, and factory processes. Utilities that operate the nation's electric grid are known to have been another target, as are US tech companies. Crucial government agencies, such as the Pentagon and the Federal Trade Commission, are also targets. It all adds up to growing evidence – recognized to varying degrees by the US public, politicians, and businesses – that cybersecurity is the next frontier of national security, perhaps second only to safeguarding the nation against weapons of mass destruction. "The cyberthreat facing the nation has finally been brought to public attention," says James Lewis, a cybersecurity expert with the Center for Strategic and International Studies (CSIS), a Washington national-security think tank. "Everyone knows it's a problem. It has moved out of the geek world, and that's a good thing. But it's led to more confusion than clarity. So now we're developing the skills to talk about it – and it's taking longer than I thought it would." The awakening to cyberthreats has been gradual. In 2010, news of the world's first cyberweapon – the Stuxnet computer worm that attacked part of Iran's nuclear fuel program – burst upon the scene, raising concern about broad replication. Then came an increasing onslaught from hacktivist groups, which often stole and released private data. Between December 2010 and June 2011, for example, members of Anonymous were responsible for cyberattacks against the websites of Visa, MasterCard, and PayPal, as part of a tit for tat over the controversial WikiLeaks website. Last year came the bald warning from Defense Secretary Leon Panetta of the possibility of a "cyber Pearl Harbor" – perhaps perpetrated by an enemy nation, extremist hacktivist groups, or cyber-savvy terrorists – that could be destructive enough to "~~paralyze~~ the nation." The threats originate from any number of sources: the lone hacker in the basement, networks of activists bent on cyber-monkey-wrenching for a cause, criminal gangs looking to steal proprietary data or money, and operatives working for nation-states whose intent is to steal, spy, or harm. But at the Pentagon, attention these days is focused on the advancing cyberwar capabilities of China, Russia, and, especially, Iran. Iranian-backed cyberattackers, who in September targeted nine US banks with distributed denial-of-service attacks that temporarily shut down their websites, were testing America's reaction, Dr. Lewis says. The same kind of attack took place in December. All the multiple attackers with various motives – and multiple targets – make defending against cyberattacks a challenge. Government agencies, the Pentagon, and defense contractors seem to have gotten serious and have greatly beefed up security. Companies' spending data also indicate an apparently growing awareness of the threat, with cybersecurity expenditures increasing. But that's hardly enough, cyber experts such as Lewis say. Critical infrastructure needs to have its cybersecurity tested to ensure it's adequate, he and others say. "Like anything else in America, there's a large, noisy debate driven by business interests and hucksterism – people shouting about cyberattacks," Lewis says. "But the situation is clearly serious. Our vulnerabilities are great. I recall our first CSIS meeting on cybersecurity in 2001. At that time, we agreed that if nothing significant was done to change things in a decade, we'd be in real trouble. Well, here we are." What more to do? Warnings such as the "Pearl Harbor" one from Mr. Panetta in October have stirred debate over further measures the United States should take to protect itself. Congress recently grappled with legislation that would have allowed the Department of Homeland Security (DHS) to do cybersecurity testing on computer networks of companies that operate natural gas pipelines and other vital assets – and would have granted those companies protection from financial liability in the event of a cyberattack on their facilities. But lawmakers did not approve it, mainly on grounds that the business community objected to the expected high cost of the new mandates and regulations, as well as the exposure of proprietary information to government. In response, President Obama is expected to issue an executive order soon, though it won't give the federal government as much authority to conduct cyberdefense testing as the legislation would have. Not everyone agrees on what defensive actions to take. Some see Panetta's words as hyperbole aimed mostly at preserving the defense budget. Others warn of a US policy "overreaction" in which Internet freedoms are stifled by Big Brother-style digital filters. "As ominous as the dark side of cyberspace may be, our collective reactions to it are just as ominous – and can easily become the darkest driving force of them all should we over-react," writes Ron Deibert, a University of Toronto cyber researcher, in a recent paper titled "The Growing Dark Side of Cyberspace (... and What To Do About It)." Still others doubt that America's cyberadversaries are as capable as they are made out to be. In Foreign Policy magazine in an article headlined "Panetta's Wrong About a Cyber 'Pearl Harbor,' " John Arquilla argues that the Defense secretary has employed the "wrong metaphor." "There is no 'Battleship Row' in cyberspace," writes the professor of defense analysis at the Naval Postgraduate School in Monterey, Calif. "Pearl Harbor was a true 'single point of failure.' Nothing like this exists in cyberspace." Scope of the damage There's little question, though, that cyberthreats are already doing harm to the US economy – and may do even more. "At a corporate level, attacks of this kind have the potential to create liabilities and losses large enough to bankrupt most companies," according to the US Cyber Consequences Unit, a think tank advising government and industry. "At a national level, attacks of this kind, directed at critical infrastructure industries, have the potential to cause hundreds of billions of dollars' worth of damage and to cause thousands of deaths." Evidence of the damage includes the following: • Cyberespionage that's intended to scoop up industrial secrets alone costs US companies as much as $400 billion annually, some researchers estimate. Much of that comes over the long term, as stolen proprietary data give firms in other nations, such as China, a leg up by slashing research-and-development costs. • The volume of malicious software targeting US computers and networks has more than tripled since 2009, according to a 2011 report by the director of national intelligence. Reports in 2012 corroborate that upward trend. • Ransomware netted cybercriminals $5 million last year, by some estimates. Smart-phone and other mobile cybervulnerabilities nearly doubled from 2010 to 2011, according to the cybersecurity firm Symantec. • The Pentagon continues to report more than 3 million cyberattacks of various kinds each year on its 15,000 computer networks. Defense contractors such as Lockheed Martin are key targets, too. At a November news conference, Chandra McMahon, Lockheed vice president and chief information security officer, revealed that 20 percent of all threats aimed at the company's networks were sophisticated, targeted attacks by a nation or a group trying to steal data or harm operations. "The number of campaigns has increased dramatically over the last several years," Ms. McMahon said. Perhaps topping the list of concerns, though, is the accelerating pace of cyberattacks on the computerized industrial control systems that run the power grid, chemical plants, and other critical infrastructure. "We know that [nation-state cyberspies] can break into even very security-conscious networks quite regularly if not quite easily," says Stewart Baker, a former DHS and National Security Agency (NSA) cyber expert now in legal practice at Steptoe & Johnson. "Once there, they can either steal information or cause damage." In 2009, US companies that own critical equipment reported nine such incidents to the Industrial Control Systems Cyber Emergency Response Team, an arm of the DHS. In 2011, they reported 198. "The threats to systems supporting critical infrastructures are evolving and growing," the Government Accountability Office concluded in a July report on the US power grid's exposure to cyberattacks. The potential impact of such attacks, the report continues, "has been illustrated by a number of recently reported incidents and can include fraudulent activities, damage to electricity control systems, power outages, and failures in safety equipment." Some experts say the rise in such incidents may be exaggerated. "What's happening is that our ability to identify attacks is improving, not necessarily that numbers or strength [of the attacks] is getting worse," says Robert Huber, a principal at Critical Intelligence, a cybersecurity firm in Idaho Falls, Idaho, that specializes in protecting critical infrastructure. An awakening A seminal speech on cyberthreats by Mr. Obama in May 2009 marked the onset of heightened public awareness of the problem. Cybersecurity would for the first time become an administration priority, he said, with a White House cyber czar and a "new comprehensive approach to securing America's digital infrastructure." "Cyberspace is real, and so are the risks that come with it," Obama said. "It's the great irony of our Information Age – the very technologies that empower us to create and to build also empower those who would disrupt and destroy." In particular, cybersecurity experts inside major corporations are becoming increasingly concerned. Corporate chief information security officers reported a 50 percent jump in the "measure of perceived risk" since March 2011, according to a cybersecurity index cocreated by Daniel Geer, chief information security officer of In-Q-Tel, the venture capital arm of the Central Intelligence Agency. In November, the index continued its upward march, rising 1.8 percent over the previous month. Awareness is building among the public, too. Two-thirds of respondents to a national survey by the University of Oklahoma in February 2012 rated the threat of cyberwar at 6.5 on a scale where zero is "no threat" and 10 is "extreme threat." But only 1 in 3 rated themselves as having above-average knowledge about the cyberwar threat. "These response patterns suggest a public that is aware of the emerging issue of cyber war, does not feel well informed about it, but perceives it to pose a substantial threat," the researchers reported. Wariness and circumspection about cyberthreats are good first steps, cyber experts say, because they are the precursor to action. They say laws that require owners of critical infrastructure to meet cybersecurity performance standards are the next logical step. "It's clear we have enemies who'd love to [attack US critical infrastructure], especially if they could escape blame for doing so," says Mr. Baker, the former NSA cyber expert. "It may not happen soon. But we would be crazy to assume it will never happen."

#### Independently causes nuclear lashout and collapses deterrence

Tilford 12, Robert, Graduate US Army Airborne School, Ft. Benning, Georgia, "Cyber attackers could shut down the electric grid for the entire east coast" 2012, <http://www.examiner.com/article/cyber-attackers-could-easily-shut-down-the-electric-grid-for-the-entire-east-coa>

To make matters worse a cyber attack that can take out a civilian power grid, for example could also ~~cripple~~ the U.S.[military](http://www.examiner.com/topic/military). The senator notes that is that the same power grids that supply cities and towns, stores and gas stations, cell towers and heart monitors also power “every military base in our country.” “Although bases would be prepared to weather a short power outage with backup diesel generators, within hours, not days, fuel supplies would run out”, he said. Which means military command and control centers could go dark. Radar systems that detect air threats to our country would shut down completely. “Communication between commanders and their troops would also go silent. And many weapons systems would be left without either fuel or electric power”, said Senator Grassley. “So in a few short hours or days, the mightiest military in the world would be left scrambling to maintain base functions”, he said. We contacted the [Pentagon](http://www.examiner.com/topic/pentagon) and officials confirmed the threat of a cyber attack is something very real. Top national security officials—including the Chairman of the Joint Chiefs, the Director of the National Security Agency, the Secretary of Defense, and the CIA Director— have said, “preventing a cyber attack and improving the nation’s electric grids is among the most urgent priorities of our country” (source: Congressional Record). So how serious is the Pentagon taking all this? Enough to start, or end a war over it, for sure. A cyber attack today against the US could very well be seen as an “Act of War” and could be met with a “full scale” US military response. That could include the use of “nuclear weapons”, if authorized by the President.

#### **Deterrence failure causes global nuclear war.**

Lendman ’11, Stephen Lendman, the Progressive Radio News Hour on the Progressive Radio Network March 13th, 2011 Nuclear Meltdown in Japan <http://www.thepeoplesvoice.org/TPV3/Voices.php/2011/03/13/nuclear-meltdown-in-japan>

"Only a single failure of nuclear deterrence is required to start a nuclear war," the consequences of which "would be profound, potentially killing "tens of millions of people, and caus(ing) long-term, catastrophic disruptions of the global climate and massive destruction of Earth's protective ozone layer. The result would be a global nuclear famine that could kill up to one billion people."

Worse still is nuclear winter, the ultimate nightmare, able to end all life if it happens. It's nuclear proliferation's unacceptable risk, a clear and present danger as long as nuclear weapons and commercial dependency exist.

#### Plan solves grid collapse—aerial wind makes bases resilient to attack.

Cahoon 11

Troy L. Cahoon, BSE Captain, USAF, thesis in fulfillment of Degree of Master of Science in Aeronautical Engineering, March 2011, Air Force Institute of Technology, “AIRBORNE WIND ENERGY: IMPLEMENTATION AND DESIGN FOR THE U.S. AIR FORCE”, http://www.dtic.mil/dtic/tr/fulltext/u2/a539255.pdf //jchen

A fourth advantage that the Airborne Wind Energy could provide is power generation portability. Since there is no requirement for a large and expensive tower and foundation, these systems could be implemented at temporary sites. AWE systems could be extremely useful in instances where power has been knocked out, such as emergency or disaster relief efforts. And they would be invaluable to the DoD in remote locations or many other situations, operational or supportive. Next, because Airborne Wind Energy is so highly available across the globe, these high-altitude systems could be placed relatively close to cities or bases. Since these systems are up and out of the way, this advantage could help to bring the AWE resource near users. This feature of the AWE system could save on infrastructure and electrical losses typically required for long-distance power transmission. Security for the public and for AWE systems could also be enhanced over the security of ground-based systems. With shorter transmission lines, there would be less exposure to potential vandals. The airborne systems would also be well out of reach of most ground-based threats.

**Grid failure wrecks US critical mission operations**

**Stockton ’11** Paul, assistant secretary of defense for Homeland Defense and Americas’ Security Affairs, “Ten Years After 9/11: Challenges for the Decade to Come”, <http://www.hsaj.org/?fullarticle=7.2.11>

The cyber threat to the DIB is only part of a much larger challenge to DoD. Potential adversaries are seeking asymmetric means to cripple our force projection, warfighting, and sustainment capabilities, by targeting the critical civilian and defense supporting assets (within the United States and abroad) on which our forces depend. This challenge is not limited to man-made threats; DoD must also execute its mission-essential functions in the face of disruptions caused by naturally occurring hazards.20 Threats and hazards to DoD mission execution include incidents such as earthquakes, naturally occurring pandemics, solar weather events, and industrial accidents, as well as kinetic or virtual attacks by state or non-state actors. Threats can also emanate from insiders with ties to foreign counterintelligence organizations, homegrown terrorists, or individuals with a malicious agenda. From a DoD perspective, this global convergence of unprecedented threats and hazards, and vulnerabilities and consequences, is a particularly problematic reality of the post-Cold War world. Successfully deploying and sustaining our military forces are increasingly a function of interdependent supply chains and privately owned infrastructure within the United States and abroad, including transportation networks, cyber systems, commercial corridors, communications pathways, and energy grids. This infrastructure largely falls outside DoD direct control. Adversary actions to destroy, disrupt, or manipulate this highly vulnerable homeland- and foreign-based infrastructure may be relatively easy to achieve and extremely tough to counter. Attacking such “soft,” diffuse infrastructure systems could significantly affect our military forces globally – potentially blinding them, neutering their command and control, degrading their mobility, and isolating them from their principal sources of logistics support. The Defense Critical Infrastructure Program (DCIP) under Mission Assurance seeks to improve execution of DoD assigned missions to make them more resilient. This is accomplished through the assessment of the supporting commercial infrastructure relied upon by key nodes during execution. By building resilience into the system and ensuring this support is well maintained, DoD aims to ensure it can "take a punch as well as deliver one."21 It also provides the department the means to prioritize investments across all DoD components and assigned missions to the most critical issues faced by the department through the use of risk decision packages (RDP).22 The commercial power supply on which DoD depends exemplifies both the novel challenges we face and the great progress we are making with other federal agencies and the private sector. Today’s commercial electric power grid has a great deal of resilience against the sort of disruptive events that have traditionally been factored into the grid’s design. Yet, the grid will increasingly confront threats beyond that traditional design basis. This complex risk environment includes: disruptive or deliberate attacks, either physical or cyber in nature; severe natural hazards such as geomagnetic storms and natural disasters with cascading regional and national impacts (as in NLE 11); long supply chain lead times for key replacement electric power equipment; transition to automated control systems and other smart grid technologies without robust security; and more frequent interruptions in fuel supplies to electricity-generating plants. These risks are magnified by globalization, urbanization, and the highly interconnected nature of people, economies, information, and infrastructure systems. The department is highly dependent on commercial power grids and energy sources. As the largest consumer of energy in the United States, DoD is dependent on commercial electricity sources outside its ownership and control for secure, uninterrupted power to support critical missions. In fact, approximately 99 percent of the electricity consumed by DoD facilities originates offsite, while approximately 85 percent of critical electricity infrastructure itself is commercially owned. This situation only underscores the importance of our partnership with DHS and its work to protect the nation’s critical infrastructure – a mission that serves not only the national defense but also the larger national purpose of sustaining our economic health and competitiveness. DoD has traditionally assumed that the commercial grid will be subject only to infrequent, weather-related, and short-term disruptions, and that available backup power is sufficient to meet critical mission needs. As noted in the February 2008 Report of the Defense Science Board Task Force on DoD Energy Strategy, “In most cases, neither the grid nor on-base backup power provides sufficient reliability to ensure continuity of critical national priority functions and oversight of strategic missions in the face of a long term (several months) outage.”23 Similarly, a 2009 GAO Report on Actions Needed to Improve the Identification and Management of Electrical Power Risks and Vulnerabilities to DoD Critical Assets stated that DoD mission-critical assets rely primarily on commercial electric power and are vulnerable to disruptions in electric power supplies.24 Moreover, these vulnerabilities may cascade into other critical infrastructure that uses the grid – communications, water, transportation, and pipelines – that, in turn, is needed for the normal operation of the grid, as well as its quick recovery in emergency situations. To remedy this situation, the Defense Science Board (DSB) Task Force recommended that DoD take a broad-based approach, including a focused analysis of critical functions and supporting assets, a more realistic assessment of electricity outage cause and duration, and an integrated approach to risk management that includes greater efficiency, renewable resources, distributed generation, and increased reliability. DoD Mission Assurance is designed to carry forward the DSB recommendations. Yet, for a variety of reasons – technical, financial, regulatory, and legal – DoD has limited ability to manage electrical power demand and supply on its installations. As noted above, DHS is the lead agency for critical infrastructure protection by law and pursuant to Homeland Security Presidential Directive 7. The Department of Energy (DOE) is the lead agency on energy matters. And within DoD, energy and energy security roles and responsibilities are distributed and shared, with different entities managing security against physical, nuclear, and cyber threats; cost and regulatory compliance; and the response to natural disasters. And of course, production and delivery of electric power to most DoD installations are controlled by commercial entities that are regulated by state and local utility commissions. The resulting paradox: DoD is dependent on a commercial power system over which it does not – and never will – exercise control.

### Scenario 2 is Power Projection

#### DoD oil dependence constrains military effectiveness now—devastates operations capability and deterrence

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The dependence on and competition for world energy supplies constrain the foreign policy and national security objectives of oil importers. The United States has long taken an energy-based security interest in the Middle East even though the United States receives only 17 percent of its oil from the region.8 Meanwhile, net exporters—such as Russia, Iran, Sudan, the Central Asian republics, Venezuela, and even Saudi Arabia—are emboldened to leverage energy sources to achieve political gains that are usually inimical to many of the oil-importing states. Examples include Russia’s restricting natural gas to former republics (and Europe), Iran’s development of nuclear capability, Sudan’s actions in Darfur, and Saudi Arabia’s weak support for human rights. Because small changes in supply or demand can have large price impacts, the dependence on oil to fuel the global economy will continue to have negative implications for our national and economic security. The Council on Foreign Relations Energy Security Task Force estimates that a 1 percent change in supply (or demand) can have a 5 to 10 percent impact on price.9 As long as our global economic partners remain significant oil consumers, the United States would still feel oil price shocks even if it could achieve energy “independence.” This shock would come in the form of higher finished good prices from our fastest growing trade partner, and potential geopolitical competitor, China. Also, our European partners, who are more reliant on Middle Eastern and Russian oil than we are, would likely suffer an economic downturn that would limit their purchase of our products. In short, oil considerations are a key component of our economic security and a significant driver of our national security posture. As former Secretary of State George Schultz noted: Once more we face the vulnerability of our oil supply to political disturbances. Three times in the past thirty years (1973, 1978, and 1990) oil price spikes caused by Middle East crises helped throw the U.S. economy into recession. Coincident disruption in Venezuela and Russia adds to unease, let alone prices, in 2004. And the surging economies of China and India are contributing significantly to demand. But the problem far transcends economics and involves our national security. How many more times must we be hit on the head by a two-by-four before we do something decisive about this acute problem?10 Some policy observers believe competition for energy sources may lead to conflict. Others, however, believe this outcome can be avoided through alternate energy sources, enhanced energy efficiency and demand reduction, and increased cooperation to ensure the security and efficiency of international oil markets.11 In FY05, the United States consumed about 20 million barrels per day. Although the entire federal government consumed a mere 1.9 percent of the total U.S. demand, DoD, the largest government user of oil in the world, consumed more than 90 percent of all the government’s petroleum (liquid fuel) use.12 Although DoD is highly dependent on petroleum and is the largest single petroleum user, it cannot by itself, drive the market. However, because DoD’s operations (the capabilities, costs, and the strategy that define them) rely so heavily on the petroleum market, they are vulnerable to the price and supply fluctuations affecting the petroleum market. Examining the impact of the future energy environment on DoD, and the options available to react to this environment, requires an understanding of the DoD energy consumption profile (how and where is energy being consumed).13 Energy consumption falls into two categories: facility energy use and mobility energy use. Facility Energy Use Facility energy is the energy required to fuel bases and other stationary products. Using data from the Annual Report to Congress (FY06) issued by DoD, LMI derived the following facility energy use profiles:14 􀂡 Of the total DoD energy consumption (1.18 quads), facility use made up 34 percent of total consumption (0.39 quad) while mobile energy use was 66 percent (0.78 quad).15 􀂡 Overseas facility energy use (OCONUS) accounted for 16 percent of total DoD facility consumption, and CONUS made up 84 percent.16 􀂡 DoD facility energy consumption consisted of electricity, natural gas, fuel oil, coal, and other types of energy (steam). Electricity counted for only 46 percent of consumption followed by natural gas, 35 percent. Fuel oil and coal made up the remainder, about 20 percent. DoD facilities have made extensive efforts to conserve energy. To date, this has been “the low hanging fruit” for controlling energy costs. As an example, over the last 10 years (FY95–FY05), energy usage at Air Force facilities has declined 15.4 percent. The unit energy cost has increased 42 percent, while the Air Force’s total utility bill has risen only 10.7 percent.17 This shows that offsets made through conservation have helped keep facility energy costs down despite steep increases in the price per energy unit, but additional initiatives will be required to address the overall fiscal burden of energy costs. Many DoD installations have shifted to a local power grid network to meet electricity needs. Although this reduces DoD’s energy infrastructure costs, it does not isolate DoD from energy market volatility, which is reflected in electricity prices. This shift has also introduced a degree of operational vulnerability due to reliance on external supplies. Mobility Energy Use Mobility energy is the fuel used to power DoD weapons platforms, tactical equipment, and all other types of vehicles. In contrast with facility energy, mobility energy consists almost entirely of petroleum-based products and accounts for 94 percent of DoD’s petroleum consumption. The categories of fuel used for mobility are jet fuel,18 gasoline, distillates and diesel, ship’s bunkers, and residuals. As illustrated in Figure 2-2, about 75 percent of the mobility fuel used by DoD is jet fuel. Distillates and diesel follow with 17 percent. Many DoD platforms are multifuel capable, so it is not appropriate to consider these percentages as directly attributable to air, land, and sea platforms. JP-8, used primarily for air operations, makes up about 56 percent of the total petroleum purchased by DoD. The continued use of JP-8 as the fuel of choice for operations is testament to the U.S. military doctrine that relies heavily on air power as an integral part of the joint force across the whole spectrum of operations. The agility, mobility, and speed that this doctrine provides have been effective, but it comes at a high cost and further reliance on liquid petroleum. A recent Los Angeles Times article noted that the U.S. military is consuming about 2.4 million gallons of fuel every day in Iraq and Afghanistan.19 The data, provided by the U.S. Central Command, show that DoD is using approximately 57,000 barrels a day, at a cost of about $3 million per day. This equates to about 16 gallons per soldier per day. This is significantly more than the 2005 consumption rate of 9 gallons per soldier. These numbers make it clear that energy consumption for military operations has increased dramatically in the last 15 years. In Desert Storm, consumption was 4 gallons per soldier per soldier, and in World War II, consumption was only 1 gallon per day per soldier. Appendix A contains additional detail about DoD’s mobility fuel use. IMPLICATIONS OF U.S. NATIONAL SECURITY POLICY Recent experience indicates that the nature of the threat facing the United States is changing. Today, we cannot be sure in advance of the location of future conflicts, given the threat of dispersed, small-scale attacks inherent in warfare with rogue nations and insurgent forces. In addition, the U.S. military must be prepared to defend against single strikes capable of mass casualties. This complex security environment—an environment in which a wide range of conventional and unconventional attacks can come from unpredictable regions of the world and the risk of a single attack is high—requires the United States not only to maintain a force that is forward and engaged on a daily steady-state basis, but also to ensure that it is ready for quick, surge deployments worldwide to counter, and deter, a broad spectrum of potential threats. Department-wide and service-specific strategy documents have identified solutions to navigating in this new environment. The solutions have three general themes (described in Appendix B): 􀂡 Theme 1. Our forces must expand geographically and be more mobile and expeditionary so that they can be engaged in more theaters and prepared for expedient deployment anywhere in the world. 􀂡 Theme 2. We must transition from a reactive to a proactive force posture to deter enemy forces from organizing for and conducting potentially catastrophic attacks. 􀂡 Theme 3. We must be persistent in our presence, surveillance, assistance, and attack to defeat determined insurgents and halt the organization of new enemy forces. To carry out these activities, the U.S. military will have to be even more energy intense, locate in more regions of the world, employ new technologies, and manage a more complex logistics system. Considering the trend in operational fuel consumption and future capability needs, this “new” force employment construct will likely demand more energy/fuel in the deployed setting. Simply put, more miles will be traveled, both by combat units and the supply units that sustain them, which will result in increased energy consumption. Therefore, DoD must apply new energy technologies that address alternative supply sources and efficient consumption across all aspects of military operations. DISCONNECTS BETWEEN ENERGY POLICY AND STRATEGIC OBJECTIVES The demands placed on the armed forces have changed significantly since their current capabilities were designed and fielded and the plans and concepts for their employment were developed. The security challenges of the 21st century require a force structure that is more expeditionary, agile, and responsive. Such a force structure will consume increasing amounts of energy if current trends continue. Building this future force structure requires the application of resources, yet budgets will be increasingly constrained by operational energy demands. We call the misalignments between energy policies and strategic objectives “disconnects,” and they exist along three lines: strategic, operational, and fiscal. In recognition of the political factors associated with increasing energy consumption and some alternative energy solutions, we also identified a fourth disconnect—environmental. Table 2-1 defines the disconnects, and the following subsections discuss them in more detail. Strategic Disconnect The goal of our security strategies is to shape the future security environment favorably to support our national interests, principles, freedoms, and way of life. However, our nation’s and DoD’s current and future growing dependence on foreign energy sources and the need to ensure their continued availability limit our ability to shape the future security environment. Protecting foreign energy sources will have an increasing impact on DoD’s roles and missions, at the expense of other security needs, potentially dictating the time and place of future conflict if action is not taken to change the trend and mitigate the effects of future reductions in the supply of oil. The security and military strategies for DoD require an energy-intense posture for conducting both deterrence and combat operations. The strategies rely on persistent presence globally, mobility to project power and sustain forces, and dominant maneuver to swiftly defeat adversaries. These current and future operating concepts tether operational capability to high-technology solutions that require continued growth in energy sources. Current consumption estimates, although based on incomplete data, validate these increasing fuel requirements and the implications for future operations. Clearly, the skill of our logistics forces in providing fuel has grown significantly since World War II. Still, we must be mindful of the operational implications of logistics requirements. The stalling of General Patton’s Third Army following its campaign across France in August and September 1944 is a telling example of the fuel “tether.” Despite the heroic efforts of logistics forces, the wear and tear on supply trucks and the strategic priority for fuel and logistics support in other areas of operations limited Patton to local operations for nearly 2 months. 20 The Defense Energy Support Center (DESC) estimates that 20,000 soldiers are employed to deliver fuel to operations (and spending $1 million per day to transport petroleum, which does not include fuel costs for contractor-provided combat support). The delivery of fuel poses such an operational and tactical risk that in July 2006, Maj. Gen. Richard Zilmer, the highest-ranking Marine Corps officer in Iraq’s Anbar Province, characterized the development of solar and wind power capabilities as a “joint urgent operational need.” General Zilmer cited reductions in often dangerous fuel transportation activities as the main motivation for this request: “By reducing the need for [petroleum-based fuels] at our outlying bases, we can decrease the frequency of logistics convoys on the road, thereby reducing the danger to our Marines, soldiers, and sailors.” 21 Operational capability is always the most important aspect of force development. However, it may not be possible to execute operational concepts and capabilities to achieve our security strategy if the energy implications are not considered. Current planning presents a situation in which the aggregate operational capability of the force may be unsustainable in the long term.

#### **Weakness invites Russian aggression—empirical evidence.**

Carafano, PhD, ’10, James Jay Carafano, prof at the naval war college, testified before congress and has provided commentary for every major network, l 9/14/2010“Lesson from Jimmy Carter: Weakness Invites Aggression,” http://www.familysecuritymatters.org/publications/id.7358/pub\_detail.asp

When Reagan took over the White House he planned to make his foreign policy everything that Jimmy Carter's was not. Carter had tried accommodating America's enemies. He cut back on defense. He made humility the hallmark of American diplomacy.¶ ¶ Our foes responded with aggression: Iranian revolutionaries danced in the rubble of the U.S. Embassy; the Soviets sponsored armed insurgencies and invaded Afghanistan.¶ ¶ Later in his presidency, Carter tried to look tough. He proposed a modest increase in defense spending; pulled the United States out of the Moscow Olympics; and slapped an embargo on wheat exports to the Soviet Union. These actions hurt high jumpers and American farmers, but didn't faze our enemies. It was too little, too late.¶ ¶ As Reagan entered his presidency, the U.S. economy and the American spirit were low. Still, he committed to a policy of "peace through strength." And, even before he put his plan into action, our enemies began to worry.¶ ¶ Yuri Andropov, the chief of the KGB -- the Soviet's spy network -- feared that Reagan planned to attack. "Andropov," wrote Steven Hayward, in his "Age of Reagan"ordered the KGB to organize a special surveillance program in the United States -- code-named Operation RYAN -- to look for signs of preparations for an attack."¶ ¶ Reagan's assertive approach to foreign policy did not spark war. It produced peace. The Kremlin discovered Reagan was not the cowboy they feared. But they respected the more muscular United States. Russia agreed to the most effective arms control treaty in history.¶ ¶ The benefits spread. According to the Canadian-based Human Security project, deaths from political violence worldwide (even accounting for operations in Afghanistan and Iraq) have declined continually since the end of the Cold War ... until recently.¶ ¶ Reagan's opponents never understood the importance of peace through strength. When the Gipper went to negotiate economic strategy with House Speaker Tip O'Neil, he was told Congress would cut $35 billion in domestic spending only if Reagan pared the same amount from the Pentagon budget.¶ ¶ Reagan refused. Defense was not the problem, he told O'Neil. Defense was less than 30 percent of spending, down from nearly half the budget when John F. Kennedy had been president. (Today, Pentagon spending is less than one-fifth of the budget.) Keeping America safe, free, and prosperous, he concluded, doesn't start with making the nation unsafe.¶ ¶ Small wonder that people are saying the world looks like a rerun of the Carter years. The Obama Doctrine possesses many Carteresque attributes: a heavy reliance on treaties and international institutions; a more humble (and, often, apologetic) U.S. presence around the globe, and a diminishment of U.S. hard power.¶ ¶ And the Obama Doctrine has reaped pretty much the same results. When asked if he feared a U.S. military strike against his country's nuclear program, the Iranian president scoffed at the notion.¶ ¶ Meanwhile, after yielding to Russian complaints and canceling plans to build missile defenses against an Iranian attack, Obama signed an arms control treaty which, the Kremlin boasts, will further limit our missile defense. Yet Moscow still complains that the more limited system the Obama administration wants to field is too much. Once again, American concessions have only encouraged Moscow to be more aggressive.

#### Russian aggression causes extinction.

Blank, prof at Army, ’09, Dr. Stephen Blank , Research Professor of National Security Affairs at the Strategic Studies Institute, U.S. Army War College, March 2009, “Russia And Arms Control: Are There Opportunities For The Obama Administration?,” http://www.strategicstudiesinstitute.army.mil/pdffiles/pub908.pdf

Proliferators or nuclear states like China and Russia can then deter regional or intercontinental attacks either by denial or by threat of retaliation. 168 Given a multipolar world structure with little ideological rivalry among major powers, it is unlikely that they will go to war with each other. Rather, like Russia, they will strive for exclusive hegemony in their own “sphere of influence” and use nuclear instruments towards that end. However, wars may well break out between major powers and weaker “peripheral” states or between peripheral and semiperipheral states given their lack of domestic legitimacy, the absence of the means of crisis prevention, the visible absence of crisis management mechanisms, and their strategic calculation that asymmetric wars might give them the victory or respite they need. 169 Simultaneously, The states of periphery and semiperiphery have far more opportunities for political maneuvering. Since war remains a political option, these states may find it convenient to exercise their military power as a means for achieving political objectives. Thus international crises may increase in number. This has two important implications for the use of WMD. First, they may be used deliberately to offer a decisive victory (or in Russia’s case, to achieve “intra-war escalation control”—author 170 ) to the striker, or for defensive purposes when imbalances in military capabilities are significant; and second, crises increase the possibilities of inadvertent or accidental wars involving WMD. 171 Obviously nuclear proliferators or states that are expanding their nuclear arsenals like Russia can exercise a great influence upon world politics if they chose to defy the prevailing consensus and use their weapons not as defensive weapons, as has been commonly thought, but as offensive weapons to threaten other states and deter nuclear powers. Their decision to go either for cooperative security and strengthened international military-political norms of action, or for individual national “egotism” will critically affect world politics. For, as Roberts observes, But if they drift away from those efforts [to bring about more cooperative security], the consequences could be profound. At the very least, the effective functioning of inherited mechanisms of world order, such as the special responsibility of the “great powers” in the management of the interstate system, especially problems of armed aggression, under the aegis of collective security, could be significantly impaired. Armed with the ability to defeat an intervention, or impose substantial costs in blood or money on an intervening force or the populaces of the nations marshaling that force, the newly empowered tier could bring an end to collective security operations, undermine the credibility of alliance commitments by the great powers, [undermine guarantees of extended deterrence by them to threatened nations and states] extend alliances of their own, and perhaps make wars of aggression on their neighbors or their own people. 172

#### Airborne Wind solves – supports basing and eliminates energy concerns.

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Troy L. Cahoon, BSE Captain, USAF, thesis in fulfillment of Degree of Master of Science in Aeronautical Engineering, March 2011, Air Force Institute of Technology, “AIRBORNE WIND ENERGY: IMPLEMENTATION AND DESIGN FOR THE U.S. AIR FORCE”, http://www.dtic.mil/dtic/tr/fulltext/u2/a539255.pdf //jchen

Tapping into higher altitude winds will have many advantages and challenges. For example, one advantage involves the effects that the planetary boundary layer and the jet streams have on power density as altitude increases. These effects lead to wind speeds that are up to 10 times faster than those near the ground, resulting in much higher power density. Another advantage of AWE is that there are more consistent winds, reducing the intermittency and energy storage requirements typically experienced by other renewable energy sources. Also, the energy source comes to the AWE system so that the system can work in isolated locations without importing fuel or being dependent on the local utilities and infrastructure. A major advantage of AWE is the global availability of the high-altitude wind, with a plentiful supply available domestically in the U.S. The AWE technology does face some significant challenges that need to be overcome. One challenge is the increased complexity of an airborne system. The airborne nature of AWE systems requires the use of lighter and more expensive materials. An airborne system will also require the development of flight controls. The long tether is also a significant design challenge. An additional obstacle to AWE implementation is the issue of allocating air space for the AWE systems to use and share with other aircraft. Despite the challenges of AWE technology, no obstacles appear to be insurmountable. AWE could be very beneficial for supporting military energy needs. AWE can be used in remote areas, wartime areas, on bases, and in certain areas of civilian populations (where air traffic does not travel). From a civil engineering perspective, AWE can be one of the tools that will be in place first as the military sets up new installations, especially in areas without electricity or other energy sources. AWE can have great impact on the security, economics, and environment for the USAF, and for the country. Supporting security and national energy independence, AWE can provide a stable and consistent source of domestic energy that is renewable. This will allow the USAF to meet the goals of the National Security Strategy 2 and the Air Force Energy Plan 2010. 39 Economically, researchers estimate that the cost of fully developed AWE technology will produce energy that will be less expensive than any other current source of energy at around 2¢/kWh (see Figure 37). 9, 10 AWE energy can tremendously benefit the USAF, since energy costs the USAF $9 billion per year (8% of the total USAF budget). 39 If renewables are to be massively adopted by the USAF or the population, the key is that the cost of renewables (such as AWE) must be lower than fossil fuels. Renewables need to be cheaper than fossil fuels and become the go-to source of energy, leaving the fossil fuels as the backup when the availability of the preferred renewable source is not available.

#### Fossil fuel dependence destroys operational capability—irregular warfare and supply gaps.

Kuntz, Army Colonel, ’07, Gordon D. Kuntz, Colonel, US Army National Guard, March 2007, “Use of Renewable Energy in Contingency Operations,” <http://www.aepi.army.mil/publications/sustainability/docs/use-of-renew-en-conting-ops.pdf>

Future conflicts or engagements will most likely occur in impoverished countries with minimal or very limited infrastructure, making traditional military operations challenging. Asymmetrical, irregular warfare with engagements taking place in urban areas, rural settings, or on inhospitable terrain will make maneuvering and re-supply extremely difficult. Commanders must examine all aspects of military operations, exploring potential renewable sources of power (photovoltaic, wind, hydro, and/or biomass) for base operations and power source(s) to run generators for maintenance of communications, health and welfare needs, and so forth. Renewable energy systems offer viable, dependable sources of energy that can effectively augment, and in some cases replace, current fossil fuel generator systems. In austere settings with asymmetrical, irregular warfare, commanders must ask several questions. What is the strategic importance of having an unimpeded source of energy especially when operating in an austere environment? Where will this source of energy, come from? How will commanders ensure they will have enough energy during Contingency Operations (CONOPS) 20 ? How will fuel get to them when roads are almost nonexistent or too dangerous to travel? How will commanders complete their mission when they cannot rely on their previously dependable or relied on sources of energy?

#### **It’s not about the size of our military lead, but how we use it. A weakened American military invites counter-balancing and aggressive enemies**

Spencer, 9/15/2000 (Jack - policy analyst for defense and national security at the Heritage Foundation, The Facts About Military Readiness, p. http://www.heritage.org/Research /Reports/2000/09/BG1394-The-Facts-About-Military-Readiness)

U.S. military readiness cannot be gauged by comparing America's armed forces with other nations' militaries. Instead, the capability of U.S. forces to support America's national security requirements should be the measure of U.S. military readiness. Such a standard is necessary because America may confront threats from many different nations at once. America's national security requirements dictate that the armed forces must be prepared to defeat groups of adversaries in a given war. America, as the sole remaining superpower, has many enemies. Because attacking America or its interests alone would surely end in defeat for a single nation, these enemies are likely to **form alliances**. Therefore, basing readiness on American military superiority over any single nation has little saliency. The evidence indicates that the U.S. armed forces are not ready to support America's national security requirements. Moreover, regarding the broader capability to defeat groups of enemies, military readiness has been declining. The National Security Strategy, the U.S. official statement of national security objectives,3 concludes that the United States "must have the capability to deter and, if deterrence fails, defeat large-scale, cross-border aggression in two distant theaters in overlapping time frames."4 According to some of the military's highest-ranking officials, however, the United States cannot achieve this goal. Commandant of the Marine Corps General James Jones, former Chief of Naval Operations Admiral Jay Johnson, and Air Force Chief of Staff General Michael Ryan have all expressed serious concerns about their respective services' ability to carry out a two major theater war strategy.5 Recently retired Generals Anthony Zinni of the U.S. Marine Corps and George Joulwan of the U.S. Army have even questioned America's ability to conduct one major theater war the size of the 1991 Gulf War.6 Military readiness is **vital** because declines in America's military readiness signal to the rest of the world that the United States is not prepared to defend its interests. Therefore, potentially hostile nations will be **more likely to lash out** against American allies and interests, inevitably **leading to U.S. involvement in combat**. A high state of military readiness is more likely to deter potentially hostile nations from **acting aggressively in regions** of vital national interest, thereby preserving peace.

#### Nuclear threats aren’t credible – flexible ground forces are key to deterrence.

Gerson ’09, Michael S. Gerson, research analyst at the Center for Naval Analyses, “Conventional Deterrence in the Second Nuclear Age,” Fall 2009, Paramters, Vol. 39, Iss. 3, ProQuest

In the current international security environment, conventional deterrence can be useful against nonnuclear and nuclear-armed adversaries. For regimes that do not possess nuclear, chemical, or biological weapons, US conventional capabilities will likely be the most credible and potent deterrent. History suggests that, in general, nations without weapons of mass destruction (WMD) are not intimidated by an opponent's nuclear capabilities. For example, nuclear weapons did not give the United States significant advantages before or during the Korean and Vietnam wars; nor did they dissuade Egypt from attacking Israel in the 1973 Yom Kippur War11 or Argentina from attacking the British-controlled Falkland Islands in 1982.12 This circumstance is due in part to the perceived impact of the "nuclear taboo," a moral and political aversion to using nuclear weapons that has emerged due to the absence of nuclear use in time of war. The nuclear taboo reduces the credibility-and therefore the utility-of nuclear weapons, especially against regimes not possessing nuclear weapons or other WMD.13 Although implicit or explicit nuclear threats may lack credibility against non-WMD regimes, many potential adversaries believe that the United States will use conventional firepower, especially because America has conventional superiority and a demonstrated willingness to use it. Consequently, when dealing with non-WMD-related threats, conventional deterrence will be the most likely mechanism for deterring hostile actions. According to Admiral Michael Mullen, the current Chairman of the Joint Chiefs of Staff, "A big part of credibility, of course, lies in our conventional capability. The capability to project power globally and conduct effective theater-level operations . . . remains essential to deterrence effectiveness."14 Conventional deterrence also plays an important role in preventing nonnuclear aggression by nuclear-armed regimes. Regional nuclear proliferation may not only increase the chances for the use of nuclear weapons, but, equally important, the possibility of conventional aggression. The potential for conventional conflict under the shadow of mutual nuclear deterrence was a perennial concern throughout the Cold War, and that scenario is still relevant. A perceived nuclear-armed adversary may be emboldened to use conventional force against US friends and allies, or to sponsor terrorism, in the belief that its nuclear capabilities give it an effective deterrent against US retaliation or intervention.15 For example, a regime might calculate that it could undertake conventional aggression against a neighbor and, after achieving a relatively quick victory, issue implicit or explicit nuclear threats in the expectation that the United States (and perhaps coalition partners) would choose not to become involved. In this context, conventional deterrence can be an important mechanism to limit options for regional aggression below the nuclear threshold. Given the current US advantage in conventional forces and mobility, a potential enemy is more likely to attack its neighbors if the regime believes it can accomplish its objectives before US forces can respond. In other words, a nuclear-armed regime may be more likely to undertake conventional aggression if it believes that a favorable local balance of power would provide an opportunity for a fait accompli. By deploying robust conventional forces in and around the theater of potential conflict, the United States can credibly signal that its forces will respond to any aggression early in a conflict. Therefore, the threatening regime cannot hope to achieve its military objectives while using its nuclear arsenal to cancel US intervention. If the United States can convince an opponent that US forces will engage early in the conflict-and that America is willing to accept the human and financial costs of combat- it may persuade opponents that the United States is resolved to continue the conflict even in the face of nuclear threats because American blood and treasure would already have been expended.16 Similar to the Cold War, the deployment of American conventional power in a region, combined with nuclear capability and escalation dominance, may prevent hostile regimes from thinking nuclear possession provides opportunities for aggression and coercion below the nuclear threshold.

#### Deep engagement deters great power war and reassures allies – theoretical and empirical evidence

Brooks, Ikenberry, and Wohlforth ’13, Stephen Brooks, associate professor of Government at Dartmouth College, John Ikenberry, Albert G. Milbank professor of Politics and International Affairs at Princeton University, and William Wohlforth, Daniel Webster professor of government and Dartmouth College, Winter, “Don’t Come Home America,” <http://live.belfercenter.org/files/IS3703_Brooks%20Wohlforth%20Ikenberry.pdf>, subject to peer review, international security, p. 33-40

A core premise of deep engagement is that it prevents the emergence of a far more dangerous global security environment. For one thing, as noted above, the United States’ overseas presence gives it the leverage to restrain partners from taking provocative action. Perhaps more important, its core alliance commitments also deter states with aspirations to regional hegemony from contemplating expansion and make its partners more secure, reducing their incentive to adopt solutions to their security problems that threaten others and thus stoke security dilemmas. The contention that engaged U.S. power dampens the baleful effects of anarchy is consistent with influential variants of realist theory. Indeed, arguably the scariest portrayal of the war-prone world that would emerge absent the “American Pacifier” is provided in the works of John Mearsheimer, who forecasts dangerous multipolar regions replete with security competition, arms races, nuclear proliferation and associated preventive war temptations, regional rivalries, and even runs at regional hegemony and full-scale great power war. 72

How do retrenchment advocates, the bulk of whom are realists, discount this benefit? Their arguments are complicated, but two capture most of the variation: (1) U.S. security guarantees are not necessary to prevent dangerous rivalries and conflict in Eurasia; or (2) prevention of rivalry and conflict in Eurasia is not a U.S. interest. Each response is connected to a different theory or set of theories, which makes sense given that the whole debate hinges on a complex future counterfactual (what would happen to Eurasia’s security setting if the United States truly disengaged?). Although a certain answer is impossible, each of these responses is nonetheless a weaker argument for retrenchment than advocates acknowledge.

The first response flows from defensive realism as well as other international relations theories that discount the conflict-generating potential of anarchy under contemporary conditions. 73

Defensive realists maintain that the high expected costs of territorial conquest, defense dominance, and an array of policies and practices that can be used credibly to signal benign intent, mean that Eurasia’s major states could manage regional multipolarity peacefully without the American pacifier. Retrenchment would be a bet on this scholarship, particularly in regions where the kinds of stabilizers that nonrealist theories point to—such as democratic governance or dense institutional linkages—are either absent or weakly present. There are three other major bodies of scholarship, however, that might give decisionmakers pause before making this bet. First is regional expertise. Needless to say, there is no consensus on the net security effects of U.S. withdrawal. Regarding each region, there are optimists and pessimists. Few experts expect a return of intense great power competition in a post-American Europe, but many doubt European governments will pay the political costs of increased EU defense cooperation and the budgetary costs of increasing military outlays. 74 The result might be a Europe that is incapable of securing itself from various threats that could be destabilizing within the region and beyond (e.g., a regional conflict akin to the 1990s Balkan wars), lacks capacity for global security missions in which U.S. leaders might want European participation, and is vulnerable to the influence of outside rising powers.

What about the other parts of Eurasia where the United States has a substantial military presence? Regarding the Middle East, the balance begins to swing toward pessimists concerned that states currently backed by Washington— notably Israel, Egypt, and Saudi Arabia—might take actions upon U.S. retrenchment that would intensify security dilemmas. And concerning East Asia, pessimism regarding the region’s prospects without the American pacifier is pronounced. Arguably the principal concern expressed by area experts is that Japan and South Korea are likely to obtain a nuclear capacity and increase their military commitments, which could stoke a destabilizing reaction from China. It is notable that during the Cold War, both South Korea and Taiwan moved to obtain a nuclear weapons capacity and were only constrained from doing so by a still-engaged United States. 75

The second body of scholarship casting doubt on the bet on defensive realism’s sanguine portrayal is all of the research that undermines its conception of state preferences. Defensive realism’s optimism about what would happen if the United States retrenched is very much dependent on its particular—and highly restrictive—assumption about state preferences; once we relax this assumption, then much of its basis for optimism vanishes. Specifically, the prediction of post-American tranquility throughout Eurasia rests on the assumption that security is the only relevant state preference, with security defined narrowly in terms of protection from violent external attacks on the homeland. Under that assumption, the security problem is largely solved as soon as offense and defense are clearly distinguishable, and offense is extremely expensive relative to defense. Burgeoning research across the social and other sciences, however, undermines that core assumption: states have preferences not only for security but also for prestige, status, and other aims, and they engage in trade-offs among the various objectives. 76 In addition, they define security not just in terms of territorial protection but in view of many and varied milieu goals. It follows that even states that are relatively secure may nevertheless engage in highly competitive behavior. Empirical studies show that this is indeed sometimes the case. 77 In sum, a bet on a benign postretrenchment Eurasia is a bet that leaders of major countries will never allow these nonsecurity preferences to influence their strategic choices.

To the degree that these bodies of scholarly knowledge have predictive leverage, U.S. retrenchment would result in a significant deterioration in the security environment in at least some of the world’s key regions. We have already mentioned the third, even more alarming body of scholarship. Offensive realism predicts that the withdrawal of the American pacifier will yield either a competitive regional multipolarity complete with associated insecurity, arms racing, crisis instability, nuclear proliferation, and the like, or bids for regional hegemony, which may be beyond the capacity of local great powers to contain (and which in any case would generate intensely competitive behavior, possibly including regional great power war).

Hence it is unsurprising that retrenchment advocates are prone to focus on the second argument noted above: that avoiding wars and security dilemmas in the world’s core regions is not a U.S. national interest. Few doubt that the United States could survive the return of insecurity and conflict among Eurasian powers, but at what cost? Much of the work in this area has focused on the economic externalities of a renewed threat of insecurity and war, which we discuss below. Focusing on the pure security ramifications, there are two main reasons why decisionmakers may be rationally reluctant to run the retrenchment experiment. First, overall higher levels of conflict make the world a more dangerous place. Were Eurasia to return to higher levels of interstate military competition, one would see overall higher levels of military spending and innovation and a higher likelihood of competitive regional proxy wars and arming of client states—all of which would be concerning, in part because it would promote a faster diffusion of military power away from the United States.

Greater regional insecurity could well feed proliferation cascades, as states such as Egypt, Japan, South Korea, Taiwan, and Saudi Arabia all might choose to create nuclear forces. 78 It is unlikely that proliferation decisions by any of these actors would be the end of the game: they would likely generate pressure locally for more proliferation. Following Kenneth Waltz, many retrenchment advocates are proliferation optimists, assuming that nuclear deterrence solves the security problem. 79 Usually carried out in dyadic terms, the debate over the stability of proliferation changes as the numbers go up. Proliferation optimism rests on assumptions of rationality and narrow security preferences. In social science, however, such assumptions are inevitably probabilistic. Optimists assume that most states are led by rational leaders, most will overcome organizational problems and resist the temptation to preempt before feared neighbors nuclearize, and most pursue only security and are risk averse. Confidence in such probabilistic assumptions declines if the world were to move from nine to twenty, thirty, or forty nuclear states. In addition, many of the other dangers noted by analysts who are concerned about the destabilizing effects of nuclear proliferation—including the risk of accidents and the prospects that some new nuclear powers will not have truly survivable forces—seem prone to go up as the number of nuclear powers grows. 80 Moreover, the risk of “unforeseen crisis dynamics” that could spin out of control is also higher as the number of nuclear powers increases. Finally, add to these concerns the enhanced danger of nuclear leakage, and a world with overall higher levels of security competition becomes yet more worrisome.

The argument that maintaining Eurasian peace is not a U.S. interest faces a second problem. On widely accepted realist assumptions, acknowledging that U.S. engagement preserves peace dramatically narrows the difference between retrenchment and deep engagement. For many supporters of retrenchment, the optimal strategy for a power such as the United States, which has attained regional hegemony and is separated from other great powers by oceans, is offshore balancing: stay over the horizon and “pass the buck” to local powers to do the dangerous work of counterbalancing any local rising power. The United States should commit to onshore balancing only when local balancing is likely to fail and a great power appears to be a credible contender for regional hegemony, as in the cases of Germany, Japan, and the Soviet Union in the midtwentieth century.

The problem is that China’s rise puts the possibility of its attaining regional hegemony on the table, at least in the medium to long term. As Mearsheimer notes, “The United States will have to play a key role in countering China, because its Asian neighbors are not strong enough to do it by themselves.” 81 Therefore, unless China’s rise stalls, “the United States is likely to act toward China similar to the way it behaved toward the Soviet Union during the Cold War.” 82 It follows that the United States should take no action that would compromise its capacity to move to onshore balancing in the future. It will need to maintain key alliance relationships in Asia as well as the formidably expensive military capacity to intervene there. The implication is to get out of Iraq and Afghanistan, reduce the presence in Europe, and pivot to Asia— just what the United States is doing. 83

In sum, the argument that U.S. security commitments are unnecessary for peace is countered by a lot of scholarship, including highly influential realist scholarship. In addition, the argument that Eurasian peace is unnecessary for U.S. security is weakened by the potential for a large number of nasty security consequences as well as the need to retain a latent onshore balancing capacity that dramatically reduces the savings retrenchment might bring. Moreover, switching between offshore and onshore balancing could well be difficult.

Bringing together the thrust of many of the arguments discussed so far underlines the degree to which the case for retrenchment misses the underlying logic of the deep engagement strategy. By supplying reassurance, deterrence, and active management, the United States lowers security competition in the world’s key regions, thereby preventing the emergence of a hothouse atmosphere for growing new military capabilities. Alliance ties dissuade partners from ramping up and also provide leverage to prevent military transfers to potential rivals. On top of all this, the United States’ formidable military machine may deter entry by potential rivals. Current great power military expenditures as a percentage of GDP are at historical lows, and thus far other major powers have shied away from seeking to match top-end U.S. military capabilities. In addition, they have so far been careful to avoid attracting the “focused en mity” of the United States. 84 All of the world’s most modern militaries are U.S. allies (America’s alliance system of more than sixty countries now accounts for some 80 percent of global military spending), and the gap between the U.S. military capability and that of potential rivals is by many measures growing rather than shrinking. 85

In the end, therefore, deep engagement reduces security competition and does so in a way that slows the diffusion of power away from the United States. This in turn makes it easier to sustain the policy over the long term.

#### And, the pursuit of primacy is inevitable— only question is effectiveness.

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This hegemony is by no means fated to end any time soon, however, given that the United States remains predominant by most conventional indicators of national power. The character of the United States’ hegemonic behavior in the future will thus remain an issue of concern both within the domestic polity and internationally. Yet the juvenescence of the United State’s “unipolar moment,” combined with the disorientation produced by the September 11 attacks, ought to restrain any premature generalization that the imperial activism begun by the Clinton administration, and which the Bush administration took to its most spirited apotheosis, would in some way come to define the permanent norm of US behavior in the global system. In all probability, it is much more likely that the limitations on US power witnessed in Afghanistan and Iraq will produce a more phlegmatic and accommodating United States over the longer term, despite the fact that the traditional US pursuit of dominance — understood as the quest to maintain a preponderance of power, neutralize threatening challengers, and protect freedom of action, goals that go back to the foundations of the republic — is unlikely to be extinguished any time soon. Precisely because the desire for dominance is likely to remain a permanent feature of US geopolitical ambitions — even though how it is exercised will certainly change in comparison to the Bush years — the central task facing the next administration will still pertain fundamentally to the issue of US power. This concern manifests itself through the triune challenges of: redefineng the United States’ role in the world, renewing the foundations of US strength, and recovering the legitimacy of US actions. In other words, the next administration faces the central task of clarifying the character of US hegemony, reinvigorating the material foundations of its power, and securing international support for its policies.

#### Empirically, US military capability reduces conflict and avoids nuclear war.

Barnett 11

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It is worth first examining the larger picture: We live in a time of arguably the greatest structural change in the global order yet endured, with this historical moment's most amazing feature being its relative and absolute lack of mass violence. That is something to consider when Americans contemplate military intervention in Libya, because if we do take the step to prevent larger-scale killing by engaging in some killing of our own, we will not be adding to some fantastically imagined global death count stemming from the ongoing "megalomania" and "evil" of American "empire." We'll be engaging in the same sort of system-administering activity that has marked our stunningly successful stewardship of global order since World War II. Let me be more blunt: As the guardian of globalization, the U.S. military has been the greatest force for peace the world has ever known. Had America been removed from the global dynamics that governed the 20th century, the mass murder never would have ended. Indeed, it's entirely conceivable there would now be no identifiable human civilization left, once nuclear weapons entered the killing equation. But the world did not keep sliding down that path of perpetual war. Instead, America stepped up and changed everything by ushering in our now-perpetual great-power peace. We introduced the international liberal trade order known as globalization and played loyal Leviathan over its spread. What resulted was the collapse of empires, an explosion of democracy, the persistent spread of human rights, the liberation of women, the doubling of life expectancy, a roughly 10-fold increase in adjusted global GDP and a profound and persistent reduction in battle deaths from state-based conflicts. That is what American "hubris" actually delivered. Please remember that the next time some TV pundit sells you the image of "unbridled" American military power as the cause of global disorder instead of its cure. With self-deprecation bordering on self-loathing, we now imagine a post-American world that is anything but. Just watch who scatters and who steps up as the Facebook revolutions erupt across the Arab world. While we might imagine ourselves the status quo power, we remain the world's most vigorously revisionist force. As for the sheer "evil" that is our military-industrial complex, again, let's examine what the world looked like before that establishment reared its ugly head. The last great period of global structural change was the first half of the 20th century, a period that saw a death toll of about 100 million across two world wars. That comes to an average of 2 million deaths a year in a world of approximately 2 billion souls. Today, with far more comprehensive worldwide reporting, researchers report an average of less than 100,000 battle deaths annually in a world fast approaching 7 billion people. Though admittedly crude, these calculations suggest a 90 percent absolute drop and a 99 percent relative drop in deaths due to war. We are clearly headed for a world order characterized by multipolarity, something the American-birthed system was designed to both encourage and accommodate. But given how things turned out the last time we collectively faced such a fluid structure, we would do well to keep U.S. power, in all of its forms, deeply embedded in the geometry to come. To continue the historical survey, after salvaging Western Europe from its half-century of civil war, the U.S. emerged as the progenitor of a new, far more just form of globalization -- one based on actual free trade rather than colonialism. America then successfully replicated globalization further in East Asia over the second half of the 20th century, setting the stage for the Pacific Century now unfolding. As a result, the vector of structure-building connectivity shifted from trans-Atlantic to trans-Pacific. But if the connectivity push of the past several decades has been from West to East, with little connectivity extended to the South outside of the narrow trade of energy and raw materials, the current connectivity dynamic is dramatically different. Now, the dominant trends are: first, the East cross-connecting back to the West via financial and investment flows as well as Asian companies "going global"; and second, the East creating vast new connectivity networks with the South through South-South trade and investment. The challenge here is how to adjust great-power politics to these profound forces of structural change. Because of the West's connectivity to the East, we are by extension becoming more deeply connected to the unstable South, with China as the primary conduit. Meanwhile, America's self-exhausting post-Sept. 11 unilateralist bender triggered the illusion -- all the rage these days -- of a G-Zero, post-American world. The result, predictably enough for manic-depressive America, is that we've sworn off any overall responsibility for the South, even as we retain the right to go anywhere and kill any individuals -- preferably with flying robots -- that we deem immediately threatening to our narrowly defined national security interests. The problem with this approach is that China has neither the intention nor the ability to step up and play anything resembling a responsible Leviathan over the restive South, where globalization's advance -- again, with a Chinese face -- produces a lot of near-term instability even as it builds the basis for longer-term stability.

Contention 3 is Solvency

#### Competitive Matching Fund solves valley of death and is key to commercialization

Bronstein 11

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Discussion and policy recommendations¶ This technology assessment has identified a number of technical and non-technical barriers to the deployment of HWP. Radical policy shifts and significant advances in S&T would be required for HWP to become a viable energy source in the future. The following recommendations are integral to enable the potential success of HWP. The federal government has done little to address the major challenges and barriers to innovation posed by the ‘valley of death.’ No technology can significantly decrease carbon emissions unless it is successfully commercialized.¶ Recommendation: ARPA-E should establish a competitive, matching fund for renewable energy companies that have been able to raise venture capital and/or seed funding for commercialization.¶These matching funds could provide a major incentive for companies that have been able to raise seed funding from the private sector. Government investment could also spur further investment from the private sector and would ideally result in sufficient cash flow to enable the company to commercialize the product.¶ While ARPA-E is a relatively new agency, it is well positioned to play a larger role in the development of renewable energy technologies. However, its current appropriation is diminutive and future funding for the program is uncertain.

#### **Airborne wind is feasible and effective – most comprehensive and recent scientific evidence.**

Caldeira et. al ’12, [Ken Caldeira, atmospheric scientist at Carnegie Institute of Science, named Hero scientist of 2008 by New Scientist magazine, stanford prof, Kate Marvel, Perry Fellow at Stanford university, PhD in theoretical physics from Caimbridge, BA in physics and astronomy from UCBerkeley, and Ben Kravitz, stanford post doc Carnegie Institution Department of Global Ecology, 9/9/2012, “Geophysical limits to global wind power,” http://iis-db.stanford.edu/pubs/23831/Marvel\_climate\_windpower\_2012.pdf

\*\*\*Peer reviewed

There is enough power in Earth’s winds to be a primary source of near-zero-emission electric power as the global economy continues to grow through the twenty-ﬁrst century. Historically, wind turbines are placed on Earth’s surface, but high-altitude winds are usually steadier and faster than nearsurface winds, resulting in higher average power densities . Here, we use a climate model to estimate the amount of power that can be extracted from both surface and highaltitude winds, considering only geophysical limits. We ﬁnd wind turbines placed on Earth’s surface could extract kinetic energy at a rate of at least 400 TW, whereas high-altitude wind power could extract more than 1,800 TW. At these high rates of extraction, there are pronounced climatic consequences. However, we ﬁnd that at the level of present global primary power demand (18 TW; ref. 2), uniformly distributed wind turbines are unlikely to substantially affect the Earth’s climate. It is likely that wind power growth will be limited by economic or environmental factors, not global geophysical limits. Here, we quantify geophysical limits to wind power by applying additional drag forces that remove momentum from the atmo- sphere in a global climate model. We perform simulations in which drag is applied to either the near-surface environment or the entire atmosphere, and analyse consequences for the atmospheric kinetic energy budget and climate. When small amounts of additional drag are added to the atmosphere, the rate of kinetic energy extraction (KEE) increases. However, in the limit of infinite drag, the atmosphere is motionless and there is no kinetic energy to extract. This suggests that there must be some amount of added drag that maximizes KEE. We refer to this maximum KEE as the geophysical limit to global wind power. Here, we consider only geophysical limitations, not technical or economic constraints on wind power. The large-scale climate impacts of increased surface drag have been considered in previous studies. In an idealized global climate model, surface friction was uniformly increased across the globe, and this was found to decrease atmospheric kinetic energy and shift eddy-driven mid-latitude jets polewards 3 . In a general circulation model with specified sea surface temperatures, altered surface drag and modified surface roughness height over selected regions, caused slight increases in global surface temperatures 4 . This effect was also observed when land-surface roughness was increased in a climate model incorporating a mixed-layer ocean 5 . Other studies have investigated the wind anomaly patterns produced by isolated regions of increased surface roughness 6 ; and estimated wind resource potential over land that was not ice-covered 7 . However, these studies focused solely on increased surface drag. The effects of increased drag in the interior of the atmosphere have been studied 8 where a drag term was added to regions of the atmosphere where wind speeds exceeded a cutoff velocity. Unfortunately, aspects of that work make their results difficult to interpret. For example, they include wake turbulence in a term that involves momentum transfer to the turbine blades despite the fact that there is no such momentum transfer in the wake and introduce a frictional parameter with units that are difficult to reconcile with their equations. Results Limits on wind power availability. We differentiate among three types of kinetic energy loss represented in the CAM3.5 model 9 : Viscous dissipation refers to the rate at which work is done by viscosity of air in converting mean and turbulent kinetic energy to internal energy through heat. Roughness dissipation refers to the rate at which pre-existing surface momentum sinks such as the land or ocean surface dissipate kinetic energy. KEE refers to the removal of kinetic energy caused by momentum loss to the added momentum sinks. In the case of wind turbines, the kinetic energy would be converted to mechanical or electrical energy, most of which would ultimately be dissipated as heat. In our simulations, this heat is dissipated locally. Drag added to the atmosphere has important secondary consequences: the velocity change and associated velocity gradients may affect both roughness and viscous dissipation. Here, KEE refers only to the rate of transfer of kinetic energy to added momentum sinks. The parameter we introduce to vary additional drag is Area : the effective extraction area per unit volume, discussed in Methods and Supplementary Section SA.1. Figure 1a shows KEE as a function of Area for cases where drag has been added to the near-surface layers (cases labelled SL(n)) and whole atmosphere (cases labelled WA(n)). (See also Supplementary Fig. SA.1a for the results on logarithmic scales.) As expected for low values of added drag, increasing extraction area increases KEE, that is, (d(KEE)=dArea)>0. At the geophysical limit to global wind power, (d(KEE)=dArea)D0. As shown in Fig. 1b, for both the near-surface and whole-atmosphere cases we approach but do not reach this limit. Therefore, the geophysical limits exceed the maximum KEE values found in our study for both cases. Figure 1b shows the depletion of atmospheric kinetic energy as a function of KEE. We find that for every additional watt dissipated by drag added in the near-surface cases, total atmospheric kinetic energy decreases by 80 kJ, whereas each additional watt dissipated in the whole-atmosphere cases decreases atmospheric kinetic energy by 400 kJ. From Fig. 1a,b we can infer that the geophysical limit on wind power availability is greater than 428 TW in the surface-only cases, and greater than 1,873 TW in the whole-atmosphere cases. These lower bounds on geophysical limits on airborne wind power exceed the present global primary energy demand of 18 TW by factors greater than 20 and 100, respectively. The results from all cases are summarized in Supplementary Table SA1. Kinetic energy production and the atmospheric heat engine. In steady state, net kinetic energy dissipation is balanced by net kinetic energy production. Furthermore, in the atmosphere, kinetic energy is produced by conversion of available potential energy. Therefore, sustained increases in net dissipation imply increases in net production of available potential energy and conversion to kinetic energy. Figure 1c shows the total rate of dissipation (the sum of viscous dissipation, roughness dissipation and KEE) as a function of KEE. For the near-surface cases, there is little change in total atmospheric dissipation. However, in the whole-atmosphere cases, for every watt increase of KEE due to added drag cases, total atmospheric kinetic energy production increases by 0.8 W. The near-linear relationship between added dissipation and total dissipation holds until the KEE in the whole atmosphere exceeds 1,600 TW. Beyond this value, increases in KEE result in declines in net kinetic energy production. Figure 1d depicts the net atmospheric energy transport from low latitudes with net atmospheric energy gain to high latitudes with net atmospheric energy loss. To a large extent, atmospheric energy transports must adjust such that energy is transported in steady-state from regions of net energy accumulation to regions of net energy loss. When drag is added near the surface alone, high KEE does cause some decrease in net poleward energy transport. For the whole-atmosphere cases, however, net energy transport remains approximately constant until KEE exceeds 1,600 TW, after which it declines sharply. Climate impacts. Figure 1e indicates that uniformly applied sur- face drag has a slight warming effect, consistent with previous studies 4,5,10 . However, we find that whole-atmosphere drag can have a large surface cooling effect as KEE approaches the geophysical limit. If we assume that the effects of extracting kinetic energy scale linearly at extraction rates less than 429 TW, then satisfying global energy demand with uniformly distributed wind turbines would cause a global mean temperature increase of 0.03 K for near-surface wind turbines, and a global mean decrease of 0.007 K for turbines distributed throughout the atmosphere. Figure 2 shows zonal mean temperature change and percentage change in zonal mean precipitation for cases SL(5) and WA(7.63), each of which have approximately the same globally integrated KEE (428 TW and 429 TW, respectively). Zonal mean temperature changes in these cases are of the order of 1 K and percentage changes in zonal mean precipitation are of the order of 10%. This suggests that, at the scale of global energy demand, uniformly distributed wind power would produce zonal mean temperature changes of 0.1 K and changes in zonal mean precipitation of 1% (see Supplementary Section SA2). Thus, reliance on widely distributed wind turbines as an energy source is unlikely to have a substantial climate impact.

#### Tech is feasible now – only federal support solves scale up

Wind Daily 12

Wind Daily 9/13/12, “High-altitude winds have large potential as a source of clean energy”, http://www.winddaily.com/reports/High\_altitude\_winds\_have\_large\_potential\_as\_a\_source\_of\_clean\_energy\_999.html //jchen

Airborne wind energy-an emerging approach to harnessing high-altitude winds-could scale up fairly quickly if given significant government support for research and development, according to a survey of experts by Near Zero, a nonprofit energy research organization.¶ Winds near Earth's surface are already used to generate substantial amounts of electricity. However, higher in the sky-much higher than today's wind turbines can reach-winds tend to be stronger and steadier, making these winds an even larger source of energy.¶ According to recent research, the amount of energy that can potentially be extracted from high-altitude winds is enormous. However, the field of airborne wind energy is still in its infancy and faces many challenges before it becomes commercially competitive.¶ Near Zero conducted both an informal discussion and a formal survey to find out what technologies are most advanced, which have the best potential, and how best government could jumpstart the development of the airborne wind energy industry. Thirty-one experts completed the formal survey, identifying technological, engineering, and regulatory barriers to testing airborne wind energy technologies and bringing the industry to large scale.¶ The results suggest that the airborne wind energy industry could grow quickly, as long as it receives a boost through government funding for R and D.¶ During this initial stage of the industry's development, funding of $10 million per year could cut many years off how long it takes for the industry to reach a significant scale, and funding of $100 million per year would further accelerate the deployment of high-altitude wind generators, the experts said.¶ However, there are many barriers facing airborne wind energy. According to the results of the expert survey, the primary barrier is the reliability of the technologies, since airborne wind energy systems would have to remain aloft for long periods of time, in the face of shifting winds and changing weather.¶ The body of existing regulations is the second-highest barrier, posing a challenge both for testing prototypes today and for large-scale implementation in coming years, according to the survey. Thus regulations pose a challenge for rapid testing of various prototypes, to see which may be commercially viable.¶ The experts favored particular types of systems-those using rigid wings-and argued against putting large funding toward approaches using balloons. Some experts also suggested installing airborne wind energy systems offshore, in part because of the large wind resource available, and because regulatory and safety issues may be easier to resolve than for land-based systems.¶ Near Zero is a non-profit organization based in Stanford, CA, founded to improve dialogue between energy experts and those who make and influence decisions about energy, in both government and business.¶ Decision makers often lack credible, impartial and timely sources of information that reflect the range of expert opinion.¶ Through open discussions and formal surveys, Near Zero aims to find out what the top experts agree on-and where they disagree, the organization works to uncover the range of opinion and reasons for the differences. Near Zero's aim is to help find paths to reducing greenhouse gas emissions. The organization has no commitment to any particular technology or approach.

#### Removing airspace restrictions key to testing and viability

Leggett 12

Nickolaus E. Leggett, Masters degree in political science from Johns Hopkins, licensed pilot for hot-air balloons, gliders, and single-engine airplanes, certified electronics technician (ISCET and iNARTE) and an Extra Class amateur radio operator (call sign N3NL), testimony to the FAA, “To the Federal Aviation Administration: Formal Comments of Nickolaus E. Leggett” 1/29/12

Near-Term Experimental Operation of AWES Prototypes¶ The first AWES prototypes should be operated in large but restricted airspace currently used for military practice work and/or for unmanned aircraft operations. The use of these areas is quite structured and disciplined which would be a useful starting point for learning to live with AWES installations.¶ The proposed limit of testing to 499 feet AGL is totally inadequate for research and development. This low height can be easily reached with a child’s classical hand-held kite. I have done it myself as a child. Such a low altitude does not represent the full physical situation of a commercial AWES installation. At this low altitude, the wind will often be too low to support a kite-type AWES installation.¶ A limit of near 2000 feet AGL is more appropriate for tests of actual deployed AWES installations. This would allow industrial-sized AWES to be tested in a realistic manner where a heavy structure is supported by the air and is exposed to the weather changes.¶ Limiting AWES tests to daylight hours is also inadequate for realistic testing. An important part of any testing program is to expose the AWES to the variations of the weather over long periods of time (at least months). Any commercial AWES will have to survive and produce power continuously for long periods of time just as commercial terrestrial wind farms do. They will not be deploying these rather complex devices every morning. Think of an AWES as being more like a suspension bridge. You set it up and you leave it for long periods of time.¶ Some mobile AWES installations will be used in the future. For example, specifically designed AWES could be used to provide electric power to ships at sea while they are in motion. This type of power could be used to recharge navy ships that are equipped with electric rail gun systems. Other mobile AWES could be used to resupply energy to fuel-cell propelled ships at sea via the electrolysis of water. Some mobile AWES will be used over land for large open-pit mining operations, prospecting efforts, and large agricultural properties. As a result of this, some controlled testing of mobile and portable AWES prototypes should be allowed by the FAA.¶ Some testing of multiple-unit AWES is also needed to understand the aerodynamics of operating several units in close proximity to each other in various weather conditions and climates. It is important to realize that a whole new family of devices is being developed here and so a fairly liberal testing environment is needed.

#### Airborne wind solves intermittency, NIMBY and space problems of conventional wind – but government investment is key

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The wind turbines that increasingly dot the landscape peak at around 300 feet above ground, with the massive blades spinning a bit higher. The wind, however, does not peak at 300 feet. Winds are faster and more consistent the higher one climbs, maxing out in the jet streams at five miles and above.

With conventional wind power facing a litany of obstacles — intermittency, space requirements, not-in-my-backyard complaints — pushing wind power up into the atmosphere could take a lot of uncertainty out of the equation. And despite a host of technical and regulatory challenges, a growing number of small companies are working hard to get up there within the next few years, with numerous designs and ideas aimed at harvesting wind power high in the sky.

“The potential is incredibly high,” says Cristina Archer, an associate professor of ocean science and engineering at the University of Delaware. Archer and a colleague published one of two recent detailed analyses of the total energy that could be extracted from the planet’s winds to generate electricity. The other was conducted by well-known climate scientist Ken Caldeira of the Carnegie Institution and Stanford University. Both found an effectively unlimited supply of power, with vastly more available as one moves up away from the ground.

But Caldeira and others say that while they see enormous long-term potential in airborne wind, the engineering and regulatory challenges are formidable, particularly if companies want to tap into powerful jet stream winds.

“I would be reluctant to remortgage my house and invest the money in these companies, because I think the probability of them being able to compete in the marketplace at scale in, say, the next decade is pretty small,” he says. Nevertheless, he believes that given both its enormous possibilities and the various hurdles it faces, the airborne wind industry is an **ideal candidate** for public research and development support.

The questions surrounding airborne wind are significant. How do you safely suspend airborne turbines hundreds or thousands of feet off the ground? How do you keep them aloft for long periods of time in high winds without having to perform frequent, costly maintenance? And what about interference with aviation?

Proponents say, however, that in some ways high-altitude wind power could end up being easier to deploy — and cheaper — than traditional wind energy. Construction costs will be markedly diminished with no need for giant steel and concrete towers, and there will be no need for the yaw mechanism that keeps standard turbines facing into the wind as wind direction changes.