**The United States Navy should acquire airborne wind energy from kite systems for energy production on United States’ Navy ships.**

**Naval Oil Advantage**

**Current oil dependence crushes the Navy**

**Marsh 10**

(Douglas, Douglas, Lieutenant US Navy, “Our Lethal Dependence on Oil” http://www.usni.org/magazines/proceedings/2010-06/our-lethal-dependence-oil)

On your drive to base today you stopped at the gas station and noticed the price of regular unleaded had increased by 2 cents a gallon. You sighed, realizing it would cost an extra 40 cents to fill up. Meanwhile, **in the time it took to fill your 20-gallon tank, the Navy consumed 33,000 gallons of fuel.** In the same ten minutes, the Department of Defense (DOD) consumed more than 100,000 gallon**s, and the United States came 5.7 million gallons closer to depleting a finite resource that plays dual roles as both cause and effect for the modern Navy**, the U.S. military, and the world as a whole.¶ **Oil is the lifeblood of** economies, industries, governments - and **militaries**. **Without it**, cars collect dust in garages, planes sit in hangars, and **ships rust in port**. Unfortunately, world and U.S. oil reserves will not last forever and may even be in jeopardy in our lifetime; **the U.S. Navy needs to transition to alternative forms of energy sooner rather than later**.¶ It takes no genius to realize that industrialized society and the Navy depend on petroleum, or crude oil. Of course, the word "depend" in this case hardly conveys the gravity of its meaning. World oil consumption in 2008 as estimated by the Energy Information Administration, an arm of the Department of Energy, exceeded 85 million barrels every day. To put this number in perspective, that equates to just over half a gallon of oil for every man, woman, and child on Earth daily. Did you drink your fill today ? Chances are you drank more than your fill - much more. The American mean per capita consumption of oil hovers above 2.6 gallons per day, and this number is rising. 1¶ The reason for such profligate consumption stems ostensibly from specific energy. In the 2006 documentary A Crude Awakening: The Oil Crash , scientist and Congressman Roscoe Bartlett (R-MD) explains, "One barrel of oil . . . will produce as much energy - as much work - as you will get with 12 people working all year." This equates to 25,000 man-hours. 2¶ Keep in mind that a barrel of oil has a mass of 140 kg, or about 300 pounds, in 42 gallons. Thus, petroleum's energy density is an excellent compromise between mass and volume. In this regard, it outmatches resources like natural gas, which has a relatively low energy per unit volume, and coal, which has a relatively low energy per unit mass.¶ Petroleum is extraordinarily cost-effective, too. Its current price is over $70 per barrel; by comparison, imagine being paid a quarter of a penny for your hour's worth of hard labor. To boot, petroleum is easily transportable, easily storable, relatively abundant, and, occasional disasters such as the Gulf oil spill notwithstanding, relatively clean (fewer carbon emissions than coal and no nuclear waste as in nuclear fission). It is no wonder why energy expert Edward L. Morse proclaims, "Petroleum has proven to be the most versatile fuel source ever discovered, situated at the core of the modern industrial economy." 3¶ The impetus behind oil's rise from beneath the ground primarily began in industry. Mass production of the automobile in particular drove demand for oil into uncharted territory over the last century. Industry responded by building trillions of dollars in infrastructure for the discovery, extraction, transportation, and storage of what became an invaluable resource.¶ In his book The End of Oil , Paul Roberts explains, "The reciprocal mechanism of supply and demand took root in the oil economy. Greater supply fostered new uses for oil, which in turn spurred even greater demand - and forced industry to reinvent itself." 4 Governments in developed and developing countries responded, too, as their economies grew increasingly reliant on a steady stream of oil. And with governments concomitantly came armies; indeed, exercising military might is impossible today without oil.¶ **Just as the world economy increasingly depends on oil, the U.S. military cannot function without it**. In the words of Dr. Sohbet Karbuz, a well-known expert on American energy consumption, "The U.S. military is completely addicted to oil." 5 Dr. Karbuz breaks down what amounts to voluminous amounts of data and a web of tangled sources to show that American military oil consumption reached 350,000 barrels of oil each day in Fiscal Year 2008.¶ Miraculously, this was down from 360,000 barrels per day in FY 05. Over the last decade, U.S. military oil consumption has remained relatively constant, owing perhaps to an overall increase in the price of oil since 2002. Dr. Karbuz cites Senator Richard Lugar (R-IN), who estimates from the Department of Defense that "**each $10 per barrel increase in oil prices costs the U.S. military an additional $1.3 billion dollars."¶** The military carries on a rich tradition with this dark, viscous substance. During World War II, Nazi Germany and Imperial Japan aggressively sought non-domestic sources of oil to satiate their military-industrial complexes. Of course, in order to counter such a threat, the Allies required vast quantities of their own oil. Britain and France, however, could not domestically produce requisite quantities, so they were lucky to have the United States on their side.¶ A land of vast, seemingly unlimited resource potential, the United States provided both war materiel through the Lend-Lease program and oil for itself and its allies. Out of every seven barrels of oil consumed by the Allies in World War II, six came from the United States. 6 The Nazis didn't fare as well - they failed in their efforts to trounce Russia and secure its reserves. Meanwhile, eventual American naval superiority in the Pacific led to the sinking of much of the Japanese tanker fleet.¶ Following World War II, the U.S. military only grew more reliant on oil. The storybook ending of Allies over Axis fails to characterize oil's centrality in world affairs through today. Whether one likes to admit it or not, oil has influenced the buildup, conduct, and outcome of virtually every military imbroglio since the turn of the 20th century. Recently, oil has been such a looming factor in warfare and diplomacy that it is considered by many nations, including the United States, as a matter of national security as opposed to a mere natural resource. As far back as the Harry S. Truman administration, U.S. national security strategy was shaped by statements like this one: "In Saudi Arabia the oil resources constitute a stupendous source of strategic power, and one of the greatest material prizes in human history." 7¶ Right across the King Fahd Causeway from Saudi Arabia is the headquarters of the U.S. Fifth Fleet. Surely, that the United States and its Navy choose to base an entire fleet in Bahrain demonstrates both the strategic and geopolitical values of the region and its resources. Bahrain provides a critical node from which to launch the U.S. Navy's unmatched power-projection capabilities in order to ensure stability in the Middle East. Such stability, of course, allows an uninterrupted flow of oil from the region, which encourages stability worldwide. The irony, however, that the Fifth Fleet uses a prodigious amount of the same oil it encourages to flow is no laughing matter. **The U.S. Navy as a whole - for its unparalleled maritime dominance - uses vast quantities of oil**.¶ Determining a quantitative value is rather difficult and perhaps impossible. According to Dr. Karbuz in his blog, "the DOD still does not know exactly how much energy by fuel type is used." He does claim that **the Navy consumed** 32 percent of total DOD energy. Assuming a direct relationship between energy as a whole and oil in particular (which we know is not the case because of oil's relatively high energy density), this amounts to **a rough estimate of 112,000 barrels per day**. Of the total fuel use by the services, 89 percent went to jet fuel (used in aircraft as well as tanks, other ground vehicles, and electric generators - remember that high specific energy), 3 percent to ground fuel, 3 percent to facility electricity, and 5 percent to other consumers. 8¶ **Even more telling of the Navy's situation is that it is the world's largest consumer of diesel fuel**. In this respect, it takes after the DOD as a whole, which is the largest single consumer of oil in the world. It is important to note, however, that DOD and Navy energy consumption represent only 1.2 percent and 0.4 percent, respectively, of the entire nation's energy consumption. 9 This implies that neither department has the ability to drive the energy market or alter American oil dependency, but they certainly wield substantial bargaining power in both cases.¶ **A navy without oil today may be stranded in port, but one hopes a navy without oil tomorrow can continue to fight**. As Zachary Petersen noted in Navy Times , "Between 2021 and 2038, 165 ships will reach the end of their expected service lives." 10 SH-60R helicopters built today will end their service lives in the same time frame. 11 And based on the procurement and service lives of their predecessors, the P-8A and F-35C should remain in service until 2060 at the latest. 12 Beyond that, however, **the Navy needs to consider using an alternate fuel to power its fleet and air forces. In the future oil will be prohibitively expensive, if not entirely unavailable. Thus, it is absolutely critical that developers of new platforms consider this in the design process. Failure to do so by building systems around a high-energy density liquid hydrocarbon like oil will leave the Navy with state-of-the-art warfighting capabilities but nothing to power them.**

**Oil dependence drastically reduces combat capability**

**Navy Times 12**

(Brock Vergakis, “Navy energy leader warns of oil dependency” [http://www.navytimes.com/news/2012/04/ap-navy-energy-leader-warns-oil-dependency-041012/#](http://www.navytimes.com/news/2012/04/ap-navy-energy-leader-warns-oil-dependency-041012/))

**The director of the Navy’s energy coordination office invoked the bombing of the Cole on Tuesday to illustrate the vulnerability the Navy faces because of its heavy reliance on oil**, dismissing criticism that alternative energy shouldn’t be a priority in times of shrinking budgets.¶ **The 2000 attack on the Norfolk-based destroyer occurred while it was in port in Yemen for refueling**. The explosion was carried out by suicide bombers in a small boat and put a massive hole into the side of the ship, killing 17 sailors and wounding 37. “**She pulled in for one reason and one reason only**,” Cmdr. James Goudreau said. “She didn’t need parts, she didn’t need food**. She needed fuel**. She needed liquid energy. We didn’t have an oiler in the area to refuel her, so she pulled into port, tied up and dropped her defenses because she was dependent upon oil. By the end of the day the Navy had a new energy security issue. We had a new energy reality.”¶ He rejected recent criticism from some Republican members of Congress that the Navy’s investment in alternative fuels is too expensive and serves a political agenda. Among other things, the Navy wants to sail a “Great Green Fleet” with ships running on alternative fuels by 2016. The Navy wants the alternative fuel it purchases for that fleet to be available at prices that are competitive with conventional petroleum fuels and is subsidizing development to help make that possible.¶ He also noted that for every $1 increase in the price of a barrel of oil, the Navy’s fuel costs rise $30 million. If alternative fuels aren’t developed and oil prices continue to rise, the Navy risks having to fly its planes and steam its ships less frequently, resulting in a less capable force.¶ Goudreau made the comments to hundreds of attendees at an energy conference at Old Dominion University, **where he laid out the Navy’s case for the need to develop alternative fuels to power its fleet. Among other things, he said some of the most vulnerable periods for a ship occur during refueling, including when it happens at sea.¶ “We’re just starting to wake up now to this reality**. The crew of the Cole got it on that day. Some folks have understood since then, but it really wasn’t until the Army and Marine Corps started taking long-term sustained casualties in ground combat that we finally woke up. But this is our reality. This is our vulnerability,” Goudreau said.¶ Goudreau said the **focus on finding alternative fuel sources is about saving money in the long run, improving the safety of sailors and expanding the service’s warfighting capability.** He referred to the Navy special warfare community’s goal of producing more of its own energy while on missions.¶ “SEALs don’t care about a political agenda. SEALs don’t care about saving the Earth. SEALs don’t care whether it’s politically correct,” he said. “They can engage the enemy better, more effectively with greater advantage, do the nation’s mission and bring everyone home alive. **It’s not about a political trick. It’s about combat capability, combat capability and more capability.”**

**Optimists are wrong- current navy oil dependence decimates the navy and risks war**

**Burke 7/27/12**

(Patrick, Intern at the Truman National Security Project, “Oil Dependence: Don’t Put a Band-Aid on a Gaping Wound” http://trumanproject.org/doctrine-blog/oil-dependence-dont-put-a-band-aid-on-a-gaping-wound/)

In a recent study, James **Bartis of the RAND Corporation** claimed that “DoD and the services have only one effective option to deal with high petroleum prices: to reduce use of petroleum fuels overall.”¶ The RAND report dismisses research into alternative fuels as a waste of money. Will petroleum prices continue to increase? Probably. Does a reliance on petroleum based fuels pose threats to national security? Definitely. Bartis’s claims are the equivalent of putting a bandage over a gaping wound – simply strengthening our hold on a single source of energy will not reduce the high cost of fossil fuels or stop wealth transfers to potentially hostile countries. Advanced biofuels promise to reduce the military’s dependence on petroleum, increasing national security and protecting soldiers.¶ **Bartis’s solution to our dependency on fossil fuels is to simply suck it up and deal with it**. **His study advocates** using “partnership-building capabilities” to “offer security improvements that could promote greater production of petroleum and natural gas reserves.” In other words, the U.S. military would need to engage in **nation building exercises in some of the world’s most dangerous places – Iraq, Nigeria, Sudan, and Libya – endangering the lives of American service members and potentially drawing the United States into more conflicts.** **Supply routes would also need further protection**. B**artis sees increased American involvement in the Asian sea lanes to protect oil shipments as a way to “achieve broader U.S. objectives” including reducing tensions in the region between India and China. Increased military presence in Asia could actually provoke hostilities from China or India toward the United States, all while continuing to stretch our military’s capabilities**.¶ The Department of Defense’s investments in advanced biofuels are not motivated by environmentalism. The military will continue to have access to fuel regardless of the cost, but **the DoD calculates that relying on a volatile global oil market is neither safe nor secure.** Every day, Americans send over $1 billion out of our economy for oil. Despite an increase in oil imports from Canada and Mexico, **much of our oil still comes from unstable or hostile countries. Increasing production alone won’t solve this problem; oil is priced on a global market, making it impossible for the U.S. government to control the price or the amount of production of oil.** **Fluctuations in the price of petroleum lead to unexpected shortfalls in the budgeting process** – $3 billion alone in FY 2011. For every $10 increase in the price of a barrel of oil, the Department of Defense must pay an extra $1.3 billion annually. **Simply strengthening the protection of our oil sources and drilling more wells is not enough; the military needs options**.

**Airborne wind energy systems can be dual used for propulsion**

**Fagiano 10**

(L Fagiano, partimento di Automatica e Informatica, Corso¶ Duca degli Abruzzi, M. Milanese¶ ∗¶ , V. Razza¶ ∗¶ , I. Gerlero¶ †¶ “Control of Power Kites for Naval Propulsion” http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=05530824)

**This paper investigates the application of an innovative technology for high–altitude wind power generation¶ to naval propulsion.** **The basic idea is to exploit the traction¶ forces exerted by automatically controlled power kites, ﬂying¶ fast in crosswind conditions, to pull a boat.** Numerical analyses¶ are carried out employing a mathematical model of the system¶ and an efﬁcient Nonlinear Model Predictive Control (NMPC)¶ law. Differently from existing approaches, the cost function¶ considered in NMPC design is directly the predicted traction¶ force exerted on the kite lines. The obtained numerical results¶ are compared with the data collected during experimental tests¶ carried out in the project KiteNav, undergoing at Politecnico¶ di Torino.¶ I. INTRODUCTION¶ During the last ﬁve years, **several studies** (see e.g. [1], [2])¶ **have been devoted to develop technologies for high–altitude¶ wind energy generation using controlled tethered airfoils.**¶ The basic idea is to capture wind energy using airfoils (e.g.¶ power kites used for surﬁng or sailing), linked to the ground¶ by one or two cables, whose ﬂight is suitably driven by an¶ automatic control unit. Wind energy is collected at ground¶ level by converting the mechanical power transferred by the¶ kite lines into electrical power, using a suitable mechanism¶ and electric generators. **This class of power generators is able¶ to exploit wind ﬂows at higher altitudes** (up to 1000 m) **than¶ the actual wind technology, where quite strong and constant¶ wind can be found basically everywhere in the world.**¶ **In this paper, the focus is on the application of the concept¶ of high–altitude wind power using controlled power kites to¶ naval propulsion**, instead of electricity generation. **The use of¶ tethered airfoils to tow a boat brings several advantages with¶ respect to classical sails, due to the possibility for the airfoil¶ to reach stronger winds blowing at higher altitudes and to ﬂy¶ fast in crosswind direction, thus generating surprisingly high¶ force values.** Indeed, this idea is currently being developed¶ and industrialized by some companies around the world, like¶ SkySails GmbH [3]. Moreover, the potential of a kite boat¶ system similar to the one of [3] has been investigated in [4],¶ considering the problem of computing kite orbits that are¶ optimal with respect to the traction forces. In this work, a¶ small boat is considered (i.e. a 38–feet–long yacht), equipped¶ with a small–scale high–altitude wind power generator. In¶ the system conﬁguration considered here, the kite is linked¶ with two cables to the boat, instead of the single cable considered in [3], [4]. This way, the kite can be controlled¶ by differentially pulling the lines via actuators placed on¶ the boat and avoiding the use of wireless actuators on the¶ airfoil. Moreover, in the case of breaking of one cable, the¶ presence of two lines makes it possible to recover both¶ the airfoil and the lines. Thus, the conﬁguration considered¶ in this paper appears to be safer than the one of [3], [4].¶ Automatic control is the key point in this application, since¶ the system to be controlled is nonlinear, open–loop unstable¶ and subject to hard operational constraints. In order to tackle¶ such a challenging control problem, an efﬁcient approximate¶ Nonlinear Model Predictive Control (NMPC) law is used¶ (see e.g. [5]). Differently from [2], [4], here the control¶ law is designed in order to directly maximize the predicted¶ traction force acting on the boat, without using any pre–¶ computed optimal kite orbit. Numerical simulations using¶ the designed NMPC law are performed to study the system¶ behaviour and its robustness to wind turbulence. Moreover,¶ the obtained numerical results are compared with the ﬁrst¶ experimental data, collected during ﬁeld tests performed near¶ Genoa, Italy, in order to evaluate the matching between real¶ world measures and simulation results

**That drastically reduces oil dependence**

**Techstar 10**(“New wind power for ships” http://www.off-grid.net/2010/01/10/new-wind-power-for-ships/)

The world’s first cargo ship to be powered with **high altitude kite-**like sails tethered on lines 100 metres in the air was “Theseus,” last year.¶ SkySails cannot power a ship unaided, but it **can reduce the amount of power needed by up to 80 percent, without any additional crew or technology**.¶ **The “Theseus” is one of three new Rhine class ships** being built for Wessels at the Komarno shipyard in Slovakia. **It is 90 meters long**, has a capacity of some 3,700 dwt and a MaK main engine that produces 1,500 kW of power. A 160 m² SkySails propulsion system works to relieve the main engine of the “Theseus” the same way it does on board the “Michael A.”¶ **The SkySails-System had previously been tested over a period of one and a half years aboard the 133-meter “Beluga SkySails**” and the 90-meter “Michael A**.” The oil consumption on each ship fell sharply**¶ “We’ve had some extremely promising results from pilot testing,” said Gerd Wessels, the managing partner of the Wessels Shipping Company based in Haren/Ems, “and with a good wind we achieved up to 8 tons of tractive force on the “Michael A.” using SkySails propulsion.” For comparison: The “Theseus” needs approximately 11 tons of thrust for full cruising speed.¶ **SkySails propulsion has been integrated into the ship’s operations; it required no major effort or expense to be installed onto the vessels. And, it has been proven that ships remain fully maneuverable while employing the SkySails-System**. What’s more, trials have confirmed that present crew strengths are fully adequate for operating the system and that the operational concept works as intended.

**It’s easy to integrate**

**Navy Times 8**

(Philip Ewing, “Wind power helps cargo ship save fuel” http://www.navytimes.com/news/2008/10/navy\_skysail\_101608/)

Diesel engines, gas turbines and nuclear reactors have propelled U.S. ships around the world for decades. They were joined Saturday by **an unlikely power source — a kite.¶ The cargo ship Beluga SkySails, under charter from the Military Sealift Command**, sailed from Newport, Wales, in the United Kingdom, **partially powered by a “sky sail,” a giant kite that uses the wind to help pull the 400-foot container ship**. The Beluga is the first ship using the novel sail technology to operate under a charter from MSC.¶ **The ship has traditional diesel engines, but its computer-controlled sky sail lessens their work and reduces fuel costs by up to 30 percent,** or about $1,600 per day, according to a Navy spokeswoman. **The sail flies about 600 feet above the ship, where winds are steadier and more powerful than on the surface. It can deploy and retract in about 20 minutes**.¶ The kite itself wasn’t a factor in the decision to award the charter for this cruise, said MSC spokeswoman Laura Seal, but the savings in fuel costs may have contributed to the Beluga’s winning bid.¶ “MSC values innovation that leads to cost savings,” said Navy Capt. Nick Holman, commander of Sealift Logistics Command Europe, MSC’s area command for Europe and Africa. “We are proud to be collaborating with innovators in the commercial maritime world to provide our customers with efficient and quality service.”¶ The Beluga is set to make three European stops to pick up a total of 211 Army and Air Force cargo containers and transport them to the U.S., according to MSC documents.

**Military acquisition solves**

**Cahoon 11**

(Troy L, Captain USAF, Thesis for Department of Aeronautics and Astronautics ¶ Graduate School of Engineering and Management ¶ 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)

Conclusions of Research ¶ **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. The design tool developed in this research will be beneficial for the future ¶ development of AWE systems because it has the adaptability to analyze the blade/rotor ¶ performance at any altitude and at any operating condition. The design tool will allow an ¶ optimum blade design to be chosen that meets the criteria of having a good combination ¶ of efficiency, while being easily and inexpensively manufactured. Key results from the ¶ blade design comparisons are that the optimal blade design had 48.9% projected ¶ efficiency, while the simplified blade A (with no chord or twist variations) had 30-38% predicted efficiencies, and the simplified blade B (with constant chord and 6° twist) had ¶ predicted efficiencies of 28-40%. The efficiency numbers that the design tool realized ¶ are promising. Through the design tool, analysis is ongoing. Changes in the design have ¶ a large affect on the performance of the blade, therefore, it is important to use a good tool ¶ to design the best AWE system blade for an application. ¶ The design tool is an invaluable instrument for analyzing trends of and coming up ¶ with recommendations for blade designs for AWE systems to be used at USAF bases.¶ USAF bases with high vulnerability to utility power disruptions have an increased need ¶ for an alternate source of energy to improve the security of their energy.¶ 34, 35¶ Using the ¶ base feasibility decision matrix, bases with a high vulnerability were scored higher ¶ because of their greater motivation to acquire an alternate energy source. The higher the ¶ power density, the more power a particular-sized system can output. Therefore, the cost ¶ of a system at a location with a high power density will be cheaper, so USAF bases with ¶ a high power density were scored higher in that category. The AWE system will need ¶ adequate air and ground space as a safety zone for testing and implementation; thus, ¶ bases with low population densities were scored higher, since finding a suitable location ¶ is more likely. In addition, bases that have a low population density in an adjacent ¶ county were also scored higher. USAF bases that consume a high amount of energy, and ¶ have higher electricity rates, would benefit more by having a larger decrease in their ¶ electric bill. These bases were scored highest in that specific category. Each category ¶ was weighted based upon its relative importance. ¶ The highest scoring USAF bases of those sampled in the decision matrix were ¶ Tinker, Vance, Wright-Patterson, Arnold, Ellsworth, and Grand Forks (Hanscom was also scored), with scores ranging between 40-60 out of 100. USAF bases beyond what ¶ Figure 35 shows can additionally be scored in a similar manner, so that planners can ¶ decide the viability of their particular base. Once any base has been selected, the design ¶ tool can then be used to design, prototype, and manufacture an AWE system tailored to ¶ the energy needs of each selected USAF base. ¶ Key results, from applying a preliminary AWE system design to the top USAF ¶ bases, showed a potential for 75-80% in cost savings for electricity. **Applying airborne ¶ wind energy to just these seven bases studied could provide up to $135 million in annual ¶ savings** for the USAF. ¶ 2. Recommendations for Future Research ¶ The results presented in this thesis show that AWE is viable for supplying USAF ¶ base energy needs. It is important to continue analysis of energy conversion on different ¶ blade designs, because what is most efficient and most cost-effective for the design of an ¶ AWE system can then be determined and made into a functioning system for use by the ¶ USAF and DoD. ¶ It is also recommended that a follow-on cost analysis for the blades of different ¶ designs be done. This analysis would compare how much total energy is produced over ¶ the lifetime of an AWE system rotor blade, and project how much longer one blade ¶ would last than the other. Then, a final comparison on which blades would win out in ¶ lifetime costs would help AWE technology be affordable from the get-go of USAF use. ¶ Future research should be conducted to develop the flight controls of an AWE ¶ system. A Finite Element Model should be constructed, in order to optimize the structures used for the AWE system. Additional analysis to optimize the number of ¶ rotors used in a single AWE system should also be conducted. ¶ **Because AWE technology has the potential to transform the energy dynamics** ¶ within the USAF**, it is recommended** that the Air Force **immediately begin a program to ¶ develop and field an AWE system**. Major companies and research offices should ¶ compete for bids in an effort to rapidly advance, improve, and employ AWE technology. ¶ Ken Caldeira, Professor of Global Ecology, has said, ―**There is enough energy in ¶ high-altitude winds to power civilization 100 times over. Sooner or later, we’re going to ¶ learn to harness that vast resource and use it to run civilization**.‖¶ 7¶ This thesis ¶ recommends continued research and active development of harnessing high-altitude wind ¶ power, or AWE, for the use of the USAF.

**That also solves Navy electricity needs- solves electrolysis and rail guns**

**Leggett ‘12**

(Nickolaus, Pilot, certified technician, MA political science, ”To the Federal Aviation Administration: Formal Comments of Nickolaus E. Leggett,” <http://www.energykitesystems.net/FAA/FAAfromNickolausLeggett.pdf>)

**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.

**Independently solves oil dependence**

**Szondy 12**

(David, freelance writer based in Monroe, Washington. An award-winning playwright, he has contributed to Charged and iQ magazine and is the author of the website Tales of Future Past, “U.S. Navy looking at obtaining fuel from seawater” http://www.gizmag.com/jet-fuel-seawater/24287/)

Tell someone that you’ve invented a car that runs on water and they're liable to report you for fraud. That hasn’t stopped scientists and engineers at the **U.S. Naval Research Laboratory** (NRL) who **want to run warships on seawater** – or at least, **to turn seawater into jet fuel**. This may sound like they’ve been standing too close to the ether again, but **the idea is to extract carbon dioxide and hydrogen from seawater and then convert these into jet fuel by a gas-to-liquids process**. **If this proves practical, American naval vessels could refuel themselves at sea.¶** At first, it seems odd that the NRL wants to make jet fuel, but many modern warships now run on gas turbines, a type of jet engine**. Every year the U.S. Navy’s fleet of 15 oilers carries 600 million gallons** (2.27 billion liters**) of fuel to ships at sea**. **This is a major logistical problem made worse by dependence on hostile or unstable nations who may cut off or interfere with fuel supplies in times of crisis.** Needless to say, **a ship that can make its own fuel while underway would be an advantage.¶ Seawater contains** about three percent **carbon dioxide** in the form of dissolved carbonic acid, carbonate and bicarbonate. That’s 140 percent more than air. **Along with the hydrogen bound in the water molecules, there’s all that’s needed to make hydrocarbon fuels at sea**. The tricky bit is how to do it.¶ According to research chemist Dr. Heather Willauer, the NRL’s approach is based on established technology. "The reduction and hydrogenation of CO2 to form hydrocarbons is accomplished using a catalyst that is similar to those used for Fischer-Tropsch reduction and hydrogenation of carbon monoxide,” she said. “By modifying the surface composition of iron catalysts in fixed-bed reactors, NRL has successfully improved CO2 conversion efficiencies up to 60 percent."¶ The Fischer-Tropsch reduction was invented by Franz Fischer and Hans Tropsch in Germany in the 1920s. It converts coal, natural gas or biomass into fuel by means of iron or some other catalyst and is used commercially in countries with abundant coal, but little oil. Despite being very inefficient and costly, the U.S. Defense Department has long been interested in it.¶ The NRL process begins by extracting carbon dioxide and hydrogen from seawater. To do this, it uses a three-chambered electrochemical acidification cell. As seawater passes through this, it’s subjected to a small electric current**.** This causes the seawater to exchange hydrogen ions produced at the anode with sodium ions. As a result, the seawater is acidified.¶ Meanwhile, at the cathode, the water is reduced to hydrogen gas and sodium hydroxide is formed. The cells recover dissolved and bound carbon dioxide by re-equilibrating carbonate and bicarbonate to carbon dioxide gas from the acidified seawater. The end product is hydrogen and carbon dioxide gas. As a bonus, the sodium hydroxide is added to the leftover seawater to neutralize its acidity.¶ In the next step, the hydrogen and carbon dioxide are passed into a heated reaction chamber with an iron catalyst. The gases combine and form long-chained unsaturated hydrocarbons with methane as a by-product. The unsaturated hydrocarbons are then oligomerized – that is, they are made to form longer hydrocarbon molecules containing six to nine carbon atoms. Using a nickel-supported catalyst, these are then converted into jet fuel.¶ The process has been tested under open ocean conditions in the Gulf of Mexico, and the NRL is now working to improve the process and scale it up to practical levels. The estimated cost of the fuel is projected to be between US$3.00 and $6.00 per gallon (US$0.79 - $1.58 per liter) and that may be something of a problem because the current price of jet fuel is about $3.30 per gallon ($0.87 per liter), which makes the NRL product potentially almost twice as expensive.¶ Another problem is that processes based on the Fischer-Tropsch reduction are very energy intensive and inefficient, which adds to the cost. Also, the end product is very pure and this can cause lubrication and sealing problems in engines.¶ However, **the big question is, where does the energy come from to make the fuel while at sea? Most Fischer-Tropsch reduction processes work because the raw material is itself a fuel. To make fuel from coal, you burn coal to run the process**. The same goes for natural gas, biomass and other examples. **With the NRL process, the raw material is seawater, so what is running the machinery?** The jet fuel produced is only an energy storage medium, not an energy source. **To use that is like trying to lift yourself off the ground by yanking on your belt**. Until that question is answered, a vital piece of the puzzle is still missing.

**Naval power controls all conflict escalation**

**Eaglen ‘11**

(Mackenzie research fellow for national security – Heritage, and Bryan McGrath, former naval officer and director – Delex Consulting, Studies and Analysis, “Thinking About a Day Without Sea Power: Implications for U.S. Defense Policy,” Heritage Foundation

**The** U.S. **Navy’s global presence has added** immeasurably **to** U.S. economic vitality and to **the economies of America’s friends and allies**, not to mention those of its enemies. **World wars**, which destroyed Europe and much of East Asia, **have become** almost **incomprehensible thanks** **to** the “nuclear taboo” and **preponderant American sea power. If these conditions are removed, all bets are off. For more than five centuries, the global system of trade and economic development has grown and prospered in the presence of some dominant naval power.** Portugal, Spain, the Netherlands, the United Kingdom, and now the U.S. have each taken a turn as the major provider of naval power to maintain the global system. Each benefited handsomely from the investment: [These **navies**], in times of peace, **secured the global commons and ensured freedom of movement of goods and people** across the globe. **They supported global trading systems from the age of mercantilism to the industrial revolution and into the modern era** of capitalism. They were a gold standard for international exchange. **These forces supported national governments that had specific global agendas for liberal trade, the rule of law at sea, and the protection of maritime commerce from** illicit activities such as **piracy and smuggling**.[4] **A preponderant naval power occupies a unique position in the global order**, **a special seat at the table, which when unoccupied creates conditions for instability.** **Both world wars, several European**-wide **conflicts, and innumerable regional fights have been fueled by naval arms races, inflamed by** the combination of passionate rising powers and feckless **declining powers.**

**That unleashes a laundry list of nuclear conflicts**

**Eaglen ‘11**

(Mackenzie research fellow for national security – Heritage, and Bryan McGrath, former naval officer and director – Delex Consulting, Studies and Analysis, “Thinking About a Day Without Sea Power: Implications for U.S. Defense Policy,” Heritage Foundation

Global Implications. **Under a scenario of dramatically reduced naval power, the** **U**nited **S**tates **would cease to be active in any international alliances.** While it is reasonable to assume that land and air forces would be similarly reduced in this scenario, the **lack of credible maritime capability to move their bulk and establish forward bases would render** these **forces irrelevant, even if the Army and Air Force were retained** at today’s levels. **In Iraq and Afghanistan today, 90 percent of material arrives by sea**, although material bound for Afghanistan must then make a laborious journey by land into theater. **China’s claims on the S**outh **C**hina **S**ea, **previously disputed by virtually all nations** in the region **and** routinely **contested by U.S. and partner naval forces, are accepted** as a fait accompli, effectively **turning the region into a “Chinese lake.”** **China** establishes expansive oil and gas exploration with new deepwater drilling technology and **secures its local sea lanes from intervention.** Korea, unified in 2017 after the implosion of the North, signs a mutual defense treaty with China and solidifies their relationship. **Japan is increasingly isolated and** in 2020–2025 **executes** long-rumored **plans to create an indigenous nuclear** weapons **capability**.[11] By 2025, **Japan has 25 mobile nuclear-armed missiles** ostensibly **targeting China, toward which Japan’s historical animus remains strong. China’s entente with Russia leaves the Eurasian landmass dominated by Russia looking west and China looking east and south.** Each cedes a sphere of dominance to the other and remains largely unconcerned with the events in the other’s sphere. Worldwide, **trade in foodstuffs collapses. Expanding populations in the Middle East increase pressure on their governments**, which are **already stressed as the breakdown in world trade disproportionately affects food importers.** **Piracy increases** worldwide, **driving food** transportation **costs** even **higher. In the Arctic, Russia aggressively asserts its dominance** and effectively shoulders out other nations with legitimate claims to seabed resources. **No naval power exists to counter Russia’s claims. India**, recognizing that its previous role as a balancer to China has lost relevance with the retrenchment of the Americans, agrees to supplement Chinese naval power in the Indian Ocean and Persian Gulf to protect the flow of oil to Southeast Asia. In exchange, China agrees to exercise increased influence on its client state Pakistan. The great typhoon of 2023 strikes Bangladesh, killing 23,000 people initially, and 200,000 **more die** in the subsequent weeks and months **as the international community provides little humanitarian relief. Cholera and malaria are epidemic. Iran dominates the Persian Gulf and is a nuclear power.** **Its navy aggressively patrols the Gulf** while the Revolutionary Guard Navy **harasses shipping and oil infrastructure to force** Gulf Cooperation Council (**GCC**) **countries into Tehran’s orbit. Russia supplies Iran with a steady flow of military** technology **and nuclear** industry **expertise.** Lacking a regional threat, the Iranians happily control the flow of oil from the Gulf and benefit economically from the “protection” provided to other GCC nations. In Egypt, the decade-long experiment in participatory democracy ends with the ascendance of the Muslim Brotherhood in a violent seizure of power. The United States is identified closely with the previous coalition government, and riots break out at the U.S. embassy. Americans in Egypt are left to their own devices because **the U.S. has no forces in the Mediterranean** capable of performing a noncombatant evacuation when the government closes major airports. **Led by Iran, a coalition of Egypt, Syria, Jordan, and Iraq attacks Israel.** Over 300,000 die in six months of **fighting** that **includes** a limited **nuclear exchange** between Iran and Israel. Israel is defeated, and the State of Palestine is declared in its place. Massive “refugee” camps are created to house the internally displaced Israelis, but **a humanitarian nightmare ensues** from the inability of conquering forces to support them. The **NATO** alliance **is shattered.** The **security of European nations depends increasingly on the lack of external threats and the nuclear capability of France, Britain, and Germany, which overcame its reticence to military capability** in light of America’s retrenchment. **Europe depends for its energy security on Russia and Iran, which control** the main **supply lines** and sources of oil and gas to Europe. Major European nations stand down their militaries and instead make limited contributions to a new EU military constabulary force. **No European nation maintains the ability to conduct significant out-of-area operations, and Europe as a whole maintains little airlift capacity**. Implications for America’s Economy**. If the United States slashed its Navy** and ended its mission as a guarantor of the free flow of transoceanic goods and trade, **globalized world trade would decrease substantially.** As early as 1890, noted U.S. naval officer and historian Alfred Thayer Mahan described the world’s oceans as a “great highway…a wide common,” underscoring the long-running importance of the seas to trade.[12] **Geographically organized trading blocs develop as the maritime highways suffer from insecurity and rising fuel prices.** Asia prospers thanks to internal trade and Middle Eastern oil, Europe muddles along on the largesse of Russia and Iran, and **the Western Hemisphere declines to a “new normal**” with the exception of energy-independent Brazil. For America, Venezuelan oil grows in importance as other supplies decline. Mexico runs out of oil—as predicted—when it fails to take advantage of Western oil technology and investment. Nigerian output, which for five years had been secured through a partnership of the U.S. Navy and Nigerian maritime forces, is decimated by the bloody civil war of 2021. Canadian exports, which a decade earlier had been strong as a result of the oil shale industry, decline as a result of environmental concerns in Canada and elsewhere about the “fracking” (hydraulic fracturing) process used to free oil from shale. **State and non-state actors increase the hazards to seaborne shipping**, which are **compounded by the necessity of traversing key chokepoints** that are **easily targeted by those who wish to restrict trade. These chokepoints include** the Strait of **Hormuz, which Iran could quickly close** to trade if it wishes. **More than half of the world’s oil is transported by sea.** “From 1970 to 2006, the amount of goods transported via the oceans of the world…increased from 2.6 billion tons to 7.4 billion tons, an increase of over 284%.”[13] In 2010, “$40 billion dollars [sic] worth of oil passes through the world’s geographic ‘chokepoints’ on a daily basis…not to mention $3.2 trillion…annually in commerce that moves underwater on transoceanic cables.”[14] These quantities of goods simply cannot be moved by any other means. Thus, **a reduction of sea trade reduces overall international trade.** U.S. consumers face a greatly diminished selection of goods because domestic production largely disappeared in the decades before the global depression. As countries increasingly focus on regional rather than global trade, costs rise and Americans are forced to accept a much lower standard of living. Some domestic manufacturing improves, but at significant cost. In addition, shippers avoid U.S. ports due to the onerous container inspection regime implemented after investigators discover that the second dirty bomb was smuggled into the U.S. in a shipping container on an innocuous Panamanian-flagged freighter. As a result, American consumers bear higher shipping costs. The market also constrains the variety of goods available to the U.S. consumer and increases their cost. A Congressional Budget Office (CBO) report makes this abundantly clear. A one-week shutdown of the Los Angeles and Long Beach ports would lead to production losses of $65 million to $150 million (in 2006 dollars) per day. A three-year closure would cost $45 billion to $70 billion per year ($125 million to $200 million per day). Perhaps even more shocking, the simulation estimated that employment would shrink by approximately 1 million jobs.[15] These estimates demonstrate the effects of closing only the Los Angeles and Long Beach ports. **On a national scale, such a shutdown would be catastrophic.** The Government Accountability Office notes that: **[O]ver 95 percent of U.S. international trade is transported by water**[;] thus, **the safety and economic security of the United States depends in large part on the secure use of the world’s seaports and waterways.** A successful attack on a major seaport could potentially result in a dramatic slowdown in the international supply chain with impacts in the billions of dollars.[16]

**Navy Key to deter Senkaku conflict**

**McCurry ’12**

Justin is Global Post Correspondent for Japan in Tokyo, “Japan v. China: Small Islands, Big Worry,” <http://www.globalpost.com/dispatch/news/regions/asia-pacific/121029/east-china-sea-japan-senkakus-diaoyu-disputed-islands>

Anyone who believed the territorial row between Japan and China would be a short-lived exercise in controlled aggression must now concede that **the region is in this for the long haul**.¶ More than a month after Japan's government bought the Senkaku islands from their private Japanese owners, sparking violent demonstrations in China, both countries continue to wage a war of attrition while their trade partnership sinks slowly toward the bottom of the East China Sea.¶ While a violent clash on the high seas seems unthinkable, the dispute is being played out in proxy displays of firepower and combat readiness that leave little doubt about the gravity of any military confrontation.¶ As a reminder of Beijing's refusal to relinquish its claims to the islands it refers to as Diaoyu, Chinese surveillance vessels have made frequent appearances close to and just inside Japanese territorial waters near the territory. On Tuesday, four Chinese maritime surveillance ships were spotted in territorial waters, the eighth time they have been seen in the area since the middle of last month.¶ A more accurate reading of China's commitment to the Senkakus, though, was the involvement this month of 11 naval and civilian vessels, eight aircraft and more than 1,000 sailors in maneuvers simulating the thwarting of an "illegal entry" into Chinese waters.¶ Chinese media reports made no mention of the Senkakus, but there wasn't much ambiguity about the drill's target: Japan. The exercise, the Xinhua news agency reported, "was aimed at improving coordination between the navy and administrative patrol vessels, as well as sharpening their response to emergencies in order to safeguard China's territorial sovereignty and maritime interests."¶ Japan, meanwhile, has reportedly shelved plans to conduct a joint drill with the US on an island in southwestern Japan. The scenario: the retaking of an island occupied by "foreign forces."¶ But don't read too much into this apparent show of self-restraint. Japan, too, has been reciprocating Chinese displays of naval prowess.¶ On Monday, as Chinese vessels were in the so-called contiguous zone — a band of waters that stretches 12 nautical miles from the edge of a state's territorial waters — Japan's Prime Minister Yoshihiko Noda pledged to "strengthen security" around its coast. The announcement followed Japan's statement Friday that it will spend $213 million to beef up its coast guard.¶ Earlier this month, Noda observed a major fleet review of 40 warships, including destroyers, hovercraft, minesweepers and submarines, to mark the 60th anniversary of its navy.¶ "Needless to say, the security environment surrounding Japan is getting tougher than ever," Noda told about 8,000 servicemen and women.¶ The display underlined Japan's shift in military focus to maritime disputes off its southern coast, after decades of concentrating land forces in the north to repel an attack from the Soviet Union.¶ Japan has made no secret of its concerns over Beijing's military budget, which has risen 30-fold in the past 24 years; China's inventory, which now includes its first aircraft carrier, is expected to surpass that of Japan in the coming years.¶ And although Japan's defense budget has decreased 5.2 percent since 2001 to 4.68 trillion yen, or $56.4 billion, it is still the sixth highest in the world, according to the Stockholm International Peace Research Institute.¶ Japan's 2012 defense white paper cited a "sense of caution" developing across the region over Chinese military expansion.¶ Citing regional territorial disputes, including those in the South China Sea over the Spratly islands, the white paper said: "China has responded to conflicting issues involving Japan and other neighboring countries in a way that has been criticized as assertive, raising worries about its future direction."¶ It continued: "The presence of US forces stationed in Japan functions as deterrent against regional contingencies, and it brings the sense of security to countries in the region."¶ The US military presence has taken on new significance in the wake of the recent flare-up over the Senkakus. Recognition of their deterrent role may have taken the sting out of the anger that followed last week's arrest of two US sailors accused of raping a woman in Okinawa, according to Jun Okumura, a counselor with the political risk and consulting firm Eurasia Group.¶ "One thing that has changed is the increased Chinese naval presence in the neighborhood of southern Okinawa prefecture," he says. "Even **the governor of Okinawa has recently expressed an understanding of the need for the US military presence**."¶ **Washington has been at pains to present itself as a concerned, but objective observer on the tricky issue of the sovereignty over the Senkakus, while acknowledging its bilateral security commitments to Japan in the event of a conflict.¶ "The biggest role of the US Navy is its deterrence effect,"** says Yuichi Hosoya, a professor of international politics at Keio University in Tokyo. "**If the US ever showed itself to be unwilling to get involved in a conflict in this area, China would naturally be encouraged to take a much tougher stance towards Japan."**

**Goes Nuclear**

**Emmot 8**

(Bill – editor of the Economist, Power rises in the east, The Australian, p. http://www.theaustralian.com.au/news/arts/power-rises-in-the-east/story-e6frg8px-1111116460128)

As well as knitting them, however, this drama is also grinding together Asian powers that had previously kept a strict economic and political separation from one another. China, India and Japan are **bumping against each other** because their national interests are overlapping and in part competing. **Each is suspicious of the others' motives and intentions** and all three hope to get their own way in Asia and further afield. To have three great powers at the same time may be unprecedented for Asia but it is not for the world. There was a similar situation in Europe during the 19th century, when Britain, France, Russia, Austria and, until German unification, Prussia, existed in an uneasy balance in which none was dominant and none was entirely comfortable, but which nevertheless coincided with a period during which Europe prospered and became firmly established as the world's dominant region. Whether you consider Europe's 19th-century experience with balance-of-power politics as a good or bad omen for Asia depends on how long a sweep of history you consider and on what you think are the most crucial differences between modern times and the world of 150 years ago. If you take a long sweep, then the precedent is bad, since Europe's power balance ended in two devastating world wars. On the other hand, it kept the peace on the continent for about half a century, which would count as an optimistic prospect today. Today the barriers against the use of war as a tool of national policy are far higher: nuclear weapons, public opinion, international law, instant communication and transparency all militate against conflict, though they do not rule it out altogether. The barriers against colonial or quasi-colonial ambitions are higher still. China and India may battle for influence over Burma, but neither is likely to invade it and turn it into a colony. Nevertheless, Asia is piled high with **historical bitterness**, **unresolved territorial disputes**, **potential flashpoints** and strategic competition that could **readily ignite**. There are at least five known flashpoints where it is already clear that any could **involve the major powers**: the Sino-Indian border and Tibet, North and South Korea, the East China Sea and the Senkaku-Diaoyutai islands, Taiwan and Pakistan.

**Even if there is no war- that wrecks US Japan alliance**

**White 12-26**

Hugh is Professor of Strategic Studies at American National University and a Visiting Fellow at the Lowy Institute, “Caught in a Bind that Threatens an Asian War Nobody Wants,” <http://www.smh.com.au/opinion/politics/caught-in-a-bind-that-threatens-an-asian-war-nobody-wants-20121225-2bv38.html#ixzz2GAKA8VUy>

Beijing apparently believes that if it keeps pushing, Washington will persuade Tokyo to make concessions over the disputed islands in order to avoid being dragged into a war with China, which would be a big win for them. Tokyo on the other hand fervently hopes that, faced with firm US support for Japan, China will have no choice but to back down.¶ And in Washington, too, most people seem to think China will back off. They argue that China needs America more than America needs China, and that Beijing will back down rather than risk a break with the US which would devastate China's economy.¶ Unfortunately, the Chinese seem to see things differently. They believe America will not risk a break with China because America's economy would suffer so much.¶ These mutual misconceptions carry the seeds of a terrible miscalculation, as each side underestimates how much is at stake for the other. For Japan, bowing to Chinese pressure would feel like acknowledging China's right to push them around, and accepting that America can't help them. **For Washington, not supporting Tokyo would not only fatally damage the alliance with Japan, it would amount to an acknowledgment America is no longer Asia's leading power, and that the ''pivot'' is just posturing**. And for Beijing, a backdown would mean that instead of proving its growing power, its foray into the Senkakus would simply have demonstrated America's continued primacy. **So for all of them, the largest issues of power and status are at stake. These are exactly the kind of issues that great powers have often gone to war over.**

**Alliance can solve prolif, Middle East peace, terrorism, and Indo-Pak exchange**

**Kawashima 3**

(Yutaka, Ex-Foreign Minister of Japan,  Japanese Foreign Policy At The Crossroads p. 53-54)

Certainly Japan should stress to the United States that in many respects a unilateral approach is not in the overall interest of the international community-and that in spite of its military preponderance, maintaining close working relationships with friends and allies will be indispensable in grappling with the global security challenge. One is reminded of a remark by Winston Churchill: "You can always rely on America to do the right thing, once it has exhausted the alternatives." Indeed, it can be frustrating to watch the United States exhausting alternatives. Still, **the bottom line for Japan is whether its security interest would be better served by downgrading or even abrogating its alliance with the United States. It seems that in spite of the problems and shortcomings of some U.S. policies, it is still in Japan's interest to support as much as possible U.S. global activism to secure international order by fighting terrorism; preventing rogue states from possessing weapons of mass destruction; maintaining a robust deterrent capability to prevent the eruption of hostilities at various flashpoints, such as those in Asia Pacific; and continuing the quest for resolution of conflicts such as those between the Israelis and the Palestinians and between India and Pakistan. Simply put, no other country is likely to be capable of achieving those objectives. The unique strength of the United States consists not only of its military preponderance but also of** what Joseph S. Nye Jr., the dean of the Kennedy School of Government at Harvard University, described as "soft power": namely, basic values such as freedom and democracy and the dynamism of its society and culture and the opportunities it offers, to which so many people all over the world are attracted.' "**Yankee go home, but take me with you**" was how the Economist depicted the ambivalence that many people harbor toward the United States.' As U.S. global activism unfolds in the coming years, certainly this sense of ambivalence will manifest itself in Japan. All sorts of reservations and criticism regarding U.S. actions will be vociferously expressed, as in the debates during the cold war. However, in the final analysis, Japan's best option seems to be to work closely with the United States, with which Japan shares not only many interests but also basic values.

**Shipping**

**Military as a first purchaser key to bring new tech to market.**

**Cohen 12**

(Armond, Executive Director – Clean Air Task Force, *DoD: A Model for Energy Innovation?*, http://energy.nationaljournal.com/2012/05/powering-our-military-whats-th.php#2211477)

Recently, the Clean Air Task Force and our colleagues at The Consortium for Science, Policy and Outcomes at Arizona State University, assessed the opportunities and challenges at the U.S. Department of Defense for accelerating a national and even global transition to advanced and clean energy technologies.

Building on background papers, a workshop, new research, and a previous project that articulated foundational principles for federal energy innovation policies, this report identified the sources of DoD’s success in fostering new technology that can be applied to both civilian energy innovation efforts and future defense-related energy efforts.

Unlike most other agencies, including the Energy Department, the Pentagon is the ultimate customer for the new technology it helps create, spending some $200 billion each year on R&D and procurement. The implications of DoD’s role as customer have not been widely appreciated, as:

· DoD, uniquely in government, supports multi-year, billion-dollar “end to end” innovation efforts that produce technology that is continuously tested, deployed and refined on bases and in the field, providing **real world feedback** that leads to **increases in performance** and **reductions in cost**. By contrast, most of the federal government’s civilian energy innovation efforts involve research loosely connected at best with the few commercialization efforts that it supports.

· DoD and its contractors know how to **bring together multiple innovations** to achieve **system-level advances** leading to **big performance gains** (examples range from nuclear submarines to unmanned aircraft to large-scale information systems). This systems approach is precisely what is needed to advance clean energy technologies.

· Relatively stable, multi-year funding allows the Pentagon to pursue “long cycle” innovation that is necessary for large, capital- intensive technologies and supports a highly capable contractor base that can respond to changing national security demands.

· The Pentagon’s scope and budget has allowed it to **experiment** with new and **creative innovation tools** such as the well-known Defense Advanced Projects Research Agency, which has produced extraordinary technological breakthroughs; and the Environmental Security Technology Certification Program, which develops and demonstrates cost-effective improvements in environmental and energy technologies for military installations and equipment.

· Because of DoD’s size and demands for performance and reliability, it is unique among government and private sector organizations as a **demonstration test-bed**. Smart-grid technologies and advanced energy management systems for buildings are already poised to benefit from this aspect of the Pentagon’s innovation system.

· DoD has collaborated effectively with other federal agencies, including the Department of Energy and its predecessors (for example, to advance nuclear energy technologies). Continuing competition and cooperation between DoD and DOE will spur energy innovation.

DoD’s innovation capabilities can enhance U.S. national security, improve U.S. international competitiveness, and spur global energy restructuring and greenhouse gas emissions reductions.

At the same time, while providing enormous opportunities to develop and test energy efficiency technologies and small scale distributed energy appropriate to forward bases, the Pentagon is unlikely to become an all-purpose hub for advancing all categories of clean-energy technologies, because its energy innovation activities will be sustainable only where they can support the nation’s defense capabilities.

Therefore, many other large-scale technologies that are of great importance to improving the environment, such as carbon-free central station generation or zero carbon transportation, may not as easily fit with DoD’s mission. Possible exceptions might include small modular nuclear reactors that can be used for producing independent, non-grid power at military bases, or, conceivably, zero-carbon liquid fuels other than anything resembling current generation biofuels.

In any case, the challenge for military-led energy innovation is to further define and delineate avenues for improved clean-energy performance that are linked to the national strategic mission. History shows that when such linkages are strong, DoD’s innovation capabilities are **second to none**.

But perhaps the more important lesson from this work is that a serious American program of civilian energy innovation could profitably look to Pentagon history for clues about how to succeed. Stable and significant funding; “end to end” thinking on long innovation cycles; procurement of advanced energy technology at commercial scale as well as research and testing; and institutional experimentation and diversity using multiple institutional channels – these have been important reasons that the United States has the most lethal and effective military arsenal in world history. If we’re serious about maintaining American superiority in the energy technology domain, some of this “defense innovation DNA” needs to be replicated or adapted to meet the challenge.

**DoD installations are key – market pull**

**Marqusse 12**

Jeffrey Marqusee 12, Executive Director of the Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP) at the Department of Defense, “Military Installations and Energy Technology Innovation”, March, <http://bipartisanpolicy.org/sites/default/files/Energy%20Innovation%20at%20DoD.pdf>

**The key reason that DoD cannot passively rely on the private sector to provide a suite of new, cost-effective energy technologies is the difficulty of the transition from research and development to full deployment**. Many have noted **this challenge**; it **is often described as the “Valley of Death**,” a term widely used in the early and mid-1990s to describe the obstacles to commercialization and deployment of environmental technologies. DoD’s environmental technology demonstration program, the Environmental Security Technology Certification Program (ESTCP), was created to overcome that hurdle. **Why can’t DoD rely on the** Department of Energy (**DOE**) **to solve the commercialization and deployment problem**? **DOE has a mixed record in this area**. **Reasons for past failures at DOE are**: 1) **the lack of a market within DOE for the technologies**; 2) **overly optimistic engineering estimates**; 3) **lack of attention to potential economic or market failures**; 4) **a disconnect between business practices at DOE and commercial practices, which leads to demonstration results that are not credible in the private sector; and** 5) **programs completely driven by a technology “push,” rather than a mix of technology push and market-driven pull**.81 **Many of these issues can be viewed as arising from the first: the lack of a market within DOE**. **Since DOE is neither the ultimate supplier nor buyer of these technologies at the deployment scale, it is not surprising that there are challenges in creating a system that can bring technologies across the Valley of Death**. **DoD’s market size allows it to play a critical role in overcoming this challenge for the energy technologies the department’s installations require**, as it has for environmental technologies. In addressing the barriers energy technologies face, and understanding the role DoD installations can play, it is important to understand the type and character of technologies that DoD installations need. Energy technologies span a wide spectrum in costs, complexities, size, and market forces. **Installation energy technologies are just a subset of the field, but one that is critical in meeting the nation’s and DoD’s energy challenges**. DOE, in its recent strategic plans and quadrennial technology review, has laid out the following taxonomy (figure 3.5): It is useful to divide these energy technologies into two rough classes based on the nature of the market and the characteristics of deployment decisions. There are technologies whose capital costs at full scale are very high, for which a modest number of players will play a key role in implementation decisions. Examples include utility-scale energy generation, large-scale carbon sequestration, commercial production of alternative fuels, nextgeneration utility-grid-level technologies, and manufacturing of new transportation platforms. Some of these technologies produce products (e.g., fuel and power from the local utility) that DoD installations buy as commodities, but DoD does not expect to buy the underlying technology. A second but no less important class of **energy technologies** are those that **will be widely distributed upon implementation, and the decisions to deploy them at scale will be made by thousands, if not millions, of decision makers**. **These include**: 1) Technologies to support improved energy efficiency and conservation in buildings; 2) Local renewable or **distributed energy generation**; and 3) Local energy control and management technologies. **Decisions on implementing these technologies will be made in a distributed sense and involve tens of thousands of individual decision makers if they are ever to reach large-scale deployment**. **These are the energy technologies that DoD installations will be buying**, either directly **through** appropriated funds or in partnership with third-party financing **through mechanisms such as** Energy Saving Performance Contracts (**ESPCs**) **or** Power Purchase Agreements (**PPAs**). In the DOE taxonomy shown above, **these distributed installation energy technologies cover the demand space on building** and industrial efficiency, portions of the supply space for clean electricity when restricted to distributed generation scale, and a critical portion in the middle where microgrids and their relationship to energy storage and electric vehicles reside.

**Bringing AWEs to market saves the shipping industry- the impact is trade and warming.**

**DSM 12**

(Dutch-based multinational life sciences and materials sciences company, http://www.dsm.com/content/dam/dsm/cworld/en\_US/documents/backgrounder-skysails-new-energy-for-shipping-with-relevant-sources.pdf)

**THE SHIPPING INDUSTRY FACES A FUNDAMENTAL CHANGE**: ¶ **Driven by rising oil prices and emissions restrictions, the responsible use of resources and the ¶ environment is becoming a major factor in determining the economic success or failure of ¶ shipping companies**. ¶ **Cargo ships are the most efficient means of transportation worldwide. Over 90% of world trade is being transported by sea**. **Thus shipping not only plays a key role with regard to global logistics of goods, ¶ but also concerning the consumption of energy resources and the emission of climate-damaging ¶ gases and consequently contributes significantly to the pollution of our environment.** ¶ **From a climate-policy perspective, maritime operations have so far been overlooked.** Thus shipping, ¶ like aviation, is not yet included in the Kyoto Protocol. ¶ Maritime shipping, with its output of over 1 billion tons of carbon dioxide (CO2) per year, is responsible ¶ for over 3% of worldwide CO2 emissions (ca. 31 billion tons in 2007).1¶ **Shipping thus emits more CO2¶ than the country of Germany. Now that the academia**2¶ **and the Intergovernmental Panel on Climate Change have identified the shipping industry as one of the biggest contributors to climate-damaging emissions, this industry too is ¶ moving to the center of the political climate change debate** **– with consequences for shipping companies**: In April 2008, the International Maritime Organization (**IMO) approved a reduction in sulfur emissions ¶ for the shipping industry**. From the year 2020 shipping companies either have to use distilled fuels with ¶ a limited sulfur content of 0.5% instead of heavy fuel oil or have to use scrubbing technology3¶ to clean ¶ their exhaust gases.4¶ **For shipping companies using distillate fuels means a doubling of fuel costs in the future,** since refined ¶ products such as Marine Gas Oil (MGO) and Marine Diesel Oil (MDO)5¶ are considerably more expensive than highly sulfurous heavy fuel oil which is predominantly being used as ship fuel at present. ¶ Already **today shipping companies must use “clean” fuel with a maximum sulfur content of 1.5%** when ¶ operating their fleets in what are called SECAs (Sulfur Emission Control Areas) on the North Sea and ¶ Baltic Sea**. This threshold will drop to 1%** starting in 2012. This is nothing less than a MDO/MGO obligation since it is not possible to reduce the sulfur content of heavy fuel oil to this level. **The result ¶ will be higher fuel costs from having to convert from heavy fuel to diesel, and from price increases in ¶ combination with a greater demand for MGO and MDO.** Starting in 2015 the maximum allowable sulfur ¶ content in marine fuels within these regions will be reduced once more to 0.1%, which will set off another rise in prices. ¶ Scrubbing as the end-of-pipe alternative leads to high investments in cleaning technology and an increase in fuel consumption of about 2% due to the higher resistance in the exhaust gas stream. It remains to be seen whether scrubbing will be allowed in the long term as it is counterproductive in view ¶ of international climate politics: when discharging sulfur oxides into the sea, large quantities of CO2 are ¶ being released. ¶ In addition to the regulations already passed and in response to global political pressure, the IMO is ¶ currently preparing a regulation on the reduction of CO2 emissions from shipping in the form of a CO2¶ indexing scheme (EEDI, Energy Efficiency Design Index6¶ ). The EU has already given the IMO a deadline of 31 December 2011 to finalize the regulations.7¶ Experts assume that corresponding regulations ¶ will be implemented in a timely manner. Thus, **shipping companies will also be burdened with emissions-based levies in the future.** **CO2 emissions can only be effectively reduced by burning less fuel**. ¶ Limited Refining Capacity as Oil Price Driver ¶ **Experts believe that fuel prices will go up once more by enacting the ban on heavy fuel oil. The reason ¶ is that refinery capacities are too limited to cover the demand. And when it comes to the demand for ¶ fuel it’s important to keep in mind that ships will be competing with cars, trucks, heating oil and all ¶ other onshore oil consumers in the future**. **¶ Modern refineries are designed to produce less heavy fuel oil** and more high-quality (and high-priced) ¶ refined products. **As a result** of this, **trade associations believe that refineries are not able to cover the ¶ additional demand.** And for the shipping industry, the situation is already making a turn for the worse over the short term: **Since refineries are producing less heavy oil, the prices for heavy ship fuels are ¶ rising disproportionately even today.** ¶ Triplication of Fuel Costs for Shipping Companies ¶ All in all these developments imply that fuel costs for shipping companies will triple in the future compared to today’s level. Thus ship operating costs will predominantly be determined by the cost of fuel ¶ in the future. The figure above shows how the internationally renowned classification society Germanischer Lloyd ¶ projects fuel prices will develop within the shipping industry (prices given exclude any increases due to ¶ inflation). Cost increases stemming from CO2 emission-based levies from the year 2013 on, as well as ¶ the mandatory use of more expensive diesel fuels (MGO) beginning in 2020, are clearly recognizable. ¶ Shipping industry customers – freight owners, such as major commodities companies, as well as logistics service providers – are working hard to reduce their CO2 emissions in response to rising pressures ¶ on the part of their own customers. For many companies, logistics are a major contributor to their ¶ overall corporate emissions levels. Providers of logistics services are already taking action by creating ¶ climate-protecting alternatives, such as DHL and Deutsche Bahn respectively with their GOGREEN¶ and “EcoPlus” (DB Schenker Rail) shipping and transportation options. The shipping industry does not ¶ yet offer these kinds of products. The fact that maritime transport accounts for a major part of many ¶ companies’ transport volume makes it one area where freight owners are especially looking for opportunities to reduce their carbon footprint. First initiatives have already been formed to address this issue, e.g. the Clean Cargo Working Group8 GREEN SHIPPING – WIND POWER AS ECONOMIC ALTERNATIVE ¶ **Cutting-edge solutions in the field of renewable energy are needed in order to meet these challenges**. **SkySails is offering a technology that contributes both to cutting ship operating costs ¶ while significantly reducing ship emissions at the same time.** ¶ It is a simple fact: **Wind is cheaper than oil and the most economic and environmentally sound source ¶ of energy on the high seas**. ¶ It was little more than a century ago that wind was the sole source of power for the world's merchant ¶ fleet. The ready availability of cheap oil at the beginning of the 20th century led to the steady replacement of sails with diesel power. The introduction of the diesel engine changed the face of shipping. **Classic sail propulsion can no longer be used in today’s world of cargo shipping. Conventional ¶ sail systems simply cannot generate the propulsion power required for modern ships**. Also, those tall ¶ masts would severely restrict the cargo capacity on deck and make loading and unloading in port ¶ extremely difficult. The tilt (or heeling) caused by the large lever arms of sails secured to masts would ¶ pose a serious safety risk. In addition, high investment costs for mast supported sail systems lower ¶ their profitability significantly. ¶ Ships are long-lasting capital goods which are in operation for 25 years and more. **The shipping industry’s greatest challenge will be to quickly and efficiently retrofit the existing cargo fleet in order to ¶ rapidly reduce the emission of climate-damaging greenhouse gases. This will not be possible with ¶ mast supported sails as it would require considerable modifications of the ships’ structures which in ¶ turn would be too expensive.** ¶ **SkySails offers an innovative propulsion system that meets the demands of today’s shipping industry ¶ and allows cargo ships to use wind energy on a grand scale once more**. The SkySails-System consists of three main components: A towing kite with rope (flying system), a launch and recovery system, and a control system for automatic operation. **The amount of space that the SkySails-System occupies on the ship is negligible from an economic ¶ standpoint.** This is because the system’s deck components are installed in the area of the forecastle, ¶ which is not used for cargo anyway. The textile towing kite is easy to stow when folded and requires ¶ very little space on board ship. A folded 160m² SkySails for example is only the size of a telephone ¶ booth. Furthermore, there are no superstructures which may obstruct loading and unloading at harbors or navigating under bridges, since the towing kite is recovered when approaching land. The heeling caused by the SkySails-System is minimal and virtually negligible in terms of ship safety and operation. The tractive forces of the SkySails towing kite are transmitted to the ship at deck level. The ¶ lever arm which causes the inclined position (heeling) of conventional sailing ships is thus shortened. ¶ The towing kite is controlled by an autopilot during flight. The ship‘s regular crew is adequate for operating the system and no additional personnel costs will arise. ¶ Depending on the prevailing wind conditions, a **ship’s average annual fuel consumption and emissions can be reduced** by 10 to **35% by using the SkySails-System.** The latest SkySails product generation has a maximal propulsion power of more than 2 MW (approx. 2,700 horse powers; equivalent ¶ ship engine) and can save up to 10 tons of oil per day – this equals cost savings of approx. US-$ ¶ 5,000 per day. For comparison: A normal family home needs 2 tons of oil for heating and warm water ¶ - per year. ¶ The worldwide patented SkySails-System generates tractive force using large, dynamically flying towing kites, which in terms of physics is the most effective form of utilizing wind energy. With a good ¶ wind the SkySails SKS C 320 can produce a pulling force in the towing rope of more than 320 ¶ kilonewton (kN) – a force greater than the thrust of both engines on an Airbus A321. The 32-meter ¶ width of the towing kite is just about as broad as the total wingspan of the A321. ¶ **SkySails propulsion is** the only wind-propulsion system that can not only be installed on newbuildings, ¶ but **easily retrofitted onto most existing cargo ships as well**. **SkySails technology thus offers a solution ¶ that can make a major and quick environmental impact by reducing the carbon emissions of the existing “old” ships in the world’s merchant fleet**. ¶ The UN body IMO (International Maritime Organisation) attaches great importance to SkySails with ¶ regard to climate protection: in its latest GHG Emissions study9¶ , the IMO states that the SkySails ¶ technology has the potential to save approx. 100 million tons of CO2 per year when applied broadly on ¶ ships of the world’s merchant fleet. This corresponds to ca. 11% of Germany’s CO2 emissions. ¶ **With its innovative wind propulsion system for cargo ships, SkySails as the market and technology ¶ leader offers one of the worldwide most attractive technologies for simultaneously reducing operating ¶ costs and CO2 emissions.**

**Trade prevents war**

**Griswold 11**

**(Daniel Griswold is director of the Center for Trade Policy Studies at the Cato Institute and author of Mad about Trade: Why Main Street America Should Embrace Globalization. “Free Trade and the Global Middle Class,” Hayek Society Journal Vol. 9** <http://www.cato.org/pubs/articles/Hayek-Society-Journal-Griswold.pdf)>

**Our more globalized world has also yielded a “peace dividend.” It may not be obvious when our daily news cycles are dominated by horrific images from the Gaza Strip, Afghanistan and Libya, but our more globalized world has somehow become a more peaceful world. The number of civil and international wars has dropped sharply in the past 15 years, along with battle deaths. The reasons behind the retreat of war are complex, but again the spread of trade and globalization have played a key role. Trade has been seen as a friend of peace for centuries. In the 19th century, British statesman Richard Cobden pursued free trade as a way not only to bring more affordable bread to English workers but also to promote peace with Britain’s neighbors. He negotiated the Cobden-Chevalier free trade agreement with France in 1860 that helped to cement an enduring alliance between two countries that had been bitter enemies for centuries. In the 20th century, President Franklin Roosevelt’s secretary of state, Cordell Hull, championed lower trade barriers as a way to promote peaceful commerce and reduce international tensions. Hull had witnessed first-hand the economic nationalism and retribution after World War I. Hull believed that “unhampered trade dovetail[s] with peace; high tariffs, trade barriers and unfair economic competition, with war.” Hull was awarded the 1945 Nobel Prize for Peace, in part because of his work to promote global trade. Free trade and globalization have promoted peace in three main ways. First, trade and globalization have reinforced the trend towards democracy, and democracies tend not to pick fights with each other. A second and even more potent way that trade has promoted peace is by raising the cost of war. As national economies become more intertwined, those nations have more to lose should war break out. War in a globalized world not only means the loss of human lives and tax dollars, but also ruptured trade and investment ties that impose lasting damage on the economy. Trade and economic integration has helped to keep the peace in Europe for more than 60 years. More recently, deepening economic ties between Mainland China and Taiwan are drawing those two governments closer together and helping to keep the peace. Leaders on both sides of the Taiwan Straight seem to understand that reckless nationalism would jeopardize the dramatic economic progress that region has enjoyed. A third reason why free trade promotes peace is because it has reduced the spoils of war. Trade allows nations to acquire wealth through production and exchange rather than conquest of territory and resources. As economies develop, wealth is increasingly measured in terms of intellectual property, financial assets, and human capital. Such assets cannot be easily seized by armies. In contrast, hard assets such as minerals and farmland are becoming relatively less important in high-tech, service economies. If people need resources outside their national borders, say oil or timber or farm products, they can acquire them peacefully by freely trading what they can produce best at home. The world today is harvesting the peaceful fruit of expanding trade. The first half of the 20th century was marred by two devastating wars among the great powers of Europe. In the ashes of World War II, the United States helped found the General Agreement on Tariffs and Trade in 1947, the precursor to the WTO that helped to spur trade between the United States and its major trading partners. As a condition to Marshall Plan aid, the U.S. government also insisted that the continental European powers, France, Germany, and Italy, eliminate trade barriers between themselves in what was to become the European Common Market. One purpose of the common market was to spur economic development, of course, but just as importantly, it was meant to tie the Europeans together economically. With six decades of hindsight, the plan must be considered a spectacular success. The notion of another major war between France, Germany and another Western European powers is unimaginable. Compared to past eras, our time is one of relative world peace. According to the Stockholm International Peace Research Institute, the number of armed conflicts around the world has dropped sharply in the past two decades. Virtually all the conflicts today are civil and guerilla wars. The spectacle of two governments sending armies off to fight in the battlefield has become rare. In the decade from 1998 through 2007, only three actual wars were fought between states: Eritrea-Ethopia in 1998-2000, India-Pakistan in 1998-2003, and the United States-Iraq in 2003. From 2004 through 2007, no two nations were at war with one another. Civil wars have ended or at least ebbed in Aceh (in Indonesia), Angola, Burundi, Congo, Liberia, Nepal, Timor-Leste and Sierra Leone. Coming to the same conclusion is the Human Security Centre at the University of British Colombia in Canada. In a 2005 report, it documented a sharp decline in the number of armed conflicts, genocides and refugee numbers in the past 20 years. The average number of deaths per conflict has fallen from 38,000 in 1950 to 600 in 2002. Most armed conflicts in the world now take place in Sub-Saharan Africa, and the only form of political violence that has worsened in recent years is international terrorism. Many causes lie behind the good news – the end of the Cold War, the spread of democracy, and peacekeeping efforts by major powers among them – but expanding trade and globalization appear to be playing a major role in promoting world peace. In a chapter from the 2005 Economic Freedom of the World Report, Dr. Erik Gartzke of Columbia University compared the propensity of countries to engage in wars to their level of economic freedom. He came to the conclusion that economic freedom, including the freedom to trade, significantly decreases the probability that a country will experience a military dispute with another country. Through econometric analysis, he found that, “Making economies freer translates into making countries more peaceful. At the extremes, the least free states are about 14 times as conflict prone as the most free. A 2006 study for the institute for the Study of Labor in Bonn, Germany, found the same pacific effect of trade and globalization. Authors Solomon Polachek and Carlos Seiglie found that “trading nations cooperate more and fight less.” In fact, a doubling of trade reduces the probability that a country will be involved in a conflict by 20 percent. Trade was the most important channel for peace, they found, but investment flows also had a positive effect. A democratic form of government also proved to be a force for peace, but primarily because democracies trade more. All this helps explain why the world’s two most conflict-prone regions – the Arab Middle East and Sub-Saharan Africa – are also the world’s two least globally and economically integrated regions. Terrorism does not spring from poverty, but from ideological fervor and political and economic frustration. If we want to blunt the appeal of radical ideology to the next generation of Muslim children coming of age, we can help create more economic opportunity in those societies by encouraging more trade and investment ties with the West. The U.S. initiative to enact free trade agreements with certain Muslim countries, such as Morocco, Jordan, Bahrain and Oman, represent small steps in the right direction. An even more effective policy would be to unilaterally open Western markets to products made and grown in Muslim countries. A young man or woman with a real job at an export-oriented factory making overcoats in Jordan or shorts in Egypt is less vulnerable to the appeal of an Al-Qaida recruiter. Of course, free trade and globalization do not guarantee peace or inoculation against terrorism, anymore than they guarantee democracy and civil liberty. Hot-blooded nationalism and ideological fervor can overwhelm cold economic calculations. Any relationship involving human beings will be messy and non-linear. There will always be exceptions and outliers in such complex relationships involving economies and governments. But deeper trade and investment ties among nations have made it more likely that democracy and civil liberties will take root, and less likely those gains will be destroyed by civil conflict and war.**

**Also resolves external conflicts- makes war unthinkable**

**Brooks 2k**

Jason Brooks, Department of Journalism at Carleton University, May 1, 2000, Garvey Contest Essay, “Make Trade, Not War,” http://www.independent.org/students/garvey/essay.asp?id=1456

Free trade is, in one sense, like a nuclear weapon. Which seems strange to say because trade is associated with peace and prosperity, while nuclear weapons are synonymous with apocalypse and terror. But here is how they are alike: they both prevent war by making it more costly. A strong argument exists that the only reason the Cold War never got “hot” between the United States and the Soviet Union was that nuclear weapons made outright conflict unthinkable. Trade, in a similar way, binds the fortunes of people in the world together. It is the best assurance of peace. By forging bonds between customers and suppliers around the world, trade gives citizens a vested interest in the wellbeing of people in other countries—war becomes a matter of mutual assured destruction, if you will. With trade, a war abroad will have fallout at home. But while trade has the deterrent effects of powerful weapons, is far preferable because of its other advantages. Where weapons are expensive, free trade brings prosperity and freedom. Where weapons bring terror, free trade fosters harmony and encourages people to resolve disputes without violence. Richard Cobden, a nineteenth century British industrialist and politician, often argued in favor of trade over armaments to discourage war. His recipe for peace remains as true today as it was more than 150 years ago: “The more any nation traffics abroad upon free and honest principles, the less it will be in danger of wars.” Free trade is indeed the wellspring of peace.

**Warming is real and anthropogenic- scientific consensus**

**Trenberth et al. 12**

(Kevin Trenberth, Sc.D, Distinguished Senior Scientist, Climate Analysis Section, National Center for Atmospheric Research Richard Somerville, Ph.D., Distinguished Professor, Scripps Institution of Oceanography, University of California, San Diego Katharine Hayhoe, Ph.D., Director, Climate Science Center, Texas Tech University Rasmus Benestad, Ph.D., Senior Scientist, The Norwegian Meteorological Institute Gerald Meehl, Ph.D., Senior Scientist, Climate and Global Dynamics Division, National Center for Atmospheric Research Michael Oppenheimer, Ph.D., Professor of Geosciences; Director, Program in Science, Technology and Environmental Policy, Princeton University Peter Gleick, Ph.D., co-founder and president, Pacific Institute for Studies in Development, Environment, and Security Michael C. MacCracken, Ph.D., Chief Scientist, Climate Institute, Washington Michael Mann, Ph.D., Director, Earth System Science Center, Pennsylvania State University Steven Running, Ph.D., Professor, Director, Numerical Terradynamic Simulation Group, University of Montana Robert Corell, Ph.D., Chair, Arctic Climate Impact Assessment; Principal, Global Environment Technology Foundation Dennis Ojima, Ph.D., Professor, Senior Research Scientist, and Head of the Dept. of Interior's Climate Science Center at Colorado State University Josh Willis, Ph.D., Climate Scientist, NASA's Jet Propulsion Laboratory Matthew England, Ph.D., Professor, Joint Director of the Climate Change Research Centre, University of New South Wales, Australia Ken Caldeira, Ph.D., Atmospheric Scientist, Dept. of Global Ecology, Carnegie Institution Warren Washington, Ph.D., Senior Scientist, National Center for Atmospheric Research Terry L. Root, Ph.D., Senior Fellow, Woods Institute for the Environment, Stanford University David Karoly, Ph.D., ARC Federation Fellow and Professor, University of Melbourne, Australia Jeffrey Kiehl, Ph.D., Senior Scientist, Climate and Global Dynamics Division, National Center for Atmospheric Research Donald Wuebbles, Ph.D., Professor of Atmospheric Sciences, University of Illinois Camille Parmesan, Ph.D., Professor of Biology, University of Texas; Professor of Global Change Biology, Marine Institute, University of Plymouth, UK Simon Donner, Ph.D., Assistant Professor, Department of Geography, University of British Columbia, Canada Barrett N. Rock, Ph.D., Professor, Complex Systems Research Center and Department of Natural Resources, University of New Hampshire David Griggs, Ph.D., Professor and Director, Monash Sustainability Institute, Monash University, Australia Roger N. Jones, Ph.D., Professor, Professorial Research Fellow, Centre for Strategic Economic Studies, Victoria University, Australia William L. Chameides, Ph.D., Dean and Professor, School of the Environment, Duke University Gary Yohe, Ph.D., Professor, Economics and Environmental Studies, Wesleyan University, CT Robert Watson, Ph.D., Chief Scientific Advisor to the UK Department of Environment, Food and Rural Affairs; Chair of Environmental Sciences, University of East Anglia Steven Sherwood, Ph.D., Director, Climate Change Research Centre, University of New South Wales, Sydney, Australia Chris Rapley, Ph.D., Professor of Climate Science, University College London, UK Joan Kleypas, Ph.D., Scientist, Climate and Global Dynamics Division, National Center for Atmospheric Research James J. McCarthy, Ph.D., Professor of Biological Oceanography, Harvard University Stefan Rahmstorf, Ph.D., Professor of Physics of the Oceans, Potsdam University, Germany Julia Cole, Ph.D., Professor, Geosciences and Atmospheric Sciences, University of Arizona William H. Schlesinger, Ph.D., President, Cary Institute of Ecosystem Studies Jonathan Overpeck, Ph.D., Professor of Geosciences and Atmospheric Sciences, University of Arizona Eric Rignot, Ph.D., Senior Research Scientist, NASA's Jet Propulsion Laboratory; Professor of Earth System Science, University of California, Irvine Wolfgang Cramer, Professor of Global Ecology, Mediterranean Institute for Biodiversity and Ecology, CNRS, Aix-en-Provence, France, 2/1/2012, “Check With Climate Scientists for Views on Climate”, http://online.wsj.com/article/SB10001424052970204740904577193270727472662.html)

Do you consult your dentist about your heart condition? **In science**, as in any area, **reputations are based on knowledge and expertise in a field and on published, peer-reviewed work**. If you need surgery, you want a highly experienced expert in the field who has done a large number of the proposed operations. You published "**No Need to Panic About Global Warming**" (op-ed, Jan. 27) **on climate change by the climate-science equivalent of dentists practicing cardiology**. **While accomplished in their own fields, most of these authors have no expertise in climate science**. **The few authors who have such expertise are known to have extreme views that are out of step with nearly every other climate expert.** **This happens in nearly every field of science**. For example, there is a retrovirus expert who does not accept that HIV causes AIDS. And it is instructive to recall that a few scientists continued to state that smoking did not cause cancer, long after that was settled science. **Climate experts know that the long-term warming trend has not abated in the past decade**. In fact, **it was the warmest decade on record**. **Observations show unequivocally that our planet is getting hotter**. And **computer models have recently shown that during periods when there is a smaller increase of surface temperatures, warming is occurring elsewhere in the climate system**, typically in the deep ocean. **Such periods** are a relatively common climate phenomenon, are consistent with our physical understanding of how the climate system works, and certainly **do not invalidate our understanding of human-induced warming or the models used to simulate that warming**. Thus, **climate experts also know what** one of us, Kevin **Trenberth, actually meant by the out-of-context, misrepresented quote used in the op-ed. Mr. Trenberth was lamenting the inadequacy of observing systems to fully monitor warming trends in the deep ocean and other aspects of the short-term variations that always occur, together with the long-term human-induced warming trend**. **The National Academy of Sciences** of the U.S. (set up by President Abraham Lincoln to advise on scientific issues), as well as major national academies of science around the world and every other authoritative body of scientists active in climate research **have stated that the science is clear: The** **world is heating up and humans are primarily responsible**. **Impacts are already apparent and will increase**. **Reducing future impacts will require significant reductions in emissions of heat-trapping gases**. **Research shows that more than 97% of scientists actively publishing in the field agree that climate change is real and human caused**. **It would be an act of recklessness for any political leader to disregard the weight of evidence and ignore the enormous risks that climate change clearly poses**. In addition, **there is very clear evidence that investing in the transition to a low-carbon economy will not only allow the world to avoid the worst risks of climate change, but could also drive decades of economic growth**. Just what the doctor ordered.

**Warming specifically causes hydrogen sulfide expansion—that causes extinction.**

**Ward 10**

(Peter, PhD, professor of Biology and Earth and Space Sciences at the University of Washington, paleontologist and NASA astrobiologist, Fellow at the California Academy of Sciences, The Flooded Earth: Our Future in a World Without Ice Caps, June 29, 2010)

In the rest of this chapter I will support a contention that within several millennia (or less) **the planet will see a changeover of the oceans from their current “mixed” states to something much different and dire. Oceans will become stratified** by their oxygen content and temperature, with warm, oxygen-free water lining the ocean basins**. Stratified oceans** like this in the past (and they were present for most of Earth’s history) **have always been preludes to biotic catastrophe**. Because the continents were in such different positions at that time, models we use today to understand ocean current systems are still crude when it comes to analyzing the ancient oceans, such as those of **the Devonian** or **Permian Periods. Both** times **witnessed major mass extinctions, and these extinctions were somehow tied to events in the sea**. Yet catastrophic as it was, the event that turned the Canning Coral Reef of Devonian age into the Canning Microbial Reef featured at the start of this chapter was tame compared to that ending the 300 million- to 251 million-year-old Permian Period, and for this reason alone the Permian ocean and its fate have been far more studied than the Devonian. **But there is another reason to concentrate on the Permian mass extinction**: it took place on a world with a climate more similar to that of today than anytime in the Devonian. Even more important, it was a world with ice sheets at the poles, something the more tropical Devonian Period may never have witnessed. **For much of the Permian Period, the Earth, as it does today, had abundant ice caps at both poles, and there were large-scale continental glaciations** up until **at** least 270 million years ago, and perhaps even later.4 But **from then until the end of the Permian, the planet rapidly warmed, the ice caps disappeared, and the deep ocean bottoms filled with great volumes of warm, virtually oxygen-free seawater. The trigger for disaster was a short-term but massive infusion of carbon dioxide** and other greenhouse gases **into the atmosphere** at the end of the Permian from the spectacular lava outpourings over an appreciable portion of what would become northern Asia. The lava, now ancient but still in place, is called the “Siberian Traps,” the latter term coming from the Scandinavian for lava flows**. The great volcanic event was but the start of things, and led to changes in oceanography. The ultimate kill mechanism seems to have been a lethal combination of rising temperature, diminishing oxygen, and influx into water and air of the highly poisonous compound hydrogen sulfide. The cruel irony is that this latter poison was itself produced by life**, not by the volcanoes. **The bottom line is that life produced the ultimate killer in this and surely other ancient mass extinctions**. This finding was one that spurred me to propose the Medea Hypothesis, and a book of the same name.5 **Hydrogen sulfide poisoning might indeed be the worst biological effect of global warming. There is no reason that such an event cannot happen again, given short-term global warming. And because of the way the sun ages, it may be that such events will be ever easier to start than during the deep past**. How does the sun get involved in such nasty business as mass extinction? **Unlike a campfire that burns down to embers, any star gets ever hotter when it is** on the “main sequence,” which is simply a term used to described the normal **aging** of a star—something like the progression we all go through as we age. But **new work by Jeff Kiehl of the University of Colorado shows that because the sun keeps getting brighter, amounts of CO2 that in the past would not have triggered the process result in stagnant oceans filled with H2S-producing microbes**. His novel approach was to estimate the global temperature rise to be expected from carbon dioxide levels added to the energy hitting the earth from the sun. **Too often we refer to the greenhouse effect as simply a product of the gases. But it is sunlight that actually produces the heat, and that amount of energy hitting the earth keeps increasing. He then compared those to past times of mass extinctions. The surprise is that a CO2 level of 1,000 ppm would—with our current solar radiation—make our world the second hottest in Earth history—when the five hottest were each associated with mass extinction**. In the deep history of our planet, there have been at least five short intervals in which the majority of living species suddenly went extinct. Biologists are used to thinking about how environmental pressures slowly choose the organisms most fit for survival through natural selection, shaping life on Earth like an artist sculpting clay. However, mass extinctions are drastic examples of natural selection at its most ruthless, killing vast numbers of species at one time in a way hardly typical of evolution. In the 1980s, Nobel Prize-winning physicist Luis Alvarez, and his son Walter Alvarez, first hypothesized that the impact of comets or asteroids caused the mass extinctions of the past.6 Most scientists slowly come to accept this theory of extinction, further supported by the discovery of a great scar in the earth—an impact crater—off the coast of Mexico that dates to around the time the dinosaurs went extinct. **An asteroid probably did kill off the dinosaurs, but the causes of the remaining four mass extinctions are still obscured beneath the accumulated effects of hundreds of millions of years, and no one has found any credible evidence of impact craters. Rather than comets and asteroids, it now appears that short-term global warming was the culprit for the four other mass extinctions.** I detailed the workings of these extinctions first in a 1996 Discover magazine article,7 then in an October 2006 Scientific American article, and finally in my 2007 book, Under a Green Sky.8 In each I considered whether such events could happen again. In my mind, **such extinctions constitute the worst that could happen to life and the earth as a result of short-term global warming**. But before we get to that, let us look at the workings of these past events. The evidence at hand links the mass extinctions with a changeover in the ocean from oxygenated to anoxic bottom waters. The source of this was a change in where bottom waters are formed. **It appears that in such events**, the source of our earth’s deep water shifted from the high latitudes to lower latitudes, and **the kind of water making it to the ocean bottoms was different as well: it changed from cold, oxygenated water to warm water containing less oxygen. The result was the extinction of deep-water organisms**. Thus a greenhouse extinction is a product of a changeover of the conveyor-belt current systems found on Earth any time there is a marked difference in temperatures between the tropics and the polar regions. Let us summarize the steps that make greenhouse extinction happen. First, **the world warms over short intervals due to a sudden increase in carbon dioxide** and methane, caused initially by the formation of vast volcanic provinces called flood basalts. **The warmer world affects the ocean circulation systems and disrupts the position of the conveyor currents. Bottom waters begin to have warm, low-oxygen water dumped into them. The warming continues, and the decrease of equator-to-pole temperature differences brings ocean winds and surface currents to a near standstill.** The mixing of oxygenated surface waters with the deeper and volumetrically increasing low-oxygen bottom waters lessens, causing ever-shallower water to change from oxygenated to anoxic. **Finally, the bottom water exists in depths where light can penetrate, and the combination of low oxygen and light allows green sulfur bacteria to expand in numbers, filling the low-oxygen shallows. The bacteria produce toxic amounts of H2S, with the flux of this gas into the atmosphere occurring at as much as 2,000 times today’s rates. The gas rises into the high atmosphere, where it breaks down the ozone layer. The subsequent increase in ultraviolet radiation from the sun kills much of the photosynthetic green plant phytoplankton**. On its way up into the sky, **the hydrogen sulfide also kills some plant and animal life, and the combination of high heat and hydrogen sulfide creates a mass extinction on land**.9 Could this happen again? No, says one of the experts who write the RealClimate.org Web site, Gavin Schmidt, who, it turns out, works under Jim Hansen at the NASA Goddard Space Flight Center near Washington, DC. I disagreed and challenged him to an online debate. He refused, saying that the environmental situation is going to be bad enough without resorting to creating a scenario for mass extinction. But special pleading has no place in science. Could it be that **global warming could lead to the extinction of humanity**? That prospect cannot be discounted. To pursue this question, let us look at what might be the most crucial of all systems maintaining habitability on Planet Earth: the thermohaline current systems, sometimes called the conveyor currents.

**Independently shipping prevents extinction**

**Brownrigg 7** Director general of British Chamber of Shipping, “Speech to the Party Fringe meetings: Shipping – An Answer To Global Warming”, http://www.findthatdoc.com/search-20687997-hDOC/download-documents-d-g-labour-party-fringe-sep-2007-doc.htm

Somewhat provocatively, we’ve called this meeting ‘Shipping – an answer to Global Warming’. Before I explain why – and why we believe that statement is true – I’d like to look quickly at the nature of the industry we’re considering. **Shipping is indispensable to** the way we – both here in the UK and **people all over the world** – live our lives today. The great **wealth and comfort we enjoy today is possible only because of the shipping industry**. 95% of the UK’s goods, by volume, are transported by ship. I think that bears repeating – 95% of our goods are transported by ship. And internationally **90% of all world trade is moved by sea**. Look around you – at the food you eat, the clothes you are wearing, your children’s toys, the car you drive, and probably even the chairs you’re sitting on – **virtually everything has come here on a ship**. In many cities, shipping is what keeps the lights on at night. **Without shipping, half the world would starve and half the world would freeze.** For the UK, a small country with a high population density and the 5th largest trading economy in the world, the simple truth is that the country does not have the capacity to sustain its population – even at subsistence level – without external input. **Shipping isn’t just vital to our way of life**; for us it’s vital to life itself. Just **a temporary suspension of shipping** and ports activities in the UK **would cause panic buying, empty shelves and major food shortages**. With the modern “just-in time” deliveries, many **items would be unobtainable**. Even the National **Health Service would quickly run out of a wide range medicines** and other supplies! Obviously then, **unless we are willing to accept a slowdown in the economy, a significant decline in our standard of living** **– and even a rationing of essential supplies** such as food, clothes and petrol – an improvement in **shipping**’s carbon footprint **can’t be achieved by** simply **reducing the number of ships** or the number of voyages. Shipping demand is a direct function of the demands of world trade. In fact, and as the title of title of today’s debate suggests, I believe that if we look at the issue of global warming more holistically, shipping’s efficiency in terms of greenhouse gas emissions means that, instead of looking at a reduction, we should look at ways of increasing the use of ships to transport our goods – and thereby reduce air and road transport. It is true that ships run on fossil fuels, that they emit carbon dioxide as a product of burning those fuels, and that carbon dioxide is a greenhouse gas. But it is also true that shipping is the most efficient way to transport goods in terms of CO2 emissions – this was clearly confirmed by Sir Nicholas Stern’s Report two years ago. Both we and he measure the potential harm done by reference both to the weight of cargo carried and the distance it is moved – for example, an over 8,000 tonne cargo ship emits about 15 grams of CO2 per tonne-kilometre compared to about 50 grams per tonne-kilometre for a heavy truck or 540 grams per tonne-kilometre for a modern aeroplane. Stern showed that globally all transport produces 14% of man-made CO2 emissions. All water transport – both inland and international shipping – produces 10% of this 14%, ie 1.4% of man-made emissions. And this is the industry that transports 90% of world trade.

**Solvency**

**Aviation, weather, and terror proof**

**Burke 12/3/12**

(Jill Burke ‘Will airborne windmills revolutionize rural Alaska energy?”

Dec 03, 2012 http://www.alaskadispatch.com/article/will-airborne-windmills-revolutionize-rural-alaska-energy-video, TSW)

**What could go wrong**?¶ Altaeros is relying on a convergence of technologies to ensure it has a stable, reliable product. But will it be safe? Here's how Altaeros says it expects the airborne turbine to handle some of the challenges it'll face:¶ **Icing: Special coatings, manual heating or altitude changes may be used to prevent it.¶** **High winds:** **The turbine is rated to withstand hurricane-force winds,** defined as winds above 75 mph. Higher than that, it will return to the ground. ¶ Breaking loose: If that happens while aloft, an emergency valve will automatically begin to deflate the shell, allowing it to slowly settle to the ground.¶ **Interfering with aviation: Like any tall structure, the airborne wind turbine will have lighting and be marked on low-altitude flight maps, to avoid problems with planes.**¶ Terrorism or vandalism: In **military applications, tethered helium blimps are able to withstand gunfire, hardly affected by a single bullet hole and only requiring repair after several such strikes.** Rein expects the airborne turbines to be no different.¶ To ensure the airborne wind turbine is up to par for the harsh weather found along much of Alaska's Western and Arctic coastlines, Rein and his colleagues plan to test the turbine in a more moderate Alaska location before testing it in the extremes.¶ The company, which has thus far survived on government grants, angel investors and a ConocoPhillips energy award, is offering to match the $740,000 from the state with $620,000 of its own, largely through labor and equipment it will provide.

**Carbon nanotube solves tether concerns**

**Bronstein ‘10**

(Max G. Bronstein is a recent graduate of the Gerald R. Ford School of Public Policy. He holds a Masters of public policy and a certificate in science, technology, and

public policy.¶ College of Engineering, University of Michigan, Ann Arbor, MI, United States “Harnessing rivers of wind: A technology and policy assessment of high altitude wind power in the U.S.” 17 October 2010, Technological Forecasting & Social Change 78 (2011) 736–746, Science Direct, TSW)

**The** continued **development of the TRC design** will require major improvements and innovations in minimizing the weight of¶ the system and the thousands of feet of tether required for successful operation. **Rapid advances in material science, specifically in¶ the area of carbon nanotubes** or other lightweight, high-tensile materials could **greatly facilitate the viability and deployment of¶ the TRC.** Such materials would be essential in constructing both the body and rotors of the craft and connecting it to a groundbased¶ power station. Recently, **the federal government and the private sector have made massive investments into energy storage¶ research, which will undoubtedly play an important role in fostering HWP.** New and innovative battery designs could offer an¶ affordable and scalable method for the massive electricity storage that is needed for constant power output suitable for distribution. While **many engineering hurdles have been overcome in the TRC design**, it is clear that further development and¶ commercialization will depend upon advances in related fields of science and technology.

**Currently feasible**

**Cahoon 11**

(Troy L, Captain USAF, Thesis for Department of Aeronautics and Astronautics ¶ Graduate School of Engineering and Management ¶ 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)

**The challenges to the development of AWE are significant, but there do not ¶ appear to be any obstacles that cannot be overcome by combining and applying current ¶ technologies**. **The advantages of the high-density wind power resource at high-altitudes ¶ provide the potential to give tremendous returns to those who can innovatively overcome ¶ the challenges and produce a competitive system.** There are currently several researchers ¶ and companies that are trying to do just that.¶ 9,10,11¶ Three specific types of innovative 26¶ approaches being pursued are a rotor based concept, a kite based concept, and a balloon ¶ based concept.

**No Disads**

**Already funded**

**Anderson 12**

Ross Andersen is an Atlantic correspondent based in Washington, D.C. He is also the Science Editor at the Los Angeles Review of Books, and a contributor to The Economist. “The 'Silent Green Revolution' Underway at the Department of Energy” 9/9/12 http://www.theatlantic.com/technology/archive/2012/09/the-silent-green-revolution-underway-at-the-department-of-energy/261905/

**After receiving an unprecedented surge in funding for renewable energy courtesy of the American Recovery and Reinvestment Act, Chu set to work** hiring big names from the nation's top research laboratories, in order to staff a new agency called ARPA-E, modeled after DARPA, the R&D wing of the Pentagon. In just three years, **ARPA-E has made more than 180 investments in basic research projects in renewable energy**, and that's in addition to grants issued by the Department of Energy proper, like the one that funded the Ocean Power Technologies project in Oregon. ¶ Michael Grunwald, a veteran reporter for TIME Magazine, is the author of The New New Deal, a new book that details the history of the much-maligned American Recovery and Reinvestment Act (commonly referred to as the Stimulus bill). In preparing to write The New New Deal, Grunwald did extensive research on the Department of Energy's Stimulus-funded quest to uncover an energy alternative to fossil fuels. Recently, I talked to Grunwald about his new book and the "silent green revolution" that is currently underway at the Department of Energy. ¶ The New New Deal is a narrative about President Obama and his $800 billion stimulus bill, but it also has an argument. Can you quickly lay out the argument, and specifically how it relates to research and clean energy?¶ Grunwald: Sure. The argument is that everything you think you know about the stimulus is wrong. It was not a pathetic failure. It helped prevent a second depression and end a brutal recession in the short term; it was a huge down payment on Obama's campaign promises to transform the U.S. economy for the long term. But clean energy was the real outlier, getting $90 billion when the U.S. had been spending just a few billion a year. **There were unprecedented investments in wind, solar, and other renewables;** energy efficiency in every imaginable form; a smarter grid; cleaner coal; advanced biofuels; electric vehicles; the factories to build all that green stuff in the U.S., and yes, clean energy research.¶ ¶ That money has really launched a silent green revolution. For example, the renewable electricity industry was on the brink of death after the 2008 financial meltdown; the Spanish wind developer Abengoa had shut down its U.S. projects, and turbines were literally rusting in the fields. The day the stimulus passed, Abengoa announced it was investing $6 billion in U.S. wind farms. When Obama took office, we had 25 gigawatts worth of wind power in the U.S., and the official federal energy forecast called for 40 gigs by 2030. It's now 2012, and we already have 50 gigs. The stimulus also jump-started the smart electric grid. It created an advanced battery industry for electric vehicles almost entirely from scratch. And so on.¶ **An airborne wind turbine** from Makani Power, **which has received ARPA-E funding** (Makani).

**Obama just approved a bunch of wind projects**

**Scheid 3/13**

(Brian, Writer for Platts a leading global provider of energy, petrochemicals and metals information, and a premier source of benchmark price assessments for those commodity markets, “Obama administration approves wind, solar energy projects” http://www.platts.com/RSSFeedDetailedNews/RSSFeed/ElectricPower/6257674)

**The Obama administration has approved two solar projects in California and one wind project in Nevada** with the potential capacity of 1,100 MW, departing Interior Secretary Ken Salazar said Wednesday.¶ The projects, which have undergone environmental reviews and public comment processes, include the 750-MW McCoy Solar Energy Project and the 150-MW Desert Harvest Solar Farm, both in California's Riverside East Solar Energy Zone, and the 200-MW Searchlight Wind Energy Project in Clark County, Nevada.¶ "**These renewable energy projects reflect the Obama Administration's commitment to expand domestic energy production on our public lands and diversify our nation's energy portfolio**," Salazar said in a statement.¶ Including these three projects, Interior has approved 37 renewable energy projects since 2009 with the potential capacity of 11,500 MW, Salazar said.¶ The McCoy project, proposed by a NextEra subsidiary, will occupy nearly 4,400 acres and a 12.5-mile generation transmission line is planned to connect the project to Southern California Edison's Colorado River Substation. ¶ The Desert Harvest project, proposed by EDF Renewable Energy, will encompass more than 1,200 acres and includes an on-site substation and 230-kV line to the Red Bluff Substation, which will connect the project to the Southern California Edison regional transmission grid.¶ The Searchlight Wind project will be built on nearly 19,000 acres and the Western Area Power Administration is proposing to construct, operate and maintain a new switching station to connect the project to the existing power grid, Interior said.

**He plans on approving more clean energy**

**Renew Grid 3/20**

(“President Obama Unveils Energy Blueprint” http://www.renewgridmag.com/e107\_plugins/content/content.php?content.9709#.UUoTlBzqmz4)

Last week, **the White House released President Barack Obama's "Blueprint for a Clean and Secure Energy Future," which includes renewable energy, smart grid and electric vehicle** (EV) **initiatives**.¶ "The United States is on the path to a cleaner and more secure energy future," the blueprint says, adding that **since President Obama took office, renewable energy generation has doubled** and carbon emissions have fallen to their lowest level in almost 20 years. "But even with this progress,” the blueprint continues, “there is more work to do."¶ Here are a few noteworthy plans highlighted in President Obama’s energy blueprint:¶ - **The president has set a goal of doubling renewable energy generation again by 2020.** In order to help achieve this, **Obama is urging Congress to make permanent the renewable energy production tax credit,** a key tax incentive among the clean energy industries, especially the wind power sector.¶ - **Obama wants the U.S. Department of the Interior (DOI) to continue making permitting for renewable energy projects “more robust**.” In 2012, the DOI successfully reached the president’s goal to permit 10 GW of renewable projects on public lands. To further such progress, the president’s budget will boost funding for the DOI’s Bureau of Land Management energy programs by about 20%.¶ - The president’s budget also includes $200 million in performance-based funding to help state governments create and implement policies to reduce the waste of energy and support grid modernization. According to the White House fact sheet, key opportunities for states include “modernizing utility regulations to encourage cost-effective investments in efficiency like combined heat and power, clean distributed generation, and demand response resources; enhancing customer access to data; investments that improve the reliability, security and resilience of the grid; and enhancing the sharing of information regarding grid conditions.”¶ - The president has proposed an Energy Security Trust, which would put $2 billion over 10 years into research and development of advanced vehicles, including EVs.

**Wind is massively increasing now**

**Upton 3/14**

(John, Writer for Grist an environmental news site, “Wind power is poised to kick nuclear’s ass” http://grist.org/news/wind-power-is-poised-to-kick-nuclears-ass/)

**In 2012, wind energy became the fastest-growing source of new electricity generation in the U.S., providing 42 percent of new generation capacity**, according to the American Wind Energy Association.¶ **Wind power is becoming so cheap and so commonplace that it appears poised to help blow up the country’s nuclear power sector**, according to a recent Bloomberg article (which you really should read in full). Other highlights from the piece**:¶ $25 billion was spent on wind energy in the U.S. in 2012**.¶ The $25 billion outlay increased nationwide wind generating capacity by 13,124 megawatts – up 28 percent from 2011.¶ That spending spree was fueled in large part by a mad scramble to qualify for federal tax credits that were set to expire at the end of last year (but were ultimately renewed by Congress).¶ Wind-generated electricity met about 3.4 percent of of American demand in 2012, a figure that’s expected to reach 4.2 percent next year**.¶ $120 billion spent on wind turbines since 2003 has increased wind power supplies 1,000 percent and created as much new electricity generation as could be provided by 14 new nuclear power plants**.¶ **In addition to federal tax credits, state-level renewable energy requirements are helping to spur wind’s growth, and the nuclear industry thinks that’s unfair:**

**Increases 17% annually**

**Wind Power Monthly 3/14**

(“Wind increases output and coverage in US” http://www.windpowermonthly.com/article/1174632/Wind-increases-output-coverage-US)

UNITED STATES: **Wind energy generation in the US increased by 17% per cent last year and played a greater role in more states**, according to the American Wind Energy Association (AWEA). Citing data from the US Energy Information Administration's (EIA), **AWEA says wind turbines generated at least 10% of electricity in nine US states in 2012**, up from five states the year before.¶ In the top **two states, wind energy was responsible for more than** one fifth of total electricity production, hitting **24**.5**% in Iowa** and 23.9% in South Dakota. Nationwide, wind produced 3.5% of US electricity in 2012 compared to roughly 2.9% in 2011.¶ "**With wind power serving as the number one source of new generating capacity in 2012, it's no surprise that wind energy is increasing its role in the overall US power mix**," said Elizabeth Salerno, AWEA's director of industry data & analysis. Wind energy provided more than 5% of generation in 14 states last year.