THE ENERGY PIVOT: HOW MILITARY-LED ENERGY INNOVATION CAN CHANGE THE WORLD

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INTRODUCTION

After facing the distinct possibility of nuclear war over missiles in Cuba, President Kennedy looked forward to a brighter future and a better way to resolve conflicts between East and West. Kennedy used his commencement address at American University in Washington, D.C., on June 10, 1963, to transition and break the deadlock in negotiations with the Soviet Union on a treaty to outlaw nuclear tests and communicate his vision for a more peaceful world. With characteristic eloquence and idealism, the President remarked:

> Too many of us think [peace] is impossible. . . . We do not accept that view. Our problems are manmade—therefore, they can be solved by man. . . . For, in the final analysis, our most basic common link is that we all inhabit this small planet. We all breathe the same air. We all cherish our children's future. And we are all mortal.[1]

Fifty years have passed since this address and though much progress has been made, Kennedy's vision for peace remains illusive. The Soviet Union is no more, and the United States is the "Default Power" in the international system.[2] American military and diplomatic missions preserve regional balances and ensure global stability.[3] Even so, the world is in a state of flux,[4] and the American national security picture is complex and

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1. President of the U.S. John F. Kennedy, Commencement Address at the American University (June 10, 1963), http://www.jfklibrary.org/Asset-Viewer/BWC7I4C9QUmLG9J6I8oy8w.aspx.

2. JOSEF JOFFE, THE MYTH OF AMERICA'S DECLINE 249–51 (2014) (noting that "[t]he United States is the Default Power that occupies center stage because it does what other actors cannot or will not do . . . . If it comes to collective action, this Default Power usually assumes the largest burden and acquires most of the shares." *Id.* at 250. Joffe goes on to provide examples ranging from the military action (first Iraq War) to bundling the strands of global diplomacy (Egypt and Israel at Camp David in 1978). He also lists examples of inaction (Rwanda, Darfur, and the UN climate conferences in Copenhagen, Durban, and Doha, and most recently in Syria), where the United States did not put its shoulder behind action and no one else stood up to lead. *Id.*

3. *Id.* at 253.

4. The last quarter century has been a dynamic one for international law and global governance. The abrupt conclusion of the Cold War in 1989 brought a wave of decolonization, the rebirth of sovereignty, and efforts to reorganize the international system around the legal process administered by domestic and international courts. Unfortunately, the unipolar world was not a peaceful one. The attacks on the United States on September 11, 2001, and the terrorist attacks in other countries that have occurred since, are again changing the architecture of the international system. Traditional notions of state sovereignty and responsibility are in flux. Individuals have access to levers of power traditionally reserved for nation-states and international institutions. The new world order is, indeed, dynamic. *See* Press Release, Library of Congress, Jason Parker to Discuss "The Empires Who Came In

dynamic. It dictates paying careful attention to the quotidian places of unrest across the globe while rebalancing resources from the Middle East and Central Asia to the Asia-Pacific region.

The Asia-Pacific is the world's fastest growing region and a key driver of global politics.[5] With over 4.2 billion people, the Asia-Pacific is home to nearly sixty percent of the world's population[6] and more than half of the global economy.[7] The seas from the Indian Ocean, through the Strait of Malacca, and the Pacific contain the world's most vibrant trade and energy routes.[8] In this critically important region, our allies and partners are looking for American leadership.

In late 2011, the Obama administration announced a strategic rebalancing of U.S. resources toward the Asia-Pacific region.[9] In his speech to the Australian Parliament, President Obama signaled this broad shift:

> Here [in the Asia-Pacific region], we see the future. As the world's fastest-growing region—and home to more than half the global economy—the Asia-Pacific is critical to achieving my highest priority, and that's creating jobs and opportunity for the American people. With most of the world's nuclear power and some half of humanity, Asia will largely define whether the century ahead will be marked by conflict or cooperation, needless suffering or human progress.[10]

After heavy investment over the last thirteen years in the Middle East and Central Asia, the United States is shifting its attention east.

The interrelated issues of energy and the environment will play a key role in this strategic rebalancing. Energy use is directly correlated to wealth. As nations like China and India continue to grow they will seek an increasing share of the world's energy resources. These quests that may range to far-flung places across the globe will cause friction as competition for energy increases. As the world's Default Power, the United States will

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From the Cold: Decolonization and the Cold War" July 21 (June 29, 2010) (on file at http://www.loc.gov/today/pr/2010/10-158.html).

5. Hillary Clinton, *America's Pacific Century*, FOREIGN POL'Y, Nov. 2011.

6. *Social Development in Asia and the Pacific*, U.N. ECON. AND SOC. COMM'N FOR ASIA AND THE PAC., http://www.unescapsdd.org/population-dynamics/overview (last visited Mar. 18, 2014).

7. Remarks, President of the U.S. Barack Obama, Remarks by President Obama to the Australian Parliament (Nov. 17, 2011), http://www.whitehouse.gov/the-press-office/2011/11/17/remarks-president-obama-australian-parliament.

8. Clinton, *supra* note 5.

9. Remarks, *supra* note 7.

10. *Id.*

have to provide enhanced presence, mediate disputes, and find lasting solutions to the difficult problems that will satisfy the countries in the region.

Rapid growth in the Asia-Pacific region is affecting global energy markets. The U.S. Energy Information Administration estimates that China and India will account for half the world's total increase in energy use through 2040. To fuel its growth, China, just as the West did during the Industrial Revolution,[11] is turning primarily to coal,[12] installing more than fifty gigawatts of coal energy capacity per year.[13] Coal is cheap and, along with other fossil fuels, provides emerging economies the surest path towards sustained growth. This increase in the use of fossil fuels will also have a big impact on the environment.

How the United States manages the dynamic global energy landscape in the Pacific region and addresses the threats to our climate will be important measures of American leadership in the years to come. If China follows the same path towards development as the West, cutting emissions only after growth, the results for the planet will be disastrous. Likewise, if China and other rising Asian powers clash in a competition for resources, the result of worldwide economic stability and the preservation of humanity could be equally destructive.

Yet these realities, while grave, offer the United States an opportunity to lead in a way that contributes to global stability while positively impacting the vexing problem of environmental damage from the rapid industrial growth in China and the Asia-Pacific region. I propose that the United States use its strategic pivot in the Asia-Pacific region to increase direct military-to-military interaction with China and our regional allies specifically on the issue of energy innovation. These interactions will forge a new energy future for the region and the world.

Energy and the environment are profound issues to U.S. national security and foreign policy. Energy shapes interests and relations between countries. When it is seen through the national security lens, rather than as a fringe environmental pursuit, climate change becomes a "threat multiplier," and an energy policy that promotes heterogeneity and efficiency becomes a

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11. Fossil Energy Office of Commc'ns, *A Brief History of Coal Use*, U.S. DEP'T OF ENERGY, http://www.fossil.energy.gov/education/energylessons/coal/coal_history.html (last updated Feb. 12, 2013).

12. U.S. ENERGY INFO. ADMIN., CHINA—ANALYSIS, http://www.eia.gov/countries/cab.cfm?fips=CH (last updated Feb. 4, 2014) (describing that coal supplied 69 percent of China's energy consumption. As a result of its incredible coal consumption, China is the world's leading energy-related carbon dioxide emitter. The country's 12th Five-Year Plan includes several measures to both curb coal use and carbon dioxide emissions.).

13. RICHARD A. MULLER, ENERGY FOR FUTURE PRESIDENTS 126 (2014).

"force multiplier."[14] Further, viewing energy policy in the national security context allows us to examine the opportunity that defense sector-led energy innovation provides as a vehicle to engage China. Engagement on these issues of common interest will increase regional stability. Further, with Chinese, Indian, and other Asian partners, an unconventional energy arms race will help change the direction of the world's energy quest.

This Article proceeds in four parts. Part I of this Article explores the Pentagon's push to reduce its use of conventional fuels and increase its energy efficiency. The military's mission is driving energy innovation. This Part will examine how successful energy technologies and effective regulatory mechanisms that support clean energy innovation are shared across the globe through informal networks and formal treaty mechanisms. The defense department's move to reduce reliance on fossil fuel and towards increased efficiency has started a Green Arms Race[15] that has the power to not only create a stronger, more capable military, but also to align the efforts of academics, environmentalists, warriors, and nations to alter the future of our warming world.

To be effective, this vision for a clean energy future must be shared with the fastest growing economies. Part II of this paper briefly examines Chinese history and culture. Culture, which consists of shared values, expectations, assumptions, perceptions, myths, and goals learned from previous generations and passed on to future generations, indeed matters. International relations are complex and even a basic understanding of the other side's starting point can facilitate increased cooperation and coordination.

Using the Obama administration's strategic rebalance of attention to the region as a vehicle, Part III of this paper suggests the United States use its military to engage China and demonstrate the power of clean and efficient energy innovation. Collaboration between the United States and China on energy and the environment is unlikely to hit politically sensitive topics like cyberspace operations or currency manipulation and allows great potential for cooperation and transparent conversation.

Managed effectively, the mutually beneficial dialogue through increased military-to-military interaction between the United States and

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14. Sarah E. Light, *The Military-Environmental Complex*, 55 B.C. L. REV. (forthcoming May 2014) (citing THE CNA CORPORATION, NATIONAL SECURITY AND THE THREAT OF CLIMATE CHANGE 1 (2007) & Memorandum of Understanding Between U.S. Dep't of Energy and U.S. Dep't of Def. 2 (July 22, 2010) (on file at http://energy.gov/sites/prod/files/edg/media/Enhance-Energy-Security-MOU.pdf)).

15. I have written previously and in more detail on this concept. *See* Siddhartha M. Velandy, *The Green Arms Race: Reorienting the Discussions on Climate Change, Energy Policy, and National Security*, 3 HARV. NAT'L SEC. J. 309 (2012).

China can facilitate the sharing of best practices on a range of security issues like humanitarian assistance or disaster relief. This engagement will also allow military leaders from both nations to develop cultural understanding and personal relationships. These ties will not only help avoid miscalculation and misunderstanding during times of crisis, but also will have the power to bend the global outlook for energy demand.

Part IV concludes by discussing the impact of sustained U.S.-China cooperation on global governance and the language of energy policy.

I. THE UNCONVENTIONAL ENERGY ARMS RACE

The United States military plays in its own league. Accounting for close to forty percent of the world's total military spending, the U.S. military budget dwarfs all others. And of course, the financial ledger does not tell the whole story. China's People's Liberation Army is the largest military force in the world, with an advertised active strength of around 2.3 million personnel.[16] Even so, the ability to project power is a critical variable. In this area, the United States has the sizable advantage.

The United States Navy is the premier vehicle of American force projection. The Navy sails ten nuclear powered aircraft carriers, with two more under construction.[17] They are the largest ships in the world, each designed for an approximately 50-year service life, with only one mid-life refueling.[18] As Ray Mabus, Secretary of the Navy, stated recently:

> [T]he Founding Fathers . . . recognized that having a Navy and Marine Corps to sail the world's oceans and protect our commerce and national interest was vital in making the United States a player on the world stage. From George Washington's first schooners . . . the Navy was seen as important, yes in wartime, but also in peacetime . . . that is called presence. Presence is what we do; presence is what the Navy and Marine Corps are all about.[19]

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16. *China's Military Rise: The Dragon's New Teeth*, ECONOMIST (Beijing), Apr. 7, 2012, at briefing, *available at* http://www.economist.com/node/21552193. By contrast, the United States active military force numbers around 1.4 million personnel. *About*, OFFICE OF THE UNDER SEC'Y FOR PERS. AND READINESS, http://prhome.defense.gov/about.aspx (last visited Mar. 18, 2014).

17. *The Carriers: The List*, U.S. DEP'T OF THE NAVY, http://www.navy.mil/navydata/ships/carriers/cv-list.asp (last visited Mar. 19, 2014).

18. *U.S. Navy Fact File: Aircraft Carriers—CVN*, U.S. DEP'T OF THE NAVY, http://www.navy.mil/navydata/fact_display.asp?cid=4200&tid=200&ct=4 (last updated Nov. 20, 2013).

19. Ray Mabus, Sec'y of the Navy, at the Surface Navy Association Symposium (Jan. 14, 2014), *available at* http://www.navy.mil/navydata/people/secnav/Mabus/Speech/SurfaceNavyAssociation14Jan14.pdf.

This global presence takes a tremendous amount of energy to fuel. The Defense Department is the single largest energy consumer in the nation, responsible for just under two percent of total consumption.[20] In 2012, the U.S. military used 4.3 billion gallons of fuel at a cost of approximately $20 billion.[21] Oil is a globally traded commodity. Due to spikes in the global market, in 2012 alone, the Department of Defense had $3 billion in unbudgeted fuel costs.[22]

Energy is an essential element of the United States' global presence, and for precisely that reason, the Department of Defense is at the center of energy innovation. Military leaders, informed by the longest sustained conflict in American history, are finding that military forces are far more agile as energy efficiency increases and the tether of liquid fuel diminishes.

This Defense-led energy innovation, managed effectively, can be shared through both formal treaty mechanisms and informal networks to globalize the demand for unconventional energy and drive the development of new technology and effective regulation. Our allies will be strong partners, able to localize the benefits of a more efficient and lethal military force. The global demand and innovation will spill over into the commercial market, making new technology available to private citizens across the globe. This defense-led energy innovation has the power to unite the once bespoke approaches to address climate change, energy policy, and national security. The unconventional energy arms race will result in a more efficient fighting force, more diverse sources of energy, and a more stable world order.

History provides great instances of defense-driven innovation leading greater change. The next section explores just one example.

A. Historical Perspective—Global Presence Fueling Innovation

Throughout history, great navies have been at the center of energy innovation.[23] Commanders seeking even incremental advantages on the seas

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20. Sharon Burke, Department of Defense Bloggers Roundtable: Operational Security, Energy Security and Operational Energy Needs of the Department of Defense, (Oct. 14, 2010), *available at* http://www.defense.gov/Blog_files/Blog_assets/20101014_burke_transcript.pdf.

21. Claudette Roulo, *Clean Energy Tied to National Security, Official Says*, American Forces Press Service, Feb. 7, 2013, *available at* http://www.defense.gov/news/newsarticle.aspx?id=119237.

22. *Dep't of Def. Appropriations for Fiscal Year 2013: Hearing Before the S. Select Subcomm. of the Comm. on Appropriations*, 112th Cong. (2012) (statement of Leon Panetta, U.S. Sec'y of Def.), http://www.gpo.gov/fdsys/pkg/CHRG-112shrg29104515/html/CHRG-112shrg29104515.htm.

23. Herodotus' history of the Battle of Salamis is instructive. In that Battle, a vastly outnumbered allied force of Greek triremes took on and defeated the Persian fleet using smaller, faster ships and superior tactics. *See generally* HERODOTUS, THE HISTORY OF HERODOTUS (George Rawlinson

led the transitions from oar power to canvas sails, from sails to coal, from coal to oil, and from oil to nuclear power.[24] In the 1850s, it was the United States Navy that led the transition from wind power to coal. After World War II, Navy Admiral Hyman Rickover and his team, in just seven years, developed the technology, engineered, and built the first nuclear submarine, the USS Nautilus.[25]

Today, the U.S. Navy is again at the forefront of energy innovation, sailing the Great Green Fleet, a carrier strike group fueled by alternative sources of energy, including nuclear power and advanced biofuel blends. The Great Green Fleet demonstrated its technology during the 2012 Rim of the Pacific exercise, the world's largest international maritime exercise. The Navy's quest for greater operational flexibility is lessening its reliance on petroleum and changing the way we think about energy. As we wade into the second decade of the 21st century, the United States Navy finds itself on a path blazed one hundred years ago by a daring First Lord of the Admiralty.

When Winston Churchill was appointed First Lord of the Admiralty in 1911, one of the most important decisions he faced was how best to position the Royal Navy to meet the challenge of an aggressive and growing German Navy.[26] Just before Churchill was appointed First Lord, Kaiser Wilhelm, looking to secure a German position in Africa, steamed the German naval vessel Panther into a harbor on the Atlantic Coast of Morocco.[27] Though the Panther posed no real threat, the buildup of the German Army increased tensions in Europe.[28] It was under these circumstances that Churchill approached his critical decision.

In the years following Queen Victoria's Diamond Jubilee,[29] the Royal Navy was the largest maritime force in the world and embodied Britain's imperial power.[30] With the benefit of a large domestic supply of coal available in Wales and a well-established global network of coaling stations, the Royal Navy was able to patrol the seas and touch all corners of the Realm.[31] Coal also had the advantage of being inert—shells exploding

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trans., New York, D. Appleman & Co., 1885), *available at* http://www.shsu.edu/~his_ncp/Herosal.html (providing a history of the Battle of Salamis).

24. Keith Johnson, *Navy Sails to Greener Future*, WALL ST. J. June 14, 2012.

25. DANIEL YERGIN, THE QUEST: ENERGY, SECURITY, AND THE REMAKING OF THE MODERN WORLD, 366–67 (2011).

26. DANIEL YERGIN, THE PRIZE 11–13 (1991).

27. *Id* at 11.

28. *Id.*

29. JOFFE, *supra* note 2, at 95.

30. YERGIN, *supra* note 26 at 11–12.

31. Erik J. Dahl, *Naval Innovation: From Coal to Oil*, JOINT FORCES Q. 50, 50–51 (2001), *available at* www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA524799.

in coal bins on board a ship or in fueling stations on shore would not ignite the fuel.[32] Coal had significant advantages for the Royal Navy.

From the moment he became First Lord, Churchill immersed himself in his work. His formal military training and service had been in the cavalry,[33] so he endeavored to learn everything—history, strengths, flaws, tactics, and capabilities—about the Royal Navy.[34] He made the Admiralty's yacht, the Enchantress, his office, and in his words, "almost my home."[35] He visited every important ship, dockyard, shipyard, and naval establishment in the British Isles and the Mediterranean.[36] Showing his leadership skill, Churchill ingratiated himself with the junior officers and sailors, often surprising them below deck to ask them all manner of questions.[37] He brought his wife, Clementine, with him on his journeys. Knowing that Churchill disliked meals where nothing important was accomplished, Clementine invited guests who could be useful to the Admiralty.

Churchill worked seven days a week. One of his advisors wrote to a friend,

> Winston stays until at least eight every day . . . . Even Sundays are no longer my own, as I have spent three out of the last four on the Enchantress. We have made a new commandment. 'The seventh day is the Sabbath of the First Lord, and on it thou shalt do all manner of work.'[38]

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32. *Id.* at 51.

33. WILLIAM MANCHESTER, THE LAST LION: WINSTON SPENCER CHURCHILL, VISIONS OF GLORY 1874–1932, at 424 (1984).

34. John McCain, *John McCain: Extraordinary Foresight Made Winston Churchill Great*, TELEGRAPH (Mar. 20, 2008), http://www.telegraph.co.uk/culture/books/3671962/John-McCain-Extraordinary-foresight-made-Winston-Churchill-great.html ("Most often, as was the case with Winston Churchill, a man of intelligence and imagination, foresight is the result of painstaking inquiry and the disciplined application of reason to acquired knowledge, in order to see a previously unseen pattern or opportunity. People who have shown extraordinary foresight are often rather unconventional. They take calculated risks. They aren't afraid to be bold. People whom history has proclaimed as visionaries have often appeared more reckless than their contemporaries.").

35. MANCHESTER, *supra* note 33, at 13.

36. *Id.* at 424; McCain, *supra* note 34 (describing that Churchill learned everything from gunnery to the moral of the force. To better understand airplanes and their potential impact on the battlefield, he learnt, much to Clementine's dismay, how to fly and spent countless hours learning the instruments and crawling around gun terrets to see how they worked.); MANCHESTER, *supra* note 33, at 438 (describing that because of Churchill's efforts and insights, England was the first nation to arm a plane with a machine gun and to fire an airborne torpedo.).

37. MANCHESTER, *supra* note 33, at 426 (quoting an article from the *Daily Express* that reported "[h]e had a yarn with nearly all the lower deck of men of the ship's company, asking why, wherefore, and how everything was done. All the sailors 'go the bundle' on his, because he makes no fuss and takens them by surprise. He is here, there, and everywhere.").

38. *Id.* at 425.

Churchill led a Royal Navy that was critical to Britain's survival. Two-thirds of the island nation's food was imported, and English merchant vessels were responsible to move over half the world's seaborne trade.[39] Churchill made it his business to put the fleet into "a state of instant and constant readiness for war in case we are attacked by Germany."[40] Germany already had the most powerful land army on the continent, and its growing naval force posed an increasing threat to Britannia.

The First Lord put the fleet on a wartime footing. From the day he checked in, officers manned the watch twenty-four hours a day and seven days a week.[41] To mentally prepare himself and his staff for the dangers that lurked offshore, Churchill hung a large chart of the North Sea in his office and used it to track the location of every German warship.[42] He also explored several physical upgrades to the fleet to maintain the Royal Navy's advantage over the Germans.

To help guide the transformation of the fleet, Churchill brought John Fisher, a former Admiral of the Fleet, on board as his counselor.[43] Admiral Fisher was a legend in Britain and was said to be "the greatest sailor since Nelson."[44] Fisher was a naval genius and when combined with Churchill's own vision, they made a brilliant and powerful pair.[45]

Fisher had three primary recommendations: arm battleships with larger guns (fifteen inch guns that could fire a 1,920 pound shell); increase the speed of the fleet by switching from coal to oil; and reform the senior leadership.[46] Churchill accepted all three recommendations and moved quickly to effect the required changes. As to the first, no gun that size had ever been used on a ship. Further, Churchill wrote, "Enlarging the guns meant enlarging the ships, and enlarging the ships meant enlarging the cost."[47] Additionally, larger, heavier ships required more powerful propulsion systems. This is where Fisher's bold suggestion to transition from coal to oil came in.

Churchill noted, "The advantages conferred by liquid fuel were inestimable . . . [But] to change the foundation of the navy from British coal

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39. *Id.* at 427.
40. *Id.*
41. *Id.*
42. *Id.*
43. *Id.*
44. *Id.* at 429.
45. *Id.* at 431.
46. *Id.*
47. McCain, *supra* note 34.

to foreign oil was a formidable decision in itself."[48] Low cost, strategic advantage, and a rich naval tradition[49] weighed heavily against any energy transition. "To commit the Navy irrevocably to oil was indeed 'to take arms against a sea of troubles.'"[50] Moreover, a direct hit on an oil tank would set it on fire, and oil storage facilities on shore would become an attractive target.[51]

Against these issues, however, oil yielded many benefits. Churchill found that oil packed twice the energy as coal, so ships of the same size could go twice as far and faster.[52] Burning oil also yielded less smoke than burning coal, so ships would be able to sail closer to their quarry without revealing their presence.[53] Further, being a liquid, oil did not have to be stored right next to the boilers; it could be stored anywhere on ship and piped to the engine without the need for stokers to shovel coal into the furnace.[54] This afforded ship designers more flexibility and allowed a reduction in manpower on board or a redistribution of personnel towards war-fighting functions.

So, with this all in mind, Churchill went all in and committed himself and the future of the Empire to making the transition. At the end of 1913, Churchill submitted his budget for the following year: £50,694,800.[55] This budget request was the largest in British history, and the largest proposed naval expenditure in the world.[56] Churchill faced another challenge: while England enjoyed tremendous coal reserves, it at the time produced no oil.[57] To overcome this, Churchill asked the government to invest £5 million in the Anglo-Persian Oil Company to ensure adequate reserves were available for war.[58] For this sum, the government would gain fifty-one percent of the company, be allowed two directors on the board, and secure a secret contract to provide the Admiralty a 20-year supply of oil.[59]

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48. Dahl, *supra* note 31, at 51.

49. MANCHESTER, *supra* note 33, at 437 (describing that at the end of a conference on naval strategy, one of the admiral accused Churchill for impugning the traditions of the Royal Navy. In response, Churchill asked "And what are they? I shall tell you in three words. Rum, sodomy, and the lash. Good morning, gentlemen.").

50. YERGIN, *supra* note 26, at 12.

51. McCain, *supra* note 34.

52. YERGIN, *supra* note 26, at 12.

53. *Id.*

54. *Id.*

55. *See* MANCHESTER, *supra* note 33, at 443–56 (providing a terrific discussion of the political battle between Churchill and Lloyd George, and how the Irish Nationalist movement impacted defense budget negotiations).

56. *Id.* at 443.

57. McCain, *supra* note 34.

58. MANCHESTER, *supra* note 33, at 431.

59. Dahl, *supra* note 31 at 52.

Churchill harnessed the language of national security to make his case to Parliament. Other nations did not need a navy like Britain did. Churchill noted that:

> [The Royal Navy's ships] were all we had. On them, as we conceived, floated the might, majesty, dominion, and power of the British Empire. All our long history built up century after century, all the means of livelihood and safety of our faithful industrious, active population depended on them. Open the sea-cocks and let them sink beneath the surface . . . and in a few minutes—half an hour at the most—the whole outlook of the world would be changed. The British Empire would dissolve like a dream; each isolated community struggling by itself; the central power of union broken; mighty provinces, whole Empires in themselves, drifting hopelessly out of control, and falling a prey to others . . . .[60]

Churchill's determination won the day. Parliament supported his efforts and thus ensured Britain's naval supremacy during the Great War. During the conflict, the German Navy largely avoided direct conflict with Churchill's Grand Fleet. In 1916, during the only large-scale naval battle of the war, the Battle of Jutland, British super-dreadnoughts, with their fifteen inch guns and unmatched speed, forced the German fleet back to its ports in the Baltic.[61] While the battle was fought to a draw, the Germans never again challenged Britain for control of the North Sea.[62]

The rest of Churchill's history is familiar. As Prime Minister, he led his nation through the darkest days of the Second World War.[63] His foresight and characteristic tenacity was evidenced early in his career. Under Churchill's leadership, the Royal Navy's conversion from coal to oil took just three years and provided a quantum leap for naval technology.

The United States Navy provided the next leap in energy innovation. In 1954, the USS Nautilus set to sea and marked a new era of naval power becoming the first nuclear powered ship on earth.[64] Today, as a result of continued innovation and stalwart leadership, the United States Navy has

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60. MANCHESTER, *supra* note 33, at 426–27.

61. McCain, *supra* note 34.

62. MANCHESTER, *supra* note 33, at 426–27.

63. *See generally id.* (describing Churchill's leadership as Prime Minister during World War II).

64. *History of the USS Nautilus (SSN 571)*, SUBMARINE FORCE MUSEUM, http://www.ussnautilus.org/nautilus/index.shtml?museumNautilus (last visited Mar. 25, 2014).

taken over the task of deterring aggression and maintaining freedom of the seas.[65]

B. Today's Force—More Fight, Less Fuel

"Energy choices save lives on the battlefield."[66]

Both in the operational environment and on board military installations, energy innovation has saved lives and reduced costs. In addition to the roughly $15 billion spent on fuel, between fiscal years 2003 and 2007, in Iraq and Afghanistan, more than 3,000 Army personnel and contractors were wounded or killed in action from attacks on fuel and water resupply convoys.[67] Further, every dollar per barrel increase in the price of oil requires a $30 million increase in the Department of the Navy's fuel budget[68] and a $130 million addition to the overall Department of Defense budget.[69] Programs like the Navy's Great Green Fleet and the Marine Corps' Experimental Forward Operating Base ("ExFOB") are driving innovation and making the Navy and Marine Corps team more mission capable.

Just as Churchill's Navy projected the power and glory of Britannia across the seven seas, United States sailors and Marines constitute today's most formidable forward-deployed expeditionary force. The Navy-Marine Corps team is constantly tasked with a wide-range of operations, which could include major combat missions in Afghanistan, or immediate humanitarian assistance and disaster relief in the Philippines during the aftermath of Typhoon Haiyan. This global presence and engagement is driving innovation.

Secretary Mabus has made energy a cultural issue for his Department. The Navy must have energy to achieve its global presence. The Navy and Marine Corps, as they have done countless times in the past,

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65. *Mission of the Navy*, U.S. DEP'T OF THE NAVY, http://www.navy.mil/navydata/organization/org-top.asp (last visited April 14, 2014).

66. U.S. MARINE CORPS, EXPEDITIONARY ENERGY STRATEGY AND IMPLEMENTATION PLAN 35 (2011), *available at* http://www.hqmc.marines.mil/Portals/160/Docs/USMC%20Expeditionary%20Energy%20Strategy%20%20Implementation%20Planning%20Guidance.pdf (quoting General James T. Conway).

67. DEP'T OF DEF., ENERGY FOR THE WARFIGHTER: OPERATIONAL ENERGY STRATEGY 4–5 (2011).

68. Michael Richardson, *U.S. Armed Forces Wage Campaign to Go Green*, STRAITS TIMES (Jan, 30, 2012), *available at* http://abccarbon.com/us-uncovering-a-great-green-fleet/.

69. Press Release, Office of the Press Sec'y, The White House, Fact Sheet: Obama Administration Announces Additional Steps to Increase Energy Security (Apr. 11, 2012) (on file at http://www.whitehouse.gov/the-press-office/2012/04/11/fact-sheet-obama-administration-announces-additional-steps-increase-ener).

are adapting to ensure the military will be able to accomplish its mission with "less risk and lower cost."[70] At the center of this strategy is the need for increased energy productivity, efficiency, and heterogeneity in sources of fuel.

The U.S. Navy demonstrated its Great Green Fleet—a carrier strike group, including its air wing, fueled entirely by alternative sources of energy, including nuclear power.[71] The Navy sailed the Great Green Fleet during the 2012 Rim of the Pacific exercise, which is the world's largest international maritime exercise. During this evolution, the Navy successfully demonstrated the ability of drop-in replacement advanced biofuel blends, made from used cooking oils and algae, to power systems operating at full capacity.[72]

The USS Makin Island ("LHD-8") is currently completing its sea qualifications for her upcoming scheduled deployment.[73] She is the Navy's first Wasp-class amphibious assault ship with an all-electric auxiliary system and a hybrid gas turbine-electric propulsion system.[74] On her maiden voyage, the Makin Island's hybrid drive saved approximately one million gallons of fuel and saved nearly half of the vessel's $33 million fuel bill.[75] The Makin Island is expected to save more than $250 million in fuel costs over her life.[76]

In addition to pure technological innovation, the Department of the Navy is pursuing novel research and funding mechanisms to reorient the bureaucracy towards energy innovation. The Farm-to-Fleet Program unites the experience and interests of the Departments of Energy, Agriculture, and the Navy in partnership with the private sector to accelerate the development of a domestic market for advanced biofuels that are cost-

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70. Sharon E. Burke, Navy Energy Forum Remarks 3 (Oct. 12, 2010), *available at* http://www.dtic.mil/ndia/2010navy/BurkeS_Remarks.pdf.

71. *Great Green Fleet: Overview*, U.S. DEP'T OF THE NAVY, http://greenfleet.dodlive.mil/energy/great-green-fleet/ (last visited Mar. 18, 2014) (describing that "[t]he Great Green Fleet is named in honor of President Theodore Roosevelt's Great White Fleet, which helped usher in America as a global power on the world stage at the beginning of the 20th Century.").

72. *Id.*

73. *USS Makin Island*, U.S. DEP'T OF THE NAVY, http://www.public.navy.mil/surfor/LHD8/Pages/default.aspx#.UynKG1yAeZh (last visited Mar. 19, 2014).

74. DEP'T OF DEF., *supra* note 67, at 9.

75. *USS Makin Island (LHD 8)*, U.S. DEP'T OF THE NAVY, http://greenfleet.dodlive.mil/files/2010/04/MakinIslandEnvironmentFactsheet_v2.pdf (last visited Mar. 28, 2014); Ray Mabus, *Green Water: Can the U.S. Navy Win the Eco-Arms Race?*, FOREIGN POL'Y (Aug. 6, 2013), http://www.foreignpolicy.com/articles/2013/08/06/navy_energy_oil_biofuels_ray_mabus.

76. *USS Makin Island (LHD 8)*, *supra* note 75.

competitive with traditional fuels.[77] The departments pledged to invest a combined $510 million on a one-to-one cost sharing basis with private partners, to build multiple, geographically dispersed, commercial scale refineries.[78]

Through this program, the military will not be forced to pay a premium for biofuel.[79] Using authority in Title III of the Defense Production Act, which supports industrialization of defense-critical domestic industries, the Department of Defense announced an award to three private companies to build capacity to produce 150 million gallons of drop-in military compatible biofuels each year at an average cost of less than $4 per gallon—a price competitive with conventional fuels.[80] The Navy committed not to pay for operational quantities of biofuel until it was cost-competitive with traditional fuel sources.[81] With creative programs like Farm-to-Fleet, the Navy now expects to be able to buy operational quantities of biofuel at competitive prices by 2016.[82]

As the Navy demonstrates and validates advanced biofuels, prices will fall and other industries will begin to incorporate proven technologies into their operations. Commercial airlines have completed test flights using biofuels and "[o]ther nations pursuing advanced biofuels like Brazil, Australia, and Singapore create the potential for increased cooperation on research, development, deployment, and increased security for our allies."[83]

Energy innovation has made the Navy more capable and better able to defend the United States around the globe. As with Churchill, these changes will require and encourage changes on shore. Navy and Marine Corps bases are also benefitting from the incorporation of efficiency standards, smart grids, and other energy efficient upgrades.[84]

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77. Jim Lane, *USDA, US Navy Unveil Farm to Fleet Program: Navy "Open for Business" as Shift to Biofuels Blends Begins*, BIOFUELS DIGEST (Dec. 11, 2013), http://www.biofuelsdigest.com/bdigest/2013/12/11/usda-us-navy-unveil-farm-to-fleet-program-navy-open-for-business-as-shift-to-biofuels-blends-begins/.

78. *Id.*

79. *Id.*

80. *Id.*

81. *Id.*

82. *Id.*

83. Mabus, *supra* note 75.

84. PEW CHARITABLE TRUSTS, POWER SURGE: HOW THE DEPARTMENT OF DEFENSE LEVERAGES PRIVATE RESOURCES TO ENHANCE ENERGY SECURITY AND SAVE MONEY ON U.S. MILITARY BASES, 11–19 (Jan. 1, 2014), *available at* http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Report/PEW-DoD_Report_2013_KS_10_020314.pdf. The Department of the Navy's strategy has four parts: reduce demand; increase on-site power generation with renewable energy; use smart grids and other enhanced energy management techniques to manage energy production and demand; and, drive facility energy innovation. *Id.*

The Navy hosts the Defense Department's largest renewable energy project. Naval Air Weapons Station China Lake in California's Mojave Desert is home to a geothermal plant that generates 170-Megawatts of energy, roughly half of all the military's renewable energy.[85] With the energy from the China Lake facility, along with the energy from a biomass plant at its base in Norfolk, Virginia, the Navy was able to produce or procure 20.6% of its energy in 2012 from renewable sources.[86]

To reduce its energy intensity, the energy used per gross square foot, the Navy plans to utilize power purchase agreements and other innovative instruments to invest $2.4 billion in efficiency improvements during 2012–2017.[87] Power purchase agreements allow the military to enter into long-term contracts with private developers who finance, build, and operate renewable energy projects on military installations.[88] The military saves money by agreeing to buy the power produced by the project at a fixed price for a set period of time up to thirty years.[89] The Navy signed the Defense Department's first power purchase agreement to build a 13.8-Megawatt solar array at China Lake.[90] This project reduced the base's energy needs by 30%.[91] However, the Marines, not to be outdone, are leading the charge for energy innovation.

Marines are frequently referred to as *Jarheads*, *Teufel Hunden* (Devil Dogs),[92] and *America's 911 Force*,[93] but not routinely as ardent environmentalists. Nonetheless, energy innovation has become a cultural issue for Marines, changing the way the " Marine Corps employs energy and resources to increase combat effectiveness and reduce [the] need for logistics support ashore."[94] The Marine Corps is a force in constant readiness, a "middleweight force, light enough to get there quickly, but heavy enough to carry the day upon arrival, and capable of operating

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85. *Id.* at 25.
86. *Id.* at 41.
87. *Id.*
88. *Id.* at 4.
89. *Id.* at 15. 10 U.S. Code, Section 2922(a) provides the Department of Defense with the authority to enter into power purchase agreements of up to thirty years with private energy-production facilities. *Id.* at 14. The Department of Defense is also one of the federal agencies with the authority to enter into enhanced use leases. *Id.*
90. *Id.* at 41.
91. *Id.* at 16.
92. *Did Marines, Not German Soldiers, Coin the Phrase 'Devil Dogs'?*, STARS AND STRIPES (Jan. 4, 2011), http://www.stripes.com/blogs/the-rumor-doctor/the-rumor-doctor-1.104348/did-marines-not-german-soldiers-coin-the-phrase-devil-dogs-1.130602#.UzXQQ8tOXaQ.
93. Timothy Lenzo, *Air Contingency Battalion Sets up America's 911 Force*, MARINES, Oct. 2, 2013, http://www.1stmardiv.marines.mil/News/NewsArticleDisplay/tabid/8585/Article/151224/air-contingency-battalion-sets-up-americas-911-force.aspx.
94. U.S. MARINE CORPS, *supra* note 66, at 13.

independent of local infrastructure."[95] The current Marine Corps is designed to be light, agile, and self-sustaining. However, the tether of fuel provides the Marines with a heavy umbilical cord.

The Commandant of the Marine Corps, General James Amos, tasked his headquarters with the goals of "reducing energy demand in our platforms and systems, increasing the use of renewable energy, and instilling an ethos of energy and water efficiency in every Marine."[96] General Amos further added:

> Our priority is force protection—saving lives by reducing the number of Marines at risk on the road hauling fuel and water. We also aim to help Marines travel lighter and move faster through the reduction in size and amount of equipment and the dependence on bulky supplies.[97]

Over several years of sustained combat, the Marine Corps has become heavier. Since 2001, a Marine Corps infantry battalion, roughly 1,000 Marines strong, has had a 300% increase in computers and other technology and a 200% increase in vehicles.[98] A company, roughly 150 Marines, uses more fuel today than a battalion used fifteen years ago.[99] Each day in Afghanistan, the Marine Corps burns through about 200,000 gallons of fuel to power vehicles, provide heating and cooling, and satisfy other needs at operating bases.[100] All this fuel comes at a steep cost. According to a Marine Corps study, during a three-month period in 2010, six Marines were wounded in convoys delivering water and fuel to forward operating bases in Afghanistan that is one Marine wounded for every fifty

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95. U.S. MARINE CORPS, AMERICA'S EXPEDITIONARY FORCE IN READINESS 1, 2 (2013), http://www.hqmc.marines.mil/Portals/61/MarineCorps101.pdf.

96. JAMES F. AMOS, 2011 REPORT TO CONGRESS ON THE POSTURE OF THE UNITED STATES MARINE CORPS 15 (2011), *available at* http://www.hqmc.marines.mil/Portals/142/Docs/FY-12%20USMC%20Posture%20Statement_Generic%5B1%5D.pdf.

97. *Id.*

98. Justin Gerdes, *Marines Push to Front Lines in Renewable Energy Innovation*, YALE ENV'T 360 (Jun. 27, 2013), http://e360.yale.edu/feature/marines_push_to_front_lines_in_renewable_energy_innovation/2667/.

99. *Id.*

100. Mark Walker, *Military: Marine Corps Testing Lighter, More Self-Sufficient Hardware*, SAN DIEGO UNION-TRIB. (Sept. 18, 2012) http://www.utsandiego.com/news/2012/Sep/18/military-marine-corps-testing-lighter-more-self/.

convoys.[101] The Marines found that over 70% of the supplies required to sustain Marines on shore are liquid: fuel and water.[102]

To achieve greater operational reach with less risk, the Marines have aggressively started to reduce their reliance on liquid supplies. In 2009, the Marines founded the Experimental Forward Operating Base ("ExFOB"), to bring together Marines, scientists, acquisition professionals, and private industry to demonstrate commercial alternative and efficient energy technologies..[103] Commercial vendors are invited to ExFOB twice a year to demonstrate their products.[104] Marines evaluate promising technologies in training and combat conditions, and the successful technologies are procured for use by the operating forces.[105]

In 2010, Marines deployed to Sangin, Afghanistan with a suite of renewable and efficient energy technologies developed and tested at the ExFOB.[106] This company was able to run two patrol bases entirely on solar power.[107] The Marines were also able to execute a three-week foot patrol without battery resupply, lightening their load by 700 pounds.[108] The systems used by this company are now available to all Marine units deploying to combat.[109] By fielding this equipment, Marine units in Afghanistan are putting 208 fewer trucks on the road, saving 5.4 million gallons of gas per year.[110] By investing in renewable and efficient energy innovation, the Marine Corps is lighter, less reliant on re-supply, and is achieving greater operational reach with less risk.[111]

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101. U.S. MARINE CORPS, *supra* note 66, at 7.

102. United States Marine Corps, *Initial Capabilities Document for United States Marine Corps Expeditionary Energy, Water, and Waste* 1 (2011), *available at* http://www.hqmc.marines.mil/Portals/160/Docs/USMC%20E2W2%20ICD.pdf.

103. *EXFOB*, U.S. MARINE CORPS, http://www.hqmc.marines.mil/e2o/ExFOB.aspx (last visited Mar. 21, 2014).

104. *Id.*

105. *Id.*

106. *See* Elisabeth Rosenthal, *U.S. Military Orders Less Dependence on Fossil Fuels*, N.Y. TIMES (Oct. 4, 2010), *available at* http://www.nytimes.com/2010/10/05/science/earth/05fossil.html?_r=3&scp=1&sq=mil& (discussing the energy technologies used by company of Marines).

107. Gerdes, *supra* note 98.

108. Ray Mabus, Sec'y of the Navy, Remarks: Truman National Security Project (May 3, 2013) (transcript available at http://www.navy.mil/navydata/people/secnav/Mabus/Speech/Remarks_TrumanNSP_Delivered3May13.pdf.).

109. *Id.*

110. *Id.*

111. *See* Memorandum from John R. Allen, General, U.S. Marine Corps Commander, Int'l Security Assistance Force/U.S. Forces–Afghanistan (Dec. 11, 2011), *available at* http://energy.defense.gov/Portals/25/Documents/Blog/20111211_Memo_Supporting_Mission_Operational_Energy.pdf (describing that the energy consciousness in the deployed environment extends well past the Marine Corps. General Allen, when he was a commander to the International Security Assistance Force and the United States Forces–Afghanistan, penned a letter to his forces on supporting the mission

Sailors and Marines, following a long tradition of bold innovation stretching back to Churchill's England, and further to the Greeks, are showing that energy and national security are intertwined and a thoughtful energy policy is essential to maintaining a competitive edge. This new culture of energy-aware service members will make units and installations more self-sufficient, safer, and ultimately, more combat effective. This culture, bound by the mission to preserve and ensure national security is driving global energy innovation. In conjunction with the United States military's global presence, this energy-aware culture has the power to affect global change. Technology and effective regulation can be transmitted through formal and informal trans-governmental networks. This next section globalizes the culture of energy innovation.

C. The Green Arms Race and the Globalization of Unconventional Energy

The United States military interacts with foreign militaries in many ways, whether through active combat operations, training exercises, foreign military sales cases, or disaster relief and humanitarian assistance missions. Each of these interactions creates a structured network of global relationships. These powerful and largely anonymous structures are utilized to transfer technology and regulation among countries in the absence of a formal multilateral agreement. These relationships hold the key to globalizing the demand for clean energy.

While states are still the primary actors on the international plane, their power has been disaggregated to their constituent parts. Individuals now can negotiate with their foreign counterparts with no need for interstate-negotiation. Anne-Marie Slaughter argues that network relationships are the "new world order," stating:

> Disaggregating the state into its functional components makes it possible to create networks of institutions engaged in a common enterprise even as they represent distinct national interests. Moreover, they can work with their subnational and supranational

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with operational energy. In it, the General stated, "I need your help with personal choices. Every light bulb, hot water heater, and air conditioner is supplied by electricity by burning fuel. We move that fuel through the country in a contested battlespace [sic] to hundreds of generators at forward locations. By turning off lights, taking shorter showers, and shutting off unused air conditioners, you can help eliminate a resupply convoy or fight. Your small choices may save someone's life." Allen goes on to state, "Some have seen operational energy programs as efforts 'just to save money.' Not so. While we must be good stewards of our resources, Operational Energy in the battle space is about improving combat effectiveness. It's about increasing our forces' endurance, being more lethal, and reducing the number of men and women risking their lives moving fuel.").

> counterparts, creating a genuinely new world order in which networked institutions perform the functions of a world government—legislation, administration, and adjudication—without form.[112]

Interaction within the informal network strengthens domestic institutions and international organizations. Direct interaction between regulators across the globe facilitates the spread of effective regulatory mechanisms and technology between jurisdictions. Cooperation within the network is achieved through the convergence of best practices fostered through repeated interaction and emulation.[113] Networks provide the venue for this interaction and the transfer of information between subject matter experts.

Networks can establish themselves in many contexts. They can occur formally within international organizations or through informal agreements between interested bureaucrats themselves.[114] These networks can encourage cooperation in the absence of a treaty, or pave the way for a new agreement by creating convergence around successful and effective technologies and regulatory policies.[115] Most importantly for our inquiry, networks facilitate the multilateral sharing of knowledge and ideas between nations. Informational networks are incredibly useful for distilling best practices to solve problems of mutual interest.[116]

This distillation of best practices makes domestic regulation more efficient and international cooperation more durable. In the defense context, efforts to better meet mission requirements and create a more efficient and effective fighting force can be exported to our international partners through networks. Repeated interaction between defense experts can create "convergence through technical assistance and training."[117]

The United States wields the most powerful military force on the globe. A cultural change that makes the United States military more efficient and capable will garner attention and have immediate credibility among foreign experts. Changes in United States law, regulation, and military practice can be transferred through formal alliances like NATO; the Australia, New Zealand, and United States Security Treaty ("ANZUS");

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112. Anne-Marie Slaughter, *The Real New World Order*, FOREIGN AFF., (Sept.-Oct. 1997), *available at* http://www.foreignaffairs.com/articles/53399/anne-marie-slaughter/the-real-new-world-or.

113. Kal Raustiala, *The Architecture of International Cooperation: Transgovernmental Networks and the Future of International Law*, 43 VA. J. INT'L L. 1, 52 (2002).

114. ANNE-MARIE SLAUGHTER, A NEW WORLD ORDER 45 (2004).

115. *Id.* at 53.

116. *Id.*

117. *Id.* at 171–72.

Republic of Korea Treaty; or through informal interactions and information transfers. These interactions will also provide feedback on the United States' regulatory schemes and technologies, which may uncover new and more efficient methods to facilitate energy innovation.

The Navy-Marine Corps team's global presence is in a prime position to promote the quest for clean energy innovation. As Navy and Marine Corps forces operate throughout the world, whether using ExFOB fielded technology in forward deployed areas or sailing the Great Green Fleet to participate in disaster relief operations, this effect will be compounded. These interactions will create global requirements and reshape military forces around a new energy paradigm.

This new model for energy innovation has already started to spread. As mentioned above, the Rim of the Pacific is the world's largest maritime exercise. It is designed to "provide a unique training opportunity that helps participants foster and sustain cooperative relationships that are critical to ensuring the safety of sea lanes and security on the world's oceans."[118] Twenty-two nations, including Canada, Australia, India, Japan, Philippines, Singapore, Thailand, Malaysia, Russia, New Zealand, the United Kingdom, and South Korea participated in 2012, bringing forty surface ships, six submarines, more than 200 aircraft, and 25,000 personnel.[119]

During the exercise in 2012, the Royal Australian Navy ("RAN") signed an agreement to partner with the United States to explore the increased use of alternative fuels. RAN Fleet Commander, Rear Admiral Tim Barrett, AM, CSC, RAN, delivered the Statement of Cooperation to Secretary Mabus on board the aircraft carrier USS Nimitz.[120] The Fleet Commander landed on the USS Nimitz and refueled his helicopter with a biofuel blend.[121] His flight back to his ship HMAS Darwin, after the signing ceremony, marked the first time an RAN aircraft flew with a biofuel blend.[122]

In accordance with the Statement of Cooperation, the RAN will partner with the United States Navy and further develop alternative fuels for use during a joint deployment in 2016.[123] During this demonstration, the

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118. *Home*, RIMPAC 2012, http://www.cpf.navy.mil/rimpac/2012/ (last visited Mar. 19, 2014).

119. *About the Exercise*, RIMPAC 2012, http://www.cpf.navy.mil/rimpac/2012/about/ (last visited Mar. 19, 2014).

120. Media Release, Austl. Gov't Dep't of Def., Australian Navy Explores Alternative Fuel Use with United States (July 20, 2012), http://news.defence.gov.au/2012/07/20/australian-navy-explores-alternative-fuel-use-with-united-states/.

121. *Id.*

122. *Id.*

123. *Id.*

United States Navy will sail the Great Green Fleet across the Pacific to Australia to commemorate the arrival of the Great White Fleet in Sydney harbor in 1907.[124] The Great Green Fleet will then refuel with biofuels made in Australia for the return journey.[125] Demand by two large naval forces will send a strong signal to the emerging advanced biofuels industry. Emerging nations, not wanting to fall behind on the future battlefield, will work towards similar gains.

So starts the Green Arms Race.

The demand for clean energy innovation, passed through networked interactions between defense experts, is spreading across the globe. The United States Defense and State Departments, in their constant interactions with their foreign counterparts, facilitate the transfer of successful efficient energy regulation and technology. Once successful technologies and regulatory schemes are validated by global defense interaction, they will spill over into the commercial market. The progeny of the Green Arms Race will be more efficient fighting forces, increased heterogeneity in the sources of energy, and a change in direction of the global resource quest.

American leadership in clean and efficient energy innovation will create a more stable world order and align the once disparate approaches to climate change, energy dependence, and national security. Military energy innovation, shared through existing and newly forming defense networks, can reveal strong avenues for increased international military and diplomatic interaction. To be most successful, the Green Arms Race must involve the two largest consumers of energy on the planet.

II. CHINA—THE MIDDLE KINGDOM AND ITS RESOURCE QUEST

In 2012, Chinese Defense Minister General Liang Guanglie invited United States Defense Secretary Leon Panetta to spend four days in Beijing at the end of September.[126] During the visit, Secretary Panetta met with various members of the Chinese leadership and addressed the People's

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124. Nigel Pittaway, *U.S., Australian Navies to Cooperate on Biofuel Research*, DEFENSE NEWS (Jul. 25, 2012), *available at* http://www.defensenews.com/article/20120725/DEFREG02/307250001/U-S-Australian-Navies-Cooperate-Biofuel-Research.

125. *Id.*

126. Leon Panetta, Sec'y of Def., & Gen. Liang Guanglie, Minister for Nat'l Def., Joint News Conference in Beijing, China, Sept. 18, 2012, *available at* http://www.defense.gov/transcripts/transcript.aspx?transcriptid=5116.

Liberation Army War College.[127] The objective for the visit was to build mutual trust and promote increased military-to-military relations between the United States and China.[128]

In the context of the larger and emerging China and United States collaborative partnership, the Chinese Defense Minister noted that new defense relationships could form the foundation for a new type "of military-to-military relationship . . . based on equality, mutual benefit, and cooperation." The General Liang went on to say that, "it is necessary for the two militaries to have more dialogues, communication, to promote understanding—good trust and deepen exchanges and cooperation so as to constantly raise the level of development of this mil-to-mil relationship."[129]

In response, Secretary Panetta spoke about the fundamental goal of building a "U.S.-China military-to-military relationship that is healthy, stable, reliable, continuous, and transparent."[130] He highlighted United States and Chinese collaboration during counter-piracy exercises in the Gulf of Aden. To build on this momentum and cooperation, Secretary Panetta invited China to send a ship to participate in the Rim of the Pacific Exercise ("RIMPAC") in 2014.[131] In Secretary Panetta's view, increased interaction with the Chinese military would lower the risk of miscalculation and prevent conflict by increasing cultural understanding and demonstrating United States resolve to ensure free and open seas.[132] Increased defense collaboration with China can add a tremendous and necessary partner to alternative energy innovation.

Over the past several years, China has, with interest, studied the United States economy and watched the United States military's efforts to innovate. As the world's most populous country and largest energy consumer, China is pursuing a "by all means necessary"[133] energy strategy to ensure its long-term growth. In September 2013, China overtook the United States as the largest net importer of oil.[134] China's oil consumption

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127. *Id.*
128. *Id.*
129. *Id.*
130. *Id.*
131. *Id.*
132. *Id.*
133. *See generally* ELIZABETH C. ECONOMY & MICHAEL LEVI, BY ALL MEANS NECESSARY: HOW CHINA'S RESOURCE QUEST IS CHANGING THE WORLD (2014) (exploring the expansion of the Chinese economy and the global effects of its meteoric growth).
134. Ed Crooks, *China Tops US as Leading Net Oil Importer*, FIN. TIMES (Oct. 9, 2013), http://www.ft.com/intl/cms/s/0/4aef8e74-3062-11e3-9eec-00144feab7de.html#axzz2uIdyhKJk (noting that the United States Energy Information Administration found that the gap between oil consumption and domestic production averaged 6.24 million barrels per day in the United States, and 6.3 million barrels per day in China).

doubled between 1990 and 2000, and has since doubled again.[135] China is also aggressively pursuing energy alternatives, and it is the global leader in solar technology and is making heavy investments in biofuels.[136]

The United States has been watching China's reemergence carefully. China's resource quest is having a global impact in economic, political, and military spheres. Most recently, tensions in the South and East China Seas have risen; China and other regional powers like Japan, the Philippines, and Indonesia are maneuvering to control and secure energy rich territory and sea-lanes.

The rebalancing of attention to the Asia-Pacific region comes at precisely the right time. This strategic shift presents a tremendous opportunity for the United States to increase military-to-military interaction with China and mitigate tension in the region. This interaction will help both nations avoid miscalculation and misunderstanding, and facilitate collaboration on operations from anti-piracy patrolling to disaster relief. The next several paragraphs provide historical context and discuss the opportunity to add China as a partner in energy innovation.

A. The Middle Kingdom—A Historical and Cultural Perspective

"The world order, as currently constituted, was built largely without Chinese participation. Hence China feels less bound by rules in the creation of which it did not participate."[137]

While modern China traces its roots back to 1949, Chinese civilization stretches so far back in history that it seems to have no beginning.[138] At its greatest reach, Chinese civilization stretched from Siberia to the tropical jungles of South East Asia, and from its ports in the east to the Himalayan mountains in the west.[139] With such a great reach and diversity, China was a world unto itself.[140] The Chinese emperor was said to preside over "All Under Heaven."[141]

As a result of its vast size and geography, China existed and progressed as a nation largely apart from other civilizations.[142] It

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135. Mabus, *supra* note 75.

136. *Id.*

137. Henry A. Kissinger, *The Future of U.S.-Chinese Relations: Conflict Is a Choice, Not a Necessity*, *in* FOREIGN AFF. (Council on Foreign Relations 2012), *available at* http://www.foreignaffairs.com/articles/137245/henry-a-kissinger/the-future-of-us-chinese-relations (last visited Mar. 24, 2014).

138. HENRY KISSINGER, ON CHINA 5 (2011).

139. *Id.* at 7.

140. *Id.*

141. *Id.*

142. *Id.* at 8.

maintained trade via the Silk Road with India, but the impenetrable Himalayan Mountains prevented casual contact.[143] Central Asian deserts separated China from the neighboring Persians, Babylonians, the Greeks, Romans, and the rest of Europe.[144]

This geography and isolation led to a feeling of ambivalence towards the world outside Chinese borders. "In the Chinese perception, China was considered the center of the world, the 'Middle Kingdom,' and other societies were assessed as gradations from it."[145] China limited access to outsiders, who in its view would either steal China's great secrets or dilute its culture.[146]

During the Ming Dynasty, China for perhaps the first time, looked outward and embarked on a series of naval expeditions. Admiral Zheng He launched fleets of technologically advanced ships across to far off lands in Java, India, the Horn of Africa, and the Strait of Hormuz.[147] During these voyages, Admiral Zheng demonstrated the Chinese emperor's wealth by bestowing gifts on the rulers he encountered. Interestingly, while desiring that foreign leaders acknowledge Chinese greatness, Admiral Zheng expressed no further territorial ambition, merely accepting tribute to the Chinese Emperor as a sign of loyalty.[148]

But China's interest in engaging the outside world quickly waned. Subsequent rulers dismantled Admiral Zheng's advanced Navy.[149] While continuing to engage in trade, any benefit to foreign engagement was tempered by the fear that foreign influence would adversely influence Chinese culture and civilization.[150] Given its vast geography, population, and resource base, the Chinese did not have to seek out foreign ports. Until the Industrial Revolution, China was far richer than the rest of the world. As late as 1820, China produced 30% of world GDP, which is greater than the current GDP contributions of Europe and the United States combined.[151] China was so prosperous that it became a global model for successful development.[152]

China entered the nineteenth century as the wealthiest nation in the world, assured of its greatness, and indifferent to foreign influence, trade,

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143. *Id.*
144. *Id.*
145. *Id.* at 10.
146. *Id.*
147. *Id.* at 9.
148. *Id.*
149. *Id.*
150. ECONOMY & LEVI, *supra* note 133, at 11.
151. KISSINGER, *supra* note 138, at 11–12.
152. ECONOMY & LEVI, *supra* note 133, at 12.

and innovation.[153] From trade to tourism, the Chinese state tightly controlled interaction with the outside world.[154] However, driven by energy innovation, and industrial and scientific advancements, a new world order had emerged in the West. For the first time, Western technology surpassed China's own.[155] Additionally, continuing a trend that began in the Ming Dynasty, as China continued to grow, China began to exceed its internal capacity to source resources, including food.[156] Increasingly, China was forced to engage the outside world.

Rather than paying tribute and bowing to state controlled trade agreements, Western traders sought to impose their own standards of free trade and sovereign equality on the newly opened Chinese market.[157] The notion that China was simply one state among many did not comport with Chinese cosmology.[158] Increased interaction with Western emissaries in the Chinese capital only increased friction. The deteriorating situation of China's international relations finally boiled over during the Opium Wars.[159]

Largely the result of black market trading from British India to China, estimates indicate that between 4 and 12 million Chinese were addicted to Opium by the mid-nineteenth century.[160] The British, not wanting to give up their lucrative opium trade, clashed with the Chinese government. In the resulting conflict, the British Army routed the outmatched Chinese forces.[161] These losses weakened China and forced the imperial government to enter into a series of "unequal treaties," which provided the British, United States, and France with access to Chinese ports, the right to travel within the country, and eased protections against foreign involvement.[162]

The turn of the twentieth century looked much different than the nineteenth; China struggled to reconcile the notion of its own singularity with foreign technology and commerce. Foreign powers and local businessmen had broken the monopoly previously enjoyed by the Chinese central government. Regional powers within China fragmented the country,

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153. KISSINGER, *supra* note 138, at 32–33.
154. ECONOMY & LEVI, *supra* note 133, at 13–14.
155. *Id.* at 34.
156. *Id.* at 13–14.
157. KISSINGER, *supra* note 138, at 40–45.
158. *Id.* at 45.
159. *Id.* at 45–51. The Opium Wars occurred 1839-to-1842 and 1856-to-1860. *Id.*
160. ECONOMY & LEVI, *supra* note 133, at 14.
161. *Id.* at 15.
162. KISSINGER, *supra* note 138, at 53.

ushering in the fall of the Qing dynasty in 1911 and the rise of the "Warlord Era."[163]

It took until 1927 for China to be reunited—General Chiang Kai-shek, the leader of the Nationalist Party established the Republic of China.[164] Chiang Kai-shek reasserted central control over key areas like foreign trade and natural resource acquisition. He created the National Resources Council ("NRC") and tasked it with managing the China's industries, mines, and other enterprises.[165] "By 1944, nearly 70 percent of the total capital of public and private enterprises belonged to state-run operations, with three-quarters of the capital going to NRC operations."[166]

The Chinese Communist Party took control in 1949 and established the People's Republic of China ("PRC") under the command of the Chairman, Mao Zedong.[167]

> Domineering and overwhelming in his influence, ruthless and aloof, poet and warrior, prophet and scourge, he unified China and launched it on a journey that nearly wrecked its civil society. By the end of this searing process, China stood as one of the world's major powers and the only communist country except Cuba, North Korea, and Vietnam whose political structure survived the collapse of Communism everywhere else.[168]

Mao immediately launched the Continuous Revolution, which he designed to put the Chinese people in a constant state of struggle, not allowing them to rest on their achievements.[169] He continued to enforce the notion that China had to rely on itself to fuel its growth.[170] Using the Soviet model, Mao developed a coordinated five-year plan for oil, steel, electricity, industrial and military development.[171]

Mao's notion of continuous revolution was rooted in his quest "for the historic Chinese uniqueness."[172] While Mao outwardly rejected the

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163. ECONOMY & LEVI, *supra* note 133, at 16.
164. *Id.*
165. *Id.*
166. *Id.*
167. *Id.* at 18.
168. KISSINGER, *supra* note 138, at 92.
169. *Id.* at 93.
170. ECONOMY & LEVI, *supra* note 133, at 18.
171. *Id.*
172. *See* KISSINGER, *supra* note 138, at 109–10 (noting, "one objective of Mao's Cultural Revolution—from which indeed it derived its name—had been to eradicate precisely those elements of modernization that threatened to involve China in a universal culture.").

ancient Chinese Confucian tradition, he grounded the revolution in his faith in the reliance and cohesion of the Chinese people.[173]

In 1958, Mao launched the Great Leap Forward, his plan to catch up to the West industrially in a three-year period. In 1966 Mao started the Cultural Revolution, during which leaders, professors, and other professionals were sent to the countryside to work the land and learn from the masses.[174] Millions of Chinese died as a result of these ill conceived and poorly executed plans.

In the international arena, Mao positioned himself as the leader of the nonaligned movement (strictly allied with neither the United States nor the Soviet Union during the Cold War) and of the developing world more broadly.[175] His Premier, Zhou Enlai, set forth Chinese foreign policy in the Five Principles of Peaceful Coexistence: mutual respect for territorial integrity and sovereignty, nonaggression, noninterference in the internal affairs of others, equality, and mutual benefit.[176] In the 1960s, China modified this policy slightly to support national liberation movements in developing countries like Angola, Indonesia, and Mozambique.[177]

During the 1960s and 1970s, under Zhou Enlai's leadership, Chinese trade grew significantly, increasing twenty-five percent annually with regional partners.[178] When China was admitted into the United Nations in 1971, trade increased again as China normalized relations with many countries throughout the world.[179] Over this twenty-year period, Chinese trade increased nearly ten-fold and China grew.[180]

After Mao's death in 1976, Deng Xiaoping transformed China into a modern economy. Deng embraced the Four Modernizations—agriculture, industry, national defense, and science and technology—and opened the country to foreign investment.[181] These reforms gradually introduced market forces to the economy and drove a quarter-century of double-digit Chinese economic growth.[182]

This double-digit growth and incredible transformation requires a massive amount of fuel. China is now a major driver of the world economy.

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173. *Id.*
174. *Id.*
175. ECONOMY & LEVI, *supra* note 133, at 19.
176. *Id.*
177. *Id.*
178. *Id.*
179. *Id.*
180. *Id.*
181. *Id.* at 21.
182. *Id.*

To ensure China's growth continues, the Chinese are engaged in a global quest for resources.

B. China's Global Resource Quest

China's resource quest is changing the world's markets for commodities. China's economy is the fastest growing on the planet. [183] As noted above, China is the largest net importer of oil,[184] and its oil imports are growing by fifty percent each year.[185] Chinese state run oil companies have rapidly expanded their global presence by investing in international oil and gas assets in Africa, the Middle East, and Central Asia, through direct acquisitions of equity and development loans in exchange for oil supply.[186] Through this global engagement, China is not only securing diverse sources of liquid fuel, but is also learning and developing its own technical drilling and mining expertise.[187]

China is the world's largest power generator, with coal accounting for two-thirds of installed electric capacity.[188] While fossil fuels account for about 80% of China's total power generation capacity, it is expanding its alternative and clean energy usage.[189] China installed 12 gigawatts of solar capacity in 2013, which is 50% more than any country has ever built in a single year.[190] China has a goal to produce at least 15% of its overall energy from renewable energy sources by 2020.[191] The state invested $65 billion in 2012 in renewable energy products and plans to spend another $473 billion on similar projects by 2015.[192] China is home to the world's largest hydroelectric project, the Three Gorges Dam on the Yangtze River, and is the worlds second-largest wind producer.[193] That all said, even with this incredible growth in alternative energy, China is still adding more fossil

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183. *See China: Country Analysis Brief Overview*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/countries/country-data.cfm?fips=CH (last updated Feb. 4, 2014) (stating that China's fast-growing economy has led it to become the largest energy consumer and producer in the world).

184. Zachary Keck, *It's Official: China's the World's Largest Oil Importer*, DIPLOMAT (Oct. 11, 2013), http://thediplomat.com/2013/10/its-official-chinas-the-worlds-largest-oil-importer/.

185. MULLER, *supra* note 13, at 19.

186. ECONOMY & LEVI, *supra* note 133, at 19.

187. U.S. ENERGY INFO. ADMIN., *supra* note 12.

188. *Id.*

189. *Id.*

190. Brad Plumer, *China Installed Record Amounts of Solar Power in 2013. But Coal is Still Winning*, WASH. POST (Jan. 30, 2014), http://www.washingtonpost.com/blogs/wonkblog/wp/2014/01/30/china-in...number-of-solar-panels-in-2013-but-coal-is-still-winning//?print=1.

191. U.S. ENERGY INFO. ADMIN., *supra* note 12.

192. *Id.*

193. *Id.*

fuel capability than solar, wind, hydroelectric, and nuclear power combined.[194] China is the largest producer and consumer of coal in the world, accounting for nearly half of global consumption.

Western corporations compete in global commodities markets with China's state-owned energy companies that enjoy ultra-cheap loans from the Chinese government.[195] When the China National Petroleum Corporation won a share in a project to pump oil in Kazakhstan, the Chinese President himself travelled to the region to celebrate.[196] Kazakhstan is home to a vast new oil find, the biggest outside the Middle East.[197] When the project started pumping oil in September 2013, it was a clear signal that China's influence in the region was growing, commenters noted, "that China's influence has eclipsed even Russia's across the former Soviet republics of Central Asia."[198]

China's energy quest is also having strategic impact on China's immediate neighbors like Japan, the Philippines, and Malaysia. Driven by a desire to secure natural resources, ensure sea lane security and national defense, and grow national pride, China has started to flex its fledgling naval might in the South and East China Seas.[199]

Estimates of the petroleum resources in the South and East China Seas vary greatly. The U.S. Geological Survey assesses between 11 billion and 28 billion barrels of oil and approximately 145 trillion cubic feet of natural gas under the South China Sea. Chinese estimates assess between 213 billion and 400 billion barrels of oil (which would make it the largest oil field in the world) and 498 trillion and 700 trillion gallons of natural gas.[200] Estimates of East China Sea oil reserves are similarly speculative, ranging from the U.S. Energy Information Administration's numbers, 60–100 million barrels, and China's 70–160 billion barrels.[201]

Even in light of such varied estimates, the interesting conversation revolves around ownership and control. China has laid claim to the entire South China Sea, as did Vietnam, each country excluding only neighboring states' exclusive coastal areas. Of course, these claims overlap with those of the other neighboring nations, including Taiwan, Malaysia, the Philippines,

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194. Plumer, *supra* note 190.

195. *Id.*

196. Jane Perlez & Bree Feng, *China Gains New Friends in Its Quest for Energy*, N.Y. TIMES (Sep. 23, 2013), *available at* http://www.nytimes.com/2013/09/24/world/asia/china-gains-new-friends-in-its-quest-for-energy.html?_r=0.

197. *Id.*

198. *Id.*

199. ECONOMY & LEVI, *supra* note 133, at 139.

200. *Id.* at 140–41.

201. *Id.* at 141.

and Brunei. In the East China Sea, Japan and China are the two main competitors, each focusing on one set of islands called the Diaoyu in China and the Senkaku in Japan. Both nations claim ownership, the Japanese tracing their stake back to 1895, and the Chinese, referring to documents between envoys, tracing theirs to the Qing Dynasty.[202]

Recently, skirmishes have erupted between Japanese and Chinese ships. In 2010, the captain of a Chinese fishing boat crashed his vessel into two Japanese patrol boats near the disputed islands.[203] The Japanese took the Chinese captain into custody and held him for two weeks.[204] In China, the response was severe. Government officials condemned the Japanese actions and suspended all high-level exchanges and threatened "strong countermeasures" when Tokyo refused to release the Chinese mariner.[205]

While the Japanese eventually released the Chinese captain, tensions remained high. In 2012, the Japanese government announced that it had purchased the Senkaku islands from their private owner, a Japanese citizen.[206] This infuriated the Chinese, who called the maneuver "the most blatant challenge to China's sovereignty since the end of the second world war."[207] In 2013, Japan accused China of locking military radar "capable of aiding weapon strikes" on a Japanese ship and helicopter in the region, a claim which China denied.[208] Competing resources claims are causing similar incidents in the South China Sea.

While tensions in the East China Sea involve two nations and one set of islands, friction in the South China Sea has many more variables. The Sea itself spans 1.4 million square miles,[209] from Singapore and the Malacca Straits to the Strait of Taiwan, from the Vietnamese coast to the Philippines, and South to Indonesia. The oil and gas reserves that lie underneath the seabed hold the promise of economic opportunity for the

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202. *Id.* at 142.

203. Justin McCurry, *Japan-China Row Escalates Over Fishing Boat Collision*, GUARDIAN (Sept. 9, 2010), http://www.theguardian.com/world/2010/sep/09/japan-china-fishing-boat-collision.

204. Martin Fackler & Ian Johnson, *Arrest in Disputed Seas Riles China and Japan*, N.Y. TIMES (Sept. 19, 2010), http://www.nytimes.com/2010/09/20/world/asia/20chinajapan.html?_r=0.

205. *Id.*

206. Julian Ryall, *Japan Agrees to Buy Disputed Senkaku Islands*, TELEGRAPH (Sept. 5, 2012), *available at* http://www.telegraph.co.uk/news/worldnews/asia/japan/9521793/Japan-agrees-to-buy-disputed-Senkaku-islands.html.

207. ECONOMY & LEVI, *supra* note 133, at 143 (quoting Associated Press, *Senkaku Islands Dispute Escalates as China Sends Out Patrol Ships* (Sep. 11, 2012)).

208. *Id.*

209. David Brunnstrom, *U.S. Says China's Fishing Curbs 'Provocative and Potentially Dangerous'*, REUTERS (Jan. 9, 2014), http://www.reuters.com/article/2014/01/09/us-usa-china-fishing-idUSBREA0817720140109.

smaller regional nations and local energy security for China.[210] Several Southeast Asian nations, including China, Taiwan, Vietnam, Malaysia, Brunei, and the Philippines, claim title to the South China Sea's largest islands: the Spratly Islands, Paracel Islands, Pratas Islands, Macclesfield Bank, and Scarborough Shoal.[211]

In addition to the natural resources under the seabed, the South China Sea is home to fisheries, trade routes, and military bases.[212] Nearly fifty percent of global trade passes through the South China Sea,[213] and its sea lanes are home to three times more tanker traffic than the Suez Canal and five times more than the Panama Canal.[214] Freedom of navigation through this region is tremendously important to the global economy.

Competing claims in the region have forced countries to pursue two related paths. First, many countries have turned to international law to resolve conflicts. The United Nations Convention on the Law of the Sea ("UNCLOS") contains extensive rules on the establishment of economic zones in international waters.[215] China has submitted claims to the United Nations ("UN") over the Diaoyu Islands.[216] Japan did the same, referring to the disputed islands, of course, as the Senkaku.[217] The Philippines also brought their dispute with the Chinese over a territory dispute in the South China Sea to a UN arbitration tribunal.[218]

Unfortunately, the rules under the UNCLOS are unclear. Often, different parts of the UNCLOS provide justification for the arguments of two separate countries.[219] Further, while the UN commission has the authority to assess "the scientific validity of claims," it does not have the actual authority to resolve disputes.[220] So, the countries often find themselves back where they started, settling the disputes on their own, which leads us to their second course of action.

China, informed by its own study of history and international law, established the "9-Dash line" to demarcate its claim to territories and waters in the South China Sea.[221] In 2009, China submitted a map to the UN that

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210. U.S. ENERGY INFO. ADMIN., SOUTH CHINA SEA, http://www.eia.gov/countries/regions-topics.cfm?fips=scs (last updated Feb. 7, 2013).

211. *Id.*

212. *Id.*

213. ECONOMY & LEVI, *supra* note 133, at 146.

214. *Id.*

215. *Id.* at 146.

216. *Id.* at 147.

217. *Id.*

218. *Id.* at 148.

219. *Id.*

220. *Id.*

221. Beina Xu, *South China Sea Tensions*, COUNCIL ON FOREIGN REL. (Jan. 11, 2013), *available at* http://www.cfr.org/china/south-china-sea-tensions/p29790.

included the 9-Dash line, as well as included the line on the new version of the Chinese passport. The line caused an immediate row with China's neighboring states.

Military activity in the South and East China Seas has increased over the past several years.[222] Vietnam and Malaysia have started building up their military forces, and the Philippines doubled its defense budget and began a five-year series of joint military exercises with the United States.[223] The Chinese Peoples Liberation Army Navy ("PLAN") is aggressively patrolling the region.[224] This militarization of a relatively small sea increases the chances for mishap and misunderstanding, which makes the possibility of finding political solutions more difficult.

The Obama administration, recently, has become more involved in these sovereignty disputes.[225] Senior administration officials have challenged China's claims, particularly with respect to the 9-Dash line.[226] In congressional testimony, Danny Russel, Assistant Secretary of State for East Asian and Pacific Affairs noted:

> Any Chinese claim to maritime rights not based on claimed land features would be inconsistent with international law. China could highlight its respect for international law by clarifying or adjusting its claim to bring it into accordance with international law of the sea . . . Our view is that these actions have raised tensions in the region and have exacerbated concerns about China's long-term strategic objectives.[227]

The Obama administration has also preemptively warned China against establishing South China Sea Air Defense Identification Zone ("ADIZ").[228] Similar warnings did not deter China from establishing an ADIZ in the East China Sea in November 2013.[229] On November 23rd, a Chinese military spokesman announced the creation of a new ADIZ and

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222. *Id.*

223. *Id.*

224. *See generally id.* (describing Chinese surveillance and patrolling of the South and East China Seas).

225. Zachary Keck, *US Challenges China's Nine-Dash Line Claim*, DIPLOMAT (Feb. 12, 2014), *available at* http://thediplomat.com/2014/02/us-challenges-chinas-nine-dash-line-claim/.

226. *Id.*

227. *Id.*

228. Zachary Keck, *China's Drafting a South China Sea ADIZ*, DIPLOMAT (Jan. 31, 2014), http://thediplomat.com/2014/01/chinas-drafting-a-south-china-sea-adiz/.

229. Mira Rapp-Hooper, *East China Sea ADIZ: A Turning Point in US-China Relations?*, DIPLOMAT (Dec. 20, 2013), http://thediplomat.com/2013/12/east-china-sea-adiz-a-turning-point-in-us-china-relations/.

that any aircraft flying through the zone would have to identify itself and follow the orders of Chinese air traffic controllers.[230] While many nations have ADIZs, they typically do not overlap with other countries' territory.[231]

China's unilateral actions have strengthened regional bilateral and multilateral alliances among its smaller neighbors; polarization of the region is a real risk. The Obama administration has strengthened ties with the Association of South East Asian Nations ("ASEAN"), which is trying to transform itself into a more integrated and powerful regional force.[232] Singapore and Malaysia have also expressed a desire to increase their security cooperation programs.[233]

President Xi's provocative actions certainly appeal domestically to China's nationalist camp.[234] This regional assertiveness may also go hand-in-hand with growing economic power.[235] It also could be a reflection of China's national security calculus. Since the Second World War, the United States has underwritten the secure and free flow of trade across the globe.[236] The United States Navy patrols critical sea lanes and keeps global trade flowing, regardless of the destination of the commodities.[237] However, there is no requirement or guarantee that the United States will keep doing so. If the United States pulls back, China might be left without reliable trade routes and its energy supply may become more volatile.[238] This, of course, has implications for China's economy and its resource quest, and therefore is of critical concern to its national security.

A recent Council on Foreign Relations report examined an air war scenario between China and Taiwan and found that fuel could pose "significant restraints" on China and Taiwan.[239] Even though China is the

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230. *China, Japan and America Face-Off*, ECONOMIST (Nov. 30, 2013), http://www.economist.com/news/leaders/21590930-chinas-new-air-defence-zone-suggests-worrying-new-approach-region-face.

231. *Id.*

232. Beina Xu, *South China Sea Tensions*, COUNCIL ON FOREIGN RELATIONS (Jan. 11, 2013), http://www.cfr.org/china/south-china-sea-tensions/p29790.

233. *Id.*

234. ECONOMIST, *supra* note 230.

235. *Id.*

236. ECONOMY & LEVI, *supra* note 133, at 167.

237. *Id.*

238. *Id.* at 168.

239. *See generally* ROSEMARY A. KELANIC, COUNCIL ON FOREIGN REL., ENERGY REPORT–OIL SECURITY AND CONVENTION WAR: LESSONS FROM A CHINA–TAIWAN AIR SCENARIO (Oct. 2013), *available at* http://www.cfr.org/china/oil-security-conventional-war-lessons-china-taiwan-air-war-scenario/p31578 (examining an air war scenario to enhance broader knowledge about fuel requirements during time of war. During the Second World War, both Germany and Japan were forced to make decisions based on military fuel requirements. In Germany's case, fuel supply limitations forced them to engage horse–drawn transportation on the Eastern Front. The desire to secure fuel in the Dutch East Indies forced Japan to attach the United States Pacific Fleet at Pearl Harbor to eliminate the threat to

fourth-largest petroleum-producing country in the world, the study finds that Taiwan could meet its fuel needs in an air war for five-months—about three times longer than China. This sheds new light on China's quest to secure petroleum, diversify its supply routes, and find new sources of energy.[240]

China has been exercising its naval forces in the South and East China Seas. While the PLAN's force projection ability is limited currently, it is innovating. The Pentagon estimates that "by the latter half of the current decade, China will likely be able to project and sustain a modest-sized force, perhaps several battalions of ground forces or a naval flotilla of up to a dozen ships, in low-intensity operations far from China."[241] In fact, the PLAN has been increasing its naval deployments to the Gulf of Aden and is partnering with the United States in counter-piracy efforts there. While the PLAN only appears to be concerned with pirate attacks on Chinese vessels, the deployments are a significant signal of China's intent to increase its presence on the seven seas.

As the United States rebalances its attention and resources to the Asia-Pacific region, it will encounter a reemerging China that is less reliant on American power to guarantee its economic future. As the United States increasingly engages with the new China, energy and the environment provide roads that both nations can walk down together.

III. THE ENERGY PIVOT

U.S.-China relations are evolving. At the conclusion of then Chinese President Hu Jintao's state visit to the United States, he and President Obama released a joint statement. This statement reaffirmed each leader's "commitment to building a positive, cooperative, and comprehensive U.S.-China relationship for the 21st Century."[242] Each country addressed the fears of the other, saying "the United States reiterated that it welcomes a strong, prosperous, and successful China that plays a greater role in world affairs. China welcomes the United States as an Asia-Pacific nation that contributes to peace, stability, and prosperity in the region."[243]

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their petroleum shipments. The study aimed to find whether military fuel demand could strain a nation's supply today. The study concludes that oil and fuel supplies could become significant constrains on China and Taiwan in the event of war.).

240. *Id.*

241. ECONOMY & LEVI, *supra* note 133, at 170.

242. Press Release, Office of the Press Sec'y, The White House, U.S.–China Joint Statement (Jan. 19, 2011), *available at* http://www.whitehouse.gov/the-press-office/2011/01/19/us-china-joint-statement.

243. *Id.*

Since then, both nations have set about to achieve their stated goals. In November 2011, President Obama officially announced the strategic rebalancing of American attention and resources from the Middle East and Central Asia to the Asia-Pacific region. He stated:

> After a decade in which we fought two wars that cost us dearly, in blood and treasure, the United States is turning our attention to the vast potential of the Asia-Pacific region . . . Our new focus on this region reflects a fundamental truth—the United States has been, as always will be, a Pacific nation . . . As the world's fastest-growing region—and home to more than half the global economy—the Asia-Pacific is critical to achieving my highest priority, and that's creating jobs and opportunity for the American people . . . I have, therefore, made a deliberate and strategic decision—as a Pacific nation, the United States will play a larger and long-term role in shaping this region and its future, by upholding core principles and in close partnership with our allies and friends.[244]

To pursue his vision, President Obama developed a comprehensive, multi-dimensional strategy designed to: strengthen alliances; deepen partnerships with emerging powers; build a stable, productive, and constructive relationship with China; empower regional institutions; and help to build a regional economic architecture that could sustain shared prosperity.[245]

The United States and China have increased their contacts and formalized their exchanges on strategic and economic issues.[246] Military-to-military contacts have resumed and high-level exchanges have occurred in various venues.[247] Even so, as interaction increases, so too do doubts and suspicions.

On the American side of the Pacific, a "significant minority"[248] wonders what a strong China means for the United States. This camp sees China as aggressively trying to displace the United States as the dominant power in the Asia-Pacific region and form Asia into a bloc that defers to

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244. Remarks, *supra* note 7.

245. Remarks, Tom Donilon National Security Advisor to the President, Remarks at the Launch of Columbia University's Center on Global Energy Policy, Office of the Press Sec'y, The White House (Apr. 24, 2013), http://www.whitehouse.gov/the-press-office/2013/04/24/remarks-tom-donilon-national-security-advisor-president-launch-columbia-.

246. KISSINGER, *supra* note 137.

247. *Id.*

248. *Id.*

Chinese economic and foreign policy objectives.[249] On the Chinese side, there is suspicion about whether American power will be used to help or hurt a growing China. They view the American pivot, increased military presence, and strengthened defense relationships with its neighbors as a coordinated effort to encircle their nation in order to prevent it from realizing its rightful place as Middle Kingdom.[250]

This Part explores the possibility of bridging the space between the two cultures using defense-led energy innovation. In Part I, we saw how the military's mission is driving energy innovation and changing the very culture of the force. In Part II, we delved briefly into China's millennia-long history and examined the remarkable growth of the Chinese economy that is driving a worldwide resource quest that deploys whatever it needs in the economic, political, and military spheres to secure the fuel it requires. Now, with the stage set, we can see the effect increased military-to-military contact between the United States and China can have on the world's energy future. These interactions can demonstrate the power of efficient and clean energy innovation, further refine successful regulatory mechanisms, and slay the two-headed dragon of Pacific instability and environmental harm caused by the Asia-Pacific region's rapid industrialization.

A. Aligning the Two Cultures

In 1959, C. P. Snow delivered a lecture, "The Two Cultures," in which he lamented the cultural divide that separates the two areas of human inquiry, science and the arts.[251] Snow noted,

> There seems . . . to be no place where the cultures meet. I am not going to waste time saying that this is a pity. It is much worse than that . . . [A]t the heart of thought and creation we are letting some of our best chances go by default."[252] Snow went on to argue that artists and scientists must build bridges between their two disciplines to fully realize human progress.[253]

This cultural separation has an analogue in the energy area. Domestically in the United States, cooperation and true progress are

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249. *Id.*
250. *Id.*
251. C.P. SNOW, THE TWO CULTURES AND THE SCIENTIFIC REVOLUTION 4, 10–11 (Cambridge Univ. Press 1959), *available at* http://sciencepolicy.colorado.edu/students/envs_5110/snow_1959.pdf.
252. *Id.* at 17.
253. *Id.* at 17–19.

hindered by the seemingly un-crossable chasm that exists between traditional defense hawks and those who support alternative energy. As we saw in Part I, the military mission has fulfilled C. P. Snow's vision and bridged the gap between the two energy cultures by reorienting the domestic energy discussion around national security.

In order to better achieve its mission, the Defense Department is changing the way it uses energy on the battlefield and on board its installations. It is becoming more efficient and secure and is proving that energy innovation allows the force to achieve greater operational reach with less risk. We are in the midst of a quantum leap in military achievement in the energy area and it occurred by aligning the mission with energy innovation. There are potentially huge gains for the environment and military capability. With this alignment, the chasm was bridged and the clash between the two cultures produced creative advancements.

While China and the United States have been important partners for the last fifty years, the relationship between the two also fits rather easily into Snow's paradigm. At 238 years old, the United States is an infant compared to China's national existence. The United States is a liberal democracy, and China is the largest communist country on earth. China views the West with suspicion, and the West is weary of a dominant China in East Asia. There is limited understanding of one side from the other, and direct and transparent conversation is nearly impossible. Issues like cyber security, currency manipulation, and human rights encounters are hot-button topics that make meaningful, or even open, dialogue impossible.

However, seen through the lens of national security, energy aligns the interests of the two nations on a wide range of issues—energy security, economic growth, climate and environmental sustainability—and tremendous progress seems possible.

B. A New Framework for Cooperation

The rise of new powers has often led to conflict with established nations, but it does not have to. Understanding even the basics of China's history and culture will allow us to begin building bridges to span the divide between East and West. Perhaps most fundamentally, China does not see itself as a "rising" power, but as a returning power, displaced from its position only temporarily by Western colonial intervention and meddling.[254]

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254. *Id.* In the wonderfully insightful passage that follows, Dr. Kissinger goes on to say:
"It does not view the prospect of a strong China exercising influence in economic, cultural, political, and military affairs as an unnatural challenge to the world order, but rather as a return to a normal state of affairs. Americans need not agree with the Chinese analysis to

As we saw in Part II, earlier experiences with foreign intervention caused a decidedly nationalist hue to color China's view on international relations. Culturally, Chinese tradition holds that the Middle Kingdom is heir to an eastern empire that is peaceful, defense-minded, self-sufficient, and pacifist. [255] They see Western culture as expansionist, militaristic, shortsighted, and selfish.[256]

Additionally, while China has opened its economy to world markets and embraced state capitalism, their view of the West remains informed by Marxist political thought, which holds that capitalist nations exploit the rest of the world.[257] Also, some Chinese leaders see America's support for Taiwan and calls for democracy as attempts to weaken the Chinese state and make it more pro-American.[258] This will help the United States win the perceived zero-sum quest for power and resources. The Chinese worst-case scenario is that the American pivot represents an attempt to increase military presence and western influence within Chinese territory.[259]

Neither nation has experience dealing with a country of similar economic power, size, resources, self-confidence, or as different a culture or political system. China's history provides no precedent for how to relate to a nation like the United States—a great power with a permanent Pacific presence with universal ideals that do not necessarily comport with Chinese conceptions.[260]

Continuing the evolution, at their June 2013 meeting in Rancho Mirage, California, Presidents Obama and Xi discussed a new model for U.S.-China relations moving forward. President Xi Jinping said:

> We're meeting here today to chart the future of China-U.S. relations . . . . We need to think creatively and act energetically so that working together we can build a new model of major country relationship.[261]

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understand that lecturing a country with a history of millennia about its need to "grow up" can be needlessly grating." *Id.*

255. Andrew J. Nathan & Andrew Scobell, *How China Sees America: The Sum of Beijing's Fears*, FOREIGN AFF., (Sept. 2012), http://www.foreignaffairs.com/articles/138009/andrew-j-nathan-and-andrew-scobell/how-china-sees-america.

256. *Id.*

257. *Id.*

258. *Id.*

259. KISSINGER, *supra* note 137.

260. *Id.*

261. Greg Botelho et al., *Despite Tensions, U.S., Chinese Leaders talk of forging 'new model' in Relations*, CNN (June 9, 2013), http://www.cnn.com/2013/06/07/politics/us-china-summit-cyber-spying/index.html.

Just as increased American military presence in the Pacific could signal the threat of encirclement in Beijing, the flexing of Chinese muscle in the South China Sea and in neighboring countries gives rise to the fear of dominance in Washington. Defense energy programs provide a mechanism through which to forge a new type of power relationship.

Luckily, the framework through which to collaborate on energy innovation is already in place. In 1979, soon after the United States and China opened formal relations, the two nations signed the Science and Technology Cooperation Agreement. [262] This agreement pledges cooperation in a diverse range of fields including physics and chemistry, earth and atmospheric sciences, health care and disease control, and a variety of energy-related areas.[263]

In the face of the global challenges of climate change and energy security, in 2008, the United States and China entered the Ten Year Framework on Energy and Environment Cooperation, which, as the title suggests, facilitates exchanges between the two countries to foster energy innovation and environmental protection. [264] In November 2009, Presidents Obama and Hu established the $150 million U.S.-China Energy Research Center, which facilitates joint research and development on clean energy technology by teams of scientists from the United States and China.[265]

Presidents Obama and Hu, in their Joint Statement in 2011, directly address cooperation on climate change, energy, and the environment:

> The United States and China agreed to continue their close consultations on action to address climate change, coordinate to achieve energy security for our peoples and the world, build on existing clean energy cooperation, ensure open markets, promote mutually beneficial investment in climate friendly energy, encourage clean energy, and facilitate advanced clean energy technology development.[266]

Each side reaffirmed their commitment to continue exchanges on "energy policy and cooperation on oil, natural gas (including shale gas), civilian nuclear energy, wind and solar energy, smart grid, advanced bio-fuels,

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262. *U.S.–China: Thirty Years of Science and Technology Cooperation, Fact Sheet*, U.S. DEP'T OF STATE (Oct. 15, 2009), http://www.state.gov/e/oes/rls/fs/2009/130625.htm.

263. *Id.*

264. *U.S.- China Ten-Year Framework for Cooperation on Energy and Environment*, U.S. DEP'T OF STATE, http://www.state.gov/e/oes/eqt/tenyearframework/ (last visited Mar. 18, 2014).

265. U.S.-China Clean Energy Research Center (CERC), *Welcome to the U.S.-Clean Energy Research Center*, *available at* http://www.us-china-cerc.org (last visited Mar. 20, 2014).

266. Press Release, *supra* note 242.

clean coal, energy efficiency, electric vehicles, and clean energy technology standards."[267]

Cooperation between the United States and China can drive global energy innovation. In his 2011 progress report on U.S.-China Clean Energy Cooperation, Secretary of Energy Steven Chu noted:

> Energy innovation in one country accelerates clean energy deployment in all countries. And the combined research expertise and market size of the U.S. and China provide an unprecedented opportunity to develop clean energy solutions that will reduce pollution and improve energy security while enhancing economic growth globally . . . As the two largest energy consumers, the U.S. and China have a shared interest in energy efficiency. Energy-saving technologies deployed in one country will reduce energy costs for the other and benefit both economies.[268]

The Obama administration's strategic rebalancing to the Asia-Pacific is already providing increased opportunities for interaction and cooperation. President Obama has invited China to join the Trans-Pacific Partnership ("TPP"), a free-trade alliance joining the Americas with Asia.[269] The current parties to the TPP are the United States, Canada, Mexico, Peru, Chile, Australia, New Zealand, Vietnam, Malaysia, Singapore, Brunei, and Japan. Together, this trading bloc makes up forty percent of the global economy.[270] This type of economic diplomacy is promising.

Closer military cooperation could also help strengthen the strategic partnership between the United States and China. In May 2013, U.S. National Security Advisor, Tom Donilon met with General Fen Changlong, Vice Chairman of China's Central Military Commission.[271] During their meetings, Donilon and General Fen discussed deepening cooperation between the U.S. and Chinese militaries on several issues like

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267. *Id.*

268. U.S. DEP'T OF ENERGY, U.S.–CHINA CLEAN ENERGY COOPERATION, A PROGRESS REPORT BY THE U.S. DEPARTMENT OF ENERGY 2, 5 (2011).

269. *China to Study Joining U.S.–Led Trade Accord After Japan Added,* BLOOMBERG NEWS (May 30, 2013), http://www.bloomberg.com/news/print/2013-05-30/china-to-study-joining-u-s-led-trade-accord-after-japan-added.html.

270. Kwanwoo Jun, *Seoul Affirms Interest in Joining TPP*, WALL ST. J. (Jan. 13, 2014, 4:09 AM), http://blogs.wsj.com/economics/2014/01/13/seoul-affirms-interest-in-joining-tpp-but-says-china-deal-comes-first/.

271. *Wang Tells Donilon China Must Coordinate Its Politics with U.S.,* BLOOMBERG NEWS (May 28, 2013), http://www.bloomberg.com/news/2013-05-27/donilon-tells-xi-the-u-s-seeks-closer-china-ties-as-talks-near.html.

peacekeeping, disaster relief, and counter-piracy missions.[272] Admiral Samuel J. Locklear III, the United States Pacific Command Commander, in remarks in November 2014, echoed these sentiments and expressed a clear desire to increase communication, understanding, and closer cooperation between the United States and Chinese militaries.[273]

As discussed in Part II above, U.S. Secretary of Defense Leon Panetta invited China to participate in the RIMPAC exercise in 2014. In 2012, twenty-two countries, including Russia, participated.[274] In 2014, twenty-three nations are expected to attend. When asked about China's participation, the Commander of the U.S. Navy's Third Fleet, Vice Admiral Kenneth Floyd noted, "For us, it's an opportunity to build trust and confidence with the partners that we will work with when we're out there. To that extent, having the Chinese participate is very valuable to us."[275]

While interaction on the operational level on disaster relief and counter-piracy missions is incredibly useful and important, using the military to engage China on energy innovation presents an unparalleled strategic opportunity. In addition to providing another forum for increased military-to-military contact, it also allows national security concerns, rather than more abstract concepts of climate change or the environment, to drive cooperation and investment in both countries.

C. The U.S.-China Military-to-Military Relationship

At the height of the Cold War, the Chinese and United States were strategic partners and enjoyed strategic military dialogue, reciprocal exchanges, and arms sales.[276] In response to the Tiananmen Square Crackdown in 1989, the United States suspended military contacts with China. In 1990, the Foreign Relations Authorization Act imposed sanctions on arms sales and other cooperation between the United States and China.[277] This Act did allow waivers that were in the general interests of the

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272. *Id.*

273. Donna Miles, *Locklear Welcomes Closer U.S.-China Cooperation*, U.S. DEP'T OF DEF. (Nov. 5, 2013), http://www.defense.gov/news/newsarticle.aspx?id=121059.

274. Ernesto Bonilla, *RIMPAC 2012 Concludes*, U.S. NAVY (Aug. 3, 2012), http://www.navy.mil/submit/display.asp?story_id=68817.

275. Gretel C. Kovach, *Carrier Reagan to Join Military Exercise: Ship Lineup for RIMPAC 2014 Off Hawaii Final in April*, SAN DIEGO UNION–TRIBUNE (Feb. 12, 2014, 3:30 PM), http://www.utsandiego.com/news/2014/Feb/12/ronald-reagan-aircraft-carrier-rimpac/.

276. Shirley A. Kan, *U.S.-China Military Contacts: Issues for Congress*, CONG. RES. SERV.1, 1 (Jul. 25, 2013), http://www.fas.org/sgp/crs/natsec/RL32496.pdf.

277. Foreign Relations Authorization Act of 1990, Pub. L. No. 101-246, § 901, 104 Stat, 86 (1990).

United States.[278] In response, China cancelled its contract with the United States to upgrade the avionics of the F-8 fighter.[279]

In 1992, President George H. W. Bush, cancelled the suspended foreign military sales cases and returned all unused Chinese funds and military equipment.[280] While President Clinton reengaged China, including the military, exchanges with the People's Liberation Army ("PLA") did not regain the closeness reached in the 1980s.[281]

Since the 1990s, military contacts have improved and deteriorated along with overall bilateral relations. [282] The National Defense Authorization Act for FY 2000 set parameters for contacts with the PLA. It prohibited the Secretary of Defense from authorizing any mil-to-mil contact with the PLA if that contact would "create a risk to national security due to an inappropriate exposure" of the PLA to twelve delineated areas that include nuclear operations, chemical and biological defense capabilities, military space operations, and arms sales or military related technology transfers, among others.[283] In practice, this law does not prohibit current or future exchanges in any meaningful way.[284]

While not directed specifically to China, the Arms Export Control Act governs the transfers of defense articles and services to another country. Section 6 of this Act prohibits sales covered by the Act to any country that is determined by the President to be engaged in a consistent pattern of intimidation or harassment directed against individuals in the United States.[285] Also limiting transfers and purchases, in the National Defense Authorization Act for 2006, Congress prohibited the procurement from any "Communist Chinese military company," of goods and services on the Munitions List, with certain exceptions.

Military-to-military relationships remained limited until around 2005, when Admiral William Fallon, Commander of U.S. Pacific Command visited China to advance contacts between all ranks of military personnel and cooperation in responding to natural disasters, reducing overall tensions

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278. Foreign Relations Authorization Act of 1990 § 902.

279. Kan, *supra* note 276.

280. *Id.* at 2.

281. *Id.*

282. *Id.*

283. National Defense Authorization Act for Fiscal Year 2000, Pub. L. No. 106–65, § 1201, 113 Stat. 512, 779–80, *available at* http://www.gpo.gov/fdsys/pkg/PLAW-106publ65/pdf/PLAW-106publ65.pdf.

284. DEP'T OF DEF., ANNUAL REPORT TO CONGRESS: MILITARY AND SECURITY DEVELOPMENTS INVOLVING THE PEOPLE'S REPUBLIC OF CHINA 1, 61 (2013), http://www.defense.gov/pubs/2013_China_Report_FINAL.pdf.

285. Arms Export Control Act, Pub. L. No. 90-629, ch. 1, § 6 (1968) (codified at 22 U.S.C. § 2756 (2010)), *available at* http://www.gpo.gov/fdsys/pkg/USCODE-2010-title22/html/USCODE-2010-title22-chap39.htm.

between the two nations.[286] Secretary of Defense Donald Rumsfeld visited China in 2005 and signaled the resumption of the formal military relationship.

In 2007, Secretary of Defense Robert Gates said that he did not see China as a "strategic adversary," but as a partner in some respects and a "competitor" in others.[287] In all cases, Secretary Gates stressed the importance of engagement with the PRC "on all facets of our relationship as a way of building mutual confidence."[288] On his visit to China in November 2007, Secretary Gates agreed to open a "hotline" between the PLA and the Pentagon.[289]

With President Obama's strategic rebalancing towards the Asia-Pacific region, he stressed the need for increased military contacts to diminish the possibility of disputes with China. The National Defense Authorization Act for FY 2010 expanded the required contents of the Defense Department's report on the Chinese military to include a section on mil-to-mil contacts and a new strategy to increase such interactions.[290]

Secretary Gates, in August 2010, told Congress that "sustainable and reliable" military-to-military ties were an important part of the overall U.S.-China relationship.[291] Further, he said that he sought to expand practical cooperation in areas where U.S. and Chinese national interests converged and to discuss candidly areas of disagreement.[292]

Leon Panetta, who took over as Secretary of Defense after Gates' departure, continued to emphasize the importance of the U.S.-China military partnership. He stated that the mil-to-mil relationship between the United States and China was a critical part of the administration's strategy to shape China's rise in a way that maximized cooperation and mitigated risks.[293]

Increasing military-to-military contacts around energy would provide a new avenue for increased dialogue. U.S. and Chinese national interests converge around this issue. This interaction can serve U.S. interests, just like any other military-to-military interaction, which includes conflict avoidance and crisis management, military-civilian coordination, and

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286. Kan, *supra* note 276, at 3.
287. *Id.*
288. *Id.*
289. *Id.*
290. *See* National Defense Authorization Act for Fiscal Year 2010, Pub. L. No. 111–84, § 1246, 123 Stat. 2190, 2544, *available at* http://www.gpo.gov/fdsys/pkg/PLAW-111publ84/pdf/PLAW-111publ84.pdf.
291. Kan, *supra* note 276, at 20.
292. *Id.*
293. *Id.*

transparency and reciprocity. Conversation between the United States and Chinese militaries on energy will also stoke the fire of the Green Arms Race.

D. Towards a lasting U.S.-China Relationship—Shared Interests Driving Global Innovation

During RIMPAC in 2012, the U.S. Navy demonstrated the power of energy innovation by sailing the Great Green Fleet across the Pacific Ocean.[294] The Chinese military leadership was intrigued and asked the Commander, U.S. Pacific Command, why they were not invited to participate.[295] The Commander looked to include the Chinese in future humanitarian and disaster relief missions, and Secretary Panetta followed with a full invitation to participate in the 2014 iteration of the exercise.[296]

As the PLAN looks to project Chinese power farther across the globe, it will look to the United States Navy as its model. Seeing the effectiveness of clean energy investment, China will pursue a similar strategy. The U.S. defense and state departments, and their constant interactions with their counterparts in China, will play a vital role as the initiators and sustainers of a U.S.-Chinese partnership in the Green Arms Race.

Pursuing energy innovation will successfully align the domestic and international interest of the United States and China. Local constituencies will be able to localize the benefits of a more efficient and more capable military and more reliable and diverse sources of energy. Defense innovation will create new jobs and spark entrepreneurship in both countries, and consumers will have access to spill over clean and efficient energy technologies.

A durable partnership on energy between the United States and China will also allow for strong leadership on climate change. As mentioned above, the developing world, knowing that energy consumption was tied closely to economic growth, ignored climate change and burned cheap carbon—the West was responsible for the bulk of the problem—and should bear the lion's share of the cleanup.

The problem, of course, is that we all live on the same planet and Asia now finds itself on the front lines of an increasingly malignant problem. In a recently published article, the former President of the

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294. *#GreatGreenFleet Sailing Toward SECNAV Energy Goals During RIMPAC 2012*, U.S. DEP'T OF NAVY (July 16, 2012, 7:05 PM), http://www.navy.mil/submit/display.asp?story_id=68408.

295. Kan, *supra* note 276, at 14.

296. *Id.* at 15.

Republic of Maldives, Mohamed Nasheed, and the Former President of East Timor, Jose Ramos-Horta, called for Asian Climate Leadership.[297] To successfully reach an agreement at the next UN Climate Summit next year in Paris, they argue that three things need to happen. First, old positions must be abandoned and countries must work together towards a global deal.[298] Second, they urge Asian countries to build clean energy economies to boost growth, increase wealth, and reduce pollution. They highlight the need "[for] electricity grids that can accommodate vast quantities of renewable energy; infrastructure that promotes green vehicles; and regulations that encourage energy efficiency."[299] Third, they recommend that Asian nations better protect their natural environments.

In both the United States and China, national security and mission accomplishment are more useful drivers for domestic support than broader and more abstract concepts like energy independence or the environment.[300] In his 2012 State of the Union address, President Obama explicitly used national security and the Defense Department to challenge legislators to take action on climate change and energy innovation. The President said:

> We can also spur energy innovation with new incentives. The differences in this chamber may be too deep right now to pass a comprehensive plan to fight climate change. But there's no reason why Congress shouldn't at least set a clean energy standard that creates a market for innovation. So far, you haven't acted. Well, tonight, I will. I'm directing my administration to allow the development of clean energy on enough public land to power 3 million homes. And I'm proud to announce that the Department of Defense, working with us, the world's largest consumer of energy, will make one of the largest commitments to clean energy in history—with the Navy purchasing enough capacity to power a quarter million homes a year.[301]

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297. Mohamed Nasheed & Josè Ramos-Horta, *The Need For Asian Climate Leadership*, HUFFINGTON POST (Feb. 19, 2014), http://www.huffingtonpost.com/mohamed-nasheed/climate-change-asia_b_4814980.html.

298. *Id.*

299. *Id.*

300. In the United States, several pieces of legislation, dating back to the Energy Policy Act of 1992, address energy and national defense. *See, e.g.*, Energy Independence and Security Act of 2007, Pub. L. No. 110–140, §933, 121 Stat. 1492, 1740–41; Energy Policy Act of 2005, Pub. L. No. 109–58, § 1837, 119 Stat. 594, 1141–42; National Defense Authorization Act for Fiscal Year 2002, Pub. L. No. 107–107, 115 Stat. 1012; Energy Conservation and Reauthorization Act of 1998, Pub. L. No. 105–388, 112 Stat. 3477; Energy Policy Act of 1992, Pub. L. No. 102–486, 106 Stat. 2776.

301. Press Release, Office of the Press Sec'y, The White House, Remarks by the President in State of the Union Address (Jan. 24, 2012), http://www.whitehouse.gov/the-press-office/2012/01/24/remarks-president-state-union-address.

A strong U.S.-China partnership on clean and efficient energy innovation, driven by shared interests and military requirements, could build support domestically in both nations to bring about the very change President's Nasheed and Ramos-Horta seek. A secure, affordable, and clean supply of energy is a goal that the United States and China share. Defense collaboration on energy via regulatory, technical, and other exchanges will increase much needed military-to-military contact between the United States and China, which will reduce tension and risk and, over time, will stabilize the region. By framing energy in national security terms, the United States can galvanize global cooperation on innovation and climate change.

E. Immediate Opportunities for Collaboration

> If we're going to get this country out of its current energy situation, we can't just conserve our way out. We can't just drill our way out. We can't bomb our way out. We're going to do it the old-fashioned, American way. We're going to invent our way out, working together.[302]

In this section, I want to briefly explore a few new technologies with defense applications. Demonstrating these developments through military-to-military engagements with China will stoke the fire of the Green Arms Race and pull innovation in its wake.

1. A Smarter Grid

On August 13, 2003, a sagging power line hit a tree near Cleveland, Ohio, tripping some circuit breakers.[303] To compensate, power was rerouted to another line, which overheated and hit another tree, tripping another circuit.[304] The result was a cascading blackout that affected power in eight states in the Northeastern United States and part of Canada.[305]

While the official investigation discovered operator error and failing computer systems, the root cause was the grid. The grid is the term used to

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302. Donald Sadoway, *Quotes from Donald Sadoway*, TED (Mar. 2012), http://www.ted.com/speakers/donald_sadoway.

303. Dan Bobkoff, *10 Years After the Blackout, How Has the Power Grid Changed?*, NPR (Aug. 14, 2013), http://www.npr.org/2013/08/14/210620446/10-years-after-the-blackout-how-has-the-power-grid-changed.

304. *Id.*

305. *Id.*

describe the "system that links together large numbers of power plants, transmission lines, transformers and users."[306] The links between numerous power plants, when the grid is working effectively, provides reliability. If one power plant needs to go offline or has a problem, other plants on the grid can surge to provide power.

The grid is a demand driven system. Power plants do not store energy. The energy that powers the light in your room was generated just seconds ago. Power companies use historic data and the weather to predict demand and then produce enough energy to meet usage. When you turn on a switch, the power is there. But, if the system fails, the lights do not dim; the power goes out.

Our current grid poses a critical vulnerability. The problems arise on high power usage days when the system is at or close to maximum capacity.[307] When someone turns on one additional switch, the system shuts down.[308] Then, when one plant shuts down, that causes a load on the other interconnected plants.[309] If they are at maximum capacity, then they shut down too.[310]

This poses a critical problem for defense installations, which require constant power to run our nation's military. The Department is fielding smart grids at their bases, both in the United States, and forward deployed, to bring energy generation and distribution into the 21st century.[311]

A smart grid is a system with the technology to actively monitor and modulate the energy that utilities generate and distribute. The smart grid is able to communicate with customers, sense and fix problems on its network, and integrate power from solar, wind, and other energy sources to meet demand.[312] The ability to modulate energy demand also enables smart grids to save costs.[313] The control system for the smart grid is also more resistant to cyber-attacks.

The military is deploying smaller versions of smart grids, creatively called micro-grids, to Afghanistan. Micro-grids connect modular power generation sources, which might include a combination of petroleum-fueled generators, solar panels, wind, and other sources.[314] This type of distributed

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306. MULLER, *supra* note 13, at 226.
307. *Id.*
308. *Id.*
309. *Id.*
310. *Id.*
311. Cheryl Pellerin, *Pentagon Looks to Smart Grids for Battlefield Energy*, AM. FORCES PRESS SERV. (Oct. 20, 2011), http://www.defense.gov/news/newsarticle.aspx?id=65740.
312. *Id.*
313. Patrick Gordon, *Smart Grid Energy Management Keeps the Lights On at the Right Price*, NAVY NEWS SERV. (Mar. 18, 2013), http://www.navy.mil/submit/display.asp?story_id=72776.
314. Pellerin, *supra* note 311.

electricity generation has applications in countless arenas outside the field of battle. China and India can use micro grids to bring reliable and efficient power generation to the countryside.[315] They can also be deployed in disaster relief and humanitarian response missions.

2. Solar and Wind Power

Increased demand is causing the price of solar cells to plummet. As a result, the deployment of solar power is surging. Sunlight brings about one kilowatt hour of power per square meter onto the surface of the East. Solar cells, or photovoltaic cells, are thin wafers that absorb sunlight and produce electricity using the photoelectric effect—physics discovered by a Swiss patent clerk named Albert Einstein. As explained simply by a physics professor:

> In the photoelectric effect, an incoming particle of light known as a photon knocks an electron away from the atoms that it is normally associated with, and it lands on a metal electrode. When that electron moves from the electrode onto a wire, it is electricity, and it carries with it some of the energy of the photon of light.[316]

Most solar cells, at peak output, convert 15 to 20 percent of sunlight into electricity; the best and most expensive cells (like those used on the Mars rover) convert forty-two percent.[317] The prices of solar cells is plunging, falling from around $7 per installed watt to $1 per installed watt in just a few years.[318] The problem, of course, is that this price is a bit misleading. Solar cells only produce electricity when it is sunny. Even so, as the markets expand, innovation and the price of batteries continue to fall. Installation and maintenance also will fall, and make solar energy attractive in areas with plenty of cheap labor, like India and China.

A few sentences on solar cell chemistry are warranted. Most cells are made of silicon.[319] It is cheap and abundant. The largest manufacturer of

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315. Martin LaMonica, *Can India's Tata Make Cheap Distributed Energy*, CNET (Mar. 29, 2011), http://news.cnet.com/8301-11128_3-20047974-54.html. *See also* William Pentland, *China Gets Serious About Scaling Distributed* Energy, FORBES, (Aug. 17, 2013), *available at* http://www.forbes.com/sites/williampentland/2013/08/17/china-gets-serious-about-scaling-distributed-energy/ (explaining how China can become the largest consumer market in 2018).

316. MULLER, *supra* note 13, at 253 (describing that the photoelectric effect was one of the foundations of quantum mechanics and the discovery for which Einstein received the Nobel Prize).

317. *Id.* at 253.

318. *Id.* at 254.

319. *Id.* at 258.

silicon solar cells in the world is Suntech Power in China, which produces more than one gigawatt of solar cells every year.[320]

First Solar, an American company, has been experimenting with solar cells made from a tellurium/cadmium ("CdTe") compound.[321] This CdTe compound absorbs sunlight tremendously and can be deposited on thin, flexible sheets.[322] First Solar is ramping up production to produce one gigawatt per year, and says that it will hit a $0.73 price point.[323] Of course, there are problems. Tellurium is rare, only about 800 tons per year being produced, and cadmium is highly toxic.[324]

Other formulations, including Copper Indium Gallium Selenide ("CIGS") cells overcome the toxicity problem, while maintaining the same ability as CdTe to readily absorb sunlight.[325] Indium, however, is in high demand. It is a transparent conductor of electricity and is used in virtually every modern television and computer sold.[326] CIGS technology has a bad name in the United States largely due to the travails of Solyndra, a CIGS-based solar company that received over $500 million worth of loan guarantees from the United States and then went bankrupt.[327] Subsidized Chinese competition was partially to blame, but Solyndra's complex design also contributed.[328]

Competition in the solar field is driving prices down and efficiency up. Solar technology is helping military installations striving to achieve net-zero energy usage. Marine Air Ground Combat Center, Twenty-nine Palms, California, saved $3.2 million from a 1.5 megawatt rooftop solar array.[329]

New wind power capacity is being installed almost as rapidly as solar. The United States installed 5 gigawatts of wind capacity in 2010, and has a total installed wind power of 40 gigawatts.[330] In the same year, China installed 15 gigawatts, bringing its total to 42 gigawatts of wind power; in 2011 China extended its lead, reaching 55 gigawatts of installed wind capacity.[331]

World wind power capacity has been doubling every three years. Wind turbines are inexpensive to build and require no energy to operate. On

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320. *Id.*
321. *Id.*
322. *Id.* at 260.
323. *Id.*
324. *Id.*
325. *Id.* at 262.
326. *Id.*
327. *Id.*
328. *Id.* at 263.
329. Pew Study, *supra* note 84, at 4.
330. MULLER, *supra* note 13, at 274.
331. *Id.*

windy days, wind farms deliver electricity for 9.7 cents per kilowatt-hour, which is comparable to the price of electricity from coal.[332] But, when the wind stops blowing, there is no power. Advancements in battery technology will drive the deployment of both wind and solar energy.

3. Storage

Saving solar and wind energy for use on cloudy days and days with no wind is critically important. A true leap in battery technology would be a rechargeable cell that does not lose capacity, that could provide grid-level storage that can dependably store hours of energy from solar and wind power at a very low cost.[333] Such a battery would change the way we get electricity by smoothing out the intermittency in the energy output from wind and solar farms.[334]

The ability to bring stored power efficiently to the grid would allow fossil-fueled power plants to close by easing the integration of renewable energy technologies.[335] It would also ease the volatility on the grid by making electricity when it is available and least expensive.[336] The grid will be more reliable and provide lower-cost electricity. Until now, no one has been able to develop a technology that can do it cheaply. A professor at MIT is about to change the world.

Donald Sadoway has developed a battery with chemistry different than any other battery used today, one with entirely liquid components.[337] This means that the parts could last for years without losing energy storage

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332. *Id.*

333. *See* Martin LaMonica, *Ambri's Better Battery*, MIT TECH. REV. (Feb. 18, 2013), http://www.technologyreview.com/featuredstory/511081/ambris-better-grid-battery/ (discussing a new battery technology being developed).

334. *Id.*

335. MULLER, *supra* note 13, at 280.

336. *Id.*

337. *Ambri Brochure*, AMBRI, http://www.ambri.com/storage/documents/2014-Brochure-v3.pdf (last viewed Mar. 24, 2014).

capacity.[338] The liquid formulation would allow the battery to tolerate the current levels needed to store energy for the grid.[339]

In formulating the battery, cost was the key driver.[340] Sadoway chose magnesium and antimony because they are cheap, and separate naturally when in liquid form—the lighter magnesium rising to the top.[341] The next layer is a liquid salt electrolyte, which lies between the magnesium and antimony.[342] The result is a three-layer cell with no moving parts. An article from the MIT Tech describes the process from here:

> When the battery is called upon to deliver power to the grid, magnesium atoms form the top layer—the anode—give off electrons. The resulting magnesium ions travel through the electrolyte and react with the antimony, forming and alloy and expanding the bottom layer of the cell—the cathode. When the battery is charging, it acts like the smelter, liberating the magnesium from its alloy and sending it back through the electrolyte to rejoin the magnesium electrode. The intense flow of current generates the heat used to keep the metals in a molten state.[343]

Sadoway spun off his battery to a company he founded called Ambri. By wiring the batteries in series, Ambri plans to put together a full sized commercial prototype that will generate 500 kilowatts and store two megawatt-hours—enough to power seventy U.S. homes for a full day.[344] Importantly, Ambri's battery is cheap and easy to make and has a negligible

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338. *Id.* The problem with most rechargeable batteries is that they lose the ability to be recharged after a few uses. Professor Muller explains the process:

> To recharge a battery, you use a generator to force the electrons to return to their original side; when there, their negative charge will attract the positive ions to break away from the compounds that they stuck to and drift back through the electrolyte. That's a great idea, but the difficulty is in the details. The ions must go back to the electrode and attach themselves in a benign way . . . they often don't; a persistent problem with rechargeable batteries is that they returning ions tend to form long fingerlike structures called dendrites. If the dendrites grow with each recharge cycle, they may eventually make the battery unusable. MULLER, *supra* note 13, at 285.

339. *Ambri Brochure*, *supra* note 337.

340. *See id.* (explaining that Ambri kept costs low by using inexpensive minerals in its battery design).

341. *Id.*

342. *Id.*

343. LaMonica, *supra* note 333.

344. *Id.*

fade rate (0.2% over 1,000 cycles).[345] This means a retention rate of greater than 99% of initial capacity over seven years or daily cycling.[346] This is 100 times better than traditional lead-acid batteries currently in use.

Ambri's battery could store solar and wind power when demand is low and then sell money back to the grid when demand is high. Grid storage could add much needed resilience and flexibility to the energy system, providing backup power to buildings and even military bases, while allowing grid operators to smooth out fluctuations in power supply. Sharing these sorts of innovations with the developing world will reduce the pressure to engage in a zero-sum global resource quest. It will also drive down the price of clean energy technology and unlock the hold that fossil fuels currently have over economic development.

IV. CONTINUOUS INNOVATION—TOWARDS A DIVERSE ENERGY FUTURE

This article reorients the discussion on energy and climate change focusing it squarely around national security. Doing so allows American ideas and innovation to lead the world towards a new energy future, one that recognizes the benefits of clean and renewable sources of energy alongside fossil fuels. The United States can use its "Default Power" to ensure global stability and alter the future of our environment by engaging the developing world with reliable and efficient solutions to their energy concerns. The strategic rebalancing to the Asia-Pacific region provides the perfect opportunity to increase direct military-to-military interaction with China to encourage energy innovation to forge a clean energy future for the region, and for the world.

The threats posed by climate change are shared by all nations. President Obama's National Security Strategy recognizes the "real, urgent, and severe" threat posed by climate change and notes that "change wrought by a warming planet will lead to new conflicts over refugees and resources; new suffering from drought and famine; catastrophic natural disasters; and the degradation of land across the globe."[347]

Any solution to this problem must involve global cooperation. Sustained and meaningful cooperation on energy and the environment

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345. *2014 Progress Update*, AMBRI, http://www.ambri.com/storage/documents/ambri_2014_progress_update.pdf (last visited Mar. 24, 2014).

346. *Id.*

347. PRESIDENT OF THE U.S., NATIONAL SECURITY STRATEGY, 47 (May 2010), *available at* http://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf.

between the United States and China, the two biggest users and polluters on the planet could change the trajectory of world energy consumption.

We are at a transformational moment. The military's pursuit of energy innovation does not reflect a fringe environmental pursuit, but rather a necessary national security choice. Two cultures, traditionalist and alternative, east and west, will be united in this quest. The critical issues of energy security and climate change desperately require American leadership and innovation. We can protect our natural environment and produce a thoughtful energy policy that can be shared internationally through military and diplomatic interaction.

Only by building a diverse, resilient, and efficient energy portfolio, one that expands opportunities to develop new energy supplies of all kinds, can the United States and China escape the short-term problems caused by price volatility and long term problems like climate change. The Green Arms Race provides the way. To save lives on the battlefield, better utilize limited tax dollars, and achieve greater operational capability, the military is leading an energy pivot towards efficiency and diversity. Technological advancements and effective regulations are being shared through defense networks across the globe. As the United States rebalances the force to the Pacific, the military will increase its interactions with the Chinese and add the world's largest energy consumer as a partner.

On October 26, 1963, President John F. Kennedy delivered remarks at Amherst College honoring poet Robert Frost. The President presented his vision for the nature and strength of American power:

> I look forward to a great future for America, a future in which our country will match its military strength with our moral restraint, its wealth with our wisdom, its power with our purpose. I look forward to an America which will not be afraid of grace and beauty, which will protect the beauty of our natural environment, which will preserve the great old American houses and squares and parts of our national past, and which will build handsome and balanced cities for our future.[348]

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348. John F. Kennedy, Former President of the United States, Remarks at Amherst College (October 26, 1963), *available at* http://www.jfklibrary.org/Asset-Viewer/80308LXB5kOPFEJqkw5hlA.aspx#. President Kennedy provided these words at the groundbreaking for the Robert Frost Library at Amherst College. Robert Frost read during President Kennedy's inauguration, becoming the first poet to participate in the official program at a presidential inauguration. Frost died in January of 1963. In his remarks at Amherst, President Kennedy stressed the importance of public service and role of the artist in a democratic society. He notes Frost's contributions to American culture, prestige, power, and national identity. President Kennedy famously stated, "When power leads men towards arrogance, poetry reminds him of his limitations. When power narrows the

Kennedy's vision of the future is within our grasp. Engaging the energy pivot will continue Churchill's determined vision that energy innovation and thoughtful energy policy are critical elements of national security.

areas of man's concern, poetry reminds him of the richness and diversity of existence. When power corrupts, poetry cleanses." *Id.*