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Mark E. Rosen
Deputy General Counsel, CNA Corporation

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ENERGY INDEPENDENCE AND CLIMATE CHANGE: THE ECONOMIC AND NATIONAL SECURITY CONSEQUENCES OF FAILING TO ACT

Mark E. Rosen *

I. INTRODUCTION

In 2007, the Center for Naval Analyses Military Advisory Board (“CNA MAB”)¹ issued a report, *National Security and the Threat of Climate Change*, which was signed by eleven retired three- and four-star flag and general officers.² That report analyzed current scientific evidence on the subject of climate change and concluded that, among other things, the “nature and pace of climate changes being observed today and the consequences projected by the consensus scientific opinion are grave and pose equally grave implications for our national security.”³ Unchecked, climate change is a “threat multiplier for instability in some of the most volatile regions in the world,” and immediate action

* Deputy General Counsel, CNA Corporation. LL.M., 1991, University of Virginia School of Law; J.D., 1978, University of Georgia School of Law; A.B., 1974, University of Georgia. Mr. Rosen has over thirty years of experience in the legal and national security fields, including positions with the U.S. Department of Homeland Security and a twenty-one year career as an international and maritime lawyer with United States Navy. Mr. Rosen holds adjunct teaching appointments at George Washington University School of Law and Virginia Polytechnic Institute and State University. He teaches courses in Homeland Security Law and Policy.

1. The CNA Corporation (“CNA”) is a 501(c)(3) nonprofit corporation headquartered in Alexandria, Virginia. CNA Corp., About Us, <http://www.cna.org/about> (last visited Feb. 23, 2010). CNA is best known for operating the Center for Naval Analyses, a federally funded research and development center serving the U.S. Department of the Navy. CNA Corp., Center for Naval Analyses, <http://www.cna.org/about/cna> (last visited Feb. 23, 2010). CNA provides analytic support to many other sponsors, including the U.S. Department of Health and Human Services and the U.S. Department of Education. See CNA Corp., Contract Vehicles, <http://www.cna.org/about/workingwith/vehicles.aspx> (last visited Feb. 23, 2010).

2. CNA CORP., NATIONAL SECURITY AND THE THREAT OF CLIMATE CHANGE 1 (2007), available at http://www.cna.org/nationalsecurity/climate/report/SecurityandClimate_Final.pdf.

3. *Id.*

should be taken to both assess the impacts on climate change and to mitigate those changes.⁴

A companion CNA MAB report, *Powering America's Defense*, discusses the extensive resources and human capital the United States commits to preserve its access to energy resources, especially oil from the Persian Gulf region.⁵ Today, the stakes are much higher for U.S. national security because the percentage of foreign oil that is being imported has increased greatly since President Carter made his famous declaration of war in favor of energy independence in 1980.⁶ According to the CNA's findings, U.S. military presence in the Persian Gulf is necessary to ensure the unimpeded flow of oil because "America's thirst for oil leaves little choice."⁷ Even in theaters of combat operations such as Afghanistan and Iraq, the "fuel intensity" of today's combat missions means that commanders must divert a disproportionate number of combat troops and assets towards protecting fuel supplies and convoys.⁸ Consequently, there are fewer troops available to engage the enemy.⁹

This article draws heavily from the works of the CNA MAB, namely the twin and interrelated challenges arising from imprudent reliance on fossil fuels by developed and developing countries, as well as the serious environmental and national security "externalities" that directly result from current consumptive trends.¹⁰

4. *Id.*

5. See CNA CORP., *POWERING AMERICA'S DEFENSE: ENERGY AND THE RISKS TO NATIONAL SECURITY* 7 (2009), available at <http://www.cna.org/documents/PoweringAmericasDefense.pdf>.

6. *Id.* at 6–7.

7. *Id.* at 7.

8. *Id.*

9. *Id.*

10. See *id.* at vii, 41. Venerable scholars like Dr. Thomas Homer-Dixon and the Army War College's Dr. Kent Butts have been writing for some time that there are serious national security implications from resource depletion, environmental degradation, and climate change. See STRATEGIC STUDIES INST., *ENVIRONMENTAL SECURITY: A DOD PARTNERSHIP FOR PEACE* v (Kent Hughes Butts ed., 1994), available at <http://www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubID=339>; Thomas Homer-Dixon, Research, <http://www.homerdixon.com/research.html> (last visited Feb. 23, 2010). However, CNA's work is unique in that it was the first time that a large number of senior "warfighters" collectively characterized environmental and hydrocarbon consumptive patterns as significant threats to the United States and global security. See CNA CORP., *supra* note 2, at 1 (discussing the findings of eleven retired "warfighters" with respect to climate change and concomitant threats to national security). CNA's work is also significant in its call for specific nonmili-

In assessing the road ahead in terms of legislation and policy, this article incorporates the analysis of two Pulitzer Prize winning authors, Thomas L. Friedman and Jared Diamond, both of whom spent a considerable portion of their professional careers trying to understand the root causes of conflict and societal collapse and, especially in the case of Friedman, offer a roadmap for the future.¹¹ Using historical case studies, Diamond assesses factors that contribute to societal collapse as well as those which enable societies under stress to survive.¹² These historical examples are instructive in identifying policy and legal approaches to combat excessive global reliance on fossil fuel and the susceptibility of states, especially in the developing world, to collapse due to climate change and, in some respects, their continued reliance upon carbon-based fuel sources.

Part II first looks at Diamond's anatomy of collapse and discusses the factors that lead to collapse for developed and developing countries. In particular, it explores how the current U.S. dependence on oil and other greenhouse gas ("GHG") producing fuels, such as coal, creates risks associated with resource scarcity as well as those associated with their use—namely, climate change and environmental degradation.

Part III examines the impact of climate change on international security and why the current trends are unfavorable because of the large number of states currently at risk of collapse.¹³

Applying Diamond's collapse risk model, Part IV assesses the risks to the United States, then reviews some of the measures being taken by the United States to reduce vulnerabilities, domestically and internationally. Drawing on the thesis of Thomas L. Friedman, Part V asserts that the current crisis in climate change and energy dependence on carbon-intensive fuels presents

tary actions to be taken at a national and global level. *See id.* at 46–48.

11. *See generally* JARED DIAMOND, *COLLAPSE: HOW SOCIETIES CHOOSE TO FAIL OR SUCCEED* (2005); THOMAS L. FRIEDMAN, *HOT, FLAT, & CROWDED: WHY WE NEED A GREEN REVOLUTION—AND HOW IT CAN RENEW AMERICA* (2008).

12. *See* DIAMOND, *supra* note 11, at 11.

13. While this article does not examine the scientific nexus between human activity and climate change, it is inescapable that climate change is real and is a danger to both the developed and the developing world. *See generally* Union of Concerned Scientists, Scientific Consensus on Global Warming, <http://www.ucsusa.org/ssi/climate-change/scientific-consensus-on.html> (last visited Feb. 23, 2010) (summarizing the consensus opinion of several scientific societies on climate change).

a unique opportunity.¹⁴ Friedman argues that the United States should be at the forefront of a “green revolution” because it presents a significant commercial and economic opportunity for the United States to emerge out of its current economic doldrums and effect transformative retraining and retooling in order to move from a carbon economy to one relying upon clean, renewable energy sources.¹⁵ “[T]he best way for America to solve its big problem—the best way for America to get its ‘groove back’—is for us to take the lead in solving the world’s big problem.”¹⁶

In the concluding section, this article assesses how best to accomplish this goal given the proposals currently on the table and the time remaining before the United States experiences significant negative consequences.

II. THE ANATOMY OF COLLAPSE: THE CAUSES AND CONSEQUENCES

The seminal anthropological study by Jared Diamond provides historical support for the proposition that natural resource scarcity can lead to conflict that threatens U.S. security.¹⁷ Diamond identified five contributing factors—environmental damage, climate change, hostile neighbors, friendly trade partners, and a society’s response to environmental problems—that led to conflict among adjoining states and, ultimately, the risk of implosion leading to extinction.¹⁸ Diamond asserts that

[W]e shouldn’t be so naïve to think that study of the past will yield simple solutions, directly transferable to our societies today. We differ from past societies in some respects that put us at lower risk than them; some of those respects often mentioned include our powerful technology (i.e., its beneficial effects), globalization, modern medicine, [etc.] . . . We also differ from past societies in some respects that put us at greater risk than them: mentioned in that connection are, again, our potent technology (i.e., its unintended destructive effects), globalization (such that now a collapse even in remote Somalia affects the U.S. and Europe), the dependence of millions (and, soon, billions) of us on modern medicine for our survival,

14. See FRIEDMAN, *supra* note 11, at 172.

15. See *id.*

16. *Id.* at 5.

17. See DIAMOND, *supra* note 11, at 498.

18. *Id.* at 11.

and our much larger human population. Perhaps we can still learn from the past, but only if we think carefully about its lessons.¹⁹

Diamond's anthropological study of the extinction of civilization on Easter Island in the South Pacific is a useful case study of the linkages between cultural decline and unsustainable use of carbon-based energy sources. Easter Island was blessed with a temperate climate and fertile soil as a result of volcanic activity.²⁰ However, the island's temperate—as opposed to tropical—climate and its geographic isolation meant that Easter Island was not endowed with as many fish species or freshwater supplies as some of its tropical counterparts.²¹ Carbon dating of remains discloses that Easter Island was settled sometime around 900 A.D. and thrived until roughly 1700 A.D.²² At one point, Easter Island had extensive agricultural activity, sophisticated systems for raising chicken and other livestock, incredible skill in stone masonry/engineering, and technology to construct large outriggers that could travel thousands of miles through the open ocean to engage in trade.²³ By the 1700s, however, the island's populations of plants, wildlife, and people were in steep decline.²⁴

Diamond notes that during the good years, much of the island became increasingly deforested as the islanders consumed palms and hardwoods for various uses, including the manufacture of charcoal for heating and cooking.²⁵ By the 1400s almost all trees had disappeared.²⁶ Once the trees disappeared, the islanders were no longer able to construct boats for trade.²⁷ Wild sources of food were lost because there were no forests to sustain wildlife, and the population exploited fish stocks to extinction.²⁸ Agriculture also collapsed: the loss of forests led to top soil erosion and nutrient loss as crops were defenseless against wind and rain.²⁹ Starvation became the order of the day, leading to civil war, population crash, and cannibalism.³⁰ Captain Cook visited the island in 1774

19. *Id.* at 8.

20. *Id.* at 83.

21. *Id.*

22. *Id.* at 90, 109.

23. *See id.* at 91–93, 99–101, 104–06.

24. *Id.* at 109.

25. *See id.* at 106–07.

26. *Id.* at 107.

27. *See id.* at 107–08.

28. *Id.* at 108.

29. *Id.*

30. *Id.* at 109.

and observed that the islanders were “small, lean, timid, and miserable.”³¹ The number of home sites in the coastal region “declined by 70% from peak values around 1400–1600 to the 1700s. . . .”³² By 1872, only 111 islanders were left on Easter, compared with a minimum population of 6000 to 8000 before the crash began.³³

The sad tale of Easter Island vividly documents the externalities associated with unsustainable exploitation of natural resources and, in particular, the dilemma facing developing countries of sacrificing forests and habitats in order to heat and feed their populations. In his discussion of Easter Island, Diamond argues that its collapse would be less likely to occur today because of increased “globalization, international trade, jet planes, and the Internet. . . . [A]ll countries on Earth today share resources and affect each other, just as did Easter’s dozen clans. . . . When Easter Islanders got into difficulties, there was nowhere to which they could flee, nor to which they could turn for help. . . .”³⁴ But because of the Malthusian effect on world population numbers, the developed and developing worlds are neither anxious nor willing—to the point of committing genocide as in modern Rwanda—to absorb populations that are displaced because of environmental collapse.³⁵ Regarding fuel consumption, even if a struggling nation were to substitute oil for charcoal as a subsistence fuel, it would not create a sustainable outcome. Developing countries frequently do not have the financial resources to purchase oil for transportation, heating, and agricultural processes; conversely, they unsustainably exploit their natural resources to pay for the fuel, which they need to survive.³⁶

The tale of Easter Island has been repeated in modern history, with violent outcomes. The genocide that occurred in Rwanda in 1992 is often attributed to ethnic violence and power competi-

31. *Id.*

32. *Id.*

33. *Id.* at 91, 112.

34. *Id.* at 119.

35. See *id.* at 313. The Malthusian effect is a theory advanced by English economist Thomas Malthus. *Id.* at 312. The basic premise of the theory is that population growth surpasses the growth of food production, and all available food supplies will be consumed unless population growth is restrained by famine, war, disease, or authorities making preventative choices. *Id.*

36. Richard G. Lugar, *Poorer by the Gallon; Oil Dependency*, INT’L HERALD TRIB., June 9, 2006, at 7.

tion.³⁷ Population growth, however, contributed to the escalation of violence leading up to the genocide as well.³⁸ Immediately before the violence in the mid-1990s, Rwanda's population density was 760 per square mile, a number much greater than the 610 per square mile population density in the United Kingdom at that time.³⁹ Because of Rwanda's population density, forests in the hillsides and lowlands were clear-cut for fuel and farming, and virtually every arable scrap of land was cultivated.⁴⁰ Poor farming practices led to widespread erosion, the drying up of streams, and irregular rainfalls.⁴¹ As a result of the collapse of agriculture and conflicts over land ownership, widespread conflict erupted in 1994 with heavy losses of life.⁴² Rwanda is not an isolated case study in the collapse of a modern state. According to *Foreign Policy*, there are currently fourteen states around the world that are in a "critical" state of collapse, including Haiti, Somalia, Zimbabwe, Afghanistan, Pakistan, Kenya, and Iraq.⁴³ In addition, forty-five states are rated "in danger" of near-term collapse.⁴⁴

There are bright spots in history. The people of the Dominican Republic, until recently, enjoyed relative prosperity in relation to its neighbor Haiti, both of which share the island of Hispaniola.⁴⁵ This can be attributed to prior efforts by the Dominican Republic leaders to establish a very large national park system and their use of the armed forces to prevent illegal logging and farming.⁴⁶ In the 1600s, Japan experienced a brief episode of deforestation for buildings, heating, and cooking.⁴⁷ In 1657, however, following a serious forest fire, a succession of shoguns "invoked Confucian

37. DIAMOND, *supra* note 11, at 317.

38. *Id.* at 318–20.

39. *Id.* at 319.

40. *Id.* at 319–20.

41. *Id.* at 320.

42. *Id.* at 322–24. Over 800,000 people were killed as a result of the violence outbreaks in Rwanda. *Id.* at 317.

43. See *The Failed States Index 2009*, FOREIGN POL'Y, July–Aug. 2009, at 82–83, available at http://www.foreignpolicy.com/articles/2009/06/22/the_2009_failed_states_index. Oil-rich Nigeria ranks fifteenth on the 2009 list of "Failed States" classified as "in danger" of collapse. *Id.* at 83.

44. *Id.* at 83.

45. See DIAMOND, *supra* note 11, at 329.

46. *Id.* at 332, 343. The situation in the Dominican Republic is less optimistic today with the reappearance of some pockets of illegal logging and the presence of a large number of illegal Haitian migrants (constituting 12% of the population in 2005) who have destructively farmed the border regions. *Id.* at 349–50, 355.

47. *Id.* at 297.

principles . . . that encouraged limiting consumption and accumulating reserve supplies” as a national ideology.⁴⁸ The end result today is that Japan has the “highest population density of any large First World country [D]espite that high population, almost 80% of Japan’s area consists of sparsely populated forested mountains . . . while most people and agriculture are crammed into the plains that make up only one-fifth of the country.”⁴⁹ Finally, the tiny but densely populated island of Tikopia in the south Pacific has 800 people per square mile but has been sustainably occupied for over 3000 years.⁵⁰ The island is covered with multi-storied rainforests in which the highest level—the canopy—provides shelter for agricultural activity in the understory.⁵¹ Throughout history, the inhabitants have practiced birth control, including less humanitarian forms of population control, and they have used a permit system in which a chief must approve the harvesting of fish or shellfish from the local waters or the hunting of animals.⁵²

A. *Consequences*

The most traditional consequence of state failure is that desperate poverty fuels mass migration to adjoining states and developed countries.⁵³ However, social science literature suggests that states in transition, i.e., failing states, are much more susceptible to internal conflicts, terrorism, the emergence of aggressive dictators, or other circumstances—which may require a military response of one sort or another by developed counties.

Regimes in transition seem to be the most prone to internal conflicts and terrorism.⁵⁴ Matthew Krain postulated in 2005 that “state failure” was causative of genocides or politicides.⁵⁵ This same body of research suggests that more democratic nations

48. *Id.* at 299.

49. *Id.* at 294.

50. *Id.* at 286.

51. *Id.* at 288.

52. *Id.* at 289–90.

53. *Id.* at 516.

54. See Alberto Abadie, *Poverty, Political Freedom, and the Roots of Terrorism*, 96 AM. ECON. REV. 50, 51 (2006).

55. Matthew Krain, *International Intervention and the Severity of Genocides and Politicides*, 49 INT’L STUD. Q., 363, 372 (2005).

have less terrorism and are less likely to experience genocide or politicide.⁵⁶ Krain explained the phenomena as follows:

State failures promote domestic instability, and open windows of opportunity during which murderous policies become more likely. In most cases, internal wars are the first in a complex series of events, often including other destabilizing events such as war, decolonization, or extra-constitutional changes in leadership. Evidence suggests that the greater the number of state failures experienced, the more severe the instance of state-sponsored mass murder.⁵⁷

In 1795, Immanuel Kant wrote the essay *Perpetual Peace*, in which he postulated that constitutional republics are a necessary condition for world peace.⁵⁸ Kant's theory was that a majority of the people would never vote to go to war, unless in self defense; therefore, if all nations were republics, it would end war because there would be no aggressors.⁵⁹ Kant's theory on state behavior has been proven correct in the post-World War II period in which state behavior is governed by the use-of-force principles set forth in the United Nations ("UN") Charter.⁶⁰ With few exceptions, in the post-UN Charter era, totalitarian regimes are more willing to resort to force while democracies tend to be reluctant to use force, sometimes to the point of isolationism.⁶¹ It logically follows then that preventing the collapse—or near collapse—of states is desirable to both mitigate the effects of the displacement of

56. See Abadie, *supra* note 54, at 51.

57. Krain, *supra* note 55, at 372 (internal citations omitted).

58. IMMANUEL KANT, *Toward Perpetual Peace*, in *TOWARD PERPETUAL PEACE AND OTHER WRITINGS ON POLITICS, PEACE, AND HISTORY* 74–75, 78 (Pauline Kleingeld ed., 2006).

59. *Id.* at 74–76.

60. U.N. Charter art. 2, para. 4. The UN Charter Framework requires that states resolve their disputes peacefully, respect the political and territorial integrity of other states, and refrain from any use of armed force. *Id.* The primary exception is the exercise of self defense against an armed attack. *Id.* art. 51. Multiple rationales can be advanced to support Kant's theory, namely:

democratic leaders are restrained by the resistance of their people to bearing the costs and deaths of war; the diversity of institutions and relations within and between democracies creates checks and balances and cross-pressures inhibiting belligerence among them; a democratic [capitalist] culture of negotiation and conciliation means that in their interaction with other democracies, democratic leaders are basically dovish; [and] democracies see each other of the same kind, sharing the same values, and thus are more willing to negotiate than fight.

R.J. Rummel, *Democracies Don't Fight Democracies*, *PEACE MAG.*, May–June 1999, at 10, 12.

61. See JOHN NORTON MOORE & ROBERT F. TURNER, *NATIONAL SECURITY LAW* 81 (2d ed. 2005).

affected individuals and prevent the emergence of regimes that could act aggressively towards the United States, its allies, or its neighbors.⁶²

Many of the lessons in *Collapse* are relevant to the questions raised by climate change and lack of energy independence, particularly as they relate to countries that are transitional or those that are at high risk of collapse. Diamond makes the especially important point, worth repeating from above, that the collapse of any state today has the potential to put distant states at risk because

[T]he types of environmental dangers . . . today [are different from] . . . those faced by past societies. A major difference has to do with globalization, which lies at the heart of the strongest reasons both for pessimism and for optimism about our ability to solve our current environmental problems. Globalization makes it impossible for modern societies to collapse in isolation, as did Easter Island and the Greenland Norse in the past. Any society in turmoil today, no matter how remote—think of Somalia and Afghanistan as examples—can cause trouble for prosperous societies on other continents, and is also subject to their influence (whether helpful or destabilizing).⁶³

B. *Factors Leading to Stress or State Collapse*

Diamond's research identified five factors that lead to collapse: (1) environmental damage rendering human habitat to be unfit, (2) climate change, (3) hostile neighbors, (4) decreased support by friendly neighbors, and (5) the ability of a given society to take measures to confront one of the other challenges and prevent collapse.⁶⁴

For policymakers in both the developed and the developing world, this five-point framework enables the assessment of any society's vulnerability to collapse, including the impacts of global climate change on the vulnerability of developed states like the United States. Examination of these issues will continue from the perspective of the loss of energy independence—a problem for de-

62. See DIAMOND, *supra* note 11, at 515–16.

63. *Id.* at 23.

64. *Id.* at 11–15. Japan and China are examples of countries which have been able to readily adapt to challenges because of their relatively homogenous populations and comparative high levels of intelligence which enabled responsible leadership to emerge. *Cf. id.* at 305–06, 373–74.

veloping countries especially—and the impacts of climate change. Even though both perspectives will be dealt with separately, it will hopefully become readily apparent that the two issues are interrelated and cannot be analytically separated.

III. OIL, GLOBAL PEACE, AND STABILITY

President Roosevelt's tacit agreement in 1945 with Saudi Arabia promising U.S. protection in return for special U.S. access to Saudi oil has more or less put the United States in the middle of four regional conflicts: Israel vs. Arab nations, Iraq vs. Iran, Iraq vs. Kuwait, and the United States vs. Iraq.⁶⁵ The links between access to oil and national security became explicit during the Carter administration, in which the United States signaled its willingness to use military force to protect the world's access to oil in order to protect the global market.⁶⁶ During that period, some international lawyers apparently reasoned that access to oil—essential for the generation of energy and food—is a fundamental human right, which might reasonably justify the use of armed force to protect commercial access.⁶⁷ Indeed, shortly after the

65. See Sarah Ebe, U.S. Foreign Oil Dependence: Issue Brief (unpublished manuscript), available at <http://www.writing.ucsb.edu/faculty/dean/50/2008papers/ebe.pdf>; see also PBS Frontline, Saudi Arabia: A Chronology of the Country's History and Key Events in the U.S.-Saudi Relationship, <http://www.pbs.org/wgbh/pages/frontline/shows/saudi/etc/cron.html> (last visited Feb. 23, 2010).

66. CNA CORP., *supra* note 5, at 6–7. The so-called “Carter Doctrine” was a policy proclaimed by former President Jimmy Carter in his State of the Union Address on January 23, 1980. *Id.* In that speech, Carter declared that the United States would use military force, if necessary, to defend its national interests in the Persian Gulf region as related to the access of hydrocarbon resources. *Id.* The doctrine was a response to the threats posed to the United States by the 1979 invasion of Afghanistan by the Soviet Union:

The region which is now threatened by Soviet troops in Afghanistan is of great strategic importance: It contains more than two-thirds of the world's exportable oil. The Soviet effort to dominate Afghanistan has brought Soviet military forces to within 300 miles of the Indian Ocean and close to the Straits of Hormuz, a waterway through which most of the world's oil must flow. The Soviet Union is now attempting to consolidate a strategic position, therefore, that poses a grave threat to the free movement of Middle East oil.

Jimmy Carter, President, State of the Union Address (Jan. 23, 1980), available at <http://jimmycarterlibrary.org/documents/speeches/su80jec.phtml>.

67. The difficulty with this argument is that the use of armed force under the UN Charter, Article 51, is only justified in self-defense of *armed attack*. U.N. Charter art. 51. However, some international lawyers suggested that deprivation of oil may constitute a form of coercion that is prohibited as a form of state behavior under Article 2(4) of the UN Charter. See Jordan J. Paust & Albert P. Blaustein, *The Arab Oil Weapon—A Threat to International Peace*, 68 AM. J. INT'L L. 410, 413, 415–17 (1974). Oil can also be linked to Articles 25 and 28 of the 1948 Universal Declaration of Human Rights, which ensures all

Iraqi invasion of Kuwait in 1990, President Bush imposed a de facto military blockade of Iraq *in advance* of an authorization by the UN Security Council for states to take military action to remove Iraqi forces from Kuwait.⁶⁸ This action was the first time since the Vietnam War that the United States had used military force to protect an economic interest.⁶⁹ The action prompted criticisms from many—including the UN Secretary General—that the United States must work through the Security Council.⁷⁰ Given that blockades are generally considered equivalent to the aggressive use of armed force under a traditional law-of-war analysis,⁷¹ the 1990 blockade vignette clearly demonstrates that the United States—and presumably other states as well—regard access to oil as a fundamental right, which may legally justify the use of military force.

There is a growing consensus in U.S. national security circles that American dependence on imported oil constitutes a threat to the United States because a substantial portion of those oil reserves are controlled by governments that have historically pursued policies inimical to U.S. interests. For example, Venezuela, which represents eleven percent of U.S. oil imports, “regularly espouses anti-American and anti-Western rhetoric both at home and abroad . . . [and] . . . promotes . . . [an] anti-U.S. influence in parts of Latin and South America . . .”⁷² that retards the growth of friendly political and economic ties among the United States, Venezuela, and a few other states in Latin and South America. This scenario plays out in many different regions. Russia, for example, has used its oil leverage to exert extreme political pressure upon Ukraine and Belarus.⁷³ Longstanding Western commercial relations with repressive regimes in the Middle East—i.e., Iran, Sudan, and Saudi Arabia—raise similar issues because of the mixed strategic messages that are being sent. Of course, large wealth

persons the rights of food and medical care. *See id.* at 436–37.

68. Michael R. Gordon, *Bush Orders Navy to Halt All Shipments of Iraq's Oil and Almost All Its Imports*, N.Y. TIMES, Aug. 13, 1990, at A1; *see also* S.C. Res. 678, U.N. DOC. S/RES/678 (Nov. 29, 1990) (approving the use of force by member states).

69. *Cf. id.*

70. R.W. Apple, Jr., *Ships Turn Away from Ports as Iraq Embargo Tightens; U.S. Military Force Pours In*, N.Y. TIMES, Aug. 14, 1990, at A1 (UN Secretary General Perezde Cuellar stating that only the UN has authority to decide about blockades).

71. MOORE & TURNER, *supra* note 61, at 735.

72. CNA CORP. *supra* note 5, at 3.

73. *See id.* at 3–4.

transfers have allowed the Taliban in Saudi Arabia to bankroll terrorism.⁷⁴

A. *Chokepoints and Flashpoints*

For the foreseeable future, the U.S. military will most likely be involved in protecting access to oil supplies—including the political independence of oil producers—and the global movements of using oil to help sustain the smooth functioning of the world economy. The security challenges associated with preserving access to oil are complicated by geographical “chokepoints,” through which oil flows or is transported, but which are vulnerable to piracy or closure.⁷⁵ “Flashpoints” also exist as a result of political—and sometimes military—competition to secure commercial or sovereign access to oil in the face of disputed maritime and land claims that are associated with oil and gas deposits. Together, these challenges have necessitated that the United States and its allies maintain costly navies and air forces to protect sea lanes, ocean access, and maintain a presence to deter military competition in disputed regions. A selection of today’s chokepoints and flashpoints follow.

The Strait of Hormuz. This strait is the narrow waterway that allows access from the Indian Ocean into the Persian Gulf. Two-thirds of the world’s oil is transported by ocean, and a very large percentage of that trade moves through Hormuz. The northern tip of Oman forms the southern shoreline of the strait.⁷⁶ Hormuz is protected by the constant transits of the U.S. Navy and its allies. Even though the strait has not been closed, the Persian Gulf has been the scene of extensive military conflict.⁷⁷ On September 22, 1980, Iraq invaded Iran, initiating an eight-year war between the two countries that featured the “War of the Tankers,” in which 543 ships, including the USS Stark, were attacked, while the U.S. Navy provided escort services to protect tankers

74. See, e.g., NAT’L COMM. ON TERRORIST ATTACKS UPON THE U.S., THE 9/11 COMMISSION REPORT 169–73 (2004) [hereinafter 9/11 COMMISSION].

75. Energy Info. Admin., World Oil Transit Chokepoints (Jan. 2008), http://www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/Full.html.

76. *Id.*

77. Energy Info. Admin., Persian Gulf Oil and Gas Exports Fact Sheet (Mar. 2002), <http://www.eia.doe.gov/cabs/pgulf2.html>.

that were transiting the Persian Gulf.⁷⁸ There have been past threats by Iran to militarily close the strait.⁷⁹ Additionally, there are ongoing territorial disputes between the United Arab Emirates and Iran over ownership of three islands that are located in approaches to the strait.⁸⁰ Closure of the strait would cause severe disruption in the movements of the world's oil supplies and, at a minimum, cause significant price increases and perhaps supply shortages in many regions for the duration of the closure.⁸¹ During the War of the Tankers, oil prices increased from \$13 per barrel to \$31 a barrel due to supply disruptions and other "fear" factors.⁸²

Bab el-Mandeb. The strait separates Africa (Djibouti and Eritrea) and Asia (Yemen), and it connects the Red Sea to the Indian Ocean via the Gulf of Aden. The strait is an oil transit chokepoint since most of Europe's crude oil from the Middle East passes north through Bab el-Mandeb into the Mediterranean via the Suez Canal.⁸³ Closure of the strait due to terrorist activities or for political/military reasons, could keep tankers from the Persian Gulf from reaching the Suez Canal and Sumed Pipeline complex, diverting them around the southern tip of Africa (the Cape of Good Hope).⁸⁴ This would add greatly to transit time and cost, and would effectively tie-up spare tanker capacity. Closure of the Bab el-Mandeb would effectively block non-oil shipping from using the Suez Canal.⁸⁵ In October 2002 the French-flagged tanker Limburg was attacked off the coast of Yemen by terrorists.⁸⁶ During the

78. Reynolds B. Peele, *The Importance of Maritime Chokepoints*, 27 PARAMETERS 61 (1997), available at <http://www.carlisle.army.mil/usawc/Parameters/97summer/peele.html>; see also FED. RESEARCH DIV., LIBRARY OF CONGRESS, IRAQ: A COUNTRY STUDY 233-34 (Helen Chapin Metz ed., 1990), available at <http://memory.loc.gov/frd/cs/irqoc.html>. Thirty-seven crew members were killed as a result of that Iraqi missile attack on May 17, 1987. *Id.* at 240-41. A total of 200 merchant sailors also lost their lives in the years of conflict. Peele, *supra*. Over eighty ships were sunk resulting in losses of \$2 billion in direct losses to cargo and hulls. *Id.*

79. FED. RESEARCH DIV., LIBRARY OF CONGRESS, IRAN: A COUNTRY STUDY 277-78 (Helen Chapin Metz ed., 1989), available at <http://memory.loc.gov/frd/cs/irtoc.html>.

80. *Id.* at 38-39 (including Abu Musa, Greater Tunb, and Lesser Tunb Islands); *Iran Asserts Claims to 3 Disputed Islands in Gulf*, N.Y. TIMES, Dec. 27, 1992, at 16.

81. Energy Info. Admin., *supra* note 75.

82. U.S. DEPT. OF DEF., NATIONAL SECURITY AND THE CONVENTION ON THE LAW OF THE SEA 12 (2d ed. 1996).

83. Energy Info. Admin., *supra* note 75.

84. *Id.*

85. *Id.*

86. *Id.*; see also William J. Fallon, Admiral, U.S. Navy, Remarks at the Fourth Annual

Yom Kippur War in 1973, Egypt closed the strait as a means of blockading the southern Israeli port of Eilat.⁸⁷

The Turkish Straits and Caspian Oil. The term “Turkish Straits” refers to the two narrow straits in northwestern Turkey, the Bosphorus and the Dardanelles, which connect the Sea of Marmara with the Black Sea on one side and the Aegean arm of the Mediterranean Sea on the other. Turkey and Russia have been locked in a longstanding dispute over passage issues involving the Turkish Straits.⁸⁸ The 1936 Montreux Convention puts Turkey in charge of regulating traffic through the straits,⁸⁹ yet Turkey has been hard pressed to stop an onslaught of Russian, Ukrainian, and Cypriot tankers, which transport Caspian Sea oil to markets in Western Europe.⁹⁰ Because of the very heavy shipping traffic and very challenging geography, there have been many collisions and groundings in the past, creating terrible pollution incidents and death.⁹¹ Thus far, none of these incidents have been attributed to state-on-state-conflict or terrorism;⁹² however, the confined waterway is an especially attractive target because of the grave economic and environmental damage that would result from a well-timed and well-placed attack on a loaded tanker. The issues surrounding the straits are also a subset of larger problems associated with the exploitation of Caspian oil, including severe pollution of the Caspian Sea as a result of imprudent extraction techniques, as well as the ever-present potential for conflict among the various claimants to the Caspian’s hydrocarbon resources due to an inability of the various Caspian littoral states to agree on their maritime boundaries—and their

Shangri La Dialogue “Enhancing Maritime Security Cooperation” (June 5, 2005), <http://www.pacom.mil/speeches/sst2005/050606-emsi-Shangrila.shtml>.

87. See Youssef H. Aboul-Enein, *The Yom Kippur War: Indications and Warnings*, MIL. REV., Jan.–Feb. 2003, at 52, 53 (2003).

88. Energy Info. Admin., *supra* note 75.

89. Convention Regarding the Regime of the Straits, July 20, 1936, 173 L.N.T.S. 215.

90. See Energy Info. Admin., Country Analysis Briefs: Turkey (Apr. 2009), <http://www.eia.doe.gov/emeu/cabs/Turkey/Full.html>.

91. *Id.* See generally Mark E. Rosen, *The Black Sea and Her Approach—Will There Be Fair Winds and Following Seas?*, in SECURITY FLASHPOINTS: OIL, ISLANDS, SEA ACCESS AND MILITARY CONFRONTATION 291–309 (Myron H. Nordquist & John Norton Moore eds., 1998) [hereinafter SECURITY FLASHPOINTS].

92. See Hugh Pope, *Turkey Stirs Up a Storm in the Bosphorus: Curbs on Waterway Traffic Anger Old Salts*, INDEP. (London), Sept. 18, 1994, <http://www.independent.co.uk/news/world/turkey-stirs-up-a-storm-in-the-bosphorus-curbs-on-waterway-traffic-anger-old-salts-1449623.html>.

legal areas in which to drill.⁹³ Any one of these problems could become a major flashpoint in the future.

China vs. Japan. The Daiyu/Senkaku islands located in the East China Sea have become an increasingly contentious dispute because both claimants have, in the past, used modern military platforms to patrol the areas of their claims in which there are suspected oil and gas deposits in the seabed.⁹⁴ In September 2005, for example, China dispatched five warships to disputed waters surrounding its oil and gas platforms, which were spotted by a Japanese maritime patrol aircraft.⁹⁵ There have been other similar military-to-military encounters.⁹⁶ Given the fact that both countries have modern armed forces and are comparatively energy starved, it is not difficult to envision serious conflict erupting over these disputed areas.

The Arctic Super Highway. Traditionalists would probably not include the Arctic as a security chokepoint. The oil connection is reasonably well known: "22 percent of the world's undiscovered energy reserves are projected to be in the region (including 13 percent of the world's petroleum and 30 percent of natural gas)."⁹⁷ However, given the very small margins that transporters earn transporting oil from point A to B,⁹⁸ shipping companies are always in search of shorter routes to transport oil to market. As the thawing of the Arctic Ocean continues as a result of climate change,⁹⁹ this may create new shipping routes that transporters of

93. See E.T. ZHANBURSHIN & A.B. BIGALIEV, ENVIRONMENTAL PROBLEMS OF WATER RESOURCES OF THE NEAR-CASPIAN REGION CONNECTED WITH EXTRACTION AND TRANSPORTATION OF HYDROCARBONS, <http://www.epa.gov/OEM/docs/oil/fss/fss06/zhanburshin.pdf> (discussing pollution of the Caspian Sea associated with the exploitation of oil) (last visited Feb. 23, 2010); Mehrdad Haghayeghi, *The Coming of Conflict to the Caspian Sea*, 50 PROBS. POST-COMMUNISM 32, 33-36 (2003), available at http://www.mthdyoke.edu/courses/sfjones/242s/restricted/conflict_caspian.pdf.

94. See Robert Marquand, *Japan-China Tensions Rise Over Tiny Islands*, CHRISTIAN SCI. MONITOR, Feb. 11, 2005, at 1.

95. See Norimitsu Onishi & Howard W. French, *Japan's Rivalry with China Is Stirring a Crowded Sea*, N.Y. TIMES, Sept. 11, 2005, at 14.

96. See Marquand, *supra* note 94.

97. CNA CORP., *supra* note 5, at 24 (footnote omitted).

98. Letter from Barry T. Hill, Assoc. Dir., U.S. Gen. Accounting Office, to Ralph Regula, Chairman, Subcomm. on Interior & Related Agencies, House Comm. on Appropriations (Aug. 19, 1998), in U.S. GEN. ACCOUNTING OFFICE, GAO/RCED-98-242, FEDERAL OIL VALUATION: EFFORTS TO REVISE REGULATIONS AND AN ANALYSIS OF ROYALTIES IN KIND 16 (1998).

99. U.S. ARCTIC RESEARCH COMM'N, REPORT ON GOALS AND OBJECTIVES FOR ARCTIC RESEARCH (2007), http://www.arctic.gov/publications/usarc_2007_goals.pdf; see also NAT'L

oil and other goods will use to maximize their profits and minimize their transit times. As supplies of readily exploitable crude oil are reduced, the probability increases that some of this trade will result from exploitation activities in the land and littoral areas adjacent to the Arctic Sea. This development is concerning for a number of reasons: (1) the area is very remote and could provide a safe haven to pirates seeking to hijack cargoes; (2) the environmental sensitivity of the area, and the concomitant difficulty of mounting a cleanup effort, means that an oil spill in that marine environment will be much more persistent than an oil spill in temperate waters;¹⁰⁰ (3) the Arctic presents unique navigational difficulties due to the lack of good charts, navigational aids, and communications towers, as well as the impacts of extreme cold on the operational effectiveness of systems;¹⁰¹ (4) the unsettled nature of claims by various countries, including the United States, to the seabed continental shelf resources in the littoral areas off their coastlines creates the potential for military competition and conflict over these claims.¹⁰² The International Maritime Organization (“IMO”) is now circulating draft guidelines for ships operating in Arctic areas to promote—but not require—ship hardening against an iceberg strike, better crew training, and environmental protection measures.¹⁰³ These guidelines are merely advisory and can only be implemented via the flag states.¹⁰⁴ Also, neither IMO nor any of the UN Law of the Sea Institutions have mandatory jurisdiction over any of the flashpoint issues re-

PARK SERV., U.S. DEP'T OF THE INTERIOR, MONITORING CLIMATE CHANGE (Dec. 2007), <http://www.nps.gov/dena/naturescience/upload/Monitoring-Climate-Change.pdf> (“The Arctic is more sensitive to climate change than perhaps any other place on Earth.”); U.S. GEOLOGICAL SURVEY, RATES AND EFFECTS OF CLIMATE WARMING AND PERMAFROST THAWING IN THE YUKON RIVER BASIN: AN ARCTIC BENCHMARK 1, <http://ny.water.usgs.gov/projects/climate/YukonClimate.pdf> (last visited Feb. 23, 2010) (“In particular, the potential permafrost thawing could significantly increase the rate of warming globally.”).

100. WORLD WILDLIFE FUND, OIL SPILL RESPONSE CHALLENGES IN ARCTIC WATERS 7 (2007), available at http://www.crrc.unh.edu/workshops/arctic_spill_summit/nuka_oil_spill_response_report_final_jan_08.pdf.

101. Int'l Maritime Org., Arctic and Antarctic Shipping Safety, Ships Operating in Polar Regions, http://www.imo.org/safety/mainframe.asp?topic_id=1787 (last visited Feb. 23, 2010).

102. See Peter Prows, *Tough Love: The Dramatic Birth and Looming Demise of UNCLOS Property Law (and What Is to Be Done About It)*, 42 TEX. INT'L L.J. 241, 270 & n.187 (2007).

103. Int'l Maritime Org., *supra* note 101 (updating earlier guidelines MSC/Circ. 1056–MEPC/Circ. 399).

104. See *id.*; Int'l Maritime Org., Flag State Implementation, http://www.imo.org/safety/mainframe.asp?topic_id=156 (last visited Feb. 23, 2010).

lating to competing continental shelf claims in the Arctic,¹⁰⁵ meaning that any disputes will remain unresolved for a long time.

The above is only a selected list of potential flashpoints in which oil is the main culprit. Disputes between China and six other nations of the Spratly Islands, and other territories in the South China Sea, remain unresolved.¹⁰⁶ The Spratly Islands could become a flashpoint in the future, involving the United States or its allies, because of the proximity of those areas to the major sea routes to Japan and Korea.¹⁰⁷ The strategic straits of Malacca, Lombok, and Sunda in Southeast Asia are absolutely essential to the movement of raw materials to Japan, Korea, and China.¹⁰⁸ Because of Lombok's depth and strategic location, it is a major transit route for very large crude carriers that move between the Middle East and Asia.¹⁰⁹ Lombok is an undefended waterway that is only eighteen kilometers in width at its southern opening, making it an attractive chokepoint for hijacking or eco-terrorism in which the waters of the environmentally sensitive Indonesian archipelago would be held hostage.¹¹⁰

B. *Negative Impacts on U.S. Military Readiness and Power*

The United States has paid dearly in fighting major conflicts in the Persian Gulf region that are linked to assuring continued

105. The IMO regulates shipping and not continental shelf claims. Int'l Maritime Org., Convention on the International Maritime Organization Summary, http://www.imo.org/conventions/mainframe.asp?topic_id=771 (last visited Feb. 23, 2010). Further, the United Nations Convention on the Law of the Sea does not provide a method for resolving these disputes. United Nations Convention on the Law of the Sea (1982), 1833 U.N.T.S. 397 (1994), available at www.un.org/Depts/los/convention_agreements/texts/unclos/unclos_e.pdf; see also Stephanie Holmes, *Comment, Breaking the Ice: Emerging Legal Issues in Arctic Sovereignty*, 9 CHI. J. INT'L L. 323, 340, 351 (2008).

106. See Hasjim Djalal, *South China Sea Island Disputes*, in SECURITY FLASHPOINTS, *supra* note 91, at 109, 113–17.

107. *Id.* at 111–13.

108. *Id.* at 111–12; see also MICHAEL LEIFER, INTERNATIONAL STRAITS OF THE WORLD: MALACCA, SINGAPORE, AND INDONESIA 53–59 (1978).

109. *Id.* at 79–80.

110. See *id.* at 79. Even though al Qaeda and sympathetic terrorist groups have not shown a proclivity to attack economic targets, Bin Laden has crowed to foreign audiences about the disproportionate payout that al Qaeda realized as a result of the 9/11 attacks: "In 2004 Bin Laden referred to the 9/11 attacks as economic: in his videotape broadcast on Al Jazeera and posted online, he bragged that Al Qaeda spent \$500,000 on the event, while America lost, 'according to the lowest estimate, \$500 billion'" See Gabriel Weiman, *War by Other Means: Econo-Jihad*, YALEGLOBAL ONLINE, June 4, 2009, <http://yaleglobal.yale.edu/content/econo-jihad>.

access to oil and keeping oil markets stable.¹¹¹ One would have thought that the United States had learned its lesson: “Despite the global economic downturn that began in the fall of 2008, U.S. and worldwide energy demand is expected to increase dramatically in the coming decade.”¹¹² The United States has made strides in increasing the fuel efficiency of motor vehicles and effected other changes that will, in the coming years, lower per capita energy consumption.¹¹³ However, these positive changes in behavior have not been sufficient to change the basic fact that the United States is far too dependent on imported foreign oil, and such overdependence “tethers America to unstable and hostile regimes, subverts foreign policy goals, and requires the U.S. to stretch its military presence across the globe” to preserve its influence and its access to foreign oil supplies.¹¹⁴ Over time, U.S. sources of imported oil have become more diversified and probably will, in time, lessen U.S. dependence on oil from the Middle East.¹¹⁵ However, the same cannot be said about U.S. allies and trading partners.¹¹⁶ Also, the United States has an enduring interest in protecting all of these markets to ensure price stability of the product and to prevent shortages.

Because the Department of Defense (“DOD”) is the largest fuel user in the country,¹¹⁷ it is moving aggressively to integrate alternative fuels on its bases, ships, and aircraft, and it has been provided \$7.4 billion in “stimulus” appropriations by the American Recovery and Reinvestment Act of 2009 (“ARRA”) to, among other things, modernize DOD’s energy infrastructure and conduct tar-

111. See CNA CORP., *supra* note 5, at 7.

112. *Id.* at 17; see also MICHAEL T. KLARE, BLOOD AND OIL: THE DANGERS AND CONSEQUENCES OF AMERICA’S GROWING DEPENDENCY ON IMPORTED PETROLEUM 10–11, 16 (2004). The Energy Information Administration, a Department of Energy entity, reported that 58% of the oil the United States uses is imported, over half of those imports coming from countries in the Western Hemisphere, including Canada, Mexico, and Venezuela. See Energy Info. Admin., Energy in Brief: How Dependent Are We on Foreign Oil?, http://ton.to.eia.doe.gov/energy_in_brief/foreign_oil_dependence.cfm (last visited Feb. 23, 2010).

113. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2009 WITH PROJECTIONS TO 2030, at 31–35, 61 fig.35, 69–70 (2009), available at [http://www.eia.doe.gov/oiat/aeo/pdf/0383\(2009\).pdf](http://www.eia.doe.gov/oiat/aeo/pdf/0383(2009).pdf).

114. CNA CORP., *supra* note 5, at 41.

115. *Id.* at 25–27.

116. See Friedman Müller, *Europe Must Diversify Its Energy Sources*, TRANSATLANTIC INTERNATIONAL POLITIK (F.R.G.), Feb. 2003, at 31–36 (arguing that Europe must follow America’s lead); see also KLARE, *supra* note 112, at 18–20.

117. CNA CORP., *supra* note 5, at 8.

geted energy efficiency research and development projects.¹¹⁸ DOD also maintains an Environmental Security Technology Certification Program to demonstrate and validate innovative technologies targeting its most urgent environmental needs.¹¹⁹

Despite positive investments that will eventually lead to more energy efficient systems, the increased “electrification” of combat has chained field commanders in Afghanistan to military fuel lines.¹²⁰ Further, a myriad of generators, refrigeration units, and other electrified combat systems need oil or gas to power them.¹²¹ This “tethering” effect creates additional risks because field commanders have to be cognizant of the constant threat of ambush or roadside bombs to convoys of fuel trucks and supply forces in the field.¹²² Conventionally powered naval vessels are, of course, dependent upon a costly and exposed network of supply ships, and DOD foreign bases exist to provide refueling support for U.S. ships and warplanes.¹²³ Finally, fluctuations in oil prices greatly complicate DOD’s ability to finance its operations.¹²⁴ An increase of just \$10 per barrel in the cost of oil translates into \$1.3 billion in increased costs of operations.¹²⁵ These types of price spikes have clear impacts on readiness since funds have to be shifted from training and maintenance accounts to pay for fuel.¹²⁶

C. *Negative Impacts on U.S. Economy*

Continued U.S. dependence on fossil fuels undermines its economic and, in some respects, its political sovereignty. The twelve million barrels that the United States imports each day to satisfy domestic demand amounted to a capital outflow of \$475 billion in

118. See American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115; see also U.S. DEP’T OF DEF., AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009: DEPARTMENT OF DEFENSE EXPENDITURE PLANS 2 (2009), available at http://www.defenselink.mil/recovery/plans_reports/2009/april/DoD_ARRA_First_Report_to_Congress-24_Mar_09.pdf.

119. Env’tl. Sec. Tech. Certification Program, Background and Contact Information for ESTCP Program, <http://www.estcp.org/about/index.cfm> (last visited Feb. 23, 2010).

120. See CNA CORP., *supra* note 5, at 9.

121. See *id.*

122. See *id.*

123. See *id.* at 11.

124. See *id.*

125. *Id.*

126. See *id.*

2008.¹²⁷ This heavy dependence on imports puts U.S. economic activity at risk if supplies are suddenly cut off for political reasons.¹²⁸ There is also good historical data on the correlation between spikes in oil prices and declines in the U.S. gross domestic product.¹²⁹ Looking long-term, to finance this incredible cost to the U.S. economy, America must borrow heavily.¹³⁰ At a number of levels, this economic outflow harms U.S. economic security by eliminating U.S. economic activity that could otherwise be taxed at the federal, state, and local levels, while helping to reduce the burgeoning U.S. government budget deficits.¹³¹ Also, “chronic trade deficits [due in large part to oil imports] have reduced U.S. economic growth by at least one percentage point a year, or about

127. PickensPlan, *The Plan*, <http://www.pickensplan.com/oilimports> (last visited Feb. 23, 2010). The Pickens Plan creates a blueprint to reduce foreign oil dependence by harnessing domestic energy alternatives and develop new technologies. *Id.*

128. See RAND CORP., *DOES IMPORTED OIL THREATEN U.S. NATIONAL SECURITY?* (2009), available at http://www.rand.org/pubs/research_briefs/2009/RAND_RB_9448.pdf.

129. See ENERGY INFO. ADMIN., *ENERGY PRICE IMPACTS ON THE U.S. ECONOMY* (Apr. 2001), available at http://www.eia.doe.gov/oiaf/economy/energy_price.html. The Energy Information Agency writes:

Looking from the 1970s forward, there are observable, and dramatic changes in GDP growth as the world oil price has undergone dramatic changes. In the past year, forecasters have acknowledged that higher energy prices can become a drag on the overall economy. Initially, overall CPI inflation was still very low, principally because inflation in commodities other than energy and agriculture was extremely low. However, the sustained high level of oil prices has begun to effect core inflation (minus energy and food) through continued pressure on prices of other commodities, in the United States and worldwide.

Id. at 1.

130. See Peter Morici, *New American Contract Policy Paper: Recalibrating U.S.-China* (June 11, 2009), http://www.newamerica.net/publications/policy/recalibrating_u_s_china (“With the trade deficit at 5 percent of GDP, Americans must spend 105 percent of what they earn, or the supply for U.S. goods and services exceeds the demand, inventories of new homes, cars and other goods mount, layoffs result, and the economy slips into recession.”).

131. See *War at Any Cost? The Total Economic Costs of the War Beyond the Federal Budget*, *Hearing Before the J. Economic Comm.*, 110th Cong. 214 (2008) (statement of Robert D. Hormats, Vice Chairman, Goldman Sachs). In testifying on the true costs of war to the U.S. economy before the Joint Economic Committee of Congress on February 28, 2008, Mr. Robert Hormats, Vice Chairman at Goldman Sachs (International) succinctly summarized the macro-economic costs of borrowing to the U.S. economy:

[B]orrowing for war, or for any other current purpose for that matter, will impose a large debt burden on future generations at a time when federal borrowing in the future will climb dramatically to pay for the skyrocketing costs of social security and health care for the aged and the poor. These vital but costly programs will put enormous stress on the Federal budget in coming decades, causing an additional increase in borrowing and/or taxes”

Id. Hormats also noted that such borrowing diverts funds from other productive government activities. *Id.*; see KLARE, *supra* note 112, at 11.

25 percent of potential GDP growth.”¹³² Trade deficits ultimately shift U.S. employment into non-trade competing industries, effectively extinguishing GDP growth potential.¹³³

D. *Impacts on U.S. Sovereignty and the Sustainment of Its Policies to Promote Democracy*

The purchases of imported oil by the United States and other developed countries have resulted in a huge transfer of wealth to a relatively small number of countries in which there have been major shifts in economic and political power.¹³⁴ These shifts have caused some undesirable political and security problems for the United States and have negatively impacted the economies and political independence of other importers and, in some circumstances, the suppliers of oil.¹³⁵ These impacts are less readily observable than an attack on an oil rig or a tanker, yet, in the long run, these impacts may be more dangerous because they undermine the economic and political independence of developing and developed countries, producers and importers.¹³⁶

Iran’s exports were estimated at \$77 billion in 2008, helping it to become “the world’s ‘most active state sponsor of terrorism,’” including funding Hezbollah and insurgent activities in Iraq.¹³⁷ Iran’s oil wealth has also created a political wedge between the United States and its treaty allies, including South Korea, Japan, and Italy, because U.S. allies cannot afford to divorce themselves from this supply of oil that powers their respective economies.¹³⁸ In the 1980s, Saudi Arabia found itself suddenly flush with oil wealth and began promoting its Sunni fundamentalist interpretation of Islam—Wahhabism.¹³⁹

The Saudi government, always conscious of its duties as the custodian of Islams’ holiest places, joined with wealthy Arabs from the Kingdom and other states bordering the Persian Gulf in donating

132. Morici, *supra* note 130.

133. *See id.*

134. *See* CNA CORP., *supra* note 5, at 4.

135. *See id.*

136. *See id.*

137. *See id.* (endnote omitted).

138. *See id.*

139. 9/11 COMMISSION, *supra* note 74, at 52.

money to build mosques and religious schools [in the Gulf region] that could preach and teach their interpretation of Islamic doctrine.¹⁴⁰

This same oil wealth provided money for Osama Bin Laden and al Qaeda, which operated through a Saudi financial support network known as the Golden Chain.¹⁴¹

Venezuela provides the United States with roughly eleven percent of its oil imports, and Venezuela has “partial or complete ownership of nine U.S.-based refineries.”¹⁴² The United States is Venezuela’s largest oil customer, yet President Hugo Chavez seems to view these interdependencies as a grant of immunity and has taken license to promote “anti-American and anti-Western rhetoric both at home and . . . in parts of Latin and South America through foreign aid (largely in the form of subsidized oil). . . .”¹⁴³ That same oil wealth has enabled Chavez to squash his political opposition and censor the press in his country.¹⁴⁴

E. *Dutch Disease*

Oil also has a corrosive effect on the countries that export it. “While oil can enable some nations to flex their muscles, it can also have a destabilizing effect on their economic, social, and political infrastructure.”¹⁴⁵ In many cases, the discovery of oil or gas deposits and subsequent reliance on them for income “can bring about ‘Dutch Disease,’ an economic condition that can occur when a nation’s large endowment of a natural resource attracts all capital away from other sectors. . . .”¹⁴⁶ For example, even though

140. *Id.*

141. *See id.* at 55.

142. CNA CORP., *supra* note 5, at 3 (footnotes omitted).

143. *See id.*

144. *See id.*

145. *See id.* at 5.

146. *See id.*

The term was coined in the Netherlands in the early 1960s, after the Dutch discovered huge deposits of natural gas in the North Sea. What happens in a country with Dutch disease is this: First the value of the currency rises, thanks to the sudden influx of cash from oil, gold, gas, diamonds, or some other natural resource discovery. . . . The citizens, flush with cash, start buying cheaper imported goods without restraint; the domestic manufacturing sector gets wiped out; and, presto, you have deindustrialization.

FRIEDMAN, *supra* note 11, at 98–99.

Russia has incredible natural resources and a talented and well-educated population, Russia's heavy reliance on oil and gas exports has held it back.¹⁴⁷ Factors that help explain this phenomenon include the heavy concentration of oil officials in the central government and an economy that is moribund because it lacks diversification.¹⁴⁸ Venezuela also suffers from "Dutch disease" in that most of its gross domestic product and public spending are dependent upon oil revenues, which can fluctuate wildly based on global oil prices.¹⁴⁹ Nigeria has significant oil resources, although it too suffers from extreme poverty, lack of infrastructure, rampant inflation, and political corruption because its wealth is concentrated in the hands of very few individuals and is not used to fund local improvements in infrastructure, which is needed to attract foreign capital, or to stimulate diversified local businesses.¹⁵⁰

F. *Oil, Lack of Energy, and Developing Countries*

Heavy reliance on imported oil has had bad security and economic impacts on developed countries, such as the United States.¹⁵¹ For developing countries the situation is worse: "Developing countries suffer more than the developed countries from oil price increases because they generally use energy less efficiently and because energy-intensive manufacturing accounts for a larger share of their GDP."¹⁵² Furthermore, they have much less ability to switch to alternative fuels.¹⁵³ Developing countries that import oil are more harmed by price increases in terms of sustaining their limited economic activities and agricultural sectors, resulting in inflation and, necessarily, higher food costs.¹⁵⁴ Indonesia, for example, "spends more money today subsidizing gasoline and cooking

147. See CNA CORP., *supra* note 5, at 3.

148. See Robert E. Looney, *The Impact of Defense Expenditure on Industrial Development in the Arab Gulf*, 30 MIDDLE E. STUD. 377, 379–80 (1994) (describing how government expenditures may retard industrial development by removing managerial skills and talent from the civilian sector and producing the "Dutch Disease effect").

149. CNA CORP., *supra* note 5, at 5.

150. See *id.*; Xavier Sala-i-Martin & Arvind Subramanian, *Addressing the Natural Resource Curse: An Illustration from Nigeria* §§ 1, 3 (Nat'l Bureau of Econ. Research, Working Paper No. 9804, 2003), available at <http://papers.nber.org/papers/w9804.pdf>.

151. See ROBERT L. HIRSCH ET AL., PEAKING OF WORLD OIL PRODUCTION: IMPACTS, MITIGATION, & RISK MANAGEMENT 28 (2005), available at http://www.netl.doe.gov/publications/others/pdf/Oil_Peaking_NETL.pdf.

152. *Id.* at 30.

153. *Id.*

154. See *id.*

oil products for its people (30 percent of the national budget) than providing them with an education (6 percent of the national budget).¹⁵⁵ Also, according to the International Monetary Fund, the high costs of oil have stimulated demand for commodities such as palm, corn, and rapeseeds oil for biofuel.¹⁵⁶ As a result, there have been concomitant worldwide increases in the prices for edible and other commodities, due to a spillover effect.¹⁵⁷ Food riots are now commonplace in some countries in Africa.¹⁵⁸

The World Summit on Sustainable Development (“Summit”) met in Johannesburg in 2002 to chart a path to global sustainable development.¹⁵⁹ Among other developments, the Summit commissioned UN-Energy to study the role of energy and sustainable development.¹⁶⁰ Worldwide, 1.6 billion people lack access to electricity, and 2.4 billion people still rely on traditional biomass fuels, lacking access to modern fuels, for cooking and heating.¹⁶¹ In fact, “[h]undreds of millions of people—mainly women and children—spend several hours daily gathering fuelwood and water” from distant locations to support their basic needs.¹⁶² UN-Energy issued its 2005 paper, *The Energy Challenge for Achieving Millennium Development Goals*, to more accurately quantify the connection between lack of access to clean energy and the inputs that lead to global warming and state collapse, particularly from the viewpoint of human and economic development.¹⁶³ Its findings were not that surprising: access to clean and inexpensive energy is essential to create mechanical power for agro-processing and

155. FRIEDMAN, *supra* note 11, at 312.

156. Int’l Monetary Fund, *Impact of High Food and Fuel Prices on Developing Countries—Frequently Asked Questions* (Sept. 11, 2009), <http://www.imf.org/external/np/exr/faq/ffpfaqs.htm>. The same can also be said about demand for palm oil, which is used as a source of biofuel. Shang-Wen Liu, *Palm Plantations Driving Destruction: Why Unilever Now Supports a Halt to Deforestation*, GREEN INVESTMENT, June 2008, at 4, available at <http://www.greenpeace.org/raw/content/china/en/campaigns/green-investment/issue-2/green-investment-issue-02.pdf>. Palm plantations are the leading cause of deforestation in Indonesia and elsewhere in the developing world. *Id.* at 4–5.

157. Int’l Monetary Fund, *supra* note 156.

158. *Id.*

159. United Nations: Johannesburg Summit 2002, http://www.un.org/jsummit/html/basic_info/basicinfo.html (last visited Feb. 23, 2010).

160. See Mats Karlsson, *Preface to UN-ENERGY, THE ENERGY CHALLENGE FOR ACHIEVING THE MILLENNIUM DEVELOPMENT GOALS 1* (2005), available at <http://esa.un.org/un-energy/pdf/UN-ENRG%20paper.pdf>.

161. UN-ENERGY, *supra* note 160, at 2.

162. *Id.* at 3.

163. See *id.* at 1, 3.

transport, refrigeration, health care, telecommunications, and education.¹⁶⁴ UN-Energy seemed to find a high correlation among the lack of modern fuels, electricity, and environmental sustainability.¹⁶⁵ Also, diversion of the population's productive time to engage in basic "gathering" activities perpetuates the vicious cycle of desperate poverty because it takes away time from progressive economic activity and education.¹⁶⁶ Further, inadequate "clean electrons," such as fuelwood, contribute to disease (due to exposure to unvented indoor cooking), the loss of natural habitats from the clearing of forests and foliage, and—one can postulate—accelerate climate change.¹⁶⁷

There have been some limited success stories. Thomas L. Friedman writes about the village of Aek Nbara in Northern Sumatra Indonesia in which much of the adjacent tropical rain forest, home to the endangered orangutan, was at threat of destruction due to deforestation.¹⁶⁸ Through a coalition between USAID and Conservation International, workshops were held to convince villagers that they were far better off economically preserving the forest floor for the growth of export crops (cinnamon, cloves, and sugar) and ecotourism.¹⁶⁹ Additionally, USAID seed money (approximately \$1 million) and matching funds from private donors are now being used to buy out the loggers' timber lease and invest in a new geothermal electric energy project, which will supply power to local villagers and nearby towns in Sumatra.¹⁷⁰ According to Friedman, the key to the success of these efforts is "buil[ding] locally, with local investment and local players," and using clean electrons.¹⁷¹

For the United States, its allies, and trading partners, every problem in the developing world is also an energy problem. Without electricity, more people will be forced into overcrowded slums in megacities, like Mumbai or Lagos, which are perfect incubators of disease.¹⁷² The impacts of climate change will have concomitant

164. *See id.* at 3.

165. *See id.* at 7–8.

166. *Id.* at 6 (noting that lack of access to modern fuels and electricity disproportionately burdens women, thereby harming their literacy and economic opportunities).

167. *See id.* at 3, 8.

168. FRIEDMAN, *supra* note 11, at 304–05.

169. *See id.* at 305–07.

170. *Id.* at 305, 307–08.

171. *Id.* at 312–15.

172. *See* LISA BENTON-SHORT & JOHN RENNIE SHORT, CITIES AND NATURE 67–68, 89–

impacts on those in the countryside: greater incidence of disease, deforestation, and loss of remaining clean freshwater supplies due to migration of peoples to higher ground.¹⁷³ These problems in the third world quickly become first world problems because of the relative ease by which disease and invasive species can spread to people and agriculture through relatively unrestricted and inexpensive international travel. Of course, as those diseases and invasive species mutate, vaccines and other countermeasures become ineffective.¹⁷⁴ The results are, at a minimum, very costly and sometimes deadly if the spread of mutated diseases rises to pandemic levels. The bottom line is that without electricity, the adaptation of states at risk of collapse to these extremes of climate change is only going to be that much more difficult.

IV. THE IMPACT OF CLIMATE CHANGE ON INTERNATIONAL SECURITY

The impacts of climate change on international peace and security are increasingly well-documented. CNA's *National Security and the Threat of Climate Change* detailed a wide range of national and international security impacts associated with climate change, including mass migration, scarcity, increased conflicts, and severe public health challenges.¹⁷⁵ Also, in June 2008 the Bush administration produced a National Intelligence Assessment ("NIA") concerning the effects of climate change on national security.¹⁷⁶ According to Dr. Thomas Fingar, the Chairman of the

91 (2008).

173. See Lori M. Hunter, *Climate Change, Rural Vulnerabilities, and Migration*, POPULATION REFERENCE BUREAU, June 2007, <http://www.prb.org/Articles/2007/ClimateChangeinRuralAreas.aspx>. See generally Anthony McMichael et al., *Human Health* (U. Confalonieri & A. Woodward eds.), in *CLIMATE CHANGE 2001: IMPACTS, ADAPTATIONS, AND VULNERABILITY* 1151 (James J. McCarthy et al., eds., 2001).

174. See, e.g., Centers for Disease Control and Preventions, Seasonal Flu Vaccine Questions and Answers, <http://www.cdc.gov/Flu/about/qa/flu vaccine.htm> (last visited Feb. 23, 2010) (describing how to guard against the seasonal flu, an example of the effects of disease mutation).

175. CNA CORP., *supra* note 2, at 6.

176. *National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030: Hearing Before the H. Permanent Select Comm. on Intelligence and the House Select Comm. on Energy Independence and Global Warming*, 110th Cong. 2-3 (2008) (statement for the record of Thomas Fingar, Deputy Director, National Intelligence for Analysis and Chairman, National Intelligence Council), [hereinafter NIA: Fingar Statement] available at http://www.dni.gov/testimonies/20080625_testimony.pdf; Nat'l Intelligence Council, *The Impact of Climate Change to 2030*, http://www.dni.gov/nic/special_climate2030.html (last visited Feb. 23, 2010); see also Kevin Whitelaw, *Intelligence Re-*

National Intelligence Council and a key participant in the NIA's production,

We judge global climate change will have wide-ranging implications for US national security interests over the next 20 years. . . . We judge that the most significant impact for the United States will be indirect and result from climate-driven effects on many other countries and their potential to seriously affect US national security interests. . . . Climate change could threaten domestic stability in some states, potentially contributing to intra- or, less likely, interstate conflict, particularly over access to increasingly scarce water resources. We judge that economic migrants will perceive additional reasons to migrate because of harsh climates, both within nations and from disadvantaged to richer countries.¹⁷⁷

It is indeed unfortunate that the issues associated with climate change and its connection with the burning of fossil fuels and industrial and human activity has been so mischaracterized and politicized for so long. The 2007 release of the Fourth Assessment Report by the Intergovernmental Panel on Climate Change ("IPCC")¹⁷⁸ has been praised due to its "well balanced and moderate" findings¹⁷⁹ that global warming is an unequivocal phenomena with "virtually certain" impacts on ecosystems, water resources, human health, industry, settlement, and society. These effects will vary from region to region and . . . be difficult to pre-

port Assesses Impact of Climate Change: Environmental Change Will Trigger New Issues for U.S. National Security, U.S. NEWS & WORLD REP., June 24, 2008, <http://www.usnews.com/articles/news/national/2008/06/24/intelligence-report-assesses-impact-of-climate-change.htm>.

177. NIA: Fingar Statement, *supra* note 176, at 4–5. "The NIA focuses on the implications of global climate change for US national security interests by 2030." *Id.* at 3.

178. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [IPCC], IPCC FOURTH ASSESSMENT REPORT: CLIMATE CHANGE 2007 (2007), *available* at http://www.ipcc.ch/publications_and_data/publications_and_data_reports.htm. The IPCC performs the secretariat and technical functions for all parties to the 1982 United Nations Framework Convention on Climate Change ("UNFCCC" or "FCCC"). *See* IPCC, Organization, History, http://www.ipcc.ch/organization/organization_history.htm (last visited Feb. 23, 2010). The UNFCCC adopted the Kyoto Protocol, encouraging states to reduce greenhouse gas emissions but not mandating such a result. U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE [UNFCCC], FACT SHEET: KYOTO PROTOCOL, http://unfccc.int/files/press/backgrounders/application/pdf/fact_sheet_the_kyoto_protocol.pdf (last visited Feb. 23, 2010). Kyoto, which expires in 2012, will undergo review at the upcoming UN Climate Change Conference in Copenhagen, Denmark in December 2009. Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 32; Provisional Agenda, UNFCCC, Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol, Fifth Session, Copenhagen, 7–18 December 2009, U.N. Doc. FCCC/KP/CMP/2009, U.N. Doc. FCCC/KP/CMP/2009/1 (Sept. 16, 2009).

179. RYMN J. PARSONS, TAKING UP THE SECURITY CHALLENGE OF CLIMATE CHANGE 1 (2009), *available* at <http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB932.pdf>.

dict. . . .”¹⁸⁰ The report also added clarity to the effects on the general security environment, which will be stressed by declining amounts of arable land, drought, desertification, loss of biodiversity, sea level rise, water shortages, population displacements, and health crises.¹⁸¹ These issues will likely become global in scope as a result of overcrowding in mega-cities and uncontrolled migration trends, which will have effects on developed and developing countries. In one respect, the United States had a strong taste of this problem when Hurricane Katrina, an extraordinary category three hurricane, hit New Orleans in 2005 causing \$81 billion in property damage, loss of life, and other serious disruptions.¹⁸²

A. *Patterns Among the “Up and Comers”*

Another dimension of current U.S. consumption habits is the effect our patterns of consumption have had upon those emerging economy states that seek to emulate our standard of living. This is certainly the case with states like China and India, who rightfully assert that they should be able to enjoy the same sort of energy-affluent lifestyle.¹⁸³ A drive on the streets of Beijing today displays many thousands of large, late model Mercedes, BMWs, Audis, Lexus’, Buicks, and a sizeable number of gas-guzzling SUVs and minivans.¹⁸⁴ China is aware of this trend and is taking aggressive action to move from oil and coal to wind, hydroelectric, and solar generation.¹⁸⁵ It remains an open question, however, whether China’s *nouveau riche* to switch from a Mercedes Benz to a Toyota Prius. The overall trend is not good as it relates to GHG emissions resulting from the increased use of coal and other fossil fuels:

180. *Id.* at 2 (citation omitted).

181. *See id.*

182. RICHARD D. KNABB ET AL., TROPICAL CYCLONE REPORT: HURRICANE KATRINA 1, 12 (2005), available at http://www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf.

183. *See* Jad Mouawad, *Cuts Urged in China’s and India’s Energy Growth*, N.Y. TIMES, Nov. 7, 2007, at C3.

184. *See* Keith Bradsher, *Beijing Pressures Automakers to Improve Efficiency*, N.Y. TIMES, Apr. 21, 2008, at C2 (describing the high sales of these types of automobiles in China).

185. Howard W. French, *Huitengxile Journal; In Search of a New Energy Source, China Rides the Wind*, N.Y. TIMES, July 26, 2005, at A4 (noting China’s goal to supply 10% of its energy needs from renewable energy sources by 2020).

World carbon dioxide emissions are projected to rise from 29.0 billion metric tons in 2006 to 33.1 billion metric tons in 2015 and 40.4 billion metric tons in 2030—an increase of 39 percent over the projection period. With strong economic growth and continued heavy reliance on fossil fuels expected for most of the non-[Organization for Economic Cooperation and Development (“OECD”)] economies, much of the increase in carbon dioxide emissions is projected to occur among the developing, non-OECD nations.¹⁸⁶

The problem, however, is that this dilemma problem is not limited to India and China. Friedman writes:

“Americans” are popping up all over now—from Doha to Dalian and from Calcutta to Casablanca to Cairo, moving into American-style living spaces, buying American-style cars, eating American style fast food, and creating American levels of garbage. . . .

Cities all over the world have caught America’s affluenza . . . [such that] “by 2030 . . . we will have gone from a world of two Americums to a world of eight or nine.”¹⁸⁷

This outbreak in affluence represents a triumph for U.S. policy favoring economic globalization because it represents the best opportunity for all states to advance economically. The unintended consequence of this effort is that this advancement comes at the expense of the planet. Newly affluent states, especially India, are relying upon coal-fired plants to satisfy their burgeoning energy demands.¹⁸⁸ This led to a 2004 headline in the *Christian Science Monitor* stating that the approximately 850 plants being constructed each year in China, India, and the United States threaten to “bury Kyoto” by a factor of five times the cap in carbon dioxide emissions envisioned in the Kyoto Treaty.¹⁸⁹ Given recent developments in the United States—including the decline in the price of natural gas,¹⁹⁰ legislative incentives to move away from

186. ENERGY INFO. ADMIN., INTERNATIONAL ENERGY OUTLOOK: 2009, at 6 (2009), available at [http://www.eia.doe.gov/oiaf/ieo/pdf/0484\(2009\).pdf](http://www.eia.doe.gov/oiaf/ieo/pdf/0484(2009).pdf).

187. FRIEDMAN, *supra* note 11, at 56. The term “Americum” refers to “any group of 350 million people with a per capita income above \$15,000 and a growing penchant for consumerism.” *Id.*

188. See ENERGY INFO. ADMIN., *supra* note 186, at 51–52.

189. See Mark Clayton, *New Coal Plants Bury ‘Kyoto,’* CHRISTIAN SCI. MONITOR, Dec. 23, 2004, at 1, available at <http://www.csmonitor.com/2004/1223/p01s04-sten.html>. “Coal can provide usable energy at a cost of between \$1 and \$2 per MMBtu compared to \$6 to \$12 per MMBtu for oil and natural gas,” and coal prices are relatively stable. MASS. INST. TECH., THE FUTURE OF COAL: OPTIONS FOR A CARBON-CONSTRAINED WORLD 12 (2007), available at http://web.mit.edu/coal/The_Future_of_Coal.pdf. It is estimated that 68% of incremental world coal demand through 2030 will come from China and India. *Id.* at 63.

190. See Clifford Krauss, *Natural Gas, Suddenly Abundant, is Cheaper*, N.Y. TIMES, Mar. 21, 2009, at B1.

coal generation plants,¹⁹¹ and cap-and-trade restrictions at the state level¹⁹²—it is likely that the number of new coal-fired plants in the United States will probably level off. But this slow down of coal-fired plants in the United States is not likely to be repeated in countries like India because they lack the resources to invest in alternative fuels and need power now in order to correct serious problems in the availability and reliability of electricity.¹⁹³

B. *Climate Change and the Developing World*

CNA's *National Security and the Threat of Climate Change* tracked the global impacts of climate change as well as its impacts on national security.¹⁹⁴ The report postulated that human civilization has flourished because "the world's climate has been relatively stable. However, when climates change significantly or environmental conditions deteriorate to the point that necessary resources are not available, societies become stressed, sometimes to the point of collapse."¹⁹⁵ The projected impacts of climate change include impaired access to fresh water for agriculture and human consumption,¹⁹⁶ loss of arable lands due to flooding¹⁹⁷ or desertification,¹⁹⁸ and violent weather causing large population

191. See, e.g., Energy Policy Act of 2005, § 411, 42 U.S.C. § 15971 (2006); see also Felicity Barringer, *Climate Legislation Sends Chill Through Areas Fueled by Coal*, N.Y. TIMES, Apr. 9, 2009, at A17.

192. See, e.g., ME. REV. STAT. ANN. tit. 38 § 580-B (Supp. 2008).

193. The Energy Information Administration has stated:

India suffers from a severe shortage of electric capacity. According to the World Bank, roughly 40 percent of residences in India are without electricity. In addition, blackouts are a common occurrence throughout the country's main cities. The World Bank also reports that one-third of Indian businesses believe that unreliable electricity is one of their primary impediments to doing business. . . .

. . . .
. . . India is both the third-largest consumer and third-largest producer of coal in the world, and although the country can supply the bulk of its needs domestically, it is currently a net importer of coal.

Energy Info. Admin., Country Analysis Briefs: India 9 (2009), <http://www.eia.doe.gov/emeu/cabs/India/pdf.pdf>. Given India's relative abundance of coal and the great amount of ground that they make up in terms of providing its population reliable access to electricity, it is hard to envision a major shift in India's consumptive patterns.

194. See CNA CORP., *supra* note 2, at 1.

195. *Id.* at 13 (citing DIAMOND, *supra* note 11, at 7).

196. See *id.*

197. See *id.*

198. See *id.* at 15.

displacements.¹⁹⁹ Large population displacements seem inevitable since over two-thirds of the world's population lives in coastal areas.²⁰⁰ In addition to loss of lands used for agriculture and habitat,²⁰¹ another concern is that fresh water supplies in rivers and aquifers will become contaminated because of saltwater intrusion.²⁰²

Changes in rainfall, snowfall, snowmelt, and salt water contamination of water supplies are almost certain to be a future cause of tension.²⁰³ One author calls water the "new oil" and describes the situation as follows:

Ethiopia and Kenya [are] two countries at the forefront of the world's coming water crisis. The director of a local water [Non-Governmental Organization ("NGO")] told me a few days after I arrived in Ethiopia in January 2008, "As you may know, Alex, the coming World War III will be fought over water, not oil." Variations on that refrain were echoed by aid workers and researchers across the region over the next several months. Women walk for miles each day to collect drinking water; farmers are pushed into deadly conflict by dwindling river flows, and city water supplies are drained by overzealous irrigation.²⁰⁴

Competition for freshwater resources is a potential source of major new conflict between Uganda and Kenya due to the very real prospect that Lake Victoria, the world's second largest lake, will dry up.²⁰⁵ If this occurs, it could endanger thirty million East Africans that live around the lake, and set off, at a minimum, a new mass migration pattern.²⁰⁶ The situation has gotten so desperate that "Kenyans chasing fish into deeper Ugandan waters have been arrested and allegedly tortured by Ugandan military."²⁰⁷

Lake Victoria is also the main reservoir for the Nile River system. That system has been used for agriculture for over 5000

199. *Id.* at 13.

200. *Id.* at 16.

201. *See id.*

202. *Id.* at 16.

203. Salt water intrusion is a particular problem for the Palestinian residents of the Gaza Strip. *Id.* at 30.

204. Alex Stonehill, *World Water Crisis*, Z MAG., June 2008, <http://www.zmag.org/zmag/viewArticle/17805>.

205. *See id.* Drought conditions in central Africa and diversion of river marine sources for hydroelectric projects are cited as among the principal culprits for the alarming drop in the water levels. *Id.*

206. *Id.*

207. *Id.*

years and supports nine countries: Egypt, Ethiopia, Sudan, Tanzania, Kenya, Uganda, Burundi, Rwanda, and the Democratic Republic of Congo.²⁰⁸ These are among “the world’s poorest nations and their populations are exploding, increasing stress on endangered water resources.”²⁰⁹

The conflict in Darfur arose between herders and farmers after which “[l]ong periods of drought resulted in the loss of both farmland and grazing land to the desert . . . compel[ling] the nomads to migrate southward in search of water and herding ground, and that in turn led to conflict with the farming tribes. . . .”²¹⁰ As is well known, Darfur has been the world’s most recent venue for significant acts of genocide.²¹¹

The snowmelt in the Himalayan Mountains currently supplies major river systems in Asia, including the Indus, Ganges, Mekong, Yangtze, and Yellow.²¹² If there is continued decline in the summer melt of mountain glaciers, it would put at risk an estimated 40% of the world’s population.²¹³ The melting of glaciers in the Peruvian and Venezuelan Andes Mountains is also a concern since they provide drinking water and hydroelectric power for much of South America.²¹⁴ Mozambique and Nigeria’s Niger Delta, home to millions, is especially vulnerable to sea level rises and storm surges.²¹⁵ Any one of these issues could erupt into serious conflict in which the U.S. military may need to intervene to prevent genocide, confront a totalitarian regime, or to contain the effects of state collapse.²¹⁶ Today, then, we can add global warming as a major new factor—in addition to others relating to oil—

208. *Id.*

209. *Id.*

210. CNA CORP., *supra* note 2, at 15.

211. *See generally id.*

212. *Id.*

213. *Id.*

214. *Id.* at 32.

215. *Id.* at 22.

216. Past U.S. interventions include Liberia in 1996 following state collapse; Haiti in 1994–95 when the government disintegrated; and Somalia when the central government collapsed and was displaced by warlords. RICHARD F. GRIMMETT, INSTANCES OF THE USE OF ARMED FORCES ABROAD 1798–2008, at 15–18 (2009), *available at* <http://www.fas.org/sgp/crs/natsec/RL3217-pdf>. Current intervention includes U.S. Navy operations in African waters to suppress piratical activity due to an absence of a viable coastal government to curtail pirate attacks that are being launched from the land. *See* Press Release, U.S. Navy Lt. Jennifer Cragg, Navy Task Force, Partner Nations Deter Pirate Attacks (Jan. 30, 2009), *available at* http://www.navy.mil/search/display.asp?story_id=42236.

which can, and probably will, lead to state collapse and to which the U.S. military may be ordered to intervene in response to domestic or international pressure. Also, given the impacts of the “Great Recession” of 2008–2010 on the world’s economies, and on donor communities in particular, the global capacity to mobilize humanitarian assistance to respond with “soft power” to control these calamitous situations is increasingly called into question, thereby raising the specter of increasingly violent situations that can threaten domestic and international national security.

V. A REPORT CARD FOR THE UNITED STATES

Applying both Diamond’s five-point typology and the lessons of failed states will hopefully suggest: (1) the types of policy and legal steps which are necessary to avoid collapse and (2) the timing of those actions. Unfortunately, time does not appear to be an ally given the greatly increasing emissions by emerging economies.²¹⁷ Moreover, the physical impacts of climate change seem to be accelerating from so-called “feedback loops.”²¹⁸ In a feedback loop, the melting of the arctic permafrost could cause the release of billions of tons of carbon dioxide and methane, over twenty times more potent a producer of GHG.²¹⁹ An added consequence of this dynamic is that the oceans are becoming much more acidic because of the presence of ambient carbon, which reduces their ability to absorb carbon resulting from human activity.²²⁰

For the above reasons, several of the factors leading to state collapse could be intensified. If these conditions greatly worsen, it would threaten U.S. survival in the long term and its standard of living in the short term. The application of Diamond’s model to the United States is assessed as follows:

Environmental Damage—Viewed in isolation, this is an area where the United States has made considerable progress, and it is not likely to be a source of collapse. Several challenges potentially will arise from intensive agricultural activities designed to compensate for the loss of arable land and the pollution asso-

217. See NASA, *Fossil Fuel CO2 Emissions Up by 29 Percent Since 2000*, Nov. 17, 2009, <http://earthobservatory.nasa.gov/Newsroom/view.php?id=41393>.

218. Kari Lydersen, *Scientists: Pace of Climate Change Exceeds Estimates*, WASH. POST., Feb. 15, 2009, at A3.

219. *Id.*

220. *Id.*

ciated with intensive fertilizer use and livestock waste.²²¹ However, the established regulatory systems, the increasingly prevalent environmental ethic, and the science and technology base of the United States, are probably sufficient to prevent these issues from becoming a significant factor leading to collapse or decline. Result: *Not a Risk Factor*.

Climate Change—Portions of the United States' coastlines will be subject to inundation resulting in internal population migrations.²²² Also, coastal areas are likely to be hit hard because of the growth of ocean "dead zones,"²²³ the deaths of coral reefs that serve as incubators of marine life,²²⁴ and the decline of phytoplankton that are a primary food supply for all marine life.²²⁵ Scientists suggest that, at a minimum, the loss of land and severe decline in oceanic life will make food far more expensive because of the loss of seafood as a source of protein.²²⁶ Loss of coastal areas in the United States will most likely fuel internal migration, which may create some localized pockets of violence in low-income areas,²²⁷ such as those now being experienced along the

221. See CHANGES IN LAND USE AND LAND COVER: A GLOBAL PERSPECTIVE 154–55 (William B. Meyer & B. L. Turner II eds., 1994) (discussing how rural land is being taxed by urban development and the implications of large-scale farms).

222. See *How Global Warming May Affect U.S. Beaches, Coastline*, SCI. DAILY, Nov. 24, 2008, <http://www.sciencedaily.com/releases/2008/11/081122083051.htm> (scientists from UC San Diego finding that "[l]and in some areas of the Atlantic and Gulf coasts of the United States will simply be underwater").

223. See David Perlman, *Scientists Alarmed by Ocean Dead-Zone Growth*, S.F. CHRON., Aug. 15, 2008, at A1. ("Dead zones where fish and most marine life can no longer survive are spreading across the continental shelves of the world's oceans at an alarming rate as oxygen vanishes from coastal waters . . ."); Bina Venkataraman, *Rapid Growth Found in Oxygen-Starved Ocean 'Dead Zones'*, N.Y. TIMES, Aug. 14, 2008, at A13 ("Many coastal areas of the world's oceans are being starved of oxygen at an alarming rate, with vast stretches along the seafloor depleted of it to the point that they can barely sustain marine life . . .").

224. See Joshua Reichert, *The Death of Coral Reefs*, S.F. CHRON., July 20, 2001, at A25 ("[O]ne quarter of the world's reefs have already been lost, and those remaining are under stress from pollution, sedimentation, destructive fishing practices and global climate change.").

225. See Andrew S. Brierley & Michael J. Kingsford, *Impacts of Climate Change on Marine Organisms and Ecosystems*, 19 CURRENT BIOLOGY R602, R608 (2009) ("In the North Atlantic, phytoplankton biomass might collapse by half . . .").

226. See generally Brian J. Rothschild, *How Bountiful are Ocean Fisheries?*, 2 CONSEQUENCES (Winter 1996), <http://www.gcric.org/CONSEQUENCES/winter96/oceanfish.html> (discussing the impact of global warming on global fish population distribution).

227. Rafael Reuveny, *Climate Change-Induced Migration and Violent Conflict*, 26 POL. GEOGRAPHY 656, 657, 658–61 (2007) (discussing how climate change can speed up migrations resulting in violent conflict under certain circumstances).

Mexican border.²²⁸ Increasingly violent storm patterns—like Hurricane Katrina—will stress the United States' response capabilities and economy.²²⁹ Result: *A Risk Factor*.

Hostile Neighbors—The threat of armed attack against the United States is probably quite low, due in part to its geographic isolation and formidable defenses. However, the dangers of unchecked illegal immigration into the United States or terrorists infiltrating with migrants cannot be reasonably discounted. According to the *Foreign Policy* rankings, there are only two countries south of the United States that are not in a “danger” or “borderline” situation.²³⁰ Several of the countries in Central America, many states in the Caribbean, and some in South America are in a high risk category.²³¹ If one of these states collapsed, the U.S. government would probably find it militarily necessary to intervene in order to help stabilize the consequences of that state's collapse, as well as to prevent mass migration into the United States. Even if forceful military intervention was not required, the tragic earthquake in Haiti in 2010 vividly demonstrates that the cash-strapped federal budget cannot indefinitely sustain the direct (\$400 million as of January 29, 2010) and indirect costs of responding to the calamitous events involving failed states.²³² Since such mass migration would probably involve people already

228. Namely, the drug-related violence plaguing the city of Juarez. See David Luhnow & Jose de Córdoba, *Amid Rising Violence, Mexicans Fight Back*, WALL ST. J., Nov. 6, 2009, at A12.

229. Another interesting potential risk factor (which will have divisive political and economic impacts) is to the U.S. legal system. In *Comer v. Murphy Oil USA*, No. 07-60756, 2009 WL 3221493, at *2 (5th Cir. Oct. 16, 2004), the Court of Appeals for the Fifth Circuit ruled that a group of Mississippi landowners could move forward with their lawsuit for “nuisance, trespass and negligence” against a group of fossil fuel, chemical, and energy companies who were allegedly responsible for GHG emissions that had increased the damage of the storm. *Id.* The lawsuit was previously dismissed by the District Court, but the three-judge panel held that federal law permits landowners the legal standing to attempt to prove the linkage between GHGs and Hurricane Katrina. *Id.* at *4, 20. Writing for the court, Judge Dennis expressed doubt that the plaintiffs would ever be able to establish causation (proximate cause) between any of the defendant's activities and Hurricane Katrina. *Id.* at *20.

230. See *The Failed States Index 2009*, ranking Argentina and Chile both as “stable,” in stark contrast to the other countries of South America. Foreign Policy, *The Failed States Index 2009—Interactive Map and Ranks*, http://www.foreignpolicy.com/articles/2009/06/22/2009_failed_states_index_interactive_map_and_rankings (last visited Feb. 23, 2010) [hereinafter *Failed States—Interactive Map*].

231. See *id.*

232. See Michelle Faul, *French President Sarkozy Announces Haiti Aid Plan*, ASSOCIATED PRESS, Feb. 17, 2010, <http://license.icopyright.net/user/viewFreeUse.act?fuid=NzEzNjE0Q%3D%3D>.

living at a subsistence level, the costs to the United States of providing education and other social support would be great and could lead to localized declines in the standard of living and localized areas of conflict. Also, continued dependence on imported oil will perpetuate the risks of interstate conflict, terrorist activities associated with preserving access to and transporting imported oil, and wealth transfers involved in the sale. Result: *A significant risk factor for military involvement and other major economic and social costs to the United States.*

Decreased Support from Friendly Neighbors—States that are not in a “high risk” category, like Mexico,²³³ are not likely to act as a willing buffer to control the mass migration that is probable from South and Central America to the United States.²³⁴ Also, the states in South and Central America that are high-risk are less likely to adopt sustainable development policies if they perceive that they must take shortcuts to feed their people because of rapid mass migration. Consequently, “borderline” states may be much less willing in the future to curtail illegal logging and farming in rainforest areas if those states perceive that they must allow these activities to sustain their populations. Apart from the risk of mass migration associated with habitat collapses, there is the added risk that the loss of the rainforest may negatively affect weather patterns in North America.²³⁵ This may aggravate the overall issue of climate change, resulting in costly storms that will damage U.S infrastructure and cause loss of life. Result: *A Risk Factor.*

233. See Failed States—Interactive Map, *supra* note 230 (ranking Mexico only as “borderline”).

234. Cf. KOKO WARNER ET AL., IN SEARCH OF SHELTER: MAPPING THE EFFECTS OF CLIMATE CHANGE ON HUMAN MIGRATION AND DISPLACEMENT 1, 7 (2009), http://www.care.org/getinvolved/advocate/pdfs/Migration_Report.pdf (discussing the inextricable link between climate change and international migration and noting the acute vulnerability of Mexico and Central America to climate change); Jock Baker et al., *Hotspots—Predictions and Action*, 31 FORCED MIGRATION REV. 44, 44–45 (2008) (identifying South and Central America as hotspots “at higher risk of future population displacement as a result of climate hazards”); William A. V. Clark, *Social and Political Contexts of Conflict*, 31 FORCED MIGRATION REV. 22, 23 (2008) (noting that environmental stress in “high risk” nations like South America will influence migration patterns).

235. See EDWIN K. SCHNEIDER, AMAZON DEFORESTATION IN CFS 4–6 (Apr. 22, 2009) (Climate Test Bed Joint Seminar Series, Nat’l Weather Service Climate Prediction Center), available at http://www.nws.noaa.gov/ost/climate/STIP/FY09CTBSeminars/eschneider_042209.htm.

Ability of Society to Adapt—Because of the political pluralism in the United States, significant inertia must be overcome to enact the political and legal changes necessary to address all of the problems associated with climate change and excess dependence on imported oil. This is in direct contrast to some states, for example, China, which, due to their strong central governments and centrally managed economies, are able to “turn on a dime,” and make rapid regulatory, economic, and consumer behavior changes.²³⁶ Even in the context of initiatives emerging from the UN Climate Change Conference in Copenhagen,²³⁷ the divided U.S. political process is unlikely to reach a consensus quickly enough to pass legislation—or appropriate funding—necessary to enable U.S. industry to keep pace with its competitors from other countries and with new initiatives resulting from the Copenhagen Conference. Lack of political consensus and concrete policies²³⁸ will also impair the ability of the United States to take bold and imaginative steps to quickly reduce its carbon footprint and divorce itself from foreign oil. That lack of consensus will undermine the ability of the United States to be an advocate on the world stage for responsible GHG reduction action because it is perceived as weak, insincere, and uncommitted.²³⁹ Political pluralism is a source of strength in many respects, but in this particular context it is a weakness because of the rapid pace of climate change. Result: *A Risk Factor*.

236. See DIAMOND, *supra* note 11, at 374.

China’s geographic core was unified already in 221 B.C. and has remained unified for most of the time since then. . . . [t]hat unity enabled China’s rules to command changes over a larger area than any European ruler could ever command [t]he strengths and risks of China’s unity have persisted into recent times

Id. at 374.

237. Press Release, United Nations, Copenhagen United Nations Climate Change Conference Ends with Political Agreement to Cap Temperature Rise, Reduce Emissions and Raise Finance, (Dec. 19, 2009), available at http://unfccc.int/files/press/news_room/press_releases_and_advisories/application/pdf/pr_cop15_20091219.pdf. See generally Press Release, United Nations, “Opportunity to Avoid Catastrophic Climate Change is in Your Hands,” Secretary-General Tells World Leaders at Climate Summit, U.N. Doc. ENV/DEV/1069 (Sept. 22, 2009).

238. PEW CTR. ON GLOBAL CLIMATE CHANGE & PEW CTR. ON THE STATES, CLIMATE CHANGE 101: STATE ACTION 1 (Jan. 2009), available at <http://www.pewclimate.org/docUploads/climate101-State-Jan09.pdf>.

239. See, e.g., Julianne Smith & Derek Mix, *The Transatlantic Climate Change Challenge*, 31 WASH. Q. 139, 139, 146 (2007–2008).

One final point that is not included in Diamond's typology but is, for the United States, critically important, should be addressed:

[T]he commonest circumstance under which societies fail to perceive a problem is when it takes the form of a slow trend concealed by wide up-and-down fluctuations. The prime example in modern times is global warming. We now realize that temperatures around the world have been slowly rising . . . [yet] President Bush of the U.S. is still not convinced of its reality, and he thinks we need more research. The medieval Greenlanders had similar difficulties in recognizing that their climate was gradually becoming colder²⁴⁰ and the Maya and Anasazi had trouble discerning that theirs was becoming drier.

Politicians use the term "creeping normalcy" . . . Such experiences are a major reason why people may fail to notice a developing problem, until it is too late.²⁴¹

VI. APPROACHES

Prior to embarking upon an examination of the specific policies that the United States is pursuing domestically and internationally to address the risks discussed above, it is useful to identify, on a macro level, the general policies that the United States must pursue in order to mitigate the risks identified thus far. Simply stated, these macro policies require the United States to:

- Reduce domestic and international dependence on imported oil to minimize political, economic, and international national security risks;
- Reduce U.S. consumption of carbon fuels to slow the effects of climate change and enable the United States to comply with international obligations;
- Provide assistance, market incentives, and effective legal structures to get newly emerging and developing countries to minimize their consumption of GHG consuming fuels and minimize other activities, such as deforestation, which exacerbate climate change; and

240. See DIAMOND, *supra* note 11, at 248. Norse Greenland's demise was due to extensive deforestation. *Id.* This minimized their supply for fuel and shelter, coupled with overgrazing and extreme erosion, all of which prevented sustainable farming. *Id.* at 248–54. The extreme erosion resulted in the loss of most natural vegetation, making it impossible to raise domesticated animals and causing the starvation of most wild animals. *Id.*

241. *Id.* at 425–26.

- Develop and field new alternative energy technologies, which increase worldwide access to cheap electrons.

A. *The Policy Agenda for the United States and Developed Countries*

Friedman recognizes the impacts of the colliding forces of unchecked population growth, state collapse, dependence on petroleum, and global warming.²⁴² He urges that the United States and other developed countries must enact market-based policies to promote the worldwide availability of clean and cheap electrical power.²⁴³ Friedman's basic construct is that developed countries should supply the technology to provide energy to less-developed countries.²⁴⁴ In exchange for that energy, developing countries will restore lands that have been ravaged by overpopulation, poor environmental and agricultural practices, and provide the cheap labor necessary to manufacture the technical solutions developed by the United States.²⁴⁵ Because there is no global governance system, it would be nearly impossible to establish a rules-based approach that forces developed countries to discontinue their use of oil or to transfer technology to developing countries for free. Acknowledging that fact, Friedman suggests enacting policies that will stimulate the international economic marketplace in clean electrons.²⁴⁶ While Friedman suggests that a market-based versus rules-based approach is the best way to confront the issues of global warming and clean electrification of the planet, the reality is that government involvement is still necessary to counteract the excesses and other externalities of the competitive marketplace, to ensure that all governments operate using the same rulebook, and provide seed money for the poorest states that can't pay.²⁴⁷

The eternal optimist, Friedman notes, "[E]nergy can not only make a hotter world more tolerable and a flatter world more equitable; it can also make a crowded world more comfortable."²⁴⁸

242. See FRIEDMAN, *supra* note 11, at 5.

243. See *id.* at 217–18, 244.

244. See *id.* at 178.

245. See *id.* at 175–76.

246. See *id.* at 143–44, 252.

247. See *id.* at 244–45.

248. *Id.* at 166.

Friedman advocates a concerted push by government and industry to (1) develop energy-efficient and green technologies to address the inherent economic and political problems of relying upon imported oil, (2) reduce greenhouse gas emissions, (3) prepare the United States for impending global policies which limit carbon emissions, and (4) promote sustainable energy development among first and third world countries.²⁴⁹ Most interestingly, Friedman suggests that the current economic crisis should signal that “[g]reen is the way you grow,” whereby substantial government and private sector investments are made in green technologies for both domestic consumption and export markets and, presumably, to provide an industrial platform for the U.S. economy and its recovery.²⁵⁰

Friedman argues that the current legal and political structure stifles energy innovation.²⁵¹ He notes that the total investment in research and development by electric utilities in alternative energy sources in the United States was only about 0.15% in total revenues, as contrasted with a typical industrial rate of research and development of 8 to 10%.²⁵² Friedman states that the last clean energy breakthrough in the United States occurred in 1975, “the days of filterless cigarettes and segregation.”²⁵³ He further argues that the Department of Energy (“DOE”) funding for basic energy research is insufficient to meet the challenges: “Seven hundred research proposals for working on solar energy were turned down for fiscal 2008” by DOE.²⁵⁴ Because of a lack of private sector incentives, premier technology providers like General Electric (“GE”) have seen only one generation of innovation in clean energy development in the past twenty-six years.²⁵⁵ In contrast, GE “has seen ‘eight or nine’ generations of innovation in medical technology”²⁵⁶ Conversely, some European govern-

249. *See id.* at 171–78, 181–83, 185–87, 189, 191–95, 198–99.

250. *See id.* at 172.

251. *Id.* at 243–46, 252–53, 260.

252. *Id.* at 247.

253. *Id.*

254. *Id.* at 383. Friedman’s view is that the “[g]overnment’s job is to seed the [basic] research that will produce the sorts of fundamental breakthroughs in chemistry, materials science, biology, physics, and nanotechnology that open the way for whole new approaches to solving energy problems” *Id.* at 382. *But see infra* notes 285–89 and accompanying text (discussing DOE’s recent Advanced Research Agency projects).

255. FRIEDMAN, *supra* note 11, at 247.

256. *Id.* Jeffrey Immelt, the Chairman and CEO of GE, reported that the company is still selling the basic coal-fired plant it sold when he first joined the company twenty-six

ments and Japan have had aggressive alternative energy incentive programs in place since 1990.²⁵⁷

Friedman notes that electrified villages in rural India are now used by Silicon Valley companies to complete remote data processing.²⁵⁸ This encourages rural residents to remain in or return to their villages, rather than migrate to strained megacities like Mumbai and Calcutta.²⁵⁹ Electrification of the rural countryside is the key to these particular success stories and is a trend that must be repeated throughout the developing world, for the current inhabitants of the countryside are those most likely to pursue sustainable land use practices and preserve unique habitats.²⁶⁰ Access to cheap electrons is the key, and the United States is in an excellent position to develop and sell technologies that will use fewer “inputs’ from forests, water, and land.”²⁶¹

In assessing the necessary steps now being taken to sustain a revolution in clean energy and independence from imported oil, it is next appropriate to review the approaches that have been taken domestically and internationally, as well as some ideas—such as those put forward by the Rocky Mountain Institute (“RMI”)—that are not part of the current menu of initiatives.²⁶² Hopefully, in this process of critical review the gaps will become evident between the reality on the ground and Friedman’s vision.

B. *Legislative Approaches: Past and Future*

1. International Efforts: The Kyoto and Copenhagen Agreements

It is beyond the scope of this paper to identify and critique every legal approach that seeks to change the behavior of individual and corporate citizens attempting to mitigate their dependency on hydrocarbons and/or their GHG footprint. However, since the Kyoto Protocol (“Kyoto” or “Protocol”) entered into force in 2005, many national governments have either enacted domes-

years ago, though “[t]hey’re a little cleaner and more efficient now” *Id.*

257. *See id.* at 388–89.

258. *See id.* at 166–67.

259. *Id.* at 167 (describing several workers who returned to their rural hometowns for a richer and more tranquil life after working in such megacities).

260. *Id.* at 167–69.

261. *Id.* at 190–91.

262. *See infra* Part G.

tic legislation that implements their specific national responsibilities under Kyoto or indirectly addresses the issue.²⁶³ Over 180 countries have ratified the Protocol; the most notable non-member of the Protocol is the United States.²⁶⁴ Generally speaking, Protocol parties commit themselves, in a politically binding fashion, to a reduction of the four GHGs (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride) and two additional resulting groups of gases (hydrofluorocarbons and perfluorocarbons) so that the overall production levels of Annex I countries are 5.2% less than their production levels in 1990.²⁶⁵

To achieve their GHG targets, national authorities have the option to simply reduce their GHG emissions or to obtain carbon credits from other countries through transfer (i.e., the Clean Development Mechanism (“CDM”)), or through the financing of clean energy projects in non-Annex I countries.²⁶⁶ Under the Protocol, only Annex I countries have to meet the 5.2% reduction limits.²⁶⁷ A country that fails to meet its attainment goals has to

263. The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change, aimed at combating global warming. See Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 32 [hereinafter Kyoto Protocol]. The UNFCCC was an outgrowth of the United Nations Conference on Environment and Development (“UNCED”), informally known as the Earth Summit, held in Rio de Janeiro in June 1992. See Edith Brown Weiss, *Introductory Note*, United Nations Conference on Environment and Development, June 3–14, 1992, 31 I.L.M. 814. The objective of the Kyoto Protocol is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Kyoto Protocol, *supra*, art. 2. The Protocol was negotiated in Kyoto, Japan in December 1997, opened for signature on March 16, 1998, and closed on March 15, 1999. See Brenda P. McGivern, *Introductory Note*, Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 22. The agreement came into force on February 16, 2005, following ratification by Russia on November 18, 2004. As of November 6, 2009, a total of 189 countries and one regional economic organization, the European Community (“EC”), have ratified the agreement, representing over 63.7% of emissions from Annex I countries. See Kyoto Protocol, *supra*, art. 24; UNFCCC, Kyoto Protocol Status of Ratification (2009), http://unfccc.int/files/kyoto_protocol/status_of_ratification/application/pdf/kp_ratification.pdf (listing countries that have ratified the Protocol).

264. See UNFCCC, Kyoto Protocol Status of Ratification, *supra* note 263. The United States has signed but not ratified the Protocol. The U.S. Senate, however, unanimously passed, by a 95–0 vote, the Byrd-Hagel Resolution. See Byrd-Hagel Resolution, S. Res. 98, 105th Cong. (1977) (“[T]he Senate strongly believes that the proposals under negotiation, because of the disparity of treatment between Annex I Parties and Developing Countries and the level of required emission reductions, could result in serious harm to the United States economy . . .”).

265. See Kyoto Protocol, *supra* note 263, art. 3, 37 I.L.M. at 33–34.

266. See *id.* arts. 5–6, 12, 37 I.L.M. at 35, 38.

267. See *id.*, art. 3, 37 I.L.M. at 33–34. There are three categories of countries in the Protocol: Annex I developed countries, Annex 2 developed countries that pay costs for developing countries, and developing countries. The United States and other highly devel-

either make up the deficit or have its GHG trading rights suspended.²⁶⁸

On February 14 and 15, 2007, delegates from Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, the United States, Brazil, China, India, Mexico, and South Africa met in Washington, D.C. and agreed to a non-binding statement that essentially outlined a successor to the Protocol.²⁶⁹ The delegates discussed a cap-and-trade system that would apply to both industrialized and developing countries, creating a global market.²⁷⁰ The Copenhagen Conference²⁷¹ was expected to include crediting systems for carbon sequestration and other technologies, tropical forest preservation, technology transfer, and biofuels.²⁷² Many preliminary meetings involving like-minded countries—including newly industrialized countries—were held to establish negotiating positions and to review negotiating text,²⁷³ although the actual Copenhagen COP 15 meetings in December 2009 failed to produce a legally binding text.²⁷⁴ It is

oped countries (and the EC) are included in both Annex I and II. See UNFCCC, Kyoto Protocol Parties and Observers, http://unfccc.int/parties_and_observers/items/2704.php (last visited Feb. 23, 2010).

268. See UNFCCC, An Introduction to the Kyoto Protocol Compliance Mechanism, http://unfccc.int/kyoto_protocol/compliance/introduction/items/3024.pdf (last visited Feb. 23, 2010).

269. See INT'L COMM'N ON CLIMATE AND ENERGY SEC., GLOBE INT'L, WASHINGTON LEGISLATORS' FORUM STATEMENT (2007), available at http://www.globeinternational.org/docs/content/washington_statement.pdf [hereinafter WASHINGTON STATEMENT]; GLOBE International.org, Statement of the Globe Washington Legislators Forum, <http://www.globeinternational.org/content.php?id=2:8:0:237:0> (last visited Feb. 23, 2010); World Bank, G8 Climate Change Dialogue Moves to Washington, <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:21220244~menuPK:51062075~pagePK:34370~piPK:34424~theSitePK:4607,00.html> (last visited Feb. 23, 2010).

270. WASHINGTON STATEMENT, *supra* note 269.

271. The United Nations Climate Change Conference took place in Copenhagen, Denmark between December 7 and December 18, 2009. UNITED NATIONS CLIMATE CHANGE CONFERENCE, OVERVIEW OF SCHEDULE 1 (2009), available at http://unfccc.int/files/meetings/cop_15/application/pdf/overview_schedule_cop15.pdf. The conference included the Fifteenth Session of the Conference of the Parties ("COP 15"), the overarching UNFCCC, and the fifth meeting of the Parties to the Kyoto Protocol ("CMP5"). *Id.* at 1, 5.

272. See UNFCCC, Draft Implementing Agreement Under the Convention Prepared by the Government of the United States of America for Adoption at the Fifteenth Session of the Conference of the Parties 7, 9, U.N. Doc. FCCC/CP/2009/7 (June 6, 2009), available at <http://unfccc.int/resource/docs/2009/cop15/eng/07.pdf> [hereinafter Draft Implementing Agreement].

273. See, e.g., *supra* note 269 and accompanying text.

274. The Conference did produce a "Copenhagen Accord" in which the states all acknowledged the existence of climate change and required states to continue their voluntary reductions, make reports on their progress, and pledge new measures, pending the im-

impossible, however, to predict what will be in the treaty and whether newly industrialized countries, like China and India, will be required to assume binding commitments to reduce greenhouse gases and, in the case of China, help pay the costs of developing countries. It is also uncertain whether developing countries will assume legally binding obligations to limit their GHG emissions and stop their destruction of tropical forests, or adopt prudent agricultural and other control measures which help to mitigate GHG emissions.²⁷⁵

However, the wide participation of states in the Copenhagen process, combined with the announcement of voluntary targets by China and India, indicates that there is still some international momentum to secure a legally binding accord even though the progress will take much longer than is desirable.²⁷⁶ Obviously, if there is a total collapse of the ongoing climate talks, it is not beyond the realm of possibility for states that feel most threatened by climate change to take unilateral measures, including trade sanctions against states perceived to not be serious in achieving reductions.

C. Current Domestic Programs to Promote Energy Efficiency and Reduce GHG

The Energy Policy Act of 2005²⁷⁷ is an exception to the United States' otherwise lackluster performance in the past decade to incentivize private industry to invest in alternative energy systems.²⁷⁸ The Act extended small tax credits to individuals and

position of mandatory measures via a binding international agreement. UN Climate Change Conference, Dec. 7–18, 2009, *Copenhagen Accord*, ¶¶ 1–2, 4–5, Decision /CP.15, available at http://unfccc.int/files/meetings/cop_15/application/pdf/cop15_cph_auv.pdf.

275. See Richard Black, *Climate Talks a Tricky Business*, BBC NEWS, Nov. 18, 2006, <http://news.bbc.co.uk/2/hi/science/nature/6161998.stm>.

276. See John M. Broder, *Countries Submit Emission Goals*, N.Y. TIMES, Feb. 2, 2010, at A10.

277. Pub. L. No. 109-58, 119 Stat. 594 (codified as amended in scattered sections of the U.S.C.).

278. In 2004, the Bush administration signaled that there might be a connection between human activity and climate change. See CLIMATE CHANGE SCI. PROGRAM & SUBCOMM. ON GLOBAL CHANGE RESEARCH, OUR CHANGING PLANET: THE U.S. CLIMATE CHANGE SCIENCE PROGRAM FOR FISCAL YEARS 2004 AND 2005, at 47 (2004), available at <http://www.usgcrp.gov/usgcrp/Library/cp2004-5/ocp2004-5.pdf> (“[O]bservations and model simulations shows that North America temperature changes from 1950 to 1999 were unlikely to be due only to natural climate variations.”). However, John H. Marburger, the President’s science adviser, stated that the report did not implicate policy. Juliet Eilperin,

businesses that installed solar electrical generation systems.²⁷⁹ The Act also extended credits to building owners that incorporated “green” lighting and heating, ventilating, and air conditioning (“HVAC”) standards and extended loan guarantees to those businesses that converted to innovative technologies.²⁸⁰ However, the legislation has been criticized for extending tax benefits to oil companies that drill in the Gulf of Mexico and for rejecting increased vehicle efficiency standards.²⁸¹ In a parallel effort, DOD funded a wide variety of initiatives to make use of renewable energy sources for its bases and military platforms,²⁸² including developing new types of fuels, re-engineering combat systems for better fuel economy, expanding use of hybrid combat vehicles²⁸³ and geothermal generation systems, and testing prototypical “smart micro grid” technology at some of its bases.²⁸⁴

The establishment of the DOE’s Advanced Research Project Agency (“ARPA-E”) in 2007 is another promising development.²⁸⁵

Administration Shifts on Global Warming, WASH. POST., Aug. 27, 2004, at A19. The Bush administration shifted course in June 2008 when the U.S. Climate Change Science Program issued a report noting that droughts, heavy rain, heat waves, wildfires, and intense hurricanes are more likely to affect North America because of global warming’s effect. U.S. CLIMATE CHANGE SCI. PROGRAM, WEATHER AND CLIMATE EXTREMES IN A CHANGING CLIMATE vii (Thomas R. Karl et al. eds., 2008), available at <http://www.downloads.climate.science.gov/sap/sap3-3/sap3-3-final-all.pdf>.

279. The Energy Policy Act of 2005 was reauthorized by the Emergency Economic Stabilization Act of 2008. Pub. L. No. 110-343, 122 Stat. 3765 (codified as amended in scattered sections of the U.S.C.). The Energy Policy Act included tax credits to homeowners for “Qualified Energy Efficiency Improvements,” including storm windows, more efficient HVAC systems, and solar and fuel cell systems, and permanent credits (beginning in 2006) for those purchasing hybrid gas-electric automobiles. Energy Policy Act §§ 1333(a), 1341(a), (c), 26 U.S.C. §§ 25C, 30B.

280. *Id.* §§ 132, 1701, 42 U.S.C. §§ 6309, 16511; *id.* § 1333(a), 26 U.S.C. § 25C.

281. See, e.g., Michael Grunwald & Juliet Eilperin, *Energy Bill Raises Fears About Pollution, Fraud; Critics Point to Perks for Industry*, WASH. POST, July 30, 2005, at A1; see also *infra* note 298 (describing similar criticisms of the 2009 Cash for Clunkers Program).

282. See CNA CORP., *supra* note 5, at 33–34; see also Tim Kauffman, *Getting to “Net-Zero” Energy Use*, FED. TIMES, Aug. 17, 2009, at 1.

283. See CNA CORP., *supra* note 5, at 33–39.

284. See William Matthews, *Maine Base Sees Savings on “Smart Microgrid.”* FED. TIMES, Aug. 10, 2009, at 16.

285. ARPA-E was originally established under the America Competes Act of 2007. America Competes Act § 5012, 42 U.S.C. § 16538 (Supp. I. 2009). ARPA-E appears to be modeled after the ARPA model found in a number of other federal agencies, including the Department of Defense (“DARPA”), the Department of Homeland Security (“HSARPA”) and Health and Human Services (“H-ARPA”). See U.S. Dep’t of Energy, *Transformational Energy Research Projects Win \$151 Million in Funding* (Oct. 26, 2009), <http://arpa-e.energy.gov> (last visited Feb. 23, 2010). In April 2009 President Obama announced \$400 million in initial funding for ARPA-E through the American Recovery and Reinvestment Act, \$151 million of which was allocated to alternative energy programs. *Id.*

On October 26, 2009, the DOE announced major funding for thirty-seven ambitious research projects—including projects that explore the use of intermittent energy sources, like wind and solar, to provide a steady flow of power, use of new battery technology for automobiles, use of bacteria to produce automotive fuel from sunlight, and use of enzymes to capture carbon dioxide.²⁸⁶ Established in 2007, the ARPA-E aimed to financially stimulate the process of “identifying and promoting revolutionary advances in fundamental science . . . and . . . accelerating transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty.”²⁸⁷ The ARPA-E can achieve this goal by using contracts, grants, and “other transaction” authority, which empowers DOE to enter into research and development programs with contractors to tackle issues of great importance to the nation.²⁸⁸ The impressive array of diverse research programs for 2009 with non-traditional research organizations (e.g., Delphi Automotive Systems LLC, E.I. du Pont de Nemours and Company, General Motors Company, Nalco Company, United Technologies Research Center)²⁸⁹ shows that the government is looking beyond academia and its usual research providers—national laboratories and federally funded research and development centers—to search for alternative energy solutions.

The Great Recession of 2008–2010 may, go down in history as groundbreaking in terms of United States’ political acceptance of the need to seriously pursue energy independence. The \$787 billion stimulus legislation in 2009, ARRA,²⁹⁰ has some noteworthy provisions to incentivize businesses. ARRA gave businesses up to a 30% tax credit for investment in “qualifying advanced energy project[s]” defined as those that “re-equip[], expand[], or establish[] a manufacturing facility for the production of” renewable or clean energy.²⁹¹ A \$2.3 billion overall cap was established on the

286. *Id.*

287. America Competes Act § 5012, (codified at 42 U.S.C. § 16538(c)(2) (Supp. I 2009)).

288. See 42 U.S.C. § 7256 (2006); U.S. Dep’t of Energy, Training Curriculum for Technology Investment Agreements (TIAs), http://management.energy.gov/policy_guidance/1412.htm (last visited Feb. 23, 2010).

289. See U.S. Dep’t of Energy, *supra* note 285.

290. The American Recovery and Reinvestment Act of 2009 was the economic stimulus package enacted by the 111th Congress and signed into law on February 17, 2009. Pub. L. No. 111-5, 123 Stat. 115 (to be codified in scattered sections of 26 U.S.C.).

291. *Id.* § 1302, 123 Stat. at 345 (to be codified at 26 U.S.C. § 48C).

program,²⁹² which appeared to be the first time that public funds have been used to fund alternative energy improvements by public utilities, plants, or factories that have on-site energy generation plants.²⁹³ ARRA also allows taxpayers eligible for the federal renewable electricity production tax credit to take the federal business energy investment tax credit or to receive a grant from the U.S. Treasury Department for new installations.²⁹⁴ Finally, over \$20 billion was appropriated to DOE to research and develop a smart electricity grid and advanced batteries as well as to guarantee loans for renewable energy projects.²⁹⁵

The enormously popular “Cash for Clunkers” legislation was also beneficial.²⁹⁶ It provided some needed stimulus for the automobile industry, while at the same time reducing GHG emissions by removing automobiles, which consumed an excessive amount of fuel and emitted commensurately greater amounts of GHGs, from U.S. roads.²⁹⁷ Even though legitimate criticisms were leveled at the Cash for Clunkers program for failing to be sufficiently aggressive in increasing the fuel economy standards for replacement vehicles,²⁹⁸ the program has made a positive contribution to

292. U.S. Dep’t of Energy, Treasury, Energy Announce More Than \$2 Billion in Recovery Act Tax Credits for Energy Manufacturers (Aug. 13, 2009), <http://www.energy.gov/news2009/7801.htm>.

293. Tom Konrad, AltEnergy Stocks, What the ARRA Means for Clean Energy: One State’s Example, http://www.altenergystocks.com/archives/2009/03/what_the_arra_means_for_clean_energy_one_states_example.htm (last visited Feb. 23, 2010).

294. American Recovery and Reinvestment Act § 1102, 123 Stat. 115, 319–20 (to be codified at 26 U.S.C. § 48).

295. *Id.* tit. IV, 123 Stat. at 138–40; *see supra* note 285 (discussing the research to be undertaken by the ARPA-E).

296. The “Consumer Assistance to Recycle and Save Program” was established in the Supplemental Appropriations Act of 2009. Pub. L. No. 111-32, §§ 1301–1302, 123 Stat. 1859, 1909–15. Because of the program’s popularity, Congress authorized an additional \$2 billion in funding for the program in a subsequent supplemental appropriations bill. Pub. L. No. 111-47, 123 Stat. 1972 (2009).

297. *See* Supplemental Appropriations Act of 2009, Pub. L. No. 111-32, §§ 1301–1302, 123 Stat. 1859, 1909–15.

298. Christopher Joyce, *Critics Say ‘Clunkers’ Program Isn’t Very Green*, NAT’L PUB. RADIO, Aug. 3, 2009, <http://www.npr.org/templates/story/story.php?storyId=1115131>; Posting of Jesse Prentice-Dunn to Sierra Club, Looking Under the “Cash for Clunkers” Hood, http://connect.sierraclub.org/post/ClimateCrossroadsBlog/looking_under_the_cash_for_clunkers_hood.html (Aug. 27, 2009, 11:14 PST). One might argue that the Cash for Clunkers program is the type of painless legislation that is needed to progressively address GHG emissions. However, despite its popularity, the resulting legislation only required that replacement vehicles achieve a two-mile-per-gallon increase in fuel efficiency. *See* Supplemental Appropriations Act § 1302, 123 Stat. at 1909–10. Senator John McCain called this watering down of the original bill, which required a differential increase in fuel economy of not less than 25% “lemon legislation” because it failed to achieve marked environmental

overall efforts to reduce the United States' dependence on imported oil and reduce the United States' carbon footprint.²⁹⁹ This one-time program, however, is hardly the type of comprehensive approach that the United States must take, domestically and internationally, to squarely address climate change and hydrocarbon dependency issues.

D. *Other Tax Incentives to Promote Investment and Research and Development in Alternative Energy*

1. Research and Experimentation

The research and experimentation ("R&E") tax credit allows companies to invest a portion of their resources in the research, development, and testing of various products and services.³⁰⁰ The credit, which has expired and been extended many times since its inception,³⁰¹ was extended by Congress in the Emergency Economic Stabilization Act of 2008.³⁰² The Act included a retroactive two-year extension of the R&E tax credit from December 31, 2007, through December 31, 2009, and increased the Alternative Simplified Credit rate to 14% for 2009.³⁰³

savings, especially given the large taxpayer investment. 155 Cong. Rec. 56844 (daily ed. June 19, 2009) (statement of Sen. McCain). McCain also referenced a statement by Senators Feinstein and Collins: "It's amazing how quickly a good idea can go bad in Washington . . . Our 'Cash for Clunkers' proposal was a win-win for the environment and the economy. Then Detroit auto industry lobbyists got involved. Soon a rival bill emerged . . . tailored perfectly to the auto industry's specifications." *Id.* (quoting Dianne Feinstein & Susan Collins, *Handouts for Hummers*, WALL ST. J., June 11, 2009, at A13).

299. Official Blog of the U.S. Secretary of Transportation, *Cash for Clunkers Ends a Successful Run*, <http://fastlane.dot.gov/2009/08/cash-for-clunkers-ends-a-successful-run.html> (Aug. 26, 2009, 14:24 EST).

300. The basic authority for the credit is section 41(b)(1) of the Internal Revenue Code, which allows businesses to claim a credit for "qualified research expenses," the sum of in-house and contract research expenses associated with the actual conduct of qualified research, as in the case of a scientist conducting laboratory experiments. I.R.C. § 41(b)(1) (2006); Treas. Reg. § 1.41-2(c)(1) (2009).

301. See 26 U.S.C. § 41(h) (2006) (amending effective date six times since 1983).

302. Pub. L. No. 110-343, 122 Stat. 3765 (codified as amended in scattered sections of the U.S.C.). The Act is commonly referred to as the "bailout" of the U.S. financial system. See, e.g., David Cho, *Bailout Program Could Be Extended*, WASH. POST, Nov. 19, 2009, at A18.

303. See Tax Extenders and Alternative Minimum Tax Relief Act of 2008, Pub. L. No. 110-343, §§ 301(a), (c), 122 Stat. 3861, 3865-66 (to be codified at 26 U.S.C. §§ 41(c)(5)(A), (h)(1)(B)).

The current R&E credit has been criticized as fickle—one never knows whether expiring legislation will be re-extended—and inadequate to compete with the policies of other countries, like Canada, which actively compete for U.S. R&E dollars by offering generous R&E credits to U.S. multinational corporations that have a presence in their country and do research there.³⁰⁴ The current iteration of the R&E credit expired on December 31, 2009,³⁰⁵ prompting calls for the credit to be made permanent and for the alternative simplified credit to be increased from 14% to 20% to establish rough equivalence—not dominance—with the credits of other U.S. trading partners.³⁰⁶ Permanent extension of the credit would also help to create positive incentives for companies to make long-term investments in basic research related to energy efficiency and alternative energy systems.³⁰⁷

2. Investment Credits

The federal business energy investment tax credit first made available under the Energy Policy Act of 2005³⁰⁸ was recently expanded by the Energy Improvement and Extension Act of 2008.³⁰⁹ This law extended the existing credits in the Internal Revenue Code³¹⁰ by eight years, for “advanced energy projects” including solar energy,³¹¹ fuel cells,³¹² and micro-turbines.³¹³ It also estab-

304. Telephone Interview with Philip Beram, Chief Tax Counsel, U.S. Chamber of Commerce (Oct. 5, 2009); *see also* ROBERT D. ATKINSON, THE INFORMATION TECHNOLOGY AND INNOVATION FOUNDATION, THE RESEARCH AND EXPERIMENTATION TAX CREDIT: A CRITICAL POLICY TOOL FOR BOOSTING RESEARCH AND ENHANCING U.S. ECONOMIC COMPETITIVENESS 5 (Sept. 4, 2006), *available at* <http://www.itif.org/files/R&DTaxCredit.pdf>.

305. Tax Extenders and Alternative Minimum Tax Relief Act § 301(a)(1), 122 Stat. at 3865 (to be codified at 26 U.S.C. § 41(h)(1)(B)).

306. *See* R&D Credit Coalition, <http://www.investinamericasfuture.org> (last visited Feb. 23, 2010).

307. *See* FRIEDMAN, *supra* note 11, at 379–80 (discussing the lack of stable investment tax credits for those investing in wind and solar technologies in contrast to the traditional support given in the tax code to the oil and gas industries in the form of depletion tax credits). Friedman’s point, however, is equally true with regard to the very expensive costs of nuclear plant construction, the conversion coal and oil-fired industries, and utilities and transportation systems that incorporate the best technologies in terms of carbon capture. *See id.*

308. Pub. L. No. 109-58, 119 Stat. 594 (codified as amended in scattered sections of the U.S.C.).

309. Pub. L. No. 110-343, div. B, 122 Stat. 3765, 3807 (to be codified in scattered sections of 26 U.S.C.).

310. *See* 26 U.S.C. § 48 (2006 & Supp. I 2009).

311. Energy Improvement and Extension Act § 103(a)(1), 122 Stat. at 3811 (to be codi-

lished new credits for small wind-energy systems,³¹⁴ geothermal heat pumps,³¹⁵ and combined heat and power (“CHP”) systems.³¹⁶

fied at 26 U.S.C. §§ 48(a)(2)(A)(i)(II), (ii)). The credit is equal to 30% of expenditures, with no maximum credit. *See* 26 U.S.C. § 48(a)(2)(A) (2006). Eligible solar energy property includes equipment that “uses solar energy to generate electricity, to heat or cool (or provide hot water for use in) a structure, or to provide solar process heat . . .” *Id.* at § 48(a)(3)(i). Hybrid solar lighting systems, “which use[] solar energy to illuminate the inside of a structure using fiber-optic distributed sunlight” are eligible. *Id.* § 48(a)(3)(A)(ii). Passive solar systems and solar pool-heating systems are not eligible. *Id.* § 48(a)(3)(A)(i). The Solar Energy Industries Association has published a four-page document that provides answers to frequently asked questions regarding the federal tax credits for solar energy. *See* SOLAR ENERGY INDUS. ASS’N, THE SOLAR INVESTMENT TAX CREDITS FREQUENTLY ASKED QUESTIONS, http://seia.org/galleries/pdf/TTC_Frequently_Asked_Questions_10_9_8.pdf (last visited Feb. 23, 2010).

312. Energy Improvement and Extension Act § 103(a)(2), 122 Stat. at 3811 (to be codified at 26 U.S.C. § 48(c)(1)(E)). The credit is equal to 30% of expenditures, with no maximum credit. *See* 26 U.S.C. § 48(a)(20)(A). However, the credit for fuel cells is capped at \$1500 per 0.5 kilowatts (“kW”) of capacity. § 103(d), 122 Stat. at 3813 (to be codified at 26 U.S.C. § 48(c)(1)(B)). Eligible property includes fuel cells with a minimum capacity of 0.5 kW that have an electricity-only generation efficiency of 30% or higher. 26 U.S.C. § 48(c)(1)(A). The credit for property placed in service before October 3, 2008, is capped at \$500 per 0.5 kW. *Id.* § 48(c)(1)(B) (2006 & Supp. I 2009).

313. Energy Improvement and Extension Act § 103(a)(3), 122 Stat. at 3811 (to be codified at 28 U.S.C. § 48(c)(2)(E)). The credit is equal to 10% of expenditures, with no maximum credit limit explicitly stated. *See* 26 U.S.C. § 48(a)(2)(A)(ii) (2006). The credit for microturbines is capped at \$200 per kW of capacity. *Id.* § 48(c)(2)(B) (2006 & Supp. I 2009). Eligible property includes microturbines up to two megawatts (“MW”) in capacity that have an electricity-only generation efficiency of 26% or higher. *Id.* § 48(c)(2)(A) (2006).

314. Energy Improvement and Extension Act § 104, 122 Stat. at 3813 (to be codified at 26 U.S.C. § 48(a)). The credit is equal to 30% of expenditures, with no maximum credit for small wind turbines placed in service after December 31, 2008. *Id.* § 104(b), 122 Stat. at 3814 (to be codified at 26 U.S.C. § 48(a)(2)(A)(i)(iv)). Eligible small wind property includes wind turbines up to 100 kW in capacity. *Id.* § 104(c), 122 Stat. at 3814 (to be codified at 26 U.S.C. § 48(c)(A)(C)). In general, the maximum credit is \$4000 for eligible property placed in service after October 3, 2008, and before January 1, 2009. *Id.* (to be codified at 26 U.S.C. § 48(c)(4)(B)). The American Recovery and Reinvestment Act of 2009 removed the \$4,000 maximum credit limit for small wind turbines. *See* Pub. L. No. 111-5, § 1103, 123 Stat. 115.

315. Energy Improvement and Extension Act § 105, 122 Stat. at 3814 (to be codified at 26 U.S.C. § 48(a)(3)(vii)). The credit is equal to 30% of expenditures, with no maximum credit limit stated. *Id.* § 106(d), 122 Stat. at 3815; *see* 26 U.S.C. § 48(a)(2)(A)(ii). Eligible geothermal energy property includes geothermal heat pumps and equipment for producing, distributing or using energy derived from a geothermal deposit. *Id.* 122 Stat. at 3816 (to be codified at 26 U.S.C. § 25D(d)(5)). For electricity produced by geothermal power, equipment qualifies only up to, but not including, the electric transmission stage. *Id.* § 109(a)(2), 122 Stat. at 3821 (to be codified at 26 U.S.C. § 451(i)(6)). For geothermal heat pumps, this credit applies to eligible property placed in service after Oct. 3, 2008. *Id.* § 105(b), 122 Stat. at 3814 (to be codified at 26 U.S.C. § 48).

316. *Id.* § 103(c), 122 Stat. at 3811 (to be codified at 26 U.S.C. §§ 48(a), (c)). The credit is equal to 10% of expenditures, with no maximum limit stated. *See* 26 U.S.C. § 48(a)(2)(A)(ii). Eligible CHP property generally includes systems up to 50 MW in capacity that exceed 60% energy efficiency, subject to certain limitations and reductions for large systems. Energy Improvement and Extension Act § 103(c), 122 Stat. at 3811–13 (to be co-

The 2008 Act allowed taxpayers to take the credit against the alternative minimum tax ("AMT"),³¹⁷ although some credits were phased out for those upper middle-class taxpayers who had the means to purchase some of these exotic new systems.³¹⁸ In general, these credits are available for systems placed in service on or before December 31, 2016.³¹⁹ Some of these credits were expanded by ARRA, commonly known as the "stimulus legislation."³²⁰

E. *The Pending "Cap-and-Trade" Legislation*³²¹

Various cap-and-trade bills have been introduced in both houses of Congress; however, enactment of legislation remains an elusive goal of the Obama administration for the foreseeable future.

dified at 26 U.S.C. § 48(c)). The efficiency requirement does not apply to CHP systems that use biomass for at least 90% of the system's energy source, but the credit may be reduced for less-efficient systems. *Id.* This credit applies to eligible property placed in service after October 3, 2008. *Id.* § 103(f), 122 Stat. at 3813 (to be codified at 26 U.S.C. § 48).

317. Tax Extenders and Alternative Minimum Tax Relief Act of 2008, Pub. L. No. 110-343, § 102, 122 Stat. 3861, 3863 (to be codified in scattered sections of 26 U.S.C.).

318. See Bob McTeer, Ph.D., *Hearing on Fair and Equitable Tax Policy, The Alternative Minimum Tax Threatens Middle-Income Families: A Fair and Equitable Tax Policy Would Solve the Problem* 1 (Sept. 6, 2007) (statement of Bob McTeer), available at <http://www.npc.org/speech/the-alternative-minimum-tax-threatens-middle-income-families-a-fair-and-equitable-tax-policy-would-solve-the-problem>.

319. Energy Improvement and Extension Act § 103(c)(2)(B), 122 Stat. at 3812 (to be codified at 26 U.S.C. § 48(c)(3)(A)(iv)); see also Energy Star, Federal Tax Credits for Energy Efficiency, <http://www.energystar.gov/taxcredits> (last visited Feb. 23, 2010). The original use of the equipment must begin with the taxpayer, or the system must be constructed by the taxpayer. U.S. Envtl. Prot. Agency, Federal Incentives for Developing Combined Heat and Power Projects, Tax Provisions, <http://www.epa.gov/CHP/incentives/index.html> (last visited Feb. 23, 2010). The equipment must also meet any performance and quality standards in effect at the time the equipment is acquired. See Energy Improvement and Extension Act § 106(d)(3)(B)(ii), 122 Stat. at 3816. The energy property must be operational in the year in which the credit is first taken. See *id.* § 103(c)(2)(B), 122 Stat. at 3812 (to be codified at 26 U.S.C. § 48(c)(3)(B)(i)).

320. Pub. L. No. 111-5, div. B, pt. I, 122 Stat. 115 (to be codified in scattered sections of 26 U.S.C.) That legislation created a credit for "plug in" vehicles, included AMT relief for the credits available to purchasers of hybrid vehicles, and reauthorized homeowner tax credits for the purchase of energy efficient heat pumps, water heaters, and wood stoves. *Id.* §§ 1121, 1141, 122 Stat. at 323, 326 (to be codified at 26 U.S.C. §§ 25D, 30B, 30D).

321. Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. (as reported by S. Comm. on Envtl. and Pub. Works, Nov. 5, 2009). According to the Environmental Protection Agency ("EPA"), a "cap and trade system" is a "policy approach for controlling large amounts of emissions from a group of sources." A limit, or cap, is placed on the amount of emissions; companies are then given "emission allowances," the total of which must not exceed the cap. These allowances can be traded among companies so long as the overall emissions cap is not exceeded, thereby giving companies flexibility in a compliance strategy. U.S. Envtl. Prot. Agency, Cap and Trade Essentials, <http://www.epa.gov/captrade/documents/ctessentials.pdf> (last visited Feb. 23, 2010).

The most advanced legislative effort—and a harbinger of the shape of future legislation—is the American Clean Energy and Security Act of 2009 (“ACES Act”), which was passed by the U.S. House of Representatives on June 26 by a vote of 219 to 212.³²² This legislation establishes an economy-wide, greenhouse gas cap-and-trade system to help address climate change and enable the United States to act as a functioning member of the Kyoto Protocol’s treaty organizations and, according to the EPA’s analysis, meet the current Protocol targets if certain “offset” assumptions hold true.³²³ Committee Chairman Henry Waxman and Representative Edward Markey are sponsors of the legislation,³²⁴ which will be presented to the Senate³²⁵ and possibly reconciled with Senate Bill 1462,³²⁶ which contains similar cap-and-trade provisions.³²⁷ In pertinent part, the bill mandates that electric utilities—through the regulatory authority of the Federal Energy Regulatory Commission—increase their use of renewable energy sources to satisfy retail energy users from 6.0% in 2012 to 20% in 2020 and the out-years.³²⁸ The legislation also establishes a State Energy and Environmental Development system where states can receive transfer payments from the federal government for the realization of energy savings by adopting national energy efficiency codes for commercial and residential real estate.³²⁹ Finally,

322. Final Vote Results for Roll Call 477 (June 26, 2009), <http://clerk.house.gov/evs/2009/roll477.xml>.

323. U.S. Env’tl. Prot. Agency, EPA Analysis of the American Clean Energy and Security Act of 2009 H.R. 2454 in the 111th Congress 2, 45 (June 23, 2009), http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis.pdf.

324. See ACES Act, H.R. 2454, 111th Cong. (2009).

325. Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. (2009).

326. American Clean Energy Leadership Act of 2009, S. 1462, 111th Cong. (as reported by S. Comm. on Energy and Natural Res., July 11, 2009). Senator Mary Landrieu (Democrat from Louisiana) and at least a half dozen Senate Democrats have withdrawn their support for the current bill because of election year politics and higher legislative priorities involving health care and the economy. See Lisa Lerer, *Senate Democrats to W.H.: Drop Cap and Trade*, POLITICO, Dec. 27, 2009, <http://www.politico.com/news/stories/1209/30984.html>.

327. For an excellent analysis of the bill, see Pew Center Summary of H.R. 2454: American Clean Energy and Security Act of 2009, http://www.pewclimate.org/docUploads/Waxman-Markey%20summary_FINAL_7.31.pdf (last visited Feb. 23, 2010).

328. H.R. 2454, § 610(d)(2). Renewable energy sources include wind, solar, geothermal, renewable biomass, biogas or biofuels; qualified hydropower, marine and hydrokinetic landfill gas and coal mine methane generation coupled with carbon capture. *Id.* § 610(a)(17). Current hydropower plant improvements and new nuclear power plants are not given a credit against current carbon generating activity but are excluded from a utility’s current activity. See *id.* § 610(a)(12), (19).

329. See H.R. 2454 § 131.

the bill establishes a loan program for clean energy projects;³³⁰ national standards and incentive payments to facilitate the replacement of outdoor lighting, stoves, and appliances;³³¹ rebates for the purchases of electric vehicles;³³² and incentives on government-backed mortgages for energy efficient homes.³³³

Title VII of the bill contains nationwide emission reduction goals—benchmarked against overall GHG emissions in 2005—for all stationary sources of GHG emissions.³³⁴ Overall federal GHG limits are established in law, and reporting entities have to reduce their GHG emissions over time to comply with the federal GHG reduction schedule.³³⁵ Entities that cannot meet federal GHG limits must satisfy their compliance obligations either by using “offset credits,”³³⁶ which will be on deposit with a registry that is run by the EPA Administrator,³³⁷ or forfeiting credits in the following years.³³⁸ Credits are also available to emitters that fund international reforestation activities.³³⁹ The legislation ac-

A State shall be considered to achieve compliance with a code described in paragraph (2)(A) [of the statute] if at least 90 percent of new and substantially renovated building space in that State in the preceding year upon inspection meets the requirements of the code. A certification under paragraph (2) shall include documentation of the rate of compliance based on—
(A) independent inspections of a random sample of the new and substantially renovated buildings covered by the code in the preceding year; or
(B) an alternative method that yields an accurate measure of compliance as determined by the Secretary.

Id. § 201(e)(3)).

330. *Id.* § 187.

331. *Id.* §§ 211, 212, 218.

332. *Id.* § 121.

333. *Id.* § 294.

334. *Id.* § 702. Entities that emit greater than 10,000 tons of CO₂ per year have to annually report their emissions. This includes fleets of vehicles which emit greater than 25,000 tons. *See id.* § 713(a)(2).

335. *See id.* § 764.

336. *See* H.R. 2454 § 722(d)(1)(A) (granting public entities the ability to use offset credits to demonstrate compliance for up to a maximum of two billion tons of GHG emissions annually). Entities can purchase offset credits from other emitting entities or can obtain offset credits as a result of reduced international reforestation activity. *See id.* § 724(a) (giving holders of offset credits the ability to sell, exchange, or transfer them with other offset holders); *id.* § 743(e)(1) (granting the Administrator the authority to issue international offset credits for GHG emission reductions achieved through activities that reduce deforestation).

337. *See id.* § 732(d).

338. *See id.* § 723(c).

339. *See id.* § 743(e).

knowledges the importance of international negotiations to prevent “carbon leakage” in specified markets and to prevent competitive imbalances.³⁴⁰

F. *Other Good Ideas*

In 2004, DOD funded the non-profit RMI to devise a strategy “for getting the United States completely, attractively and profitably off oil.”³⁴¹ The engineers and scientists at RMI proposed a variety of novel public policies to accelerate the process of restructuring the oil economy.³⁴² One such proposal was a decade-long investment of \$180 billion in various industries and programs, which RMI projects will be paid for many times over by the creation of new jobs associated with converting oil-based industry and transportation systems to systems that rely upon alternative energy sources.³⁴³ Some of the specific suggestions include:

- **Vehicle Standards:** The Great Recession of 2008–2010 has wrought substantial restructuring of the U.S. auto industry, which has increased its focus on fuel economy. The RMI stated that the United States had an “endangered automotive sector” with a history of “[r]eliance on lawyers and lobbyists . . . to avert competition and regulation [that] . . . long restrained American automakers from fully exploiting their extraordinary engineering prowess.”³⁴⁴ In particular, RMI noted that “GM lobbyists killed California’s Zero-Emission Vehicle rule, which had given a head start” in the development of a battery-electric hybrid,³⁴⁵ arguably because of concerns about the industry’s future, the loss of consumer choice, and potential safety risks for drivers.³⁴⁶ Of course,

340. *See id.* § 766.

341. AMORY B. LOVINS ET AL., ROCKY MOUNTAIN INSTITUTE, WINNING THE OIL ENDGAME vii, 278 (2005).

342. *Id.* at vii.

343. *Id.*

344. *Id.* at 130.

345. *Id.* at 130 n.571 (noting that after GM lobbyists “killed” the zero emissions rule “a 2001 anti-CAFE standards lobbying blitz strove to convince Americans that efficient cars [were] unsafe and unaffordable”). “CAFE” refers to the sales-weighted average fuel economy of a manufacturer’s fleet of passenger cars and light trucks, manufactured for sale in the United States. Nat’l Highway Traffic & Safety Admin., CAFE Overview, <http://www.nhtsa.dot.gov/CARS/rules/CAFE/overview.htm> (last visited Feb. 23, 2010).

346. *See* RICHARD BYRNE, LIFE IN THE SLOW LANE: TRACKING DECADES OF AUTOMAKER ROADBLOCKS TO FUEL ECONOMY 1 (2003). It is also possible that lobbyists simply did not want to demonstrate compliance with CAFE standards.

the net result was that Toyota and Honda took the lead in hybrids.³⁴⁷ To reverse the trend permanently, RMI suggested that the United States should eliminate two effective subsidies of the automobile industry: excessively low taxes on fuels—as compared with the rest of the developed world³⁴⁸—and fuel efficiency standards that reward inefficiency and encourage U.S. automakers to under-compete.³⁴⁹ In the current environment, increased Corporate Average Fuel Economy (“CAFE”) standards will have some beneficial impacts on a global scale, since world auto manufacturers will want to be able to access the lucrative U.S. market. Higher CAFE standards³⁵⁰ will also serve as a forcing function which drives efficiencies in overseas markets. On May 19, 2009, President Obama announced that the United States would establish more aggressive fuel efficiency standards to take effect in 2016.³⁵¹ The National Highway Traffic Safety Administration (“NHTSA”) and EPA issued a joint notice of proposed rulemaking on September 28, 2009.³⁵²

347. See LOVINS ET AL., *supra* note 341, at 131.

348. See *id.* at 173–74.

349. See *id.* at 175.

350. On December 19, 2007, President George W. Bush signed into law the Energy Independence and Security Act of 2007, Pub. L. No. 110-140, 121 Stat. 1492, (codified in scattered sections of the U.S.C.). President’s Remarks on Signing the Energy Independence and Security Act of 2007, 43 WEEKLY COMP. PRES. DOC. 1612 (Dec. 19, 2007). This Act aimed to improve vehicle fuel economy and other conservation goals. See John M. Broder, *Bush Signs Broad Energy Bill*, N.Y. TIMES, Dec. 19, 2007, <http://www.nytimes.com/2007/12/19/washington/19cnd-energy.html>. This was the first overhaul in standards in over thirty years. *Id.* The Act set a goal for the national fuel economy standard of 35 miles per gallon by 2020. See Energy Independence and Security Act § 102(b)(2)(A), 121 Stat. at 1499 (codified at 49 U.S.C. § 32902(2)(A) (Supp. I 2009)).

351. Press Release, The White House, Office of the Press Secretary, President Obama Announces National Fuel Efficiency Policy, May 19, 2009, *available at* http://whitehouse.gov/the_press_office/President-Obama-Announces-National-Fuel-Efficiency-Policy.

352. Proposed Rulemaking To Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 74 Fed. Reg. 49,454 (proposed Sept. 28, 2009) (to be codified at 40 C.F.R. pts. 86, 600 and 49 C.F.R. pts. 531, 533, 537, and 538). The new CAFE Standards will cover model years 2012–2016, require an average fuel economy standard of 35.5 mpg in 2016, and include the first-ever national emissions standards under the EPA’s greenhouse gas program. Notice of Upcoming Joint Rulemaking to Establish Vehicle GHG Emissions and CAFE Standards, 74 Fed. Reg. 24,007, 24,009 (proposed May 22, 2009); U.S. ENVTL. PROT. AGENCY, OFFICE OF TRANS. AND AIR QUALITY, EPA-420-F-09-047, EPA AND NHTSA PROPOSE HISTORIC NATIONAL GREENHOUSE PROGRAM TO REDUCE GREENHOUSE GASES AND IMPROVE FUEL ECONOMY FOR CARS AND TRUCKS (2009). This particular notice of proposed rulemaking came on the heels of an earlier notice of proposed rulemaking on May 19, 2009, in which the Department of Transportation and the EPA issued a notice of intent proposing a National Program for Model Years 2012 and 2016 to coordinate greenhouse gas emissions and fuel economy. Notice of Upcoming Joint Rulemaking to Establish Vehicle GHG Emissions and

• **Increased fuel taxes/carbon tax:** While gas and diesel fuel tax increases would be politically unpopular, they would reward helpful social behavior and signal efficient market behavior.³⁵³ Since taxes are regressive, some of their impact on the poor could be reduced by tax credits or reduction of payroll taxes. Despite their unpopularity,³⁵⁴ tax increases would help distribute the carbon dioxide pollution, road damage, and other vehicle operation costs society incurs beyond the initial purchase of vehicles.³⁵⁵ Such taxes are also the only effective price signal to discourage unnecessary driving and create market opportunities for other transportation systems, like trains and mass transit.³⁵⁶ Former Federal Reserve Chairman, Paul Volcker, and former Council of Economic Advisors Chairman, Martin Feldstein, have endorsed this general approach as a viable method of reducing the federal budget deficit and equalizing the tax treatment of other states.³⁵⁷

• **Permanent Feebate System:** Similar to the recent Cash for Clunkers program, RMI suggested a permanent system in which purchasers of light vehicles would receive a government credit, against the purchase price of the vehicle, if that vehicle's fuel economy exceeded a "pivot point" for vehicles of a given size.³⁵⁸ Surcharges, similar to the U.S. "gas guzzler" tax,³⁵⁹ would be levied upon vehicles that are above the pivot point.³⁶⁰ Interestingly, RMI proposed that the pivot point be legally set at a current rate where the surcharge revenue is equal to that of the "feebates" so that the entire program can be revenue neutral.³⁶¹ RMI suggested feebates could be used as an alternative to CAFE standards.³⁶² CAFE standards have to be constantly adjusted through a complex and divisive political process.³⁶³ By contrast, feebates are ma-

CAFE Standards, 74 Fed. Reg. at 24,007 (proposed May 22, 2009).

353. See LOVINS ET AL., *supra* note 341, at 174 n.720.

354. *But see id.* at 266 (discussing how the subsequent income tax revenues from income no longer spent on fuel will "entirely offset" the decline of gas tax receipts).

355. See *id.* at 174 (arguing "[t]he main virtue of higher gasoline taxes would be [to] reduc[e] miles driven after the car is bought").

356. See *id.* (stating that fuel prices do not show all the costs of gasoline use to society, but fuel taxes could reduce the number of miles people drive).

357. See *id.* at 174 n.719.

358. *Id.* at 186.

359. 26 U.S.C. § 4064 (2006).

360. LOVINS ET AL., *supra* note 341, at 186.

361. See *id.*

362. See *id.* at 186–87.

363. The recent proposed rule by EPA and DOT to increase CAFE standards was over

thematically constant, based on a reward and penalty system that will continuously propel innovation.³⁶⁴ For low-income individuals, the feebates systems could be augmented with a program similar to Cash for Clunkers or a novel system in which the U.S. Government would competitively procure highly efficient vehicles for lease to low-income or qualifying small business taxpayers.³⁶⁵

- **Aggressive Propulsion Research:** RMI advocates aggressive funding of alternative energy technologies in the military sector, both to eliminate the combat effectiveness concerns discussed by the CNA MAB and also to help spur commercialization of fuel cell technologies that are already in use in submarines and spacecraft.³⁶⁶ RMI asserted that U.S. research and development commitments in hydrogen fuel cell research are no greater than those of other major developed countries, yet hydrogen is argued to be the best possible hope for the United States to eliminate its dependence on imported oil and carbon producing fuels, including natural gas.³⁶⁷ It makes good sense to concentrate this basic and applied research activity in the DOD because it needs fuel cells for a full spectrum of uses: light vehicles, heavy vehicles, power plants, aircraft, and other platforms. Also, direct financing of traditional DOD contractors in the applied research and fielding of working fuel cell prototypes, is the fastest way to bring these technologies to market quickly, as opposed to funding basic research and national laboratories, which have spotty track records of being able to successfully transition technology into the commercial marketplace.³⁶⁸ Since the RMI report was written in 2005,

300 pages in length. See Proposed Rulemaking To Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 74 Fed. Reg. 49,454–49,789 (proposed Sept. 28, 2009) (to be codified at 40 C.F.R. pts. 531, 533, 534, 537, and 538). One can easily envision a docket of many thousands of pages of comments that will have to be analyzed by DOT and EPA officials and incorporated into a commentary that will accompany the final rule. That process of review and documentation is likely to take months and many years of effort.

364. LOVINS ET AL., *supra* note 341, at 187.

365. *Id.* at 193.

366. *See id.* at 230–32.

367. *Id.* at 232, 236, 242. Fuel cell powertrains have about one-tenth of the moving parts of an engine-based power train and have considerable potential as both mobile and stationary sources of energy generation (versus fuel-fired plants) and heavy lift applications. *Id.* at 232, 236; Jennifer Gangi, *Fuel Cells Do Some Heavy Lifting*, ALTERNATIVE ENERGY EMAG., June 2007, http://www.altenergymag.com/emagazine.php?issue_number=07.06.01&article=fork_lifts.

368. NAT'L ACAD. OF SCI. ET AL., *THE GOVERNMENT ROLE IN CIVILIAN TECHNOLOGY: BUILDING A NEW ALLIANCE* 18, 74–79 (1992).

much has been done in the development of alternative fuels and energy sources; however, it is still appropriate to revisit whether programs are sufficient to advance these goals.

G. *International Assistance and Development Programs*

The Kyoto Protocol successor agreement is expected to contain the same system as the original Protocol, in which Annex II countries are incentivized—through a carbon credit—to fund clean energy development and carbon sequestration projects in the developing world.³⁶⁹ The jury is out on whether this funding will be sufficient and available on time to prevent the collapse of many states. Accordingly, widening access to energy services for the poor abroad must be a component of the overall security strategy. The ability of the United States to successfully grapple with this reality and to take effective action will ultimately determine whether the U.S. government is an impact player on the international development stage or the author of many glossy studies that talk about the need for action but take none.

Currently, it seems clear that there is bipartisan consensus for domestic programs to curtail domestic reliance on imported oil and to move America to a new energy economy.³⁷⁰ It also seems clear that the Kyoto/Copenhagen successor agreement will contain some sort of carbon trading system.³⁷¹ The carbon sequestration aspect of a global trading system does incentivize developing countries to plant trees and engage in sustainable agriculture, but the question remains whether those macro policies will trickle down quickly enough to have the impact necessary to stave off the onset of climate change effects and the subsequent collapse of the states that are currently at risk. It also is unclear

369. See *Climate Deal Sealed by U.S. U-Turn*, BBC NEWS, Dec. 15, 2007, <http://news.bbc.co.uk/2/hi/science/nature/7145608.stm> (describing the 2007 “Bali roadmap” to a successor Kyoto Protocol). Most recently, the Copenhagen Climate Change Conference was expected to further the goal a final successor agreement to the Kyoto Protocol. See *Copenhagen and Beyond: Is There a Successor to the Kyoto Protocol?*, Hearing Before the H. Comm. on Foreign Affairs, 111th Cong. 1–4, 51–52 (2009) (statements of Howard L. Berman, Chairman, Ileana Ros-Lehtinen, Member, H. Comm. on Foreign Affairs, and Steven Groves, Bernard and Barbara Loman Fellow).

370. See SARAH LADISLAW ET AL., WORLD RES. INST., CTR. FOR STRATEGIC & INT’L STUDIES, A ROADMAP FOR A SECURE, LOW-CARBON ENERGY ECONOMY: BALANCING ENERGY SECURITY AND CLIMATE CHANGE 7, 25 (2009), available at http://csis.org/files/media/isis/pubs/090204_energy_roadmap.pdf.

371. *Climate Deal Sealed by U.S. U-Turn*, *supra* note 369.

whether or not these macro policies will immediately translate into clean electric power generation plants in the developing world.

The central governments in many developing countries are either too weak or too disorganized to have central energy policies that are effective.³⁷² Additionally, public utilities in those countries are often very “inefficient and . . . see no incentive or profit to serve [the poor].”³⁷³ Though controversial, the U.S. government, working either independently or in concert with other countries,³⁷⁴ needs to mobilize the U.S. energy sector to become direct participants in energy generation activities of developing countries. The U.S. government should provide a combination of loan guarantees or heavily subsidized political risk insurance—against expropriation—to diversified and properly capitalized energy companies, including U.S. utility companies, in order to supply windmills, electric grid supplies, and other low-carbon energy systems in the developing world, in exchange for granting these companies long-term concessions to operate these generation systems. Such a program might also include giving the supplying company a limited monopoly to provide or license the local manufacture of lighting, stoves, and refrigeration units to the ultimate consumers, in exchange for putting some capital at risk to enter these volatile markets. Strong governmental involvement by U.S. embassies abroad³⁷⁵ to facilitate these transactions in the developing world is essential.

372. See, e.g., PACIFIC ISLANDS RENEWABLE ENERGY PROJECT, PACIFIC REGIONAL ENERGY ASSESSMENT 2004, at vi–vii, x, 37–38 (2004), http://www.sprep.org/att/publication/000427_vanuatu_PIREP_final.pdf.

373. UN-ENERGY, *supra* note 160, at 9.

374. China immediately comes to mind given its extensive investment activity in Africa. See generally Ed Cropley & Ben Hirschler, *Davos Special Report: Africa Rising*, REUTERS, Jan. 26, 2010, <http://www.reuters.com/article/idUSTRE60P04120100126> (discussing Chinese investment in African infrastructure).

375. Critics may argue that this falls within the mission of Commercial Attachés at U.S. embassies abroad to promote U.S. exports. See Int’l Trade Admin., Promoting Trade and Investment, <http://www.trade.gov/promotingtrade/index.asp> (last visited Feb. 23, 2010). However, these small offices often lack the overall clout with host governments or the resources to have the type of impact necessary to arrest imprudent use of carbon-based fuels and prevent state collapse. *Fortress America Abroad: Effective Diplomacy and the Future of U.S. Embassies, Hearing Before the Subcomm. on National Security and Foreign Affairs of the Comm. on Oversight and Government Reform*, 110th Cong. 36–39 (2008) (testimony of John K. Naland, President, American Foreign Service Association). To be successful, this should be made a top priority of the ambassador to these countries with their career success directly tied to the number of deals that they are able to close.

Also, we must accept that in some developing countries, there is little or no hope of any commercial success; therefore, programs in such countries would have to be driven almost exclusively with public financing from either donor countries, NGOs, or the successor to the IPCC.³⁷⁶ As a commercial option, these programs should be driven by the commercial imperative of creating new markets for the U.S. energy industry and the policy goal of providing clean electrons to the developing world. It should not be viewed as a competitor to or replacement for traditional assistance programs or as *the* U.S. approach to the Clean Development Mechanism under the Kyoto scheme.³⁷⁷

H. *International Sanctions and Trade*

The Kyoto agreement and its eventual successor will largely rely on self-enforcement.³⁷⁸ What is absent from the Protocol, and is not mentioned in the discussion of negotiating drafts in preparation for the Copenhagen Round, is a discussion of substantive sanctions if a state does not make its commitments.³⁷⁹ Indeed, the Copenhagen Accord relies, out of political necessity, entirely on voluntary compliance activities by states.³⁸⁰ If all states do not voluntarily comply with Kyoto, the entire system will likely collapse. Therefore, in assessing the wisdom of the current ap-

376. UN-ENERGY, *supra* note 160, at 13.

377. Even though this proposal should not be predicated as a compliance technique under the Kyoto Protocol's CDM, or its successor, it should not suggest that trading credits could never be made available to companies as an inducement to enter into these transactions. In order for the United States to comply with its basic obligations under Kyoto, it is envisioned that a number of public utilities currently using coal as their primary fuel will have to use the CDM as a crutch to stay in operation for the near term. If there are sufficient opportunities in the CDM for the benefit of all industrial concerns in the United States, then that course of action should certainly be pursued.

378. Countries that fail to meet their emissions targets by the end of the first commitment period (2012) must make up the difference plus a penalty of 30% in the second commitment period. Their ability to sell credits under emissions trading will also be suspended. UNFCCC, An Introduction to the Kyoto Protocol Compliance Mechanism, http://unfccc.int/kyoto_protocol/compliance/introduction/items/3024.php (last visited Feb. 23, 2010).

379. See Edward Wong & Jonathan Ansfield, *China Insists that Its Steps on Climate Be Voluntary*, N.Y. TIMES, Jan. 30, 2010, at A5 (suggesting that the voluntary nature of emissions targets is crucial to ensuring the involvement of developing countries in global efforts to fight climate change).

380. See generally Morten Andersen, *A Copenhagen Accord It Is*, Government of Denmark, Dec. 19, 2009, <http://www.denmark.dk/en/menu/Climate-Energy/COP15-Copenhagen-2009/Selected-COP15-news/A+Copenhagen-Accord-it-is.htm>.

proach, it is useful to review the reasons for the relative success³⁸¹ of the Montreal Protocol³⁸² in containing the emission of substances that deplete the Ozone Layer.³⁸³ Article 8 of the Montreal Protocol empowered the Treaty's Implementation Committee to establish enforcement and compliance modalities.³⁸⁴ By 1992, an Implementation Committee was formed with the powers to receive and investigate complaints and approve and monitor draft action plans of offending countries.³⁸⁵ Other sanctions "might be taken by a meeting of the parties in respect of non-compliance with the Protocol' includes issuing formal cautions and the suspension of specific rights and privileges under the protocol, such as those dealing with finance and trade"³⁸⁶ Even though no trade sanctions have ever been ordered by the parties to the Montreal Protocol, the regime allows for restrictions on trade in products controlled by the agreement, such as bans for those products that have been produced using any prohibited gases.³⁸⁷ These provisions are essential to prevent industry from moving from one country to another in order to escape the phase-out schedules of the treaty.³⁸⁸ These provisions are also necessary to prevent countries from backsliding on their obligations to gain industry advantages.

381. The [Montreal Protocol] has proved to be a highly effective agreement. . . . [b]y September 2003, a total of 184 countries had ratified it. No producers or significant consumers are left outside. Even though it allows developing nations, unlike industrialized states, a grace period in which to implement controls, world production of [chlorofluorocarbons] fell by 86 percent between 1986 and 1999 . . . [such that] full recovery is expected by the middle of the century.

Duncan Brack, *Monitoring the Montreal Protocol*, in VERIFICATION YEARBOOK 2003, at 209, 212 (Trevor Findlay ed., 2003).

382. Montreal Protocol on Substances that Deplete the Ozone Layer, Sept. 16, 1987, 104 Stat. 2399, 1522 U.N.T.S. 3.

383. Brack, *supra* note 381, at 209; *see also* U.N. ENV'T. PROGRAMME IMPLEMENTATION COMM., DECISIONS OF THE PARTIES RELATED TO THE NON-COMPLIANCE PROCEDURE OF THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEplete THE OZONE LAYER 31-115 (Oct. 2007), available at http://ozone.unep.org/Meeting_Documents/impcom/MOP_decisions_on_NCP.pdf.

384. Montreal Protocol on Substances that Deplete the Ozone Layer art. 8, *supra* note 382, 104 Stat. at 2668, 1522 U.N.T.S. at 35.

385. Brack, *supra* note 381, at 216-18.

386. *Id.* at 218. States that are non-compliant would lose access to the Treaty's Multilateral Fund, which is designed to provide financial and technical assistance to states in order to enhance their compliance activities. *Id.* at 223.

387. Montreal Protocol on Substances that Deplete the Ozone Layer art. 4, *supra* note 382, 104 Stat. at 2668, 1522 U.N.T.S. at 33-34; *see also* Brack, *supra* note 381, at 220.

388. Brack, *supra* note 381, at 200.

VII. CONCLUSIONS AND RECOMMENDATIONS

Some controversy remains over the extent or pace of climate change. However, there seems to be universal agreement from individuals from all political spectrums that reducing U.S. dependence on foreign oil is a national security imperative.³⁸⁹ Even President George W. Bush endorsed the principle in his 2006 State of the Union Address stating that the United States needed to wean its addiction to foreign oil and “increase our research in better batteries for hybrid and electric cars and in pollution-free cars that run on hydrogen.”³⁹⁰ There also seems to be an emerging national consensus that reducing GHG emissions is something that needs to happen domestically and internationally in a prompt and balanced fashion.

In assessing the macro policies outlined above and the various steps being taken, all measures being undertaken both domestically and internationally comport with their stated policies and, over time, will help reduce U.S. vulnerabilities. The current and planned tax preferences for private industry investment in alternative energy—including the utility companies—are essential to stimulating the research and development associated with fielding these new technologies. Investment in such technologies is important to reduce many of the risk factors to the United States as outlined by Jared Diamond,³⁹¹ especially climate change, since the United States is such a large per capita producer of GHG,³⁹² and U.S. actions will be copied by other states. In that regard, the United States needs to reconsider its tax policies on research and experimentation. These credits should be made permanent and should be on par with those of other developed countries to ensure, at the very least, that the research and development dollars do not migrate from the United States to other jurisdictions that grant a more generous preference.³⁹³ Investment tax credits for

389. See John Kerry & Lindsey Graham, *Yes We Can (Pass Climate Change Legislation)*, N.Y. TIMES, Oct. 11, 2009, at WK11 (discussing the alignment of Republicans and Democrats on finding clean, independent energy sources that will protect American jobs and safeguard national security).

390. Address Before a Joint Session of the Congress on the State of the Union, 42 WEEKLY COMP. 150 (Jan. 31, 2006).

391. See DIAMOND, *supra* note 11, at 486.

392. Seth Borenstein, *Pollution Up Despite Economic Downturn*, SEATTLE TIMES, Nov. 18, 2009, at A3.

393. Peter Morici, *Recalibrating U.S.-China*, New America Foundation, Policy Paper,

conversion to alternative energy sources should be given time to work, but consideration should be given to making those tax credits permanent and inclusive of such things as conversion from coal and oil to natural gas.

United States government funding for basic and applied research in alternative energy by DOE should be increased. Although the most recent list of research programs by DOE's Advanced Research Program³⁹⁴ is impressive, it needs to be continued and expanded. DOD also should continue to program for and develop next generation systems using alternative energy sources, such as hydrogen fuel cells, which could be transitioned into the commercial marketplace. There are many good programs in DOD; there needs to be more.³⁹⁵ This heavy investment in research, development, and technology needs to continue at a high rate because the United States risks being commercially marginalized out of this important emerging market if it does not aggressively invest now. China, for example, is now investing ten times as much in clean power—as a percentage of GDP—as the United States.³⁹⁶

The revolutionary proposals put forth by RMI to increase fuel taxes and dampen demand for petroleum need to be given close scrutiny. United States consumers currently pay an 18.4 cents per gallon federal tax³⁹⁷ on finished gasoline, which is far below the true costs associated with the use of that product.³⁹⁸ The fed-

(June 11, 2009), http://www.newamerica.net/publications/policy/recalibrating_U_S_China.

394. See *supra* note 285 and accompanying text concerning ARPA-E.

395. In September, DOD awarded an \$11 million contract to Solazyme of San Francisco, California, and Sustainable Fuels of Bozeman, Montana, to produce jet fuel from algae and camalina. *Executive Summary*, FED. TIMES, Sept. 14, 2009, at 2. The Marine Corps recently awarded a contract to General Electric to build and manage a "smart grid" system for the Twentynine Palms Marine Corps Air Station in California, the Marine Corps' largest base. William Matthews, *Marine Base Sees Savings in 'Smart Microgrid'*, FED. TIMES, Aug. 10, 2009, at 16. The Marine Corps Air Station in Camp Pendleton, California has renewable energy projects including the installation of photovoltaic and solar panels. Press Release, Lee H. Saunders, Naval Facilities Eng'g Command, Recovery Act Funds Camp Pendleton Air Station Solar and Lighting Upgrades (Sept. 10, 2009), available at https://portal.navfac.navy.mil/portal/pls/portal/APPPAOP.PRESS_RELEASE_FULL_DYN.Show?p_arg_names=newsid&p_arg_values=3412.

396. See John Doerr & Jeff Immelt, *Falling Behind on Green Tech*, WASH. POST, Aug. 3, 2009, at A17.

397. 26 U.S.C. § 4081(a)(2)(A)–(B) (2006). States also levy taxes on fuel. State taxes range from 32.4 cents in Alaska to 69.7 cents in California. See AM. PETROLEUM INST. MOTOR FUEL TAXES: OCTOBER SUMMARY REPORT (2009), http://www.api.org/statistics/fuel_taxes/.

398. Robert Puentes & Adie Tomer, *Untangling Transportation Funding*, BROOKINGS

eral tax is also well below the per gallon tax in other industrialized countries, including Germany (\$6.28), the UK (\$3.49), Japan (about \$5.20),³⁹⁹ and Korea (\$3.21).⁴⁰⁰ We should not repeat the expensive mistakes of the past with regard to the U.S. auto industry by not holding them to high energy efficiency standards. The United States should follow through to establish aggressive CAFE standards. Using the interesting feebates proposal also would help to contain SUV excesses and send the correct technology development signals.⁴⁰¹ In both cases, higher taxes on gasoline and stricter standards will dampen dependence on imported oil and would help mitigate the “hostile neighbors” risk factor mentioned above.

The successor of the Kyoto agreement and domestic cap-and-trade legislation must be pursued quickly to address a variety of risks. It is hoped, however, that U.S. negotiators learn the lessons of the Montreal Protocol and incorporate provisions that enable some treaty entity—like the CDM secretariat—to have the power to levy some sort of sanctions against states that fail to domestically enforce their GHG mandates. For example, trade that is linked to non-complaint GHG emissions could be banned from international trade and commerce.⁴⁰² Those sorts of provisions are essential to preserve the overall integrity of the treaty and to build consensus in the United States for shared sacrifices, which will be felt as domestic cap-and-trade levels begin to take hold and result in increased electrical power costs—in the near term, at least. This approach is also essential to dampen calls for mod-

INST., Feb. 26, 2009, http://www.brookings.edu/opinions/2009/0226_vehicle_miles_traveled_puentes.aspx?p=1.

399. *Rising Sum: Japan's Gas-Tax Debate Challenges Government*, WALL ST. J., May 13, 2008, available at <http://blogs.wsj.com/environmentalcapital/2008/05/13/rising-sum-japan-gas-tax-debate-challenges-government>. United States tax rates are comparable to those in China (14.8 cents) and Singapore (43 cents). See Fu Jing, *Fuel Tax Reform an Energy Milestone*, CHINA DAILY, Dec. 29, 2008, available at http://www.chinadaily.com.cn/bizchina/2008-12/29/content_7349014.htm; Nat'l Ctr. for Env'tl. Econ., Singapore Road and Vehicle Taxation (Jan. 28, 2010), <http://yosemite.epa.gov/ee/epalib/incent.nsf/Geographic%20Area!OpenView&Start=88> (follow “Singapore” hyperlink; then follow “11.1.5.5. Singapore Road and Vehicle Taxation” hyperlink).

400. Sonya Hoo & Robert Ebel, *An International Perspective on Gasoline Taxes*, TAX NOTES, Sept. 26, 2005, available at <http://www.urban.org/publications/1000845.html>.

401. See *supra* notes 361–65 and accompanying text.

402. Another model for consideration would be the methods by which trade of the products derived from endangered species is banned. See Convention on International Trade in Endangered Species of Wild Fauna and Flora, Mar. 3, 1973, 27.2 U.S.T. 1087, 993 U.N.T.S. 243.

ification of the world trading system so that producers in states that do not comply with GHG emission levels are punitively taxed.⁴⁰³ Any such proposal to link a Copenhagen “agreement” to the World Trade Organization (“WTO”) agreements would be enormously controversial and sure to produce gridlock at the WTO.⁴⁰⁴ Such well-intentioned proposals could also lead to serious trade wars in which there are never any winners.

Most Americans support a transition to clean energies like wind, solar, geothermal, and renewable fuels.⁴⁰⁵ What is not clear is whether advanced technologies will be able to satisfy U.S. and global demand for electricity and power transportation systems in the foreseeable future. Transition from coal and oil will not occur overnight, and U.S. policymakers will need to assess whether nuclear energy and natural gas are appropriate transitional forms of energy. Nuclear energy emits no greenhouse gases and is not dependent upon foreign fuel sources.⁴⁰⁶ Yet, it remains politically charged because of lingering concerns with safety, and legal

403. The skirting of these GHG obligations translates into the avoidance of costs by exporters. Such avoidance would seem to have the same practical effect as a subsidy that would entitle the receiving country to levy something akin to a countervailing duty for the costs of compliance. The WTO Agreement on Subsidies and Countervailing Measures does not currently recognize this type of cost avoidance as a subsidy. See Agreement on Subsidies and Countervailing Measures, 1994 O.J. (L 336) 156. Although, some scholars feel that a “border tax adjustment” is appropriate and lawful under the WTO regime to “make adjustments for the fact that industries in the relevant sector in non-participating States do not bear the burden of GHG mitigation costs that are borne by participating States.” See Eliza Malathouni & Denise Prévost, *An International Trade Law Perspective on Sectoral Greenhouse Gas Emission Mitigation Approaches* 25 (June 12, 2009), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1417343; see also Jake Colvin, *America's Green Trade Challenge*, BUSINESSWEEK ONLINE, Aug. 11, 2009, available at http://businessweek.com/print/bwdaily/dnflash/content/aug2009/db2009811_875168.htm (expressing fear that the new “green trade” movement will be used as a new protectionist measure to exclude foreign products from the U.S. market and start a trade war). Colvin cited examples of such measures, including Brazil recently raising its tariff on wind turbines from 0% to 14%, as well as China sheltering its market for its “local green contracts even as it exports much of its clean energy manufacturers, like solar energy panels, to the U.S.” *Id.*

404. In 2001, the WTO started negotiating a new agreement on agricultural subsidies. See John Miller & Greg Hitt, *World News: Tariff Disputes Make Breakthrough Unlikely in Doha Trade Talks*, WALL ST. J., July 18, 2008, at A5. As of the most recent Doha round of trade negotiations, an agreement has still not been reached. See Mary Kissel, *Bureaucrats at the Barricades*, WALL ST. J., Oct. 5, 2009, at A17.

405. See Steven Mufson & Jennifer Agiesta, *On Energy, Obama Finds Broad Support*, WASH. POST, Aug. 28, 2009, at A21.

406. U.S. DEP'T. OF ENERGY, *THE GLOBAL NUCLEAR ENERGY PARTNERSHIP: GREATER ENERGY SECURITY IN A CLEANER, SAFER WORLD* (2006), <http://www.energy.gov/media/GN/EP/06-GA50035b.pdf>.

issues, which have blocked planned waste disposal projects, and the high costs of plant construction.⁴⁰⁷ Nonetheless, this is an energy source in which the United States has developed excellent technology,⁴⁰⁸ and it deserves a fair hearing.

Natural gas, on the other hand, is relatively abundant in the United States and has been called a “Bridge to a Lower Greenhouse Gas” future by both environmental groups and utilities⁴⁰⁹ because natural gas is the cleanest of the fossil fuels and now provides U.S. utility companies with a hedge to comply with both cap-and-trade programs of the twenty-three states that regulate greenhouse gas emissions⁴¹⁰ and projected new federal standards.⁴¹¹ Natural gas is also very plentiful, given recent advancements in extractions adjacent to plentiful shale deposits in the U.S.⁴¹² and is comparatively low cost. Natural gas is not a panacea because of fugitive methane emissions—twenty-one times greater global-warming potential than carbon dioxide⁴¹³—and the emission of carbon dioxide incident to the refining process. But with

407. RMI believes that nuclear power is not a long-term solution because of affordability concerns. New nuclear plants are “simply unfinanceable in the private capital markets.” LOVINS ET AL., *supra* note 341, at 258. Despite that fact, the NRC has received seventeen license applications for twenty-six new nuclear plants. These are the first applications for new reactors since the 1970s. ENERGY INFO. ADMIN., STATUS OF POTENTIAL NEW COMMERCIAL NUCLEAR REACTORS IN THE UNITED STATES (2009), http://www.eia.gov/cneaf/nuclear/page/nuc_reactors/com_reactors.pdf.

408. See LARRY PARKER & MARK HOLT, NUCLEAR POWER: OUTLOOK FOR NEW U.S. REACTORS 3–4 (2007).

409. See Eileen Clausen, President, Pew Ctr. on Global Climate Change, Speech at the American Gas Association Executive Conference (Oct. 6, 2008), available at www.pewclimate.org/speeches/climate-policy-and-natural-gas (“[Pew Center] Members come from a range of sectors, including oil, . . . electric and gas utilities, . . . and, of course, natural gas.”).

410. CONG. RESEARCH SERV., MARKET-BASED GREENHOUSE GAS CONTROL: SELECTED PROPOSALS IN THE 111TH CONG. 1–4 (2009).

411. *Id.*

412. See, e.g., Robert Francis, *Chesapeake Makes Major Natural Gas Discovery, Adds to Barnett Shale Rigs*, FORTH WORTH BUS. PRESS, May 26, 2008, available at <http://www.fwbusinesspress.com/display.php?id=7235> (describing major discoveries of natural gas in Louisiana, Oklahoma, and Texas); Geology.com, Marcellus Shale-Appalachian Basin Natural Gas Play, <http://geology.com/articles/marcellus-shale.shtml> (last visited Feb. 23, 2010). To extract the natural gas from shale deposits, geologists employ a “fracturing method” to release natural gas trapped in the shale structure. Estimates vary, yet according to Geology.com, the volume of gas from the Marcellus Shale deposit is sufficient to supply the entire United States for two years. However, horizontal drilling in this one vast field would double or triple those reserves. See *id.*

413. JOEL BLUESTEIN, PEW CTR. ON GLOBAL CLIMATE CHANGE, COVERAGE OF NATURAL GAS EMISSIONS AND FLOWS UNDER A GREENHOUSE GAS CAP-AND-TRADE PROGRAM 4 (2008) (citing UNFCCC, Global Warming Potentials, http://www.unfccc.int/ghg_data/items/3825.php (last visited Feb. 23, 2010)).

stricter standards to minimize fugitive GHG emissions, natural gas has excellent promise as a “bridge fuel to a more climate-friendly energy supply.”⁴¹⁴ More extensive use of compressed natural gas (“CNG”) in U.S. transportation systems appears to be the best way to not only greatly reduce or eliminate the need to import foreign oil, but also mitigate a major economic and political risk factor for the United States.⁴¹⁵ Given the evidence surrounding the availability of these two domestic sources of energy, are policymakers doing enough to create the same body of incentives in the form of tax credits or loan guarantees for investments in nuclear and natural gas energy? Also, are there sufficient incentives for the developers of these technologies to spend money on research and experimentation, or to attract venture investment capital on projects like construction of CNG infrastructure along major highways, or on conversion of vehicles from gasoline or diesel fuel to CNG?

Electrification of the underdeveloped and developing world is the one item that the current panoply of programs, laws, and policies does not squarely address. The notion of forging a new partnership between the U.S. government and industry to deliver alternative energy systems to the underdeveloped and developing world is highly costly and controversial, but it is arguably the single most important policy that the United States and other developed countries must pursue to reduce the rate of state failure and additional negative externalities. Such a unilateral approach is inspired by Friedman, who holds the view that a market-based approach, involving private investment capital, is the only effective way to move high technology into grossly underserved markets.⁴¹⁶

414. Claussen, *supra* note 409.

415. Some energy advocates, such as T. Boone Pickens, suggest that natural gas and wind power generation are the best approach to eliminate dependence on imported oil, with compressed natural gas being the only viable alternative to diesel fuel and gasoline to power cars and trucks. Pickens appears to have been successful in building substantial support for many aspects of his plan; especially dealing with expanded use of domestic natural gas. See T. Boone Dickens & Orin Hatch, Op-Ed, *Natural Gas Vehicles Would Cut Oil Imports*, SALT LAKE TRIB., Oct. 14, 2009. Others have also questioned whether domestic supplies are in fact bountiful enough to displace imported oil, and whether the United States can easily sustain the costs of conversion to compressed natural gas. See Thomas K. Grose, *Can Natural Gas Break Our Oil Habit?*, U.S. NEWS & WORLD REP., Online Edition, Mar. 5, 2009, available at <http://www.usnews.com/articles/news/energy/2009/03/05/can-natural-gas-break-our-oil-habit.html>.

416. See FRIEDMAN, *supra* note 11, at 171, 176, 187.

“[T]here is no ark without a Noah. In every instance you need a Noah who is able to pull together this coalition, this ecosystem, by helping everyone see his or her self-interest in its preservation.”⁴¹⁷ As things now stand, government and NGO donor programs lack the technical expertise or size necessary to implement this plan on a global scale. The merit of the approach outlined above is that, if the United States is successful on a limited scale, it could stimulate competition with other developed countries and induce their industries to enter this emerging market. There should be no illusions that this direct investment scheme does not entail some risk of loss for companies, the U.S. government—at the macro level—and for U.S. Ambassadors. However, this is a risk that is worth taking because it presents an enormous economic opportunity for the United States. The United States should address the whole host of problems discussed in this paper and reclaim its rightful position of leadership.

417. *Id.* at 303.
