

Wind Energy: CDMs and Clean Green Power

by

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Introduction

Wind Energy is the process by which the wind is used to generate mechanical power and even electricity.¹ It may come as a surprise to some that wind energy can more aptly and broadly be classified as solar energy. The blowing of the winds is caused by the uneven heating of the atmosphere of the sun and the irregularities of the earth's surface and the rotation of the earth.² Wind flow patterns are modified by the earth's many and various terrain, bodies of water and vegetation.

Part I of this paper discusses the history and background of wind energy throughout the years as well as its impact on various parts of the world. Part II discusses the demand for clean green energy internationally as well as domestically and how it came to be an area at the forefront of environmental discussions. It also discusses the Kyoto Protocol, the United States' response to Kyoto, as well as some discussion about Kyoto's mechanisms, with an emphasis on clean development mechanisms in China. Lastly Part III of the paper lays out the advantages, disadvantages, effects and potential future problems and successes with wind power.

I. Background

For thousands of years, people all over the earth have realized that the winds can be a potentially useful and powerful source of energy. As far back as 5000 BCE inhabitants living

¹U.S. Department of Wind Energy, *How Wind Turbines Work*, (11/30/2006),page 1, http://www1.eere.energy.gov/windyandhydro/printable_versions/wind_how.html.

² Id.

along the Nile River were using the wind to propel primitive sea-faring vessels.³ By 200 BCE, the Chinese had harnessed the power of wind to operate simple windmills for the purpose of pumping water, while vertical-axis windmills made from woven reed sails were used in Persia and the Middle East regions to grind grain.⁴ In the 11th century ACE, people in the middle-east had found ways to use the wind energy for food production and around the same time Europeans used wind energy to propel boats carrying merchants and foreign crusaders.⁵ The Dutch took ancient windmill designs and made them their own. They did this by vastly refining them, adapting them to aid in many more geographically important tasks such as draining lakes and marshes.⁶ In the 19th century ACE, the power of the wind was used in the New World in the more remote and rural areas. Farms and ranches utilized the wind to pump water and eventually to produce small amounts of electricity.⁷

However, the industrial age changed the way the modern world would use wind. The quick and profitable industrial changes led to the gradual decline in the use of windmills and led to the increase in the use of such modern, cutting edge technologies as steam-engines.⁸ Industrialization also led to the development of larger windmills using the modern wind turbines to generate electricity.⁹ By the time WWII hit, fuel prices fell and any interest in wind turbines and their electricity producing capacity slipped away as an outdated and archaic form or technology. Conversely, in the 1970's the price of oil went through the roof seemingly overnight

³ U.S. Department of Wind Energy, *History of Wind Energy*, (9/12/2005), page 1, http://www1.eere.energy.gov/windandhydro/printable_versions/wind_history.html.

⁴ Id.

⁵ Id.

⁶ Id.

⁷ Id.

⁸ Id.

⁹ Id.

and in turn a new worldwide interest in the development of wind turbines and the power they produced was re-born.¹⁰

Today almost all wind energy is harnessed by some form of the use of a wind turbine. The wind turbine works in the opposite way that a fan operates. Whereas a fan uses wind electricity to make wind, a turbine uses wind to make electricity.¹¹ The wind spins the blades of the turbine, which in turns spin a rotating shaft inside the turbine, which is connected to a generator which, simply put, has the modern capability to create electricity.¹²

The progression of wind energy throughout history has been a cyclical one. It began as a cutting edge technology when the source was readily available and accessible by relatively cheap means. When the market and ultimately the modern world changed, so did the history of wind energy as the research and development of this once incredible source quickly became outdated. Now, the world has again changed; with a newfound concern for cleaner burning fuels and less reliance on the fossil fuels, wind energy has become the modern, seemingly intelligent choice for energy, again.

II. Clean Energy Demand

It is no secret that the earth is gradually getting warmer. This change in the climate has already had an enormous impact on human beings and the natural environment around them. scientists have estimated that this climate change has already claimed the lives of 150,000 people

¹⁰ Id

¹¹ U.S. Department of Wind Energy, How Wind Turbines Work, 1.

¹² Id.

worldwide.¹³ This deadly change in climate has been credited mainly to the global emission of greenhouse gases (GHGs).¹⁴

Future impacts due to climate change are projected to tell an equally grim tale. The International Panel on Climate Change has predicted that rain will be more prevalent in areas that are already heavily saturated with water, rainfall will substantially decrease in arid regions that are already stressed due to lack of water supply, and droughts will only increase in severity, all the while flooding will be more frequent.¹⁵ Also, crop production will decline, the coasts will erode, and sea levels will continue to rise at alarming rates.¹⁶ The number of people that will die of flooding, heat waves, storms, fires, and droughts as well as of cardio-respiratory and infectious diseases will also incline significantly.¹⁷

The world began to take notice and began on a path to take serious steps towards eradicating many of the GHGs and the problems that came along with them. In 1992, a framework convention was organized by the United Nation's General Assemble to bring as many of the world's countries together as possible¹⁸ to address the issue of anthropogenic impacts on the Earth's climate due to the emission of GHGs.¹⁹ Functionally, there was a framework convention in place for consensus building and setting out broad policy goals.²⁰ It was envisioned that subsequently thereafter Conference of Parties (COP) would be used to

¹³ Jonathan Patz, *Impacts of Regional Climate Change on Human Health*, 438 NATURE 310, 314 (2005).

¹⁴ John Sautter, *The Clean Development Mechanism in China: Assessing the tension between development and curbing anthropogenic climate change*, 27 VA. ENVTL. L.J. 91 (2009).

¹⁵ Derald J. Hay, *Post-Kyoto Stress Disorder: How the United States Can Influence International Climate Change Policy*, 15 Mo. ENVTL. L. & POLY REV. 493 (2008).

¹⁶ Id.

¹⁷ Id.

¹⁸ Lavanya Rajamani, *Re-Negotiating Kyoto: A Review of the Sixth Conference of Parties to the Framework Convention on Climate Change*, 2000 COLO. J. INT'L ENVTL. L. & POL'Y 201, 204 (2000).

¹⁹ Daniel Bodansky, *The United Nations Framework Convention on Climate Change: A Commentary*, 18 YALE J. INT'L L. 451, 454 (1993).

²⁰ Hay at 498.

develop protocols to lay out and refine specific methods of achieving and implementing goals and policies set forth by the framework convention.²¹

Unfortunately, solutions to the global climate changes were not quick to come by. The UNFCCC only set out a few requirements on the part of the ratifying countries. It did, however, outline several key aspects of climate change to be addressed in the future.²² The UNFCCC parties also made firm commitments including a requirement for nations to develop a national inventory system for emissions accounting, a requirement for the developed countries to share technology with the lesser developed countries of the world and a requirement to promote and fund further research on the impacts and control measures of climate change.²³ The other commitments were basically future objectives to promote emission stabilization, taking into account socio-economic mitigating factors.²⁴ One of the main points clearly agreed upon at the convention was that the excuse of scientific uncertainty should not and would not be considered a valid reason to delay implementation of control measures.²⁵ The fact that the UNFCCC met and took place with an element of importance to the participating nations was a colossal step in the right direction.²⁶ Unfortunately, there were no hard requirements or targets set to reduce deadly emissions of GHGs, only weak regulatory regimes by developed nations created for that purpose.²⁷

²¹ Jutta Brunnée, *The United States and International Environmental Law: Living with an Elephant*, 15 EUR. J. INT'L L. 617, 636-637 (2004).

²² Bodansky at 504.

²³ U.N. FCCC, 3rd Sess., *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, Conference of Parties, U.N. Doc. FCCC/CP/1997/L.7Add.1 (1997).

²⁴ *Id.* Article 3 and 4.

²⁵ *Id.* Article 4.

²⁶ Rajamani at 204.

²⁷ *Id.* and Bruneel at 637.

Two years later however, the COP met in Kyoto, Japan to pick up where the UNFCCC had left off and to discuss future commitments.²⁸ The Kyoto Protocol did just that as it set out specific GHG emission targets for each participating nation to achieve.²⁹ The nations designated as Annex I nations under the UNFCCC (consisting of the most developed nations)³⁰ agreed to make a firm commitment to reduce GHG emissions,³¹ whereas Annex II nation under the UNFCCC (consisting of the least developed nations and some nations making the transition to a 500 market economy)³² agreed to the broad principles of the Protocol but were not actually charged with a commitment to achieve any emissions target³³.

The nations came to an agreement to stabilize emissions to a certain percentage of their emissions from 1990, which was set as the base year.³⁴ Many of the participating nations agreed to a five to ten percent reduction in the emissions from what was emitted in 1990.³⁵ These targets were not actually based on any scientific understanding of the required reduction of GHGs needed to combat climate change³⁶ but through the “usual give and take of an intergovernmental negotiation process.”³⁷

A. Kyoto Mechanisms

Although targets were set, the Kyoto Protocol also built in a number of mechanisms for countries to utilize if the emissions target was unachievable or not agreeable.³⁸ These

²⁸ Hay at 499.

²⁹ U.N. FCCC, 3rd Sess.

³⁰ FCCC, Annex I.

³¹ Kyoto Protocol, Art. 3.

³² FCCC, Annex II.

³³ Kyoto Protocol, Annex B.

³⁴ Kyoto Protocol, Art. 3.7

³⁵ Kyoto Protocol, Art. 3(1)

³⁶ FCCC, Art.2.

³⁷ Michael Grubb, Christiaan Vrolijk and Duncan Brack, *The Kyoto Protocol: A Guide and Assessment* (1999).

³⁸ Hay at 501.

mechanisms aimed to simply reduce domestic emission level and included joint implementation, carbon sinks, provisions for emissions trading and Clean Development Mechanisms.³⁹

Joint Implementation allows nations to work within a regional framework to jointly reduce GHGs.⁴⁰ This allows the nations to utilize economic integration among them to cooperatively reach emissions levels equal to the sum of their emission in the aggregate.⁴¹ A project under joint implementation must provide a reduction in emission by sources, or an enhancement of removals by sinks, which is considered to be additional to what would have otherwise occurred.⁴²

The outline for emissions trading is set out in Article 17 of the Kyoto Protocol.⁴³ This system allows for countries that have emission units to spare to sell this excess capacity to countries that have already exceeded their emissions targets.⁴⁴ In this manner a new commodity is created in the form of emission reductions.⁴⁵ The principle GHG is carbon, so the main trade is done with carbon credits, which is known as the carbon market.⁴⁶

The Kyoto Protocol also set up a system in which nations could apply carbon stored in carbon sinks as a reduction to the nation's total emissions.⁴⁷ Carbon Sinks are any "process, activity or mechanism which removes a GHG, aerosols, or a precursor of a greenhouse gas from

³⁹ Id.

⁴⁰ Id.

⁴¹ Id.

⁴² UNFCCC website, Kyoto Protocol- Mechanisms, page 1,

http://unfccc.int/kyoto_protocol/mechanisms/joint_implementation/items/1674.php.

⁴³ UNFCCC website, Kyoto Protocol- emissions trading, page 1,

http://unfccc.int/kyoto_protocol/mechanisms/emissions_trading/items/2731.php.

⁴⁴ Id.

⁴⁵ Id.

⁴⁶ Id.

⁴⁷ Kyoto Protocol, Art. 6.1(b).

the atmosphere”⁴⁸ and then stores that gas in something called a reservoir. A reservoir is defined as the component in which the GHG is ultimately stored.⁴⁹ The advantage and purpose of carbon sinks is that they result in the permanent or long-term removal of carbon from the atmosphere and it is stored in such a way that will not be as detrimental to the climate change as it would not contribute to the atmospheric levels of carbon.⁵⁰ The enhancement of carbon sinks has advantages even beyond atmospheric carbon levels. For example, a sink such as reforestation areas that had been previously clearcut can have substantial economic,⁵¹ ecological,⁵² and environmental benefits⁵³ as well.

Perhaps the most discussed and controversial mechanism set forth by the Kyoto Protocol was that of Clean Development Mechanisms (CDMs). CDMs were initially discussed and outline in Article 12 of the Kyoto Protocol,⁵⁴ but the parties did not actually come to an agreement on the framework until the seventh meeting of the UNFCCC in Marrakesh, Morocco in 2001.⁵⁵ The three main goals of the CDMs are to (1) promote sustainable development in the country that is hosting the CDM project, (2) to limit greenhouse gas emissions all over the globe and (3) to assist the least developed countries in meeting their GHG reduction obligations as set forth under the Kyoto Protocol.⁵⁶

⁴⁸ Brendan P. McGivern, *Introduction*, Conference of the Parties to the Framework Convention on Climate Change: Kyoto Protocol, 37 I.L.M. 22, 23 n.4 (1998).

⁴⁹ Hay at 503.

⁵⁰ Id.

⁵¹ Forest production is a large sector of agricultural production in LDCs. Gopa Joshi, *Forest and Forest Policy in India*, 11 SOCIAL SCIENTIST 43 (1983).

⁵² Forests and wetlands play an important role in providing suitable habitat for threatened and endangered species. Derald J. Hay, *When Sealing the Leaks of Habitat Conservation Banking, Multiple Gaskets are Needed: The Case for Bog Turtle in Pennsylvania*, 14 PENN ST. ENVTL. L.REV. 299, 310 (2006).

⁵³ David Pimental & Nadia Kounang, *Ecology of Soil Erosion in Ecosystems*, 1 ECOSYSTEMS 416 (1998).

⁵⁴ Kyoto Protocol

⁵⁵ Seventh Conference of the Parties, *Official Website for the Seventh Conference of the Parties*, (last accessed October, 29 2009), <http://unfccc.int/cop7/>.

⁵⁶ Sautter at 93.

Clean Development Mechanisms are typically built with the intention to displace the construction of coal-burning generation stations and can include carbon neutral electricity production from hydroelectric dams, photovoltaics, biogas and wind generation facilities.⁵⁷ The CDMs provided an additional method in which Annex I countries could reduce emissions of GHGs. This can be done by the purchase of certified emission reductions (CER).⁵⁸ For this process to work businesses, governments and non-governmental actors jointly create projects in developing countries that hypothetically will reduce the overall amount of GHG emissions by replacing polluting projects with more environmentally safe alternatives.⁵⁹ The Annex I country that invested in and owns the project, then monetizes the reduction in their carbon footprint and issue a proportional amount of CERs that can be potentially sold in the global carbon market.⁶⁰ Industrial nations can offset or negate some of the GHGs in their own nation by creating clean energy projects in lesser developed countries, while at the same time being able to make money on the project and promoting the economy in the lesser developed country.

The process involved to get credits for a CDM has come under fire for various reasons in the past few years. First, an Annex I country that wishes to apply must gain the consent of the lesser developed nation that will host the project, that the project will be used to contribute to sustainable development.⁶¹ The applicant must then establish “additionality.”⁶² It must be shown that the carbon project would not have happened without the particular CDM.⁶³ This must be done by using one of the approved 127 approved methodologies listed on the UNFCCC

⁵⁷ Sautter at 95.

⁵⁸ Sautter at 94-95.

⁵⁹ Sautter at 95.

⁶⁰ Id.

⁶¹ UNFCCC, *Clean Development Mechanisms*, page 1, <http://cdm.unfccc.int/index.html>.

⁶² Sautter at 96.

⁶³ Id.

website, 67 of which are for large scale projects.⁶⁴ The project developer may submit a new methodology to the Methodology Panel, and if approved the new methodology will then be converted to an approved methodology.⁶⁵

Establishing additionality is an extremely important step of the process because without it, applying nations could get a “free ride.” In other words these industrial nations could earn the credits and their monetary value without actually earning them. An example of this would be if a nation must comply under certain domestic regulations like the Clean Air Act, and the mechanism that the nation puts in place to comply with the Act could also qualify as a CDM under the Kyoto Protocol.⁶⁶ That nation would not be able to establish additionality because the project would not have taken place in the absence of the CDM.⁶⁷

The additionality requirement has also been open to multiple interpretations. The first competing theory is environmental additionality that is additional only if the emissions from the project are lower than the baseline.⁶⁸ This theory only looks at additionality in a vacuum, only considering the impact on the environment and does not look to any other potential factors at play.⁶⁹ The second competing theory is that of project additionality. This is the more common notion that additionality is only proven when the project would not have happened without the CDM.⁷⁰

⁶⁴ UNFCCC, *Home Page*, page 1, <http://unfccc.int/2860.php>.

⁶⁵ *Id.*

⁶⁶ See Generally Elizabeth Burleson, *Energy Security, Green Job Creation, and Youth Innovation*, 24 *Conn. J. Int'l L.* 381 (Spring, 2009).

⁶⁷ *Id.*

⁶⁸ UNFCCC, *Clean Development Mechanisms*, 1.

⁶⁹ See Generally, Burleson.

⁷⁰ UNFCCC, *Clean Development Mechanisms*, 1.

Next an applicant must establish a baseline estimating the future emissions in absence of the registered project.⁷¹ The case is then validated by a third party agency or Designated Operations Entity to make sure that the project does in fact result in real, measurable, and long-term emission reductions.⁷² Lastly, the Executive Board decides whether or not to approve the project.⁷³ If a project is approved and subsequently implemented, only then will the Executive Board issue credits (CERs) to project participants based on the monitored difference between the baseline and the actual emissions.⁷⁴

CDMs have gone through a great deal of scrutiny and criticism for a number of reasons. Specifically the low participation rate, administrative hula-hoops, high transaction costs, and low emission reduction capacity have come under fire in recent years.⁷⁵ The difficulties with the additionality requirement, as previously mentioned, as well as the reportedly high transaction costs involved with implementing such projects have also been major points of critical discussion. Also, as a part of the project, funds cannot be diverted from other money sources that are used for developmental assistance.⁷⁶ Lastly, it has been reported that the mid-range estimate for possible emissions reduction from CDMs only amounted to one and a half percent of a lesser developed country's emissions level.⁷⁷

B. CDMs in China

⁷¹ Id.

⁷² Id.

⁷³ Id.

⁷⁴ Id.

⁷⁵ Hay at 511.

⁷⁶ Id.

⁷⁷ Id.

It is important to note that under the designations at the Kyoto Protocol, China is a non-Annex I nation that has no emission reduction obligations to comply with.⁷⁸ However, when one looks at the worldwide distribution of CDM CERs it is interesting to note that 80% of all of the credits go to four countries; Brazil, India, Korea, and China.⁷⁹ Of those four countries China has had more than two and a half times the amount of CDM CERs distributed to them than any other nation.⁸⁰

Although China is the world's single largest emitter of GHGs⁸¹ as well as the world's leader in CDM projects,⁸² its motives are not necessarily to do their share in the global initiative and to negate their effect on climate change, but rather to use CDMs as a means in which to maximize economic gains⁸³ and to make significant profits.⁸⁴ The Chinese set out their own set of specific goals for implementation of CDMs when (effective on October 12, 2005) the Office of National Coordination Committee on Climate Change (ONCC) issued a declaration.⁸⁵ It is three-fold and lays out the specific goals for China as: (1) effective management of CDM projects by the Chinese government, (2) protection of China's rights and interests, and (3) to ensure the proper operation of CDM activities.⁸⁶ China's priorities differ from that of the Kyoto protocol because the declaration only discusses the environment tangentially. Within the declaration are no direct

⁷⁸ Elizabeth C. Economy, *The River Runs Black: The Environmental Challenge to China's Future* (2004).

⁷⁹ See Appendix A: available at <http://images.google.com/imgres?imgurl=http://carbontrading-gib.com/images/dev-diag.png&imgrefurl=http://carbontrading-gib.com/dev.html&usq=dvSCHwDAQ98iXtn7leHymnyOCpY=&h=342&w=350&sz=37&hl=en&start=9&um=1&tbnid=qsLvEfyPyv7yqM:&tbnh=117&tbnw=120&prev=/images%3Fq%3DCDM%2BCER%2Bdistribution%2Bby%2Bcount%26hl%3Den%26sa%3DN%26um%3D1>.

⁸⁰ See Appendix A, *Id.*

⁸¹ Sautter at 92.

⁸² Sautter at 98.

⁸³ See Andrew E. Kramer, "In Russia, Pollution is Good for Business," *N.Y. Times*, Dec. 28, 2005, at C4.

⁸⁴ Sautter at 99.

⁸⁵ Sautter at 99 (effective on October 12, 2005).

⁸⁶ Sautter at 99.

references to the environment as an important resource on its own right outside of the context of technology, development economically and CDM projects.⁸⁷

Converse to the overarching goals of CDMs, China actually funnels some of the monetary profit through CDM projects into industrial manufacturers that emit HFC-23 and use this to expand other parts of their un-regulated enterprise, resulting in a net effect of increasing carbon emissions.⁸⁸ HFC-23 is a by-product of making a coolant used when building refrigeration units (HFC-22) and its warming effects are thousands of times more severe than carbon dioxide.⁸⁹ The creation of incinerators and other facilities seems to be a potentially large revenue producing project for China in light of their domestically created need.⁹⁰

Unfortunately, incinerators are quick and simple investments compared to long-term renewable energy projects, which can and have been delayed for a myriad of environmental, construction, and political obstacles.⁹¹ On top of that, HFC-23 incineration projects are much less expensive per ton than any other CDM investment alternatives. Although, on paper, China's HFC-23 projects seem to accomplish the goal of assisting Annex I countries with reducing their obligation under the Kyoto Protocol, it is also highly likely that this manner of CDM violates the second goal of Article 12, which is to generally contribute to the production of real, measurable, and long-term benefits related to the mitigation of climate change.⁹² Ultimately, in this regard, it would appear that the Kyoto Protocol is allowing for and subsequently providing incentives for

⁸⁷ Sautter at 100.

⁸⁸ Jeffrey Ball, John D. McKinnon, and Shai Oster, *China Cashes In on Global Warming*, Wall St. J., A10, Jan. 8, 2007.

⁸⁹ Michael Wara, *Is the Global Carbon Market Working?*, *Nature*, 445, 595-96, Feb. 8, 2007.

⁹⁰ UNFCCC, *Project Design Document*, China Fluoro Technology Co. Ltd, Project No. 1194, Zhaojiazhuang, Luokou, Jinan city, China, 3, Mar. 15, 2007.

⁹¹ Sautter at 103.

⁹² *Id.*

the increase of emissions of HFC-23 and defeating the purpose of the UNFCCC and Kyoto Protocol in general.

C. Kyoto Protocol and the United States

The United States was one of the signatories of the Kyoto Protocol. Upon the signing, it was sent stateside for ratification.⁹³ However, this event never occurred. The Senate was completely opposed to the notion and advised President Bill Clinton that the United States should not be a signatory to any treaty that would; (1) mandate new commitments to limit or reduce greenhouse gas emissions from Annex I Parties, unless the Protocol or other agreements also mandates new specific scheduled commitments to limit or reduce GHGs from Developing Country Parties within the same compliance period, or (2) would result in serious harm to the economy of the United States.⁹⁴

Without the support needed President Clinton never brought the Kyoto Protocol before the Senate for ratification and upon the election of President George W. Bush the outlook for ratification of the protocol became even grimmer.⁹⁵ Bush would eventually declare that the Kyoto Protocol was “fatally flawed” and that he had no intention to sign and ratify the treaty.⁹⁶ There were three major reasons cited by Bush to do so: (1) scientific uncertainty regarding the threat of climate change, (2) the lack of commitments from least development countries (LDCs), and (3) arbitrary, unscientific emission targets that would harm the United States’ economy.⁹⁷

⁹³ Hay at 503

⁹⁴ Id.

⁹⁵ Id. at 504

⁹⁶ Id.

⁹⁷ Id.

The United State rejection of the Kyoto Protocol could potentially have some severe results, not only in the grand scheme of things, but also domestically as well. It seems that the Protocol will lead party governments to continue to provide support to the clean energy sectors in their countries, which will enable them to become world leaders in renewable energy technology and allowing those companies to emerge as profitable enterprises in their own right, no longer needing subsidies and tax breaks and providing jobs and boosting their local and national economies.⁹⁸ In turn, those countries will become major players in the world's market while American companies may be left to deal with the so-called "boom and bust" cycle of the fossil fuel national energy policy.⁹⁹ Companies within the United States face the chances of losing out on profits in both the short and long term and may be eventually forced to play a potentially lackluster and preventable game of catch-up.¹⁰⁰ Lastly, American companies may find it difficult to participate in energy generation and emissions abatement projects in some of the lesser developed, but environmentally booming countries like China or India.¹⁰¹

It is a fair assessment to say that the United States, as just one of many nations that inhabit this world, has ethical obligation in need of fulfillment. According to the theory of distributional fairness, it is the ethical obligation of the developed nations to constrain carbon emissions. This is the theory that weighs the equities of those who have contributed the most to climate change, those who are most affected by climate change, those who are in the best

⁹⁸ Eric Shaffner, *Repudiation and Regret: Is the United States Sitting out the Kyoto Protocol to its Economic Detriment?*, 37 *Env't. L.* 441, 460 (2007).

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ *Id.*

position to adapt technology to combat climate change, and those who are in the best position to weather the impacts of climate change.¹⁰²

The United States and the other more developed nations of the world are mainly responsible for the build-up of GHGs in the atmosphere to present levels. Unfortunately, most of those countries and people that will be most affected by the climate change will have contributed little to the actual problem itself.¹⁰³ On the reciprocal side, the United States and the other most developed nations in the world, who emit most of the GHGs, are least threatened by the adverse climate change impacts.¹⁰⁴ Moreover, the United States has a greater ability than the developing nations to domestically adapt to any impacts of climate change and is in a better position than developing nations to develop new mechanisms and install new energies that do not result in carbon emissions.¹⁰⁵ These are the exact elements that should be the catalyst for the United States collectively to do its part by implementing clean energy sources.

III. The Power of the Winds

With all of the discussion about implementation of clean green energy projects, the particular type that seems to creep into conversations most often is that of Wind Energy. There is almost an incalculable amount of wind that can be utilized worldwide.¹⁰⁶ Wind is a clean energy source that doesn't pollute the air like power plants that rely on fossil fuels and wind

¹⁰² Donald Brown, *White Paper on the Ethical Dimensions Of Climate Change*, 10 (2006), available at <http://rocketethics.psu.edu/climate/whitepaper/edcc-whitepaper.pdf>.

¹⁰³ Hay at 506.

¹⁰⁴ *Id.*

¹⁰⁵ *Id.* at 506 and 507.

¹⁰⁶ See Generally Appendix B, available at

http://images.google.com/imgres?imgurl=http://www.renewableenergyworld.com/assets/images/story/2008/3/3/4561-first-ever-global-wind-map-promises-to-accelerate-development-of-renewable-energy-projects.jpg&imgrefurl=http://www.renewableenergyworld.com/rea/photo%3Fid%3D47084&usq=_YvCBYNbHOiqioQvgLvcxfZAAvw0=&h=348&w=450&sz=111&hl=en&start=1&um=1&tbnid=c-hozCPmWThg-M:&tbnh=98&tbnw=127&prev=/images%3Fq%3Dglobal%2Bwind%2Bmap%26hl%3Den%26um%3D1.

turbines don't produce atmospheric emissions that cause acid rain or GHGs.¹⁰⁷ Wind Energy is abundantly found in the United States as the Department of Energy states that 6% of U.S. lands could supply more than 1.5 times the current electricity consumption of the country.¹⁰⁸ It is one of the lowest-priced renewable energy technologies available today and its contents cannot be exhausted.¹⁰⁹ As a matter of fact, its costs have been reduced by more than 80% over the past twenty years.¹¹⁰ This type of energy can also be of a benefit to rural communities, as most of the best wind sites are located in such areas. Additionally wind turbines only take up a small fraction of the land, therefore farmers and ranchers could take advantage of the clean energy and still use their land for the previously intended purposes to almost the same degree.¹¹¹

So, what are the arguments against wind? First of all, it is an incomplete fact to say that the production of wind energy is completely clean and does not create any emissions. Wind Turbines are made out of steel, and the production of these materials indeed does create some emission into the atmosphere.¹¹² Also, wind energy does call for a higher initial investment than fossil-fuel based generators.¹¹³ Although, wind farms can be good for rural locales and their local economy, these areas usually are in remote locations that may not have the basic needed equipment to support such a system and often these locations are far from more populous areas, where the energy is in higher demand.¹¹⁴ One of the major problems with this type of energy is

¹⁰⁷ U.S. Department of Energy, *Wind and Hydropower Technologies Program*, page 1, (11-18-2008) http://www1.eere.energy.gov/windandhydro/wind_ad.html.

¹⁰⁸ Elizabeth Burleson, *Wind Power, National Security, and Sound Energy Policy*, 17 Penn State Environmental Law Review 137 (2009).

¹⁰⁹ U.S. Department of Energy, *Wind and Hydropower Technologies Program*, 1.

¹¹⁰ Burleson, *Wind Power* at 137.

¹¹¹ U.S. Department of Energy, *Wind and Hydropower Technologies Program*, 1.

¹¹² See Generally, Burleson, *Wind Power*.

¹¹³ U.S. Department of Energy, *Wind and Hydropower Technologies Program*, 1.

¹¹⁴ *Id.*

that the winds are intermittent and are hard to store without some type of battery.¹¹⁵ Research has also shown that wind turbines can create holes in military radar performance.¹¹⁶ Lastly, the biggest hurdle to the mass implementation of wind energy is the legal issues that have consistently accompanied such projects.¹¹⁷

All things considered, electricity generated by wind has grown by more than 400% since 2000 in the United States.¹¹⁸ Investments globally in renewable energy rose by 60% to 148 billion in 2007.¹¹⁹ One third of which was directed towards wind power, which encompassed approximately 50.2 billion.¹²⁰ Other countries worldwide far outpace the United States and have already begun sufficient investment in and implementations of wind energy.

Denmark, for example already produces about 20% of its electricity by wind.¹²¹ This is the highest proportion of electricity generated from wind in the entire world.¹²² Denmark also plans to introduce the world to vehicles charged by wind power.¹²³ The Danish companies in the wind industry are now moving towards development in the American markets, which may be of positive or negative monetary value in the United States.¹²⁴ One of the largest wind based companies is the Danish company of Vestas Wind Systems, which recently announced its establishment of a new turbine blade factory in the United States.¹²⁵ The encouragement of international investors to come to the United States may prove crucial in fostering a ripe

¹¹⁵ Id.

¹¹⁶ Burleson, *Wind Power* at 140. Because of this interference the Ministry of Defense is completely opposed to all wind farms within the line of sight of any radar stations.

¹¹⁷ Brit T. Brown, Benjamin A. Escobar, *Wind Power: Generating Electricity and Lawsuits*, 28 *EnergyLJ* 489 (2007).

¹¹⁸ Burleson at 137.

¹¹⁹ Id.

¹²⁰ Id.

¹²¹ Adam M. Dinell, Adam J. Russ, *The Legal Hurdles to Developing Wind Power as an Alternative Energy Source in the United States: Creative and Comparative Solutions*, 27 *NW Int'l L. and Bus.* 535, (2007).

¹²² Id.

¹²³ Burleson, *Wind Energy* at 138.

¹²⁴ Dinell at 570-571.

¹²⁵ Id. at 571

domestic wind energy market,¹²⁶ but too much foreign control over another American market can potentially push the United States even further behind in this particular industry.

As previously mentioned, the United States biggest hurdle to successfully implementing a solid wind harnessing market is the courtroom.¹²⁷ Perhaps the biggest areas of concern that have been litigated in the wind sector have been aesthetic and environmental concerns.¹²⁸ The re-occurring theme in the aesthetic realm is that of NIMBY. NIMBY stands for “not in my back yard.” This opposing view is only a partial one. The general outlook on wind and clean green projects seems to be overwhelmingly positive.¹²⁹ However, the general attitude seems to fall along the lines of, “I support wind energy and think it is important to reduce our dependence on foreign oil and to reduce atmospheric emissions. But , I just don’t want to see it in my back yard or immediate geographical area.”

Environmentally the biggest issue seems to be those involving the Migratory Bird Treaty Act (MBTA),¹³⁰ the Bald and Golden Eagle Act¹³¹ and the Endangered Species Act.¹³² One of the leading cases on the MBTA is *Kerncrest Audubon Society v. Los Angeles Department of Wind and Power*, which dealt with the environmental impact of the proposed Pine Tree Wind Project on migratory bird patterns.¹³³ The Los Angeles Department of Wind and Power Board of Commissioners approved results from an Environmental Impact Report concerning the

¹²⁶ *Id.*

¹²⁷ See Generally: *Alliance to Protect Nantucket Sound, Inc. v. U.S. Dept. of Army*, 398 F.3d 105, (1st Cir. 2005), *Ten Taxpayer Citizen Group v. Cape Wind Assocs.*, 278 F. Supp. 2d 98 (D. Mass. 2003), *City of Akron v. Akron-Westfield Cmty. Sch. Dist.*, 659 N.W.2d 223 (Iowa 1991).

¹²⁸ Brown at 493.

¹²⁹ See Generally, Burleson, *Wind Power*.

¹³⁰ See Brown generally and Dinnell at 555-556.

¹³¹ Dinnell at 557-558.

¹³² *Id.* at 559.

¹³³ Brown at 495.

project.¹³⁴ The Audubon Society fiercely objected this due to the supposed lack of definite studies concerning the projects potential threat to specific kinds of birds, especially migratory songbirds, protected by the MBTA.¹³⁵

The strongest wind resources in the United States occur in the western states and the Great Plains Region.¹³⁶ Unfortunately, the majority of the population in the United States resides near the coastlines.¹³⁷ Due to this natural and geographical information, the development of offshore wind sources has been heavily discussed and is in its infancy in the United States. The other advantages of such a method of harnessing wind include the fact that there are strong winds generated over water, vast space available, and the ability to place such facilities out of avian flight routes.¹³⁸ Also, the size of such turbines can be “out of people’s backyards” and can therefore vastly eclipse the size of onshore wind facilities.¹³⁹

The drawbacks to such a method include the increased construction and maintenance costs.¹⁴⁰ Part of the reason for the costs incurred is because these facilities must be able to survive the offshore wind and wave loading of severe storms and also must be sufficiently protected from any corrosive marine environment.¹⁴¹ Environmental groups are quick to point out that comparatively less research has been conducted on the environmental effects that

¹³⁴ Id.

¹³⁵ Id.

¹³⁶ See Appendix C, available at:

http://images.google.com/imgres?imgurl=http://rredc.nrel.gov/wind/pubs/atlas/maps/chap2/gifs/map2-1.gif&imgrefurl=http://rredc.nrel.gov/wind/pubs/atlas/maps/chap2/2-01m.html&usq= BRzozhOWDkTb7UuE_yTPZ-CMPnw=&h=713&w=1130&sz=426&hl=en&start=1&um=1&tbnid=SZZDxQpoC24KVM:&tbnh=95&tbnw=150&prev=/images%3Fq%3Dunited%2Bstates%2Bannual%2Baverage%2Bwind%2Bpower%26hl%3Den%26sa%3DN%26um%3D1, and Dinnell at 543.

¹³⁷ Dinnell at 544.

¹³⁸ Brown at 502.

¹³⁹ Dinnell at 544.

¹⁴⁰ Id at 544.

¹⁴¹ Id.

offshore wind projects may have on birds, fish, sea mammals and animals on and below the seabed floor.¹⁴² The legal challenges to this type of facility are even hazier than for its on-shore counterparts, as it is in its infancy and will have to be adapted to laws already in place.¹⁴³

The United States has more than enough wind resources to make this a viable and reliable market domestically. According to the Department of Energy, there are 8,000 gigawatts of available wind, just based on land.¹⁴⁴ American wind generates 1% of domestic electricity supply.¹⁴⁵ Currently the United States produces only 10,000 megawatts of electricity, which is enough to power 2.5 million homes.¹⁴⁶ Even South Dakota has plenty of opportunities to take advantage of wind energy. South Dakota ranks fourth in the nation for wind power potential and if used to its full extent could power more than 27 million homes.¹⁴⁷ The excuses and the hesitations that may have been prevalent in the past are quickly evaporating from society and although new legal challenges are on the horizon, the wind energy market seems to be a safe place to invest both economically and environmentally.

IV. Conclusion

There is increasingly less and less debate over the fact that climate change is a global debate that needs immediate action. The UNFCCC and Kyoto Protocol were strong and reasonable efforts to push this initiative, but unfortunately have not been able to put forth a truly solid working anecdote for our worldwide dilemma. Without tight, enforceable regulation (which will neither be simple or a quick fix) on such important issues, countries in an

¹⁴² Id.

¹⁴³ See Generally Dinnell.

¹⁴⁴ Burleson at 139.

¹⁴⁵ Id.

¹⁴⁶ Id.

¹⁴⁷ PIN Lecture, University of South Dakota Law School Room 102, October 26, 2009.

advantageous position (like China and their HFC-23 emission) will only seek to further themselves economically. Neither the UNFCCC nor the Kyoto Protocol was meant to be the solution, but only a fluid step in the right direction. However, the allowance of such aforementioned practices may ultimately lead to an adverse or retarded effect on the originally intended purpose.

The wind energy market can be one of the pieces to the puzzle in solving our environmental problems, not only nationally but worldwide. Although the modern age of wind power is young, it is a clean green power that has many advantages that seem to outweigh the disadvantages in the grand scheme of things. America should position itself to capitalize on this opportunity and individual states should invest in bringing wind power online. Doing so can substantially address the GHG emissions generated by the United States and provide leadership for global climate change mitigation.