2.0 PROJECT DESCRIPTION

This section provides information on the purpose and need for the project; selection of the Kibby Wind Power Project site to meet the project purpose; and discussion of the site's premiere wind resource. This is followed by a description of details relating to the project, including project facilities; construction procedures; operational issues; decommissioning; and project schedule.

2.1 Project Purpose and Need

The purpose of the Kibby Wind Power Project is to utilize a premiere wind resource to respond to the growing demand for clean, renewable and sustainable energy. The project will make an important contribution to the reduction in emissions of air pollutants including greenhouse gases, enhance fuel diversity and lessen reliance on imported fossil fuels, and respond directly to the economic needs of Franklin County and the people who live and work in the vicinity of Kibby, Skinner and Chain of Ponds Townships.

2.1.1 Utilizing a Premier Wind Resource

The single most important criterion in evaluating a potential wind energy site is the wind resource. Without a robust wind resource, a potential site will be unlikely to support a viable wind power project, despite close proximity to transmission accessibility, or other favorable attributes.

Wind speed is a crucial element in projecting turbine performance, and a site's wind speed is measured through wind resource assessment prior to a wind system's construction. The power available in the wind is proportional to the cube of its speed, which means that doubling the wind speed increases the available power by a factor of eight. Thus, a turbine operating at a site with an average wind speed of 12 miles per hour (mph) (5.4 meters per second [m/s]) could in theory generate about 30 percent more electricity than one at an 11 mph (4.9 m/s) site, because the cube of 12 (1,728) is 30 percent larger than the cube of 11 (1,331).

What seems like a small difference in wind speed can mean a large difference in available energy and in electricity produced, and therefore, a large difference in the cost of the electricity generated. Also, there is little energy to be harvested at very low wind speeds (6 mph [2.7 m/s] winds contain less than 1/8 the energy of 12 mph [5.4 m/s] winds).

Estimates of the wind resource in the U.S. Wind Atlas are expressed in wind power classes ranging from Class 1 (poorest) to Class 7 (best), with each class representing a range of mean wind power density or equivalent mean speed at specified heights above the ground (Table 2-1). Areas designated Class 4 or greater are suitable with advanced wind turbine technology under development today.

Table 2-1: Wind Power Classifications

Wind Power Class	Resource Potential	Wind Power Density, W/m^2	Speed at 50m, m/s	Speed at 50m, mph
1	Poor	0–200	0.0–5.6	0.0–12.5
2	Marginal	200–300	5.6–6.4	12.5–14.3
3	Fair	300–400	6.4–7.0	14.3–15.7
4	Good	400–500	7.0–7.5	15.7–16.8
5	Excellent	500–600	7.5–8.0	16.8–17.9
6	Outstanding	600–800	8.0–8.8	17.9–19.7
7	Superb	>800	>8.8	>19.7

W/m^2 = Watts per square meter

Source: U.S. Department of Energy (DOE), National Renewable Energy Laboratory (NREL) wind map of Maine, May 19, 2004.

As shown on the map in Figure 2-1, taken from the U.S. Wind Atlas, the Kibby Wind Power Project is in an area classified as Wind Power Class 5. The strong winds are located mainly in the mountainous areas of Maine, due to the regional weather patterns and the topographical features of the area. As Garrad Hassan notes in its preliminary assessment of the Kibby Wind Power Project (provided in Appendix 2-A):

> *It is expected that the main general mechanism that produces significant winds at the Kibby Mountain site is the formation of a prominent depression track across the area. It is quite common, especially in the winter, to find most of western and upper Maine, the St-Laurent seaway, the Gaspé peninsula, and the maritime provinces at the tail end of a well developed depression or storm track moving across the North American continent [2.3][1]. The fronts of weather systems, which are sources of strong winds, have a tendency to orient themselves along the track. The formation of the track is in turn strongly influenced by the position and strength of the jet stream above. Given the significant elevation of the ridges when compared to Québec plains to the west, the Kibby Mountain site is well exposed to the westerly winds produced by this track formation. The perpendicular north-south ridges also promote an acceleration of the wind speeds as the wind moves across the site*.

Figure 2-1 shows that, on a macro scale, only the northwest portion of Maine has winds at Class 5 and above. While other areas within Maine may be able to support wind projects, the macro scale map demonstrates the very limited areas within Maine that are likely to be candidates for further analysis by wind developers.

The total areas in on-shore Maine that have a wind power class of 5 or greater make up a very small percentage of the state's land mass. Thus, the Kibby Wind Power Project's site is exceedingly rare from a wind resource perspective.

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[1] Reference 2.3 from the Preliminary Wind Resource Report in Appendix 2-A.

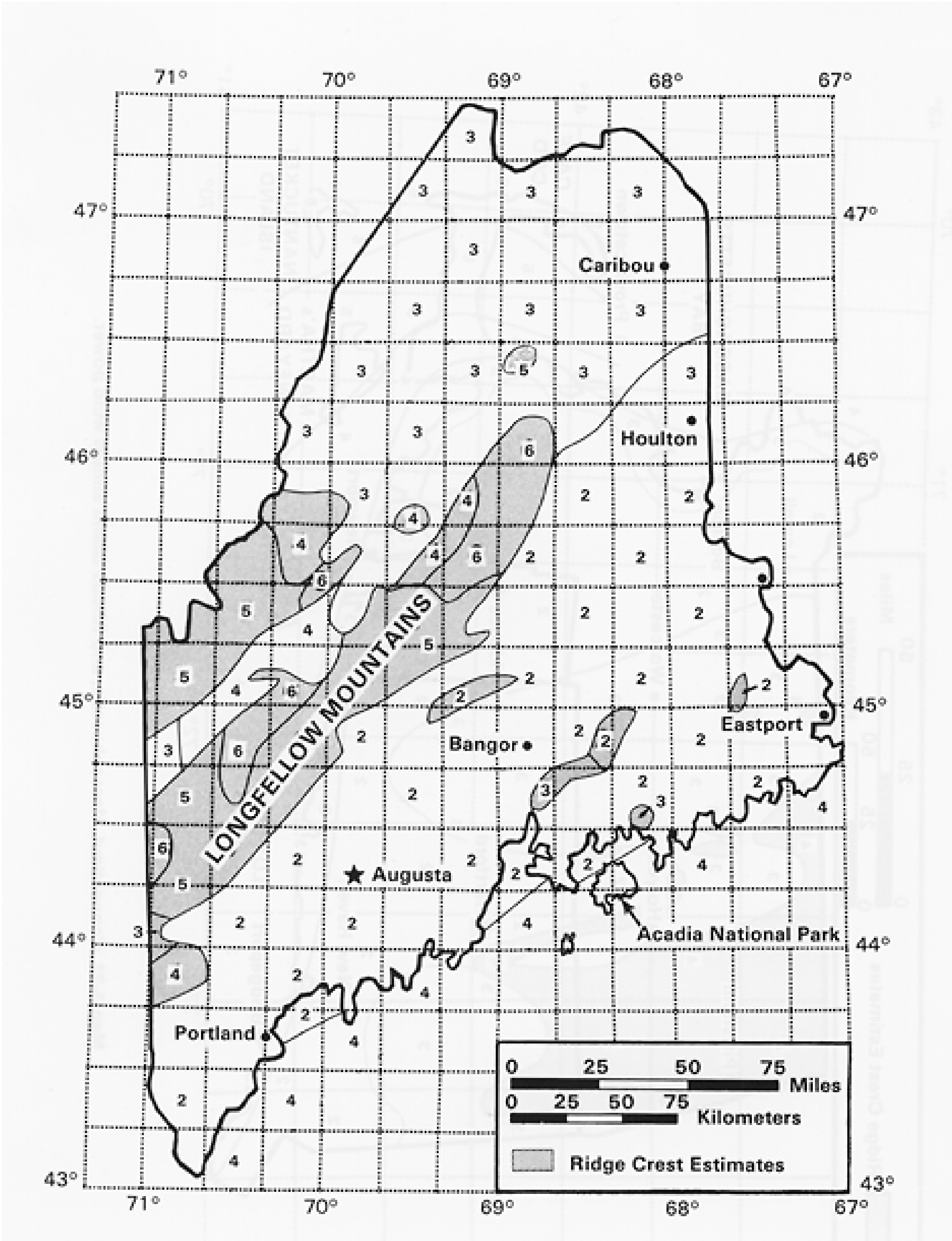


Figure 2-1
Wind Classification Mapping for Maine

If the additional constraint of proximity to transmission lines is layered onto the analysis, the area where viable wind projects could be sited in Maine is dramatically reduced. The northern portion of the state is not interconnected to the New England grid and has very limited transmission capacity. Locating a project there would require the power to be sold in an area with very little native load (demand), exporting the power to New Brunswick, or would require substantial new transmission infrastructure to bring the power into the southern portion of the state.

Even with strong winds and proximity to transmission lines, potential sites are further restricted by being in or near conservation areas. As can be seen from Figure 2-2, various conservation areas cover a significant amount of the territory in northern Maine, eliminating many potential sites from ever being developed as wind projects.

Finally, severe slopes or other construction restrictions must be taken into account in accessing a potential wind site. Severe slopes make construction difficult or impossible. Crossing ridgelines for transmission access makes more remote sites economically infeasible as commercial wind projects.

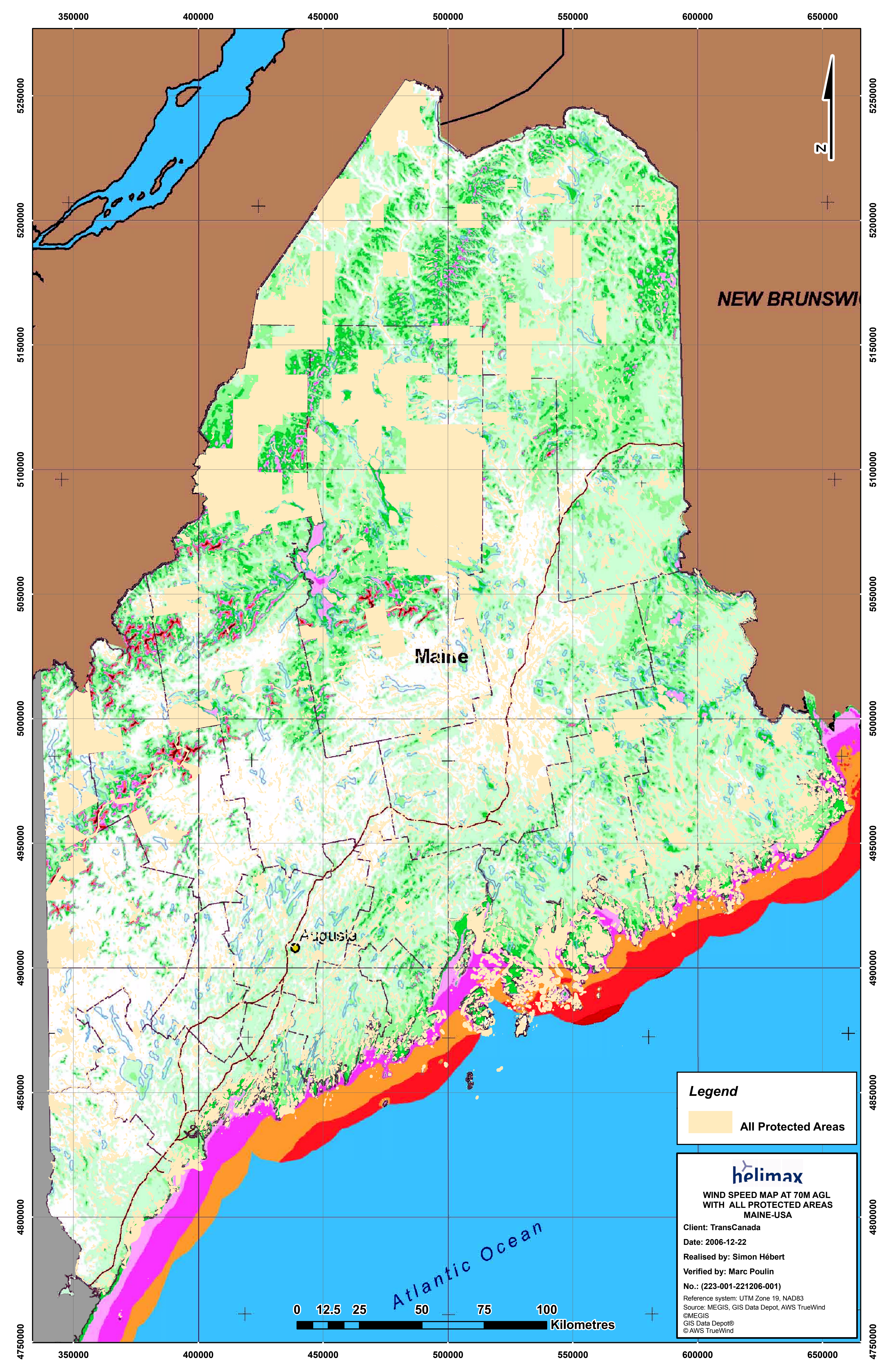
All of these factors (as further discussed in Section 2.2) were considered in identifying the Kibby Wind Power Project site as a location where the presence of a premiere wind resource is appropriately balanced with the range of other issues. Additional details regarding the nature of the wind resource at the Kibby Wind Power Project site are provided in Section 2.3.

2.1.2 Consistency with State and Federal Environmental Policies

There is little debate that there exists an overwhelming need on a regional, national and even a global level for clean, renewable and sustainable energy resources. As discussed in this section, the need for renewable energy is supported by a number of federal and state policy initiatives. Many of these policy initiatives have resulted from growing concerns within the scientific community regarding global climate change. Evidence is mounting that global climate change poses a critical threat to our planet’s well-being, and that its effects are likely already being felt. That atmospheric concentrations of greenhouse gases are increasing at an alarming rate is indisputable. Further, substantial evidence suggests that the migration routes of animals have been altered; glaciers are melting and weather is changing.

2.1.2.1 Threats of Global Warming

Global warming is the observed increase in the average temperature of the Earth's atmosphere and oceans in recent decades. The prevailing scientific opinion on climate change is that most of the warming observed over the last 50 years is attributable to human activities. These activities have increased the amounts of carbon dioxide (CO_2) and other greenhouse gas concentrations in the atmosphere.



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All Protected Areas
helimax
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WITH ALL PROTECTED AREAS
MAINE-USA
Client: TransCanada
Date: 2006-12-22
Realised by: Simon Hébert
Verified by: Marc Poulin
No.: (223-001-221206-001)
Reference system: UTM Zone 19, NAD83
Source: MEGIS, GIS Data Depot, AWS TrueWind
©MEGIS
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A continued increase in greenhouse gas concentrations is likely to raise the Earth's average temperature. Higher temperatures will cause a melting of ice in Greenland and Antarctica, which will accelerate the rise in sea level. Such a development will adversely affect worldwide water supplies, air quality and weather patterns. There is global recognition of this danger, as exemplified by the 1997 Kyoto Protocol. That Protocol, ratified by 165 countries so far, commits those parties to individual targets to limit or reduce their greenhouse gas emissions, which add up to a total reduction in greenhouse-gas emissions of at least 5 percent from 1990 levels in the commitment period 2008 to 2012 (United Nations 1994).

According to the Regional Greenhouse Gas Initiative (RGGI), the dangers of global warming include:

> *Severe droughts and floods; atmospheric warming resulting in increased concentrations of ground-level ozone (smog) and associated adverse health effects; changes in forest composition as dominant plant species change; increases in habitat for disease carrying insects like mosquitoes and other vectors; increases in algae blooms that damage shellfish nurseries and can be toxic to humans; sea level rise that threatens coastal communities and infrastructure, saltwater contamination of drinking water and the destruction of coastal wetlands; increased incidence of storm surges and flooding of low-lying coastal areas which would lead to the erosion of beaches (RGGI 2005)*.

A copy of the RGGI Memorandum of Understanding (MOU) is provided in Appendix 2-B.

The New England Climate Coalition warns that global warming will have particularly devastating effects on this region. For instance, there is the potential that up to 60 percent of Maine's hardwood forests could be replaced by warmer-climate forests with a mix of pines and hardwoods or by grassland and pasture; while spruce and fir forests in higher altitudes could be reduced by as much as 40–50 percent (New England Climate Coalition website). In addition, New England's special attributes could cause it to bear even more significant economic costs from global warming than other areas of the country, because of declines in fall foliage-related tourism and the skiing industry, for example (New England Climate Coalition 2003; text provided in Appendix 2-C).

The burning of fossil fuels is the major cause of the increase in atmospheric greenhouse gases that is leading to this potential environmental destruction. Over the last 150 years, burning fossil fuels has resulted in more than a 25 percent increase in the amount of CO_2 in our atmosphere (Union of Concerned Scientists 2005). Fossil fuels are also implicated in increased levels of atmospheric methane and nitrous oxide, which also contribute to global warming (Union of Concerned Scientists 2005). The U.S. EPA states that it is a virtual certainty that "the atmospheric buildup of CO_2 and other greenhouse gases is largely the result of human activities such as the burning of fossil fuels" (U.S. EPA 2006).

2.1.2.2 United States Policies to Address Global Warming

Although the United States is not a signatory to the Kyoto Protocol, it is committed to reducing the greenhouse gas intensity of the American economy by 18 percent over the 10-year period from 2002 to 2012 (U.S. Department of State 2005). This initiative puts America on a path to slow the growth of greenhouse gas emissions, and then to stop and eventually reverse that growth.

Greenhouse gas intensity is the ratio of greenhouse gas emissions to economic output. The United States goal is to lower emissions from an estimated 202 tons (183 metric tons) per million dollars of Gross Domestic Product (GDP) in 2002, to 166 tons (151 metric tons) per million dollars of GDP in 2012 (U.S. EPA 2006). This would achieve an emissions reduction of 110 million tons (100 million metric tons) in 2012 alone, with more than 551 million tons (500 million metric tons) in cumulative savings over the entire decade (U.S. EPA 2006). The policy focuses on reducing emissions through technology improvements and dissemination, improving the efficiency of energy use, and voluntary programs with industry and shifts to cleaner fuels (U.S. EPA 2006).

The current administration has recognized the value of wind power in the national effort to combat the increase of greenhouse gas emissions. The Energy Policy Act (EPACT) of 2005 (U.S. 109th Congress 2005) includes numerous provisions in support of renewable and alternative energy technologies, including wind power. In particular, the EPACT extended until 2007 a 1.9 cent per kWh production tax credit (PTC) for new wind energy (U.S. 109th Congress 2005). The tax credit has just been extended an additional year, through 2008. This extension is critical to allow the continued installation of commercial electricity generation projects from wind sources and is a direct recognition of the significant role that wind power plays in achieving our national energy policy objectives. As a result, 4,200 MW of new wind power, enough energy for the annual needs of 1 million households, is expected to be installed by the end of 2006 due in part to the extension of production tax credits in the energy bill (DOE 2006). A total of more than 15,600 MW of wind energy could be online by the end of 2007, which is enough energy to power roughly 5 million homes (DOE 2006). This new power alone would offset the emission of approximately 7.5 billion pounds of CO_2, equivalent to keeping nearly 529,000 sport utility vehicles (SUVs) off the road, according to the American Wind Energy Association (DOE 2006). In addition to the recognition of the value of wind power in EPACT, President Bush acknowledged that wind power has the potential to supply up to 20 percent of the electricity consumption of the United States in his 2006 Advanced Energy Initiative.

Wind power is a critical weapon in the national battle against the effects of global warming. Thus, the Kibby Wind Power Project will help meet the need demonstrated on a global and national level to prevent the continuing harmful effects of greenhouse gas emissions.

2.1.2.3 State Policies to Address Global Warming

The state of Maine has been applauded as a national leader in responding to the threat of global warming and in implementing policies that encourage development of alternative energy sources (Environmental Defense 2003). In 2005, Governor Baldacci signed "An Act to Enhance Maine's Energy Independency and Security," which is now codified within the Electric Industry

Restructuring Act at 35-A MRSA §3210-C, and sets a goal of increasing renewable power in Maine by 10 percent by 2017.[2] This legislation specifically declares that the reduction of greenhouse gas emissions from the electricity generation sector is a policy of the state of Maine. The Act also authorizes the Public Utilities Commission (PUC) to accept long-term contracts for new capacity, with the objective of reducing and stabilizing electricity costs within the state. This is a clear statement by Maine lawmakers of the need for such projects as the Kibby Wind Power Project.

In addition, in 2003 the state passed "An Act to Provide Leadership in Addressing the Threat of Climate Change," which was signed by the governor on June 26, 2003 (Public Laws of Maine 2003). This law requires a reduction in greenhouse gas emissions in Maine to 1990 levels by 2010, to 10 percent below those levels by 2020, and ultimately by a sufficient amount to avert the threat of global warming over the longer term (Public Laws of Maine 2003). In 2004, the DEP completed a year-long effort to draft a Climate Action Plan to meet the goals set forth in that legislation (Maine Legislature 2004). The Plan calls for 54 recommended actions necessary to fill the gap between the baseline and the target greenhouse gas emissions (Maine Legislature 2004). Besides the short-term emissions goals, the legislation requires Maine to develop a climate change action plan to reduce CO_2 by as much as 75 to 80 percent over the long term, as agreed to by the New England Governors and Eastern Canadian Premiers. With this law, Maine has joined a growing number of Northeastern states that have, as a group, taken the task of climate change into their own hands. Such a goal can only realistically be attained by the use of clean, sustainable and diverse energy sources.

Maine is also one of the seven Northeastern states participating in the RGGI which has proposed a new cap and trade program to reduce CO_2 emissions from power plants in the region (RGGI 2006). RGGI would be the first mandatory cap-and-trade program for CO_2 emissions in United States history, and includes Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York and Vermont (Bogdonoff and Rubin 2006).

This groundbreaking program would begin in 2009 by setting a cap on CO_2 emissions from certain electrical power plants in the region. The initial cap is set at 5 percent above recent CO_2 emission levels, equaling 121 million tons annually, and would not change until after 2015. The states would then reduce the cap incrementally over a 4-year period to achieve a 10 percent reduction by 2019. Compared to the emissions increases expected under a "business as usual approach," the estimate is that RGGI will result in an approximately 17 percent reduction in CO_2 emissions by 2020 (Bogdonoff and Rubin 2006). Regulated plants will include all coal, oil and natural gas-fired electric generating units with a capacity of 25 MW or more. Regulated power plants may meet the RGGI cap by reducing their emissions or by buying credits from other facilities.

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2 The Restructuring Act already requires that at least 30 percent of the electric energy provided to Maine consumers be derived from renewable and/or efficient resources. 35-A MRSA §3210(3).

Unlike most other pollutants, there is currently no technology commercially available that can "scrub" or "capture" CO_2 from a fossil-fuel powered facility's emissions (National Energy Technology Laboratory 2004). Thus, while the use of "offsets" will help industry meet initial RGGI targets, to achieve ultimate compliance with the declining CO_2 cap there must be a significant reduction in dependence on fossil fuels to generate electricity along with a corresponding shift to zero emission sources of power. In other words, for RGGI to work, this region must build significant new wind farms and other zero emission electric generating facilities.

2.1.3 Consistency with Policies to Enhance Energy Resource Diversity

Another demonstrated need within the New England region generally and Maine in particular is related to energy resource diversification. Currently, approximately 40 percent of New England's electricity supply depends upon natural gas (Maine PUC 2005). Such over-reliance on natural gas has resulted in large increases in electricity prices, price volatility and reliability risks, particularly when demand is high and natural gas supplies are low.

According to the DOE, natural gas consumption in New England will grow at an annual average rate of 1.38 percent from now until 2024, while demand for natural gas in the power generation sector is projected to grow by 1.48 percent annually over the same period (ISO-NE 2005). At the same time, producers in other regions are encountering accelerated depletion trends in traditional natural gas-producing basins (ISO-NE 2005). As a result, ISO-NE estimates that the region will have adequate gas supplies only through 2010 (ISO-NE 2005). A copy of the ISO-NE report is provided in Appendix 2-D. The Power Planning Committee of the New England Governors' Conference and the Maine Legislature have also recognized the importance of reducing our dependence on natural gas and the need to diversify our energy sources to ensure an adequate and reliable supply of energy in the future (Maine Legislature 2005). A copy of this legislative report is provided in Appendix 2-E.

An increase in renewable energy production will also reduce both the level and volatility of electricity prices in the region. Natural gas facilities set the market clearing, or wholesale, price[3] of electricity in New England approximately 60 percent of the time. Thus, according to the Maine PUC, "the price of natural gas in global markets is by far the dominant factor in the price consumers pay for electricity in [Maine]" (Maine PUC 2006). According to the PUC, as more non-natural gas alternatives are added, those resources along with less expensive natural gas resources will set the clearing prices in a greater number of hours, reducing both the level and volatility of electricity prices throughout the region (Maine PUC 2006). Wind generation can play a significant role in this regard. With no fuel cost and low operating costs, wind projects typically

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[3] In the electricity market "clearing price" method, buyers and suppliers submit bids and offers for each hour. The market is "cleared" at the price that balances supply and demand, that is, enough suppliers are willing to sell energy at or below a price that would result in enough energy to meet customers' needs in that hour. Buyers with bids at or above the clearing price pay the clearing price for the quantity purchased. Suppliers with offers at or below the clearing price are paid the clearing price for the quantity sold.

bid their power into the grid at or near zero. This incremental power forces more expensive and volatile priced generation sources to be turned down or dispatched off, thus lowering the market clearing price to all consumers. To the extent that such generating facilities are situated within Maine borders, the benefit to Maine consumers will be more direct. Reduction in the region's reliance on natural gas will also result in a more secure system, making it less likely that any electricity shortages will affect service in Maine.

In November 2003, the Maine Energy Resources Council (MERC) adopted a revised statement of its energy principles. These include the acknowledgement that competitively priced energy is vital to the state's economy and the wellbeing of its citizens. MERC asserts that Maine should strive to provide energy to all its citizens at the lowest possible cost to promote economic development and retain jobs (MERC 2003). In addition, MERC stated that Maine should continue to support indigenous renewable energy resources in all energy-using sectors to ensure that Maine participates in an effective manner in national and international efforts to promote energy independence, diversity and long-term sustainability (MERC 2003).

Because the price of natural gas is the most significant factor driving New England's electricity costs, ISO-NE also recommends that New England diversify its power generation fuel mix by the development of resources using alternative fuels, particularly renewable resources, such as wind projects, to help manage regional electricity costs (ISO-NE 2006; Maine PUC 2006). ISO-NE estimates that the addition of 1,000 MW of supply from low-cost facilities would save consumers $595 million per year (ISO-NE 2006; Maine PUC 2006). Under a "business as usual" approach; however, electricity costs are expected to remain high, and a 5 percent increase in usage will increase costs by $693 million (ISO-NE 2006; Maine PUC 2006).

In 1995, LURC found that there was a demonstrated need for a 210 MW wind power project in this same area (LURC 1995). That project was never built; since that time the energy demands within the region have only increased, and the potentially devastating impacts of global warming are now virtually undisputed. The Kibby Wind Power Project will provide 132 MW of clean, renewable energy for Maine and the region, thereby responding to a need that has been acknowledged by LURC, the State of Maine and the United States government, and which is reflected in the legislative and policy directives of those bodies.

2.1.4 Market Perspective

As wind energy costs fall, and interest in the economic and environmental benefits of wind power grow, markets for wind-generated electricity are expanding. The U.S. EPA Green Power Partnership is a voluntary organization that encourages the purchase of green power as a way to reduce environmental impacts associated with conventional electricity use. U.S. EPA maintains an updated list of its Top 25 Green Power Partnership Partners, whose annual green power purchase is the largest. Combined, their purchases amount to almost 4.7 billion kWh annually. As of September 22, 2006, the Top 25 members who have purchased some or all of their green power as wind power include Wells Fargo, Whole Foods Market, Inc., Johnson & Johnson, Starbucks, Vail Resorts, World Bank Group, IBM, Sprint Nextel, The Tower Companies and Staples.

Whole Foods is the biggest corporate user of wind power in the country, and is buying enough wind power credits to cover energy use at all of its United States stores, bakeries, distribution centers, regional offices and its Austin headquarters.

In addition, there are a number of Maine organizations that are currently participating in the Green Power Partnership, including the University of Southern Maine, Colby College, Bates College, Bowdoin College, Unity College, and College of the Atlantic. Additionally, Sugarloaf USA and Sunday River, the two largest ski resorts in Maine, in November 2006 announced that they have jointly chosen to offset 100 percent of their resort operations' electricity usage with energy generated from wind. Together these resorts are now the largest purchasers and consumers of wind power in New England. Under the new plan, electricity generated from wind will be used at all resort base lodges, offices, ski lifts, energy-intensive snowmaking operations and three Grand Resort Hotel and Conference Centers. The two resorts are purchasing 30 million kWh of renewable energy to achieve this goal.

Another reason for the increase in market demand relates to Renewable Energy Credits (REC). A number of states in New England require electricity providers to include a minimum percentage of qualifying renewable energy in the electricity they provide (know as renewable portfolio standards, or RPS). A REC is a tool for implementing RPS. One REC represents one megawatt-hour generated by a renewable energy source, as defined by the RPS. Electricity providers must purchase sufficient RECs to satisfy the RPS. In this region, this system is maintained and tracked through the New England Generation Information System (NE-GIS). Unlike other energy tracking systems used around the country, the NE-GIS assigns certificates to all electricity produced, regardless of fuel source, making it the most comprehensive such system in the United States.

Tradable RECs have been implemented in many states with RPS requirements. RECs generally belong to the generator of power and may be sold or traded to load serving entities who use the RECs to satisfy their RPS-mandated obligation to purchase and supply renewable energy. Maine is one of a few states with compliance-driven RECs, which have evolved out of a thriving and still growing market of voluntary RECs. Rhode Island, Massachusetts and Connecticut also have compliance-driven RECs. Because New England is part of a single electrical grid, the member states' RPS generally can be met by purchasing RECs from qualifying sources within the New England region. According to the Center for Resources Solutions, which administers what is known as the "Green Tag" program; sales grew twelve-fold from 2002 to 2003 and encompassed 1.8 million megawatt-hours, while utility sales of certified renewable electricity grew 12 percent.

The demand for renewable energy in New England is expected to grow dramatically over the next few years. The future of the REC supply is uncertain because although a number of projects have been proposed in the region, few have been built so far. This uncertainty and the existing supply shortage will lead to high REC demand.

The need for clean, renewable energy is unquestionable. The purpose of the Kibby Wind Power Project is to respond to that need by developing an appropriately sited wind farm that captures a premier wind resource. In doing so, the Kibby Wind Power Project will serve as an important tool in protecting our environment and meeting our future energy needs.

2.1.5 Anticipated Air Quality Benefits

As noted above, a significant benefit of wind power projects is the displacement of emissions through increased wind power energy generation. Section 6 provides a detailed discussion of anticipated air emissions benefits associated with the Kibby Wind Power Project. Estimates of regional emissions displacement associated with the project have been calculated utilizing data published by ISO-NE in its New England Marginal Emissions Rate Analysis (ISO-NE 2006) This study provides a means to obtain an accurate estimate of emissions offset by adding new sources of generation (or reducing demand) in the NEPOOL system.

Electric generation is “dispatched” by ISO-NE by ordering power plants to come on-line or off-line on a real-time basis. Least-cost units run on a base-load basis (they run around the clock), while more expensive units “cycle” (they come on- and off-line as the demand for electricity increases and decreases throughout each day). Based on actual generation data from all electric generation units in NEPOOL, the “marginal” emission rate (the emission rate of the last unit turned on) can be calculated on an hour-by-hour basis. By estimating the frequency of operation of the project on an annual basis (capacity factor), the regional emissions that would be avoided can be calculated.

TransCanada’s emissions displacement analysis is provided in Appendix 2-F, and further discussed in Section 6. As discussed in Section 6, the project will displace approximately 200,000 tons per year of CO_2, which is equivalent to removing about 35,000 cars from the road. The project will also displace approximately 90 tons per year of nitrogen oxides (NO_x), an ozone precursor. This is roughly equivalent to the NO_x produced in New England to serve the electric needs of over 25,000 households. Finally, it is important to note that these emission reduction benefits will extend well into the future. Assuming that the marginal emission rates remain near current levels, the project will replace about five million tons of CO_2 over its 25-year life.

2.2 Site Selection

Opportunities for the successful development of wind power facilities are limited to areas with significant natural wind resources and access to markets. TransCanada initially identified New England as a potential wind energy project development area due to:

- The availability of areas with wind resources suitable for project development;
- Increasing regional demand for electricity combined with heavy reliance on fuels with which wind can economically compete (e.g., natural gas);
- Strong policy support for renewable energy as evidenced by the implementation of renewable portfolio standards in several New England states; and
- TransCanada’s familiarity with the region and its energy markets.

New England presents areas with both wind resources and relative proximity to demand centers. The region is heavily dependent on natural gas, as opposed to other regions which are more dependent on cheaper coal resources. Further, the regulatory and policy environment in New England is favorable to the development of renewable resources, as reflected in the stated energy policy of Maine and several other New England states. In addition, TransCanada is a significant participant in the energy market in New England, including Maine. Through its ownership interests in the Portland Natural Gas Transmission and Iroquois Gas Transmission systems, TransCanada holds natural gas pipeline assets in Maine, New Hampshire, Vermont, New York and Connecticut. In addition, through its ownership of Ocean State Power and the Deerfield and Connecticut River hydroelectric assets, TransCanada operates power generating facilities in Rhode Island, Massachusetts, New Hampshire and Vermont. The energy regulatory and policy environment in these states, and the intricacies of their energy markets, are well known to TransCanada development, operations, and marketing staff. Development of a new wind project in this region was, therefore, preferable to projects in other regions where TransCanada does not have similar investment and knowledge.

In identifying development opportunities, TransCanada became aware of the previously approved, but not built, wind power project that had been proposed by Kenetech several years ago. Some of the development easements and rights from that project had been maintained by surviving project interests. In evaluating this development opportunity, TransCanada independently reviewed and verified the site selection process used by Kenetech, as detailed in that project's LURC application (Appendix 2-G). Based on that review, combined with its knowledge of the overall market conditions and regulatory environment, TransCanada determined that development of the Kibby Wind Power Project at the proposed site was an appropriate step in the expansion of its renewable energy portfolio.

The following discussion presents a brief overview of the regulatory and market conditions for wind power in the United States in general, and the Northeast and Maine in particular, that support TransCanada's decision to pursue development of the Kibby Wind Power Project. Further information on the project's consistency with national and state energy policies is presented in Section 2.2.1. Subsequent sections present a summary of criteria that make this site not only an appropriate site for wind development, but the best reasonably available site.

2.2.1 Review of Regulatory and Market Issues

The regulatory and market environment has improved dramatically with respect to the viability of wind power development over the last decade since the Kenetech project was approved. Technological improvements have made wind turbines significantly more economical and reliable, and capable of utility-scale generation. The extension of the PTC, implementation of RPS, concerns about global warming, energy independence, and increasing worldwide demands on, and competition for limited oil and gas resources, have all contributed to a dramatic increase in the number and success of large scale wind development projects throughout the United States.

In the United States, the EPACT of 2005 included numerous provisions in support of renewable and alternative energy technologies, including wind power. In particular, the EPACT of 2005 included an extension of the federal PTC for wind projects. This extension is in direct recognition of the significant role to be played by wind power in achieving national energy policy objectives and directly impacts the economic viability of wind projects. As noted on the DOE's website, "wind energy diversifies the nation's energy supply, takes advantage of a domestic resource, and helps the nation meet its commitments to curb emissions of greenhouse gases, which threaten the stability of global climates." With increasing consensus among scientists and policy makers regarding the reality of the impact of greenhouse gas emissions on global climate changes, the national awareness and support for renewable, zero emission energy sources (hydro, wind, solar, geothermal, tidal) has reached an all-time high. Among these resources, only wind is currently capable of making a significant contribution in response to the need for new electricity generation.

In the United States, New England is among the areas interested in expanding wind energy development. This is due to both the availability of significant wind resources in relative proximity to demand centers and a favorable regulatory and policy environment for renewable resources. Further, concerns in the region regarding the adequacy of power generation assets to supply growing demand in the near- and long-term, combined with the fact that most new generation in the region is natural-gas fired, resulting in price stability concerns, has led power purchasers in addition to regulators and policy makers to recognize the important role to be played by wind projects in ensuring a reliable and least cost energy supply for the region. The New England states and New York have traditionally been in the forefront of policy makers supporting renewable energy resources. With the exception of New Hampshire, all the New England states and New York have adopted an RPS which applies to wind projects, representing almost 25 percent of the states with some form of RPS. Maine is a leader in this area, with a 30 percent requirement for renewable resources and a requirement for a share of new generation.

Maine has recognized the value of wind energy resources specifically, and is actively seeking to add appropriate wind resources to its energy mix. In 2004, the State Legislature enacted the Maine Wind Energy Act which directed the Maine PUC to conduct a study of the realistic potential for wind power development in Maine, the cost of wind power, potential markets, impacts of wind power on the electric grid, potential for siting wind facilities on tribal lands, and obstacles to wind power development in the state. The PUC issued its final report in January 2005 (Maine PUC 2005). According to the Executive Summary of the report:

> *"there is substantial potential for the development of wind power facilities throughout the State, including a realistic potential for development on tribal lands. The report concludes that the potential for wind power development that is economic, environmentally sound and publicly acceptable is not likely to exceed approximately 1,000 MWs, at least for the foreseeable future, and that there are sufficient markets available to wind power facilities developed in Maine. The report also finds that wind power does not present any serious or insurmountable grid system reliability or market operation concerns, nor is wind power development in Maine likely to have substantial*

impacts on existing generating facilities beyond those resulting from possible changes in market prices.

The report concludes that the cost of wind generation, assuming the continued availability of the federal PTC, is competitive with the cost of other generation resources in New England. Accordingly, the report finds that no additional financial assistance or subsidies beyond the PTC are likely necessary to allow grid-scale projects to compete on a cost basis in the current electricity market."

This report also identified mechanisms which could be implemented to further the development of cost-effective wind resources in the state, several of which are under active consideration or development.

This is the context within which TransCanada has determined that development of the Kibby Wind Power Project in Maine is an appropriate decision for expanding its renewable power generation assets.

2.2.2 Macro-Level Site Selection Process

There are several criteria that must be met to develop a utility-scale wind power project. These include:

- Favorable and consistent wind resource;
- Reasonable access to the regional transmission grid;
- Compatibility with current ownership and local environmental resources and land uses; and
- Community support.

TransCanada reviewed and independently verified Kenetech's site selection analysis (provided in Appendix 2-G). Like Kenetech, TransCanada limited its siting consideration to on-shore locations. Current technology limits off-shore development to locations with a strong wind resource, shallow depths, and relatively low ocean waves. Very few off-shore locations in New England would meet these criteria. To date, TransCanada has not pursued off-shore wind development. As evidenced by the significant controversy surrounding the Cape Wind project proposed for the Nantucket Sound in Massachusetts, off-shore projects have not yet gained widespread public or regulatory acceptance in New England.

A key consideration in TransCanada's willingness to undertake a significant investment in the development of a wind power or any other project is the existence of community and regulatory support. As evidenced by the successful permitting and support for the prior Kenetech project and the more recent approval and construction of the Mars Hill project, TransCanada believes there is regulatory and community support for properly sited and constructed on-shore wind power in Maine. Favorable and consistent wind resource is a crucial siting criterion. Because potential project output is exponentially related to wind speed, areas with stronger, more consistent winds can generate the same electrical output as developments in less windy areas with considerably fewer wind turbines, and with a correspondingly smaller development area. As discussed in Section 2.1.1, wind resource values vary significantly, and a commercial wind power project relies on selecting a site with strong and reliable wind.

As would be expected, the highest quality on-shore wind resources in New England are typically found in mountainous regions of Maine, New Hampshire and Vermont. Figure 2-1 depicts wind resources mapping for the state of Maine. Overlaying the regional high voltage transmission system on the wind resource maps will identify areas with access to transmission and high wind resources. Additional screening then considered land use areas that would be fundamentally incompatible with wind development, including national and state parks, the Appalachian and Long Trail systems, and large tracts of public land (see the map of conservation areas shown in Figure 2-2). Based on this macro scale overview, western Maine is readily identified as an area for further detailed study. As noted, TransCanada independently verified Kenetech's assessment of wind resources, access to transmission infrastructure and compatibility with existing land use and environmental resources.

2.2.3 Localized Site Selection Process

TransCanada places a high priority on working with regulators and environmental and community interests to ensure that its projects satisfy the concerns of those stakeholders. LURC's prior approval of the Kenetech project was an important indication to TransCanada of the regulatory and stakeholder support that existed for wind power in this location. To ensure that the assumptions that led to approval of the Kenetech project remained relevant, TransCanada undertook a detailed analysis of the factors that led Kenetech to select this particular area for development and confirmed that this location was the best reasonably available site for development of a large scale wind power project.

Kenetech initiated a regional and localized site selection process to identify the specific locations with the optimal characteristics for development of a wind project (provided in Appendix 2-G). This assessment was based on the recognition that higher ridgelines experience the greatest localized wind resources due to the influence of topography. Therefore, Kenetech identified specific ridgelines in western Maine and evaluated each in the context of a conceptual wind project relative to several criteria. As explained in its LURC application, Kenetech considered the following:

(1) *Quality of Wind Resource:* Site visits were conducted by meteorologists to examine evidence of wind potential such as flagging. Capacity and energy estimates were developed using topographical maps, information gathered during the site visits, and available wind data.

(2) *Transmission Access:* Kenetech examined alternative transmission line routes for grid interconnection and impacts on local communities. Central Maine Power (CMP) provided Kenetech with estimates of interconnection cost, system upgrades, and line losses for various configurations under consideration.

(3) *Land Ownership:* Kenetech estimated the size of contiguous tracts, number of landowners, present land uses, and land values.

(4) *Construction Related Costs:* Kenetech considered impacts of road access, local terrain, and soil conditions.

(5) *Site Viability:* Kenetech considered visual impacts on the Appalachian Trail, townships, public roads, and recreational areas, assessed potential for environmental impacts, and potential for local and state support by discussing possible sites with many policy makers and opinion leaders including state officials, regulators, environmental advocacy groups (Natural Resource Council of Maine [NRCM)], Maine Audubon, Appalachian Mountain Club, Conservation Law Foundation [CLF]) and others.

Using the above criteria, Kenetech performed a preliminary review of each ridgeline. Some areas were eliminated at this stage due to viewshed impacts to sensitive areas such as the Appalachian Trail or population centers. Kenetech then evaluated the relative cost tradeoffs of the various locations associated with transmission interconnection. Based on this analysis, Kenetech identified the proposed project location as the lowest cost area which also satisfied the other criteria. Field assessments and environmental assessments were then conducted to establish the configuration for the project.

TransCanada again independently verified the findings of Kenetech's localized site selection process which identified the specific ridgelines on which wind power elements were proposed.

(1) *Quality of Wind Resource:* TransCanada retained Garrad Hassan, a recognized expert in wind resource assessment, to evaluate meteorological data available from the Kenetech project. Preliminary capacity and energy estimates were developed, and a strategy outlined for collecting additional data. In November 2005, TransCanada received authorization from LURC for the installation of up to eight meteorological towers (met towers) at heights approximating the likely hub of anticipated wind turbines. Three meteorological towers were installed during the winter of 2005/2006, and the on-going collection of data continues to inform project feasibility and design refinements. Additional information with regard to wind resource issues is provided in Section 2.3.

(2) *Transmission Access:* TransCanada conducted an alternatives analysis for potential transmission line routes (discussed further in Volume V). This assessment considered the former Kenetech routing as well as several alternate strategies in order to determine the potential level of environmental and community impact associated with each. Cost estimates were also considered in this evaluation. Meetings have been held with CMP to discuss interconnection. An Interconnection Feasibility Study for the project (provided in Appendix 2-H) was conducted under the ISO-NE Open Access Transmission Tariff on behalf of ISO-NE and CMP. The study was performed in accordance with the ISO-NE Operating Documents, including the Interconnection Procedures contained in Schedule 22 of the Tariff; as such, the study was performed separately from the Interconnection System Impact Study. The study includes an

assessment of thermal loads and voltage limit violations resulting from the interconnection and an assessment of circuit breaker short circuit capability limits exceeded as a result of the interconnection. The Interconnection System Impact Study will finalize these reviews, and will also identify any instability or inadequately damped response to system disturbances resulting from the interconnection. The Interconnection System Impact Study is currently being undertaken, and will be made available at a later time. Under the Minimum Interconnection Standards, the study is performed to determine the additions or modifications needed to interconnect in a manner that avoids any significant adverse effect on the system reliability, stability, and operability while protecting against any degradation in transfer capability. The Feasibility Study analysis demonstrates that the project meets the Minimum Interconnection Standard required to interconnect the proposed generation resource without substantial system upgrades.

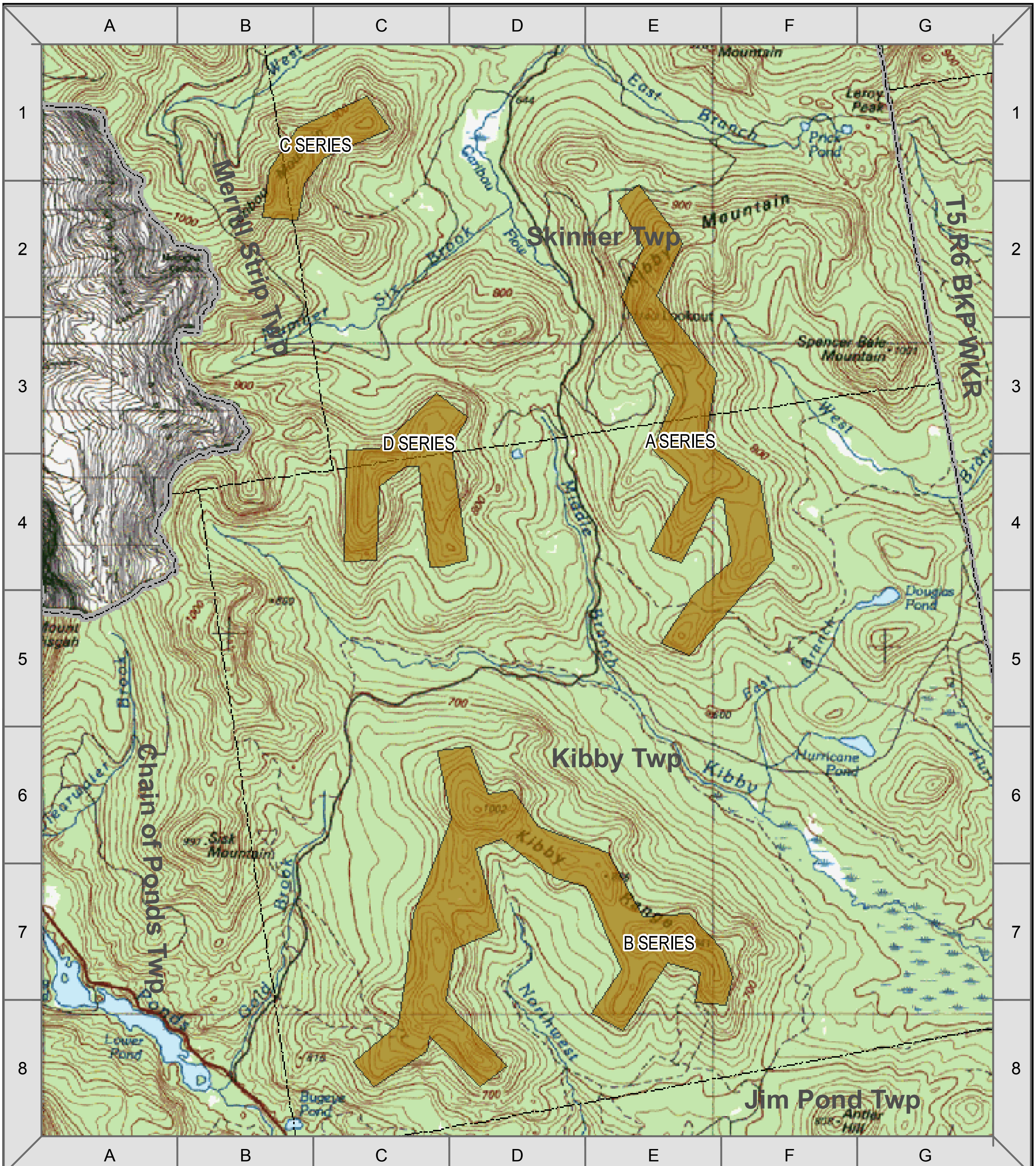
(3) *Land Ownership:* Land ownership issues were well established for the wind turbine development area. Along the transmission line corridor, the alternatives analysis took land ownership into consideration along with other factors evaluated.

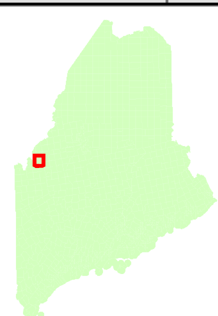
(4) *Construction Related Costs*: As will be discussed below, TransCanada implemented a formal evaluation of engineering feasibility, including costs, prior to the decision to develop the Kibby Wind Power Project at this site. In the fall of 2005, TransCanada retained James W. Sewall Company to develop topographic mapping of the site (to 5 foot contours) and potential transmission line corridor (to 2 foot contours) based on aerial photography. This was intended to ensure that feasibility evaluation and preliminary design would be based upon accurate landform information.

(5) *Site Viability:* TransCanada reviewed documentation associated with site issues (including visual, recreational, and avian) in detail, and held meetings with key stakeholders (LURC, Maine DEP, NRCM, Maine Audubon, CLF and others) in January 2005. The detailed review conducted and discussions with stakeholders indicated the viability of the project at the proposed site, and the desire within Maine for development of wind power projects. In addition, site reconnaissance was conducted by key project personnel to ground truth information identified through file review.

As a result of this independent assessment, TransCanada confirmed the technical and environmental viability of development of a utility scale wind project in the proposed project area. TransCanada concluded that, with the use of newer wind turbine technology, the development of a wind project at this location would be an appropriate focus of development efforts.

Of the four potential ridgeline areas included in the development agreement (Figure 2-3), TransCanada eliminated Series C and Series D from further consideration, and decided to focus on the areas known as Series A (Kibby Mountain) and Series B (Kibby Range). As discussed in Section 2.2.4 below, Series C (Caribou Mountain) and Series D (an unnamed ridge) were determined, based on field reconnaissance, to have challenging terrain and poor existing road





Legend

- Conceptual Turbine Locations
- State Boundary
- County Boundary
- Town Boundary

Notes: Base Map: 100k USGS Topographic Map

N

2

Miles

Figure 2-3

Kibby Wind Power Project

Original Kibby Wind Power Project Development Areas

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access that would result in greater environmental impact and development cost. Further site feasibility activities were, therefore, undertaken on Series A and B only.

2.2.4 Preliminary Engineering Feasibility Evaluation

Having concluded that the general and localized site selection efforts of Kenetech were still valid, TransCanada initiated a preliminary engineering feasibility evaluation in early 2006 designed to confirm site feasibility and optimize the site layout for the proposed Kibby Wind Power Project.

TransCanada retained AMEC to conduct several engineering efforts to further the understanding of project feasibility. Efforts included terrain analysis, definition engineering, development of a layout with evaluation of alternatives, detailed stormwater design, identification of other work space requirements, and cost estimation.

The detailed layout was developed using the topographic survey data collected for the ridgelines. The layout also incorporated historic wind resource data. Although newly collected wind resource data were not yet available, this evaluation was to identify through an engineering constraints analysis the locations suitable for road and turbine layout. AMEC utilized a series of design considerations in developing a layout, including maintaining road grades of no greater than 10 percent; utilizing flatter areas along the ridgelines for siting turbine locations; and avoiding areas with excessive grade or side slopes along the ridgelines.

For preliminary geologic assessment, TransCanada retained S.W. Cole to observe the excavations required for met tower anchoring during their installation. AMEC was able to utilize the information gathered through these spot observations with regard to bedrock depth and condition at the site in three locations distributed along the potential ridgeline areas for the foundations design assumptions and cost estimates.

AMEC was also asked to incorporate detailed stormwater management information in the developed layout. This included stormwater calculations pre- and post-development, and details with regard to design measures for controlling stormwater flow. Erosion and sedimentation potential was minimized through careful layout and design, and further care was taken in the stormwater design to address such issues.

The engineering feasibility effort was completed in March 2005. Based upon a review of plan and cost information, TransCanada determined that the proposed project was feasible at this site. Note that the engineering layout developed through this process further focused the potential development footprint, avoiding the placement of turbines in the northernmost portions of the A Series due to steep slopes. The road corridors identified through the design effort were carried forward, along with other identified work space areas, in the ongoing field evaluations for further refinement.