Basic Overview of Offshore Wind Energy Development
For the Production of Electricity
Draft Meeting Summary

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Meeting Description and Purpose
Wind power development has grown substantially during the past few years in the United States, and developers are beginning to look offshore for greater wind resources and lower costs. As this is a new application for wind power in the United States, background information is needed about environmental, technical, economic and political issues. Some of this information can be gathered from Europe as they have been working on offshore wind energy development for the past decade. However, each situation varies and thus local factors need to be taken into account. This meeting was the first step of the National Wind Coordinating Committees learning about the issues.

This meeting sought to:
• Exchange information about offshore wind development in the United States and Europe.
• Raise and discuss issues and concerns about offshore wind development.
• Explore the role that the NWCC could play in addressing these issues, including organizing another workshop.

Welcome and Introductions
Abby Arnold, RESOLVE welcomed the participants from all the sectors and reviewed the meeting agenda.

Overview of the NWCC
Refer to attachment A for Mr. DeMeo’s presentation slides.

Ed DeMeo, Renewable Energy Consulting, presented an overview of the National Wind Coordinating Committee and its current activities. He outlined the mission of the NWCC, which is to foster dialogue on key wind energy issues. Mr. DeMeo reported that offshore wind energy development was a new issue to the NWCC. He noted that in order to conduct work on a topic the related issues must fall in line with the NWCC guiding principles of helping to create a commercial wind power market that is environmentally, economically, and politically sustainable. The collaborative will decide by consensus in 2003 whether additional work on offshore development will be part of the NWCC work plan.

Presentations: Introduction: What is Offshore Wind Development?
Refer to attachment B for a copy of Mr. Bailey’s slides and attachment C for Mr. Smith’s slides.

Bruce Bailey AWS Scientific, reviewed attributes of wind power and provided an overview on why developers are looking offshore, as opposed to onshore. The key reasons why developers are looking offshore in both Europe and in selected parts of the US is that offshore wind power provides the only option for many states where windy land is in short supply and energy usage exceeds availability. Further, offshore development is closer to load centers than land based wind development sites in the Midwest or western parts of the country. Mr. Bailey pointed out the challenges of offshore development are: the hostile environment found at sea, higher costs for development and maintenance, unique infrastructure needs and fact that permitting for offshore development in the US is new. Mr. Bailey then summarized offshore components: turbines are between 2-4 MW, tower heights are over 200 feet and rotor diameters
are from 250-350 feet. He then reviewed the developments proposed offshore in the US and in particular parts of the country and the complex web of steps in the permitting process.

Mr. Bailey presented a map of United States showing that the heartland has the greatest wind resource availability. Because 54% of the population is on the coasts, there are transmission problems in getting the energy from these remote generation sources to the load centers. The costs for offshore farms are higher because of more difficult construction, but the sites are windier and thus produce higher energy yields. Mr. Bailey estimates that if only 5% of the total estimated offshore resource in the eastern United States were developed, it would produce 15,000 MW, or enough electricity for 15 million people.

Kevin Smith, Global Energy Concepts, presented information on the motivation for offshore wind development in the U.S.; regions with potential for offshore; relative costs of offshore. The motivation for offshore wind development includes: local land constraints can limit development opportunities, larger installations may be possible in a region where large wind projects on land are not feasible, generation capacity can be situated closer to major load centers, and local policy may establish a market for wind energy.

Mr. Smith presented a detailed map showing the extent of shallow water regions around the U.S. where reasonable conditions for bottom mounted offshore wind turbines may exist. Current and past offshore projects in Europe have been installed in water ranging in depth from about 6 ft to 40 ft. In the majority of the U.S. coastline, large regions of shallow water in this range exist in a narrow band that extends from the shore line to approximately 1 to 3 miles. Wind speeds of at least 18 mph (at a height of 164 ft) in a region of shallow water (up to 50 ft deep) approximately 6-12 miles offshore with small wave action are desirable for offshore wind development to be competitive.

Under these criteria, offshore areas with the most potential in the US are limited to the New England and Mid-Atlantic coast. The Southeast has conclusive shallow water regions however the wind resource is low. In addition, hurricanes are frequent which must be taken into consideration in the turbine design. In the Gulf of Mexico off Texas, there may be some potential, however finding large amounts of available land in Texas has not been a problem. In the Great Lakes, Lake Erie is shallow enough to build wind turbines, based on current water depth requirements. An additional concern about the Great Lakes is that they freeze in the winter, and thus engineers would have to deal with ice issues. Water depth is a problem on the West Coast as the shelf drops off rather close to shore. Offshore installations cost are 30% to 50% more than the onshore equivalent. The offshore wind resource is greater than available LOCALLY on land but the cost of energy has been estimated to be 5% to 35% greater than being realized in large wind farms in the West and Mid West. The primary question remains whether a power purchaser is willing to pay a higher cost for off shore wind energy. Local power rates and economics may create an environment where these higher costs are manageable.

Discussion Points:

- A question was asked about the impact of offshore development on marine animals. A current database on locations of feeding and migratory sites does not exist at the moment, but it is under development. Engineers are studying the impact of vibrations from installation and operation on marine animals. The audio output at 15 rotations/ minute is not great. As for the electromagnetic radiation of the transmission cables, as long as they are placed 2 meters deep, the radiation is less than the earth's natural emission.
- The presenters responded to a question about the lack of onshore wind development in New England. They noted a lack of wind resource and heavily forested areas as the primary reasons.
- One participant raised the question of using offshore dumping sites for offshore wind development, since they have already been permitted for “development” activities. The
presenters acknowledged the possibility, but expressed some concern as to the stability of the base of the turbines on these sites.

- Another asked about purchasing agreements and insurance costs? The purchasing agreements can be very difficult and insurance costs are higher.
- The presenters noted that a renewable portfolio standard would most likely benefit offshore wind development because utilities would then be forced to buy renewables as part of their portfolio – with wind being a commercial option. The federal government already has a goal to purchase 2.5% of its energy resources from wind by 2005 for federal facilities. In the Senate draft of the Energy Bill, there is an RPS of 10% by 2020 starting in 2005. Some states already have RPS requirements, including Massachusetts, Texas, and Minnesota.

Presentations: What is the European Experience with Offshore Wind Development?

Refer to attachment D and F for Hans Sørensen and Dan Hannevig respectively for slides.

Hans Sørensen, SPOK ApS, presented information on his experience in Denmark, Sweden and England.

In 1995 a government policy was established in Denmark to construct one 150 MW wind farm each year until 2030, which would ultimately provide half of Denmark's electricity needs. 150 MW was determined to be large enough to provide substantial power, but small enough to take off-line if problems arose with the facility. Developers found that two turbines could be installed a day. There is one agency which handles all offshore wind development issues.

The UK has until now taken a different approach for development where farms are limited to 30 turbines (even if 2 MW turbines are used, that is only 60 MW). Mr. Sørensen stated that this limit is too restrictive because economies of scale are not available to the developer. Another problem is that the approval process is decentralized and spread between 17 authorities, making it hard for developers to fulfill permitting requirements.

Mr. Sørensen reported on economic, technical, environmental, and public perception problems gained through experience with many projects. Examples of technical problems and solutions include:

- Sea ice at the surface of the water: cones placed around the base of the turbine serves as an icebreaker.
- Access to offshore turbines: helicopters are now used in construction and maintenance because they are faster than ships and prevent seasickness.
- Transportation for installation: specialty ships were designed to move equipment.
- Interaction with Avian and Fish species: Construction was scheduled to avoid the April molting areas of birds and fish spawning areas. One of the benefits of 150 MW farms is that if problems are identified the farm can be shut down without a great disruption to the grid and loss of value, as the turbines can be used at another site.

Mr. Sørensen divided environmental issues into the different phases of a wind farm: construction, operation and dismantling. During construction three issues have arisen: sedimentation, noise and vibration. One specific lesson learned from the oil and gas industry is that when hammering during construction, workers need to start slowly to scare off animals; otherwise fish and seals will die of shock. Oceanographers studied the installation area and map flora and fauna before and after construction and found negligible effects from the construction processes. Operational impacts are uncertain at this point due to the short time farms have actually been running. There
have been no reports of bird kills. According to studies birds are able to detect changes in the wind currents 1.5 miles ahead in dense fog and 2 miles ahead in clear weather, so they can change their paths to avert turbines. A concern is that the foundations will create an artificial reef, i.e. food for birds, which has been documented. Dismantling effects are also unknown at this point. It is believed that it would not be unlike offshore oil and natural gas developments.

To address public perception problems, local residents were brought into the project planning process to inform, involve and educate them on what to expect. Mr. Sørensen noted that if locals are involved in the siting process early, it is easier to prevent opposition based on visuals. He pointed out that different configurations, such as one straight line versus three rows, appeased residents concerned about visual impacts. Some locals are also more amenable if the farms become tourist sites and bring increased economic activity to the area. Mr. Sørensen recommended giving the public a choice of sites to give them a feeling of control over the situation. He stated that in parts of Europe no development is not a viable option due to increasing energy demand and the non polluting aspect of wind works in its favor. Noise is no longer considered to be an issue. Engineers dealt with the problem after complaints in the 1980s and early 1990s.

In summary, Mr. Sørensen reviewed the issues that ought to be addressed during siting, but he did not believe any of them should prevent a farm from being developed:
- Ships colliding with turbines (radar can address this problem rather easily)
- Raw materials excavation
- Pipelines
- Fishing
- Low-flying aircraft flight patterns
- Radar when talking about rescue operations

Thor Dan Hannevig, Sure Engineering Europe, from Ireland has also worked to develop an improved process for offshore wind development. This ensures a guide to the process of offshore wind development and that all issues are addressed. Based on his experience, one of the main issues the United States needs to deal with is the permitting process and subsequent environmental impact statement (EIS); it should be centralized and straightforward. A “one stop shop” process would involve a spearhead agency handling permitting and environmental issues. It is in the developer’s hands to work on scoping the issues that might apply for their specific proposal. Using what is learned during scoping, research will be able to focus on areas of actual concern in the EIS. It may be worth commenting that the scoping exercise could justify the exclusion of some headings that are clearly not relevant to the proposal under consideration. According to Mr. Hannevig, the EIS should include a description of the proposed development, existing development, impacts of the proposed development, measures to mitigate adverse impacts and a non-technical summary. Within the statement the following environmental issues need to be addressed: fauna, flora, soil, water, air, climate, landscape, architectural, archaeological, cultural heritage, and interrelationship of the preceding factors.

Mr. Hannevig encourages public involvement to increase acceptance. He also suggests that mitigation plans be a mandatory section of developers’ proposals. Therefore, if a problem does arise, a solution is already planned.

Presentations: Regulatory and Permitting Considerations: Overview of State and Federal Agencies and the Regulations That Apply or Could Apply to Offshore Wind Development Projects in the United States
Refer to attachment E for Mr. Cruickshank’s slides, attachment F for Ms. Godfrey’s slides, attachment G for Mr. Bigford’s slides, and attachment H for Mr. Kaiser’s slides.

There are many agencies that have oversight of different legislation that impact potential development and thus must be consulted. The panel members discussed their various roles and responsibilities in the permitting of offshore wind facilities.

Mr. Cruickshank, Minerals Management Service (MMS) spoke to the role of the MMS, which produces oceanic studies, prioritizes conflicting uses of the outer continental shelf, coordinates oil and natural gas programs, and addresses Northeast sand issues. MMS has the geologic and environmental research capabilities and engineering expertise on staff. Currently the lead organization for offshore wind development permitting is the Army Corps of Engineers. If the current legislation, HR 5156, is passed, oversight of offshore wind development will fall under the Department of Interior’s Mineral Management Service. Under this legislation the Secretary of Interior could grant easements, and the developers would have exclusive rights over the site and tenure for all activities. MMS would implement a rental fee for use of the sea bed as it does with for other activities. The agency’s goal with HR 5156 is to increase system stability and encourage innovative use of the outer continental seabed (OCS).

Other Interior agencies have responsibility to supervise aspects of offshore development including the Fish and Wildlife Service (FWS) and the National Park Service (NPS). FWS oversees the Migratory Bird Treaty, Bald and Golden Eagle Protection Act and the Endangered Species Act, which could be potentially affected by offshore wind power development. NPS only comes into play if the development is directly offshore from a National Park.

Discussion Points:
• While some statutory clarification is necessary, the National Environmental Protection Act (NEPA) will apply to offshore wind development in the Outer-Continental Seabed.
• There was a question regarding requirements for decommissioning of offshore wind facilities. Mr. Cruickshank responded that all decommission provisions will be known to the permittee at the initial permitting phase and changes to the conditions would be unlikely.

Christine Godfrey, Army Corps of Engineers (Corps), reviewed her responsibilities as lead of the permitting process in the Massachusetts and New York areas. Of the 6,000 permits that are submitted each year in New England only three or four need a full Environmental Impact Statement (for example, permits for highways or ports). The Corps reviews the applicable statutes and consults with other agencies to see if an environmental assessment (EA) or a more detailed environmental impact statement (EIS) is needed. NEPA requires a full EIS on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. Permitting a development project is considered “an action”. “Significant” requires consideration of both context and intensiveness of the following factors: beneficial and adverse impacts, public health/safety, and unique geographic characteristics such as, historic/cultural areas, park lands, farm lands, wetlands, wild and scenic rivers, and ecologically critical areas. Ms. Godfrey summarized the six phases of the EIS development process. In total the process can be expected to take over two years. The Corps’s decision on whether to permit will be based on an analysis of whether the project is contrary to the “public interest.” The Corps will examine alternatives, relative extent of public and private need, alternative locations and methods, the implications of the size and economic viability when making decisions. Alternatives include others locations, sizes and formations.

Tom Bigford, Division of Habitat Conservation, National Marine Fisheries Service (NMFS), covered most of the applicable laws, acts and treaties for offshore wind developments. He then reviewed the role of the NMFS. NMFS has many products and services available for interested parties. Mr. Bigford stressed
that NMFS’s first priority is to the living marine resources and their habitats. Mr. Bigford pointed out that while the reality of a situation is important in the decision making process, perception is also important.

David Kaiser works in the Office of Ocean and Coastal Resource Management (OCRM) of the National Oceanic and Atmospheric Administration’s (NOAA’s) National Ocean Service. NOAA’s National Ocean Service is the Nation’s principal advocate for coastal and ocean stewardship through partnerships at all levels. It supports and provides the science, information, management, and leadership necessary to balance the environmental and economic well-being of the Nation’s coastal resources and communities. Its jurisdiction covers the Coastal Zone Management Act (CZMA) and the National Marine Sanctuary Act. The role of OCRM in offshore wind development issues is as a mediator or interpreter between the states and federal agencies on CZMA Federal Consistency issues.

Tom Skinner spoke about the role of the Massachusetts Office of Coastal Zone Management (CZM). CZM is involved in offshore development and has jurisdiction even if the development is outside of state waters, which generally extend three miles out from land. The agency becomes involved in the planning of proposed projects as early as possible to highlight the state’s enforceable coastal policies to prevent federal consistency issues. CZM reviews the impact of a proposed project on resources, fish and avian issues, as well as coastal geology.

Jay Wickersham, Massachusetts Environmental Policy Act (MEPA) Office, presented a case study on the Cape Wind Project off Cape Cod. In addition to dealing with the direct impacts of the project they also had to take into account the Massachusetts Renewable Portfolio Standard and numerical targets and the Northeast governors’ regional agreement on a climate change action plan. Mr. Wickersham noted that the question to develop or not is not just a legal question, but also political.

Mr. Wickersham noted the many lessons learned during the review to date for the Cape Wind project. First, coordination between government agencies is necessary. The MEPA Office was successful in coordinating the state agencies with the Corps and the Cape Cod Commission (CCC). The developers presented one set of documents to all agencies for review, reducing bureaucratic procedures. Second, developers need to be open to the public process. It helped that the developers were willing to participate in meetings and listen and respond to public opinion. Third, there is generally a lack of knowledge about the issues. Specifically, more information is needed about the environmental impacts. Some of this information may be found from the European projects, but ongoing monitoring will be critical. Finally, weighing benefits and impacts of the total project are necessary to determine if it is worth the time and effort. Benefits tend to be regional or national, such as fewer emissions, while the impacts are local, such as aesthetics. A non-build alternative should be used as the baseline, which includes the negative impacts of the same megawatts of fossil fuels. Costs and benefits also need to weigh the alternatives of other renewables. The Cape Wind project review, which is still ongoing, has been by no means perfect, but a good learning situation for all stakeholders.

Presentations: Issues Being Raised About Offshore Wind Development in the United States
Refer to attachment I for Mr. Raacke’s slides, attachment J for Ms. Burke and Mr. Watson’s slides.

Gordian Raacke, Citizen Advisory Panel Long Island (CAP), works as a consumer advocate and energy watchdog. Mr. Raacke is working with the Long Island Power Authority (LIPA) to determine the issues and concerns of experts and the public for an offshore wind project proposed for the area. The CAP is attempting to address the issues through outreach, education and advocacy. Mr. Raacke believes that one of the problems is the enormous amount of misinformation available on the web, which contributes to the public’s hesitation to accept the development. Based on his experience, one-on-one conversations work best in dealing with opposition. In response to public concerns, Mr. Raacke discusses the noise of the
turbines and presents landscape character assessments (providing detailed digital pictures preparing people for what the view will look like).

Kristen Burke and Greg Watson, Massachusetts Technology Collaborative (MTC), have been working on the Cape Wind proposal as an "honest broker" for information regarding the proposed offshore wind farm in Nantucket Sound, a similar role to the CAP and dealing with the same issues. Ms. Burke and Mr. Watson briefed the group on their role and intentions to inform the public with regards to the proposal. MTC is trying to work as an intermediary on the issue of offshore wind development. Ms. Burke stressed that the main concern is lack of information; in general the public knows very little about wind power and less about offshore. The MTC has hired a professional facilitator to assist in working with a broad stakeholder group to determine what the unanswered questions are and what needs to be learned. This stakeholder process is not intended to reach consensus on the project, but to assist in constructively framing the issues so all stakeholders can objectively and informatively comment on the Army Corps of Engineer's Draft Environmental Impact Statement.

Some have questioned the MTC's ability to remain impartial and unbiased on a project which promises a maximum of 400 MW to the region. Ms. Burke responded that failure of this project to fulfill its promises of energy and minimal environmental impact is not a positive step for the future of renewable energy development, part of the MTC's mission. Just as important as the development of renewable energy is for New England, it is more important any renewable energy development be well understood.

Next Steps

Meeting participants drew up a list of issues to be addressed:

- An overall education of the public needs to take place on the local level, including reports, to reduce the number of errors and over-exaggeration of facts concerning offshore wind power development. Information should be from a third-party neutral source.

- Many questions came up concerning how much information is available about the environmental marine impacts of the turbines during installation and operation. A centralized system or clearing house set-up was favored by some attendees.

A follow-up activity would be to streamline the overall regulatory process. While the federal government appears to be considering this task, it is important for state level agencies to follow suit. Assuming such a process takes some time to change, a manual outlining each agency’s responsibilities would be very useful.

- A study is needed to analyze the cumulative affects of offshore wind developments, environmental impact as well as economic development.

There seemed to be an acknowledgement that Europe was far ahead and there is a lot the United States developers and regulatory agencies could learn from their experiences. A follow-up workshop or paper summarizing the European experience was offered as a possible next step.

A. Arnold thanked all meeting participants for their contributions and noted the NWCC would elect whether to pursue any of these projects later in the year, or early in 2003.

The meeting adjourned at 5:15 pm.