Access System Framework for Regulating Offshore Wind Power in State Waters

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Published research suggests the presence of a large wind resource off the U.S. coast. Although there is considerable interest among wind power developers in the coastal states, few projects have been proposed to date. A major factor constraining resource development is the lack of a regulatory framework to provide access to the ocean space and allocate property rights to the submerged lands where the wind turbines can be installed. Efforts to address this void began in 2005 at the federal level, but it has progressed unevenly and unsuccessfully since that time. At the state level, no coastal state has adopted a comprehensive and detailed regime to regulate, manage, and oversee this new ocean use in state waters. This article examines various approaches taken by coastal states to facilitate existing and emerging ocean uses and recommends a regulatory framework for installing offshore wind turbines in state waters.

Keywords coastal zone regulation, energy policy, leasing, offshore wind power, permitting, state waters

Introduction

Coastal areas of the United States are home to a wealth of economic and natural resources. Accounting for more than half of the population (Crossett et al., 2004), coastal areas are some of the most densely populated and developed areas in the nation. Continuing demographic influx is changing land use patterns and straining critical resources. Because conventional energy sources are limited in coastal areas, most of the energy is imported either as fuel stock or electricity. Strong and growing demand strains existing energy infrastructure, congesting transmission linkages and inflating energy prices (U.S. DOE, August 2006; PJM, 2008).

Pollutants and greenhouse gas emissions from conventional sources are added concerns. Indeed, political leaders increasingly consider global warming the most important environmental issue, symbolized by the melting of sea-ice in the Arctic Ocean and accelerating loss of the Greenland ice sheet. Global warming has thus become a driver for developing carbon free energy sources at the regional, national, and global levels (see, e.g., the Regional Greenhouse Gas Initiative (RGGI), the Energy Policy Act of 2007 recently passed by the Congress, the 4th Assessment Reports issued by the Intergovernmental Panel on Climate Change (IPCC), and the Bali Climate Change Action Plan). For coastal states
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with strong ocean winds and wide continental shelves, one of the emerging large renewable energy resources is offshore wind power.

A gently sloping continental shelf, the presence of a large wind resource offshore along the Mid-Atlantic Bight (Kempton et al., 2007; Dhanju et al., 2008) and off the coast in other parts of the United States (Musial and Butterfield, 2004), along with high regional costs for conventional sources, make offshore wind power of particular interest in many coastal areas. As of January 2009, four utility-scale offshore wind installations were in the proposal stage in different coastal states (Delaware, Massachusetts, New Jersey, and Rhode Island). A fifth, smaller project that was being developed off of Long Island, New York, was recently put on hold; however, officials are now exploring a larger wind farm off the south shore of Queens, New York. Although the technology is still evolving, many technical challenges such as marination of wind turbines and offshore foundations have already been addressed during the design and operation of offshore wind farms in northern Europe.

Through November 2008, the installed capacity in Europe is close to 1.5 GW, and more than 30 GW is planned by 2015 (EWEA, 2008). Technical advances and operational experience highlight a remaining restraint on U.S. development of the offshore wind resource—the lack of a regulatory framework, both at federal and state levels.

When the first wind power project was proposed off the U.S. coast in federal waters in Nantucket Sound, the federal government had yet to establish a regime to regulate offshore renewable energy. Drawing on the experience of the offshore oil and gas regime managed by the Minerals Management Service (MMS), the land-based wind program run by the BLM, and experience in Europe, Firestone et al. (2004) made recommendations for an offshore wind regime. Shortly thereafter, Congress enacted the Energy Policy Act of 2005, granting the MMS jurisdiction to regulate offshore renewable energy and establishing a broad regulatory framework that was generally consistent with (although not necessarily as a result of) an approach advocated by Firestone et al. (2004). MMS completed a programmatic Environmental Impact Statement (PEIS) pursuant to the National Environmental Policy Act (NEPA) in November 2007. Following the PEIS, MMS released proposed rules for alternative energy in the outer continental shelf (OCS) in July 2008. Final rules are expected in late 2009.1

Although at first blush one might surmise that almost all offshore wind power development in the United States in the foreseeable future will take place in federal waters due to limited area under state oceanic waters (generally within 0–3 nautical miles of the coast), for a number of reasons that is likely not to be the case. First, coastal waters off Texas, the Gulf coast of Florida, and Puerto Rico are a notable exception to the 3 nautical mile rule, as state jurisdiction extends out to 9 nautical miles. Second, there are state inland estuarine waters in bays (e.g., Delaware Bay), where large wind farms could be cited that are not proximate to the shore. Third, the Great Lakes are state waters and a number of states (e.g., Ohio, Michigan, and Wisconsin) are exploring offshore wind power development.

Fourth, Firestone et al. (2008) found in a Delaware public opinion survey, that coastal residents (who lived on average 0.6 miles from the beach) prefer a large offshore wind farm at a distance of just over a mile from the shore to further fossil fuel development. Fifth, a coastal community, the town of Hull, Massachusetts, is actively working to develop a four turbine facility that will be 1.3 to 1.7 nautical miles offshore. Sixth, phase I of the proposed offshore wind project in Rhode Island will be a 20 megawatt (MW) facility in state waters. In light of an emerging consensus to address greenhouse gas emissions, the fact that many states have laws requiring that a certain fraction of electricity supply come from renewable sources known as renewable portfolio standards (RPS), and constrained
land-based renewable resources, these factors suggest that states may well desire to devise programs and rules to regulate offshore wind power.

Currently, states greatly differ in siting of new electric power facilities. Some states, such as Massachusetts, have institutions that have jurisdiction to consider whether proposed new generation facilities would be consistent with that state’s energy planning (e.g., the method of generation and the location of the facility). Massachusetts Energy Facilities Siting Board (MEFSB) is charged with licensing the construction of major energy infrastructure in the state, including large power plants and electric transmission lines. Other states, like Delaware, have not established specific institutions but instead rely on a state natural resource agency to supervise this process (although the Delaware Public Service Commission (PSC) does oversee long-term planning by regulated utilities under Title 26, Chapter 10 of the Delaware State Code). In either case, the regulatory scope of existing state institutions is limited and they often lack expertise and experience in managing offshore energy facilities.

In fact, no coastal state, other than Louisiana and Texas, is regulating offshore wind power development in any manner. Yet even in Louisiana, where its legislature adopted legislation to enable offshore wind resource development, the delegated state agency has yet to enact implementing regulations; in Texas, the General Lands Office is leasing out submerged lands to prospective developers as part of an executive initiative. In 2005, Texas conducted the nation’s first competitive lease sale for the rights to develop offshore wind power in the Gulf of Mexico. Four tracts, totaling 73,098 acres, were offered, bid on, and accepted. Three east coast states: New Jersey, Rhode Island, and Delaware, recently approved utility-scale offshore wind projects. New Jersey selected a project developer through a bidding process for a 345.6 MW project, and Rhode Island also used a bidding process to select a developer for an offshore wind power installation. New Jersey is offering $4 million to three developers to install meteorological towers to collect wind measurement data. Delaware also recently concluded a bidding process that led to a long-term power purchase agreement (PPA) between a regulated utility and Bluewater Wind, which will require the installation of a utility-scale offshore wind farm in federal waters.

All these activities at the state level underscore the importance of states establishing comprehensive regulatory frameworks for state waters now.²

Offshore Wind Power

An offshore wind power facility or farm is a collection of wind turbines in the ocean, bays, and other great bodies of water such as the Great Lakes to harness the prevailing wind resource. A wind farm can vary from a few (e.g., the proposed development off of Hull, Massachusetts) to hundreds of turbines (e.g., the proposed London Array project in the outer Thames estuary off the coast of the United Kingdom, which will have approximately 341 wind turbines, with a nameplate capacity³ of 1,000 MW). A wind turbine installed offshore is a “marinized” version of a land-based turbine—that is, it is modified to prevent corrosion from salt spray and operate in the comparatively harsh offshore conditions. These turbines are anchored to the ocean bottom using a gravity foundation or a driven monopole steel structure, and connected to an offshore electric transformer. A submerged cable from the transformer connects to a terrestrial substation and then electricity is transmitted on to the electric grid.

Offshore wind power projects differ from land-based ones in terms of the complexity of placing turbines at uneven water depths, laying submerged cables, and understanding the
environmental impacts of the offshore wind farm and the effects of the marine environment (e.g., salt spray and wave action) on the turbines. Maintenance presents some challenges, with safety of the crew being the critical issue.

The challenge of installing and operating an offshore installation and related increased costs are at least partially compensated by the gains in energy output. The smoothness of water surface as compared to that on land affords much lower surface friction, creating higher and more consistent wind speeds. Wind power is roughly a function of “cube” of the wind speed, and thus a small increase in wind speed results in much higher energy generation from wind turbines. Higher and steadier winds offshore coupled with the lack of utility-scale winds on-shore in many densely populated coastal states are the major reasons for interest in offshore wind resource.

Regulatory Challenges

Although problems can still arise in the harsh offshore environment, a decade and a half of successful installation and operation of facilities off the coast of Europe in the North Sea has largely addressed the technical challenges that would be faced by a developer of the offshore wind power. On the other hand, important regulatory issues, such as defining property rights in natural resources in the Atlantic ocean, which are in essence held in common (so-called common pool or open-access resources), and the concomitant leasing of marine resources (submerged land, the water column, and the airspace above) to prospective developers remains mostly unresolved in the United States. Offshore wind power, however, is not the first novel use to force regulators to face this challenge. Coastal states have successfully regulated other ocean uses that at one time were, or presently are novel, such as oil and gas exploration, sand and gravel mining, and open-ocean aquaculture (aka, mariculture or fish farming). Their experience in managing those resources provides insights that can be drawn on in crafting state offshore wind power regulations. To the extent a regulatory regime is adopted to govern offshore wind power in state waters, that regime will be influenced by the interplay between federal and state jurisdiction, discussed in next section.

State–Federal Coastal Jurisdictional Interplay

Control of resources in the oceans is divided by a boundary-line between state and federal waters. In response to a U.S. Supreme Court decision vesting all non-tidal oceanic submerged lands in the federal government, US v. California, 332 U.S. 19 (1947), Congress enacted the Submerged Lands Act (SLA) of 1953. The SLA effectively transferred ownership of submerged lands and superjacent waters within the first 3 nautical miles (9 nautical miles in the case of the Florida Gulf coast and Texas) and the right to exploit natural resources in that area to the adjacent state, subject to the federal government’s retained rights to regulate those lands and waters for navigation, national security, commerce, and the like. Thus, coastal states hold the rights to natural resources such as oil, gas, and wind located within 3 nautical miles of its coastline. States also have jurisdiction over the full extent of inland waters within the United States such as bays and the Great Lakes.

In 1953, Congress also enacted the Outer Continental Shelf Lands Act (OCSLA), which grants the Secretary of the Interior jurisdiction to lease outer continental shelf (OCS) lands for oil and gas exploration and development in the federal waters. The federal jurisdiction extends from 3 to at least 200 nautical miles (9–200 nautical miles in the case of the Florida Gulf coast and Texas), and includes the U.S. territorial sea, which extends to 12 nautical miles, and the 12–200 nautical-mile zone, which is designated
as the U.S. exclusive economic zone (EEZ) in the water, and the continental shelf, on the submerged lands. In addition, states control internal waters such as bays and the Great Lakes, where offshore wind power also may be viable.

State Regulation in the Coastal Zone

Within the state waters, the regulation of offshore wind power will be influenced by the existing state environmental and coastal zone regulations. As discussed earlier, offshore wind power along with other marine renewable energy sources is not actively regulated by any coastal state, thus an entity that wishes to develop a project in state waters must navigate through a state’s existing laws and regulations such as: state environmental protection acts (state parallels to NEPA), coastal siting laws, acts regulating structures on submerged lands, tidal wetland protection requirements, laws regulating the dredging and filling of state waters, coastal erosion management requirements, waterfront laws, and historic preservation regulations. As an example, in Table 1, we have compiled a check list of regulations pertinent to offshore wind power development in coastal states along the Mid-Atlantic Bight.

Although a wide variety of regulations typically would apply to a proposed resource development, they do not create a comprehensive regulatory framework reflecting the scope or the economic, ecological, and social aspects of the development of a large offshore wind farm.

Pertinent Federal Regulations in Offshore Waters

A host of other federal regulations will also bear on any development activity in state waters, including but not limited to Rivers and Harbors Act (RHA), Section 404 of Clean Water Act (CWA) (governing dredging and filling navigable water bodies, and wetlands adjacent thereto) by the U.S. Army Corps of Engineers (USACE) and the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA), which are jointly administered by the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) (Firestone et al., 2004). NEPA will require the lead federal agency, presumably USACE, in consultation with other agencies, to prepare an environmental assessment (EA), or if the environmental effects are significant, an environmental impact statement (EIS). Because the state resource agency will likely be the lead government agency and because USACE does not have expertise in resource management, USACE may rely in large part on the MMS programmatic EIS for alternative energy projects in federal waters and any state environmental evaluation of the offshore wind power proposal. A further complicating issue would arise if a project straddled state and federal waters. Given the close proximity of the state–federal boundary line to the coast, such an eventuality is conceivable. In that case, the state would be the lead agency for the project in state waters while MMS would be the lead agency in federal waters. Concerns of various federal agencies such as the Federal Aviation Administration will also need to be addressed. For a full list of pertinent regulations, their jurisdiction, and potential applicability refer Firestone et al. (2004).

The Federal Coastal Zone Management Act (CZMA) of 1972 adds another regulatory layer. It encourages coastal states to prepare and gain federal agency approval of state coastal zone management plans. Most importantly for present purposes, it allows a coastal state with an approved coastal program plan to review for consistency with that state’s coastal zone management plan, federal projects, and applications for federal permits and licenses to “conduct an activity, in or outside of the coastal zone, affecting any land or
Table 1
Coastal state regulations pertinent to offshore wind power development

<table>
<thead>
<tr>
<th>State</th>
<th>State Environmental Policy Act (State NEPA)</th>
<th>Coastal area review facility</th>
<th>Submerged lands permit</th>
<th>Tidal wetland protection permit</th>
<th>Dredging permit</th>
<th>Coastal erosion mgt. permit</th>
<th>Waterfront development permit</th>
<th>Historic resource permit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine</td>
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<td>√</td>
<td>√</td>
<td>√</td>
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<td>Massachusetts</td>
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<td>Rhode Island</td>
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<td>Connecticut</td>
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<td>New York</td>
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<td>√</td>
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<tr>
<td>New Jersey</td>
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<td>√</td>
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<tr>
<td>Delaware</td>
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<td>√</td>
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<tr>
<td>Maryland</td>
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<td>√</td>
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<tr>
<td>Virginia</td>
<td></td>
<td></td>
<td>√</td>
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<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>North Carolina</td>
<td></td>
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<td>√</td>
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<td>√</td>
</tr>
</tbody>
</table>

1. These are general permits requirements that are pertinent to offshore wind power development.
2. Some states require specific permitting under an umbrella coastal act for any facility that might have an impact on the coastal zone.
3. Rhode Island follows a different regulatory mechanism through a “Coastal Resource Management Council.”
water use or natural resource of the coastal zone” (NOAA, 2002). The review under the
provisions of federal consistency is a comprehensive review of an activity’s effect on the
coastal zone, including impacts to environmental quality, navigation, fish and wildlife,
commerce, and tourism. Upon completion of the review, a coastal state can choose to
concur, issue a concurrence that places conditions on the license or permit should one be
issued, or file an objection. If a coastal state decides not to concur in the issuance of a
federal permit or license, the permit or license cannot be issued without a decision by the
U.S. Secretary of Commerce to override the state position—a decision that is rarely made
and that in any event only can be made on very narrow grounds.

The key here, however, is that the consistency review can only be based on enforceable
policies included in the state’s NOAA-approved coastal zone management plan. These
enforceable policies need to be based on existing state regulations and cannot go beyond
(be stricter) than state law. As federal consistency review limits a coastal state’s authority
over a proposed project to speak to the arguable effects of an activity, a state cannot
categorically prohibit or allow a particular use, such as offshore wind. As all enforceable
policies are rooted in existing laws, the state coastal program is responsible for including
updates and additions to existing laws in relevant Routine Program Changes submitted to
NOAA.

Examples of how a state might be able to influence development in federal waters
include: creating triggers for cessation of operations to protect migratory birds, creating
exclusion zones in certain types of habitat, and establishing preferences for tract size.
Thus, even those states that do not intend to develop near-shore oceanic waters because of
view-shed, competing uses, or environmental concerns, could obtain benefits from crafting
an offshore wind power development strategy/policy/law.

In Section 388 of the Energy Policy Act of 2005, Congress set forth with a broad brush
the program for regulation of alternative energy development, including wind power, in
federal offshore waters. MMS has worked to develop detailed rules to implement Section
388. Proposed rules were released in July 2008, and final rules are expected in 2009. One
subsection of particular interest to coastal states amends the OCSLA Section 8(g) program
and provides that 27% of the rents and royalties obtained from an offshore wind project
that has at least one turbine within 3 nautical miles (6.9 miles) seaward of state submerged
lands. Thus, to the extent development occurs in federal waters, a coastal state would have
a financial interest in that development occurring within 6 nautical miles from the coast.

Although federal initiatives such as proposed revenue sharing mechanisms in Section
388 of Energy Act 2005 and MMS’s current rulemaking efforts will likely strongly influence,
guide, and set the tone for many state regulatory efforts, we explore those issues here
independent of those initiatives.

Property Rights and Common Pool Resources

Property rights are the social institutions that define or limit the range of privileges granted to
individuals or corporations to specific assets, such as parcels of land or access to freshwater
resources. Property-rights institutions range from formal arrangements to informal customs
and conventions and affect decision-making regarding resource use. On land, with few
exceptions (e.g., state or national park or forest land), land owners and private entities own
exclusive property rights to the surface and subsurface resources. In accordance with local
land use laws and zoning regulations, owners can exercise these rights.

A common pool resource such as the ocean, on the other hand, is characterized by
two elements. First, it is sufficiently large to make it costly (but not impossible) to exclude
potential beneficiaries from obtaining benefits from its use (Ostrom, 1990). The difficulty of exclusion arises from several factors including the cost of parceling or fencing the resource and the cost of designing and enforcing property rights to control access to the resource. The second issue is one of subtractability; when a unit of a larger common pool resource is withdrawn, it is no longer available to other participants in the resource system (Knight, 2002). Because ocean (or bay) space occupied by one offshore wind developer is not available to other developers, and will diminish, if not closed off to competing uses, the issue of subtractability is of concern for offshore wind power development.

Common pool resources such as oceans can be plagued with what Garrett Hardin in a famous essay referred to as the “Tragedy of the Commons”—that is, they are at risk of over-exploitation due to aggregated effect of multiple users, each pursuing his or her own best interest (Hardin, 1968). Efforts by a coastal state to manage these areas may limit the access to open-access resources, arguably limiting some of the existing public rights. At the same time, such limits, if well imposed, create conditions for conservation of the resources, its sustainable use and harvest, and fair compensation for its use.

Offshore wind power development presents a challenge to resource managers to control and manage access and, if desired, at the same time, to encourage development of the resource. A well-designed system can achieve either or both of these goals. At its core, effective management requires defining property interests in a resource. Property rights, however, are not a unitary concept, but a bundle of separable rights that can be split or shared in different ways (Yandle et al., 2006). Schlager and Ostrom (1992) break property rights into groupings of operation level rights, including access (right to enter), withdrawal (right to extract), management (right to regulate internal use), exclusion (right to deny access), and alienation (right to sell, lease, or transfer). We term this collection of features the access system framework. An access system framework for offshore wind power in state waters will be explored in the following sections. A similar study by Hoagland et al. (2006) outlines a legal and regulatory framework for siting offshore wind energy facilities. It draws on the existing regulations for siting offshore wind turbines in foreign jurisdictions, and regulations in the United States for managing public lands and resources in federal water. This study differs in its scope in that it focuses exclusively on state waters and draws on the experiences of coastal states in regulating various ocean uses.

Methodology

This article examines the approaches by coastal states to facilitate ocean uses—approaches that govern either the extraction of nonrenewable resources or the leasing of ocean space. The four uses that we consider are: oil and gas extraction, open ocean aquaculture, sand and gravel mining, and offshore wind power development. Telephone interviews were conducted with resource managers in Alaska, Delaware, California, Florida, Louisiana, Hawaii, Rhode Island, and Texas to provide further insight into the goals, objectives, and methods employed in the programs. These states were chosen because of their experience in actively regulating one or more of the four marine uses we consider.

Data were collected on eight key regulatory elements: management structure; leasing systems; length of tenure; transferability of the leasehold; public input into the process; financial terms for allocating property rights; decommissioning rules; and mechanisms for resolution of multiple use conflicts.
Framework for Regulating Offshore Wind Power

In addition, we provide recommendations regarding the necessity and extent of environmental assessment that would be required prior to lease issuance. Finally, after examining options under each regulatory element, a course of action is recommended.

Access System Framework

The structure we propose is premised on the notion that the regime will be characterized by the economic aspects of fair competition for using common pool resources, sociopolitical aspects of fostering co-operation and avoiding conflict among diverse stakeholders, and policy aspects of designing an efficient management structure. The following sections explore in detail various elements of a regulatory structure for offshore wind power development in state waters.

Management Structure

Some coastal states regulate ocean uses through a single agency or department, while others are managed through multiple agency structures with a lead agency supervising the process (see Table 2). A centralized management structure benefits from streamlined single-window permitting for resource prospectors and developers. The Division of Oil and Gas in Alaska and State Mineral Board in Louisiana are central agencies regulating mineral resources in their respective states. Similarly, the General Lands Office (GLO) uses this model to lease ocean space for offshore wind power development off Texas. A drawback of this approach is that some critical agencies (e.g., those that regulate pollution discharge) that can contribute and enrich the decision process with their expertise are not directly involved. Nevertheless, even in that instance, the NEPA process associated with the consideration of a USACE permit would facilitate input from other agencies.

A decentralized management structure distributes resource management responsibility across various agencies, potentially creating a diverse stakeholder group because each agency has its own distinct constituency. With a diverse management structure there remains the need for a lead agency to supervise the process, while other agencies contribute to the process through their specialized expertise and skills. Texas aquaculture leasing is an example of decentralized management structure, where resource leasing is handled by multiple agencies with Texas Department of Agriculture as the lead agency. In absence of a strong coordinating mechanism, however, this approach can create red tape and bureaucratic delays for resource developers.

Lease Systems

How government is to go about leasing rights to ocean space is a critical issue in resource management. Rights to resources such as telecommunication spectra, non-renewable oil and gas resources, and water column resources are allocated using one or a combination of three methods: first-come, first-serve (FCFS); competitive leasing; and auctioning (see Table 3).

A first-come, first-serve system allocates a lease to the first entrepreneur interested in harnessing a particular resource in a specified location. First possession rules are attractive because they recognize incumbent parties who may be more likely to have previous experience in exploiting similar resources elsewhere. Incumbents often have direct stake in access to the resource and will be important constituents in any resource distribution (Libecap, 2006). This system also recognizes first-movers, innovators, entrepreneurs, and
<table>
<thead>
<tr>
<th>Management option</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Examplesa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralized</td>
<td>Efficiency</td>
<td>More limited input from other agencies, though NEPA would require inter-agency</td>
<td>AK &amp; LA oil and gas; TX</td>
</tr>
<tr>
<td>one-agency</td>
<td></td>
<td>consultation and coordination</td>
<td>offshore wind power</td>
</tr>
<tr>
<td>Decentralized</td>
<td>Diverse stakeholder agencies with</td>
<td>Greater coordination among agencies, red tape and bureaucratic delays</td>
<td>TX aquaculture</td>
</tr>
<tr>
<td>multiple agency</td>
<td>different interested parties, wider skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and expertise in management process</td>
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</tbody>
</table>

1 States listed are examples of the various management options presented.
Table 3
Lease systems

<table>
<thead>
<tr>
<th>Management option</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-Come, First-Serve</td>
<td>Recognizes first movers, entrepreneurs, innovators</td>
<td>May lack optimal utilization of resources. Speculators &amp; frivolous developers</td>
<td>HI &amp; LA aquaculture</td>
</tr>
<tr>
<td>Competitive Leasing</td>
<td>Transparency &amp; efficiency</td>
<td>Inflated bidding</td>
<td>LA oil &amp; gas, more recently TX offshore wind power</td>
</tr>
<tr>
<td>Auctioning</td>
<td>Reveals information on market price of resource</td>
<td>Inflated resource valuations</td>
<td>—</td>
</tr>
<tr>
<td>Long Term Power Purchase Agreement</td>
<td>Guarantees financial returns and certainty for novel resource development</td>
<td>—</td>
<td>Proposed DE offshore wind power project</td>
</tr>
</tbody>
</table>
risk-takers to experiment with resource development. Society benefits from such activities, and first-possession recognizes such actions. Aquaculture in Hawaii and Louisiana and the initial leasing of submerged tracts for offshore wind power in Texas followed this principal in allocating resource property rights.

Although it offers expedited resource development and a penchant for risk-taking ventures, FCFS may not always result in optimal utilization of the resource (environmental and social impacts may not be minimized). Initial developers may lack expertise to develop the resource to its greatest potential, and the subtractability principle would make the same resource unavailable to other potential users. Further, it may attract speculators and frivolous applications from prospective developers who may “flip” and sell development rights at a profit with no value added to a more qualified developer. Introducing performance requirements such as turbine availability for energy generation, and instituting state-level review of performance and a penalty system for deficient performance or defaulting on performance can ameliorate some of the drawbacks of this system.

Prior to the passage of the Energy Policy Act of 2005, the federal system could rightly be characterized as first-come, first-serve. Indeed, much of the criticism leveled at the 420 MW Cape Wind project in Nantucket Sound, off of Cape Cod, Massachusetts, stems from the fact that a private entity, Energy Management, Inc., selected the site location (Kempton et al., 2005). Another early entrant was Winergy, LLC (now known as Deepwater Wind), which mapped out more than a dozen specific locations in the Mid-Atlantic with a stated intention to develop large offshore wind farms. Winergy, never moved forward on any of those large sites, although it (Deepwater Wind) was the winning bidder in Rhode Island, and, in partnership with the utility, PSEG, the winning bidder in New Jersey.

Competitive leasing avoids the distribution concerns associated with first-possession. In this process, the resource developer submits a sealed bid to the issuer and the resource is awarded to the developer with the best mix of price, experience, technical expertise, financial capability, project location, number of turbines and nameplate capacity, and other relevant criteria (e.g., project completion date). Transaction costs, while higher than FCFS, are still low and there are few efficiency implications in this process (Libecap, 2006). It is favored in mineral leasing activity because it facilitates greater competition in resource exploitation and higher revenues for the state. Transparency and efficiency are major advantages of the process. Louisiana oil and gas extraction and more recently Texas offshore wind power are examples of competitive leasing. A problem with this process is that it may result in bids that are so high that the project might be abandoned before development. Introducing an evaluation system based on criteria other than price to evaluate prospective developers’ financial status and their development, environmental assessment, and public outreach plans, can mitigate some of that drawback.

With auctioning, rights are sold to the highest bidder provided a clearing price is reached. Auctioning thus places the offshore resource into the hands of that individual or entity with highest value for the resource. A bid reveals approximately a bidder’s valuation of a resource, but it underestimates the value of the resource because bidders bid prices that allow them to retain some profit. But if there are sufficient bidders with good information on the resource, then bids tend to reflect the market price of the resource. Auctioning is not just about raising money, it also reveals information about the value of the resource (Libecap, 2006). Like competitive leasing, a drawback of this process is that for novel uses with no prior development history, markets may create inflated resource valuations based on expected future policy and technical developments. Such developments may not materialize, thereby adversely impacting resource development. No example in our database follows the auctioning process.
The three allocation methods can be entirely developer driven (e.g., a particular tract is competitively leased or auctioned after a developer approaches the leasing agency expressing interest in developing that tract) or they can be used in conjunction with and subsequent to a tract being “pre-designed” by the resource management agency. In the latter instance an agency conducts pre-leasing studies and outreach programs to determine suitable tracts. Identified tracts are then offered to prospective resource developers. If done appropriately and comprehensively, pre-designated leasing avoids conflicts with existing uses due to extensive stakeholder consultations that are undertaken before leasing out the tracts. MMS periodically offers pre-designated offshore tracts for oil and gas development through a bidding process. A drawback of this approach is that the resource agency that intends to lease the tracts has to spend public resources for stakeholder outreach efforts, without a guarantee of recouping these costs through the leasing process. Moreover, unless the selection of pre-designated tracts is based on extensive resource and site analysis, the tracts offered may not be the most optimal sites for resource development.

Given the high upfront capital costs, a variable that has played out on several occasions to date and is likely to be the dominant mode in the near future for developing offshore wind power resource is where developers bid to supply new power pursuant to a long-term power purchase agreement (PPA) with the local electric utility, a public power authority, or the state, rather than engage in a competition for specific ocean space. The state or the local electric utility will negotiate with prospective developers, signing a long-term PPA with the successful bidder. Next, MMS (if in federal waters) or the state resource management agency (if in state waters) will allocate property rights for the tract that the winning bidder proposed to develop, provided that selected site is confirmed after extensive environmental review and stakeholder and public outreach process and inputs. Examples include the 2006 Delaware request for proposals for new power generation that led to the Bluewater Wind bid in an all generation source bidding competition before the four state agencies; the Long Island Power Authority (LIPA) offshore wind bidding competition that was recently put on hold due to projected high costs associated with the project; the New Jersey Board bidding competition for 345.6 MW of offshore wind power; and the Rhode Island bidding process for an offshore wind farm to serve 15% of the state’s average electric load. If a PPA model is employed, care must be taken to ensure that the subsequent environmental evaluation of the potential impacts of the project is carried out with the same integrity that it would be if an agreement for new power was not already in hand; this may be easier if the PPA includes more than one potential location for offshore wind power development.

A state also should consider whether it will allow wind power development in state waters that is not part of a PPA that will be selling energy to its residents. That is, does a state want to develop its coastal waters for wind power that does not directly benefit its citizens in terms of energy use, but that would nevertheless provide good high-paying jobs, have significant economic development benefits for the state, and contribute to the national and global response to climate change?

Any regulatory effort should also build in enough flexibility to allow the resource management agency to consider the emergence of alternative models such as merchant wind power installations wherein the generated energy is sold in the regional day-ahead or hourly markets, or via power purchase agreements with out-of-state utilities. Both of these models are facilitated by regional markets managed by Regional Transmission Organizations (RTOs) such as PJM, and would result in trading and retailing of renewable energy generated in regional markets.
Public Process to Debate New Ocean Uses

The first proposed offshore wind power project in the United States, off Cape Cod in Massachusetts, faced a vocal opposition from multiple stakeholders, largely due to a well-funded opposition and mis-information or lack of accurate information on impacts and effects of the proposed project on the Nantucket sound environment (Firestone & Kempton, 2007; Firestone et al., 2009). A well-designed regulatory regime (Firestone et al., 2004), including a statewide public process to debate proposed activities, can outline contentious issues, educate stakeholders about the impacts of a proposed project, provide a forum for stakeholders to voice concerns and influence project development, and, to the extent feasible and appropriate, address stakeholder concerns. Moreover, public processes can provide a sense of ownership to the participating public even when they do not engage in the complex analyses that are of most use to the public decision-makers. It can be particularly effective in a small state like Delaware as experienced with the recent public hearings conducted by DE Public Service Commission (PSC) where a hearing or workshop can be held in each of Delaware’s three counties. Creating a Web-based docket, as the PSC has done on the bid for new power generation, allowing comments to be sent in by electronic means, and establishing an e-mail service list of interested parties for the filing of pertinent documents can also enhance participation. The public processes employed in oil and gas leasing and in leasing ocean space for aquaculture also provide a starting point for a public process for offshore wind power.

Moreover, we recommend an open public process with the maximum amount of transparency to establish regulations to allow input from various stakeholders, thereby laying a foundation for greater stakeholder involvement on proposed wind power projects. Coastal states could consider at least three different formats: notice and written comment; notice and written comments supplemented by open public hearings and input comments by other public agencies (essentially the NEPA model); and an independent commission model. The notice and comment model uses official websites, newspaper notices, and television and radio stations to reach out to various stakeholders and solicit comments. The initial outreach effort is followed by a phase during which comments are accepted from stakeholders. The benefit of this model is that the public agency reaches out to a large number of stakeholders relatively quickly and easily. California aquaculture management follows this model for leasing offshore tracts. On the downside, this model may not facilitate or create public space for interaction among various stakeholders to foster larger public debate on the issue.

In addition to soliciting comments, some resource agencies conduct open public meetings over a period of time for a greater involved approach with multiple stakeholder interactions. Stakeholders are encouraged to submit comments during such meetings, which are documented and processed by the resource management agency. This effort addresses the drawbacks of the previous approach by creating space for the greater public debate. Louisiana aquaculture leasing follows this approach, with the LA Department of Wildlife and Fisheries conducting open public meetings before leasing tracts. An expanded version of this approach is followed by Florida Division of Aquaculture (FDA). In addition to public hearings, FDA circulates a resource management plan to other state agencies for their input, and utilizes their expertise in the process. The odds that public meetings will achieve their objectives of an informed public and a public that informs decision-makers will increase with a well-planned and executed publicity campaign. Indeed, it requires considerable time and other resources to manage open public meetings and obtain feedback from other state agencies that may not be directly involved with the leasing process. The downside is that
all this advance planning can significantly delay the leasing process, causing financial loss
to the state and the prospective developers, and delay the development of carbon-free wind
ergy.

Independent commissions are seldom used in resource management. Often their in-
volve ment in resource management is the result of a legislative mandate or an executive
order. Commissions carry out all deliberations on resource management through an open
public process, and the process benefits from the expertise and diversity of backgrounds and
experience of commission members. The Delaware Public Service Commission (DPSC)
recently evaluated bids for new power by involving the public in the crafting of the lan-
guage and scoring of the RFP, providing an opportunity for written public comment, and
conducting public meetings across the state. On a cautionary note, Commissioners in many
states are appointed by political representatives and thus may not provide a non-partisan
platform.

Final choice of a public process is likely to be influenced by the lease system (com-
petitive bids, first-come, first-serve, auctioning, or leasing through a power purchase agree-
ment) and the entity (private resource developer, public power authority, or public agency)
proposing the offshore wind power installation (see Table 4). In addition to a public com-
ment/debate period, it is advisable to include an educational component in the leasing
process, to discuss scientific research on impacts and benefits of a proposed facility and
debate resource management strategies. Although often an undervalued component of the
environmental assessment process, research indicates that public education processes, in
general, improve involvement in the environmental impact assessment process (Sinclair &
Diduck, 1995). Some popular education techniques are citizen training, open houses, plain
language of legal text, videos, websites, and phone lines.

Tenure (Duration of Lease) Models

There are four prevalent tenure models: fixed tenure; year-to-year lease; variable time
lease; and habendum clause. In a fixed-tenure arrangement, resources are leased out for a
pre-determined period of time, usually 10–25 years,\textsuperscript{15} often with an option to renew the
lease thereafter. However, if instances of non-compliance with the agreement or law occur
or unacceptably large environmental impacts arise during the leasehold, lease agreements
typically would have a suspension and/or cancellation provision. Such clauses are required
by the OCSLA,\textsuperscript{16} which could serve as a model for the coastal states.

Fixed-tenure agreements can be beneficial for capital-intensive projects, as they facil-
itate long-term financing at reasonable terms. Hawaii, Florida, and Louisiana aquaculture
follow this model in leasing water columns and submerged lands to resource developers.
A potential downside of the fixed-tenure model is that it locks development of a resource
for an extended time period, and the management agency may fail to capture appreciation
in market value of the resource as increased revenues.

In a year-to-year tenure system, a lease is renewed annually, contingent on satisfactory
performance by the developer. This approach is used mainly for living resource management
where the impact of resource extraction on environmental quality is a major concern.
It allows a resource agency to implement strict resource development and management
protocols. Texas aquaculture is an example of this approach. Given the large upfront
costs of developing offshore wind power, a year-to-year model, by introducing significant
uncertainty on the developer side, would almost certainly forestall resource development.
### Table 4
Public process options

<table>
<thead>
<tr>
<th>Management option</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Comments Period</td>
<td>Reaches out to large number of stakeholders with ease</td>
<td>Does not create public space for debate</td>
<td>CA aquaculture</td>
</tr>
<tr>
<td>Open Public Hearings + Comments</td>
<td>Creates space for stakeholder interaction</td>
<td>Requires public campaign and logistic management</td>
<td>FL aquaculture</td>
</tr>
<tr>
<td>by Other Public Agencies</td>
<td>Benefits from expertise of Commission members and staff</td>
<td>Commissioner appointments are political</td>
<td>DE bid for new power</td>
</tr>
<tr>
<td>Independent Commission Model</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
With a variable lease model, tracts are leased for a varying number of years (e.g., 5, 7, or 10 years), often depending on the tract location and possibility of enhancing revenues through fresh leases. This model introduces flexibility missing in the fixed tenure model and provides discretion to the resource agency to set the lease period. It also avoids locking resource development for an extended period of time and, in a case of anticipated appreciation in resource value, allows an agency to capture the higher value in the next phase of leasing. Alaska offshore oil and gas leasing follows the variable lease model. However, for large capital projects, this approach can introduce significant uncertainty if the information on lease terms and lease period is not made firm beforehand.

A habendum clause, where a lease is good until the resource lasts, is prevalent in mineral resource leasing. This allows leaseholders to extract a resource until it is exhausted. Because the wind is renewable, a habendum clause would not be applicable in the offshore wind power context, and is not discussed further.

Given the high cost of resource assessment and installation, and the importance of financing at affordable interest rates, a fixed tenure model is in our view the preferred model for offshore wind power development. We recommend that leases should be for at least 10 years. Bluewater Wind’s project off the Delaware coast is illustrative. Its upfront development cost is many times that of a similarly sized natural gas power installation, although the ultimate cost per megawatt-hour (MWh) of energy generated from the natural gas plant may cost more than that from the Bluewater project due to unknown future costs of natural gas and carbon allowances and other considerations. For a summary see Table 5.

**Tract Size**

Tract size is the area of submerged land and water column leased out by the management agency for resource development. The tract size we consider here is the total area enclosed by the wind farm, including both the footprint of the wind turbines and the area between turbines. We consider this total area despite the fact that we also recommend that the area between turbines be open to compatible uses such as recreational boating and fishing. Coastal states can regulate tract size using one of four models: no-limit; negotiation; defined upper limit; or not-hinder-open-access.

The “no-limit” model places no pre-determined restriction on tract size. Resource developers determine the size of the project and request leasing of tracts, although the law could provide state resource agencies with the ability to place limitations on tract size on a case-by-case basis. This model provides flexibility for project developers and is followed by the State of Alaska for aquaculture. An unintended consequence of this approach is that a developer may lease a much larger tract than required for a proposed project to prevent competitive development in nearby areas. Even if the over-leasing is inadvertent, it acts to impair at least to some extent the use of the area by others.

A second model encourages potential developers to “negotiate” tract size with resource managers. Negotiations are influenced by the proposed project size and by exclusion zones (e.g., the location of a sand and gravel site, a former dump site, or an avian migration pathway), if any. Access to information on resource potential and competing uses are important components in this process and resource managers seek active input from developers and other stakeholders on location and size of tracts. Initially, leasing tracts for offshore wind power in Texas coastal waters was a negotiated process between the General Lands Office and resource developers. However, it is difficult to implement this model in a competitive bidding process with multiple interested developers, many of whom may not want to make their development plans public before the lease agreement.
### Table 5
Options for the duration of a lease

<table>
<thead>
<tr>
<th>Management option</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Tenure</td>
<td>Beneficial to capital intensive projects; facilitates inexpensive financing</td>
<td>Locks resource with one developer for a long time; may not capture resource appreciation as revenues</td>
<td>HI, FL, &amp; LA aquaculture</td>
</tr>
<tr>
<td>Year-to-Year Lease</td>
<td>Strict resource development oversight by resource agency</td>
<td>Creates uncertainty and can hinder resource development</td>
<td>TX aquaculture</td>
</tr>
<tr>
<td>Variable Time Lease</td>
<td>Flexibility and benefit from resource appreciation</td>
<td>Uncertainty for resource development with large upfront costs</td>
<td>AK oil and gas</td>
</tr>
</tbody>
</table>
Some states dictate the tract size, with an upper limit specified. This approach allows flexibility in leasing tracts while preventing occupation of unusually large tracts by private developers. California oil and gas and Louisiana aquaculture are examples of this approach. To the extent a coastal state was to adopt this approach, it should impose a sufficiently high upper limit so as not to impair the economies of scale that can be achieved with large wind farms. This is highlighted by comparing the recent decision by Long Island Power Authority (LIPA) to put on hold a smaller 144 MW offshore wind project, to the movement in Delaware and New Jersey toward larger offshore wind farms (350–600 MW); the price differential per kilowatt-hour (kWh) between Bluewater’s 600 MW and 450 MW project proposals; and findings in Rhode Island comparing the costs associated with a 30 and 200 MW offshore wind power project (RIWINDS, 2007).

“Not hinder open access” is the fourth model, wherein no restriction is placed on the tract size unless it hinders open access to a resource by other users. This model prevents user conflict through spatial separation of various uses. It is employed by the Hawaii aquaculture program. A drawback of this approach is that a strict separation-of-use policy discourages synergetic resource uses such as offshore wind power and recreational fishing.

A possible variant suitable for offshore wind power installation is to limit the number of turbines (or MW installed) rather than the tract size. This allows developers to optimally configure the wind farm to reduce the effect of one turbine on another’s potential to capture the wind (the so-called wake effect) (Elkinton et al., 2006) and avoid conflict with other resources and resource uses (see Table 6).

Transferability and Financial Assurance

Abandonment prior to operation, liability during project operation, and decommissioning concerns after the useful life of the project are three important issues that are implicated if a project’s ownership or control has been transferred after lease issuance. In handling these issues, resource agencies use one of three prevalent models: “one-link-one-permit”; “transfer of lease with permission”; and “transfer-at-will.” Because a lease is specific as to the allowed uses, transfer should not alter the intended use of a leased tract (see Table 7).

Sale and transfer of a lease is not permitted in the “one-link-one-permit” model; rather, the site reverts back to the state resource management agency control. Forbidding transfer of property rights simplifies the lease arrangement and creates a single liable entity for life of the project. Texas offshore wind power and Texas aquaculture resource leasing follow this management option. This option locks the original lessee into a long term resource development plan and prevents change in ownership and transfer of a resource to a more efficient developer or to one that places a higher value on the resource.

A second model allows “transfer of a lease with permission” of the lead resource management agency. It requires fulfilling certain conditions and a fee is charged to cover the administrative expenses. The resource agency evaluates lease transfer applications on a case-by-case basis. This model creates an efficient process for lease transfer. California, Alaska, and Florida aquaculture along with Alaska oil and gas follow this model. Success of the model depends on the ability to scrutinize financial and technical strength of the new developer and transfer and enforcement of decommissioning liability. Given different ways in which businesses (e.g., corporations, trusts, partnerships, joint ventures) and sales of those businesses can take (e.g., merger, stock sale, purchase of assets), it is important when drafting such a provision to include within the ambit of the provision transfer of legal or beneficial ownership or control of the lessee or lease.
### Table 6
Tract size options

<table>
<thead>
<tr>
<th>Management option</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Limit Negotiation</td>
<td>Flexibility for project developers</td>
<td>May be used to impair competition</td>
<td>AK aquaculture</td>
</tr>
<tr>
<td></td>
<td>Input of various stakeholders and prospective developers in defining tract size</td>
<td>Difficult to follow in competitive bidding process</td>
<td>TX offshore wind power</td>
</tr>
<tr>
<td>Defined Upper Limit</td>
<td>Prevents occupation of unusually large tracts</td>
<td>May limit size of wind farm to uneconomical size</td>
<td>CA oil &amp; gas; LA aquaculture</td>
</tr>
<tr>
<td>Not Hinder Open Access</td>
<td>Prevents user conflicts through spatial separation of uses</td>
<td>Prevents synergetic development of uses</td>
<td>HI aquaculture</td>
</tr>
</tbody>
</table>
Table 7
Lease transfer restrictions

<table>
<thead>
<tr>
<th>Management option</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-Link–One-Permit</td>
<td>Single liable entity</td>
<td>Prevents migration of resource to efficient developer</td>
<td>TX aquaculture</td>
</tr>
<tr>
<td>Transfer of Lease with Permission</td>
<td>Efficient process; protects State</td>
<td>May lack ability to scrutinize financial and technical strength of the new developer. May generate issue around decommissioning liability</td>
<td>CA, AK, &amp; FL aquaculture and CA oil and gas.</td>
</tr>
<tr>
<td>Transfer At Will</td>
<td>Autonomy to developers</td>
<td>Concerns over decommissioning liability</td>
<td>HI aquaculture</td>
</tr>
</tbody>
</table>
The “transfer-at-will” model allows a resource developer to transfer or sell a lease independent of resource management agency influence. It provides a free market approach and permits the developer to decide ownership and control issues without external influence. Some minor conditions such as notice to the state resource agency may still be required in the process. Resources tend to migrate to developers that place a higher value on the resource in this scenario. Hawaii aquaculture follows this model.

When allowing transfer (either with permission or authorizing it “at-will”), it is important for legislation to require both the original lessee and the entity to whom the lease is being transferred to be responsible for maintaining any performance bond to ensure completion of construction and decommissioning and closure, and for having liability to the state should any issues arise in the future. The transferor and the transferee can decide among themselves how to allocate these responsibilities in the second instance, but both should have responsibilities vis-à-vis the state.

Transferability issues with offshore wind power projects are not only about change of ownership but also control and liability. An upfront decommissioning/liability trust fund or performance bond can be set up to address some of these issues. In addition, the state could condition transfer approval on the reimbursement of the administrative costs incurred to review and oversee the transfer. Given the importance and costs associated with decommissioning, a transfer-on-permission clause is an appropriate model in the offshore wind power context.

Financial Terms for Allocation

Linking financial terms to allocating property rights creates legitimacy in the leasing process and allows a resource agency to charge reasonable rent for harnessing a public resource. The Bureau of Land Management (BLM) wind energy program is a good example of leasing public lands for wind power development. In 2005, it conducted a programmatic environmental impact statement (PEIS) to establish new policies for wind power development on federal public lands (which are found in the western United States). In a related rulemaking process, the BLM (2008) established a base annual rental fee of $4,155/MW. Rent, however, is reduced during the first two years: 25% in year one and 50% in year two.

Similarly, in Texas, compensation gradually increases over the life of the project. However, Texas collects a production royalty based on gross revenues. It also ensures that revenues do not fall below a specified amount by setting an annual minimum royalty amount, which is based on installed MW capacity of the wind farm. Following the oil and gas model, payments are then funneled into the Texas Permanent School Fund.

A coastal state could implement a program modeled on the BLM or the recent Texas offshore wind power model, or more generally choose among the following options: variations in rent structures (rent only or rent with bonus); royalty (production with or without an annual minimum); or a combination of bonus, rent, and royalty (see Table 8). In any event, a coastal state will want to continue to closely follow developments at the federal level to ensure that its program is not working at cross-purposes with MMS’s.

Rent charged for a resource use is a widely used financial model for allocating property rights. It is a periodic payment by the holder of a lease during the primary lease term for the right to use a resource for purposes established in the lease. In some cases, rent is combined with an upfront bonus, usually to defer the administrative costs associated with the leasing process. Provision of rent provides certainty of dedicated financial returns to the government. Rents may be graduated with the size of resource or independent of it. For example, California charges aquaculturalists $2 per acre for tracts of less than 10 acres.
<table>
<thead>
<tr>
<th>Management option</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variation of Rent Structure</td>
<td>Certainty of financial returns for resource agency</td>
<td>Rent calculations over-ambitious; may hinder resource development</td>
<td>CA and FL aquaculture</td>
</tr>
<tr>
<td>Minimum Annual + Production Royalty</td>
<td>Stimulates competition for resource and allows small developers to compete</td>
<td>May encourage speculators and short-term prospective developers</td>
<td>TX offshore wind power</td>
</tr>
<tr>
<td>Bonus, Rent and Royalty</td>
<td>Spreads revenue stream over various phases of resource development</td>
<td>Creates financial pressure on developer before the resource production.</td>
<td>LA offshore wind power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discourages small entrepreneurs</td>
<td></td>
</tr>
</tbody>
</table>
and $10 per acre for larger tracts. In contrast, Louisiana charges a flat rent of $2 per acre, independent of the tract size. Rent and other fees must be carefully chosen in light of the policy goals of the state (e.g., climate change mitigation; receipt of optimal market value for use of state natural resources; equitable allocation of submerged lands among user groups).

In the second financial model, financial returns are linked to the resource production through a royalty charge. The royalty structure can be based solely on energy production on a per MWh basis, or like Texas, also include an annual minimum royalty payment to guard against the possibility that in a given year a wind farm, for example, would not generate significant power due to down-time. An annual minimum royalty payment is similar to a rent payment in lieu of royalty payments in those years. Production royalties can be established so that they increase in percentage of revenue over time. Imposing a royalty on resource production reduces the financial risks for a developer and stimulates additional bidding competition, particularly from small firms. On the other hand, this model can encourage speculators, who do not have a long-term interest in resource development, particularly in the absence of strict lease transfer policies. It also can allow a “developer” to tie up a large expanse of ocean space without compensating the public for that privilege.

A combination of bonus, rent, and royalty allows for a one-time bonus on leasing, annual rent on occupation, and royalty on revenue. This model identifies the most efficient producer that values the property most highly and minimizes administrative and compliance costs. Further, it spreads the revenue stream over various phases of resource development and creates a strong incentive for a leaseholder to proceed with the development of the resource to recoup the upfront bonus payment to the resource agency. The Office of Mineral Resources in Louisiana is proposing this model for leasing offshore wind power resources, with a one-time bonus, rent based on lease acreage, and royalty payments based on electric power production revenues. A major disadvantage of this approach is that the bidding requires more initial capital than in other models. This model creates financial demands on the lessee even before resource production begins in the form of an upfront bonus. This may discourage small enterprises from competing for the resources.

Depending on the state role and the extent to which the state wants to support utility-scale green energy endeavors, it could charge no rent or royalty in initial years of production or they may be graduated. States also can financially support offshore wind power through measures similar to federal production tax credit (PTC), which provides a 1.9-cents per kilowatt-hour (kWh) benefit for the first ten years of a wind power facility’s operation. This financial incentive allows developers to offset the higher cost of wind power and compete effectively with conventional energy sources, which have historically received and continue to receive large government subsidies (see, e.g., the Energy Policy Act of 2005) (GAO Report, 2007).

Exclusion Zones

A supplement to the management options discussed earlier to address ocean uses is the creation of a spatial inventory of the existing uses. This effort can then be used by coastal states to map exclusion zones for offshore wind power development. Dhanju et al. (2008) created an inventory for Delaware by mapping exclusion zones such as ammunition dumps, marked shipping lanes, waste dumps, sand borrow areas for beach nourishment, and critical habitat areas. These areas should be designated as no-development zones for offshore wind and other marine renewables. Other environmental and existing use conflicts such as visual exclusion zones, bird flyways, fishing areas, and historically significant sites could also be excluded after further research and consultation with stakeholders. MMS is presently
Creating a marine cadastre that will map ocean uses in federal offshore waters as part of MMS’s new responsibilities under the Energy Policy Act of 2005. Exclusion zones can be used to help direct wind power development in pre-determined and pre-approved areas. States can then auction pre-approved sites through a public process to minimize conflict. This approach also facilities mixed-use permitting by encouraging complementary uses such as aquaculture or recreational boating with offshore wind power or other marine renewable resources. Moreover, to the extent a coastal state designates by law certain types of areas as off limits (e.g., critical fishery habitat, as noted earlier) or mandates that other activities be permitted to be co-located with offshore wind facilities and then includes the same in its state coastal zone management plan, that coastal state may be able to assert greater control over the manner in which resource development in federal waters occurs through CZMA consistency review.

Policy in regard to exclusion zones also needs to consider the implications for other uses of the ocean. For example, to what extent, if any, does a leaseholder (e.g., aquaculturalist, offshore wind power developer) or user of the resource (e.g., fisher), have the right to exclude other users based on perceived threats or conflict with his or her own use?

Environmental Impact Assessment Requirements

Installation of offshore wind turbines will create short- and long-term environmental impacts that need to be evaluated along with potential mitigation measures, prior to granting final approval to construct a project. An offshore wind power project proposal in state waters will require, pursuant to NEPA, the preparation of a comprehensive EIS, or the more abbreviated EA, as appropriate. NEPA compliance is triggered by the wind developer’s application for a Section 10 Rivers and Harbors Act (addressing obstructions in navigable waters) permit and a Section 404 Clean Water Act permit (addressing dredging and filling). These environmental assessment documents provide a systematic and interdisciplinary evaluation of the potential effects of the proposed offshore wind installation on the physical, biological, cultural, and socioeconomic attributes of the chosen tract. Site-specific efforts should be directed under the supervision of the state resource agency, and ultimately be subject to the approval of that agency and the USACE, as the lead federal agency. The EIS effort should be sufficiently broad to inform state resources covering the three important phases of the project: construction, operation, and decommissioning. Because USACE’s primary institutional concern in reviewing a proposed project is that project’s potential effect on navigation and national security, and because USACE is not an expert natural resource agency, a coastal state should consider requiring an environmental evaluation of its own. The state environmental impact assessment should consider the impacts on the environment that are specific to offshore wind power, including but not limited to:

1. Avian impacts.
2. Impact on benthic organisms during the construction and the operation phase.
3. Any impairment of water quality either temporary or permanent from the construction and operation of offshore wind power facility.
4. Any impacts on shell fishing, fin-fishing, or other recreational activities.
5. Impacts from sound propagation during the installation and operation of wind turbines on marine mammals and fish.
6. Impacts to aquatic or tidal vegetation or benthic organisms or other flora and fauna and their habitats.
7. The extent to which the project will impact natural surface, ground water hydrology, and sediment transportation functions.
8. Temporary or permanent impact on air quality, including noise.
10. Air quality and water quality impacts from the required maintenance of wind turbines.
11. Aesthetic impacts.
12. Effects on competing uses.

Not all effects to be evaluated are likely to pose the same risk to the environment in terms of occurrence and exposure. Thus, while all the considerations noted above will need to be evaluated, it will be useful in a scoping process to prioritize and give more emphasis to those effects likely to pose the greatest risk to the environment (e.g., avian migration given the importance of Delaware Bay as an international migratory flyway). Because the consideration of new power generation by means of an offshore wind power project does not occur in a vacuum, the EIS/EIA also should undertake a comparative life cycle analysis of the environmental (including human health) impacts of alternative means of electricity generation (e.g., coal, natural gas, and solar) to the offshore wind power project. We recommend that such analysis be undertaken on a per kWh basis to afford the best “apples to apples” comparison (see Kempton et al., 2005).

The federal EIA and the state EIA should be integrated to the maximum extent feasible and the coastal state should work in close coordination with USACE to eliminate duplicative efforts and ensure the efficiency of the environmental evaluation process. The finding of a draft federal EIS/state EIA should be made available to the public for review and comment. The final federal EIS/state EIA should reflect the concerns and comments of various stakeholders.

Access System Framework Recommendations

Based on the investigation of ocean use regulation by coastal states, this report outlines a set of preliminary recommendations to manage its offshore wind power development. These recommendations cover major elements of the access system framework.

Centralized One-Stop Management Structure

We recommend that the states create a centralized one-stop agency model. Such an agency would handle all resource management issues, from allocating property rights, managing and monitoring the resource use, to overseeing decommissioning of the wind turbines. A coastal state may choose to create a new agency or configure one of the existing agencies

Leasing System

A lease should be awarded to the winner of a power purchase agreement bid, conducted by the state agency having jurisdiction over regulated utilities (such as Public Service Commission or Public Utility Commission) in those instances when a power purchase agreement is at issue. In the absence of such power purchase bidding processes, tracts should be bid competitively. Importantly, this model will likely involve the local/regional electric utilities in the bidding process and create competition among prospective developers.
**Highly Public Permitting Process**

Offshore wind power is a novel ocean use with no operating wind farm in U.S. waters at present. Research indicates that at least at one site there was widespread misinformation and lack of information on impacts from its potential development. We recommend a highly public permitting and leasing process. Public hearings on a project should be preceded with outreach efforts to inform stakeholders about the resource and the technology. We also recommend that there be no automatic exclusion of any uses from the leased tracts for offshore wind turbines. Existing uses such as recreational fishing and tourism (which may see gains from the wind farm) are complementary to this resource development. Research, impact analysis, and public discussion should precede any exclusion of the public from the wind farm zone. State environmental resource agencies presumably will take the lead on the issue of areas that should be categorically excluded from wind farm development, including undertaking baseline studies and analysis. New Jersey is already offering grants to conduct environmental impact and socioeconomic studies for the proposed offshore wind power test facility.

**Long Fixed-Tenure Model**

Coastal states should adopt a long-term fixed-tenure model, preferably 20–25 years, that is renewable on fair, negotiated terms, given that it corresponds to the expected life of the installed turbines. This model will facilitate long-term power purchase agreements and enable financing of offshore wind projects at reasonable terms. Developing an offshore wind power project carries large upfront costs of exploring resources, environmental impact studies, design of the project, and installing the wind turbine, and reasonable financing is critical.

**Fixed Tract Size**

It is recommended that in the leasing process that fixed tracts should be offered in semi-enclosed seas such as a bay or an estuary and in the Great Lakes given the size of the area that could be potentially developed and its distance from shore, while a negotiable policy should be adopted in offshore areas, as some developers may wish to place turbines solely in state oceanic waters while others may prefer to straddle the state–federal line.

**Financial Assurance and Transferability Subject to Approval**

We recommend that developers be required to establish upfront a decommissioning/liability trust fund or provide appropriate financial assurance to address the costs of abandonment, decommissioning, and closure. This requirement would address decommissioning and liability concerns that may arise during the life of the project. We also recommend that the transferability of lease rights be subject to approval by the state and that original leaseholders not be excused from financial assurance guarantees.

**Graduated Rent and Royalty Formula**

We recommend that coastal states adopt a rent and graduated royalty formula. Rent would be charged each year beginning with the issuance of the lease through decommissioning. The basis for the rent charge is that the developer is occupying public offshore waters. Rent could be charged based on either a per-turbine or per-acreage basis. Royalties, which would
be based on the power actually produced by the offshore wind project, would not commence
until the project is operational, at the earliest. The state, however, should consider waiving
royalties (or alternatively, establishing graduated royalties, which would increase over time)
for the first years of a project to encourage development of this carbon-free and pollution-
free technology while at the same time ensuring in the long-run that the public is adequately
compensated for the use of public ocean space.

Conclusion

Offshore wind power is a novel ocean use that can provide utility-scale renewable energy
at competitive costs. Its development offers the opportunity to meet the increasing energy
demand in U.S. coastal areas, while displacing greenhouse gas–emitting fossil fuel power
plants. To facilitate development of this non-polluting, non-CO$_2$ resource in state waters
while at the same time compensating the public for the use of common space and ensuring
that development is undertaken in a manner that minimizes any environmental and social
impacts will require the creation of comprehensive and detailed regulatory frameworks at
state and federal levels. Although progress is underway at the federal level, coastal states
have made little to no progress to date. Coastal states can use the framework set forth here
to guide the revision of their existing coastal regulations and institutions or, as appropriate,
the formulation of new regulations and institutions to define rights to lease ocean space
for offshore wind power development. Moreover, with a proactive regulatory approach a
state bordering the ocean also may be able to utilize the CZMA consistency review process
to influence offshore wind power development in adjacent federal waters, which is where
most of the development off its shore is likely to take place.

Moving beyond offshore wind power, states such as Oregon, Washington, and Rhode
Island have already seen efforts to develop wave energy off of their coasts. Although these
development efforts are embryonic at this point in time, it is not too early for those states
to begin to consider how best to regulate those uses. With modifications to account for the
different jurisdictional situation in which “water” power exists (FERC asserts jurisdiction
in state oceanic waters over water power) as compared to wind power, the framework
presented here could provide a starting point for the development of regulations to manage
other emerging sources of marine renewable energy—the tides, waves, and currents.

In sum, it is time for coastal states to embrace responsible marine renewable develop-
ment in a manner that recognizes other values and protects marine natural resources. We
believe what we have proposed offers a way forward to meet these objectives.

Notes

1. Final Rules were expected to be issued in late 2008, but were delayed because of a dispute
between MMS and the Federal Energy Regulatory Commission (FERC) over jurisdiction over wave
and tidal projects. See J. Firestone, MMS-FERC standoff, ReNews America 17 (February 5, 2009).
2. Although the findings here may be germane to a wider regulatory framework that considers
other marine renewable energy sources such as wave, tidal, and current power, it is important to note
that both MMS and FERC are each asserting jurisdiction over such hydrokinetic resources under the
Federal Power Act.
3. The maximum rated output of a generator under specific conditions designated by the
manufacturer. Generator nameplate capacity is usually indicated in units of kilovolt-amperes (kVA)
and in kilowatts (kW) for smaller units and in MW for larger units.
4. Environmental impacts include impacts of avian species, marine mammals, fish, and benthic organisms. The most comprehensive studies done to date, however, suggest that these cumulative impacts are unlikely to have population-level effects, particularly if the wind farm is properly located and are likely to be far less than conventional sources of power. See http://www.ens.dk/graphics/Publikationer/Havvindmoeller/havvindmoellebog_nov_2006_skrm.pdf

5. Indeed, Europe has a goal of installing 40,000 MW of offshore wind power by 2020.


7. Congress expressly excluded water (but not wind) for the definition of “natural resources” in the act. 43 USC § 1301(e).


10. The CZMA, 16 USC §1455b, provides for states to identify coastal waters that are threatened by foreseeable environmental impacts and prepare management measures for such areas.

11. A developer may undertake pre-bidding surveys of potential sites and provide an argument for a site's suitability (e.g., based on bathymetry, distance from shore, access to onshore transmission infrastructure, and environmental impacts among other factors) in the bidding document.

12. See J. Firestone (November 13, 2007) Comments on Pace Report and Public Advocate Filing, submitted before the Public Service Commission of the State of Delaware, wherein he raises concerns with the methodology and consistency of the consultant's analysis on which the “hold” decision was based. See http://depsc.delaware.gov/electric/irp/jfonpace111307.pdf

13. Day-ahead is a forward market while real time is a spot market. These markets are operated by the Regional Transmission Organization (RTO) or Independent Systems Operator (ISO).

14. PJM is the Regional Transmission Organization (RTO) that, among other areas, serves the Mid-Atlantic states. It operates the electric transmission system and electric markets in the region.

15. The Federal Energy Regulatory Commission (FERC) can issue hydropower licenses for a period of up to 50 years.

16. See OCSLA, 43 USC §1334, for administration of leases.


19. MMS has provided notice of an interim policy to guide development (primarily by authorizing the collection of meteorological data and for technology testing) prior to the finalization of rules and has issued a related draft lease. See 72 Federal Register 62673–62675 (November 6, 2007) and 72 Federal Register 71152–71157 (December 14, 2007). MMS also has conducted a synthesis and analysis of existing information on environmental impacts (available at http://www.gomr.mms.gov/PI/PDFImages/ESPIS/4/4260.pdf) and undertaken a Programmatic Environmental Impact Statement (available at http://www.ocsenergy.anl.gov/). MMS is expected to issue its final rules during 2009.

20. For example, New Jersey is not encouraging development close to Cape May, which is an important migratory bird flyway.


22. Benthic organisms are bottom-dwelling organisms in an aquatic environment.

23. For a partial effort in this regard, see the MMS PEIS.

References


A. Dhanju and J. Firestone


tion. Available at http://www.oceanservice.noaa.gov/programs/mlb/supp_cst_popu

Conference & Exhibition, June 36, 2007, Los Angeles, CA: AWEA.


Duff, A. 2004. Offshore management considerations: Law and policy questions related to fish, oil,

(OWFLO) Project: Preliminary Results, University of Massachusetts, Amherst, MA. AIAA-
2006–998, 44th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, January 9–12,
2006.


Firestone, J., and W. Kempton. 2008. Delaware Opinion on Offshore Wind Power, Final Re-
port, January 2008. Available at http://www.ocean.udel.edu/Windpower/docs/FinalDNRECO


and aquaculture: Messages from land and sea. Cornell Journal of Law and Public Policy

GAO. October 2007. Federal Electricity Subsidies: Information on Research Funding, Tax Expen-
ditures and other activities that Support Electric Production. U.S. Government Accountability

for natural resources: Drawing lessons for ocean aquaculture in the U.S. Exclusive Economic
Zone. In Open-ocean aquaculture: From research to commercial reality, eds. C. Bridger and B.

Hoagland, P., M. E. Schumacher, H. L. Kite-Powell, and J. A. Duff. June 2006. Legal and Reg-
ulatory Framework for Siting Offshore Wind Energy Facilities. Offshore Wind Energy Col-
laborative Pilot Project Grant Program, Massachusetts Technology Collaborative. Project No.
2004-OWEC-01.

Between Delmarva Power and Bluewater Wind LLC, submitted to Delaware Public Service
January 12, 2008).

reductions via offshore wind power matched to inherent storage in energy end-uses. Geophysical
Research Letters 34: L02817.


Framework for Regulating Offshore Wind Power


### Appendix 1

#### Table of state offshore wind, oil & gas, sand & gravel, and ocean aquaculture leasing programs

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<th>State/Program</th>
<th>Status</th>
<th>Management Structure</th>
<th>Public Process</th>
<th>Lease System</th>
<th>Tenure</th>
<th>Tract Size</th>
<th>Transferability</th>
<th>Fees</th>
<th>Bonding</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA OWP</td>
<td>Legislation authorized State Mineral Board &amp; DNR to lease submerged lands. DNR lead agency. Rulemaking underway.</td>
<td>State and parish official journals.</td>
<td>State and parish official journals.</td>
<td>Oil and gas procedures: Competitive bid process.</td>
<td>No more than 5,000 acres.</td>
<td>Transfer after consultation and approval of State Mineral Board.</td>
<td>Proposed lease terms: One time bonus; Rent based on lease acreage and Royalty of energy sales. Bonus within 24 hrs of lease rent.</td>
<td>General liability insurance after commencement of construction.</td>
<td></td>
</tr>
<tr>
<td>AK AQ</td>
<td>Leasing for shell fish, aquatic plants only. Decentralized Lead agency ADRN, ADFG, ADEC, ACMP, other agencies. Batch processing of permit applications.</td>
<td>Public process required. Notice in the newspapers, Web, and e-mails to interested parties</td>
<td>Designated areas through public process. Lease application accepted Jan.–Apr. Bottom and water column lease. ADF&amp;G issues operation permit.</td>
<td>10 years lease for development plan.</td>
<td>No min. or max.</td>
<td>Leases transferable, if in good standing. $100 fee to DNR and ADF&amp;G.</td>
<td>$450 up to 1 acre + $125 each additional acre/year due at the time lease issued.</td>
<td>Bonds Mandatory. $2500 per farm site due at the time lease issued.</td>
<td></td>
</tr>
</tbody>
</table>

Q19
CA AQ  SB201: new marine AQ law. Regulations being revised. Leases available under strict environmental regulations. Dept. of Fish & Game lead agency. Public notice and advertisement in regional newspaper. Competitive bidding process. Water bottom & water column lease. 10 years. — Commission permission required for transfer. Rent $2 per acre (<10 acre), $10 per acre (>10). Bonds, letter of credit, or trust funds required toward decommissioning.

TX AQ  New regulations. Link one person to one permit. Permit activities limited to one block. Native species only. Precautionary approach. Decentralized, Texas Dept. of Agriculture lead agency. GLO leases submerged lands. Defined by GLO. Submerged lands lease only. GLO authority. One year permitting period, extended year-to-year. Defined by GLO. Sale & Transfer of Permit Prohibited. One link-one permit life of permit strategy. $1,500/permit or renewal fee. One time permit to introduce fish is free.


FL AQ  Active leasing under first-come, first-serve basis. FL aquaculture bureau presents proposal to Governor’s office. Public hearing + other agencies comment. First-come, first-serve. 10 years Determined by developers. Transferable formal process. Annual fee ($30–$40 per acre) No bonds, special conditions in lease require decommissioning & site cleaning. (Continued on next page)
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<th>Fees</th>
<th>Bonding</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK O&amp;G</td>
<td>New Leases offered. (AS 38.05) Certain areas restricted.</td>
<td>Centralized, Dept of Natural Res., Division of Oil and Gas.</td>
<td>60-day public comment period.</td>
<td>Area-wide leasing. Revenues to general fund (74.5%), permanent fund (25%), school (0.5%).</td>
<td>Best interest finding—10-year lease. 5–7–10-year depending on location.</td>
<td>Variable</td>
<td>Lease transferable contingent on certain conditions.</td>
<td>Fixed &amp; variable bonus, royalty sharing. Min: 85-810/acre. Royalty 12 1/2-20%.</td>
<td></td>
</tr>
<tr>
<td>LA O&amp;G</td>
<td>Dev. limited to offered areas.</td>
<td>Centralized, State Mineral Board lead agency.</td>
<td>Prior public notice.</td>
<td>Competitive bidding.</td>
<td>5 years.</td>
<td>—</td>
<td>Transfer of lease allowed.</td>
<td>Royalty &amp; annual rent. Royalty min: 1/8 of production.</td>
<td>—</td>
</tr>
<tr>
<td>HI O&amp;G</td>
<td>No regulations</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>LA Sand &amp; Gravel</td>
<td>Use not actively regulated by the State.</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<td>—</td>
</tr>
<tr>
<td>RI Sand &amp; Gravel</td>
<td>No economically viable resource. No regulations.</td>
<td>—</td>
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Appendix 2

Description of state offshore wind, oil & gas, sand & gravel, and ocean aquaculture leasing programs

**Louisiana Offshore Wind Power:** Louisiana legislature passed Act 481 in 2005, authorizing the State Mineral Board and Dept of Natural Resources (LDNR) to lease submerged lands for offshore wind power development. Currently, LDNR is engaged in rulemaking. The leasing regulations are expected to follow Louisiana’s oil and gas process and procedures. Leasing will be carried through competitive bidding. Regulations will be promulgated soon.

**Texas Offshore Wind Power:** The General Lands office (TGLO) has been leasing State lands for oil and gas resource extraction for more than a century. The rents and royalties from lease sales are funneled to the Permanent School Fund (PSF). In 1995, the TGLO included sustainable energy sources such as wind, solar and geothermal in the services provided to state customers. The Sustainable Energy Development Council (SEDC), co-chaired by the Land Commissioner and the Chairman of the Public Utility Commission, initiated a program to comprehensively harness renewable energy resource in Texas. Offshore wind power development is part of this strategy. The TGLO is currently leasing submerged lands for offshore wind power installation to interested developers. Initially, leases were proposed by private developers on a first-come, first serve (FCFS) basis and awarded after an assessment by TGLO. But more recently TGLO leased tracts through a competitive leasing process. The lease period is divided into two phases; the first phase allows for research and data collection, followed by development and production in the second phase. The first phase runs until the lessee receives approval of its production plan or exercises its option to terminate the lease. A lessee pays an annual royalty on a quarterly basis, which is reassessed at 8th and 16th year of installation. There is a “no transfer of lease” clause in the lease agreement, and the lands revert back to GLO after the lease is over. A deposit is required for decommissioning either as bond, cash, or irrevocable letter of credit.

**Alaska Aquaculture:** Leases are offered only for shellfish and aquatic plants harvesting. Leasing process is a multi-department process with Alaska Department of Natural Resource (ADNR) as the lead agency. Other agencies involved are Alaska Department of Fish and Game (ADF&G), Alaska Department of Environmental Conservation (ADEC), and Alaska Coastal Management Program (ACMP). The aquatic farm program is administered through a batch processing method wherein all applications received during the “opening period” are processed simultaneously. The general application period opening is every two years from January to the end of April. Public review process is required and involves notices in newspapers, websites, and e-mails to interested parties. Year around leasing is conducted for some pre-designated sites. Public review process is conducted before leasing these sites. These are referred to as over-the-counter sites. Leases and permits are for 10 years. Presently, there is no limitation on the lease acreage. Rent for the lease is $450 up to 1 acre and then $125 for each additional acre per year. A $2,500 bond is required per site, due at the time lease is signed. Leases and permits can be sold as long as it was in good standing. Current permit holders or leaseholders are required to submit a transfer request to the agencies and pay a fee of $100 to DNR and ADF&G.

(Continued on next page)
Description of state offshore wind, oil & gas, sand & gravel, and ocean aquaculture leasing programs (Continued)

**California Aquaculture:** SB 201 “Sustainable Ocean Act” legislation was recently enacted to regulate aquaculture in State waters. SB 201 is an effort to rationalize regulations. Currently, CA Department of Fish & Game is conducting a programmatic EIR (Environmental Impact Report) for rulemaking. Draft regulations will be available later this year. California Environmental Quality Act (CEQA) demands strict environmental assessment and regulations for aquaculture. Consequently, only a few aquaculture facilities are operational. The current process involves a competitive lease for submerged lands and water column. Rent of $2 per acre for tracts less than 10 acres and $10 per acre for tracts greater than 10 acres. Bonds, letter of credit or trust funds are monitory instruments required toward decommissioning.

**TX Aquaculture:** Open ocean aquaculture is tightly regulated due to the threat of invasive species in the Gulf of Mexico. New regulations were adopted recently. Aquaculture is regulated by a collection of state agencies. Permits are required for site development, to introduce species, and for harvest, and for processing and marketing of the harvest. The Texas Department of Agriculture (TDA) is the lead agency and responsible for regulating aquaculture, while Texas Commission on Environmental Quality (TCEQ) establishes and enforces water quality standards. Texas General Land Office (TGLO) is responsible for managing state-owned submerged lands, Texas Animal Health Commission (TAHC) is responsible for management of animal disease necessary to protect agriculture, and the Texas Department of State Health Services (TDSHS) is the primary agency for protecting human health and safety, including seafood safety. The regulations link one-person to one-permit for the life of the permit. Proposed rules will limit the operational areas for permitted activities to specific areas on Outer Continental Shelf (OCS). The permits allow only native fish, shell fish, and aquatic plants for open ocean aquaculture. The precautionary principle is applied by the TDA to regulate use. The offshore aquaculture permit is valid for a period of up to one year. Because offshore aquaculture is a new technology and the variety of potential impacts is unknown, the TDA authorizes aquaculture activities only on a year-to-year basis. This allows it to closely monitor the projects and analyze their environmental impacts. Sale and transfer of permits are prohibited. A permit fee of $1,500 required.

**Hawaii Aquaculture:** Hawaii has comprehensive aquaculture regulations, motivated by the demand for seafood, 80% of which is imported. Currently there are two offshore aquaculture facilities in Hawaii state waters. The leasing process starts with developers interacting with the local communities about the proposed plan and locating a site while trying to minimize user conflict. Once the developer has collected enough information, scoping meetings are held with Federal, State, and County officials. This is followed by the environmental assessment (EIS) of the proposed activity. The EIS is submitted to the Office of Conservation (OCC). This is followed by a formal public hearing case, where the developer can be taken to arbitration. Following this, the lease is considered by the Hawaii Board of Agriculture. If the Board approves, the developer is issued a right to entry. The developer next has to negotiate with the Division of Land Management and seek the approval of the Land and Natural Resource Board. In parallel, the developer has to submit an Environmental Impact Statement (EIS) to EPA for a National Pollutant Discharge Elimination System (NPDES) permit and also seek a boating permit from the Division of Recreation along with applying to the US Army Corps of Engineers.
Description of state offshore wind, oil & gas, sand & gravel, and ocean aquaculture leasing programs

for a Section 10 permit. Simultaneously, a developer has to submit an application to Coastal Zone Management program for consistency evaluation. Leases are allocated on a first-come, first serve basis. Department of Land and Natural resource is the lead agency while the Department of Agriculture is the coordinating agency. A competitive bidding process has as of yet not been established. Tenure of the lease is around 20 years. There is no formal limitation on the tract size, as long as it does not hinder open access of ocean space to other uses. The lease is for submerged land only. Twenty percent of the lease rent is directed toward the Office of Hawaiian Affairs, while a part is deposited in a special research and development fund for open-ocean aquaculture and another part is funneled into the general fund. Rent is negotiated with the developer, on a basis comparable to agriculture rates and graded as% of the gross revenues. There is a base lease rate and rising percentage on the profit. Bonding is required of the lessee.

**Florida Aquaculture:** Projects are proposed by aquaculture developers on a first-come, first-serve basis. Proposals are submitted to Florida Bureau of Aquaculture, the lead agency. Once the proposals have been examined, they are presented to the Governor’s office for the final decision. The lease is for submerged lands and water column. Other concerned agencies comment on the lease proposal and public meetings are conducted. The lease is signed for a period of 10 years and involves an annual fee of $30–$40 per acre. A fee is also charged for the lease application. A lease is transferable through a formal process. No bonds are required, but special clauses in the lease require site cleaning. Currently, most of the aquaculture expansion is in clam farming.

**Louisiana Aquaculture:** Aquaculture and Mariculture leases are banned in coastal state waters, except oyster cultivation which is permitted through submerged land leases on a first-come, first-serve basis. There are currently about 9,000 oyster leases, held by about 1,200 leaseholders covering around 390,000 acres of State-owned bottomlands. Louisiana Department of Wildlife and Fisheries is the lead agency. Public meetings are required as part of the public review process. Lease tenure is 15 years and renewable thereafter. Tract size per lease is limited to 2000 acres. Transfer of lease is permitted. A rent of $2 per acre is charged. A task force recently explored the possibility of aquaculture along oil and gas platforms.

**Alaska Oil and Gas:** Division of Oil and Gas under the Department of Natural Resources manages the leasing of oil and gas resource in the State. New leases are offered periodically. The public process involves a 60 day comment period. Lease tenure is variable, usually 5–7–10 years, depending on the location and the lease can be transferred, contingent on certain conditions. The agency charges fixed and variable bonuses and collects a share of the royalties. Of the revenues, 74.5% are funneled to the general fund, while 25% are deposited into a permanent fund, and 0.5% into the school fund.

**California Oil and Gas:** The last major leasing was conducted in the 1960s. Currently proposals are pending for new leases. The California Lands Office is the lead agency for leasing oil and gas in State waters. The Division of Oil & Gas regulates the drilling and resource extraction process. The bidder is required to undertake an environmental impact assessment (EIA) based on specified statutory requirements set out in the Public Resource Code. Thereafter a negotiated sublease can be undertaken. A public hearing after a 30-day notice is required in coastal towns and counties.

(Continued on next page)
Description of state offshore wind, oil & gas, sand & gravel, and ocean aquaculture leasing programs (Continued)

No new fixed platform leases can be offered for drilling in the State waters. A new lease should use an existing platform or access resources from federal waters or from a terrestrial facility. Mobile rigs also can be used for exploration and drilling. The leasing program employs a “habendum clause,” wherein the lease is good as long as the resource lasts. The tract size cannot exceed 5,760 acres. The property rights defined by the lease are transferable. A rent of $1/acre/year is payable every year irrespective of the production. Royalty, from 1960 leasing used a sliding scale, from a minimum of 50% to 2/3 of revenue. Bonding toward abandonment of oil and gas installations is required. Each lease is bonded on separate terms, and insurance is required. Developers are required to join an Oil Spill Cleanup cooperative. Part of the bonding receipts go toward certificates of financial responsibility (COFRs), which insure minimum financial responsibility of lessees in the event of an oil spill.

**Louisiana Oil & Gas:** Leasing of submerged lands is restricted to the areas offered by the State Mineral Board. The Department of Natural Resources is the lead agency for leasing submerged lands. Leases are conferred after prior public notice and public bidding. Leasing is a nine step process, offered for five years. Transfer of a lease is allowed after permission from the Department. A minimum royalty of 1/8 of production is negotiated.

**Hawaii Oil & Gas:** No active program to lease submerged land tracts in State waters for resource exploration and extraction. No leasing provisions available.

**Louisiana Sand & Gravel Mining:** Sand and gravel mining is not actively regulated by the State.

**Rhode Island Sand and Gravel Mining:** Due to the lack of viable sand and gravel resources offshore, there is no formal permitting or regulation process in the State.