Potential role of power authorities in offshore wind power development in the US

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A R T I C L E   I N F O

Article history:
Received 20 June 2010
Accepted 2 August 2011

Keywords:
Power authority
Offshore wind power
Cost of electric generation

A B S T R A C T

This article examines how power authorities could facilitate and manage offshore wind power development in US coastal waters. The power authority structure is an American 20th century institution for managing energy resources—a form of a public authority or public corporation dedicated to creating, operating and maintaining electric generation and transmission infrastructure. Offshore wind power is characterized by high capital costs but no fuel costs and thus low operating costs. Therefore a power authority, by virtue of its access to low-cost capital and managerial flexibility, could facilitate offshore wind power development by reducing financial risk of developing and lowering debt payments, thus improving the risk profile and lowering the cost of electricity production. Additionally, power authorities can be made up of multiple states, thus opening the possibility for joint action by neighboring coastal states. Using primary and secondary data, we undertake an in-depth analysis of the potential benefits and shortcomings of a power authority approach.

1. Introduction

Wind power is now a major source of renewable energy in the US. As of April 2011, more than 41 GW (gigawatts) of wind capacity has been installed, all of which is on land (American Wind Energy Association (AWEA), April 2011). Utility-scale turbines are now a familiar feature on ridge tops, cornfields, prairie lands and other landscapes in states that are endowed with significant land-based wind resources. Coastal states in the US northeast and southeast until recently have been an exception to the fast expansion of wind developments, because those states lack significant land-based resources. Some of the small existing resource is unlikely to be developed due to conflicting land-uses. Thus, these coastal states naturally look to the possibility of developing their abundant offshore wind resources. Recent resource analysis for the Mid-Atlantic Bight,2 and Great Lakes region (Kempton et al., 2007; Dhanju et al., 2008; Adelaja and McKeown, September 2008; Hingtgen, 2003) indicates that offshore wind resource potential is sufficient to meet all the energy needs in the region. Consistent with these developments, a recent report by the US Department of Energy (U.S. DOE, July 2008) anticipates that offshore wind power will play a major role in the expansion of wind power in the US.

Nevertheless, the promise of bountiful clean energy from offshore wind power could be delayed or forestalled for a number of reasons: early-introduction economics, where wind power has to compete with long established and subsidized conventional energy sources in the open markets (Environmental Law Institute (ELI), September 2009; US Government Accountability Office (US GAO), October 2007); high capital costs due to submerged support structures and grid connection (British Wind Energy Association (BWEA), n.d.); localized public opposition to the first proposed facility, spooking developers despite opposition not appearing in other locations (Firestone and Kempton, 2007) and high operational and maintenance risk in the marine environment (Fichaux, May 2009).

More importantly, high price of electricity and greater risks make financing of projects more difficult. Reducing the risks and decreasing the cost of financing would substantially facilitate competitive offshore wind power development.3 One way to achieve this is with a joint effort between industry and government (Bruinje, March 2004). The public authority structure provides the institutional framework for such an effort.

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1Currently at Bureau of Ocean Energy Management (BOEM) as a contract staff.

2The Mid-Atlantic bight is a broad sand and gravel continental shelf extending from Cape Cod to Cape Hatteras.
Public authorities are a time-tested approach for managing socio-economic projects that have public benefit. It provides the efficiency of a private corporation and the financial benefits of a government agency. For offshore wind power, public authorities as project developers and potentially operators can abate resource development risk, provide access to low-interest financing and promote interstate collaboration.

This article explores the potential role of a power authority, one type of public authority, to facilitate and manage offshore wind power development in the US. The first section of the paper provides background information on the state of offshore wind power in the US and various financial arrangements through which power will be sold. The next section examines the public authority model as an institutional concept, explores its important attributes such as governance and financial mechanisms, and discusses its strengths and weaknesses. It sets the stage for analyzing power authority model for electric generation and transmission. The final section uses qualitative and quantitative data to assess the potential role of power authority model in facilitating offshore wind power development by lowering the cost of capital, reducing the financial risk of developing and operating a wind power project and enhancing regional collaboration among coastal states.

2. Offshore wind power proposals and financial arrangements in the US

Although there are no operational offshore wind power projects in the US (as of August 2011) utility-scale projects have been proposed off the coasts of Massachusetts, Rhode Island, New York, New Jersey, and Delaware. All of the proposed projects, with the exception of the Long Island Power Authority (LIPA) and New York Power Authority (NYPA) proposals, can be categorized as Independent Power Producers (IPPs) or Non-Utility Generators (NUGs). A product of 1978 Public Utility Regulatory Policy Act (PURPA) and electric deregulation, an IPP is not an electric utility and has no assigned service territory. Rather, it is a stand-alone entity that owns or operates electric generation facilities. An IPP either services an obligation, that is, a power sales contract with a local utility, or it offloads its generation into the short-term market. An IPP may service an obligation, that is, a power sales contract with a local utility, or it offloads its generation into the short-term market.

Allocation of price risk is the major difference between the PPA and the spot market approach. A PPA transfers part of the price risk from the IPP to the electric utility customers, in exchange for stable-priced electricity over the life of the project. The risk of a PPA to the power buyer is the potential for lower future power prices, whereas a PPA mitigates the risk of higher future power prices.

On the other hand, by offering the power output in spot market auctions, the IPP takes the risk of lower future prices, and reaps any benefit of higher future prices. Although one might consider this a reasonable trade, betting that future prices will go up, most large lenders would not consider this uncertainty acceptable for project financing—certainty is required. A public authority dedicated to developing offshore wind resource can hedge and transfer the financial risk, as explained in the following sections.

3. Public authorities background

Public authorities emerged in the early twentieth century from the need for greater efficiency in public services. Taking a cue from private corporations, public service reforms in the late nineteenth and the early twentieth century introduced the corporate culture for public projects. The main mission of a corporation is to generate wealth for its shareholders and since corporations are answerable to their shareholders, they are always under pressure to refine their business practices to maximize returns. Through such a structure, corporations symbolize efficient and flexible operations tuned for profit maximization. This was the genesis of the public authority concept, a public entity with a social mission, but the structure and capabilities of a private corporation. It loosely integrates the governance and management of private organization with that of public and non-profit sectors into a unique organizational form. Public authorities are designed to separate politics from administration, yet in a way keep them indirectly accountable to the public. They are expected to be entrepreneurial, yet with a sense of fiscal responsibility.

Jerry Mitchell, an expert on the issue, defines public authorities as “a corporate entity chartered by one or more governments (national, state, or local) governed by an appointed board, and responsible for various public service functions” (Mitchell, 1992). This definition applies to almost every organization with the name ‘public authority’ and to some organizations that have ‘corporations’ or ‘commissions’ as their names.

The concept of public authority was first practiced in Australia with the creation of the State Saving Bank of Victoria as a statutory corporation in 1841 (Wettenhall, 1985). Thereafter, such entities slowly begin to appear around the world, mostly as part of the local or municipal governance reforms. The Port of London Authority, formed in 1908, was the first public-benefit corporation to use the ‘authority’ name. It was so because nearly every paragraph of its enabling legislation included the phrase, “Authority is hereby given” (Cohen, 1946).

An early authority-like mechanism in United States was the Panama Railroad Company established in 1904 (Mitchell, 1992), but the first American organization to use authority in its name was the Port Authority of New York and New Jersey (PANYNJ), formed in 1921. Its establishment was closely associated with public service reforms undertaken at the time. Effort to introduce private sector business-type management techniques into the public sector was an important aspect of that movement (Leigland, 1994). Quasi-independent government corporations like PANYNJ were portrayed as an ideal way for a government enterprise to realize many of the strengths of business management, including administrative and
financial flexibility, and freedom from special political influence and corruption. During 1930s, authorities were given a strong endorsement by President Franklin Roosevelt with the New Deal program. Following the successful operation of the PANYNJ, the concept expanded significantly to create port facilities, electric utilities, public housing, transportation systems, along with intervention in other policy areas in the succeeding years (Mitchell, 1992). As of 1990 there were 6397 public authorities, including 45 federal authorities such as Tennessee Valley Authority, US Postal Service and Amtrak (Mitchell, 1999). Some form of public authority now functions in all states and within every major metropolitan area, touching peoples’ lives in countless ways.

Public authorities derive a part of their strength and flexibility from an autonomous governance and management structure. It allows them to address emerging policy challenges. Public authorities in the electric utility sector or ‘power authority’ is one such expression, which has been widely applied to create and manage electric infrastructure. Many of the largest utility projects in the country were constructed and are now operated by power authorities. A famous example is the Niagara hydroelectric power project by the New York Power Authority. Power authorities in specific are discussed in detail in a later section.

3.1. Powers, governance and management structure

Public authorities operate in a hybrid framework that selectively borrows on the financial and managerial attributes of government agencies and private corporations. Public authorities as autonomous entities are designed to be independent of elected officials and the statutory rules that apply to traditional government agencies. Although authorities generally do not have power to tax, they do have the ability to raise money from private money markets, the right to sue or be sued, the power of eminent domain, the discretion to establish rates and charges, an exemption from property and corporate taxation, and the freedom to establish their own personnel systems (Walsh, 1978, as cited in Mitchell, 1992). Public authorities are not usually covered by tax and expenditure limitations imposed on state and local governments, but in some cases they apply for and receive government grants.

The governance of a public authority mirrors that of a private corporation. However, unlike directors of private firms, the authority directors are not answerable to stockholders and enjoy secure tenure (Walsh, 1978). A governor, mayor or legislative body appoints a governing board composed of three or more citizens to make policy, supervise administrative activities, oversee the issuance of bonds, safeguard the public interest, and keep the public informed through hearings and public notices. Although they are appointed, board members do not necessarily work for elected officials. In most instances, they cannot be removed from office until their term expires. Most board members serve staggered terms, for a fixed number of years, and they serve without financial compensation (Mitchell, 1992).

The administration or management of an authority is the responsibility of an executive director, who is appointed by the board or the parent government. The executive director is responsible for day-to-day policy decisions and directs the delivery of services. It is generally considered good practice for the executive director to be ideologically neutral and to undertake assignments without concern for partisan politics or views of the community (Horn, November 1976). Compared to private corporations, public authority managers enjoy an envious position. They have wide discretion over corporate strategy, relatively secure tenures, and minimal administrative oversight (Walsh, 1978).

A major administrative instrument that distinguishes a public authority from other government agencies is its financial flexibility. In fact, financial self-sufficiency and ability to raise money is a major reason for the creation of public authorities by states. Many state constitutions require specific public-approval procedures to issue debt for public projects. The creation of a public authority is a time-tested approach to bypass such provisions. Public authorities can access tax-exempt bond markets without having to obtain voter approval or stay within a constitutional or statutory statewide debt ceiling. The municipal bond market is a loosely organized system for issuing and selling short- and long-term securities of state and municipal agencies of all types including public authorities (Walsh, 1978). Public authorities can raise capital in this market by issuing and selling bonds. The interest to these securities is paid each year to the note or bondholder and it is exempt from federal income taxes. In addition, if the investor resides in the state that issued the bond, the state income tax may be exempted. The municipal bond market is thus referred to as a tax-exempt market (Walsh, 1978). The interest payments on these tax-exempt municipal bonds are usually lower then that paid on private corporate bonds (which are not tax exempt). Consequently, public authorities can raise capital at a lower cost than private corporations and entities. The issuers as a result reduce debt-service costs for the activities that require large amounts of capital, such as building new transport infrastructure or installing utility-scale offshore wind projects.

According to Walsh (1978), municipal bonds attract certain type of investors, who rely on tax-free steady returns from these bonds. The municipal bonds are also used by investment banks and insurance agencies to diversify their investments in the capital market. In terms of long-term safety of investment, the municipal bonds are considered by investment advisers as second only to US government bonds.

The tax-free municipal bonds issued by the public authorities are generally known as revenue bonds, since they are paid back out of the financial revenue of the authority. Since revenue bonds are not backed by taxing power, the public authorities may pay a small increment in interest rate as compared to governments and special districts, which normally issue general obligation bonds backed by tax revenues. It is important to note that the rate of interest on a bond issue for a project depends on the credit rating of the issuer. According to Annette Thau (2001), there are strong and weak credits in both (revenue and general obligation) bond sectors. Theoretically, general obligation bonds are safer since they are backed by the ‘unlimited taxing power’ of the issuer. In real world though this power is limited by economic and political considerations. On the other hand, the supposedly lower safety of revenue bonds are based on the fact that issuers run a business whose revenues cannot be predicted with certainty. Again, most electric utilities can and do raise rates to pay for increasing cost. Consequently many revenue bonds, particularly those paid by essential services such as electric power have high quality credits.

Another distinction is that the public authority bonds are more tightly controlled by the investors and brokers than general obligation bonds. A public authority usually must appoint an independent bank as trustee to exercise repayment responsibilities for its revenue bonds, and sign an indenture agreement—a contract between the authority and bondholder—that is administered by a bank as trustee (Walsh, 1978). The purpose of these indentures is to protect the revenue earning capacities that back up repayment. In many cases, the indentures specify what use may be made of authority revenues. Indenture terms add to the cost and narrow the flexibility of public authorities in...
exchange for readily available low-cost capital. It is important to understand that the rights of public authority bondholders do not correspond to those of stockholders in the private sector. Bondholders are lenders and not owners. They have the legal right to be paid back with specified interest, but they do not enjoy the rights of the stockholders in directing the administrative and financial workings of a public authority.

Financial independence from elected officials and flexibility of raising resources are important characteristics of a public authority. The autonomy enjoyed is in large part because the authorities rely primarily on fees obtained from users of their facilities (Doig, 1983), particularly in the case of transportation and electric utility sectors (Walsh, 1978).

The widespread creation of public authorities is due to the acknowledgement of their operational, managerial and budgetary flexibility, and the ability to operate across political and administrative jurisdictions (Mitchell, 1999). Nevertheless, the attributes of public authorities that have contributed to their success, have also promoted mismanagement of resources and misuse of authority. The criticism has resulted in greater accountability and supervision of the financial and human resources.

3.2. Weaknesses of public authorities

The administrative activities of public authorities are now under more scrutiny, after recent examples of impropriety, poor investment decisions, and corrupt practices. Consequently, greater oversight has been instituted in some authorities. The effective functioning of a public corporation suffers from four inter-related problems: complexity of its organization, lack of accountability to political systems and markets, poor financial planning, and abuse of power for political and personal patronage (Mitchell, 1999). In some instances, fiscal management has created significant financial burden for the general public.

In the most dramatic of such cases, in 1982 the Washington Public Power Supply System (WPPSS) defaulted on revenue bonds worth $2.25 billion because of poor planning and inferior management practices. These bonds were issued for the construction of nuclear power plants. Subsequently, the bondholders sued the public utility and were able to partly recoup their investments after 13 years of protracted legal confrontation. Washington State’s ratepayers, on the other hand, were forced to bear the remaining cost burden of mismanagement. This case inspired many states to establish oversight mechanisms for public authorities. However, due to the autonomous nature of public authorities external scrutiny is often insufficient. Fiscal management has created significant financial burden for the general public.

Power authorities inherit the administrative versatility and financial flexibility to fund, create, and operate large-scale public projects. They can be created at federal or state levels, and also through interstate compacts. Traditionally, states have created power authorities through enabling legislation. For example, the Texas legislature created the Lower Colorado Power Authority (LCRA) to deliver electricity, manage water supply, and support community and economic development in central Texas (Lower Colorado Power Authority (LCRA), October 19, 2009). TVA as a federal initiative, on the other hand, was created by an act of the US Congress in 1933 (Tennessee Valley Authority (TVA), 1933). Power authorities based on interstate compacts are rare, although states have created multiple regional advisory arrangements to cooperate on a range of energy issues.

Contingent on their mandate, power authorities construct, manage, and operate generation and transmission infrastructure to serve their captive customers and stakeholders. Many power authorities have been set up to develop a specific resource. For example, NYPA was initially created to harness hydroelectric potential, though later it expanded its role by installing fossil fuel power plants. In response to new challenges such as rising retail electricity prices, some states with deregulated electric markets are creating new power authorities with a novel scope. These authorities aim to mitigate high retail prices by investing in new or existing generation capacity, and engaging in long-term Power Purchase Agreements (PPA) (McCullough, February 24, 2009). Illinois for example created a power agency in 2007. The Illinois Power Agency (IPA) is now administering an annual competitive procurement process for stable priced, environmentally sustainable electric service. If it chooses to, it can expand the scope of its activities to develop and own generation facilities financed by municipal bonds (Illinois Power Agency Act, 2007). Connecticut followed the Illinois model and created a state electric authority in 2009. Connecticut Electric Authority (CEA) was created in response to states’ high retail electric rates (Energy Information Administration (EIA), January 2009). CEA will bypass the traditional Locational Pricing Mechanism (LMP) in the New England ISO market, and contract with electricity generators to buy stable and reasonably priced power for Connecticut customers.

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4. Power authorities: public authorities in electric utility sector

Power authorities are one important type of public authorities. For example, the creation of the New York Power Authority (NYPA) in 1931 was an early experiment of a public authority dedicated to electric generation and transmission. It was a state initiative under the aegis of Governor Franklin D. Roosevelt to harness the hydroelectric potential for public interest. NYPA served as a model for major federal initiatives in the US such as the Tennessee Valley Authority (TVA) and the Bonneville Power Authority (BPA) that were established later during the New Deal era (New York Power Authority (NYPA), n.d.). Since then, numerous power authorities have been created at the state and federal levels to install and manage electric generation and transmission infrastructure.

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4.1. Research methodology

In the following sub-sections, we first analyze the potential role of power authorities in offshore wind power development at a regional level in the US. In April 2009, BOEMRE\(^8\) released the much-awaited final rules that established a regulatory framework for siting and construction of offshore wind power and other marine renewable energy facilities on the outer continental shelf (Department of Interior (DOI), April 29, 2009). The framework embraces a 'cradle-to-grave' approach covering a complete range of activities such as coordination with stakeholders (particularly state and the local governments), leasing of submerged lands and water columns, plans for oversight, payment to cover bonding activities and decommissioning at the end of a project’s life span (Department of Interior (DOI), April 29, 2009). There is no authority for BOEMRE or other permitting agencies to reduce the financial risks through loan guarantee or similar incentives. Moreover, a federal initiative to create a power authority could conflict with the active role of coastal states on this issue. Given this, it is highly unlikely the federal government will preempt state initiatives.

Coastal states in the US, particularly in the Mid-Atlantic region, are actively involved with resource development, which is apparent from the recent offshore wind power proposals in Delaware, Rhode Island, and New Jersey. The state government (variously, the Public Service Commissions, legislature, and/or governor’s offices) initiated these proposals and defined the parameters of the bidding processes. For example, the evaluation criteria for all source bidding process in Delaware required the proposal to be sited in-state, and considered price stability, environmental benefits, and new technology as desirable attributes. The offshore wind-specific RFPs in New Jersey on the other hand evaluated proposals based on criteria such as developer experience, energy price ($/MWh), economic development, project cost, ability to finance the project, and environmental attributes (New Jersey Board of Public Utilities (NJBPU), October 5, 2007). Bluewater Wind in Delaware, and Garden State Offshore Energy in New Jersey emerged as winning bidders in those respective states. In New Jersey, the Board of Public Utilities (NJBPU) later decided to recognize the top three bidders, including providing funds for meteorological towers to all three.

Due to the primary role of states in energy planning and utility regulation,\(^9\) states are a logical entity to create a power authority. In the following sub-sections, we first analyze the potential role of power authority at the state level, and then we examine the mechanisms for creating an interstate or regional power authority and its potential benefits for managing offshore wind power development at a regional level in the US.

4.1. Research methodology

Primary and secondary data were collected to assess the potential role of power authorities in offshore wind power development. The primary data collection was based on unstructured interviews with five stakeholders and experts, between November 2005 and February 2006. These interviews were conducted in-person and by telephone. The unstructured interview format is effective in interacting with a diverse set of respondents and providing flexibility to target the questions for each informant, based on that informant’s prior responses. These informants are identified as R1, R2, R3, R4, and R5 in the text.

- Informant R1: CEO of an energy company that is developing an offshore wind power project in the US.
- Informant R2: A mid-level manager at a utility and a project manager for a proposed offshore wind power installation.
- Informant R3: A mid-level manager with a power authority, involved with a proposed offshore wind project.
- Informant R4: An employee with a regional power authority that has interests in land-based wind power installations and transmission projects.
- Informant R5: An academic expert on public authorities and author of books and articles on the subject.

The interviews were also valuable in identifying and in some cases accessing secondary sources. In addition, secondary data on corporate and municipal bonds from the US Federal Reserve statistical release were accessed to calculate and compare the cost of capital of these financial instruments. The following section describes the results of this research.

4.2. Power authority at the state level

Financial support, community outreach, and resource stewardship are some of the benefits that a state enabled power authority can offer. We examine each of these in detail.

Although offshore wind power development is technically viable with nearly two decades of operational experience, the high upfront capital cost can impede resource development. A power authority can lower the cost of capital and reduce the financial risk of developing and operating a wind power project, each of which will reduce per-kWh cost of generation and retail electric prices for consumers.

In fact, electric power from publicly owned utilities including power authorities have a track record of lower retail rates than both the investor owned and cooperative utilities. Analysis by the American Public Power Association (APPA)\(^10\) indicates that compared to the investor owned utilities, the average rates for public utilities are lower for residential, commercial, and industrial customers (see Graph 1) (American Public Power Association (APPA), 2009).

As we discuss below, a state power authority can financially facilitate offshore wind power development in two ways: it can either develop the resource, that is, invest in generation and manage the project itself, or it can solicit bids, provide loans, and/or sign a PPA for the power.

4.2.1. Power authority as a developer and operator

If a power authority decides to build a wind power project, it can raise capital from the municipal bond market at a lower cost than a private developer could. A recent article in Wind Power Monthly underlines the importance of capital cost, suggesting that a significant proportion of an offshore wind power project’s cost lies in paying back the project loans and rewarding equity investors for higher risk (Milbow, September, 2009). Consequently, access to low-cost capital can significantly lower the cost of electricity from low-fuel generators such offshore wind power projects.

\(^8\) A MOU between FERC and BOEMRE (dated April 09, 2009) clarified the jurisdictional understanding regarding renewable energy projects in the Outer Continental Shelf (OCS). FERC has exclusive jurisdiction to issue licenses and permits for hydrokinetic projects such as wave and tidal, while MMS has jurisdiction over non-hydrokinetic sources such as offshore wind power.

\(^9\) The US has adopted a federalist system for regulating electricity industry: the federal government has certain regulatory powers such as wholesale transactions, interstate transmission, and licensing of hydroelectric facilities, while states are the main units of electric regulation (Federal Energy Regulatory Commission (FERC), n.d.). State public service commissions, often in coordination with state energy offices, manage the siting of generation facilities, and regulate rates and services of private and investor owned utilities (Massachusetts Energy Facilities Siting Board (MAEFSB), n.d.).

\(^10\) This analysis is based on the Energy Information Administration (EIA) “Annual Electric Utility Report” year 2006 data.
Depending on the financial instruments accessible to a developer, the cost of capital can vary considerably (Ehrhardt & Brigham, 2008). For example Federal Reserve data from 2010 to 2011 indicates (see Graph 2) that on average interest rates for municipal bonds which are accessible to a power authority are 1–2% lower than the corporate bond rates that would be used by an Independent Power Producer (IPP), merchant power plant, or an Investor Owned Utility (IOU) (The Federal Reserve Board, 2011). This difference in interest rates translates into lower cost of generation, which we calculate using a spreadsheet model.

University of Delaware researcher Andrew Levitt (Levitt et al., 2011) has implemented a spreadsheet model based on an MIT analysis of nuclear power financing (Massachusetts Institute of Technology (MIT), 2003), which calculates the cost of electricity from an offshore wind power project. We use this model to calculate and compare the cost of energy ($/MWh) for a hypothetical 200 MW offshore wind power project financed by municipal bonds floated by a power authority, and a similar sized facility financed by cooperative bonds issued by an IPP.

An important input in this analysis is the municipal and corporate bonds interest rate. Drawing on the US Federal Reserve Board statistical release, Table 1 lists the monthly interest rates for a period of one year from June 2010 to May 2011.

Bond interest rate depends on the rating of a specific bond issue by a credit agency. Interest rates in Table 1 are an average of rates across all industries, based on Moody’s credit rating. The ratings, or risk assessments, determine the interest that an issuer must pay to attract purchases to the bonds. Ratings are expressed as a series of letters and digits. Bonds that are rated ‘AAA’ are judged to be the best quality and carry the smallest degree of investment risk, while bonds that are rated ‘BAA’ are considered as medium grade obligations. Rating ‘C’ is the lowest rating for bonds.

The data for commercial bonds from the US Federal Reserve Board is available for two different rating categories “AAA” and “BAA”. Investigation of recent corporate bond ratings for six IPPs and IOUs (NRG, Pepco, PPL electric utilities, Constellation Energy, FPL, and PSEG) using the Standard and Poor’s NetAdvantage dataset suggest the rating to be in the range of ‘B’–’BBB’. ‘BAA’ is closest to the ‘B’ rating in Table 2. Therefore, we use corporate bond rating ‘BAA’ for calculating the cost of energy for IPP projects, resulting in a slightly more favorable rate for IPPs than recent experience would suggest.

Other input parameters in the analysis include capital cost, operations and maintenance (O&M) cost, debt fraction, and equity rate. For capital cost, we use a figure representative of early EU projects, while others represent typical US project rates (see Table 2). Public utilities can have as much as 100% debt financing whereas, debt to equity ratio for a merchant power plant or an IPP project is typically 60:40 (Klein et al., December 2007).

Considering the life of a project, the debt term is assumed at 20 years. Power authorities are exempt from federal, state, and local taxes on their revenue, therefore a 0% tax rate is considered, while a rate of 37% is considered for an IPP project. The model assumes a depreciation tax shield for 6 years which can be availed by wind power projects under the Modified Accelerated Cost-Recovery System (MACRS)12. The cost of equity is assumed at 15% (Klein et al., December 2007). Combining the debt and equity rate for an IPP, the Weighted Average Cost of Capital (WACC) is 8.3%, compared to 4.6% for a power authority project. The model assumes a variable O&M cost of $35/MWh, and a 2.5% inflation escalation for PPA prices, RECs, PTC, and O&M. Cost of construction, and the Operation and Maintenance (O&M) costs provide the total costs. Similarly, total energy generation, power price, and subsidies provide the revenues. Both the costs and revenues are discounted at the WACC. Using an offshore wind capacity factor in the Mid-Atlantic Bight of 39% from Kempton et al. (2007), the model calculates the cost of energy in $/MWh and $/kWh. The final output is the Breakeven Price (BP), which includes all the costs over the lifetime of a project: initial investment, operations and maintenance, cost of fuel, and capital cost.

The model also considers three financial incentives: Investment Tax Credit13 (ITC) at 30%, $22/MWh PTC for 10 years, and

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12 Power authority projects cannot avail these benefits.
13 Under present law wind power developers can choose between a Production Tax Credit (PTC) or an Investment Tax Credit (ITC). Under PTC an income tax credit of 2.2 $/kWh is allowed for the production of electricity from utility-scale wind turbines. Wind project developers can choose to receive a 30% Investment Tax Credit (ITC) in place of the PTC for facilities placed in service in 2009 and 2010, and also for facilities placed in service before 2013 if construction begins before the end of 2011 (Source: AWEA).
Some of the input parameters here are subject to uncertainty and change. In particular as we write in summer 2011, the interest rates on various financial instruments are subject to change, the equipment part of the cost of capital is subject to profiteering due to shortage of tested and validated machines, the construction costs are uncertain, and risk premiums may be high due to lack of projects and experience. (These factors may help to explain the high cost of the announced Cape Wind-National Grid PPA, 22.5 ¢/kWh for RECs plus energy.) Therefore, the percentage differential in the cost of electricity is more reliable than the absolute cost of electricity number. Nevertheless, it may be relevant to note that the wholesale price for long-term contracts in this region is $80–$110. Therefore, Table 3 also suggests that an unanticipated effect of dropping the ITC— if our input parameters are correct—a public authority will still be capable of producing cost-competitive electricity, whereas an IPP will not.

4.2.2. Power authority and power purchase agreement (PPA)

Another option for a power authority is to enter into a long-term Power Purchase Agreement (PPA) with a private developer to hedge financial risk. For a private developer, a PPA guarantees a steady rate of return on investment and enables raising capital at affordable interest rates. With no fuel costs, the price of energy from a wind power project can be predicted over long-term, and debt can be serviced from the revenues. Power authorities can in turn service its own customers, as would be in the case for Long Island Power Authority (LIPA), or it can sell the output to distribution utilities via long-term contracts, or in the regional spot market.

Power authorities also gain much from a PPA. Informant R3, a mid-level manager at a power authority explains, “many power authorities such as LIPA are not interested in constructing and operating a complex facility such as an offshore wind power project.” By signing a PPA with an experienced private developer, the power authority offloads the operational risk to the developer.
and gets the benefits of a new generation facility. Offshore wind power is an emerging technology: PPA arrangement effectively transfers the risk of completion, cost overruns and costs due to technical defects to a private developer. For example, multiple offshore wind projects in Europe such as Horns Rev, Scroby Sands, Kentish Flats, and Barrow have suffered production downtime due to gearbox failure (Westwood, July/August 2007). In the most dramatic case, all the 80 wind turbines at Horns Rev wind power project off Denmark malfunctioned after only 2 years of operation owing to the effect of salt water and air on the generators and gearboxes (Wallace et al., 2009). In a PPA arrangement, the power authority and its captive customers would be shielded from major financial loss in the event of such failures.

Production Tax Credit (PTC) and Investment Tax Credit (ITC) are other reasons for not constructing and operating a project in-house. Informant R4 from a regional power authority states, “a public authority cannot take advantage of the PTC due to their tax-exempt status if they constructed their own wind farm.” (Analysis in Table 3, shows that power authority still have 10% cost advantage over IPPs when tax incentives are considered, and a 50% cost advantage without tax incentives). The New York Power Authority in 2009 proposed a utility-scale (120–500 MW) wind project in the Great Lakes that will be constructed and operated by a private developer. The project will be sited in New York state waters of Lake Erie or Lake Ontario and NYPA will purchase the full output from this project through a long-term PPA (New York Power Authority (NYPWA), December 1, 2009a, 2009b). Some wind developers and power authorities are designing creative financial arrangement involving PPAs to finance wind power projects. In a recent arrangement, Cannon Power Group, a wind energy developer secured a $178 million financing deal to expand Windy Flats land based wind project in Washington state through an innovative pre-pay purchase agreement with the Southern California Power Authority. Under the financing structure, the power authority agreed to pre-pay for a block of output from the installation for 20 years. The authority will issue long-term, tax-exempt bonds to finance the pre-pay amount. The power authority will also buy any excess power under the PPA, and it can also exercise the option to buy the project after 5 years. In exchange of the pre-payment, the power authority received a price discount on generated power (Wagman, November/December, 2009).

4.2.3. Other benefits and problems with a power authority

The governance flexibility of a power authority structure allows it to expand its scope and create related infrastructure such as transmission lines. For example, the Lower Colorado River Authority (LCRA) partnered with American Electric Power (AEP) to construct a 145 mile long 345,000 V transmission line which they term a ‘renewable highway’. It will carry power from the growing number of wind power projects in west Texas to the major load centers in the central and eastern parts of the state. Respondent R4 says, “it made much business sense for the authority to invest in the transmission network since there is no return on equity the authority has to worry about, and they could raise cheap capital through municipal bonds to pay for such projects.” This on-land model can be replicated in the offshore environment to create a transmission trunk line which can levelize output power, slow down fluctuations and thus increase the capacity value of the offshore resource (Kempton et al., 2010).

An indirect benefit regards public support or opposition to offshore wind power. Results from two surveys suggest that power authorities are more likely than private developers to assuage stakeholder concerns (Firestone et al., 2009). Power authorities, particularly the established ones, can use their public goodwill and political capital to minimize local concerns and instill confidence in the local community for a project. This was also seen in the interviews: Respondent R3 believed that as a public authority, LIPA faced much less public opposition than Cape Wind project. He further adds, “public power authorities like LIPA work for the greater public-good as an entity of the state. The local community realizes this and places much greater faith in their decision making mechanism than they would for a private developer.” This point was validated at the Cape Wind project where the opposition successfully painted the private developer as greedy, seeking profit over community or environmental priorities, and able to manipulate the political system (Kempton et al., 2005).

One drawback of the power authority model is that creating a new power authority, or modifying an existing one requires an act of the state legislature. Creating a new power authority in particular could generate political resistance; expanding the scope of an existing power authority on the other hand is likely to face less resistance. According to respondent R5, the academic expert, “expanding the scope of an existing authority is much easier [than creating a new one] ... though it still requires legislative approval.”

5. Multi-state power authorities

From experience with other resources, many states recognize that the efficient use, management, and regulation of natural resources are often challenged by the political boundaries not aligned with the extent of a natural resource. For example, watershed management across state lines is often encumbered by the lack of interstate cooperation. Similarly, the extension of state boundaries into the Great Lakes, bays, and the ocean can divide a natural feature into political jurisdictions, leading to smaller or disconnected developments.

Several announcements were made in 2008 and 2009 for interstate coordination and cooperation, but none with any institutional powers. The Mid-Atlantic states of New York, New Jersey, Delaware, Maryland, and Virginia formed the Mid-Atlantic Regional Council on the Oceans (MARCO) to enhance cooperation on ocean issues, among others to include “collaborate on a regional approach to support sustainable development of renewable energy in offshore areas” (Mid-Atlantic Regional Council on the Ocean (MARCO), June 2009). Similarly, six New England coastal states (Maine, New Hampshire, Massachusetts, Vermont, Rhode Island, and Connecticut) have created a regional network–Northeast Regional Ocean Council (NROC)- partnering with relevant federal agencies15 to enhance cooperation on multiple issues including ocean energy planning and management (Northeast Regional Ocean Council (NROC), n.d.). A parallel effort is currently underway in the Great Lakes region with the Great Lakes Wind Collaborative (GLWC). In a collaborative effort focused exclusively on offshore wind power, states of Delaware, Maryland, and Virginia entered in a Memorandum Of Understanding (MOU) to enhance cooperation on a range of issues including transmission services, regional policies, and incentives, collaboration on federal policy issues, supply chain facilities, encouraging research and development, and regional workforce development efforts (Memorandum of Understanding (MOU), November 9, 2009). None of these collaborative efforts have any statutory authority or legislatively granted powers and limited administrative staff.

15 Federal agencies that are part of NROC include: National Oceanic and Atmospheric Administration (NOAA), US Environmental Protection Agency (US EPA), US Department of Interior (US DOI), US Army Corps of Engineers (USACE), US Department of Agriculture (USDA), and US Coast Guard.
A public authority based on an interstate compact is a time-tested approach to manage shared resources.

Interstate compacts are powerful, durable, and adaptive tools for promoting cooperative action among the states. As one of the oldest mechanisms available for states to work together, their use predates founding of the nation (Mountjoy, June/July, 2002). Interstate compacts are formal agreements or contracts between two or more states that allow them to pursue a common agenda, or deal with issues that affect them jointly (Voit and Nitting, 1999). To form a compact, two or more states typically negotiate an agreement, then each state legislature enacts a law that is identical to the agreement reached. Once all the states specified in a compact have enacted such laws, the compact is formed. In some cases, if a compact affects the balance of power between the states and the federal government or affects a power constitutionally delegated to the federal government, states must also obtain congressional consent. In consenting to a compact, the Congress may add certain conditions, such as specifying that compact disputes be resolved in federal courts (U.S. Government Accountability Office (US GAO), April 2007). Once the Congress has approved a compact, states are prohibited from altering it without Congressional consent. Compacts that have been approved by the participating states are legally binding, and their provisions have legal superiority; that is, they take precedence over conflicting state laws (Bowman, October 2004).

Interstate compacts can be bilateral or multilateral depending on their scope. They can be broadly divided into three groups: border compacts, advisory compacts, and regulatory compacts. Border compacts establish or alter state boundaries, while advisory compacts examine a problem, and report to respective states on its findings. A regulatory compact can be used to create a new public agency, for example a power authority.

The existing interstate compacts in the energy sector focus broadly on either energy conservation or nuclear energy (generation, safety, and waste disposal) (Voit et al., 2003). Examples include the Interstate Oil and Gas compact (to conserve oil and gas), Southern Compact (to manage nuclear energy), and Appalachian State Low-level Radioactive compact. Nearly, all these energy compacts are advisory in scope, consequently they established commissions and boards to conduct studies and develop recommendations for the participating states (Zimmerman, 2002). Although advisory compacts are useful mechanisms for enhancing interstate cooperation, they lack the administrative commitment to develop and manage shared resources such as offshore wind power. A regulatory compact is better suited since it would create a dedicated power authority to provide the needed institutional framework.

5.1 Interstate power authorities

Although interstate power authorities are rare (and currently specific to nuclear or energy efficiency sectors), they have been suggested to develop interstate transmission for locationally constrained energy resources such as wind power (National Renewable Energy Laboratory (NREL), October 2, 2009). In the past, federal government has actively created regional power authorities such as Bonneville Power Administration (BPA) and Tennessee Valley Power Authority (TVA) to build and manage hydroelectric resources, and construct transmission to move that power. The focus has now shifted to wind power development and its transmission to load centers, but no one is calling for a new federal authority for this purpose. Interstate transmission is traditionally a federal subject, managed by the Federal Energy Regulatory Commission (FERC). A regional power authority framework offers states the opportunity of constructing and managing interstate transmission infrastructure, without the peril of federal preemption. This discussion on interstate transmission can be readily applied to offshore wind resources.

A regional power authority provides the benefits which were discussed in detail earlier with a single-state power authority, with the added capability to develop resources across state boundaries. In creating an interstate power authority, the participating states surrender a part or all of their authority on shared resources in exchange for shared sovereignty over the entire resource by the interstate public authority, of which it is a member. In turn, the authority would provide a dedicated administrative setup to develop and manage the resource on a regional scale. It is important to note that states would agree to a regional arrangement when the perceived benefits of collaboration in their assessment would outweigh the cost of surrendering authority over a resource.

The coastal states could create an interstate authority dedicated to offshore wind power in two ways: by creating a new authority or by modifying an existing one. The process for creating a new one was described above. Precedence for modification of interstate compacts exists, with the Delaware River and Bay Authority (DRBA), being one such example. DRBA is a bi-state government agency that was created in 1962 to manage the shared road, air, and waterway transportation infrastructure in New Jersey and Delaware. Revision of the compact in 1990 by the 101st Congress empowered the authority to participate in economic development ventures in Delaware and southern part of New Jersey (Delaware River and Bay Authority (DRBA), 1990).

A related option is for the states to expand the mandate of an existing interstate compact. For example, DRBA could be expanded to cover offshore wind power development, transmission, and/or development of offshore wind manufacturing.

A dedicated regional power authority would facilitate offshore wind development in three ways. First, a power authority acting on behalf of the participating coastal states could prepare a regional resource management plan in coordination with BOEMRE and other concerned federal agencies. A regional plan could identify potential conflicts with other ocean and coastal uses and the natural environment, and devise strategies to resolve potential conflicts. An important part of this effort could be a regional marine spatial plan to guide and facilitate resource development. This planning effort could compliment the ongoing national Coastal and Marine Spatial Planning (CMS) effort (National Oceanic and Atmospheric Administration (NOAA), n.d.) and inform the broader ecosystem management practices for ocean resources.

Second, since state jurisdictional waters only extend three nautical miles on the Atlantic coast. Where there is greater potential for visual and environmental effects, more offshore wind power development will occur in federal waters. BOEMRE is the lead agency for the leasing process, although federal leases will have to be consistent with the coastal state regulations. If participating states in a regional authority choose so, the authority could work with BOEMRE to suggest optimal resource development strategies and coordinate on permitting issues.

Third, there is a shared energy economy at the regional level in terms of developing and using electric generation and transmission infrastructure. MARCO states with the exception of New York

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16 The only exception is the low-level radioactive waste disposal compact. It is an interstate compact between the states of Texas, Marine, and Vermont. It is hosted by Texas and it allows Maine and Vermont to ship their low-level radioactive waste to Texas.

17 Federal preemption is a doctrine based on supremacy clause of the US Constitution. It allows a federal law to take precedence over or to displace state law in matters of national importance such siting of interstate transmission lines.
are part of the PJM® Regional Transmission Organization (RTO), which manages a shared generation and transmission pool, and operates a unified regional wholesale market. Further, each state has a Public Service Commission (PSC) that makes state decisions about power plant development and siting. A regional power authority could make agreements about state PSC regulatory priorities, and would have more influence than any one state at PJM (however, PJM decisions are driven by member companies, not by constituent state governments).

6. Conclusion

Offshore wind power development in the US currently stands where hydroelectricity was in 1930s. In much the way power authorities facilitated hydroelectric power generation, they could also now be used to facilitate offshore wind power development. The disadvantage of a power authority is that it requires legislative action by one or more state legislatures, and requires setting up a new institution, or adapting an old one. Among the several advantages discussed above, including planning and coordination functions, the most important may be that it lowers the cost of power by as much as 50% and preserves the ability to pursue more cost-competitive development even if the current federal incentives are removed.18

Acknowledgment

The authors would like to thank Andrew Levitt of University of Delaware for his support with the research. This article is based on Ph.D. research work supported by the University of Delaware College of Earth, Ocean and Environment and the Magers Family Scholarship.

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18 PJM® is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all of 13 states (Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia) and the District of Columbia.

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Please cite this article as: Dhanju, A. et al., Potential role of power authorities in offshore wind power development in the US. Energy Policy (2011), doi:10.1016/j.enpol.2011.08.002.

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