Evaluation and Comparison of US Wind and Skipjack Proposed Offshore Wind Project Applications

REVISED Public Version

prepared for the

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TABLE OF CONTENTS

FIGURES

TABLES

ACRONYMS

AEO	Annual Energy Outlook
APS	Allegheny Power System
AWST	AWS Truepower
BGE	Baltimore Gas & Electric
BOP	Balance of Plant
BRA	Base Residual Auction
BOEM	Bureau of Ocean Energy Management
CETL	Capacity Emergency Transfer Limit
CETO	Capacity Emergency Transmission Obligation
CIR	Capacity Interconnection Right
COD	Commercial Operating Date
COMAR	Code of Maryland Regulations
COP	Construction and Operations Plan
CP	Capacity Performance
DPL	Delmarva Power & Light
EIS	Environmental Impact Statement
EMAAC	Eastern Mid-Atlantic Area Council
EPC	Engineering, Procurement, and Construction
ESA	Environmental Site Assessment
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
FTE	Full-time Equivalent Job
GAAP	Generally Accepted Accounting Principles
GATS	PJM Generation Attribute Tracking System
ISO-NE	New England Independent System Operator
ITC	Investment Tax Credit
JEDI	Jobs and Economic Development Impact
LDA	Locational Delivery Area
MAAC	Mid-Atlantic Area Council
MDPSC	Maryland Public Service Commission
MEA	Maryland Energy Administration
MW	Megawatt
MWh	Megawatt-hour
NAICS	North American Industry Classification System
NM	Nautical Mile

NREL	National Renewable Energy Laboratory
NYISO	New York Independent System Operator
NYMEX	New York Mercantile Exchange
O&M	Operations & Maintenance
OCS	Outer Continental Shelf
OREC	Offshore Renewable Energy Credit
OSW	Offshore Wind
OWEA	Offshore Wind Energy Act of 2013
PEPCO	Potomac Electric Power Company
PJM	Pennsylvania-Jersey-Maryland Interconnection
POI	Point of Interconnection
PTC	Production Tax Credit
PV	Present Value
REC	Renewable Energy Certificate or Credit
RFP	Request for Proposal
ROW	Right of Way
RPM	Reliability Pricing Model
RPS	Renewable Portfolio Standard
RTO	Regional Transmission Organization
SAP	Site Assessment Plan
SCADA	System Control and Data Acquisition
STEO	Short Term Energy Outlook
UCAP	Unforced Capacity
WEA	Wind Energy Area

EXECUTIVE SUMMARY

PROCESS AND SCHEDULE

Levitan & Associates, Inc. and its subcontractors DNV GL, Sullivan Cove, and Chesapeake Environmental Management, were retained by the Maryland Public Service Commission (MDPSC) as independent consultants and experts to conduct the Offshore Wind Renewable Energy Credit (OREC) procurement process, consistent with the Offshore Wind Energy Act of 2013 (OWEA) and the MDPSC's Regulations to implement OWEA. We were selected on October 7, 2014 through a competitive process pursuant to PSC contract #02-19-14. On December 15, 2014, we established a public website, www.MarylandOffshoreWind.com, which contains general OREC information, key documents, the procurement schedule, questions and answers, and a news page. The website also has secure portals with individual password-protected access for each potential applicant. A locked cabinet in our offices was set aside for hard copies of applications and supporting information. We conducted a Technical Conference with MDPSC staff for potential applicants and other interested parties on January 8, 2015.

We received two applications for potential offshore wind projects. The first application was submitted by US Wind, Inc., a subsidiary of Toto Holding SpA, a large Italian engineering and construction firm, on February 3, 2016. The 248 MW US Wind Project would be located in the Maryland Wind Energy Area (WEA).[1] Our initial review for administrative completeness uncovered missing and incomplete information that we subsequently received. Once we confirmed the US Wind application contained all of the information identified in COMAR 20.61.06.02 D-N, we determined it to be administratively complete on February 24, 2016. Our determination triggered the commencement of the initial 180-day Application Period on February 25, 2016.

The second application was submitted by Skipjack Offshore Energy, LLC, a subsidiary of Deepwater Wind Holdings, LLC, whose majority owner is D.E. Shaw, a large, privately-held global investment management and technology development firm. The application was submitted on August 23, 2016, just prior to the end of the original Application Period. The 120 MW Skipjack Project would be located in the Delaware WEA.[2] Our initial review for administrative completeness uncovered missing and incomplete information that we subsequently received, and we determined the Skipjack application to be administratively complete on September 22, 2016. A map from the US Department of the Interior's Bureau of Ocean Energy Management (BOEM), the agency that auctions off the WEA leases, that illustrates the Maryland and Delaware WEAs in which the Projects would be located is provided below as Figure 1.

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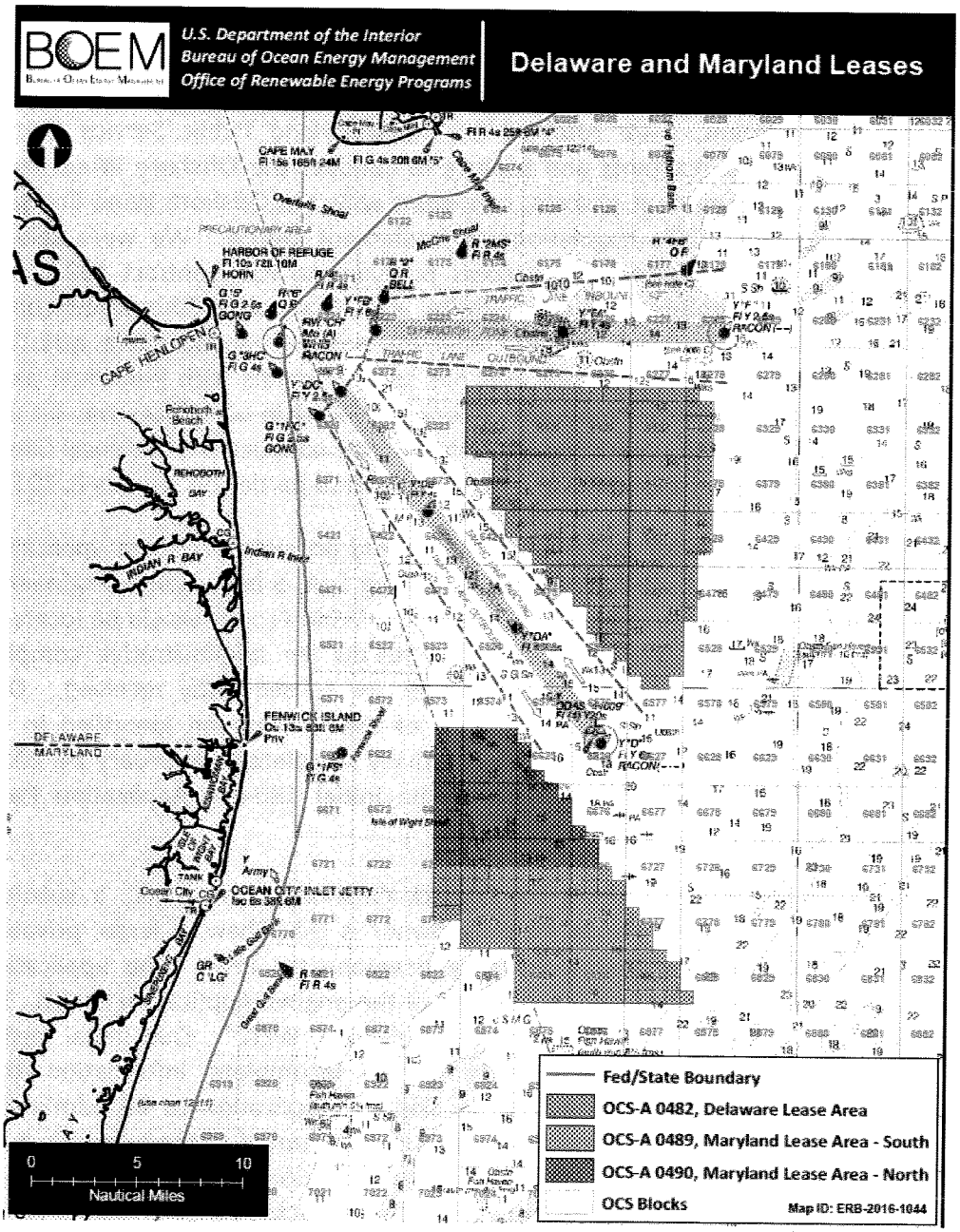
[1] US Wind ultimately plans to develop a total of 748 MW of offshore wind capacity on the Maryland WEA.

[2] A discussion of the Delaware WEA vis-à-vis the definition of a Qualified Offshore Wind Project is included on pages 139-140 of this report.

Figure 1. BOEM Mid-Atlantic Wind Energy Areas



We requested three 30-day extensions to the Application Period to allow us time to conduct the determinations required by the Regulations and to independently evaluate both applications in a consistent fashion. We found the US Wind and Skipjack applications satisfied the minimum threshold criteria outlined in COMAR 20.61.06.03 A, discussed at length later in this report, including general definitional and financial criteria as well as OWEA's definition of a

Qualified Offshore Wind Project. During our evaluations, we determined that the OREC quantity and prices submitted initially by US Wind would exceed the net ratepayer caps in the Regulations. US Wind subsequently submitted a revised OREC Price Bid for its Project that satisfied the net rate caps. Therefore, we concluded that both applications would satisfy the price and net ratepayer caps prescribed by OWEA. The Application Period ended on November 18, 2016, which commenced a 180-day period by the end of which the MDPSC must decide to approve, conditionally approve, or deny the applications.

EVALUATION METHODOLOGY

During our review of the applications, we requested and received additional information that US Wind and Skipjack provided through supplemental document submittals and conference calls. Pursuant to the Regulations, the applicants' supplemental responses became part of their respective application to be considered by the MDPSC during its evidentiary proceeding.[3] Our qualitative analyses of the applications included the comprehensiveness and quality of the applicants' qualifications, project characteristics, financial plan, site control, planned schedule, operations and maintenance (O&M) plan, and decommissioning plan; their estimates of net ratepayer impacts, economic i.e. employment, taxes, and local spending impacts, environmental and health benefits; and other factors consistent with COMAR 20.61.06.03 B(1). In our qualitative evaluation, we took into consideration the riskiness and future uncertainties associated with domestic offshore wind farm development.[4] Thus, there were instances in which an applicant did not have all of the requested information, which we found to be reasonable given the early stage of development for both projects.

Our quantitative analyses included independent forecasts of net ratepayer impacts, in-state economic impacts, and emission and health benefits, consistent with COMAR 20.61.06.03 B(2). Our independent forecasts were designed to provide the MDPSC with a consistent and impartial basis of comparison for the two proposed offshore wind projects. The MDPSC will use our findings in general to evaluate the two applications and issue an order pursuant to COMAR 20.61.06.03 C, D, and E.

In our review of the applications and in preparing our findings, we recognized that OWEA and the regulations were designed to mitigate ratepayer risk associated with a potential offshore wind project. Not only must the OREC prices offered by the applicants meet the price and net rate caps in the Regulations, the applicants are to be entirely responsible for the development, permitting, financing, construction, and operation of their proposed offshore wind projects. Maryland ratepayers should only pay for ORECs that are delivered into the PJM system

[3] While the Regulations contemplate the ability to issue further information requests, applicants are prohibited from submitting a response that changes the proposed OREC price schedule, the proposed OREC amount, or any other material change to the application after the close of the Application Period, i.e. November 18, 2016, per COMAR 20.61.06.01 E.

[4] As of December 2016, there is only one domestic offshore wind project in operation, the Block Island Wind Farm, a 30 MW demonstration project in Rhode Island state waters.

(referred to as "take-if-tendered"), up to an annual quantity and at prices set in the application and confirmed by the MDPSC in its Order. Maryland ratepayers should not pay more if a selected project costs more to construct or operate than initially anticipated, if its performance is below expectations, or if the applicant cannot achieve the financial results that were projected. We found that the offshore wind procurement and evaluation process (i) was as fair, transparent, and workable as possible, (ii) lead to robust and competitive bids, and (iii) preserved ratepayer protections, all as defined in OWEA and the Regulations.[5] This Executive Summary provides a high-level overview and key findings for each proposed project, side-by-side, organized by COMAR sections. More detailed evaluations of each project follow in succeeding chapters, also organized by COMAR sections, along with risk factors and project differentiators to facilitate the MDPSC's selection process.

OVERVIEW OF THE PROPOSED OFFSHORE WIND PROJECTS

The proposed US Wind Project, to be located in the Maryland WEA, and the Skipjack Project, to be located in the Delaware WEA, are described in general below.

US Wind	Skipjack
US Wind has proposed a 248 MW offshore wind project to be located in the Maryland WEA. The two Maryland WEA leases were awarded to US Wind through a competitive auction conducted by BOEM. US Wind plans to develop as much as 748 MW in the Maryland WEA. Any offshore wind development in excess of 248 MW in the Maryland WEA will be independent of, and would not affect, the US Wind Project seeking OREC funding.	Skipjack has proposed a 120 MW offshore wind project to be located on the Delaware WEA. The BOEM lease for the Delaware WEA was originally awarded to Bluewater Wind, LLC, a subsidiary of NRG Energy, Inc. Deepwater is in the process of purchasing the lease for Skipjack and obtaining BOEM approval for the transfer.[11] Skipjack would utilize the southern portion of the Delaware WEA; the remainder could be used to develop an offshore wind project serving other market and would be independent of, and would not affect, the Skipjack Project.
US Wind intends to utilize sixty-two 4 MW Siemens turbines mounted on jacket foundations.[6] The US Wind Project would generate 913,845 MWh/year (a net capacity factor of 42.1% after losses) and an equivalent amount of ORECs. US Wind is considering a smaller number of larger, e.g. 6 MW, turbines mounted on jacket, i.e. latticework,	Skipjack intends to utilize fifteen 8 MW turbines, mounted on monopile foundations. The Skipjack Project is projected to generate 455,482 MWh/year (a 43.3% net capacity factor after losses) and an equivalent amount of ORECs. Skipjack is considering larger rotors

[5] *See* Request for Proposals, PSC #02-19-14.

[6] US Wind originally selected monopile foundations. Both designs are acceptable.

foundations, but the OREC price and quantity must remain unchanged.[7] The US Wind Project would have a submarine cable to a transition vault on the Delmarva Peninsula, a second buried cable to a new substation, and a short overhead transmission line to the Indian River substation owned by Delmarva Power (DPL), where the US Wind Project's energy will be delivered to PJM.

Initially, US Wind submitted a 2-part, 20-year OREC price with an expected Commercial Operating Date (COD) of January 1, 2020 that met the $190/MWh price cap but exceeded the net rate caps.[8] Subsequently, US Wind submitted a revised 2-part bid with a lower levelized (2012 $) price of $177.64/MWh that met the net rate caps. Pursuant to the Regulations, an applicant is permitted to submit either a 1-part or 2-part OREC price.[9] US Wind submitted a PJM interconnection request and based on PJM's studies completed to date, no upgrades would be required. The adjusted revised levelized (2012 $) OREC price, i.e. without any upgrade costs, would be $176.66/MWh.

that may affect the Project's design, but the OREC price and quantity must remain unchanged pursuant to the Regulations. The Skipjack Project would have a submarine cable to a transition station on the Delmarva Peninsula and an underground cable to the Ocean Bay or 138th Street substation owned by DPL, where the Skipjack Project's energy will be delivered to PJM.

Skipjack submitted a 1-part OREC price bid with an expected COD of November, 2022, and a 2022 price of $166/MWh. The levelized (2012 $) price of $134.36/MWh, assuming a January 1, 2023 COD, meets the price cap and the net rate caps. The 1-part bid is not subject to any adjustment based on the actual cost of PJM transmission upgrades. However, the Skipjack application proposes certain conditions, described below, that could result in different OREC prices.

Except for working to acquire the BOEM lease for the Delaware WEA and to subdivide it for two projects, Skipjack has not commenced its development efforts, e.g. applying for permits and approvals, but intends to do so after it

[11] Deepwater, through its joint venture subsidiary, is purchasing the lease from NRG Bluewater. BOEM has determined that the subsidiary is qualified to hold the lease.

[7] After the close of the Application Period i.e. November 18, 2016, the Regulations permit an applicant to supplement or amend its application, e.g. project design, in response to Commission questions, provided that the response does not alter the proposed OREC price schedule, the proposed OREC amount, or other material change per COMAR 20.61.06.01 E. The Regulations also permit an applicant to revise its design after issuance of an OREC award, but any material change to the project capacity, the turbine model, the design of the foundation or support structure, the project COD, the decommissioning plan, or other project component, must be reported to the MDPSC within 30 days of the date of that decision, and will be acted upon in the Commission's discretion per COMAR 20.61.06.18 B.

[8] Pursuant to the Regulations, an applicant is permitted to submit either a 1-part or 2-part OREC price. In a 2-part OREC price, the first component is a firm set of prices and the second component is subject to a true-up (to occur at a later date) based upon any change between the MDPSC's estimated cost of transmission upgrades and PJM's actual upgrade costs as specified in an executed Interconnection Service Agreement. The total OREC price after any true-up would remain subject to the price and net rate caps in the Regulations.

[9] Per COMAR 20.61.06.02 M(1), the trued-up OREC price would remain subject to the price and net rate impact caps for residential and non-residential customers, as described in Public Utilities Article ("PUA") § 7-704.1(e)(1)(ii) and (iii).

US Wind has actively pursued development and permitting activities since it obtained the lease for the Maryland WEA. US Wind has achieved a number of permit and approval milestones, including completing an initial geological survey and submitting a Site Assessment Plan (SAP) to BOEM.[10] Other early milestone dates were missed, so we expect US Wind's COD will be delayed.

receives "...a fully-approved, mutually-acceptable, un-appealable" MDPSC order. Assuming an MDPSC order by June 30, 2017, Skipjack's development is about two years behind US Wind assuming its COD is delayed.

DETERMINATION OF ADMINISTRATIVE COMPLETENESS – COMAR 20.61.06.02 A

An application shall contain the information described in D through N of this regulation, but an OSW applicant may submit additional information or materials, or both. The Commission in its discretion shall determine whether the information and materials that an OSW applicant provides are sufficiently detailed to satisfy D through N of this regulation.

After receiving applications from US Wind and Skipjack for a proposed offshore wind project, we made preliminary findings whether each application was administratively complete, as defined above. Our initial review was for completeness only, and would not disqualify an application on its merits. We requested and received additional information from both applicants and determined each to be administratively complete during the Application Period.

APPLICANT INFORMATION – COMAR 20.61.06.02 E

An application shall include a signed and notarized statement by an officer of the OSW applicant attesting that:

(1) the officer has the authority to submit the application to the Commission;

(2) The application, including the proposed OREC price schedule and proposed OREC amount, shall remain binding until the expiration date;

(3) The information and materials contained in the application are accurate and correct; and

(4) If the application is selected, the OSW applicant will work diligently and engage in a continuous development and construction program to achieve the project COD for the qualified offshore wind project.

[10] WEA leaseholders are required to submit an SAP to BOEM that describes the initial activities necessary to characterize a lease site, e.g. collecting meteorological and oceanographic data, to allow BOEM to evaluate the potential impacts of such proposed activities and structures.

US Wind and Skipjack provided signed and notarized statements pursuant to COMAR 20.61.06.02 E. Skipjack, however, included conditions pertinent to its attestations, as summarized below.

US Wind	Skipjack
US Wind did not include any conditions in its application.	Skipjack's application included conditions, listed below, that could affect its OREC price and thus impose risks on ratepayers. We believe the MDPSC has discretion to ascertain whether these conditions are acceptable and in compliance with COMAR 20.61.06.02 E. (1) Skipjack requested "grandfathering provisions to mitigate change in law risk," e.g. provisions to assure lenders' rights to escrow account funds. (2) Skipjack requested that its obligations be contingent on receiving "...a fully-approved, mutually-acceptable, un-appealable" order. Skipjack explained "...the Maryland PSC has the authority to cause the winning bidder to receive payments for the full term of the commitment approved in the Maryland PSC order, whether or not there is a subsequent successful constitutional challenge to the program, or to the Maryland PSC order, under state or federal constitutional law." (3) Skipjack's application stated "In the event that a change in law or policy results in a higher available tax credit rate, Deepwater Wind offers to lower its price to account for the increased value of the ITC." Skipjack also confirmed that a lower ITC will result in a higher OREC price. (4) Skipjack's proposed COD and OREC prices are dependent upon obtaining an un-appealable order from the MDPSC by March 30, 2017, revised to June 30, 2017. If Skipjack receives an "...un-appealable order from the MD PSC after [June] 30, 2017, the base rate

	will be adjusted upward to account for the lower federal tax credits for which the Project will qualify." Skipjack identified other conditions regarding its attestations that do not impose OREC price risks on Maryland ratepayers, e.g. Skipjack will apply for state and federal grants provided they will have a "material benefit for the Maryland ratepayers" and/or "do not adversely affect the ability of the Company to develop, construct, and operate the Project."

APPLICANT INFORMATION – COMAR 20.61.06.02 F

An application shall include the following information:

(1) An organizational chart that shows:

(a) Complete ownership structure of the proposed project (including all parents, subsidiaries, and other affiliates that have direct or indirect management or voting control over the proposed project); and

(b) Any lenders or entities funding the proposed project, including those entities funding on a contingent basis; and

(c) If different from the proposed project, the relationship between the OSW applicant and the proposed project.

(2) Legal name and type of business organization of each entity listed on the organizational chart described in F(1)(a) of this regulation, including certificates of formation and certificates of good standing certificated by the relevant governmental authority for each entity and, if applicable, foreign qualification certificates or other evidence that the proposed project and the OSW applicant are qualified to do business in the State;

(3) Bylaws or operating agreement of each entity listed on the organizational chart described in F(1)(a) of this regulation and relevant board resolution (or equivalent written consent) to submit an application;

(4) Name, title, address, telephone number, email address, and curriculum vitae of each member of the OSW applicant's executive team and project team that will be responsible for the proposed project, demonstrating capability and expertise in, at a minimum, project management, development, financing, permitting, engineering, procurement, construction, operations, maintenance, decommissioning and other significant functions for ocean-based energy projects, utility-scale wind projects, or large scale generation projects;

(5) For each entity that is, or has committed to, providing financing to the proposed project:

(a) The identity of the entity and a brief description of its business;

(b) Name, title, address, telephone number, and email address of the primary contact person;

(c) Most recent audited financial statements that use either generally accepted accounting principles or International Financial Reporting Standards; and

(d) Issuer or long-term senior unsecured debt ratings, or both, from at least one nationally recognized statistical ratings organization (if available);

(6) Name, title, address, telephone number, and email address of the primary contact at any entity with which the OSW applicant has a contract or similar agreement to perform permitting, engineering, procurement, construction, operations, maintenance, decommissioning or similar functions for the proposed project;

(7) Complete information about any current or prior business bankruptcies, defaults, disbarments, investigations, indictments, or any other actions against the OSW applicant and any member of the executive team, the project team, or key employee(s) of any company included in F(1) of this regulation; and

(8) Complete information about work performed by one or more entities included in F(1) or (6) of this regulation that is similar to the proposed offshore wind project, including ocean-based energy projects, utility-scale wind projects, or other large scale generation projects.

US Wind and Skipjack provided information about themselves and their contractors that satisfied COMAR 20.61.06.02 F.

US Wind	**Skipjack**
US Wind is a Massachusetts corporation registered in Maryland. US Wind is a wholly-owned subsidiary of Renexia SpA, which itself is a subsidiary of Toto Holding SpA. Toto Holding is a large, privately-held company whose core business is engineering, constructing, and operating large transportation and infrastructure projects primarily in Italy. Renexia develops onshore wind and solar renewable energy projects. Renexia and Toto Holding do not have prior offshore wind experience, but US Wind hired a Director of Project Development with significant domestic offshore wind, transmission, and underwater cable experience.	Skipjack is a Delaware limited liability company authorized to do business in Maryland. Skipjack is a wholly-owned subsidiary of Deepwater Wind Holdings, whose majority owner is D.E. Shaw, a large, privately-held global investment management and technology development firm. Deepwater is actively involved in the development, construction, and operation of offshore wind projects. Deepwater has grown rapidly in the last year as its 30 MW Block Island Wind Farm, the first domestic offshore wind project, has neared completion. Skipjack has retained a limited number of subcontractors with offshore wind and power

US Wind has Renexia and Toto Holding employees with civil and structural engineering and project management experience. US Wind has retained subcontractors who have relevant and significant experience in virtually all phases of offshore wind development, design, engineering, construction, operating, environmental mitigation, and general management tasks to conduct initial studies and develop the Project.

US Wind, through its parent companies, Renexia and Toto Holding, has the financial strength to fund the Project. As of year-end 2015, Toto Holding's consolidated balance sheet was €1.7 billion in assets, revenue was €367.8 million, and profit, i.e. income after taxes, was €12.0 million. [redacted]

expertise to support project design work.

Skipjack, through its parent companies, Deepwater and D.E. Shaw has the financial strength to fund the Project. D.E. Shaw manages a number of investment funds with $38 billion in capital, and makes private equity investments in technology, offshore wind, real estate, and other fields.

PROJECT INFORMATION – COMAR 20.61.06.02 G

G. An application shall include the following information about the proposed offshore wind project:

(1) A general description of the proposed offshore wind project, including but not limited to site plan, location, number of turbines, nameplate capacity, area, typical distance to shore, typical water depths, general seabed description, main competing uses, and sensitive areas;

(2) General maps showing turbine layout, landfall and grid interconnection points, and construction layout site;

(3) A wind resource and energy yield assessment at planned hub height with supporting data in an industry-standard report with expected gross (at generator terminals) and net (at PJM billing meter) annual energy production, including a breakdown of energy losses as well as turbine technical availability (scheduled and forced outages), uncertainty estimates of the net annual energy production at confidence intervals (P5, P10, P50, P90, and P95), and hourly energy production profiles by month (12x24 matrices) for a typical year;

(4) Wind turbine technology with turbine manufacturer, model, performance history, track record in offshore wind applications, physical dimensions and weight, hub height, rotor diameter, and nameplate capacity, design standard, turbine certification status under applicable standards and guidelines such as those developed by the International Electrotechnical Commission, service life, and design life information;

(5) Foundation and support-structure descriptions that include explanations of why the foundation and support structures are appropriate for the site, as well as climatology information that includes wind, wave, and current data;

(6) A description of the electrical collection system and connection to the transmission grid that includes the location and description of any onshore and offshore substations, inter-array and export power cables, interconnection route, landfall and facilities (including rights of way), interconnection plans, status of the interconnection request submitted to PJM, schedule for completing the interconnection studies, and electrical one-line diagram of the facility up to the interconnection point;

(7) Site-control status and plan to acquire and ensure site control for the operating term, interconnection and right-of-way status (or plans), and status of discussions with BOEM and other relevant entities;

(8) A general description of balance of plant components that includes any meteorological mast, communication system, and supervisory control and data acquisition system;

(9) A procurement and construction plan that includes the following, with milestones:

(a) All steps from commencement of procurement and construction to testing and project COD of the proposed project;

(b) A contracting strategy and construction organizational chart;

(c) A description of laydown, storage, and assembly areas;

(d) The OSW applicant's plan to promote the prompt, efficient, and safe completion of the proposed project (particularly with regard to the construction and maintenance of the project in accordance with Public Utilities Article, 7-704.1(d)(1)(ix), Annotated Code of Maryland);

(e) Plans to comply with The Merchant Marine Act of 1920; and

(f) A framework for a construction period health and safety plan;

(10) An operations and maintenance plan with a schedule of principal operations and maintenance activities, locations of specific ports with operations and maintenance facilities, and estimated operations and maintenance labor divided between specialized out-of-state and in-state labor;

(11) A permitting and approvals plan with a detailed matrix listing all required federal, state, and local environmental and regulatory permits and approvals, and setting out the schedule for obtaining the permits and approvals. This should include plans to obtain a certificate of public convenience and necessity for a proposed qualified submerged renewable energy line and plans to conduct an environmental review in compliance with applicable statutes, such as the

National Environmental Policy Act, and that include a description of the types of studies (physical, biological and socio-economic) to be performed. Plans should demonstrate compliance with the Endangered Species Act, Migratory Bird Treaty Act, and Marine Mammal Protection Act, applicable BOEM regulations and guidelines for surveying natural resources (including, but not limited to avian species, benthic habitats, fish, marine mammals, and sea turtles), local/state regulations, and the Coastal Zone Management Act, as applicable;

(12) A decommissioning plan that demonstrates the safe and environmentally responsible removal and disposal of the turbine structures, offshore electrical substation and other offshore facilities, and interconnection facilities, particularly those located in State waters and on State lands; a comprehensive estimate of facility and interconnection decommissioning costs; and assurance that adequate funding shall be available for complete decommissioning of the proposed project, including a detailed explanation of how adequate funding shall be assured.

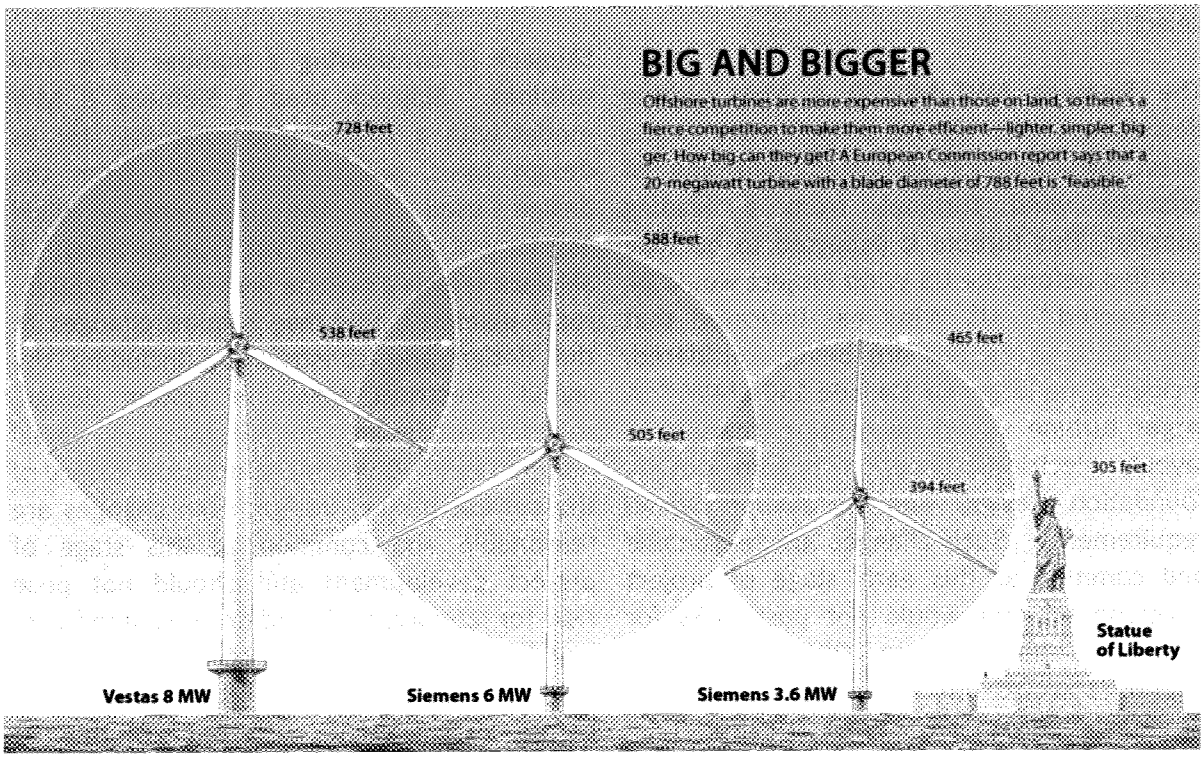
US Wind and Skipjack provided technical, schedule, and operational information about their respective Projects as required by COMAR 20.61.06.02 G - I. US Wind's application provided considerably more detail than Skipjack's, reflecting the permitting and other development work US Wind has performed to date. Skipjack will commence development work after it receives a MDPSC order, so our commentary on the required permits and approvals submitted by each applicant reflects this difference. Both applicants intend to utilize the Sparrows Point Shipyard for equipment storage, final assembly, and staging for installation. Both applicants also intend to have the steel foundations fabricated at the Sparrows Point Shipyard, site of the now-closed Bethlehem Steel mill, or at another location[12], but it is not certain that the required expertise and infrastructure can be developed in time to support the schedules presented in each application. Figure 2 below illustrates the relative sizes of turbines and rotors under consideration, although the distance from shoreline is not accounted for.[13]

[12] Skipjack's application explicitly stated that other in-State locations would be considered, whereas US Wind stated that they reserve the right to change the fabrication based on "reasonable commercial necessity" but did not state whether such change would be limited to in-State locations.

[13] The 3.6 MW turbine shown above has a rotor diameter of 394 feet, equal to 120 meters, slightly smaller than the 130 m rotor diameter assumed by US Wind. US Wind is considering a larger turbine with a 150 m rotor diameter, equal to the 6 MW turbine shown above.

Skipjack assumed an 8 MW turbine with a 154 m rotor diameter for its design, slightly larger than the rotor diameter of the 6 MW turbine shown above. Skipjack's energy assessment was based on an 8 MW turbine with longer blades and a rotor diameter of 179 m, production, larger than the 164 m rotor diameter of the 8 MW turbine shown above.

Figure 2. Relative Turbine and Rotor Sizes



Source: Sierra Club

US Wind	Skipjack
Project Development and Design	
US Wind's overall plan for the development, design, construction, operation, and decommissioning of its 248 MW Project is reasonable given the current early stage of development. US Wind's plans generally meet COMAR requirements.	Skipjack's overall plan for the development, design, construction, operation, and decommissioning of its 120 MW Project is reasonable given the current early stage of development. Skipjack's plans generally meet COMAR requirements.
US Wind hired experienced subcontractors to prepare the wind resource and net energy yield assessment based on a Siemens SWT-4.0-130 turbine. The results indicate that the US Wind Project will produce 913,845 MWh/year at the P-50 confidence interval, i.e. the most likely probability case. This estimate will need to be updated with wind data	Skipjack hired experienced subcontractors to prepare the wind resource and net energy yield assessment, the results of which indicate that the Skipjack Project will produce 455,458 MWh/year at the P-50 confidence interval based on an 8 MW turbine with a 179 m rotor diameter. This estimate will need to be updated with wind data measured at the site

measured at the site and the final turbine selection.

The Siemens SWT-4.0-130 4 MW turbine described in the US Wind application is the latest evolution of an established line of offshore wind turbines from a leading supplier. This turbine is expected to be type certified before the US Wind Project would be constructed.[14] US Wind has indicated that other turbine models are being considered, including the larger GE Haliade 150-6MW.[15] A larger turbine would necessitate changes in layout, electrical collection system design, foundation design, and installation vessel requirements. Such changes are reasonable and common at this early stage of project development and would not pose risks for ratepayers because the OREC price and quantities would not change. Based on the turbine models that US Wind is considering, we expect that type certification will be achieved before the Project commences construction.

US Wind proposed a monopile foundation for the turbines and a 4-leg jacket foundation for the OTM. US Wind has since indicated that its Project will use jacket foundations for the turbines, a proven technology that, according to US Wind, is more suited to local fabrication experience. US Wind intends to have the foundations fabricated at the Sparrows Point Shipyard, but it is unclear if the manufacturing facility will be available in time and will have the capacity to support and maintain the overall schedule.

and the final turbine selection.

Skipjack is considering a number of 8 MW turbines. Skipjack used a Siemens 8 MW model with a 154 m rotor diameter for its design basis, which is different from the design used for the net energy yield assessment and is not yet type-certified. If Skipjack selects a turbine with a larger (180 m) rotor diameter, this may require changes to the design and construction, including the layout, electrical collection system design, foundation design, and installation vessel requirements. Given the conceptual nature of the current project design, such changes are reasonable and common at this stage of project development and should not pose risks for ratepayers. Based on current industry trends, we expect that 8 MW turbines with 180 m rotor diameters will be type-certified before the Skipjack Project commences construction.

Skipjack proposed a monopile foundation for the turbines. Monopiles are the most common type of support structures for offshore wind turbines, but there is limited experience to date (and none in the US) fabricating and installing the size of monopiles that will be required for 8 MW wind turbines at the Skipjack Project. Skipjack plans to have the foundations and transition pieces partially fabricated at the Sparrows Point Shipyard, but it is unclear if the manufacturing facility will be available in time and will have the capacity to support and maintain the overall schedule.

Skipjack intends to design and build the

[14] Wind turbine certification verifies conformity to applicable codes, standards, and regulatory requirements by an accredited certification body. DNV GL is a recognized certification body. Type Certification includes, at a minimum, design assessment, manufacturing evaluation, component testing, and full-scale testing. Type-certification is often mandatory for insurers, financiers, and procurement agencies.

[15] The Block Island Wind Farm utilizes five GE Haliade 150-6 MW turbines.

[redacted] Toto Holding is financially strong and has extensive construction and project management experience with very large projects. [redacted] While this is a risk factor, it is mitigated by US Wind having the obligation to complete and operate the US Wind Project before it collects any revenues from ratepayers. Any cost overruns or performance shortfalls will be borne by US Wind.

Project using a "multiple primes" approach in which it will manage and integrate a limited number of discrete contracts. Each contract, e.g. foundation construction, foundation installation, turbine procurement, etc. would be executed with contractors having expertise in that field. Deepwater used this approach, common in Europe, for its Block Island Wind Farm in Rhode Island.

The Construction Plan indicated there will be six main work packages under the in-house Skipjack project management team to oversee and integrate the work. The application listed the benefits of this strategy, i.e. cost effectiveness, bankability, and familiarity, and takes advantage of the Skipjack team's experience with the development and construction of the Block Island Wind Farm.

Operation & Maintenance and Decommissioning

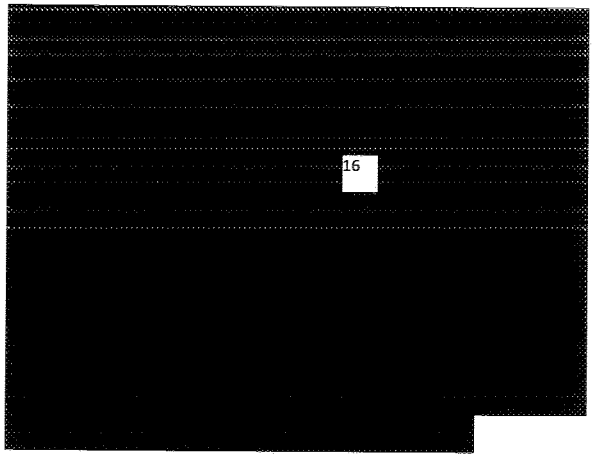
The general O&M Plan is reasonable and adequate given the early stage of development. Later on, US Wind will need to better define certain aspects of the O&M plan, including O&M for the Balance of Plant, turbine access solutions, major equipment replacements, and the selection of Ocean City as the O&M hub.

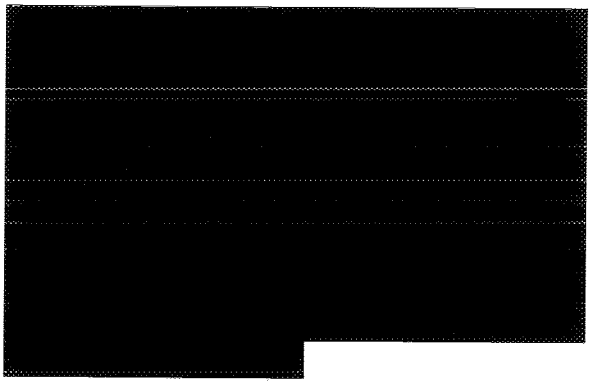
US Wind's estimated decommissioning costs appear to be understated compared to our in-house data, but BOEM regulations will require an independent decommissioning cost estimate, ongoing funding by US Wind, and financial security for future unfunded amounts. Thus Maryland's ratepayers would not bear any risk if US Wind's initial decommissioning costs are in fact underestimated.

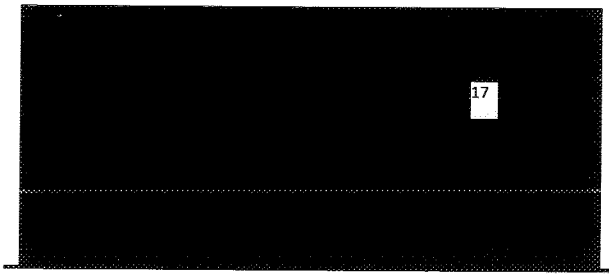
Skipjack submitted an O&M Plan with a high level overview of planned O&M activities and facilities, along with a division of responsibilities. Skipjack intends to utilize Ocean City for its Operations Center. While the O&M Plan is missing some relevant information and presents some risks, it is adequate for this early stage of development.

Skipjack provided a brief Decommissioning Plan and an estimated cost that appears reasonable, although the estimated value for the used materials appears optimistic compared to expected scrap metal prices. BOEM regulations will require an independent decommissioning cost estimate, ongoing funding by Skipjack, and financial security for future unfunded amounts. Maryland's ratepayers would not bear any risk if Skipjack's initial net decommissioning costs are in fact optimistic.

BOEM awarded US Wind the leases for the Maryland WEA, and US Wind has full site control.







Deepwater is in the process of acquiring the BOEM lease for the Delaware WEA through its joint venture subsidiary. The lease was originally awarded to Bluewater Wind, LLC, a subsidiary of NRG Energy, Inc., through a competitive BOEM auction. BOEM has determined that Deepwater's subsidiary is qualified to hold the lease, which must submit an application, annual lease payment, and financial assurance by December 1, 2016. Deepwater intends to subdivide the lease so that Skipjack can utilize the southern portion of the Delaware WEA. Any offshore wind development in the northern portion would be independent of, and would not affect, the Skipjack Project.

Skipjack has not commenced any significant permit or approval activities and has not submitted an interconnection request to PJM, but will do so if and when its application is approved by the MDPSC.

Skipjack is not going to have a meteorological tower and will therefore not be submitting a SAP. Rather it will only be submitting just a COP after the lease has been obtained.

Environmental studies have not started. The COP Survey Plan will be coordinated with federal, state, and local agencies beginning in early 2017, which would lead to on- and offshore environmental data collection starting in summer 2017. The COP and all federal and state permits would be submitted

[16] A COP must be submitted once a WEA leaseholder has sufficient data and a clearly defined project proposal for BOEM to conduct technical, environmental, and other required reviews. A COP can be submitted concurrently with an SAP or afterwards. BOEM relies on the COP as the basis for analyzing the environmental and socioeconomic effects and operational integrity of a project's construction, operation, and decommissioning activities.

[17] A list of US Wind's required permits and approvals is provided on pages 49-51 of this report.

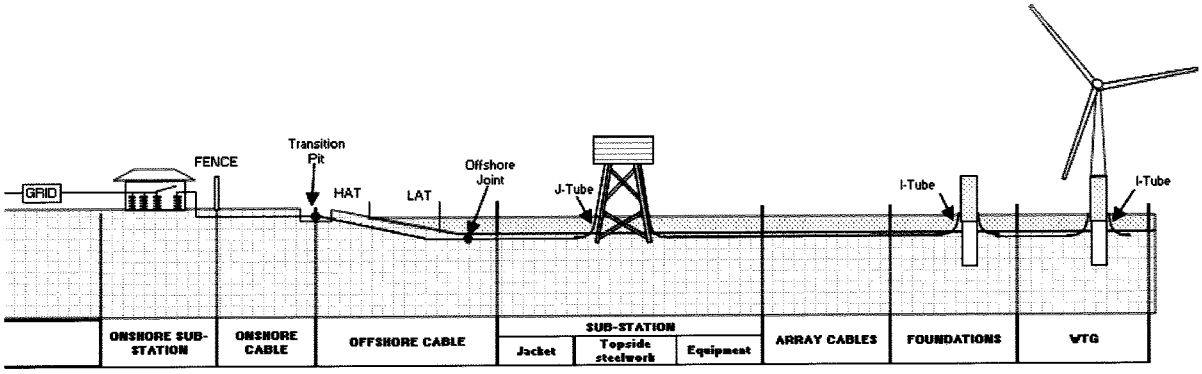
[redacted][18]

US Wind submitted an interconnection request with PJM in August, 2015, and was assigned queue position AB1-056. PJM has completed the Feasibility Study and the more detailed System Interconnection Study; a Facilities Study that will finalize system upgrades is expected in May, 2017.

in June 2018 with anticipated federal and state authorizations to be received by June 2020.[19]

The permitting process and milestone schedule outlined in the Skipjack application is comprehensive, and the schedule is reasonable but uncertain because Skipjack has not yet started its permitting process.

Figure 3. Typical Offshore Wind Components



PROJECT INFORMATION – COMAR 20.61.06.02 H

H. An application shall include a project COD and a proposed timeline for the proposed offshore wind project's development and critical path schedule that includes milestones for site assessment, engineering, permitting, turbine certification, financing, procurement, manufacturing, construction, testing and commissioning commercial operation dates, and delivery term;

US Wind and Skipjack submitted schedules with the required information. US Wind has commenced development activities, including permits and approvals, with a proposed January 1, 2020 COD that is likely to be delayed. Skipjack will commence development activities once it receives a MDPSC order and proposed a COD about three years later in November, 2022. Given

[18] Environmental studies would comply with the National Environmental Policy Act (NEPA).

[19] A list of Skipjack's required permits and approvals is provided on pages 115 - 117 of this report.

US Wind's head start on development, it is likely to achieve commercial operation well before Skipjack. We do not view a COD delay as problematic, consistent with designing the OREC price bid forms to accommodate up to five years of delay in recognition of the many uncertainties in developing the first commercial-sized domestic offshore wind project.[20]

US Wind provided a comprehensive and detailed schedule from site geological investigation to final COD of January 1, 2020. Some details were not provided, which is reasonable given this early stage of development. We note that certain early milestones, e.g. meteorological tower installation, were not met and we anticipate other permitting, development, and external activity risks will delay the US Wind schedule.

Although some uncertainty is understandable at this stage of project development, US Wind has not provided much information describing how these risks will be managed or mitigated. However, any delays would not affect the OREC price or quantity and would not harm ratepayers.

Skipjack provided a Milestone Schedule and a more detailed Project Schedule that was based on a February 24, 2017 Project Selection date that is inconsistent with Skipjack's acceptance of a final, un-appealable MDPSC Order by June 30, 2017. The Project Schedule has Financial Close in February 2021, Offshore Construction starting April 2022, and COD in November 2022, but is missing other key milestones.

If Skipjack selects a turbine with a 180 m rotor, there will be design changes and schedule risks that were not adequately addressed in the timeline. Such changes, however, would not affect the OREC price or quantity and would not harm ratepayers.

PROJECT INFORMATION – COMAR 20.61.06.02 I

I. An application shall indicate whether the proposed project's nameplate capacity is larger than required to provide the aggregate proposed OREC amount for the term of the proposed OREC price schedule. If the proposed project's nameplate capacity exceeds the capacity required, and the OSW applicant submits a two-part OREC price as described by M of this regulation, the application shall include a methodology for determining a reasonable allocation of the transmission upgrade costs to be included in the OREC price. The OSW applicant shall have the burden of demonstrating that its proposed allocation methodology is fair and in the interest of ratepayers.

[20] COMAR 20.61.06.16 discusses the implications of a delayed project COD, including next steps if the new estimated COD is projected to occur later than 730 days, within 5 years, or after 5 years of the original estimated COD.

Each applicant proposed to avoid any concerns about allocating PJM upgrade costs between its Project and any additional development on its WEA by having separate delivery cables, interconnections, and meters, thereby satisfying COMAR 20.61.06.02 I.

US Wind proposed separate delivery cables, interconnections, and meters at the Indian River substation.	Skipjack proposed separate delivery cables, interconnections, and separate meters at the Ocean Bay or 138th Street substation.

COMMERCIAL INFORMATION – COMAR 20.61.06.02 J

An application shall include the following commercial information related to the proposed offshore wind project:

(1) OSW applicant's plan for engaging small businesses;

(2) Subject to Regulation .06 of this chapter, OSW applicant's plan for compliance with the Minority Business Enterprise Program for the construction, manufacturing, and maintenance phases of the proposed offshore wind project;

(3) OSW applicant's plan for the use of skilled labor, especially for the construction and manufacturing components of the project, including outreach, hiring, or referral systems, or all of these, that are affiliated with registered apprenticeship programs under Labor and Employment Article, Title 11, Subtitle 4, Annotated Code of Maryland;

(4) OSW applicant's plan for using an agreement designed to ensure the use of skilled labor and to promote the prompt, efficient, and safe completion of the project particularly with regard to the construction, manufacturing, and maintenance of the proposed offshore wind project; and

(5) OSW applicant's plan to provide for compensation to its employees and subcontractors consistent with wages outlined in State Finance and Procurement Article, Title 17, Subtitle 2, Annotated Code of Maryland.

US Wind and Skipjack submitted plans to accomplish the goals in COMAR 20.61.06.02 J. US Wind has taken concrete steps over the past year; Skipjack will use "good faith efforts" if it is selected.

US Wind	Skipjack
US Wind has conducted workshops, hosted forums, used local contractors (including MBEs), and worked with union and	Skipjack has not yet commenced any significant efforts to engage small businesses, etc., but will use "good faith efforts," to

employment representatives. US Wind submitted additional plans to engage small businesses and Minority Business Enterprises (MBEs), train and utilize skilled labor, and provide compensation consistent with Maryland regulatory requirements. These concrete steps demonstrate US Wind's commitment to its Project.	accomplish the employment, MBE, and compensation goals.

FINANCIAL INFORMATION – COMAR 20.61.06.02 K

An application shall include the following financial information related to the proposed offshore wind project:

(1) Detailed financial analysis of the proposed project, including:

(a) A pro forma income statement, balance sheet and cash flow projection covering the development period, construction period and operating term during the term of the proposed OREC price schedule, with detailed revenues and expenses;

(b) Description and estimated benefits of any State or federal grants, rebates, tax credits, loan guarantees or other similar benefits received by the proposed project; and

(c) Estimated internal rate of return and return on equity;

(2) Proposed offshore wind project balance sheet at project COD with all capital expenditures broken down by major cost category;

(3) Proposed capital structure identifying equity investors, sources of debt, any other sources of capital, and written demonstration of equity and debt funding commitments, which include the following:

(a) For an OSW applicant that is seeking equity investors in a proposed offshore wind project:

> *(i) Documentation of the OSW applicant's serious, good-faith efforts to solicit and interview a reasonable number of minority investors, which shall include a demonstration of the OSW applicant's coordination with the Governor's Office of Minority Affairs; and*
>
> *(ii) A confidential statement listing the names and addresses of all minority investors interviewed and whether or not any of those investors have purchased an equity share in the proposed offshore wind project; or*

(b) For an OSW applicant that is not seeking equity investors in a proposed offshore wind project, a statement from that OSW applicant affirming that it is not seeking equity investors in the proposed offshore wind project;

(4) Year-by-year spending projections of expenses and capital expenditures by five- or six-digit NAICS code extending through the term of the proposed OREC price schedule and divided into four categories:

(a) In-State labor;

(b) In-State non-labor;

(c) Out-of-State labor; and

(d) Out-of-State non-labor;

(5) Detailed matrix, supported by documentation, demonstrating that the OSW applicant has applied for all current eligible State and federal grants, rebates, tax credits, loan guarantees, or other programs available to offset the cost of the proposed project or provide tax advantages;

(6) Affirmative statement of the OSW applicant's commitment to use best efforts to apply for all eligible State and federal grants, rebates, tax credits, loan guarantees, and other similar benefits as those benefits become available and to agree to pass along to retail electric customers 80 percent of the value of any State or federal grants, rebates, tax credits, loan guarantees, or other similar benefits received by the proposed project and not included in the application;

(7) Affirmative statement that the OSW applicant will execute a memorandum of understanding with the Commission that requires the OSW applicant to make serious, good-faith efforts to interview minority investors in any future attempt to raise venture capital or attract new investors to the qualified offshore wind project;

(8) Affirmative statement of the OSW applicant's commitment to deposit $6,000,000 into the Maryland Offshore Wind Business Development Fund, which shall consist of an initial deposit of $2,000,000 within 60 days of the Commission's approval of a proposed offshore wind project, $2,000,000 within 1 year after the initial deposit, and $2,000,000 within 2 years after the initial deposit;

(9) Affirmative statement by the OSW applicant that it will hold harmless the retail electric customers, OREC purchasers, and the State for any cost overruns associated with the proposed offshore wind project; and

(10) Affirmative statement that the OSW applicant will use commercially reasonable efforts to sell its electricity service attributes to the PJM markets.

US Wind and Skipjack each provided all of the required financial information, including capital costs broken down by North American Industry Classification System (NAICS) code, and presented credible financing plans that rely on their parent companies' financial size and strength. To the extent that an MDPSC order approving a project does not require Maryland's utilities to purchase ORECs under long-term contracts, we anticipate that both companies will face debt funding challenges if lenders are concerned about regulatory risk, e.g. project revenues being interrupted or insufficient to cover debt service, in which case parent company credit support would be required.

US Wind	Skipjack
US Wind expects the US Wind Project to cost $1.375 billion ($5,544/kW), which appears reasonable based on the cost for other offshore wind projects.	Skipjack expects its Project to cost $720 million ($6,000/kW), which appears reasonable based on its relatively small size and the cost for other offshore wind projects.
US Wind expects to provide [redacted][21]	Skipjack expects to fund its Project with $130 million in equity from its parent, Deepwater, $190 million in tax equity (based on 18% ITC and accelerated depreciation tax benefits), and $400 million in senior secured debt. Deepwater successfully funded the $360 million Block Island Wind Farm with a similar mix of funds.
[redacted] US Wind has been working with the Maryland Governor's Office of Minority Affairs (GOMA) to contact minority investors.	Skipjack provided Letters of Interest from its parent company and D.E. Shaw, plus one bank. Skipjack has not solicited interest from minority investors but attested that it will do so if it seeks outside investors.
US Wind provided the required affirmative statement to (i) apply for state and federal grants and tax credits, (ii) attract minority investors, (iii) deposit funds into the Maryland Offshore Wind Business Development Fund, (iv) hold harmless parties for cost overruns, and (v) use reasonable efforts to sell its power to PJM. US Wind imposed no conditions on these commitments.	Skipjack provided the required affirmative statement to (i) apply for state and federal grants and tax credits, (ii) attract minority investors, (iii) deposit funds into the Maryland Offshore Wind Business Development Fund, (iv) hold harmless parties for cost overruns, and (v) use reasonable efforts to sell its power to PJM, subject to its application being approved and the Project is determined to be a Qualified Offshore Wind Project. Skipjack conditioned its commitment to apply for state and federal grants provided Skipjack expects them to have a "material benefit for the Maryland ratepayers" and/or "do not adversely affect the ability of the Company to develop, construct, and operate the Project." These are reasonable conditions, but we do not know if they are acceptable to the MDPSC.

[21] [redacted]

COST-BENEFIT ANALYSIS – COMAR 20.61.06.02 L

An application shall include a cost-benefit analysis that covers the following items and the assumptions and data that the OSW applicant used to generate each item:

(1) An input-output analysis describing the in-state impact on income, employment, wages, and state and local taxes, with particular emphasis on effects on manufacturing employment in the State, as well as the complete set of data and assumptions that the OSW applicant used to generate the input-output analysis;

(2) An analysis describing expected employment impacts in the State (expressed as full-time equivalent positions), including expected type and duration of employment opportunities, the expected salary range of positions, and other effects resulting from, for example, in-state construction, operations, maintenance, and equipment purchases, and supported by detailed documentation, including any binding commitments;

(3) An analysis describing the in-state business impacts of the proposed offshore wind project;

(4) An analysis describing anticipated environmental and health impacts, including impacts on the affected marine environment based on publicly available information, related to construction, operation and decommissioning of the proposed offshore wind project, including direct emissions impacts created by the proposed offshore wind project related to carbon dioxide, oxides of nitrogen, sulfur dioxide, particulates and mercury emissions (in each case, expressed in terms of the number of tons of emissions abated per annum), as well as other relevant environmental and health impacts to the citizens of Maryland;

(5) An analysis describing any other impacts on residential, commercial, and industrial retail electric customers over the life of the proposed offshore wind project;

(6) An analysis describing the long-term effect of the proposed offshore wind project on wholesale energy, capacity, and ancillary services markets administered by PJM that includes analysis of contributions to regional system reliability, fuel diversity, competition, transmission congestion, and other power market benefits;

(7) An analysis describing any other benefits to the State created by the proposed offshore wind project, such as in-state construction, operations, maintenance, and equipment purchases; and

(8) Other relevant considerations that the OSW applicant elects to include.

US Wind and Skipjack submitted analyses of economic (employment, taxes, and local spending) impacts, environmental (air emission) impacts, and net rate impacts. Skipjack also estimated the health value of emission reductions. Each applicant utilized their own models and assumptions that we found had shortcomings. Hence their results are useful indications but are not accurate or comparable. We therefore recommend that the MDPSC rely on our independent analyses, presented on page ES-39 of this report.[22]

[22] PUA § 7-704.1(d)(2) states that, "[i]n evaluating and comparing an applicant's proposed offshore wind project under paragraph (1) of this subsection, the Commission shall contract for the services of independent consultants

Economic Impact

Both applicants hired outside consultants to estimate the indirect and induced benefits of in-state expenditures and employment using economic input-output models.[23] These economic models measure employment in terms of one-year full time equivalent jobs (FTEs).[24] Both Projects expect to import the turbines and blades from European suppliers, as well as other specialty items, e.g. submarine cables, that are not available in the US. Table 1 summarizes the economic impacts estimated by US Wind's and Skipjack's consultants.[25]

Table 1. Applicants' Estimates of In-State Economic Benefits
(2015 $ million)

	US Wind		Skipjack	
	Development & Constr'n	Operating Period	Development & Constr'n	Operating Period
Direct Expenditures	$309.8	$3,538.0	$ 183.5	$ 90.7
Indirect and Induced Sales	$184.3	$ 740.0	$ 119.4	$ 58.8
Total ($ millions)	$494.1	$4,278.0	$ 302.9	$ 149.5
Direct Employment	1,039	560	706	740
Indirect and Induced	1,081	3,980	762	320
Total Employment (FTEs)	2,120	4,540	1,468	1,060
Tax	$ 17.3	$ 48.0	$ 25.2	$ 3.7

US Wind	Skipjack
US Wind's consultant, EDR Group, did a reasonable job estimating the economic benefits from the Project except we believe EDR overestimated operating phase benefits by including all Project revenues. We anticipate that only a small amount of those	We believe Boston Pacific did a reasonable job estimating the indirect and induced economic in-State benefits from the Skipjack Project.

and experts." Further, PUA § 7-704.1(e)(2)(1) states that, "[w]hen calculating the net benefits to the State under paragraph (1)(i) of this subsection, the Commission shall contract for the services of independent consultants and experts."

[23] Direct expenditures include project expenditures on goods and services from in-state suppliers. Indirect benefits occur when project suppliers purchase materials from in-state companies; induced benefits occur when supplier employees purchase goods and services at the household level.

[24] An FTE is for one year, e.g. two six-month seasonal jobs are equivalent to one FTE.

[25] The inflator is derived from data contained in the Budget of the United States Government: Table 10.1 - Gross Domestic Product and Deflators Used in the Historical Tables 1940-2020.

operating period revenues will be spent on in-State O&M and administration; most operating revenues will flow to the equity partners and debt lenders to repay the Project's capital investment.

Environmental Impact

Both applicants submitted environmental impact analyses, i.e. the change in air emissions from power plants due to an offshore wind project. As stated above, the applicants' analyses are not comparable, and both had shortcomings that render their results suspect. We recommend the MDPSC rely on our independent estimate provided on page ES-40 of this report.

US Wind	Skipjack
US Wind estimated the avoided power plant air emissions assuming the US Wind Project would displace an equivalent amount of in-state coal-fired or gas-fired energy. This is an overly-simplistic assumption that ignores the fact that Maryland is integrated into the PJM system.	Skipjack estimated the avoided power plant emissions using projected emission rates for generators in the Mid-Atlantic Area Council (MAAC) portion of PJM based on data from the US Energy Information Administration.[26] Skipjack assumed its Project would displace gas-, oil-, and coal-fired energy in proportion to their projected contribution, i.e. averaged. Although the Skipjack Project would displace marginal generation, not average fossil generation, we found Skipjack's approach was reasonable for CO_2 and SO_2 but conservative for NO_x.[27] Skipjack's consultant prepared three cases; the Base Case results are presented in Table 2 below.
US Wind presented a range of emissions reductions over 20 years of operation assuming in-State gas- or coal-fired generation would be displaced. US Wind also presented a range of construction and decommissioning emissions for the Project. Table 2 below uses the mid-point values.	
Impacts of the US Wind Project on the marine environment were not discussed. US Wind discussed the monetary value of improved health due to reduced air emissions, but did	Skipjack's consultant noted that no Environmental Impact Study would be necessary based on BOEM's environmental assessment of the Mid-Atlantic WEAs. However, we expect a large offshore wind

[26] Skipjack's consultant relied on data for RFC-East, an area under the purview of the Reliability First Corporation, one of eight FERC-approved Regional Entities, that is responsible for planning the reliability of the PJM bulk power system. The RFC-East area is virtually identical to MAAC, the original PJM market area that includes New Jersey, central and eastern Maryland, Delaware, and most of central and eastern Pennsylvania.

[27] NOx = nitrogen oxides, CO_2= carbon dioxide, SO_2 = sulfur dioxide, PM = particulate matter, Hg = mercury.

not provide a dollar value for those benefits.	project like Skipjack will impact the marine environment and an Environmental Impact Study will be required. Skipjack estimated the present value of net emissions reductions to be $146.5 million (2016 $) for the Base Case.

Table 2. Applicants' Estimates of Lifecycle Avoided Emissions
(tons)

	US Wind	Skipjack
Area	Maryland	MAAC
NO_x	16,150	554
SO_2	35,311	3,330
CO_2	18.9 million	5.16 million
PM	1,642	346
Hg	0	0.02

Net Rate Impact

Both applicants hired consultants to prepare the net rate impact analyses, i.e. the net cost to Maryland ratepayers due to an offshore wind project. As stated above, the applicants' analyses are not comparable, and both had shortcomings that render their results suspect. We recommend the MDPSC rely on our independent estimate provided on pages ES-31 - ES-38 of this report.

US Wind	Skipjack
US Wind's consultant, Leidos, estimated an average residential rate impact of $1.44/month (2012 $) and a non-residential rate impact of 1.42% over the OREC Price Term.[28] US Wind did not provide a detailed analysis of the wholesale energy, capacity and ancillary services impacts and concluded that the impacts on energy prices would be "negligible" due to PJM's large size.[29]	Skipjack's consultant, Boston Pacific, estimated an average residential rate impact of $0.51/month (nominal dollars) equivalent to $0.34/month (2012 $), and an average non-residential impact for BGE commercial customers of 0.32%. These impacts include the direct OREC costs, energy, capacity, and REC credits, and impacts on wholesale energy and capacity prices.

[28] In an updated application submitted on November 11, 2016, US Wind's submission cited an average residential impact rate impact of $1.50/month and an average non-residential impact of 1.49%.

[29] The expected US Wind Project energy output of 913,845 MWh/year represents just over 0.1% of PJM's total energy deliveries of just under 4,800 million MWh/year.

OREC PRICE AND QUANTITY – COMAR 20.61.06.02 M AND N

M. An application shall include a proposed OREC price schedule for the proposed offshore wind project's electricity service attributes that is subject to the following requirements:

(1) The proposed OREC price schedule shall consist of either a:

> *(a) Two-part OREC price in which the first component is expressed as either a single firm price for each calendar year or a series of firm prices for each calendar year and the second component is expressed as a single firm price for each calendar year subject to a true-up based upon any change between the Commission's estimated cost of transmission upgrades and PJM's actual upgrade cost as specified in the executed Interconnection Service Agreement, for a total OREC price up to and not exceeding $190 per megawatt hour (levelized in 2012 dollars) and subject to the projected net rate impact caps for residential and nonresidential customers, as described by Public Utilities Article, 7-704.1(e)(1)(ii) and (iii), Annotated Code of Maryland; or*
>
> *(b) One-part OREC price, expressed as either a single firm price for each calendar year or a series of firm prices for each calendar year, that is not subject to true-up, up to and not exceeding $190 per megawatt hour (levelized in 2012 dollars) and subject to the projected net rate impact caps for residential and nonresidential customers, as described by Public Utilities Article, 7-704.1(e)(1)(ii) and (iii), Annotated Code of Maryland;*

(2) The unit of OREC price on the proposed OREC price schedule must be on a dollars ($) per delivered OREC (MWh) basis by calendar year; and

(3) All proposed OREC price schedules shall propose OREC prices for each calendar year for an initial term of up to 20 years commencing on the estimated project COD and an additional schedule of OREC prices for each of the five calendar years immediately following the end of the initial term to cover potential delays in project COD.

N. An application shall include a proposed OREC amount that is a quantity, expressed as a single annual number on a megawatt hour per calendar year basis and fixed for the proposed term of the project's proposed OREC price schedule, and that is accompanied by the expected generation confidence level associated with that proposed OREC amount.

Each applicant had the option to submit a 1-part or 2-part OREC price using OREC Bid Price Forms we prepared. The 1-part bid requires an applicant to take on the risk that the actual cost of PJM transmission system upgrades may be different than anticipated; no adjustment or future true-up to the OREC price bid is permitted.[30] The 2-part bid allows an adjustment to the second part of an applicant's bid price based on the actual PJM upgrade cost (determined through the PJM interconnection process) compared to the MDPSC's estimated cost.[31] In no

[30] Transmission upgrades are required to maintain the reliability of the PJM transmission system in the event of contingencies, e.g. failures of generators or transmission components. Such upgrades may be located throughout the transmission system, excluding the point of interconnection.

[31] Axum Energy Ventures prepared a System Impact Study Report for the MDPSC on January 30, 2015, in which they estimated the upgrade costs for a generic 250 MW offshore wind project to be $18.5 million (2012 $). PJM

case may the adjusted 2-part bid exceed the price and net rate caps in OWEA and the Regulations.

The price cap is a levelized price of $190/MWh (2012 $) per OREC. The residential net rate cap is $1.50/month (2012 $) over the proposed OREC term assuming an annual consumption of 12,000 kWh/year. The non-residential net rate cap is 1.5% of the total annual electric bills over the proposed OREC term. US Wind and Skipjack provided the required OREC price and quantity information in their respective applications, and estimated that they would meet the price and net rate caps. As stated above, the net rate analyses are not comparable, and both analyses had shortcomings that render their results suspect. We recommend the MDPSC rely on our independent estimate provided on pages ES-35 - ES-38 of this report.

US Wind	Skipjack
US Wind submitted a 2-part, 20-year bid with a first year (2020) price of $212.40/MWh and a levelized (2012 $) price of $187.18/MWh, satisfying the $190/MWh price cap.	Skipjack submitted a 1-part, 20-year bid with a first year (2022) price of $166.00/MWh and a levelized (2012 $) price of $134.36/MWh assuming a January 1, 2023 COD (close to the proposed November 2022 COD), satisfying the $190/MWh price cap. The 1-part price is not subject to any adjustment based on the cost of PJM transmission upgrades.
During the course of our analysis, we determined that US Wind's initial proposed OREC price and quantity would exceed the net rate caps defined in OWEA and the Regulations. Subsequently, US Wind submitted a revised OREC bid 2-part price starting at $201.57/MWh and a levelized price of $177.64/MWh (2012 $) that satisfied the net rate caps.	Skipjack proposed a P-50 annual OREC quantity of 455,482 MWh based on the estimated (not measured) wind resource, turbine performance, and system losses, equivalent to a net capacity factor of 43.3%. Skipjack's net capacity factor is higher than for US Wind due to slightly higher wind speeds in the Delaware WEA. Skipjack's annual OREC generation estimate assumed a rotor diameter of 179 m compared to the 154 m rotor assumed for the Project's design.
US Wind received its System Interconnection Study, the second of three steps in the PJM interconnection process, and will likely not have any upgrades costs, in which case US Wind's adjusted, i.e. without any upgrade costs, levelized OREC price would be $176.66/MWh (2012 $).[32]	
US Wind proposed a P-50 annual OREC quantity of 913,845 MWh based on the	

will develop a final and binding upgrade cost at the completion of the interconnection process, typically about two years after an interconnection request is submitted.

[32] US Wind can request a PJM Merchant Transmission Interconnection to identify other upgrades required to eliminate any chance of Project output being curtailed; such upgrades may have cost implications.

estimated (not measured) wind resource, turbine performance, and system losses, equivalent to a net capacity factor of 42.1%.

MINIMUM THRESHOLD CRITERIA RECOMMENDATION– COMAR 20.61.06.03 A(1)-(6)

An application must demonstrate the proposed offshore wind project meets the following minimum threshold criteria, as specified:

(1) The proposed offshore wind project complies with Public Utilities Article, 7-701(k)(1) and (2), Annotated Code of Maryland;

(2) The term of the proposed OREC price schedule is not longer than 20 years, and commences no earlier than January 1, 2017;

(3) The OREC price on the proposed OREC price schedule do not exceed $190 per megawatt hour in levelized 2012 dollars, as measured using a nominal discount rate equal to the long-term composite Treasury Bond rate (or equivalent) and a deflation rate equal to the near-term average GDP Deflator (or equivalent), notified by the Commission to potential OSW applicants;

(4) Demonstration that the proposed project, including the associated transmission-related interconnection facilities, will be constructed using commercially proven components and equipment available to the OSW applicant;

(5) Demonstration that the project COD is reasonable in light of the permitting, technical, construction, operational, and economic challenges generally faced by offshore wind project developers; and

(6) Evidence of site control or demonstration of a feasible plan to obtain site control.

We reviewed the US Wind and Skipjack applications, plus additional information they provided, and found that both generally satisfied the minimum threshold criteria regarding location, interconnection, term, schedule, price, use of commercially proven components, and site control. For the purpose of our evaluation, it appears that the Skipjack Project meets the definition of a Qualified Offshore Wind Project under PUA §7-701(k)(1) and (2).[33]

[33] Public Utilities Article, 7-701(k)(1) and (2) are as follows: "Qualified offshore wind project" means a wind turbine electricity generation facility, including the associated transmission–related interconnection facilities and equipment, that: (1) is located on the outer continental shelf of the Atlantic Ocean in an area that: (i) the United States Department of the Interior designates for leasing after coordination and consultation with the State in accordance with 388(a) of the Energy Policy Act of 2005; and (ii) is between 10 and 30 miles off the coast of the State; (2) interconnects to the PJM Interconnection grid at a point located on the Delmarva Peninsula;

US Wind	Skipjack
We reviewed the US Wind application and found that the minimum threshold criteria regarding location, interconnection, term, schedule, price, and use of commercially proven components were met. There are some project permitting, development, and external activity delays that will push back the January 1, 2020 target COD. However, the OREC procurement process was designed to allow up to five years of COD delay as long as the OREC quantity did not change, the OREC Price remained below $190/MWh ($2012 levelized), and the net rate caps would not be exceeded.	We reviewed the Skipjack application and found that the minimum threshold criteria regarding location, interconnection, term, schedule, price, and use of commercially proven components were met. Skipjack proposed a COD of November, 2022, that is dependent on receiving an un-appealable MDPSC Order by June 30, 2017. Although Skipjack has not achieved the development milestones that US Wind has, it has a reasonable chance of achieving its COD.

QUALITATIVE ANALYSIS – COMAR 20.61.06.03 B(1)

For each application that meets the minimum threshold criteria, the Commission shall conduct independent qualitative and quantitative analyses that considers the criteria enumerated in Public Utilities Article, §7-704.1(d)(1)(i) through (xiii), Annotated Code of Maryland.

(1) The qualitative analysis shall use a ranking system to identify applications with characteristics that contribute to the likelihood of successful development and to the net economic, environmental, and health benefits to the State.

We conducted a qualitative evaluation of the applications to determine (i) if the applicants have a credible plan to develop, construct, and operate the offshore wind project so it can deliver the proposed quantity of ORECs beginning on the proposed COD; and (ii) whether the projects will provide positive net economic, environmental, and health benefits as required by OWEA and the Regulations. We conducted a thorough and comprehensive high-level qualitative analysis of the information provided in each application and in supplemented information provided during the Application Period. Based on the qualitative analyses detailed in each of the COMAR 20.61.06.02 E-N sections above, we assigned a color-code score for each if the qualitative criteria listed in COMAR 20.61.06.03 B(1) to make it easier to rank the Projects. We divided a criterion where necessary to differentiate between important sub-parts.

Table 3. Qualitative Color-Coding of Applications as Submitted

Qualitative Criterion	US Wind	Skipjack
(i) Project team experience	*yellow*	
(ii) Project characteristics and design	*yellow*	*yellow*
(iii) Financial plan and strength	*yellow*	
Obtaining grants, tax credits, etc.		
(iv) Site control and interconnection ROW		*yellow*
(v) Project COD		*yellow*
Project schedule (including delay risk)		*yellow*
(vi) Transmission upgrade cost allocation		
(vii) Operations and maintenance plan	*yellow*	*yellow*
(viii) Decommissioning plan	*yellow*	*yellow*
(ix) Transmission improvements	*yellow*	*yellow*
(x) In-state economic benefits	*yellow*	*yellow*
(xi) Quality of env'l and health analysis		
Net environmental and health impacts		*yellow*
(xii) Meet Maryland RPS target		*yellow*
(xiii) Unique attributes of project	*yellow*	*yellow*
Conditions to pursue development	*yellow*	
(xiv) Small and minority business engagement		
(xv) Minority investor solicitation		*yellow*
(xvi) Ratepayer cost impacts (as bid)	*yellow*	
Ratepayer cost risk		
(xvii) Quality of electric market analysis	*yellow*	*yellow*
Impacts on wholesale electric market		*yellow*

Color codes: green = good, yellow = meets expectations, red = poor, and blue = unsatisfactory.

QUANTITATIVE RATE ANALYSIS – COMAR 20.61.06.03 B(2)(A)

(a) The quantitative analysis of the projected net rate impacts for an average Maryland retail electric customer based on an annual consumption of 12,000 kilowatt hours and nonresidential retail electric customers shall include consideration of the proposed OREC price schedule (including the proposed additional OREC prices for a further period of five years referenced in

Regulation .02M(3) of this chapter) and proposed OREC amount, the value of energy, capacity, and ancillary services generated by the proposed project, the value of avoided Tier 1 REC costs, and any consequential impacts on wholesale market energy, capacity, ancillary service, and REC prices, to determine the following:

(i) Whether the projected net rate impact for applicable classes exceeds the limitations established in Public Utilities Article, §7-704.1(e)(1)(ii) and (iii), Annotated Code of Maryland; and

(ii) The forecasted net rate impact to ratepayers over the initial term of the proposed project;

We estimated the net ratepayer impacts by developing independent forecasts of (i) wholesale energy in the four Maryland utility zones (DPL, BGE, PEPCO, and APS), (ii) wholesale capacity prices in EMAAC, and (iii) Maryland Tier 1 REC prices.[34] All of our results are expressed in present value 2016 dollars. We utilized the AURORAxmp chronological dispatch simulation model to forecast zonal hourly wholesale energy prices that reflect transmission constraints within PJM and between PJM and surrounding power markets. We forecasted hourly wholesale energy prices in the four Maryland utility zones over the 20-year term of each proposed project: 2020-2039 for the US Wind Project and 2022-2042 for the Skipjack Project.

We forecasted the zonal wholesale capacity price for the EMAAC Locational Deliverability Area (LDA), which includes DPL where the projects would be interconnected.[35] We also forecasted the change in wholesale capacity prices for EMAAC and the other Maryland LDAs that take into account each Project's expected generation during Summer Peak Hours under PJM's Capacity Performance construct. Under PJM rules, all wind projects are assigned an initial default UCAP value of 13% for at least the first three years of operation, but plant owners are permitted to request a higher value with suitable documentation. PJM agreed that US Wind's offshore wind project qualified for a higher initial UCAP value of 26%, equal to 64.5 MW, based on wind resource and energy generation analyses.[36] In order to be consistent, we modeled both Projects with an initial 26% UCAP value for the first six years. Once a plant has one year of operating data, its owner may request a higher UCAP value based on the plant's generation during the specified Summer Peak Hours up to the plant's Capacity Interconnection Rights value PJM utilizes for planning studies.[37] Our six year lag accounts for PJM's three-year forward capacity market and PJM's two-year interconnection review process.

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[34] PJM is the independent administrator of the wholesale power market serving Maryland and the Mid-Atlantic and upper Midwest regions. PJM has competitive energy and capacity pricing mechanisms that account for transmission and other constraints that result in price differences across its market area. DPL is in the Eastern Mid-Atlantic Area Council (EMAAC) region of PJM that includes New Jersey, the Delmarva Peninsula, and the Philadelphia area.

[35] DPL and the rest of the Delmarva Peninsula are located in EMAAC; BGE and PEPCO are located in Southwest MAAC (SWMAAC); APS is located in the western portion of PJM.

[36] PJM Generator Interconnection Feasibility Study Report, Queue Position AB1-056.

[37] PJM utilizes a plant's Capacity Interconnection Rights value to conduct planning studies once an interconnection application is received.

We forecasted Maryland Tier 1 REC prices for over the OREC Term utilizing a cost-based revenue requirement model that takes into account the expected cost to build and operate new onshore wind projects in PJM less expected energy and capacity revenues. Maryland Tier 1 REC prices are identical for the two proposed offshore wind projects.

The PJM energy and capacity markets were designed to mimic competitive markets; therefore we expect that an offshore wind project will cause a "market response" and displace potential new renewable energy generation. According to the PJM interconnection queue, almost all new renewable energy projects are onshore wind resources that would be predominantly located in western and central PJM. We assumed that an offshore wind project would displace onshore wind that would have provided an equivalent quantity of RECs. The market response will cause unequal impacts for Maryland ratepayers because offshore wind generation would be injected on the Delmarva Peninsula while the displaced generation would be in western and central PJM. Overall, we found that Maryland ratepayers would benefit from an offshore wind project; DPL ratepayers would benefit the most and APS ratepayers the least.[38]

US Wind	**Skipjack**
Energy Prices	
We forecast that DPL energy prices would decline by $0.09/MWh (present value 2016 $) on average and DPL ratepayers would save $9.6 million over twenty years as a result of the US Wind project. BGE and PEPCO ratepayers would both save $1.2 million, and APS energy costs would go up by $0.8 million due to the assumed displaced onshore wind capacity in western and central PJM. Maryland as a whole would save $11.2 million in wholesale energy costs over the twenty year OREC Price Term. If we assumed no market response, i.e. no displaced onshore wind in western and central PJM as discussed previously, all energy rates decline and all	We forecast that DPL energy prices would decline by $0.05/MWh (in 2016 $) on average and DPL ratepayers would save $5.3 million over twenty years. BGE and PEPCO ratepayers would save $0.4 and $0.5 million, respectively. APS energy costs would increase by less than $0.1 million due to the assumed displaced onshore wind capacity in western and central PJM. Maryland as a whole would save $6.1 million in wholesale energy costs over the twenty year OREC Price Term. If we assume no market response, all energy rates decline and all ratepayer costs go down.

[38] DPL is more strongly interconnected with other EMAAC utilities, i.e. Atlantic City Electric, Jersey Central Power and Light, PECO Energy, Public Service Electric and Gas, and Rockland Electric, than with other Maryland utilities. Similarly, BGE and PEPCO are more strongly interconnected with each other in SWMAAC than with other Maryland utilities, and APS is more strongly interconnected with other western PJM utilities than the other Maryland utilities. As a result, the energy and capacity price impacts of an offshore wind project would be most pronounced within EMAAC, while the market response loss of onshore wind resources in western and central PJM would be most pronounced in APS.

ratepayer costs go down.

Capacity Prices

Based on discussions with PJM and PJM documents, we confirmed that a wind project's UCAP would be limited to its Capacity Interconnection Rights (CIR) determined by the PJM Planning Department.[39] We expect that both Projects will lower capacity prices for all Maryland ratepayers, where DPL customers will have the highest benefit while APS customers would have the lowest. We note that PJM's capacity rules in its Reliability Pricing Model (RPM) for intermittent resources, e.g. offshore wind projects, may evolve over the next few years.[40]

In its interconnection request, US Wind requested and PJM agreed to an initial UCAP value of 26% of the Project's capacity in lieu of the wind class average of 13%. Thus we expect the US Wind Project will be entitled to 64.5 MW of UCAP for the first six years of operation. Although US Wind proposed a higher UCAP value thereafter (based on its expected 42.1% net capacity factor during Performance Assessment Hours), we assumed the US Wind Project would have a UCAP value of 71.9 MW (based on a 29.0% net capacity factor during Summer Peak Hours) starting in the seventh year of operation.

Overall, Maryland ratepayers would benefit from lower capacity costs over the life of the US Wind Project and would save $16.4 million (present value 2016 $) in wholesale capacity costs over the 20-year term.

Although Skipjack did not request a PJM interconnection, we assumed Skipjack will receive the same treatment as US Wind and be granted an initial UCAP value of 26% of the Project's capacity. Thus we assumed the Skipjack Project would have a UCAP value of 31.2 MW for the first six years, increasing to 41.3 MW (based on a 34.4% net capacity factor during Summer Peak Hours) starting in the seventh year of operation. Skipjack assumed an initial UCAP value of 13.0%, with the UCAP value ramping up from 13.0% in year 1 to 23.1% in year 2 and 33.2% in year 3 before reaching its maximum of 43.3% in year 4.

Overall, Maryland ratepayers would benefit from lower capacity costs over the life of the Skipjack Project and would save $10.9 million (present value 2016 $) in wholesale capacity over the 20-year term.

[39] According to PJM, a plant's UCAP value cannot exceed its CIR that is based on Summer Peak Hours.

[40] Current PJM rules limit a capacity resource's UCAP to its CIR based on its performance during Summer Peak Performance Hours. PJM's RPM Capacity Performance construct has penalties for capacity under-performance that outweigh benefits for acceptable capacity performance. As a result, both Projects may have an incentive to offer less than their full UCAP quantity to PJM to avoid such penalties. We do not know if PJM will modify its Capacity Performance rules for intermittent generators and have not attempted to determine if either Project would offer less than its full UCAP quantity in the Base Residual Auctions (BRAs). In a November filing at FERC, PJM indicated support for intermittent and seasonal resources to submit an aggregated UCAP bid. Neither applicant indicated an intention to do so, and it is not clear any performance benefit, e.g. solar resources with higher summer output combined with offshore wind resources with higher winter output, would outweigh the combined risk of under-performance as a Capacity Resource. Therefore we did not consider an aggregated bid in our evaluations.

REC Prices

REC prices are cost-based, driven by revenue requirements for marginal renewable energy credits, i.e. the net cost after energy and capacity revenues. Moreover, we have incorporated market responses in which onshore wind resources that would generate an equivalent quantity of RECs would be displaced. Therefore we do not expect the US Wind Project or the Skipjack Project to affect Maryland Tier 1 REC prices.

The US Wind Project will generate 913,845 RECs/year over its 20 years of operation. Maryland ratepayers will benefit from $219.1 million (present value 2016 $) in avoided REC costs from the US Wind Project.

The Skipjack Project will generate 455,482 RECs/year over its 20 years of operation. Maryland ratepayers will benefit from $102.2 million (present value 2016 $) in avoided REC costs from the Skipjack Project.

Other Market Impacts

In addition to the power and REC impacts described above, both the Skipjack and US Wind Projects would lessen Maryland's and PJM's dependence upon gas for power plant fuel. The Projects and would also help decrease any congestion on the Delmarva Peninsula. While congestion on the Delmarva Peninsula has been a problem in the past, we do not expect it to persist now that the 300 MW Garrison Energy Center has been completed and various transmission improvements at 230 kV (Red Lion-Cedar Creek-Milford) and at 138 kV (Townsend-Church, Glasgow-Cecil, Basin Road-Bear, Vienna-Nelson) are completed.

Gross and Net OREC Prices

Each OREC purchased by ratepayers will provide offsetting revenues from the associated one MWh of energy and an amount of capacity, both valued at PJM market prices, plus a Tier 1 REC for ratepayers valued at REC market prices.[41] We deducted the value of each of these attributes as a credit against the "gross" OREC cost proposed by the applicants to arrive at a "net" OREC cost. Ratepayers will also benefit from the reduction in wholesale energy, capacity, and REC prices, to the extent that an offshore wind project's generation would lower wholesale prices. The different metrics for these components required us to calculate the total dollar impacts by utility zone, combine the four impacts based on utility load share, and then convert those totals into unitized ratepayer prices. Thus the net ratepayer cost was calculated as the levelized equivalent of the proposed OREC Price annual payments, less the levelized equivalent of forecasted energy and capacity market and REC credits, plus any reductions in wholesale energy and capacity prices, all expressed in 2012 dollars per year.

For each OREC purchased by Maryland ratepayers, they will receive credit for one MWh of energy valued at the DPL zonal price and one REC valued at the PJM price. For each of the first

[41] Energy is valued at DPL prices; capacity is valued at is valued at EMAAC prices; RECs are valued at PJM prices.

six years of OREC purchases, Maryland ratepayers will receive a UCAP credit of 65.4 MW for US Wind and 31.2 MW for Skipjack valued at the EMAAC price. For each of the remaining years, Maryland ratepayers will receive a UCAP credit of 71.9 MW for US Wind and 41.3 MW for Skipjack valued at the EMAAC price.

Table 4. Independent Estimate of Net Ratepayer Costs

	US Wind		Skipjack	
	Total Cost (PV 2016 $ millions)	OREC Costs ($/MWh Lev. 2012 $)	Total Cost (PV 2016 $ millions)	OREC Costs ($/MWh Lev. 2012$)
Gross OREC Cost	$3,139	**$177.64**	$1,157	**$134.36**
Energy Credit	($739)	($41.82)	($371)	($43.09)
Capacity Credit	($72)	($4.07)	($42)	($4.82)
REC Credit	($219)	($12.40)	($102)	($11.86)
Net OREC Cost	$2,109	**$119.35**	$642	**$74.58**
Energy Price Effect	($11)	($0.64)	($6)	($0.71)
Capacity Price Effect	($16)	($0.93)	($11)	($1.26)
REC Price Effect	$0	$0.00	$0	$0.00
Net Ratepayer Cost	**$2,081**	$117.79	**$625**	$72.61

Net Ratepayer Impacts

OWEA and the Regulations prohibit the MDPSC from approving a project that is projected to exceed the residential net ratepayer impact cap of $1.50/month ($2012) assuming an average residential load of 12,000 kWh/year, or the nonresidential net ratepayer impact cap of a 1.5% annual increase.[42] These net rate caps include all power market impacts, i.e. the gross OREC cost, credits for energy, capacity, and RECs included in the OREC purchases, plus any changes in wholesale market energy and capacity prices. Our independent estimates of these effects are shown on project term and levelized dollars per OREC basis in Table 4.

The year-by-year net cost impacts, in terms of total dollars for Maryland as a whole, are shown graphically in Figure 4 and Figure 5 below for the US Wind and Skipjack Projects. Gross OREC prices are depicted as the dark blue bars; the credits and energy and capacity price reductions are individually depicted below the $0 x axis, and the total net cost is depicted as the red line and circles.

US Wind	Skipjack
Based on US Wind's revised OREC prices, we calculated the average net ratepayer impact	Based on Skipjack's OREC prices, we calculated the average net ratepayer impact for

[42] The projected net rate impact for all nonresidential customers is calculated as a blended average based on the net OREC cost combined with wholesale energy and capacity price savings, and cannot exceed 1.5% of nonresidential customers' total annual electric bills, over the duration of the proposed OREC pricing schedule per PUA § 7-704.1(e)(3).

for Maryland residential customers (levelized $2012) to be $1.49/month and the average net rate impact for Maryland non-residential customers to be 1.47%. Over the 20-year term, the US Wind Project is expected to cost ratepayers $2.1 billion (present value 2016 $). If the PJM interconnection studies result in zero system upgrade costs (as currently projected), the net residential and non-residential rate impacts would be $1.47/month and 1.46% respectively.	Maryland residential customers (levelized $2012) to be $0.45/month and the average net rate impact for Maryland non-residential customers to be 0.44%. Over the 20-year term, the Skipjack Project is expected to cost ratepayers $625.4 million (present value 2016 $). Skipjack requested that its OREC price be adjusted if it receives "...an un-appealable order after [June] 30, 2017..." or "[I]n the event that a change in law or policy results in a higher [or lower] available tax credit rate"...' Skipjack explained that a lower ITC will result in a higher OREC price, i.e. a 12% ITC would increase the residential ratepayer impact to $0.46/month and a 0% ITC would increases the residential ratepayer impact to $0.49/month. We do not know if the MDPSC can accept the risk that OREC costs for ratepayers could increase due to a delayed order or to a change in ITC law or policy.

Figure 4. Independent Estimate of US Wind Annual Ratepayer Costs

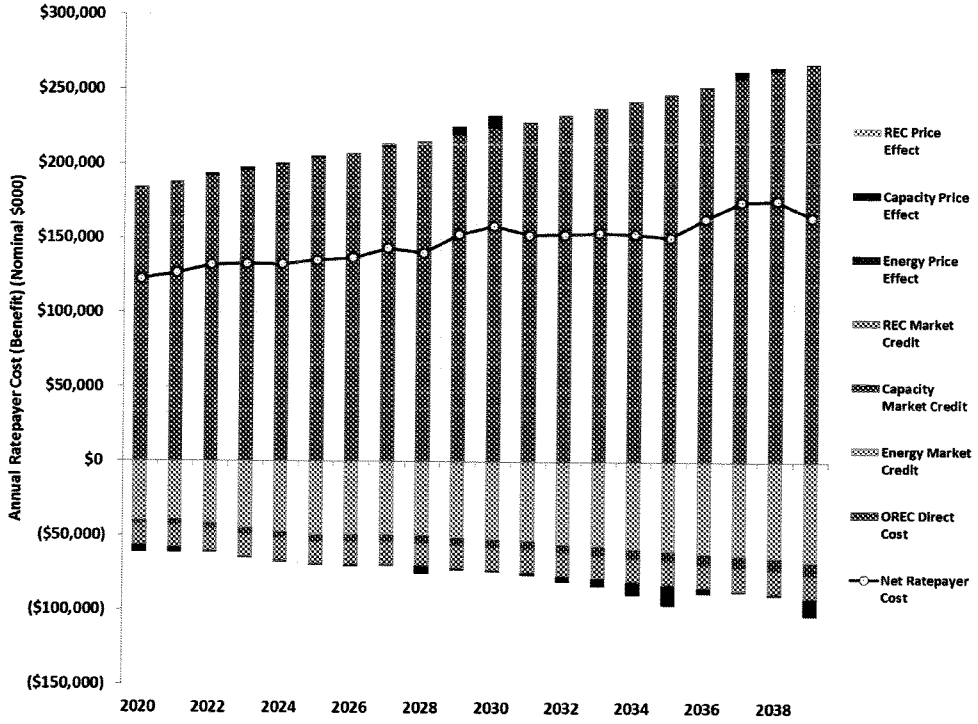
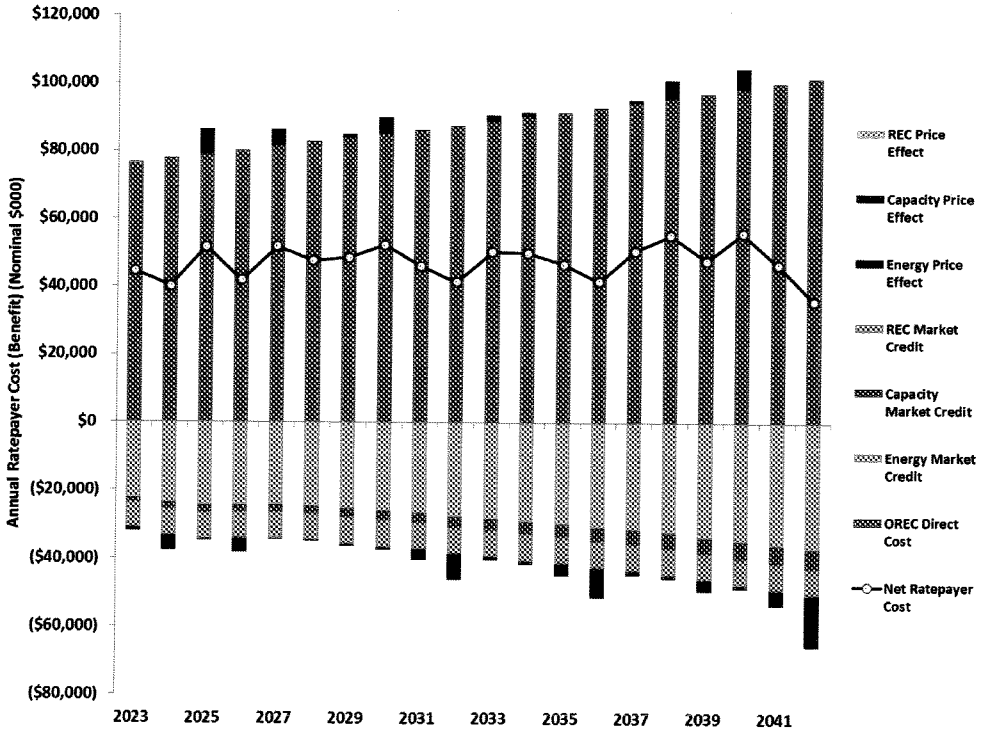


Figure 5. Independent Estimate of Skipjack Annual Ratepayer Costs



QUANTITATIVE ECONOMIC ANALYSIS – COMAR 20.61.06.03 B(2)(B)

(b) The quantitative analysis of the economic impacts on Maryland associated with the proposed project shall assess the projected impact of the proposed project on in-state income, employment, taxes, and local spending associated with the project lifecycle including construction, operations, maintenance, and equipment purchases.

We estimated the local spending, tax, and employment impacts of each proposed project using the IMPLAN economic input-output analysis model, an industry standard model. Our estimates were based on year-by-year spending data provided by the applicants, broken down between non-labor and labor and between in-state and out-of-state. We adjusted the spending data only where necessary and to ensure consistent treatment of the Projects. We believe that the US Wind Project should have about twice the economic benefits compared to Skipjack during the development and construction periods due to it being about twice the size. During the operational period, the US Wind Project should have about five times the economic benefits compared to Skipjack due to the greater number of turbines and a higher percentage of in-State spending. Our key findings are as follows.

Table 5. Independent Estimates of In-State Economic Benefits
(2015 $ millions)

	US Wind		Skipjack	
	Development & Constr'n	Operating Period	Development & Constr'n	Operating Period
Direct Expenditures	$ 331.8	$ 433.4	$ 185.9	$ 83.7
Indirect and Induced Sales	$ 278.0	$ 310.8	$ 160.9	$ 50.1
Total ($ millions)	$ 609.8	$ 744.2	$ 346.8	$ 133.8
Direct Employment	1,298	2,282	913	484
Indirect and Induced	1,636	1,833	901	336
Total Employment (FTEs)	2,934	4,116	1,815	820
Tax	$ 28.7	$ 98.7	$ 14.9	$ 11.3

QUANTITATIVE ENVIRONMENTAL AND HEALTH ANALYSIS – COMAR 20.61.06.03 B(3)

(3) The independent analysis of the environmental and health benefits on Maryland associated with the proposed project, quantitatively expressed in tons of avoided air emissions and qualitatively expressed in terms of health impacts associated with avoided air emissions and impacts on the affected marine environment based on publicly available information.

We performed an independent forecast of avoided power plant emissions over the proposed 20-year operating terms in Maryland and in the overall PJM market using the AURORAxmp model. Based on power plant efficiencies and fuel type, we forecasted the change in CO_2, NO_x,

and SO_2. Since Maryland is integrated into the PJM power system, most of the changes in emissions occur outside of the State.

For either project, we found that CO_2 emissions (one of the principal greenhouse gasses) would decrease in Maryland as in-state power plants (mostly gas-fired) operate less frequently. Due to market response reductions in planned onshore wind resources in western and central PJM, CO_2 emissions (from coal-fired plants) would increase in those regions. Reduced CO_2 from power plants in Maryland would help limit global warming and help Maryland achieve its carbon and greenhouse gas reduction goals. NO_x (a precursor to ground-level ozone, a component of smog, and a contributor to acid rain) and SO_2 (a contributor to acid rain and a cause of respiratory problems) emissions would decrease for both Projects as well. The change in power plant emissions for US Wind is about twice the change for Skipjack, reflecting the size difference between the Projects.

Table 6. Independent Estimate of Average Annual Change in Maryland Air Emissions
(tons/year)

Pollutant	US Wind	Skipjack
CO_2	(12,809)	(6,384)
NO_x	(6.8)	(3.4)
SO_2	(3.1)	(1.6)

RISK FACTORS, SIMILARITIES, DIFFERENTIATORS, AND APPROVAL REQUIREMENTS

In order to facilitate a comparison between the US Wind and Skipjack Projects, we identified key risk factors, similarities, and differentiators to help the MDPSC in making its decision.

Risk Factors	US Wind	Skipjack
Offshore Wind Experience	Limited to experienced contractors	Developed and constructed 30 MW Block Island Wind Farm
Requested Order Exceptions	None	Order must be fully-approved, mutually-acceptable, un-appealable, and received by June 30, 2017 or else OREC price would be higher
Levelized Gross OREC Price (2012 $) and Risks	$177.64/MWh before adjustment for PJM upgrades $176.66/MWh with PJM estimate of $0 upgrade cost	$134.36/MWh w/ 18% ITC $138.24/MWh w/ 12% ITC and Nov 2023 COD $144.23/MWh w/ 0% ITC and Nov 2024 COD
Requested Legal and Policy Exceptions	None	A change in ITC law or policy would affect OREC price.

Similarities	US Wind	Skipjack
Completion Commitment	There are no penalties if the selected applicant fails to complete its proposed Project and deliver ORECs to Maryland ratepayers.	
Wholesale Capacity Credit	Both Projects may qualify for UCAP up to CIR, but may bid lower UCAP in BRAs to minimize potential CP penalties.	
Assembly and Staging Location	Both Projects intend to utilize Sparrows Point	
Operating Base	Both Projects intend to utilize Ocean City	
Differentiators	**US Wind**	**Skipjack**
Size and Output	248 MW; 913,845 MWh/year	120 MW; 455,482 MWh/year
Contribution to RPS	53.0% of offshore wind carve-out	25.9% of offshore wind carve-out
Offshore Wind Experience	None, mitigated by hiring experienced contractors	Developed and constructed 30 MW Block Island Wind Farm
Development Work to Date	Substantial: workshops, used local contractors (incl. MBEs), requested PJM interconnection, and worked with union and employment representatives	Minimal so far, has retained five contractors, none of which are headquartered in Maryland
In-State Development and Construction Expenditures	$609.8 million	$346.8 million
Maryland Employment during Dev't and Constr'n	2,934 FTE job-years	1,815 FTE job-years
Maryland Employment during Operations	206 FTEs/year	41 FTEs/year
Levelized (Gross) OREC Price (2012 $)	$177.64/MWh	$134.36/MWh
Net Levelized OREC Price (2012 $)	$119.35/MWh	$74.58/MWh
Net Maryland Ratepayer Cost (as proposed PV 2016$)	$2,081 million	$625.4 million
Net Residential Impact	$1.49/month (99% of cap)	$0.45/month (30% of cap) - $0.49/month (33% of cap)
Net Non-Residential Impact	1.47% (98% of cap)	0.44% (30% of cap) -

		0.49% (33% of cap)
Greenhouse Gas (CO_2) reductions in Maryland	12,809 tons/year	6,384 tons/year

Pursuant to PUA §7-704.1 (E), the MDPSC may not approve a proposed offshore wind project unless (i) it demonstrates positive net economic, environmental, and health benefits to the State, (ii) it meets the net residential rate impact test of $1.50/month (levelized 2012 $), (iii) it meets the net non-residential rate impact test of 1.5% of total annual electric bills, and (iv) the OREC price does not exceed the $190/MWh (levelized 2012 $) cap. We have summarized our independent evaluations of the Projects for each of these four approval requirements in Table 7 below.[43]

Table 7. Project Approval Requirements

Approval Requirement	US Wind	Skipjack
Demonstrates Net Economic, Environmental, and Health Benefits	Yes; about double Skipjack benefits	Yes; about one-half US Wind benefits
Meets Net Residential Rate Impact Cap	Yes; $1.49/month	Yes; $0.45-$0.49 /month
Meets Net Non-Residential Rate Impact Cap	Yes; 1.47%	Yes; 0.44% - 0.49%
OREC Price below the Price Cap	Yes; $177.64/MWh	Yes; $134.26/MWh - $144.23/MWh

[43] The Skipjack net ratepayer impacts and OREC prices reflect potential delays in receiving a final MDPSC order, with a subsequent schedule delay and loss of ITC. Due to the conditions requested by Skipjack, these net rate impacts and OREC prices could be higher in the event a change in law or policy reduces or eliminates the ITC and Skipjack's schedule is unaffected, i.e. a November 2022 COD.

INTRODUCTION

The Offshore Wind Energy Act of 2013 was passed by the Maryland General Assembly and signed by then Governor O'Malley on April 9, 2013. OWEA carves out a portion of the Tier 1 renewable resource requirement under Maryland's Renewable Energy Portfolio Standard (RPS) for "Qualified Offshore Wind Projects", as defined by the Public Utilities Article, *Annotated Code of Maryland* statute § 7-701(k), to support the development of one or more offshore wind farms to be located 10 to 30 miles off the coast of Maryland and interconnected to the grid on the Delmarva Peninsula. According to a Fact Sheet issued by then Governor O'Malley's office in 2013, offshore wind projects would create manufacturing, construction, and O&M jobs, supply clean electric energy, reduce air emissions and public health costs, and help establish Maryland as a manufacturing and supply chain base.

Among its key provisions, OWEA does the following:

- Creates a "carve-out" for offshore wind energy in Maryland's RPS, beginning in 2017 and extending beyond 2022, for up to 2.5% of total retail electricity sales.
- Establishes an application and review process for proposed offshore wind projects to be conducted by the MDPSC.
- Specifies an OREC price cap and rate caps for residential and non-residential electric customers.
- Establishes a Maryland Offshore Wind Business Development Fund and Advisory Committee within the Maryland Energy Administration (MEA) to promote emerging businesses related to offshore wind.
- Establishes a Clean Energy Program Task Force and a Clean Energy Technical Education Task Force.
- Establishes an escrow account to ensure the transparent transfer of ORECs between offshore wind generators and electric suppliers and of energy and capacity revenues from PJM.[44]

Under OWEA, Electricity Suppliers (as defined by COMAR Title 20) are required to purchase ORECs from one or more offshore wind projects selected by the MDPSC through the escrow account. ORECs would be tracked though the PJM Generation Attribute Tracking System. OWEA required the MDPSC to establish Regulations that: (i) define an Offshore Wind Project procurement process with specified activities and milestones, (ii) provide clear instructions for applicants, (iii) establish minimum threshold application qualifications, (iv) define quantitative and qualitative criteria for evaluating applications, (v) establish the quantitative and qualitative approaches to evaluate the applications, and (vi) define the requirements, including positive

[44] PJM is the regional transmission organization that coordinates the movement of wholesale electricity in the Mid-Atlantic region, including Maryland. Acting as a neutral, independent party, PJM operates the competitive wholesale energy and capacity markets, manages the high-voltage electricity grid, and conducts long-term regional planning efforts to ensure reliability and economic benefits on a system-wide basis.

net economic, environmental, and health benefits, for the MDPSC to consider when selecting one or more projects.

OFFSHORE WIND REGULATIONS

The MDPSC initiated Rulemaking 51 to adopt revisions to COMAR Title 20, subtitles 51 and 61, and to establish a new chapter .06 in subtitle 61, for the purpose of issuing a comprehensive set of Regulations implementing OWEA. The MDPSC retained outside advisors to assist in drafting the Regulations: the law firm of Kaye Scholer, commercial consultants Levitan & Associates, Inc., technical consultants DNV GL, and local consultants Sullivan Cove Consultants and Chesapeake Environmental Management. MDPSC Staff, with the aid of their advisors, submitted recommendations regarding offshore wind project application requirements, evaluation criteria, and selection processes that were presented to the MDPSC in hearings on May 8 and 12, 2014. The MDPSC provided an opportunity for all interested parties, including wind project developers and others interested parties, to present testimony. The MDPSC convened a second Rulemaking 51 hearing on August 26, 2014 to hear additional testimony and resolve remaining questions.

At the conclusion of the hearings, the MDPSC adopted the Offshore Wind Regulations (COMAR 20.51.01, .02, and .03; COMAR 20.61.01, .04, and .06) as published in the Maryland Register on July 11, 2014. The Regulations define the commercial arrangements and transaction mechanism, established the OREC Escrow Account, and established the application, evaluation, selection, and approval process for new offshore wind projects, consistent with OWEA.

OREC APPLICATION EVALUATION PROCESS

Consistent with OWEA's directive to contract for the services of independent consultants and experts, the MDPSC retained us to conduct this OREC procurement process, particularly to evaluate applications and recommend one or more offshore wind projects, if appropriate. The process commenced on December 15, 2014 with the launching of a public website, www.marylandoffshorewind.com, with information on OWEA, the Regulations, related documents, and a Q&A forum. The website also provided secure portals for developers to obtain additional information and submit their offshore wind project applications. Hard copies of applications and supplemental information were kept in a locked cabinet. A technical conference was held on January 8, 2015, to explain the OREC procurement process in more detail and to answer questions from interested parties.

The first application was received on January 28, 2016, from US Wind. Once that application was determined to be administratively complete, the MDPSC opened a 180-day Application Period on February 25, 2016 to allow other offshore wind project developers to submit applications.[45] The second application was submitted by Skipjack Offshore Energy, LLC on the last day of the original Application Period, August 23, 2016. We requested the MDPSC extend the Application Period for three 30-day periods to allow us to evaluate the applications and to

[45] *See* Maillog #183939: *Notice of Maryland Offshore Wind Project Application Period* (Feb. 25, 2016).

conduct our independent analyses. The Application Period ended on November 18, 2016, which started a 180-day period by the end of which the MDPSC must approve, conditionally approve, or deny recommended applications. On November 21, 2016, we notified the MDPSC that both Projects were found to be administratively complete and to have met the minimum threshold criteria per COMAR 20.61.06.02 A and .03 A, respectively.

We were directed to prepare this report to document that the offshore wind procurement and evaluation process (i) was as fair, transparent, and workable as possible, (ii) lead to robust and competitive bids, and (iii) preserved ratepayer protections, all as defined in OWEA and the Regulations.[46] In order to ensure these goals were achieved, we relied upon best practices and lessons learned from previous procurements for offshore wind and for other renewable and conventional resources, including Maryland's previous Request for Proposal (RFP) for gas-fired Generation Capacity Resources.[47] We also relied on our extensive experience in developing, administering, and monitoring procurements for our clients.

Throughout this process, we were guided by a key OWEA principle: applicants bear all development, construction, and operating risks of their offshore wind projects and interconnection facilities, thereby protecting ratepayers. OWEA and the Regulations contain price and rate caps to further mitigate project risks and to protect Maryland ratepayers. This report summarizes our evaluations and findings for the MDPSC.

[46] *See* Request for Proposals, PSC #02-19-14.

[47] The Amended RFP in Commission Docket No. 9214 was issued on December 8, 2011.

METHODOLOGY

We evaluated the US Wind and Skipjack applications on a transparent, consistent, and independent basis to permit comparison between them. This section describes the methodology we utilized to confirm the reasonableness of the project capital costs, to forecast wholesale energy and capacity prices, to forecast REC prices, and to estimate the local economic impacts that we used to evaluate the two Projects.

PROJECT CAPITAL COST

In order to confirm the reasonableness of the Projects' capital costs, we found the following publically available cost data for offshore wind projects. We caution that publicized costs may not include all capitalized costs beyond the core foundation / turbine / blades and installation, e.g. development and permitting, underwater electrical systems, onshore facilities and electrical interconnection, necessary upgrades to the existing transmission system, owner costs during construction, capitalized interest and fees, etc. In reporting these cost data, we did not attempt to adjust the underlying assumptions of these offshore wind cost estimates to make them consistent with the US Wind or Skipjack Projects.

- The US DOE's estimated overnight (excluding interest during construction) cost is $6,230/kW (2012 $) based on a 400 MW project.[48]
- The reported cost of $2.6 billion for the 468 MW Cape Wind project would have been equivalent to $5,556/kW.
- According to the European Wind Energy Association, ten European offshore wind projects with a combined capacity of 3,034 MW completed in 2015 had a combined cost of €13.3 billion, an average of €4,384/kW which is equivalent to $4,864/kW.[49]
- The latest Offshore Wind Market and Economic Analysis prepared for the DOE provided cost data for offshore wind projects worldwide then under construction, which generally ranged from $4,300/kW to $6,000/kW (2012 $).[50]

POWER MARKET PRICE AND NET RATE IMPACT CALCULATIONS

We considered three principal elements to estimate the net rate impact for Maryland customers:

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[48] US Energy Information Administration, Updated Capital Cost Estimates for Electricity Generation Plants, April 2013.

[49] It is not certain that every project reported the all-in total capital cost; some may have only included physical property costs or EPC costs.

[50] US DOE 2014 Annual Market Assessment of the Offshore Wind Market and Economic Analysis, September 8, 2014.

- The direct (or gross) OREC Price for each application
- The net OREC Price that includes the value of energy, capacity, and RECs included in the ORECs which offset a portion of the gross OREC Price
- The reduction in wholesale energy, capacity, and REC market prices

Market Response

In order to develop consistent net rate impacts for the two projects, we prepared forecasts of PJM energy and capacity prices for the four Maryland zones – DPL, PEPCO, BGE, and APS – as well as of REC prices for Maryland. Details of our forecasts are presented below. The impact of either offshore wind project on wholesale capacity and energy prices would be most pronounced in DPL, the service territory in which both projects will be interconnected. The APS service territory would be least affected by an offshore wind project, but would be most affected by a market response, i.e. a reduction in planned onshore wind project development in response to a new offshore wind project.

This type of market response would be expected because the PJM capacity and energy markets were designed to provide competitive results, although the exact response is impossible to predict. Onshore and offshore wind development in PJM is largely driven by the RPS targets of the states. Wind project development is responsive to changes in the demand for RECs, and REC prices are a function of renewable project revenue requirements after capacity and energy revenues. In Maryland, the ORECs purchased by Maryland utilities will offset their purchases of Tier 1 RECs from other renewable resources. Therefore, we assumed that an offshore wind project would offset an equivalent amount of RECs from planned onshore wind resources that would have been located predominantly in the western portion of PJM, consistent with the location of onshore wind projects in the PJM interconnection queue.[51] Thus, we assumed the US Wind Project would displace 372 MW of planned onshore wind resources and the Skipjack Project would displace 186 MW of planned onshore wind resources, based on a 28% average capacity factor for onshore PJM wind projects.[52] Once those onshore wind projects are displaced, we assumed that the REC market would rebalance and onshore wind projects would continue to be developed as PJM would still need renewable resources and RECs to satisfy future Tier1 RPS requirements.

Table 8. Independent Market Response Calculation

Project	Capacity	Offshore Capacity Factor	ORECs/year RECs/year	Onshore Capacity Factor	Onshore Wind Market Response
US Wind	248 MW	42.1%	913,845	28.0%	372 MW
Skipjack	120 MW	43.3%	455,482	28.0%	186 MW

[51] 89% of all PJM onshore wind projects are located in the western portion of RTO; 6% are located in MAAC; 5% are in southern PJM; virtually none are in EMMAC or SWMAAC.

[52] The AURORAxmp database utilizes a 28% average annual capacity factor for onshore PJM wind projects.

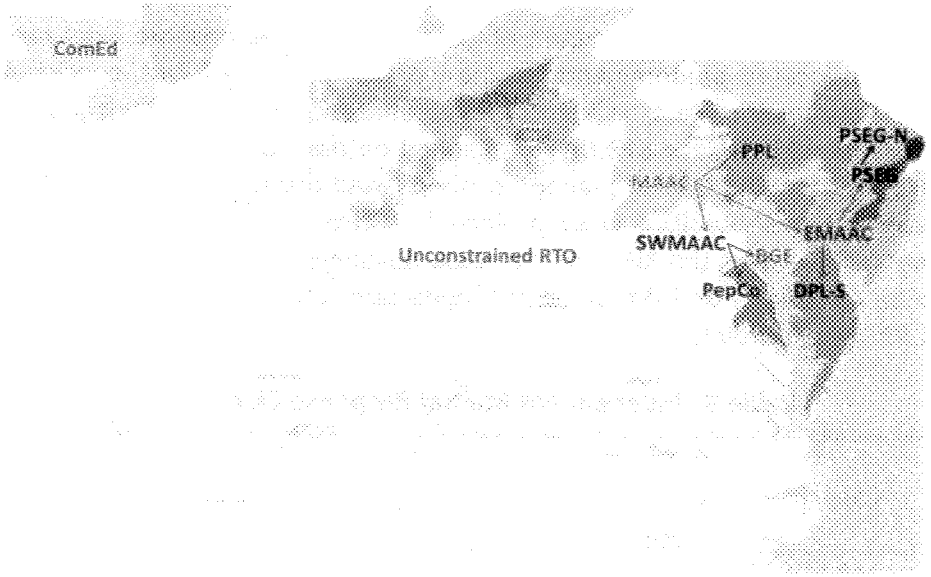
We assumed that an initial UCAP for both proposed offshore wind projects will be 26% of the nameplate capacity for the first six years based on PJM's treatment of the US Wind project, and would be higher in succeeding years supported by project operational data. We also assumed that the UCAP for onshore wind projects would be 13%, PJM's Class Average Capacity Factor for wind resources.

Wholesale Capacity Prices

Overview of the Reliability Pricing Model

In its RPM, PJM sets locational capacity prices and quantities in annual BRAs three years in advance of the associated Capacity Delivery Year. We calculated the change in capacity clearing prices with and without a market response for Maryland consumers, over the relevant twenty years in the 2020-2042 Study Period starting with the 2017 BRA (2020/2021 Capacity Delivery Year) for the US Wind Project and the 2020 BRA (2023/2024 Capacity Delivery Year) for the Skipjack Project. The BRAs utilize unforced capacity (UCAP) measures of supply-side and demand-side capacity resources that account for their ability to deliver reliable energy, i.e. whenever necessary to meet peak power system demands.[53] Parts of Maryland lie within three PJM capacity zones, referred to as Locational Deliverability Areas (LDAs), as shown in Figure 6 below.

Figure 6. PJM Locational Deliverability Areas



Source: Third Triennial Review of PJM's VRR Curve, 15May2014

- DPL, which serves the Delmarva Peninsula and the Eastern Shore, is in the EMAAC portion of PJM

[53] For example, a conventional 100 MW that operates 90% of the time (after scheduled outages such as maintenance outages and unscheduled or forced outages) would have 90 MW of UCAP.

- BG&E and PEPCO, which serve Baltimore and the central portion of Maryland, are in Southwest MAAC (SWMAAC)
- APS, which serves the western portion of Maryland, is in the LDA referred to as the Regional Transmission Organization (RTO) that encompasses all of PJM

Under the RPM construct, smaller LDAs are "nested" within larger LDAs. EMAAC and SWMAAC are each nested within MAAC, which itself is nested within the RTO. Under RPM rules, the wholesale capacity price in a smaller LDA cannot be lower than the price for the LDA in which it is nested, e.g. EMAAC and SWMMAC prices can be unequal but cannot be lower than the MAAC price.

Under the RPM construct, PJM determines the wholesale capacity clearing price based on the intersection of capacity demand and supply curves. The Variable Resource Requirement (VRR) demand curves are administratively-determined based on the estimated net Cost of New Entry (CONE) for each LDA, the Installed Reserve Margin (IRM), and other planning parameters. The shape of the VRR curves changed slightly beginning with the 2015 BRA for the 2018/2019 Delivery Year, and is shown in its current shape in Figure 7. PJM has conducted two BRAs with the new VRR curve.

Capacity resources submit confidential capacity bids in each BRA that generally represent their marginal revenue requirements, i.e. their net costs after expected energy, REC, and ancillary service revenues. The capacity bids are "stacked" by increasing price to create supply curves for each LDA, illustrated in Figure 8, and the point at which it crosses the VRR curve determines the wholesale capacity price for that LDA. Capacity bids that clear under the VRR curve are awarded Unforced Capacity Obligations that provide them with performance-adjusted capacity revenues and require them to bid into PJM's day-ahead energy market to assure resource adequacy in that Capacity Delivery Year.

As explained in the previous section, we expect that both Projects would result in the displacement of planned onshore wind capacity that would have provided an equivalent quantity of RECs. We estimate that the US Wind Project would displace 372 MW and the Skipjack Project would displace 186 MW of planned onshore wind resources, predominantly in the western portion of the RTO LDA. Such a market response would be consistent with PJM's design of its energy and capacity pricing mechanisms to produce competitive results.

Capacity Pricing Methodology

PJM Manual 21 *Rules and Procedures for Determination of Generating Capability* states that all new wind projects are assigned the Class Average Capacity Factor of 13% of nameplate capacity for UCAP during the first three years of operation. Once a wind project has at least a full year of operating history, it can request a higher UCAP value as long as it is supported by an analysis with sufficient information.[54] In addition, a generator's UCAP value cannot exceed its CIR,

[54] Falin, Tom. "UCAP and CIR Determinations of Intermittent Resources." presentation by the PJM Planning Committee February 11, 2016.

which is based on Summer Peak Hours and is used by PJM planners for interconnection and other planning studies.[55]

US Wind presented PJM with estimated offshore wind performance data indicating a much higher expected capacity factor during those Summer Peak Hours compared to the onshore wind projects.[56] As a result, PJM agreed to credit the US Wind Project with an initial CIR of 64.5 MW, i.e. 26% of 248 MW, which would also set its maximum UCAP.[57] We expect PJM will treat Skipjack equitably and thus credited it with a CIR (and thus maximum UCAP) of 31.2 MW, i.e. 26% of 120 MW for the purpose of our analyses. We assumed these initial UCAP values for the first six Capacity Delivery Years, after which the Projects may be able to obtain higher CIRs and UCAP values based on their actual performance. This would require a Project to submit a new interconnection request, re-enter the PJM queue, and be found not to cause (or contribute to) any system reliability violation.[58]

An offshore wind project with at least one full summer of operating data could request an increase to its CIR based on a three year average performance during Summer Peak Hours that would include one year of actual performance and two years of the initial 26% CIR value.[59] However, we do not think it would be realistic for an offshore wind project to go through this process three times, once each year of actual summer operating data is established, so we assumed the CIR value would increase one time after three years of operating history.[60] Thus we assumed both Projects would request and be granted higher CIRs (and maximum UCAP values) starting with the seventh year of operation, based on its expected performance during Summer Peak hours that we calculated from each Project's 24 x 12 matrix of expected energy production. Starting in the seventh year of operation, we assumed the US Wind Project would be entitled to 71.9 MW of UCAP (29.0% performance during Summer Peak Hours) and the Skipjack Project would be entitled to 41.3 MW of UCAP (34.4% performance during Summer Peak Hours).

LDA Dynamics: In each BRA, PJM models LDAs that have the potential to clear at higher capacity prices based on the ratio of the Capacity Emergency Transfer Limit (CETL) to Capacity Emergency Transmission Obligation (CETO) for those LDAs and other factors. If the ratio is high, that LDA has more than adequate transmission import capability to ensure reliability and PJM

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[55] CIRs are defined as "the rights to input generation as a Generation Capacity Resource into the Transmission System at the Point of Interconnection where the generating facilities connect to the Transmission System" per Aaron Berner, "Capacity Interconnection Rights" May 6, 2016. Summer (June-August) Peak Hours are hours ending 1500 - 1800, i.e. the four hours from 2 pm to 6 pm.

[56] By providing sufficient evidence indicating expected performance greater than the Class Average Capacity Factor, an intermittent resource may be granted a higher initial CIR value as stated in PJM Manual 21: Rules and Procedures for Determination of Generating Capability.

[57] The PJM Generation Interconnection Feasibility Study Report for Queue Position AB1-056 indicates a CIR of 64.45 MW, 26% of the US Wind 248 MW nameplate capacity.

[58] Ibid, 54.

[59] Ibid, 54, 56.

[60] While this may be a conservative assumption, we believe it is realistic.

may not model it.[61] If the ratio is small, there is a chance that the LDA will "bind" in the BRA and will clear at a price higher than the LDA in which it is nested. While the CETL/CETO ratio is generally a good indication of whether an LDA will bind and have a higher capacity price, it is not a guarantee as explained below for the Maryland LDAs.

In order to make an informed assumption about future BRAs, we reviewed past capacity market dynamics for Maryland. As Table 9 shows, capacity clearing prices in all Maryland LDAs for the past three BRAs (Capacity Delivery Years 2017/18 onward) have cleared at the same price as the RTO with the exception of EMAAC, which had higher prices in the last two years. PJM also looks at the capacity transfer limits in an LDA at the utility level, e.g. BGE, DPL, and PEPCO, for price separation, but Maryland utilities have always cleared at their respective LDA prices.[62]

Table 9. Historical PJM Wholesale Capacity Prices by LDA
($/MW-day: highlighted values cleared above RTO)

BRA Year	Capacity Delivery Year	RTO	MAAC	EMAAC	SWMAAC
2004	2007/2008	$ 40.80	$ 40.80	$ 197.67	$ 188.54
2005	2008/2009	$ 111.92	$ 111.92	$ 148.80	$ 210.11
2006	2009/2010	$ 102.04	$ 191.32	$ 191.32	$ 237.33
2007	2010/2011	$ 174.29	$ 174.29	$ 174.29	$ 174.29
2008	2011/2012	$ 110.00	$ 110.00	$ 110.00	$ 110.00
2009	2012/2013	$ 16.46	$ 133.37	$ 139.73	$ 133.37
2010	2013/2014	$ 27.73	$ 226.15	$ 245.00	$ 226.15
2011	2014/2015	$ 125.99	$ 136.50	$ 136.50	$ 136.50
2012	2015/2016	$ 136.00	$ 167.46	$ 167.46	$ 167.46
2013	2016/2017	$ 59.37	$ 119.13	$ 119.13	$ 119.13
2014	2017/2018	$ 120.00	$ 120.00	$ 120.00	$ 120.00
2015	2018/2019	$ 164.77	$ 164.77	$ 225.42	$ 164.77
2016	2019/2020	$ 100.00	$ 100.00	$ 119.77	$ 100.00

Based on these historical wholesale capacity prices, we have made the following capacity market assumptions:

- EMAAC cleared above MAAC in the past two BRAs. We expect EMAAC will continue to clear above MAAC in spite of having a high CETL/CETO ratio (294% for the 2015 BRA and 561% for the 2016 BRA). PJM has explained that it conservatively adjusts its EMAAC resource assumptions and will continue to do so.

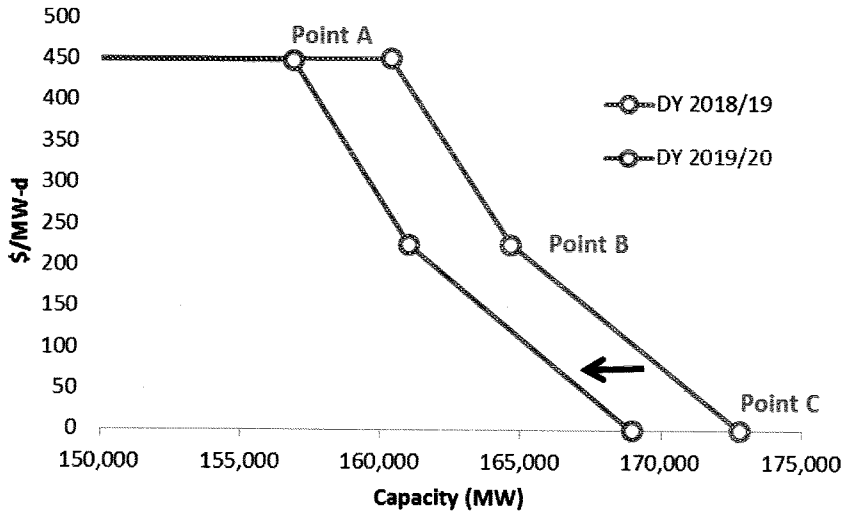
[61] An LDA is modeled in the BRA and has a separate VRR Curve if (i) the LDA has a CETO/CETL margin that is less than 115%; or (ii) the LDA had a locational price adder in any of the three immediately preceding BRAs; or (iii) the LDA is EMAAC, SWMAAC, and MAAC.

[62] For the 2019/2020 Delivery Year, BGE cleared $0.30/MW-day above the SWMAAC price. This price separation is minimal and we consider an anomaly not expected to carry on into future BRAs.

- SWMAAC has not separated (with higher prices) from MAAC during the past ten BRAs. We expect SWMAAC will continue to clear at the MAAC price given its high CETL/CETO ratio (192% for the 2015 BRA and 240% for the 2016 BRA).
- We expect MAAC to clear at the RTO price as it has for the past three BRAs, consistent with MAAC's high CETL/CETO ratio.

VRR Demand Curve Forecast: We utilized PJM's most recent load forecast to set the VRR curves for the upcoming BRAs in which we expect the offshore wind projects to participate. PJM's load forecast utilizes a revised methodology to incorporate up-to-date trends concerning economic growth, distributed generation and behind-the-meter solar installations, home appliances, commercial / industrial equipment, and other key assumptions. As a result, PJM's load forecast is markedly lower than previous forecasts, which will result in a one-time shift to the left and produce lower capacity clearing prices for a given supply curve. Based on the results of the previous three BRAs, we assume that all of the Maryland LDAs will clear between point B and point C on the new VRR curve.

Figure 7. Shift in VRR Demand Curve due to PJM's New Load Forecast Methodology



Source: PJM BRA Planning Parameters 8Aug2015 and 24May2016

Table 10 provides a breakdown of Maryland's summer peak demand forecast from its latest Ten Year Plan.[63] PJM allocates Maryland's wholesale capacity costs using this breakdown that we kept constant for our analysis.

[63] The 2014-2023 Maryland Ten Year Report is available at:
http://webapp.psc.state.md.us/intranet/Reports/2014%20-%202023%20TYP%20Final.pdf

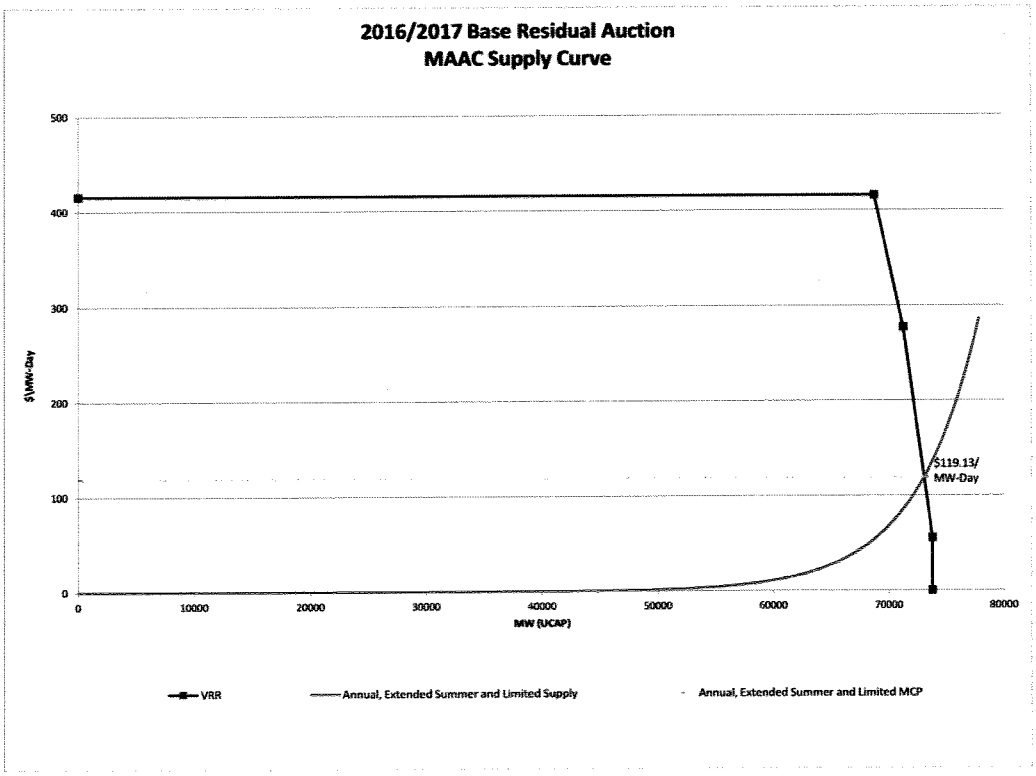
Table 10. Maryland Peak Load Distribution by Locational Deliverability Area

Utility	LDA	2016 Percentages
DPL	EMAAC	9%
BGE	SWMAAC	50%
PEPCO	SWMAAC	30%
APS	RTO	11%
Total		100%

Source: Maryland 2014 Ten Year Plan

Supply Curve: PJM keeps capacity resource bids confidential and only released sample supply curves for the certain BRAs. We assumed the supply curves in our analyses would have the slope shown in the PJM sample supply curve for the 2016/2017 Capacity Delivery Year shown in Figure 8 below.[64]

Figure 8. Sample BRA Supply and Demand Curves for the MAAC LDA



Source: PJM Supply Curves for Base Residual Auction, 29July2013

Capacity Performance: PJM recently implemented the Capacity Performance (CP) resource category in the BRA to assure year-round plant availability in light of fuel and other plant

[64] PJM has not provided supply curve information for auctions since the 2016/2017 Delivery Year.

performance problems encountered during the Polar Vortex of January 2014.[65] The CP concept is being phased in over the next few years with two categories of capacity resources:

- CP Resources that can perform during critical periods, referred to as Performance Assessment Hours
- Base Generation Resources that are not capable of sustained, predictable operation, particularly during summer months.

The 2017 BRA for the 2020/2021 Capacity Delivery Year will be the first BRA in which all of the resources to be procured will be CP. CP Resources will be subject to non-performance charges when they fail to perform under emergency conditions. As results from the two transition BRAs have shown, CP Resources have cleared at a price only slightly higher than Base Generation Resources. Trying to estimate the impact of the CP concept on the future functioning of the BRA and the clearing price results was beyond the scope of our work. Moreover, as the results of the last two transition BRAs have indicated, the CP concept is not expected to have a material impact on our results.

Forecast of EMAAC Capacity Prices: As discussed earlier, we assumed Maryland ratepayers would be credited with 64.5 MW of UCAP for the US Wind Project and 31.2 MW of UCAP for the Skipjack Project during the first six years of operation, and 71.9 MW of UCAP for the US Wind Project and 41.3 MW of UCAP for the Skipjack Project thereafter. Both Projects' capacity revenues would be priced at the EMAAC LDA in which they would be interconnected. We assumed EMAAC will continue to have capacity prices above MAAC and the rest of the PJM RTO, resulting in higher capacity payments to generators located in EMAAC.

EMAAC capacity prices, shown in Figure 9 below, have been volatile over the last few years, consistent with other LDAs. We projected EMAAC capacity prices based on the ratio of EMAAC capacity prices to Net CONE and the projected installed reserve margin.[66] As the reserve margin tightens up and drops to a level close to PJM's 16.5% target installed reserve margin from the most recent BRA, we expect capacity prices to clear at a higher ratio to Net CONE than they have historically. We estimated the 2020/21 EMAAC capacity price at $157.01/MW-day and future EMAAC capacity prices will increase slowly for the first ten years while the actual installed reserve margin is greater than the target. Once the actual installed reserve margin approaches the target and the reserve margins grow tighter, we expect the EMAAC capacity clearing price to approach Net CONE more rapidly.[67]

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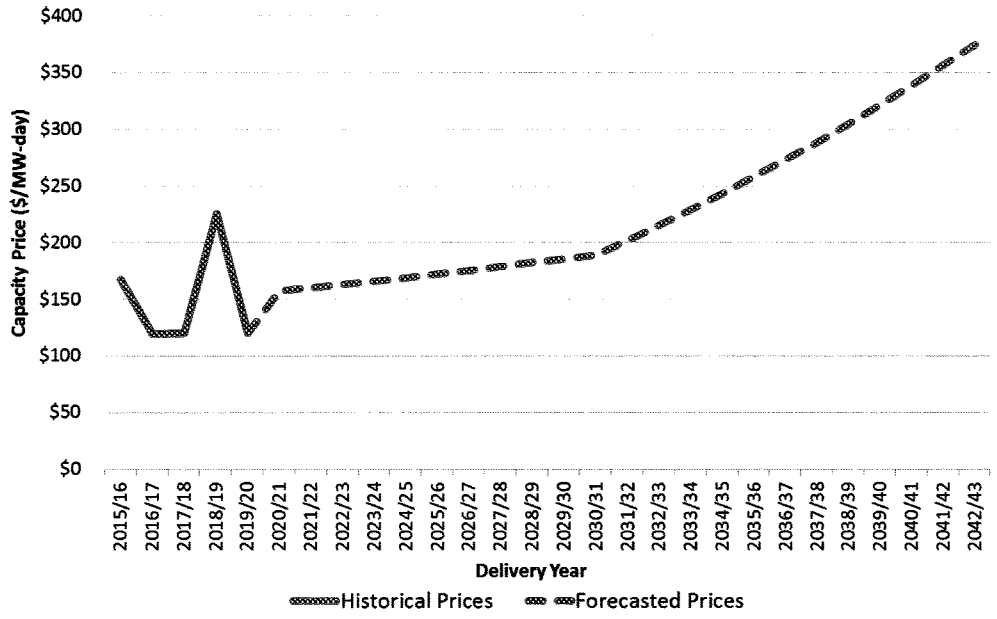
[65] CP was established when FERC accepted a series of tariff reforms contained in PJM's CP filing in Docket No. ER15-623 in June 2015.

[66] Net CONE, i.e. the cost of new capacity after expected energy and ancillary service revenues, is a key component in PJM's BRAs and was projected to increase with inflation. The installed reserve margin is the minimum level of installed capacity reserves needed to maintain the desired level of reliability and is a function of the PJM load forecast, expected system retirements and additions, and other planning parameters.

[67] We add generic gas-fired resources to maintain system reliability in our AURORAxmp model as the reserve margin grows tighter to maintain system reliability.

Figure 9. Historical and Independent Forecast of EMAAC Capacity Prices
($/MW-day)



WHOLESALE ENERGY PRICES

We prepared long-term forecasts of hourly PJM wholesale energy prices over the Study Period (January 1, 2020 – December 31, 2042), with and without the US Wind and Skipjack Projects, to forecast the change in energy prices for Maryland ratepayers on a zonal basis. We assumed that each Project would cause a market response in the form of displaced planned onshore wind generation, predominantly in western PJM. We used the most up-to-date load, transmission, plant entry, and plant retirement data available for the Study Region that included PJM, NYISO, and ISO-NE to capture price-sensitive power flows between those markets that affect Maryland wholesale energy prices. We also modeled the zones within each of these markets, using internal transfer limits, to capture the principal congestion patterns that cause zonal energy price differentials.[68] We supplemented this data with in-house assumptions where necessary, including future fuel costs, long-term plant additions / retirements, new import transmission projects, etc. We assumed a 1.87% long-term inflation rate, consistent with the minimum threshold criteria as specified in COMAR 20.61.06.03 A (3).

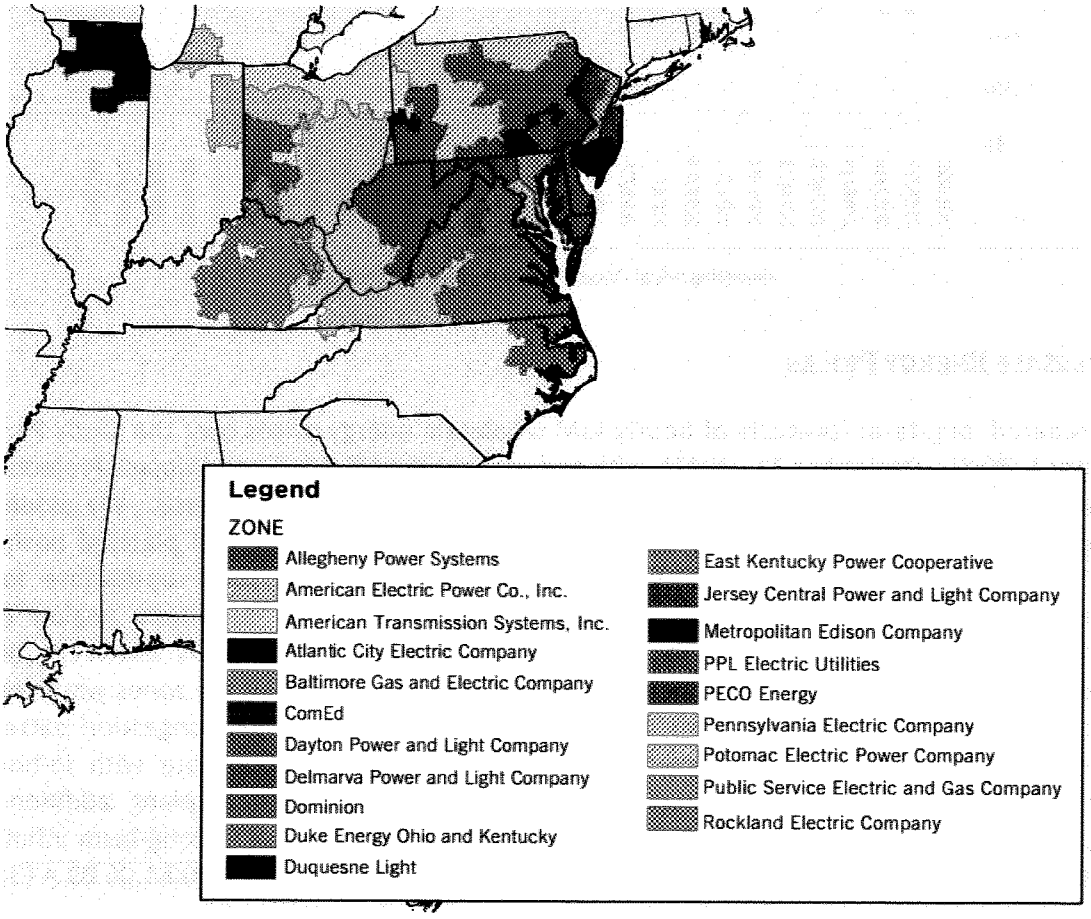
Key Model Assumptions

We utilized the AURORAxmp production cost and dispatch simulation model to forecast hourly energy prices for each PJM zone. AURORAxmp is an industry-standard model that simulates the day-ahead commitment and dispatch of individual generation resources, dispatchable

[68] The internal transfer limits also capture transmission limitations across groups of zones that are more restrictive than the sum of their individual zonal transfer limits.

demand-side resources, and inter-zonal power flows on an hourly basis. We forecasted wholesale energy prices for all of the PJM transmission zones shown below, including the four Maryland zones: DPL, BGE, PEPCO, and APS. We modeled the Study Area of PJM, NYISO as eleven zones (using NYISO zones A-K), and ISO-NE as thirteen zones (using ISO-NE Regional System Plan subareas). In order to capture the general energy flows to and from the markets surrounding the Study Area, i.e. IESO, HQ, MISO, TVA, VACAR, and SERC, we prepared fixed hourly schedules based on the most recent three years of interchange data to establish hourly scheduling patterns for one representative week of each month. [69]

Figure 10. Map of PJM Transmission Zones



Source: PJM

We incorporated zonal transfer limits based on EPIS's AURORAxmp North American database, updated to reflect the latest available information from the following sources:

- PJM Planning Period Parameters for the 2015/16 through 2019/20 BRAs

[69] In ISO-NE, we anticipate that either the 1,090 MW Northern Pass Transmission project or the 1,000 MW New England Clean Energy Link project will be constructed. The impacts and timing of both projects are very similar; we assumed that Northern Pass Transmission would be constructed in 2019.

- 2015-2016 NYSRC Installed Capacity Requirement Report, December 15, 2015
- 2015 ISO-NE Regional System Plan Report, November 5, 2015[70]

We used the latest load forecasts from PJM, NYISO, and ISO-NE, extrapolated through 2042, the last year of the Study Period. Passive demand resources and energy efficiency were embedded in the load forecasts. For generation retirements, we reviewed each RTO's planned deactivations list for known near-term retirements, primarily coal and nuclear, and performed a coal attrition analysis for longer-term retirements. For generation additions, we added proposed facilities that have cleared PJM's BRAs or ISO-NE's Forward Capacity Market, as well as small renewable resources that have executed signed Interconnection Service Agreements. Since NYISO does not have a 3-year forward capacity procurement market, we added new resources that have advanced far enough in the interconnection process to accept their class year cost allocation, a key financial commitment. We also added renewable resources, primarily onshore wind, consistent with the RPS for individual states. Finally, we added conventional gas-fired simple cycle and combined cycle plants as needed to maintain each ISO/RTO's planning reserve margin.[71]

Table 11. Resource Additions and Retirements, Base Case 2016-2042
(MW)

	PJM	NYISO	ISO-NE
Wind Additions	28,197	17,850	4,405
Other Renewable Additions	9,723	2,936	3,292
Conventional Additions	31,981	1,145	5,351
Conventional Retirements	20,733	2,207	3,083
Net Additions	49,168	19,724	9,965

Fuel and Emission Allowance Price Forecasts

Fuel prices, particularly natural gas, are a key driver of wholesale energy prices in PJM and the rest of the Northeast. In general, we forecasted fuel prices using publically available forward indices and forecasts, e.g. the New York Mercantile Exchange (NYMEX) and the 2016 Annual Energy Outlook (2016 AEO) issued by the Energy Information Administration, supplemented by our in-house models.

Our gas forecast is based on NYMEX futures prices, the long term Henry Hub (the US benchmark price) in the 2016 AEO, and the GPCM simulation model we utilize to forecast basis, *i.e.*, the difference in gas prices between Henry Hub and other trading points in North America, based on changes in production, consumption, pipeline capability, and imports / exports. As

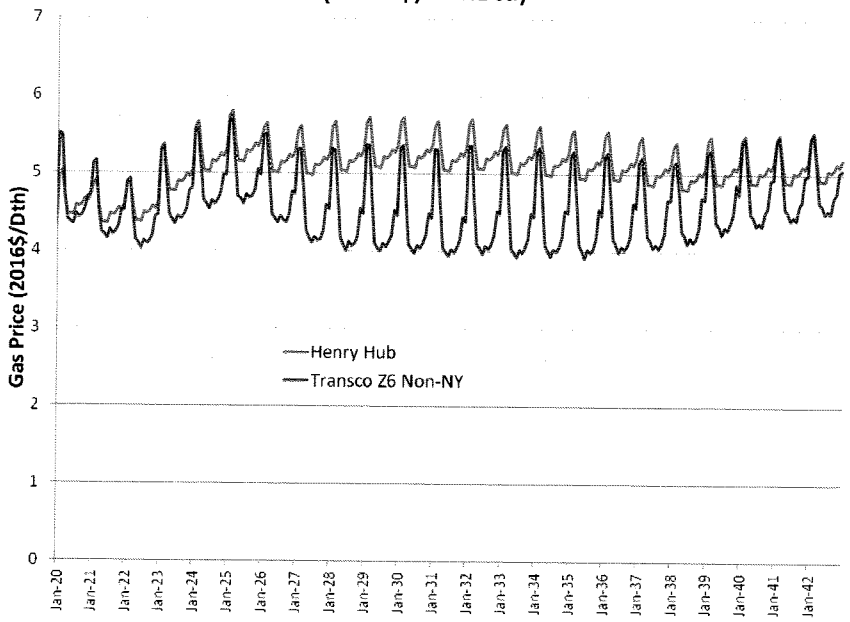
[70] In ISO-NE, we anticipate that either the 1,090 MW Northern Pass Transmission project or the 1,000 MW New England Clean Energy Link project will be constructed. The impacts and timing of both projects are very similar; we assumed that Northern Pass Transmission would be operational in 2019.

[71] Wind and other renewables are nameplate values; capacity values for reliability and planning purposes are significantly lower.

shown in Figure 11, delivered gas prices in Maryland are expected to be below Henry Hub during the non-winter months due to the high volume of fracked gas produced in the PJM region.

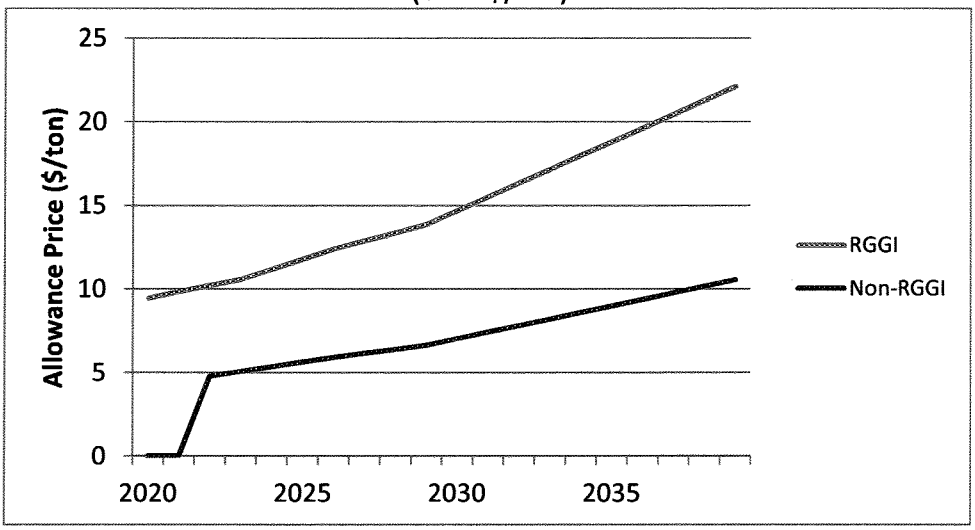
Consistent with our gas price forecast, our forecast of delivered oil prices starts with the current NYMEX forward price curves for domestic crude oil and for ultra-low-sulfur diesel (ULSD), the primary backup fuel for gas-fired plants. The NYMEX crude oil and ULSD prices extend through December 2024 and January 2020, respectively, so we extended those price projections through 2042 based on the 2016 AEO. Our coal price forecast is based on the Energy Information Administration Short-Term Energy Outlook and the 2016 AEO, adjusted to reflect state- or plant-specific transportation costs, quality considerations, and mine sources.

Figure 11. Independent Forecast of Henry Hub and Delivered Gas Prices in Maryland
(2016 $/mmBtu)



We incorporated emission allowance prices as a variable operating cost for generators to comply with state and federal environmental requirements, including the EPA's Clean Power Plan to regulate greenhouse gases, the Cross-State Air Pollution Rule, and, where applicable, the Regional Greenhouse Gas Initiative. AURORAxmp tracks NO_x, SO_2, and CO_2 emission rates for all fossil fuel resources and emission allowances, including those which are allocated to generators at no cost and those that are auctioned. The emissions allowances are valued at their opportunity cost, i.e. the market price in the year that the allowance is used or retired.

Figure 12. Independent Forecast of CO_2 Allowance Prices
(2016 $/ton)



Renewable Energy Credit Prices

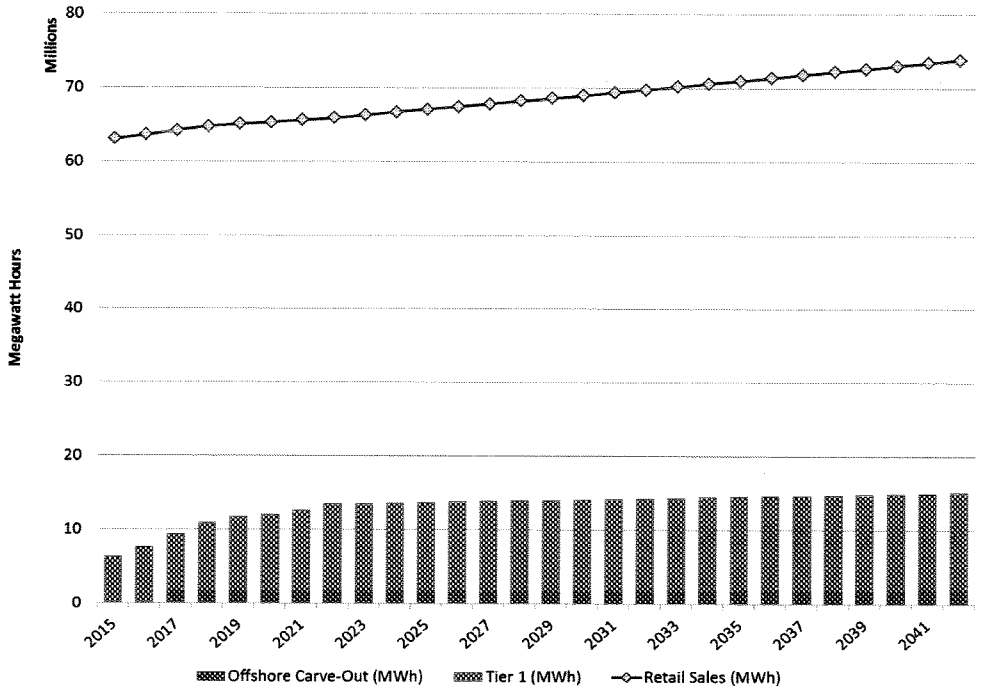
Maryland's RPS was enacted in May 2004 and revised numerous times. Maryland's RPS requires electricity suppliers, i.e. all utilities and competitive retail suppliers, to use renewable energy sources to generate a minimum portion of their retail sales with two tiers of renewables, Tier 1 and Tier 2.[72] ORECs are a Tier 1 REC carve-out, up to a maximum of 2.5% of retail electricity sales, starting in 2017. RECs are mandated in Maryland and other PJM states as a part of each state's RPS and are tracked by the PJM Generation Attribute Tracking System (GATS).[73]

In April 2013, Maryland enacted legislation (H.B. 226 / S.B. 275) creating a resource carve-out for offshore wind facilities. The carve-out is a maximum 2.5% of retail electricity sales in 2017 and beyond, with the actual requirements to be determined by the MDPSC subject to the 2.5% limitation, as well as other ratepayer protection as described in this report. We projected Maryland's Tier 1 RECs requirements with the 2.5% OREC carve-out as shown in Figure 13.

[72] According to the Database of State Incentives for Renewables, Maryland Tier 1 renewables include solar, wind, biomass, methane from anaerobic decomposition, geothermal, ocean, fuel cells powered through renewables, small hydro, poultry-litter incineration facilities, waste-to-energy facilities, refuse-derived fuel, and thermal biomass energy. Tier 2 renewables include hydroelectric power other than pump-storage generation.

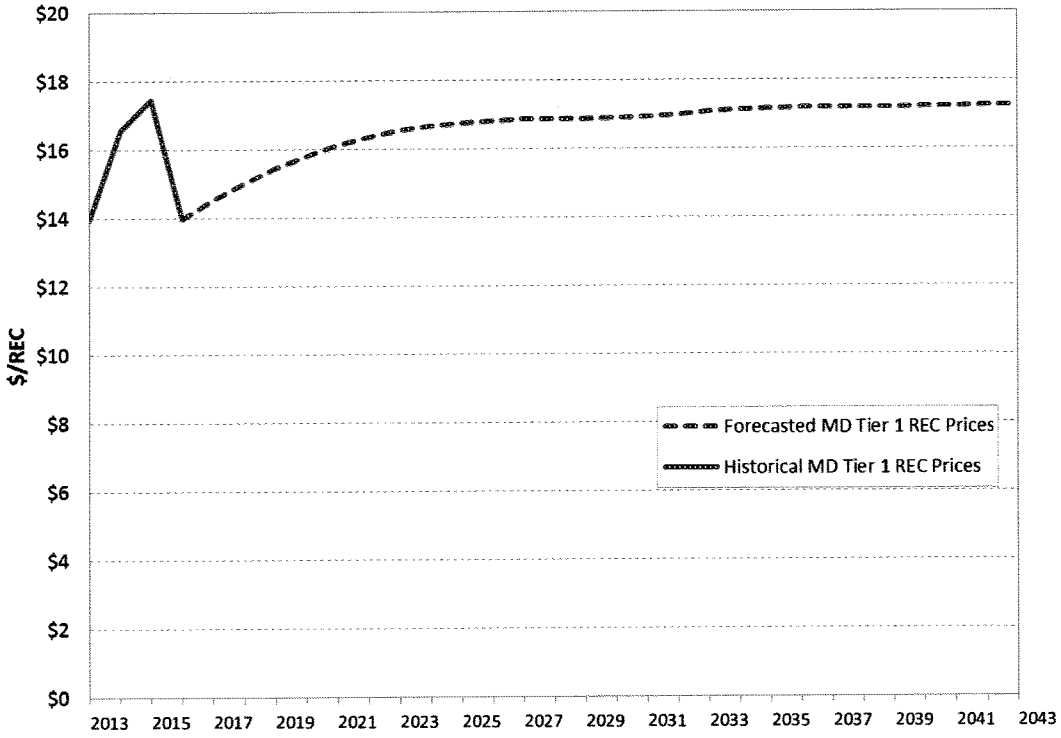
[73] Energy sales are measured in MWh; one MWh of energy from a qualified renewable resource produces one REC.

Figure 13. Maryland Tier 1 REC Req'ts, OREC Carve-Out, and Retail Electricity Sales
(millions MWh)



RECs are an important revenue source for renewable resources and help drive developer decisions on building new renewable resource projects. We forecasted Maryland Tier 1 REC prices over the Study Period utilizing a revenue requirements optimization model that takes into account the expected cost to build and operate a new onshore wind project in PJM along with expected energy and capacity revenues. Our forecast assumed that the REC market operates at equilibrium, i.e. the number of RECs would be unchanged with an offshore wind project due to a market response, so there would be no change in Tier 1 REC prices. Our assumption is also consistent with the relatively small number of ORECs that either Project would generate relative to the 67 million RECs generated in 2015 (according to PJM GATS) and the fact that all PJM states with RPS allow up to three years of REC banking. Figure 14 provides four years of historical Maryland Tier 1 REC prices and 27 years of our forecasted prices.

Figure 14. Historical and Independent Forecast of Maryland Tier 1 REC Prices
(nominal $/REC)



Net Ratepayer Impact Analysis

OWEA and the Regulations specify maximum net ratepayer impacts that cannot be exceeded: an increase of $1.50 per month for residential ratepayers based on 12,000 kWh/year consumption and 1.5% for non-residential ratepayers annual electricity bills.[74] The net ratepayer impacts include "...the value of energy, capacity and ancillary services generated...", "...the value of avoided Tier 1 REC costs...", and "...any consequential impacts on wholesale market energy, capacity, ancillary service, and REC prices..." Consistent with the Regulations, we calculated the net rate impacts in 2012 levelized dollars.

In order to calculate the net impact to Maryland residential and non-residential ratepayers, we combined three principal elements: the gross OREC price, market credits (for energy, capacity, and RECs) as reflected in the net OREC price, and reductions in wholesale energy, capacity, and

[74] In calculating the net impact for non-residential ratepayers, OWEA and the Regulations exclude large industrial (>75,000 MWh/year) and agricultural (> 3.0 MWh/month and filing an IRS Form 1040, Schedule F) loads from OREC requirements. We were informed that no ratepayers are known to satisfy these criteria because none were identified and reported by Maryland electricity suppliers as part of their April 30 annual compliance filings. The MDPSC cannot project in advance whether or how much load may be affected by these exclusions. *See* COMAR 20.61.04.02 B(3).

REC prices. We do not expect either Project to provide ancillary services, nor do we expect there to be any change in wholesale ancillary service prices.

We calculated the Net Ratepayer Cost for each Project on an annual basis over the 2020-2042 Study Period in nominal dollars. We calculated the Gross OREC cost as the annual product of a Project's OREC Price ($/MWh) and annual OREC quantity (MWh/year) for each year over the proposed term. The annual market credit for energy was determined as the sum of hourly products of Project generation (based on the 24 x 12 output profiles provided by the applicants) and the forecasted hourly DPL zone energy prices from the simulation model run for each Project. The annual market credit for RECs was based on the annual OREC quantity and our forecast of Maryland Tier 1 REC prices, and the annual market credit for capacity was based on the products of annual UCAP and forecasted EMAAC capacity prices. The annual wholesale energy price impact for each Project was based on the differences in hourly energy prices in the four relevant zones (DPL, PEPCO, BGE and APS) with and without each Project. These zonal differences were multiplied by corresponding hourly loads for the zones and by the fraction of each zone's load allocable to Maryland. The annual wholesale capacity price impact for each Project was determined by estimating the change in LDA capacity prices, multiplied by a factor representing the Maryland load share for that LDA. We determined that there would be no measureable Maryland Tier 1 REC price impact, since our modeling assumes a market response that would maintain REC quantities.

The annual components of Net Ratepayer Cost were discounted to present value and divided by the present value equivalent of the annual Maryland affected load to determine a levelized measure in $/MWh of load.[75] This measure of wholesale power cost impact flows directly to retail residential and non-residential loads, and can be converted to dollars per month for residential customers (assuming an annual consumption of 12,000 kWh per customer) and to a percentage of total electric bill for non-residential customers (assuming a 2012 all-in non-residential rate of $0.101/kWh based on EIA 860 data for Maryland).

Economic Impact Analysis

We prepared independent estimates of both Projects' impact on in-state income, employment, taxes, and local spending based on their respective spending assumptions, making adjustments only where necessary, as required by OWEA. We utilized IMPLAN, an industry-standard input-output economic model, which was also utilized by US Wind's consultant, EDR Group. Skipjack's consultant, Boston Pacific, utilized National Renewable Energy Laboratory's (NREL) Jobs and Economic Development Impact (JEDI) to estimate the economic impacts on the Maryland economy. JEDI requires fewer input data than IMPAN as it is pre-loaded with average standard industry values, but it generates results similar to IMPLAN.

The IMPLAN model allows the user to input several categories of expenditures and divide them between in-state and out-of-state on an annual basis. The economic impacts are reported by

[75] Discounting cost components and load to 2012 using the nominal discount rate for cost components and the real discount rate for load quantity, the resulting unit costs are expressed in 2012 $/MWh of load.

IMPLAN as direct, indirect, and induced. Direct impacts are due to initial capital and O&M expenditures, indirect impacts are expenditures, e.g. investments, made by local industries so they can make the direct sales, and induced impacts are due to spending of earned household income from both the direct and indirect impacts. We estimated each Project's impacts during their development and construction phases for each year because IMPLAN does not have the capability to estimate the impacts of economic activities over multiple years. We then combined those impacts to report the total impacts during the development and construction phases. We estimated the local impacts during the operating phase of each Project slightly differently because each Project expects to incur the same annual O&M expenditures over the twenty-year operating period (ignoring inflation). Thus we ran IMPLAN for the first operating year and multiplied the estimated impacts by twenty to estimate the total operating phase impacts.

EVALUATION OF THE US WIND APPLICATION

APPLICANT INFORMATION

COMAR 20.61.06.02 E

E. An application shall include a signed and notarized statement by an officer of the OSW applicant attesting that:

(1) The officer has the authority to submit the application to the Commission;

(2) The application, including the proposed OREC price schedule and proposed OREC amount, shall remain binding until the expiration date;

(3) The information and materials contained in the application are accurate and correct; and

(4) If the application is selected, the OSW applicant will work diligently and engage in a continuous development and construction program to achieve the project COD for the qualified offshore wind project.

Findings

US Wind provided a signed and notarized statement (in English and Italian) by Riccardo Toto, President and the sole director of US Wind, attesting to each of these conditions, meeting the COMAR requirement.

We expect there will be changes to the design of the US Wind Project. COMAR 20.61.06.01 E permits applicants to submit additional project information. However, applicants are prohibited from changing the proposed OREC price schedule or quantity, or materially changing other information, after the Application Period closes, i.e. on November 18, 2016. Consistent with COMAR 20.61.06.18 B, US Wind stated it would inform the MDPSC of any material changes in the Project prior to the COD as a matter of good business practice.

COMAR 20.61.06.02 F (1) and (2)

F. An application shall include the following information:

(1) An organizational chart that shows:

(a) Complete ownership structure of the proposed project (including all parents, subsidiaries, and other affiliates that have direct or indirect management or voting control over the proposed project); and

(b) Any lenders or entities funding the proposed project, including those entities funding on a contingent basis; and

(c) If different from the proposed project, the relationship between the OSW applicant and the proposed project.

(2) Legal name and type of business organization of each entity listed on the organizational chart described in F(1)(a) of this regulation, including certificates of formation and certificates of good standing certificated by the relevant governmental authority for each entity and, if applicable, foreign qualification certificates or other evidence that the proposed project and the OSW applicant are qualified to do business in the State;

Findings

US Wind provided a corporate organizational chart and legal name, and business organization for US Wind Inc., a Massachusetts corporation registered in Maryland. US Wind is owned by Renexia SpA, which itself is owned by Toto Holding SpA and other individuals. Renexia and Toto Holding are Italian joint stock companies, i.e. shareholder corporations, privately held, and headquartered in Chieti, Italy.

The organizational chart did not include investors or lenders. This omission is not problematic given (i) the uncertain financial structure at this early stage and because (ii) potential investors and lenders were identified in response to COMAR 20.61.06.02 K (3).

US Wind confirmed its intention to develop and own the US Wind Project directly. US Wind may explore other ownership structures, in which the project would be developed, owned, and operated by (i) a subsidiary of US Wind or (ii) an affiliate of US Wind if there are financing or other advantages. These alternative structures should not be problematic as long as US Wind informs the MDPSC of any material changes as required by COMAR 20.61.06.18 B.

US Wind provided Registration Certificates for Renexia (number 021921 10696) and Toto Holdings (number 001344 10695) filed with the Chieti Chamber of Commerce. These Registration Certificates also indicate when they were founded, shareholders, business activities, employees, directors, and other basic corporate information. Since US Wind is qualified to do business in Maryland and will be responsible for all development, ownership, and operations, we do not view these alternative structures as problematic.

Toto Holding's core business is large transportation and infrastructure construction: roads, motorways, and railways, as well as motorway concessions, aviation, engineering, and renewable energy through Renexia. We were informed that US Wind will either be the project entity or will establish a project entity as a wholly-owned US Wind subsidiary. Either corporate structure should be satisfactory in the context of the Regulations.

COMAR 20.61.06.02 F (3)

(3) Bylaws or operating agreement of each entity listed on the organizational chart described in F(1)(a) of this regulation and relevant board resolution (or equivalent written consent) to submit an application;

Findings

US Wind provided the Bylaws of all three companies, two Board Resolutions of September 25, 2015 from Toto Holding and Renexia, and a Sole Director Resolution dated April 28, 2015 from US Wind, each authorizing US Wind to submit the application.

COMAR 20.61.06.02 F (4)

(4) Name, title, address, telephone number, email address, and curriculum vitae of each member of the OSW applicant's executive team and project team that will be responsible for the proposed project, demonstrating capability and expertise in, at a minimum, project management, development, financing, permitting, engineering, procurement, construction, operations, maintenance, decommissioning and other significant functions for ocean-based energy projects, utility-scale wind projects, or large scale generation projects;

Findings

US Wind provided the documents listed above for the company's President Riccardo Toto, Vice-President Paolo Sammartino, Director of Project Development Paul Rich, Executive Program Manager Francesco Salvatore, Financial Manager Marco Ciferni, and General Counsel / Secretary Dr. Salvatore Vitale.

- Riccardo Toto has a 17 year background in civil aviation and corporate management.
- Paulo Sammartino has worked for 12 years and has been involved in civil engineering for Toto Holding for the last 9 years, specializing in geotechnical issues for solar and wind renewable energy projects.
- Paul Rich has 15 years of significant and relevant wind experience having led the development of the Deepwater Block Island Wind Farm in Rhode Island, the first offshore wind project in the US and having senior engineering / electrical positions with two underwater transmission projects in the northeastern US.[76] Prior to that he served with the US Navy for 11 years.
- Francesco Salvatore is a structural engineer with 7 years of increasing responsibilities in civil and industrial projects.
- Marco Ciferni has 11 years of financial analysis and planning experience, of which 7 years was with Toto Holding.
- Salvatore Vitale has been a lawyer for 12 years, of which the last 5 was with Toto Holding.

[76] The 30 MW Block Island Wind Farm will consist of five 6 MW turbines and should be operational by year-end 2016. Jacket foundations were installed in 2015, electrical cable work was installed in 2016, and the turbines plus blades were installed in August / September 2016.

The core US Wind development team, particularly with the background of Paul Rich, should be adequate for the project development phase of this project.

COMAR 20.61.06.02 F (5)

(5) For each entity that is, or has committed to, providing financing to the proposed project:

(a) The identity of the entity and a brief description of its business;

(b) Name, title, address, telephone number, and email address of the primary contact person;

(c) Most recent audited financial statements that use either generally accepted accounting principles or International Financial Reporting Standards; and

(d) Issuer or long-term senior unsecured debt ratings, or both, from at least one nationally recognized statistical ratings organization (if available);

Findings

Renexia is the renewable energy development, construction, and management subsidiary of Toto Holding. Renexia has developed and has either sold or retained interests in a number of wind and solar energy projects. Toto Holding's core business is large transportation and infrastructure construction: roads, highways, and railways, as well as highway concessions, aviation, engineering, and renewable energy.

US Wind provided 2015 financial statements for US Wind and 2014 and 2015 financial statements for Renexia and for Toto Holding (on consolidated and unconsolidated bases). COMAR 20.61.06.02 F(5)(c) requires financial statements that use either generally accepted accounting principles (GAAP) or International Financial Reporting Standards. The US Wind financial statements meet this requirement. Renexia and Toto Holding, however, are privately held and thus are not required to prepare financial statements that meet those principles / standards under Italian law. Those statements meet another set of standards appropriate for privately held firms and therefore should be considered acceptable. COMAR 20.61.06.02 F(5)(d) requires credit ratings if available. We were informed that as privately held companies, neither Renexia nor Toto Holding have credit ratings. We researched credit ratings and found none, so this requirement should be considered satisfied.

US Wind: The 2015 audited financial statements were prepared in accordance with GAAP. As of year-end 2015, US Wind had $16.4 million in total assets and in total liabilities and equity. The majority of the assets were categorized as assets under construction and prepaid rent, reflecting early investments and future lease payments for the US Wind Project and another offshore wind project in New Jersey. The majority of the total liabilities and equity were notes payable to its parent, Renexia, and paid-in capital. The financial statements indicate that Renexia has entered into a debt facility agreement with US Wind for up to $40 million. This agreement is a positive

demonstration of Renexia's (and by extension, Toto Holding's) commitment to the US Wind Project.

Renexia: The 2014 and 2015 financial statements were prepared by the Audit Board in accordance with Article 2429 of the Italian Civil Code, i.e. the Italian Accounting Principles issued by the Organismo Italiano di Contabilita, the relevant standards for privately held Italian companies.[77] During 2015, Renexia benefitted financially from the sale of a 22.8 MW wind project under development, Ponte Albanito, and the termination of the Serra Energie project. Renexia entered into the Parco Eolico Casalduni House wind project, acquired the Compagnia Generale Investmenti wind project, and reported its progress in the US Wind project. Renexia is involved in other wind and solar projects as well. Renexia's financial results are consolidated in Toto Holding financial statements.

Renexia's financial statements indicate that it had €41.7 million in total assets and in total liabilities plus equity as of year-end 2015. This amount represents a 25% increase over year-end 2014, which had increased 50% over year-end 2013. The 2015 change was primarily due to an increase in payables and receivables for the US Wind project. The 2014 change was primarily due to a reclassification of project loans to short-term receivables due from subsidiaries, along with an offsetting liabilities increase in short-term payables due to the parent company. Renexia was highly leveraged as of year-end 2015, with payables comprising 89.7% of liabilities.

Renexia had revenues of €3.7 million and had net income (book basis after taxes) of €0.0 million in 2015. Renexia had revenues of €0.5 million and net losses of €1.0 million in 2014 and €1.4 million in 2013. Renexia's cash flow was positive €9.5 million in 2015 primarily due to the sale of Ponte Albanito and was negative €0.1 million in both 2014 and 2013. Renexia's financial metrics are consistent with its corporate objective of developing, acquiring, and managing renewable energy investments through its project subsidiaries.

Toto Holding (consolidated basis): The 2014 and 2015 financial statements were prepared by the Audit Board in accordance with Article 2428 of the Italian Civil Code, i.e. the Italian Accounting Principles issued by the Organismo Italiano di Contabilita, and were audited by KPMG SpA.

Toto Holding's financial statements indicate that it had €1,748.6 million in total assets and in total liabilities plus equity as of year-end 2015, a 17.5% decrease from year-end 2014, which had a 4.4% decrease from year-end 2013. The decrease was primarily due to selling off non-strategic assets and closing out work orders as inventory and short-

[77] Publicly-traded Italian companies and financial institutions are required to provide financial statements prepared in accordance with the International Financial Reporting Standards.

term payables (due within one year) declined.[78] As of year-end 2015, Toto Holding had €219.1 million in net equity, equivalent to 12.5% of total liabilities plus equity, compared to €228.7 million and 10.5% as of year-end 2014.[79]

Toto Holding had revenues of €367.8 million in 2015 and €443.1 million in 2014. Toto Holding had a €88.8 million operating profit in 2015, an improvement over operating profits of €63.5 million in 2014 and €68.9 in 2013. After financial charges and adjustments (primarily interest charges), Toto Holding had a net profit of €12.0 million in 2015, an improvement over net losses of €29.9 million in 2014 and €79.4 million in 2013. Toto Holding's improved performance in 2015 reflects an improving regional economic and geopolitical environment in Italy and the rest of the European Union. Toto Holding's cash flow was a negative €22.8 million in 2015 compared to a positive €62.6 million in 2014 as inventory decreased and loans were paid down.

[redacted] US Wind, as the developer, would be responsible for developing the scope of work for the various subcontractors and the EPC contractor would be responsible for finalizing, executing subcontracts, and coordinating the various subcontracts.

As a wholly-owned subsidiary of Toto Holding, we believe US Wind has sufficient financial strength to undertake this Project.

COMAR 20.61.06.02 F (6)

(6) Name, title, address, telephone number, and email address of the primary contact at any entity with which the OSW applicant has a contract or similar agreement to perform permitting, engineering, procurement, construction, operations, maintenance, decommissioning or similar functions for the proposed project.

Findings

US Wind has retained and provided contact information for consultants in and outside of Maryland. The following Maryland-based companies are or will be providing US Wind the following services:

- High Street Strategies Lobbyist

[78] In 2015, Toto Holding sold off the Ponte Albanito wind project and the Rail One project, and delivered aircraft to Air Purchase Fleet Limited to resolve a legal dispute.

[79] On an unconsolidated basis, Toto Holding had €294.0 million in net equity (equivalent to 76.7% of total liabilities plus equity) in 2015 and €291.9 million in net equity (58.4% of total liabilities plus equity) in 2014, indicating a reasonable and improving degree of debt leverage for the ultimate parent company.

• Moffatt & Nichol	Civil and structural engineering and design
• Taft Hardy & Associates	Lobbyist
• DLA Piper and Saul Ewing	Legal services
• Mott MacDonald	Electrical engineering
• Amerigo Offshore	Energy assessment and turbine siting
• R. Christopher Goodwin & Assoc.s	Cultural resource management
• Alpha Energy (minority owned)	PJM interconnection
• JLM HR Consulting	Maryland labor law
• The Hatcher Group	Public relations
• Apex Companies	Graphics support
• Ogos Energy	Project development; potential investor
• Pitcher & Associates	Legislative consultant
• Impact Business Solutions	IT services

Other consultants based outside of Maryland include:

• A.H. Glen and Associates	Meteorological and ocean design conditions
• Keystone Engineering	Civil and structural foundation design
• AWS Truepower (AWST)	Wind resource assessment
• ESS	Permitting and environmental services
• Energy Initiatives Group	PJM interc'n support to Alpha Energy
• Sea Risk Solutions	Fisheries studies
• Alpine Ocean	Geophysical and geotechnical surveys
• Gardline Environmental	Geophys / geotech support to Alpine Ocean
• Economic Dev't Research Group	Economic impact analysis

The companies in and outside of Maryland each appear to have relevant experience that should support US Wind's planning, permitting, and construction efforts.

COMAR 20.61.06.02 F (7)

(7) Complete information about any current or prior business bankruptcies, defaults, disbarments, investigations, indictments, or any other actions against the OSW applicant and any member of the executive team, the project team, or key employee(s) of any company included in F(1) of this regulation.

Findings

Neither the Applicant nor any subcontractor has experienced any bankruptcies, defaults, investigations, and/or indictments. Toto Holdings has had and is currently

involved in a small number of investigations and tax disputes according to its Consolidated Financial Statements for 2015. Toto Holding was able to reduce its Reserves for Risks and Charges from €130.6 million in 2014 to €51.7 million in 2015 as a number of disputes were resolved and outstanding charges were paid.

COMAR 20.61.06.02 F (8)

(8) Complete information about work performed by one or more entities included in F(1) or (6) of this regulation that is similar to the proposed offshore wind project, including ocean-based energy projects, utility-scale wind projects, or other large scale generation projects.

Findings

Renexia has been building up its experience with wind and solar photovoltaic renewable projects since it was established in 2011. Renexia is supported by Toto Holding's significant experience over many decades with large-scale civil construction projects.

- In Appendix 1-9.1, Renexia listed ten onshore wind and two offshore wind projects that are in early development (two, including the US Wind Project), waiting for permits (eight), or under construction (two). The projects are located in Italy, the US, and Tunisia.

In the Second Set of Answers provided by US Wind, the following projects were described:

- Renexia developed the Monteboli solar photovoltaic 24 MW project that was completed in 2011 and sold to another firm.
- Renexia was involved in the development of the Intersun solar photovoltaic 3.4 MW project at the Abruzzi Interport.
- Renexia developed the Ponte Abanito 22.8 MW wind farm that was completed in 2014 and sold to another firm.
- Renexia is involved in the development of the Circello 27 MW wind farm with completion anticipated for January 2017.
- Renexia has development rights to the Casalduni 36 MW wind farm, the Tunisia 100 MW wind farm, and one of two BOEM leases for WEAs off the New Jersey coast.

Many of the principal project subcontractors have experience with offshore wind and similar projects, as follows:

- Keystone Engineering has extensive experience in offshore oil and gas construction projects. Their offshore wind project work includes designs for Cape Wind, the Virginia Offshore Wind Technology Advancement Project, the

Block Island Wind Farm (currently under construction), and Fishermen's Atlantic City Wind Farm.

- A.H. Glenn and Associates Services have performed thousands of studies in meteorology and oceanography for the offshore industry in over 100 countries.
- Moffat and Nichol currently operates internationally; its practice areas include ports and harbors, as well as coastal, environmental, and water resources. They prepared the Offshore Wind Energy Staging Port Feasibility Study for the Maryland Energy Administration and are creating the preliminary offshore wind turbine substructure design. Their offshore wind clients include Cape Wind, Bluewater Wind, Fishermen's Energy, the Block Island Wind Farm, and international firms.
- Mott MacDonald operates internationally and has considerable global offshore wind engineering experience, listing four domestic projects and 78 international projects. They have provided conceptual engineering services as well as detailed construction and operating period cost estimates.
- AWST provides wind resource assessment (offshore wind resource modeling and measuring/monitoring), project layout development, and metocean condition assessment. AWST has performed work for Deepwater Wind, Cape Wind, US DOE, Garden State Offshore Energy, the University of Maine and others.
- ESS Group has led project planning, licensing, and monitoring efforts for many energy generation (conventional and renewable) and transmission (overland and submarine) projects, including more than 450 MW of offshore wind power over the past 15 years. Their offshore experience includes Cape Wind, Bluewater Wind, Town of Hull, Gamesa Energy, the New York Power Authority, and Seawind Renewable Energy Corp.
- Energy Initiatives Group, LLC provides electric transmission and related planning, engineering, and project management services. They provided submarine cable technical support to the Block Island Wind Farm (to Narragansett, Rhode Island), Neptune Cable Project (New Jersey to Long Island), Trans Bay Cable Project (San Francisco), and the Lanai Wind Project (Hawaii).
- Alpine Ocean Seismic Survey, Inc. has technical expertise in geophysical, geotechnical, hydrographic, oceanographic, environmental and positioning services. Alpine has worked on more than 3000 marine survey projects worldwide including the Statoil Floating Wind farm project in Maine, Fishermen's Energy Offshore Wind Farm in New Jersey, and the Lake Erie Wind Power Project, and other submarine cable projects.
- Gardline provides marine support to the UK offshore oil and gas industry, including unexploded ordnance, geophysical survey operations, habitat assessment, and environmental baseline surveys including passive acoustic monitoring of marine mammals for a number of offshore wind farms in Europe.

PROJECT INFORMATION

COMAR 20.61.06.02 G (1)

G. An application shall include the following information about the proposed offshore wind project:

(1) A general description of the proposed offshore wind project, including but not limited to site plan, location, number of turbines, nameplate capacity, area, typical distance to shore, typical water depths, general seabed description, main competing uses, and sensitive areas;

Findings

US Wind provided a complete description of the US Wind Project to be located on the Outer Continental Shelf (OCS) within the Maryland WEA and between 10 and 30 miles off the Maryland coast. The lease area was determined through a multi-year stakeholder engagement process conducted by the BOEM. US Wind provided sufficient information regarding the site plan and turbine layout.

The application indicated that the US Wind Project will utilize 62 Siemens SWT 40-130 wind turbines for a total nameplate capacity of 248 MW. The application indicated that 61 turbines will be supported by monopile foundations with transition pieces; the remaining turbine will incorporate a Siemens OTM on a twisted jacket foundation. In response to questions submitted on June 14, 2016, US Wind indicated that it now plans to use jacket foundations (similar to a lattice tower) for the turbines as well as for the OTM. US Wind also indicated that they are assessing other turbine models.

The total area for the leased WEA is 79,707 acres, however the total area for the US Wind Project is not explicitly provided. Based on the standard area for OCS lease blocks (approximately 5,700 acres), we expect the US Wind Project area is approximately 19,950 acres. The US Wind Project will be located in the western portion of the WEA. The application indicated that the closest point to land will be the northwest corner of the US Wind Project, approximately 12 nautical miles (NM; equivalent to 14 miles) from Fenwick Island and 15 NM (17 miles) from Ocean City.[80] US Wind confirmed these distances in response to a question submitted on June 14, 2016. However, we measured these distances and estimate that the closet point of the US Wind Project (the northwest corner of lease block 6624-I) is approximately 10.2 NM (11.7 miles) from Fenwick Island and 13.5 NM (15.5 miles) from Ocean City. Our estimated distances are consistent with the map presented in Figure 2-1.2 in the application. Water depths across the WEA range from 60 to 100 ft and the water depths at the proposed turbine locations range from 53 ft to 89 ft (16 to 27 m) based on an in-situ marine survey. Although US Wind did not provide precise water depths for the turbine locations, the

[80] One nautical mile = 1.15 statute miles.

bathymetric survey data presented in the surveys conducted for the project area are referenced to Mean Lower Low Water.

The US Wind application described the general geophysical and geotechnical surveying conducted for the WEA commissioned by the MEA and preliminary geotechnical surveying for the Project conducted by Alpine Ocean on behalf of US Wind. The seabed conditions consist primarily of sand and clay soils and are generally conducive for a range of foundation concepts.

Potential competing uses of the Maryland WEA discussed in the application include underwater utilities, commercial uses, military uses, and fishing uses. Each of these stakeholders was involved in the BOEM stakeholder engagement process to determine the WEA. No existing underwater utilities have been identified to date within the WEA. US Wind considered impacts due to commercial maritime and aviation traffic, as well as military marine and aviation traffic and found no limiting impacts. US Wind used the Federal Aviation Administration (FAA) online Department of Defense Preliminary Screening tools to evaluate the lease blocks and found that the bulk of the US Wind Project will have no impact on Air Defense and Homeland Security radars and Weather Surveillance radar, but the entire WEA falls within the confines of the W-386 unspecified military operations area. A fisheries habitat study was conducted to identify potential fisheries that may be impacted by the US Wind Project and provided recommendations for ongoing marine liaison activities as the US Wind Project advances. Although further consultations with each of these stakeholder groups will be required, these competing uses are manageable and are relatively low risks.

Identification of sensitive areas was a primary focus of the WEA stakeholder engagement process and no prohibitive sensitive areas have been identified to date. US Wind will have to confirm this through the BOEM environmental approval process. US Wind is aware of several sensitive species in the Delmarva Peninsula water area and of sensitive viewshed areas. The application indicated that viewshed analysis will be conducted as part of the permitting process and US Wind will engage with key stakeholders.

COMAR 20.61.06.02 G (2)

(2) General maps showing turbine layout, landfall and grid interconnection points, and construction layout site;

Findings

US Wind provided several maps showing the turbine layout, export cable, landfall, and grid interconnection points. US Wind also provided maps showing the location of the primary port, Sparrows Point Shipyard, for supporting the construction of the US Wind Project and the proposed sailing route from the port to the US Wind Project site.

COMAR 20.61.06.02 G (3)

(3) A wind resource and energy yield assessment at planned hub height with supporting data in an industry-standard report with expected gross (at generator terminals) and net (at PJM billing meter) annual energy production, including a breakdown of energy losses as well as turbine technical availability (scheduled and forced outages), uncertainty estimates of the net annual energy production at confidence intervals (P5, P10, P50, P90, and P95), and hourly energy production profiles by month (12x24 matrices) for a typical year;

Findings

We reviewed the preliminary wind resource and energy yield assessment conducted by Amerigo Offshore LLC and AWST on behalf of US Wind. The assessment provided all of the information required by the Regulations, including:

[redacted]

- Net energy (delivered to PJM) of 913,845 MWh/year (42.1% net capacity factor)
- Energy uncertainty estimates at the specified confidence intervals
- A 12x24 energy production profile indicating maximum production October-March and minimum production June-August

The assessment deviates from an industry-standard assessment in that it relies entirely on a proprietary mesoscale wind map to estimate the wind resource at the US Wind Project site at 100 m. An industry-standard assessment would consist of at least some measured data, but this is an acceptable deviation given this early stage of project development.

The energy yield assessment by Amerigo and AWST was based on a total capacity of 248 MW and a maximum output of 4.0 MW for each turbine. We note that US Wind is considering Siemens' power boost option which allows an increase in power of up to 5% between wind speeds of 11 m/s and 23 m/s, amounting to an increase in effective turbine capacity of up to 4.2 MW.[81] US Wind is also considering larger, e.g. 6 MW, turbines. Either option would allow the US Wind Project to produce the same amount of ORECs with fewer turbines. Additionally, the layout presented in the assessment was optimized for energy production and did not consider a comprehensive constraints assessment. This is reasonable at this stage of project development.

We agree with AWST's recommendation for further investigations, including collecting high quality wind, meteorological, and oceanographic data within the project area for a

[81] The increased energy generation would be less than 5% since wind speeds are often below 11 m/s or above 23 m/s.

minimum period of one year. In addition, any change in the turbine model or layout will need to be incorporated into an updated analysis.

COMAR 20.61.06.02 G (4)

(4) Wind turbine technology with turbine manufacturer, model, performance history, track record in offshore wind applications, physical dimensions and weight, hub height, rotor diameter, and nameplate capacity, design standard, turbine certification status under applicable standards and guidelines such as those developed by the International Electrotechnical Commission, service life, and design life information;

Findings

US Wind provided a brief technical specification and description for the Siemens SWT-4.0-130 wind turbines. This turbine is the latest in a long line of offshore wind turbines from Siemens (formerly Bonus) that have been used extensively in the European offshore wind industry. The SWT-4.0-130 is a variant of the 3.6 MW family of turbines, of which more than 1,100 units have been installed worldwide. US Wind indicated that the first four SWT-4.0-130 wind turbines were installed at the 400 MW Longyuan Putian Nanri Island wind farm in China on December 21, 2015. That wind farm will be completed in 2018 and will consist of 100 Siemens SWT-4.0-130 machines. A total of 222 SWT-4.0-130 turbines are being installed at the Gemini project in the Netherlands and the Sanbank project in Germany, both of which are currently under construction. No Siemens offshore wind turbines have been installed in the United States or in other areas with a 60 Hz power grid, but there are 11,000 MW of Siemens onshore turbines installed in the US so the risk of converting the SWT-4.0-130 from 50 Hz to 60 Hz is expected to be minimal.[82] US Wind is considering the option of using the Siemens power boost option, described above, to increase turbine capacity to 4.20 MW under certain conditions. We consider the power boost option to be technically reasonable but it is not clear if Siemens will guaranty the improved performance.

We consider this turbine to be a viable choice for the US Wind Project based on a high-level review of the site conditions. Later in the development process, a site suitability assessment should be conducted by the turbine supplier and by an independent engineer to examine suitability of this turbine to the site conditions in more detail.

US Wind states that the SWT-4.0-130 turbine is to be certified by DNV GL and that a type certificate will be provided prior to construction which is typical practice.[83] We expect that the completed Type Certificate will be delivered within a reasonable timeframe, e.g. by the COD, and will be required under the turbine supply agreement.

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[82] Source: AWEA 2015 Annual Report.

[83] DNV GL's Renewables Certification unit is one of a handful of organizations that provide independent, accredited certification of wind turbines. Such certification may be required by investors, insurance underwriters, and/or regulatory bodies to demonstrate the quality, safety, and long term performance of a wind turbine model.

In response to questions submitted on June 14, 2016, US Wind verbally indicated that no turbine supply agreement or other binding contractual agreements have been entered into with any turbine supplier. In an effort to secure the most "economically sound" agreements, US Wind stated it is seeking offers from other turbine suppliers and indicated verbally that it is considering the GE Haliade 150-6MW wind turbine. The selection of a different turbine model will have broad impacts on the design of other components of the US Wind Project, e.g. overall turbine layout, collection system, foundation, installation vessel, etc. US Wind did not provide any timetable for executing a turbine supply agreement but indicated that the project schedule presented in the application will be met. This flexibility in turbine selection is acceptable in this early stage of project development.

COMAR 20.61.06.02 G (5)

(5) Foundation and support-structure descriptions that include explanations of why the foundation and support structures are appropriate for the site, as well as climatology information that includes wind, wave, and current data;

Findings

In its application, US Wind explained that it considered monopile, jacket, and twisted jacket foundations and provided design basis and preliminary design engineering reports for all three from three engineering firms known to have experience in offshore wind turbine foundation design. US Wind also provided reports on the wind, wave, and current conditions at the site as required for foundation design. Overall, we consider the level of detail provided in the reports to be reasonable for this stage of development.

US Wind originally selected monopile foundations for its Project based on a first round of designs. In an update to the application, US Wind indicated that it will utilize a 4-legged jacket design (for turbines and OTM) and submitted a revised jacket foundation design. US Wind indicated that jackets were selected over monopiles due to the suitability for local fabrication, reduced scour protection requirements, lower likelihood for post-installation remedial actions, and higher stiffness to weight ratio. We offer the following commentary:

- Jacket foundations have been used with offshore wind turbines in Europe for several years, although in much smaller numbers than monopiles. Jackets and their piles use smaller steel members than monopiles and have been successfully manufactured in the United States. This domestic manufacturing experience gives jackets an advantage over monopiles for the US Wind Project. In addition, the smaller piles used to pin the jacket to the seabed requires a smaller hydraulic hammer, reducing the cost of the piles and the required lead time to procure the hammer.

- The US Wind application did not provide any information regarding the cost-effectiveness of the different foundation concepts considered. Monopiles typically represent a more cost-effective solution than jackets.
- US Wind stated that the jackets are preferred over monopiles in part due to the risk of post installation remediation for addressing "crumbling grout" on monopiles. Although several European projects did experience issues associated with grout failure, this issue has largely been resolved and is, therefore, not a significant differentiating factor between the technologies.
- Jackets generally have not been used for smaller turbine sizes (4 MW or less); however, the "second round" jacket design is shown with what appears to be a GE Haliade 150-6.0 MW wind turbine but the turbine model that is used as the design basis is not explicitly stated in the design document. A jacket foundation would likely be suitable for a 6 MW or larger turbine for the US Wind Project.
- Based on the design presented by US Wind, the jacket design is a 4-legged steel structure similar to those used in offshore oil and gas applications and the foundations installed at Block Island Wind Farm (although due to lifting limitations of the installation vessels, the foundations installed at Block Island were two-piece jackets; the design for the Skipjack Project is for a one-piece jacket).[84]
- The US Wind application did not include a detailed review of the site conditions, so we cannot confirm the similarity of the seabed and metocean conditions for the US Wind Project and sites in Europe. Typically, as more detailed seabed and metocean data are gathered throughout the development process, these data would be provided to the foundation designer for further refinements to the foundation design.

US Wind's jacket foundations would be anchored to the seabed with piles and connected using grout. A transition piece provides the interface between the jacket and the base of the turbine tower. Each jacket is expected to weigh approximately 800 tons apiece, including the jacket, piles, and transition piece. Four preliminary jacket designs were submitted to US Wind covering two different water depths (20 m and 30 m) and two different turbine configurations (the Siemens SWT-4.0-130 and an unspecified 6 MW turbine). The revised jacket design was only provided for one water depth (30 m).

The jacket design would typically be refined as more detailed geotechnical information becomes available and a final turbine model is selected. US Wind provided an indicative layout for a jacket fabrication facility which appears to reflect a reasonable layout that is generally consistent with the space and facilities available at Sparrows Point. We

[84] Fishermen's Energy's Atlantic City Wind Farm and Dominion's VOWTAP are planning to utilize twisted jacket foundations.

anticipate that further facility upgrades will be required to accommodate jacket fabrication, assembly, and storage for the US Wind Project.

COMAR 20.61.06.02 G (6)

(6) A description of the electrical collection system and connection to the transmission grid that includes the location and description of any onshore and offshore substations, inter-array and export power cables, interconnection route, landfall and facilities (including rights of way), interconnection plans, status of the interconnection request submitted to PJM, schedule for completing the interconnection studies, and electrical one-line diagram of the facility up to the interconnection point;

Findings

US Wind provided a high-level description of the electrical collection system, consisting of a one-line diagram, cable schedule, detail of a Siemens OTM, and an interconnection plan that sufficiently describe the US Wind Project from the turbines to the PJM interconnection point. Sixty-two Siemens SWT 4.0-130 turbines will be daisy-chained with buried 3-core submarine cable in strings of 8 or 10 turbines, intersecting at turbine 26 that is to include a Siemens OTM with a 168/224/280 MVA, 34.5/230 kV, delta/wye-ground transformer.

The OTM will be connected via approximately 22 miles of buried 230 kV 3-core submarine cable to an onshore transition vault, and then continue via a buried cable to a new substation and a short overhead line to DPL's Indian River substation. The Siemens OTM was described, but it referenced a different project of 42 turbines rated at 6 MW each, equivalent to 252 MW, and a 400 kV interconnection that is not consistent with other US Wind Project documents. US Wind indicated that the final engineering design for the OTM will be based on the specific US Wind Project parameters. The final OTM design will also have to conform to PJM's interconnection requirements.

US Wind submitted an interconnection request with PJM in late August 2015 and was assigned queue position AB1-056. PJM completed the Feasibility Study for the US Wind Project and the more detailed System Impact Study in September 2016.[85] PJM found the US Wind Project would not trigger any transmission system upgrades, in contrast to the estimate of $48.5 million (constant 2012 dollars) estimated by the MDPSC's consultant, Axum Energy Ventures.[86] PJM expects to complete a Facilities Study with definitive upgrades and costs in May 2017, after which US Wind can pursue an interconnection agreement with DPL through the established PJM process. The

[85] PJM's dynamic simulation analysis included in the System Impact Study was based on 41 GE Haliade 150-6.0 MW turbines.

[86] The Axum Energy Study cost estimate of $18.5 million (2012 $) prepared for the MDPSC was assumed in the 2-part OREC price bid.

conceptual electrical collection system design and interconnection plan are reasonable and consistent with expectations given the early status of the US Wind Project.

COMAR 20.61.06.02 G (7)

(7) Site-control status and plan to acquire and ensure site control for the operating term, interconnection and right-of-way status (or plans), and status of discussions with BOEM and other relevant entities;

Findings

US Wind entered into two leases with BOEM which comprise the Maryland WEA. Both leases are fully executed and have effective dates of December 1, 2014, which gives US Wind exclusive rights to develop wind energy projects within the WEA. The leases have identical terms and conditions and include a 5-year site assessment term beginning on the effective date of the lease and a 25-year operations term beginning on the date that BOEM approves US Wind's COP. The US Wind Project spans portions of both lease areas.

The leases provide for any necessary easements through Federal waters for export cables. US Wind has identified a potential route for the export cable which runs from the OTM to the POI. The intermediate landfall location in Delaware was selected based on previous approval by the State of Delaware for similar uses. The export cable route is covered under Federal and State of Delaware rights-of-way; the final export cable right of way (ROW) has not been established. US Wind identified the POI based on its own studies, the Axum Energy Study, and consultations with DPL. The POI selection will be confirmed by PJM as part of its interconnection process.

US Wind indicated that they have had and continue to have regular correspondence and meetings with BOEM regarding the US Wind Project, including a pre-SAP filing meeting. US Wind has also indicated that they have initiated engagement with the Delaware Regulatory Advisory Service that convenes representatives from all relevant state agencies to discuss the export cable ROW and interconnection. US Wind indicated that it has also had numerous engagements with various other stakeholder groups including Maryland State regulatory agencies, utilities, and PJM.

US Wind has demonstrated that site control has been secured and appropriate actions are being taken to fulfill the requirements of the leases for the US Wind Projects. The level of engagement with various stakeholders is appropriate for the current stage of the US Wind Project. US Wind is taking appropriate actions to identify the ROW and secure approval from BOEM and the State of Delaware.

COMAR 20.61.06.02 G (8)

(8) A general description of balance of plant components that includes any meteorological mast, communication system, and supervisory control and data acquisition system;

Findings

The US Wind application included a description of the primary balance of plant (BOP) components including the submarine power cable, the meteorological mast, the OTM, and the communication and control systems. The descriptions of each of these components represent preliminary designs typical for an early stage of development. While there is some uncertainty associated with each of these components, the level of uncertainty is typical for a project at this stage and does not present any unusual risks.

The submarine cable description includes the export cable and the array cables and reflects typical cross-linked polyethylene submarine cable design. US Wind did not discuss procuring of the cable, but there are multiple global suppliers of such cables. The cable will likely require significant lead time for manufacturing depending on the design, volume, and manufacturer (see discussion below under COMAR 20.61.06.02 G (9)).

The sea-bed is variable with some sand waves and exposed clay at the sea-bed surface, indicating potential for scour and for cables to become exposed. We therefore expect that there will be scour protection around bases of foundations and/or along some stretches of cable. The application did not include any description of scour protection or other cable protection that may be necessary in areas where target burial depths are not achievable. In response to questions submitted on June 14, 2016, US Wind indicated that a cable burial risk assessment will be conducted after completion of the geophysical and geotechnical survey of the cable route, which is typical. This survey will allow US Wind to determine the target burial depth and identify areas that may require additional cable protection, e.g. where the target burial depth cannot be achieved.

The Procurement and Construction Schedule in the application indicates that the meteorological mast is scheduled for installation during June and July 2016. However, in response to questions submitted on June 14, 2016, US Wind indicated that the meteorological mast installation will not occur in 2016 due to delays associated with the air permit that is required. The installation timeline will be updated when greater clarity on the permitting process is available. The SAP, provided as Appendix 2-7.4, includes a comprehensive description of the meteorological mast design and instrumentation package which represents a configuration that is appropriate for the intended purpose.

The application included a description of the Siemens Web-WPS System Control and Data Acquisition (SCADA) system which will provide a control system for supervision,

data acquisition, control, and reporting for the US Wind Project.[87] The WPS SCADA system is a proven system, but final design and specification has not been completed, which is typical at this stage. Communications will be supported by the fiber optic cables integrated into the submarine cables.

COMAR 20.61.06.02 G (9)

(9) A procurement and construction plan that includes the following, with milestones:

(a) All steps from commencement of procurement and construction to testing and project COD of the proposed project;

(b) A contracting strategy and construction organizational chart;

(c) A description of laydown, storage, and assembly areas;

(d) The OSW applicant's plan to promote the prompt, efficient, and safe completion of the proposed project (particularly with regard to the construction and maintenance of the project in accordance with Public Utilities Article, 7-704.1(d)(1)(ix), Annotated Code of Maryland);

(e) Plans to comply with The Merchant Marine Act of 1920; and

(f) A framework for a construction period health and safety plan;

Findings

Schedule

US Wind provided a schedule from site geological investigation to final COD for the entire 748 MW project. Construction of each phase is shown separately, with the US Wind Project constructed as the first phase. The schedule is comprehensive in that it shows all relevant phases including design, fabrication, installation, and commissioning. Details for each phase are not shown, which is reasonable given this stage of development. We have the following comments:

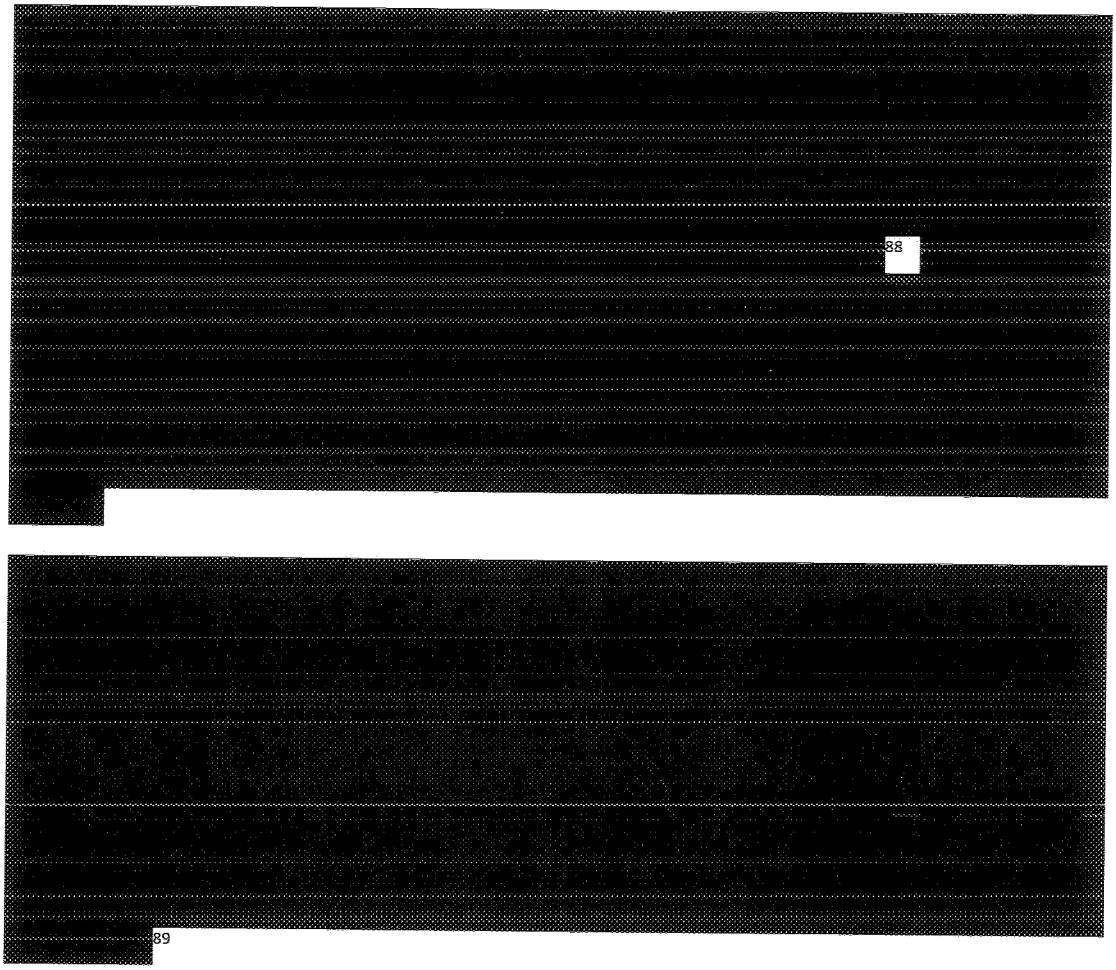
- Meteorological mast design and installation, expected to occur in June and July 2016 according to the SAP, is not shown on the schedule. As indicated above, US Wind has indicated that the meteorological mast installation has been delayed and will not occur in 2016.
- The final design process for the foundations will commence in January 2017 and take place over the first seven months of 2017. The final design process appears to be complete prior to COP approval which implies that the Certified Verification Agent (nominated in the COP) may not be provided sufficient review time during the foundation design process.

[87] If another turbine supplier is selected, we expect US Wind will select a different SCADA system.

- Since the meteorological mast will not be installed in 2016, data collection will be delayed which will delay foundation and tower design work. Typically, at least 12 months of on-site date is collected prior to commencing final design.
- The foundation installation was shown as taking place over three 180-day seasons for the 748 MW project. Based on the number of turbines, this will necessitate about 3 days per foundation, which is reasonable and consistent with rates achieved on European projects. Seasons 1 (for the 248 MW US Wind Project) and 3 are from October to April, while Season 2 is shown from April to October. Although construction during the Season 2 winter will be difficult given harsh winter conditions, this issue is not relevant for our evaluation.
- The US Wind Project schedule indicated that monopile installation will not commence until fabrication of all monopiles for the US Wind Project is complete. However, it is common for installation to start prior to fabrication completion with a sufficient time lag to ensure that there is a continuous supply of completed monopiles. This overlap minimizes the storage requirements which may be a limiting factor. US Wind verbally indicated that foundation installation will commence after a certain number of foundations have been completed in order to ensure that the installation vessel will be continuously fed with components to avoid any standby time. We note that the schedule has not been updated to reflect the change to a jacket design.
- The schedule does not include any line item for upgrades that may be required at the Sparrows Point Shipyard.
- The schedule does not include any line items associated with vessel fabrication / procurement. Installation, transport, and cable vessels are notoriously late against their proposed delivery dates. It is customary to allow two years from placing an order for a vessel and to include a few months contingency. Accelerated timelines can be considered, but we view this as a risk to the schedule. If a vessel is ordered by fall of 2016, it likely could be available to support installation activities as laid out in the Project schedule, but it is not clear when the vessels will be ordered.
- The schedule includes 240 days to complete the export cable design and 150 days to complete the array cable design for the US Wind Project. Longer lead times are common for submarine cables.

Contracting Strategy

US Wind described the contracting strategy for the US Wind Project, which we believe is reasonable and reflects typical contracting practices. US Wind aims to encourage multiple qualified bidders, including minority-owned businesses in Maryland, to participate in the procurement process to ensure that costs are minimized while economic benefits to ratepayers are maximized.



Laydown, Storage, and Assembly Areas

US Wind is proposing to use the Sparrows Point Shipyard for assembly, fabrication, unloading / offloading, storage, and staging for the US Wind Project. Based on the information the application presented on the estimated areas needed to support these activities, it appears that Sparrows Point has sufficient area. The application did not present information regarding any upgrades that may be necessary to ensure sufficient bearing capacities, crane capacities, suitability of the seabed for jacking at the quayside, or other requirements. The information on the upgrades required at Sparrows Point

[88] For example, Dominion's recent Virginia Offshore Wind Technology Advancement Project (VOWTAP) experience indicates that an EPC approach may not be cost-effective. Dominion initially pursued an EPC approach for VOWTAP but this ultimately ended up with one bidder and an estimated cost of $375-400 million. After conducting a stakeholder engagement process aimed at identifying cost reduction opportunities and alternative strategies, Dominion broke the scope into four main work packages and received bids that reduced the cost range to $300-380 million with a larger number of bidders participating.

[89] The financial strength and management ability of Toto Holding can be found in our analysis corresponding to COMAR 20.61.06.02 F(5).

Shipyard do not include details on the seabed loading capabilities along the quayside (to allow the installation vessel to jack-up) and other geotechnical and geophysical data.

We understand that Baltimore County has applied for a $26 million federal grant to upgrade the Sparrows Point Shipyard to support offshore wind development by accommodating turbine and foundation assembly, fabrication, transportation, etc. We do not know the likelihood of the grant application being approved. US Wind verbally indicated that the upgrade work at Sparrows Point will commence upon approval of the COP by BOEM, will include refurbishment of the bulkhead and fabrication area, and will take approximately 6 months to complete. Establishing a fabrication facility at Sparrows Point to fabricate foundation and transition pieces is admirable but there are potentially some quality control issues. Highly automated facilities have evolved in Northern Europe to manufacture large diameter Submerged Arc Welded thick walled monopiles efficiently and cheaply. It is highly unlikely that the costs of the first batches of US monopiles will be comparable with those made in those custom facilities. Although the application did not include details regarding a monopile manufacturing facility, US Wind responded to a question that it has had discussions with multiple qualified bidders and received multiple bids to manufacture these monopile foundations. US Wind provided an indicative layout for a jacket fabrication facility, but did not provide additional detail.

On page 2-9C-7 of the application, the bullet titled "Storage Area" indicates that "The Twisted Jackets will be stored in a vertical position." US Wind confirmed that this is a typo and the twisted jacket concept will not be used for the US Wind Project.

Plan to Promote the Prompt, Efficient, and Safe Completion of the Project

US Wind provided a brief description of how it plans to work with the private sector, organized labor, and contractors to ensure the prompt, efficient, and safe completion of the US Wind Project in compliance with PUA § 7-704.1(d)(1)(ix). US Wind indicated that they have been working with the local private sector and organized labor, primarily through the Business Network for Offshore Wind, to educate local industry about the proposed US Wind Project and the work force requirements. US Wind intends to require contractors to partner with unions to qualify for work on its Project.

Compliance with the Merchant Marine Act of 1920 (Jones Act)

US Wind indicated that Jones Act compliant vessels will be used for all operations where necessary. Formerly, it was proposed that derrick barges and liftboats were to be used to install the foundations and liftboats to install the wind turbines. US Wind's responses to questions now describe a Jones Act compliant dynamically positioned 200m long by 55m beam jack-up vessel being designed. This would be larger than the largest vessel in the Northern European installation fleet that is 161m long by 49m beam.

The proposed jack-up vessel should be capable of all operations proposed. As previously discussed, the procurement schedule for this vessel has not been provided, although US Wind indicated that they are working with a "world-renowned" vessel fabrication company on the design of the vessel and that the vessel will be ready to start activities per the US Wind Project schedule. US Wind has not provided any information regarding the financing or ownership of this new vessel.

Recent experience installing Siemens SWT 3.6-107 turbines in the UK showed that liftboats are capable of performing these operations, but are sub-optimal for US Wind's installation plan. Cyclic operations require highly capable vessels with high operability, whereas liftboats tend to transit once to site, jack-up, and stay on location for long periods of time waiting for good weather. Specific vessels were not identified in the application, but we have the following general comments regarding the use of liftboats:

- The time to jack-up and pre-load may be longer than for other available vessels.
- Liftboats often cannot transit in medium-to-heavy seas, and the minimal freeboard may lead to deck wash, which is undesirable with expensive machined components like the nacelles.
- Although self-propelled, liftboats tend to have low transit speeds of 6-8knots (as opposed to the 12 knot norm) that can lead to long voyage times.
- Liftboats often have minimal deck space with short lengths which limit their ability to transport components.
- The footprints associated with large spudcans, i.e. the base cones on mobile-drilling jack-up platforms, evolved for the soft seabeds of the Gulf of Mexico and can cause considerable issues when planning jacking positions, particularly if the foundation has three array cables, with their respective exclusion zones.
- The capacity of the cranes fitted to most US liftboats, even with the base-boom, i.e. with boom extension inserts fitted, is lower than many turbine components which may necessitate tandem lifting, jacking to extreme heights, or other accommodations.

Although the vessels proposed by US Wind are planned to be Jones Act compliant, the proposed approach may not have been optimized for installing offshore wind

foundations and turbines and may not be able to support the proposed schedule. A newbuild vessel, built to the 4 or 6 legged European form, should be able to maintain the installation rates in the schedule.

Health and Safety Plan

US Wind indicated that they will prepare a health and safety plan in accordance with the requirements specified in BOEM regulations. The health and safety plan will be developed in partnership with BOEM and defined in the COP, which is typical practice.

Summary

In summary, we find that US Wind has presented a construction and procurement plan that is generally responsive to COMAR 20.61.06.02 G(9), but there are several key aspects that represent significant risks, particularly for the schedule. [redacted] It is typical for there to be a number of uncertainties at this stage of project development, but US Wind has not sufficiently acknowledged or addressed the significant schedule risks that the US Wind Project faces. The OREC process was designed to accommodate COD delays and Maryland ratepayers would not be exposed to any risks due to such delays.

COMAR 20.61.06.02 G (10)

(10) An operations and maintenance plan with a schedule of principal operations and maintenance activities, locations of specific ports with operations and maintenance facilities, and estimated operations and maintenance labor divided between specialized out-of-state and in-state labor;

Findings

US Wind prepared an O&M Plan that provides a high level overview of the planned O&M activities and facilities, along with the associated division of responsibilities. According to the initial O&M Plan, Siemens will be responsible for turbine O&M under a Service Agreement, while US Wind will be responsible for BOP O&M. We understand that the BOP assets include the foundations, the array cables, the OTM, the meteorological mast, the export cable, the onshore Transition Station, and equipment at the Indian River substation. US Wind, however, did not explicitly identify these assets or how they would be operated and maintained.

The O&M Plan indicated that US Wind will be responsible for cleaning the blades and inspecting and certifying the service lifts. This split of responsibilities is unusual and we

recommend clarifying these particular requirements. US Wind indicated in its supplemental information that it will engage a third party company to perform the BOP O&M services. Although this is fairly typical given the development stage for the US Wind Project, outages associated with BOP components, particularly cables and other electrical equipment, can have significant impacts on project performance, so US Wind will need to thoroughly investigate potential options for O&M of those components.

The O&M Plan does not state the proposed term for the Siemens Service Agreement, but US Wind indicated in the OREC Supplement that Siemens will be engaged for the full 25-year operating term. The O&M Plan does not describe the warranty coverage or any availability guarantee, which we expect will be determined through the Service Agreement negotiations.

US Wind presented an O&M organizational chart for Siemens' O&M organization. We note that the chart includes helicopter crews, but the OREC Supplement states that helicopter crews will not be hired. US Wind will primarily use Crew Transfer Vessels to access the wind turbines for O&M activities. US Wind indicated that the wind turbines will be equipped with helidecks, but helicopter access is not the preferred solution. The OREC Supplement included an organizational chart for the overall O&M roles within US Wind.

In our opinion, the O&M organization for the US Wind Project seems to be typical for an offshore wind project. We have not been able to confirm the division of responsibilities and the planned terms of the different scope of services provided by Siemens. Having Siemens responsible for turbine O&M is common practice and appropriate due to its experience performing these services for its own projects and for others. Although the roles and responsibilities will need to be clarified prior to executing a Service Agreement, this is not a material risk at this point in project development. Given that the turbine model and supplier has not been finalized, the turbine O&M organization is subject to change, and we expect US Wind would enter into a similar service agreement with the ultimate turbine supplier.

US Wind evaluated several possible ports (including Salisbury, Indian River, and Ocean City) to locate the O&M base and selected Ocean City as the closest adequate port. However, US Wind identified the following challenges there:

- Limited physical space for onshore facilities
- Limited waterfront warehouse facilities
- Low channel depth
- Inlet storm conditions
- Limited berthing sites

US Wind should undertake a detailed suitability analysis once an O&M vessel has been selected. US Wind verbally indicated that experienced local companies had been engaged to evaluate all known port issues and that the issues listed above were considered in selecting Ocean City. US Wind did not provide any additional information documenting this evaluation. In addition, it is not clear whether larger vessels, e.g. cable laying or jack-up vessels, could operate from Ocean City during operations to facilitate repairs or replacements. This is not a major issue for the US Wind Project, since major component replacement works are infrequent and could be mobilized from alternative ports, but this consideration should ultimately be included in the O&M Plan.

The intended crew transfer vessel specifications are in line with current industry standard vessels routinely used in European offshore wind farms and should accommodate the transfer limit of 1.75 m in wave height as indicated in Figure 2-10.1 of the O&M Plan. However, US Wind did not provide sufficient information on vessel access considering the transit times from the O&M port to the US Wind Project turbines, the access system, and the metocean conditions. Given the stage of development, not having a detailed access study is typical but will need to be conducted to optimize the O&M Plan and to address accessibility risks.

The O&M Plan does not include any description of how major equipment replacements will be accomplished, an important factor for long-term performance. US Wind has not entered into any agreements at this point to charter or procure a jack-up vessel for such activities, a common strategy to ensure access to a suitable vessel within a reasonable time frame. There are many strategies that depend on a number of factors, including the availability and cost of suitable vessels, specific project conditions, and the owner's risk appetite. US Wind verbally indicated that heavy-lift helicopters will be used to facilitate transport and replacement of medium-weight components when feasible, and the installation vessel will be used for replacement of heavier components, but did not provide any detailed information. We are not aware of heavy-lift helicopters being used for offshore wind O&M activities. US Wind will have to better define an equipment replacement strategy before construction can commence.

Overall, the O&M Plan is missing some information that will need to be addressed later, but is adequate at this early stage of project development. We note that the minimum requirements listed in the indicative layout provided for the onshore facilities are in line with industry standards, but a more detailed analysis of the selected port of Ocean City will be required since US Wind recognized the limited available space.

COMAR 20.61.06.02 G (11)

(11) A permitting and approvals plan with a detailed matrix listing all required federal, state, and local environmental and regulatory permits and approvals, and setting out the schedule for obtaining the permits and approvals. This should include plans to obtain a certificate of public convenience and necessity for a proposed qualified submerged renewable energy line and plans to conduct an environmental review in compliance with applicable statutes, such as the

National Environmental Policy Act, and that include a description of the types of studies (physical, biological and socio-economic) to be performed. Plans should demonstrate compliance with the Endangered Species Act, Migratory Bird Treaty Act, and Marine Mammal Protection Act, applicable BOEM regulations and guidelines for surveying natural resources (including, but not limited to avian species, benthic habitats, fish, marine mammals, and sea turtles), local/state regulations, and the Coastal Zone Management Act, as applicable;

Findings

US Wind provided a listing and discussion of the applicable federal, state, and local regulations along with an estimated filing date and agency review time as Table 2-11.1 in the application. Our comments on each of these regulations are provided in Table 12 below. In order for US Wind to comply with NEPA, BOEM will conduct its environmental review through US Wind's submission of an SAP and a COP for the proposed meteorological mast and the Project itself.

A programmatic Environmental Impact Statement (EIS) was developed for the site by BOEM prior to issuing a lease. This programmatic EIS (i) evaluated whether issuing leases and approving SAPs would have an environmental impact on the OCS and (ii) established policies, best management practices, and mitigation measures. In January of 2012, BOEM issued its environmental assessment report, *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia - Final Environmental Assessment* (USDOI, MMS, 2012), that determined there would be no significant impact and an EIS would not be required. BOEM will review US Wind's SAP and COP to determine if the impacts addressed are consistent with those identified in the Environmental Assessment. If they are not, additional NEPA reviews may be required.

Based on the executed leases, US Wind submitted a SAP to BOEM in November 2015 with the main focus to install and operate a meteorological mast within the lease areas to measure and record environmental data. According to US Wind, BOEM is not required to complete its required reviews within a specific timeline but BOEM approval is expected in Q2 2016, after which US Wind would submit the COP for the US Wind Project in Q3 2016 with a BOEM approval in Q4 2017. We note that agency coordination, requests for additional information or studies, and public comment may delay this timeline.

If the SAP approval is delayed or found to be inadequate, further NEPA analysis could be required which may delay the SAP approval and COP filing dates. In addition, when a COP is submitted, BOEM will conduct a project-specific NEPA analysis, which may extend the COP approval timeline. BOEM correspondence was not provided for review, so some uncertainty exists in the BOEM review and approval timeline.

To comply with NEPA regulations and requirements for a SAP, COP, and federal, state, and local permits, US Wind stated that it will conduct the necessary studies to assess

environmental resources and potential impacts and to develop mitigation plans. Some studies have been completed for the meteorological mast and are part of the SAP that addresses the affected environment, environmental impacts, and mitigation measures. Anticipated studies for the COP will include physical, biological, and socio-economic resources using existing data and new data sources as needed.

Figure 2-11.2 Plan of Environmental Resources Studies in the application listed the reports to be completed including physical resources, biological resources, archeological / historic resources, visual impact assessments, socioeconomic analysis, and transportation / navigation analyses. These resource areas are consistent with BOEM's Programmatic EIS and EA. A review of the status of the key applicable environmental permits and approvals is provided below.

Table 12. Key US Wind Environmental Permits and Approvals

Requirement	Permit/ Approval	Review Team Comments
Clean Water Act, Section 404 – Nationwide Permit (33 U.S.C. 1344); Rivers and Harbors Act of 1899 (33 U.S.C. 403)	Section 10; 404 permit	The SAP states that impacts to water quality would be minor and would include vessel discharges and activities related to installation and removal of meteorological mast. COP will need to assess impacts.
Endangered Species Act (ESA) Compliance, Section 7 and Section 9 (6 U.S.C. 1531-1544; 60 C.F.R 17 and 424)	ESA Review (Section 7 consultation)	Continued consultation with USFWS and BOEM due to species listed in the ESA known to exist near Project area. Incidental Take Statements and Biological Assessment may impact construction activities, e.g. pile driving, and reasonable and prudent measures as described in SAP most likely to be required. Impacts to ESA and construction schedule will need to be assessed in the COP.
Marine Mammal Protection Act (MMPA)(16 U.S.C. 31)	Incidental Harassment Authorization (IHA)	MMPA depleted marine mammals and sea turtles have been known to exist near Project area - IHA will likely require mitigation measures as outlined in SAP. COP would also need to include mitigation measures and may have impacts to construction and operations.

Requirement	Permit/ Approval	Review Team Comments
Magnuson-Stevens Fishery Conservation and Management Act (50 CFR 600)	Essential Fish Habitat (EFH) Review	EFH designated for species near Project area – implementation of BOEM procedures and SAP mitigation measures to reduce impacts. COP would also need to include mitigation measures and may have impacts to construction and operations.
Migratory Bird Treaty Act Compliance (16 U S.C. 703 – 712)	No permit	Mitigation measures are included in SAP; COP will need similar assessment. A Bird and Bat Conservation Strategy may be prepared.
National Environmental Policy Act of 1969 (42 U.S.C. 4321)	NEPA Review	BOEM Final Programmatic EIS completed in 2007. SAP and COP environmental assessments would supplement NEPA review. If additional NEPA analysis is required, the Project timeline would be impacted.
National Historic Preservation Act Section 106 Compliance (36 C.F.R. 800)	Section 106 consultation	SAP states that there were no potential cultural resources identified, but recommends that an unanticipated discoveries plan to be implemented. COP would also need to include this mitigation measure.
Notice of Proposed Construction (Form 7460-1) Hazard Determination (14 C.F.R. 77.13, 77.15, 77.17)	Determination of No Hazard for turbine locations - FAA	SAP states that BOEM will conduct the Obstruction Evaluation and Determination of Hazard/No Hazard because the meteorological mast will be more than 12 NM from shore. The COP would also have BOEM review.
Outer Continental Shelf Lands Act of 1953 (43 U.S.C. 1331)	Lease, SAP and COP approval	Applicant states that BOEM expects to approve the SAP in Q2 2016 and COP in Q4 2017. BOEM correspondence was not reviewed; therefore, timeline is not verified.
Phase I Environmental Site Assessment (ESA) (30 C.F.R. 312)	No Permit	Phase I ESA may be needed for onshore construction; Phase I ESA was not listed on permit & approvals plan
U.S. Coast Guard Regulations (46 U.S.C. and 33 U.S.C. 30)	Private Aid to Navigation approval needed	SAP states meteorological mast will be marked in accordance with USCG requirements. COP will need to assess requirements for wind farm.
Clean Air Act (42 U.S.C. 7627)	Outer Continental Air Quality Permit	SAP states that impacts to air quality are expected to be negligible and mitigation measures will be put in place. Similar assessment will need to be done for COP.
Clean Water Act, Section 401- Water Quality Certification (33 U.S.C. 1341) and Delaware – federally Delegated to State	401 Water Quality Certification	Delaware Department of Natural Resources and Environmental Control Division of Water will issue water quality certification for the electrical interconnection.

Requirement	Permit/ Approval	Review Team Comments
Clean Water Act, Section 402 - National Pollution Discharge Elimination System (NPDES) Permit (40 C.F.R. 122) – federally Delegated to State	NPDES permit	Delaware Department of Natural Resources and Environmental Control will issue a Sediment and Stormwater Plan Construction Permit for the substation, if applicable.
Coastal Zone Management Act (CZMA) (16 U.S.C. 1454, 1465)	Consistency certification	According to the SAP 1.3.5, BOEM issued a Regional Consistency Determination for the meteorological mast installation, operation and decommissioning; Maryland concurred on September 23, 2011. BOEM, Delaware, and Maryland will need to issue determinations for the wind farm and electrical interconnection.

In reviewing the key permits and approvals for the US Wind Project, we note that a Phase I Environmental Site Assessment, which may be necessary for the on-shore transmission and interconnection facilities, and a certificate of public convenience and necessity from Delaware, were not included in the list of permits and approvals presented in the application.

The Plan of Environmental Resources Studies identified the studies that will need to be completed for the COP submission, but a schedule and status for completing the studies and associated activities were not listed. The status of these studies may impact the COP application deadline and approval timeline. Section 2-13 of the application stated that the timeline is "aggressive, yet realistic" and was developed so that the time from lease execution on December 1, 2014 to commercial operations would be 6 years. However, the timeline has a January 5, 2020 COD, just over 5 years from lease execution.[90] If additional NEPA analysis is required at any step, it may impact the overall Project timeline. Endangered species and essential fish habitat have been identified in the SAP as being in or near the Project area. Continuing coordination with USWFS and NMFS will be necessary to obtain needed permits and to develop COP mitigation measures which would impact construction schedules.

In summary, the permitting process outlined in the US Wind application is reasonable and comprehensive, but aggressive. Given the limited information provided regarding the status of environmental resource studies and permits / approvals, we conclude that the schedule is aggressive and may not be achieved. [redacted]

[90] US Wind has put forth and we have based our evaluation on a January 1, 2020 COD.

COMAR 20.61.06.02 G (12)

(12) A decommissioning plan that demonstrates the safe and environmentally responsible removal and disposal of the turbine structures, offshore electrical substation and other offshore facilities, and interconnection facilities, particularly those located in State waters and on State lands; a comprehensive estimate of facility and interconnection decommissioning costs; and assurance that adequate funding shall be available for complete decommissioning of the proposed project, including a detailed explanation of how adequate funding shall be assured.

Findings

US Wind provided a Decommissioning Plan based on the current preliminary design, in which the turbines, meteorological mast, and OTM will be removed and taken to shore. The Decommissioning Plan describes methods of lifting out and transporting the components to shore using heavy lift vessels of various potential types. Foundations will be removed to a depth of 4.6 m (15 ft) below the seabed, consistent with BOEM regulations, by underwater cutting of the monopiles. Export cables will be left in place including the portions within conduits at the landfall, and array cables will be removed unless it is certain they can remain safely buried. Scour protection will be left in place to preserve the marine habitat unless it is required to be removed. Obligations to remove or decommission the facilities and to provide financial security are contained in the BOEM leases per existing regulations. BOEM regulations can permit decommissioning in place, i.e. not removing certain components, so this approach is appropriate and is generally in line with industry best practice.

The Decommissioning Plan recognizes uncertainties associated with the BOEM requirements and that decommissioning operations may have disruptive effects. US Wind is taking measures to identify and address hazardous or potentially polluting fluids or materials. Although the regulations require all facilities to be removed, exceptions may be allowed on a case-by-case basis. The level of detail in the Decommissioning Plan is appropriate for this stage in project development. We expect the Plan will be reviewed after installation and at intervals thereafter, particularly if the US Wind Project utilizes jacket rather than monopile foundations. Consideration of environmental and ecological aspects of the decommissioning was brief but adequate for the purposes. The proposed methodologies for removing the components were generally appropriate and based on current technologies and equipment. It is very unlikely that the turbines will be re-used (as assumed in the Decommissioning Plan); this factor is expected to have a minor impact on the overall cost.

The Decommissioning Plan included an estimated decommissioning cost that excluded pre-decommissioning surveys, waste management, and any monitoring required.[91] US

[91] We note that US Wind's estimated decommissioning cost is consistent with other estimates from earlier studies, but it is now broadly recognized that those estimates should be much higher.

Wind stated it will provide funds to fully cover the decommissioning costs at the end of the 25-year project life, and BOEM regulations require the decommissioning obligations to be covered by an accrual fund guaranteed by a Surety Bond secured prior to installation. Based on an operating life of 25 years, US Wind proposed to fund an escrow account with one twenty-fifth of the expected decommissioning costs per year over 25 years prior to decommissioning; the Surety Bond would decrease each year by the same amount. The application assumed a 25 year turbine operating life, but the design life for offshore wind turbines is often 20 years, as is the case for the Siemens SWT-4.0-130. While a 25 year life may be attainable, the size and timing of the decommissioning fund and the Surety Bond will ultimately be subject to negotiation with and approval by BOEM. US Wind noted that decommissioning funding requirements will be updated / audited each year by a qualified independent third party per BOEM requirements.

We find US Wind's decommissioning estimate to be substantially low, based on direct experience with detailed cost modelling of offshore wind farm decommissioning that considers the full cost of vessels and equipment, marine logistics, preparatory engineering and management costs, and post-decommissioning activities. Our assumptions are similar to those of US Wind, e.g. cutting piles below the mudline, leaving some equipment in-situ and utilizing existing equipment and techniques. We conclude that a higher decommissioning cost may be required for the US Wind Project. Maryland ratepayers, however, will not bear decommissioning cost risk because BOEM will require US Wind to fully fund and securitize the decommissioning.

COMAR 20.61.06.02 H

H. An application shall include a project COD and a proposed timeline for the proposed offshore wind project's development and critical path schedule that includes milestones for site assessment, engineering, permitting, turbine certification, financing, procurement, manufacturing, construction, testing and commissioning commercial operation dates, and delivery term;

Findings

US Wind provided a proposed timeline for the US Wind Project as discussed in COMAR 20.61.06.02 G (11). However, the critical path for the US Wind Project is not shown and the timeline does not include milestones for turbine certification and financing or for external activities, e.g. upgrades at Sparrows Point and procurement and fabrication of a new installation vessel.

COMAR 20.61.06.02 I

I. An application shall indicate whether the proposed project's nameplate capacity is larger than required to provide the aggregate proposed OREC amount for the term of the proposed OREC price schedule. If the proposed project's nameplate capacity exceeds the capacity required, and

the OSW applicant submits a two-part OREC price as described by M of this regulation, the application shall include a methodology for determining a reasonable allocation of the transmission upgrade costs to be included in the OREC price. The OSW applicant shall have the burden of demonstrating that its proposed allocation methodology is fair and in the interest of ratepayers.

Findings

Although US Wind intends to develop as much as 748 MW (often rounded to 750 MW in the application) of offshore wind capacity within the Maryland WEAs, US Wind proposed that the 248 MW US Wind Project will have its own electrical collection system, OTM, export cable, and on-shore breaker location at the Indian River substation. The physical separation of the US Wind Project is consistent with US Wind's intention to go through the PJM interconnection process on a stand-alone basis. This would avoid any questions about allocating any PJM transmission upgrade costs for a project larger than is required to generate the intended OREC amount.

COMMERCIAL INFORMATION

COMAR 20.61.06.02 J (1)

J. An application shall include the following commercial information related to the proposed offshore wind project:

(1) OSW applicant's plan for engaging small businesses;

Findings

In its application, US Wind described its efforts to engage small businesses (including disadvantaged, women-owned, service disabled, and HUBZone businesses) by:

- Conducting small business information sessions
- Using existing member supply chain groups to disseminate information
- Working with Contractors to partner, mentor and unbundle work for small businesses

US Wind described the following recent activities to engage small businesses: conducting workshops through the Small Business Development Center, holding forums through the Business Network for Maryland Offshore Wind, and contracting with Maryland small businesses for various roles. Some of these companies are MBEs that are addressed below in regard to COMAR 20.61.06.02 J (2).

US Wind described additional planned activities to utilize Maryland-based and other US-based businesses, large and small, for the development, construction, and operation of this project. Major contractors will also be required to engage small businesses. At the

same time, US Wind recognized the fact that many turbine key components "...can only be sourced from the European market."

Given the early stage of development, US Wind has demonstrated tangible evidence to maximize the use of Maryland-based small businesses. We recommend that GOMA or another agency monitor US Wind's future efforts to engage and utilize small businesses in Maryland.

COMAR 20.61.06.02 J (2)

(2) Subject to Regulation .06 of this chapter, OSW applicant's plan for compliance with the Minority Business Enterprise Program for the construction, manufacturing, and maintenance phases of the proposed offshore wind project;

Findings

US Wind described its approach and commitment to ensuring compliance with Maryland's MBE Program that "...seeks to remedy discrimination for small minority- and women-owned businesses within the State contracting arena. Maryland's overall statewide MBE participation goal is currently 29 percent." US Wind's approach centers on the following elements:

- Commitment to MBE utilization and establishment of MBE participation goals
- Senior level management engagement in achieving MBE goals
- Establishing and documenting its MBE Compliance Plan as a defined set of written policies, procedures and metrics for achieving MBE participation levels
- Implementation of MBE outreach programs
- Use of capacity building, teaming arrangements, and the unbundling of work
- Making Windfarm technology selections that are informed by the potential for local content, including MBE participation
- Requiring major subcontractors to establish and meet MBE Goals of their own

US Wind set an MBE goal of 15% for development (pre-construction), construction, and O&M activities. According to the application, US Wind has already contracted with three MBE firms:

- Ogos Energy LLC – project planning
- JLM HR Consulting LLC – HR services
- Alpha Energy LLC – engineering sub-contractor to ESS, a contractor

Given the early stage of development, US Wind has demonstrated tangible evidence of complying with Maryland's MBE Program based on retaining three MBE firms to date

and its self-imposed 15% MBE goal. We recommend that GOMA or another agency monitor US Wind's future efforts to engage and utilize MBE businesses in Maryland.

COMAR 20.61.06.02 J (3) and (4)

(3) OSW applicant's plan for the use of skilled labor, especially for the construction and manufacturing components of the project, including outreach, hiring, or referral systems, or all of these, that are affiliated with registered apprenticeship programs under Labor and Employment Article, Title 11, Subtitle 4, Annotated Code of Maryland;

(4) OSW applicant's plan for using an agreement designed to ensure the use of skilled labor and to promote the prompt, efficient, and safe completion of the project particularly with regard to the construction, manufacturing, and maintenance of the proposed offshore wind project;

Findings

US Wind plans to ensure compliance with Maryland's Labor and Employment Article, Title 11, Subtitle 4, that encourages apprenticeship and training programs to develop a skilled labor force. In addition to the actions described above, US Wind has begun working with the Laborer's International Union of North America and the Jane Addams Resource Center, and will coordinate with the appropriate Maryland agencies.[92] US Wind also intends to have its contractors comply with the apprenticeship and training requirements. US Wind specified the following actions:

- Collaboration with local and national organized labor organizations
- National certification and apprenticeship programs
- State and national governmental labor and apprenticeship agencies
- Local membership-based supply chain organizations

Given the early stage of development, US Wind has demonstrated good faith evidence of complying with Maryland's apprenticeship and training goals, as well as its intent to utilize skilled labor to complete the project. We recommend that the appropriate Maryland agencies work with and monitor US Wind's future efforts to train and utilize skilled laborers.

COMAR 20.61.06.02 J (5)

(5) OSW applicant's plan to provide for compensation to its employees and subcontractors consistent with wages outlined in State Finance and Procurement Article, Title 17, Subtitle 2, Annotated Code of Maryland.

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[92] According to US Wind, this union has agreed to coordinate dealings with other union trades, including electrical, crane operators, welders, pile drivers, etc. The Jane Addams Resource Center is a non-profit organization in Baltimore that trains and certifies skilled labor, including welding and using machine tools. The Baltimore location was established in 2015 as an offshoot of the Center's base in Chicago.

Findings

US Wind appears to understand the prevailing wage and other compensation requirements laid out in COMAR Title 17, Subtitle 2. US Wind engaged the Maryland-based human resources and payroll services company JLM HR Consulting to prepare an Employee Handbook that will describe a compensation plan consistent with state regulatory requirements, including salary, medical, dental / vision, insurance, retirement, and worker's compensation information.

Given the early stage of development, US Wind has demonstrated good faith evidence of complying with Maryland's compensation requirements. We recommend that the appropriate Maryland agencies work with and monitor US Wind's future efforts in this regard.

FINANCIAL INFORMATION

COMAR 20.61.06.02 K (1)

K. An application shall include the following financial information related to the proposed offshore wind project:

(1) Detailed financial analysis of the proposed project, including:

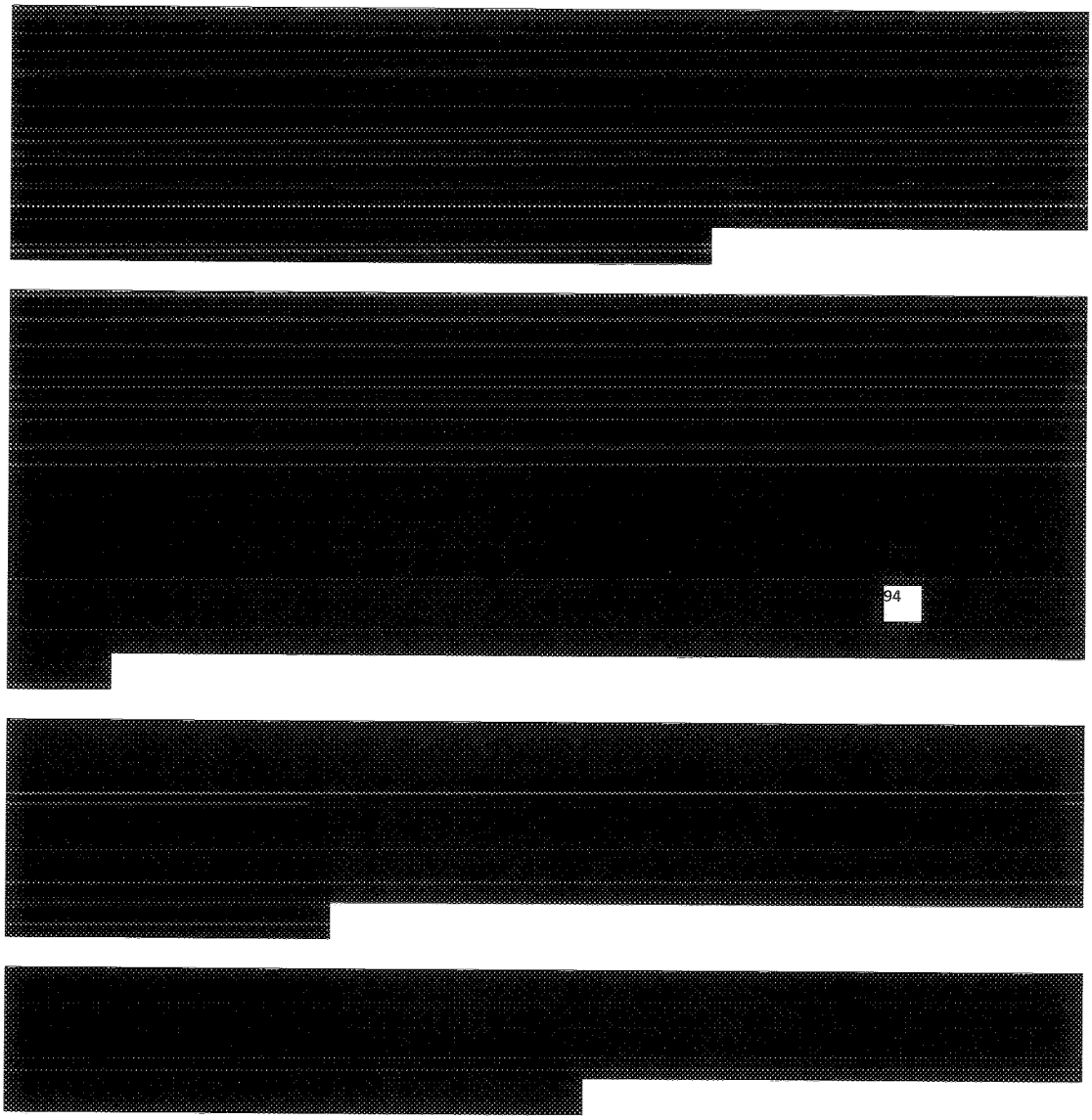
(a) A pro forma income statement, balance sheet and cash flow projection covering the development period, construction period and operating term during the term of the proposed OREC price schedule, with detailed revenues and expenses;

(b) Description and estimated benefits of any State or federal grants, rebates, tax credits, loan guarantees or other similar benefits received by the proposed project; and

(c) Estimated internal rate of return and return on equity;

Findings

US Wind provided key financing assumptions and printed (non-active) financial income statement, balance sheet, and cash flow spreadsheets [redacted]



As explained above, US Wind has provided the financial information required by COMAR 20.61.06.02 K(1) necessary to demonstrate that the US Wind Project will be financially viable under base case assumptions.

COMAR 20.61.06.02 K (2)

(2) Proposed offshore wind project balance sheet at project COD with all capital expenditures broken down by major cost category;

[93] On December 18, 2015, the Protecting American from Tax Hikes Act of 2015, Pub. L. No. 114-113, Div. Q, 129 Stat. 2242, enacted amendments to the PTC and the ITC for wind and other renewable energy facilities.

[94] IRS Notice 2016-31.

Findings

US Wind provided a balance sheet at the expected COD [redacted] US Wind estimated the total Project cost to be $1,375.3 million as of the January 1, 2020 COD, and provided a breakdown that demonstrated all capital cost categories were appropriately considered.[95] The total estimated capitalized cost of $1,375.3 million is equivalent to $5,546/kW, which is in the range of other offshore wind cost estimates identified in the Methodology section of this report. Based on these other offshore wind project estimates, US Wind's estimated total capitalized cost is reasonable. We expect that the first domestic offshore wind projects will likely cost more than European projects that have benefited from a relatively long history of actual development and construction experience.

COMAR 20.61.06.02 K (3)

(3) Proposed capital structure identifying equity investors, sources of debt, any other sources of capital, and written demonstration of equity and debt funding commitments, which include the following:

(a) For an OSW applicant that is seeking equity investors in a proposed offshore wind project:

(i) Documentation of the OSW applicant's serious, good-faith efforts to solicit and interview a reasonable number of minority investors, which shall include a demonstration of the OSW applicant's coordination with the Governor's Office of Minority Affairs; and

(ii) A confidential statement listing the names and addresses of all minority investors interviewed and whether or not any of those investors have purchased an equity share in the proposed offshore wind project; or

(b) For an OSW applicant that is not seeking equity investors in a proposed offshore wind project, a statement from that OSW applicant affirming that it is not seeking equity investors in the proposed offshore wind project;

Findings

US Wind provided a Proposed Capital Structure sufficient to fund the total US Wind Project cost as shown in Table 13. [redacted]

[95] The actual COD may be different due to delays and changes to the project schedule.

[redacted]

Table 13. US Wind's Proposed Capital Structure

($ millions)

[redacted]		
Total Sources of Capital	$1,375.3	100.0%

[redacted]

Based on this information, US Wind has provided adequate evidence of being able to fund the US Wind Project consistent with COMAR 20.61.06.02 K (3).

COMAR 20.61.06.02 K (4)

(4) Year-by-year spending projections of expenses and capital expenditures by five- or six-digit NAICS code extending through the term of the proposed OREC price schedule and divided into four categories:

(a) In-State labor;

(b) In-State non-labor;

(c) Out-of-State labor; and

(d) Out-of-State non-labor;

Findings

US Wind provided a year-by-year breakdown of construction period and operating period expenditures broken down by NAICS code and divided into multiple labor and non-labor categories. Total construction period spending was estimated at $241 million in 2014-2019 in-state and $1,097 million out-of-state. These figures exclude $37.5 million in pre-construction development expenditures.

Table 14. US Wind Construction Period Expenditures
($ millions)

Category	In-State	Out-of-State
Labor	$ 162.7	$ 329.7
Non-Labor	$ 78.3	$ 767.2
Total	$ 241.0	$1,096.9

COMAR 20.61.06.02 K (5)

(5) Detailed matrix, supported by documentation, demonstrating that the OSW applicant has applied for all current eligible State and federal grants, rebates, tax credits, loan guarantees, or other programs available to offset the cost of the proposed project or provide tax advantages;

Findings

US Wind provided a matrix [redacted]

COMAR 20.61.06.02 K (6) – (10)

(6) Affirmative statement of the OSW applicant's commitment to use best efforts to apply for all eligible State and federal grants, rebates, tax credits, loan guarantees, and other similar

benefits as those benefits become available and to agree to pass along to retail electric customers 80 percent of the value of any State or federal grants, rebates, tax credits, loan guarantees, or other similar benefits received by the proposed project and not included in the application;

(7) Affirmative statement that the OSW applicant will execute a memorandum of understanding with the Commission that requires the OSW applicant to make serious, good-faith efforts to interview minority investors in any future attempt to raise venture capital or attract new investors to the qualified offshore wind project;

(8) Affirmative statement of the OSW applicant's commitment to deposit $6,000,000 into the Maryland Offshore Wind Business Development Fund, which shall consist of an initial deposit of $2,000,000 within 60 days of the Commission's approval of a proposed offshore wind project, $2,000,000 within 1 year after the initial deposit, and $2,000,000 within 2 years after the initial deposit;

(9) Affirmative statement by the OSW applicant that it will hold harmless the retail electric customers, OREC purchasers, and the State for any cost overruns associated with the proposed offshore wind project; and

(10) Affirmative statement that the OSW applicant will use commercially reasonable efforts to sell its electricity service attributes to the PJM markets.

Findings

Riccardo Toto, President of US Wind, provided an executed Affirmative Statement that covered the requirements enumerated in COMAR 20.61.06.02 K(6) - (10).

COST-BENEFIT ANALYSIS

COMAR 20.61.06.02 L (1) - (3)

L. An application shall include a cost-benefit analysis that covers the following items and the assumptions and data that the OSW applicant used to generate each item:

(1) An input-output analysis describing the in-state impact on income, employment, wages, and state and local taxes, with particular emphasis on effects on manufacturing employment in the State, as well as the complete set of data and assumptions that the OSW applicant used to generate the input-output analysis;

(2) An analysis describing expected employment impacts in the State (expressed as full-time equivalent positions), including expected type and duration of employment opportunities, the expected salary range of positions, and other effects resulting from, for example, in-state construction, operations, maintenance, and equipment purchases, and supported by detailed documentation, including any binding commitments;

(3) An analysis describing the in-state business impacts of the proposed offshore wind project;

Findings

US Wind hired EDR Group to conduct an IMPLAN economic benefit analysis. IMPLAN is an industry-standard input-output economic model that projects the monetary impacts of changes in direct spending or investment through local, state, and national economies. Those impacts include (i) indirect benefits as the direct spend recipients purchase goods and services from associated industries and (ii) induced benefits as households have more money to spend in-state. US Wind provided the basic activity assumptions and cost data to EDR Group as shown in Section 4-4 and Appendix 5-1.1. US Wind estimated that just under half of its development expenditures will be in-state and about 20% of its construction period expenditures will be in-state, as summarized in Table 15 below.

Table 15. US Wind Expenditure Breakdown[96]
(millions 2015 $)

	In-State		Out-of-State	
Development Expenditures				
Labor	$ 9.5	*3.7%*	$ 7.0	*0.7%*
Non-Labor	$ 8.4	*3.2%*	$ 12.6	*1.3%*
	$ 17.9		$ 19.6	
Construction Expenditures				
Labor	$162.7	*62.9%*	$ 329.7	*33.6%*
Non-Labor	$ 78.3	*30.2%*	$ 767.2	*64.4%*
	$241.0		$1,096.9	
Totals[97]	$258.9	*100.0%*	$1,116.5	*100.0%*

US Wind revised the input-output results for sections 5-1 through 5-3 in its Errata submitted on April 9, 2016. Monetary results were presented in constant 2015 dollars. In section 5-1, US Wind provided the input-output results including expected in-state impacts on income, employment, wages, and state and local taxes. In section 5-2, US Wind provided detailed expected in-state employment impact results for each phase of the project including expected type and duration of employment opportunities and the expected salary range for different positions. In section 5-3, US Wind provided in-state business impact results. A high-level summary of the estimated economic impacts of the US Wind Project is provided below. More details are provided in the findings of COMAR 20.61.06.03 B (1)(a)(x).

- Total in-state development phase expenditures of $17.9 million in legal, engineering, public relations, permitting, certification, equipment leasing, and marine transportation activities are expected to generate total (direct, indirect,

[96] Excludes capitalized financing costs.

[97] Percentages may not add up to 100% due to rounding.

and induced) in-state benefits of 210 FTEs, $33.9 million in new business, and $1.1 million in tax revenues in 2014 - 2018.

- Total in-state construction phase expenditures of $241 million, in engineering, manufacturing, transportation, installation, and related activities is expected to generate total in-state benefits of 1,454 FTEs plus $373.6 million in new business in 2016-2019. In addition, US Wind expects that $51 million would be invested by a steel manufacturer in its Baltimore-area plant to provide steel products for the project, which would increase the total in-state benefits to 1,910 FTEs and $460.2 million in new business. Tax revenues of $16.2 million 2016-2019 were calculated including the steel plant investment.

- Total in-state operating phase benefits were prepared by estimating the first year benefits and extrapolating them for the 20-year project term. US Wind expects to employ 32 in-state staff (excluding Board members) and spend $3.7 million in the first operating year on labor, and expects to have contract services for another 39 staff (34 FTEs in-state). US Wind estimated total in-state benefits during the first year of operations for staff payroll, contractor labor, and non-labor operating expenses of 226 FTEs, $213.9 million in new business for Maryland-based firms and $2.4 million in tax revenues. Practically all the first operating year economic benefits estimated by US Wind result from the project revenues. However, we think the use of these revenues will likely not directly impact the Maryland economy. By the 20th year, a cumulative total of 4,530 FTEs are expected to be created and a cumulative spending benefit of $4.3 billion.

In summary, US Wind provided all of the information required under COMAR 20.61.06.02 L (1)-(3). We have no doubt that most direct in-state expenditures will produce indirect and induced effects that will magnify the overall benefit to Maryland. However, we believe that EDR Group overestimated the net economic benefits during the operating phase as described above. We recommend that the MDPSC rely on our independent IMPLAN analysis provided on pages 90-91 of our report.

COMAR 20.61.06.02 L (4)

(4) An analysis describing anticipated environmental and health impacts, including impacts on the affected marine environment based on publicly available information, related to construction, operation and decommissioning of the proposed offshore wind project, including direct emissions impacts created by the proposed offshore wind project related to carbon dioxide, oxides of nitrogen, sulfur dioxide, particulates and mercury emissions (in each case, expressed in terms of the number of tons of emissions abated per annum), as well as other relevant environmental and health impacts to the citizens of Maryland.

Findings

US Wind's submitted estimated environmental impacts of its Project on reduced power plant air emissions during operations and during construction and decommissioning. In order to calculate avoided power plant emissions, US Wind utilized 2012 DOE EIA data for in-state power generation by fuel type to calculate reductions in NO_x, SO_2, CO_2, PM_{10} and $PM_{2.5}$, and Hg emissions. The reductions assumed the US Wind Project would displace 913,000 MWh/year of in-State coal-fired or gas-fired generation over the 20-year term.[98] US Wind did not run a dispatch simulation model to estimate what the actual breakdown between coal-fired and gas-fired plants would be or if the reductions would affect generators in other PJM states. The Project itself would not have any air emissions. As Table 16 indicates, US Wind's consultant calculated that the reductions would be greatest for coal-fired plants, equivalent to 5-6% for all five categories.

Table 16. US Wind Estimated Reductions of Maryland Power Plant Emissions
(over 20 years; based on 2012 DOE EIA data for Maryland power plants)

	NO_x (tons)	SO_2 (tons)	CO_2 (tons)	PM_{10} & $PM_{2.5}$ (tons)	Hg (lbs)
Coal-Fired Plants	15,968	46,078	20,967,908	1,642	0
Gas-Fired Plants	16,971	146	12,263,215	n/a	n/a
Blend	16,150	35,311	18,905,790	1,642	n/a

US Wind recognized that the actual emissions reductions will depend on the actual mix of generation in place over the 20-year operating life of the Project and that the actual reduction could be very different than was estimated. In fact, US Wind used an overly simplistic approach to calculate the reduction in emissions by assuming that the Project would only displace generation from in-State power plants. All Maryland power plants are dispatched through a security-constrained least-cost algorithm by PJM so that the displaced generation would be spread throughout the PJM market. We recommend that the MDPSC rely on our independent dispatch simulation and emission analysis, provided in the COMAR 20.61.06.03 B(3) section of this report, that estimates the emission changes throughout PJM.

US Wind also estimated air emissions during project construction and decommissioning. US Wind estimated that small quantities of NO_x and CO_2 would be emitted from trucks and ships for transportation and construction during those phases based on publicly available information for similar offshore wind projects. Furthermore, US Wind claimed it will implement mitigation measures, e.g. utilizing clean fuels and avoiding unnecessary idling, to minimize air emissions during construction and decommissioning.

[98] In the emission calculations in its application, US Wind assumed the Project operated at a 41.0% capacity factor and would generate 890,717 MWh/year, less than the current proposed 42.1% capacity factor value and 913,845 MWh/year, a minor inconsistency.

Table 17. US Wind Estimate of Emissions during Construction and Decommissioning

	(tons over 3 years)
NO_x	450-900
SO_2	30-60
CO_2	60,000-120,000
PM_{10} & $PM_{2.5}$	60-120
Hg	0

US Wind discussed the health impacts of avoided, SO_2, PM_{10} / $PM_{2.5}$, and Hg due to the Project based on data from the American Heart Association and the EPA. Reducing NO_x emissions is expected to reduce ground level ozone concentrations that, along with PM, can cause short- and long-term health effects to individuals with pre-existing respiratory and cardiovascular health conditions. SO_2 contributes to the formation of particulate matter, so reducing SO_2 emissions will reduce PM exposure and the associated cardiovascular mortality and hospital admissions for vulnerable populations. Reducing Hg emissions is expected to reduce Hg concentrations in water bodies and possibly fish living in those waters that can be ingested, although the link between methylmercury in fish and Hg power plant emissions, compared to other sources of Hg, cannot be quantified according to the EPA. US Wind also pointed out that lower CO_2 emissions during operations will help the State achieve its greenhouse gas reduction targets.

There was no discussion of the impacts of the US Wind Project on the local marine environment due to construction, operation, and decommissioning. Those environmental impacts will be addressed during the BOEM NEPA permitting process for the Project, which will probably be completed by Q3 2017.

COMAR 20.61.06.02 L (5)

(5) An analysis describing any other impacts on residential, commercial, and industrial retail electric customers over the life of the proposed offshore wind project;

Findings

US Wind's consultant, Leidos, estimated the impacts of its project on residential, commercial, and industrial retail electric customers based on the two-part OREC price schedule, a commercial operating date of January 1, 2020, the estimated hourly production of the Project, a proprietary market forecast of PJM energy, capacity, and ancillary prices, and a forecast of Maryland Tier 1 REC prices. US Wind used the general methodology outlined in our report to estimate the net ratepayer impact, i.e. crediting the value of energy, capacity, and RECs against the gross OREC price, using Maryland state energy sales by class. However, Leidos' approach was simplistic because it applied the Project's expected hourly forecast of monthly generation to its forecast of average on-peak and off-peak energy prices to estimate Project energy revenues, and did not take into account hourly price and generation variations or transmission constraints

within Maryland, i.e. congestion, that lead to different energy prices for the utility zones. Leidos' forecast of capacity prices was very optimistic in that it assumed they would approach and converge with net CONE capacity, in contrast to historical prices that have been much lower. Lastly, Leidos did not include the impact of any decrease in PJM wholesale market energy or capacity prices due to the Project because it assumed such a decrease was "negligible" for this calculation.

With these assumptions and its original OREC price schedule (that we found would exceed the net rate caps), US Wind estimated an average single year residential rate impact of $1.49/month (never exceeding $1.50/month) and an average single year non-residential rate impact of 1.47% (never exceeding 1.49%). US Wind's net ratepayer estimates were not updated for its revised, lower OREC price schedule (that we found would satisfy the net rate caps). US Wind's results are not comparable to Skipjack's; we recommend the MDPSC rely on our independent estimate of net ratepayer impacts.

COMAR 20.61.06.02 L (6)

(6) An analysis describing the long-term effect of the proposed offshore wind project on wholesale energy, capacity, and ancillary services markets administered by PJM that includes analysis of contributions to regional system reliability, fuel diversity, competition, transmission congestion, and other power market benefits;

Findings

US Wind provided a high-level qualitative analysis of the impacts on PJM's wholesale energy, capacity, and ancillary services markets. US Wind did not provide any quantitative market impacts resulting from the Project, and concluded that the impacts on energy prices would be "negligible". US Wind described other project benefits:

- Improved reliability by reducing PJM's dependence on gas supply especially during winter months when Project generation peaks and PJM typically faces fuel supply issues
- Improved reliability from the Project providing about 60% of its output during on-peak hours
- Improved fuel diversity because the Project is not gas-fired
- Eased west-to-east transmission congestion by interconnecting into the DPL load zone in eastern Maryland
- Help Maryland meet carbon reduction goals

US Wind provided a satisfactory qualitative discussion of contributions to regional system reliability, fuel diversity, competition, transmission congestion, and other power market benefits.

COMAR 20.61.06.02 L (7)-(8)

(7) An analysis describing any other benefits to the State created by the proposed offshore wind project, such as in-state construction, operations, maintenance, and equipment purchases; and

(8) Other relevant considerations that the OSW applicant elects to include.

Findings

US Wind claimed that a Baltimore steel manufacturing plant would likely require an investment of $60 million in 2017 to form (roll), weld, and coat steel plates for the foundations and towers. US Wind estimated that 85% of this investment, or $51 million, will come from Maryland, which will create 457 FTEs and $86.7 million in new business for Maryland-based firms in that year.

EDR Group also conducted an IMPLAN economic benefit analysis for a 748 MW project that was similar to its analysis for the 248 MW US Wind Project. Although informative, the analysis for the 748 MW project did not influence our evaluation of the US Wind Project.

COMAR 20.61.06.02 M

M. An application shall include a proposed OREC price schedule for the proposed offshore wind project's electricity service attributes that is subject to the following requirements:

(1) The proposed OREC price schedule shall consist of either a:

(a) Two-part OREC price in which the first component is expressed as either a single firm price for each calendar year or a series of firm prices for each calendar year and the second component is expressed as a single firm price for each calendar year subject to a true-up based upon any change between the Commission's estimated cost of transmission upgrades and PJM's actual upgrade cost as specified in the executed Interconnection Service Agreement, for a total OREC price up to and not exceeding $190 per megawatt hour (levelized in 2012 dollars) and subject to the projected net rate impact caps for residential and nonresidential customers, as described by Public Utilities Article, 7-704.1(e)(1)(ii) and (iii), Annotated Code of Maryland; or

(b) One-part OREC price, expressed as either a single firm price for each calendar year or a series of firm prices for each calendar year, that is not subject to true-up, up to and not exceeding $190 per megawatt hour (levelized in 2012 dollars) and subject to the projected net rate impact caps for residential and nonresidential customers, as described by Public Utilities Article, 7-704.1(e)(1)(ii) and (iii), Annotated Code of Maryland;

(2) The unit of OREC price on the proposed OREC price schedule must be on a dollars ($) per delivered OREC (MWh) basis by calendar year; and

(3) All proposed OREC price schedules shall propose OREC prices for each calendar year for an initial term of up to 20 years commencing on the estimated project COD and an additional

schedule of OREC prices for each of the five calendar years immediately following the end of the initial term to cover potential delays in project COD.

Findings

US Wind originally submitted a two-part OREC price bid with an initial price of $212.40/MWh for the first delivery year of 2020 and a 20-year term through 2039. The levelized OREC prices, allowing up to five years of delay, are all below the $190/MWh (2012 $) levelized cap.

After being informed that the original OREC price bid exceeded the net ratepayer caps, US Wind submitted a revised two-part price bid of $201.57/MWh that met the levelized price cap as well as the net ratepayer caps. Part 1 of US Wind's OREC price bid, $200.24/MWh, would escalate at 2.0% annually. Part 2 of US Wind's OREC price bid, $1.33/MWh with no escalation, would cover the transmission system upgrade costs downstream of the expected interconnection point at the Indian River 230 kV substation. The actual upgrade costs would ultimately be set through the PJM interconnection process based on any change from the placeholder estimate of $18.5 million.[99] PJM has completed the Feasibility Study and the more detailed System Impact Study for the US Wind project and determined that no system upgrades would be required.[100]

COMAR 20.61.06.02 N

N. An application shall include a proposed OREC amount that is a quantity, expressed as a single annual number on a megawatt hour per calendar year basis and fixed for the proposed term of the project's proposed OREC price schedule, and that is accompanied by the expected generation confidence level associated with that proposed OREC amount.

Findings

US Wind proposed a 248 MW (gross turbine generator rating) Project that would generate 913,845 ORECs annually (net MWh/year) at a P-50 confidence interval, equivalent to a 42.1% net capacity factor. US Wind arrived at this OREC amount utilizing site-specific modeled offshore wind data and turbine-specific performance data to estimate annual gross generation of [redacted]. US Wind then took account of various site-specific losses to estimate net generation of 913,845 MWh/year. These calculations were reviewed under COMAR 20.61.06.02 G (3) of this report.

[99] Axum Energy Ventures LLC developed the "placeholder" estimate for the MDPSC in its January 30, 2015 report.

[100] US Wind has the option to request a Merchant Transmission Interconnection to eliminate any potential for energy curtailments, which could require upgrades at some cost.

MINIMUM THRESHOLD CRITERIA

COMAR 20.61.06.03 A

This section of COMAR lists the minimum threshold criteria that must be satisfied in order for an application to be eligible for further multi-part (qualitative and quantitative) review per COMAR 20.61.06.01 D(1)(a). Once we determined that the US Wind Project was administratively complete per COMAR 20.61.06.02 A, we reviewed each minimum threshold criterion as described below.

COMAR 20.61.06.03 A (1)

A. An application must demonstrate the proposed offshore wind project meets the following minimum threshold criteria, as specified:

(1) The proposed offshore wind project complies with Public Utilities Article, 7-701(k)(1) and (2), Annotated Code of Maryland;

Public Utilities Article, 7-701(k)(1) and (2) are as follows:

"Qualified offshore wind project" means a wind turbine electricity generation facility, including the associated transmission–related interconnection facilities and equipment, that:

(1) is located on the outer continental shelf of the Atlantic Ocean in an area that:

(i) the United States Department of the Interior designates for leasing after coordination and consultation with the State in accordance with 388(a) of the Energy Policy Act of 2005; and

(ii) is between 10 and 30 miles off the coast of the State;

(2) interconnects to the PJM Interconnection grid at a point located on the Delmarva Peninsula;

Findings

The US Wind Project will be located in BOEM WEA lease parcels OCS-A 0489 and OCSA-A 0490 off the coast of Maryland and will interconnect to the PJM grid at the Indian River substation on the Delmarva Peninsula, thus satisfying the requirements of PUA §7-701(k)(1) and (2).

COMAR 20.61.06.03 A (2)

(2) The term of the proposed OREC price schedule is not longer than 20 years, and commences no earlier than January 1, 2017;

Findings

The term of the US Wind Project will be 20 years with a target COD of January 1, 2020, thus satisfying the requirements of PUA §7-701(k)(3).

COMAR 20.61.06.03 A (3)

(3) The OREC price on the proposed OREC price schedule do not exceed $190 per megawatt hour in levelized 2012 dollars, as measured using a nominal discount rate equal to the long-term composite Treasury Bond rate (or equivalent) and a deflation rate equal to the near-term average GDP Deflator (or equivalent), notified by the Commission to potential OSW applicants;

Findings

The US Wind Project will have a levelized price of $177.64/MWh (2012 $) based on the 2-part bid submitted utilizing the placeholder value for PJM system upgrades. If the US Wind Project is delayed for up to five years the levelized price will remain under $190/MWh (2012 $).

COMAR 20.61.06.03 A (4)

(4) Demonstration that the proposed project, including the associated transmission-related interconnection facilities, will be constructed using commercially proven components and equipment available to the OSW applicant;

Findings

The US Wind Project will be constructed using commercially proven components and equipment.

COMAR 20.61.06.03 A (5)

(5) Demonstration that the project COD is reasonable in light of the permitting, technical, construction, operational, and economic challenges generally faced by offshore wind project developers; and

Findings

The US Wind Project will likely not be able to achieve the proposed COD of January 1, 2020 due to permitting, development, and construction risks that will likely delay the COD. US Wind recently indicated that the meteorological mast installation will not occur as scheduled in June-July, 2016, due to delays associated with the required air permit. Such delays should be viewed as typical for the first domestic large-scale offshore wind project and should not disqualify US Wind under this minimum threshold criterion. The risk of COD delay was explicitly recognized in designing the OREC procurement process and the OREC Bid Price Form was designed to accommodate up to

a five-year COD delay without financial penalties per COMAR 20.61.06.16. Maryland ratepayers would not be penalized due to a COD delay.

COMAR 20.61.06.03 A (6)

(6) Evidence of site control or demonstration of a feasible plan to obtain site control.

Findings

The US Wind Project was awarded the BOEM Maryland WEA site leases and thus satisfies the requirements of COMAR 20.61.06.03 A (6).

INDEPENDENT QUALITATIVE AND QUANTITATIVE ANALYSES

COMAR 20.61.06.03 B

B. For each application that meets the minimum threshold criteria, the Commission shall conduct independent qualitative and quantitative analyses that considers the criteria enumerated in Public Utilities Article, 7-704.1(d)(1)(i) through (xiii), Annotated Code of Maryland.

(1) The qualitative analysis shall use a ranking system to identify applications with characteristics that contribute to the likelihood of successful development and to the net economic, environmental, and health benefits to the State.

Findings

We have evaluated the qualitative aspects of the US Wind application and applied a color-scheme ranking system to characterize our findings, as shown on page ES-31 of the Executive Summary.

QUALITATIVE ANALYSIS

COMAR 20.61.06.03 B (1)(a)(i)

(a) The following factors shall be considered as part of the qualitative analysis:

(i) Qualifications of the OSW applicant's project team, including but not limited to experience in project development, environmental permitting, engineering and construction, operations, maintenance and financing;

Findings

US Wind is a subsidiary of Renexia, a company with wind and solar project development experience, which itself is a subsidiary of Toto Holding, a large Italian company with significant transportation and infrastructure construction projects. In addition, US Wind hired permanent staff and subcontractors with offshore wind development,

environmental permitting, engineering and construction, operations, maintenance, and financing expertise.[101]

COMAR 20.61.06.03 B (1)(a)(ii)

(ii) Project characteristics, including but not limited to project design (for example, demonstration that turbine layout is consistent with best practices for optimal output and maintainability), turbine technology (for example, commercial availability, certification status, compatibility with project service life, warranties), foundation and support structure (for example, suitability for site conditions, design standards), converter station and interconnection (for example, appropriateness of equipment for site, turbine ratings, and number of turbines; reasonableness of interconnection and delivery points; interconnection designs consistent with best practices), and reasonableness of claimed net capacity and annual energy output;

Findings

US Wind presented a project that reflects a layout design and technology that is generally appropriate for the Project site. The technology described in the application is commercially available. There are still considerable design and construction uncertainties given that US Wind has not yet made a final turbine or foundation selection. It is typical for a project at this early stage of development to still be considering different turbine models, and key project characteristics will remain uncertain until the final turbine model is selected as discussed on page 35 of this report.

COMAR 20.61.06.03 B (1)(a)(iii)

(iii) Financial plan, including but not limited to completeness and reasonableness of the plan, financial strength of the developer, sources of debt and equity and firmness of commitments, plan for addressing cost overruns and other development risks, evidence of best efforts to identify and access State or federal grants, rebates, tax credits, loan guarantees or other similar benefits available to the proposed project and future commitments to seek out future benefits;

Findings

US Wind proposed a complete and reasonable financial plan [redacted][102]

[redacted]

[101] A fuller discussion of US Wind's staff and subcontractor expertise is in our evaluation of COMAR 20.61.06.02 F.

[102] [redacted]

[redacted] US Wind has committed to utilize state and federal grants and other benefits.[103]

COMAR 20.61.06.03 B (1)(a)(iv)

(iv) Demonstration of site control such as a BOEM lease or, alternatively, adequacy of plan for obtaining site control, as well as arrangements for interconnection right-of-way;

Findings

BOEM awarded US Wind development rights to the Maryland North Lease Area OCS-A 0489 and the South Lease Area OCS-A 0490 via an August 2014 auction. US Wind has exclusive development rights for 25 years commencing December 1, 2014. The BOEM leases give US Wind easements rights to export power to the mainland. US Wind intends to install a 230 kV AC submarine cable from the OTM to a land-based splicing vault just south of the Indian River inlet. US Wind conducted an initial investigation and found no known underwater utilities that would interfere with the submarine cable.

The splicing vault would be underground within a Delaware State Park parking lot. The State of Delaware has previously approved splicing vaults for other projects that were never developed, so siting approval is very likely. The connections to and from the vault would be created via horizontal directional drilling to minimize environmental disturbances.

A second submarine cable will exit the vault and continue west through the Indian River Bay to the existing Indian River 230 kV substation on the Delmarva Peninsula. US Wind has initiated discussions with the Delaware Regulatory Advisory Service to obtain the necessary right-of-way in the Indian River Bay; no problems were disclosed.[104] DPL owns the land surrounding the substation, and we expect that US Wind will be granted an easement or ROW for the cable to access the substation.

In summary, US Wind has site control for the offshore lease area and has identified a practicable plan to obtain all the necessary rights-of-way to interconnect to the PJM grid.

COMAR 20.61.06.03 B (1)(a)(v)

(v) Project COD and schedule, including but not limited to reasonableness of the proposed schedule (acknowledging, for example, weather delays), construction plan (reasonableness of plan and level of detail, for example, port, storage, lay-down and staging-areas, as well as

[103] A fuller discussion of US Wind's financing plan and ability is in our evaluation of COMAR 20.61.06 K.

[104] The Delaware Regulatory Advisory Service is comprised of representatives from each division within the Department of Natural Resources and Environmental Control to facilitate environmental permitting.

evidence of consistency with procurement plan, supply chain descriptions, and contracting strategy), and testing and commissioning plan;

Findings

US Wind has presented a construction and procurement plan that is generally responsive to COMAR 20.61.06.02 G (9), but there are several uncertainties and risks, particularly for the schedule, that have not been adequately addressed. The delay in installing the meteorological mast due to an unforeseen permitting delay reflects the challenges of offshore wind development in the nascent U.S. market. While it is typical for there to be many uncertainties at this early stage of project development, US Wind did not propose plans to manage or mitigate them. [redacted]

In any event, Maryland ratepayers will not bear any of the risks from these issues.

COMAR 20.61.06.03 B (1)(a)(vi)

(vi) If applicable, the reasonableness of the proposed transmission upgrade cost allocation methodology, taking into account whether the proposed methodology fairly serves the interest of ratepayers;

Findings

The transmission connection for the proposed US Wind Project will be separate from any other transmission connection that US Wind may locate in the BOEM lease area, so no allocation methodology is necessary.

COMAR 20.61.06.03 B (1)(a)(vii)

(vii) Operations and maintenance plan, including but not limited to reasonableness of proposed management plan and mitigation strategies and evidence of unique requirements in the context of a large offshore wind facility (for example, port, maintenance vessel, staffing, spare parts supplies);

Findings

US Wind presented an O&M Plan that is reasonable and describes the approach and organization for the Project. The O&M Plan, reviewed in detail in COMAR 20.61.06.02 G(10), addresses the turbines and BOP, and describes the port facilities, vessels, staffing, and division of responsibilities between the different organizations that will be involved in O&M activities. Overall, the O&M Plan is missing some information and presents some risks for US Wind that will need to be addressed, but is adequate at this early stage of development. Maryland ratepayers will not be exposed to any of these risks.

COMAR 20.61.06.03 B (1)(a)(viii)

(viii) Decommissioning plan, including but not limited to quality and completeness of plan, and assurance of available funding to decommission the plant, interconnection facilities and associated equipment;

Findings

US Wind presented a decommissioning plan that describes an approach that is appropriate and generally consistent with regulations and industry best practices, and is reasonable given the early stage of development. US Wind provided a decommissioning cost estimate without sufficient support and that is significantly lower than what we would expect for the Project. However, any financial risk will be adequately mitigated by BOEM's requirements for adequate financial security to be posted by US Wind and for an independent decommissioning cost estimate to be updated and audited every year.

COMAR 20.61.06.03 B (1)(a)(ix)

(ix) Transmission improvements, including but not limited to quality and completeness of analysis, and consideration of benefits created by associated transmission and distribution upgrades such as improved reliability or reduced congestion;

Findings

US Wind submitted an interconnection request for the Indian River 230 kV substation with PJM and was assigned queue position 056 in Class Year AB1 on September 9, 2015. PJM completed the first two of three interconnection studies, a Feasibility Study (date unknown) and the more detailed System Impact Study (September 2016) that defined interconnection and system upgrade requirements. Interconnection costs are part of the US Wind Project capital cost, and upgrade costs are accounted for in the 2-part OREC price bid.

PJM's System Impact Study found no need for new reinforcements, no contribution to previously identified system reinforcements, and no voltage, short circuit, or stability issues. Thus the US Wind Project will help meet the demand on the Delmarva Peninsula currently only served from the north, thereby reducing congestion and improving reliability. The US Wind Project will not cause PJM to reinforce its system serving or on the Delmarva Peninsula,

COMAR 20.61.06.03 B (1)(a)(x)

(x) OSW applicant's input-output analysis required by Public Utilities Article, 7-704.1(c)(3)(i), Annotated Code of Maryland, including completeness of descriptions and documentation, verifiability of model inputs and reasonableness of outputs, and extent to which the analysis demonstrates positive net economic benefits to the State;

Findings

We reviewed US Wind's input-output analysis and prepared an independent input-output analysis (as required by COMAR 20.61.06.03 B (2)(a)) to estimate the economic changes in Maryland from new spending by or due to the proposed US Wind Project. US Wind's economic consultant, EDR Group, used IMPLAN, an industry-standard input-output model. IMPLAN takes the direct spending, i.e. local spending on goods and services estimated for the Project, and estimates the (i) indirect impacts on jobs and local spending created through the supply chain due to the direct spending, plus (ii) the induced impacts created by households spending additional income earned from the direct or indirect spending. These indirect and induced impacts "multiply" the initial direct spending. IMPLAN has a detailed database that allows these multiplier benefits to be calculated by sector within the local economy.

US Wind provided a detailed list of IMPLAN input assumptions and results in its application. We made a number of changes to some of those assumptions and compared our results to the EDR results to evaluate their reasonableness. We divided our independent analysis into three periods of time, consistent with EDR's approach:

(i) Development expenditures from 2014 through 2018

(ii) Construction period capital expenditures from 2016 through 2019

(iii) Operating period expenditures from 2020 through 2039

For each period of time we report three types of economic benefits:

(i) Direct benefits, including local spending on goods and services

(ii) Employment benefits, i.e. jobs

(iii) State and local tax revenue benefits

EDR's findings, all of which are reported in 2015 dollars, are reported below. Detailed modeling results from our analysis are provided in COMAR 20.61.06.03 B (2)(a).

Development Period (2014-2018)

Impacts on Maryland's Spending

EDR Group estimated direct development spending to be $17.9 million for a variety of in-state pre-construction and support services, e.g. legal, engineering, public relations, permitting & obtaining certificates, equipment leasing, and marine transportation. EDR estimated that Maryland would see an additional $16.0 million of in-state indirect and induced spending, for a total of $33.9 million that would peak in 2016. Close to $21.4 million of the in-state spending would occur in the services sector, with additional amounts in the government and transportation / information / public utilities sectors.

Table 18. US Wind Development Spending and Employment Impacts

Type	Spending (millions 2015 $)	Employment (FTEs)
Direct	$17.9	111
Indirect	$ 4.9	30
Induced	$11.0	69
Total	$33.9	210

Totals may differ from annual amounts due to rounding

Impacts on Maryland's Employment

EDR Group estimated that US Wind would directly create 111 FTEs in Maryland and provide an additional 99 FTEs for a total of 210 in-state FTEs, an average of 42 FTEs over the 2014-2018 development period. EDR Group estimated that 138 of those FTEs would be in the services sector, which includes legal, engineering, marketing and other services in the state's economy. The majority of these service sector FTEs would be created through the induced impact as households spend some of their additional income. Other sectors with increased employment would be government, trade, and transportation / information / public utilities.

Impacts on State & Local Tax Revenue:

The combined state and local tax revenue impacts estimated by EDR Group for the 2014 through 2018 period across the various revenue sources peak in 2016 and total $1.1 million.

Construction Period (2016-2019):

Impacts on Maryland's Spending

EDR Group estimated US Wind would directly spend $240.9 million in Maryland during the 2016-2019 construction period, as shown in Table 19.[105] The largest amount would be for manufacturing the support towers ($94 million), followed by foundation fabrication and assembly in Baltimore ($76 million), and design services ($26 million). EDR Group estimated an additional $168.3 million of indirect and induced spending to arrive at total in-state spending of $460.2 million over the 2016-2019 construction period.

[105] EDR Group included the impacts associated with a $51 million investment in 2017 at an in-state steel manufacturing plant in the construction period analysis. We included that investment in our analysis as well.

Table 19. US Wind Construction Period Spending and Employment Impacts

Type	Spending (millions 2015 $)	Employment (FTEs)
Direct	$ 240.9	928
Indirect	$ 82.3	446
Induced	$ 86.1	536
Total	$ 409.3	1,910

Totals may differ from annual amounts due to rounding

EDR Group estimated that the largest increases in spending will be in Maryland's manufacturing sector ($181 million), service sector ($162 million), and construction sector ($65 million) during the 2016-2019 construction period.

Impacts on Maryland's Employment

After multiplier effects, EDR Group estimated that Maryland can expect 1,910 new FTEs as shown in Table 19, which are associated with the $460.2 million in new business for Maryland-based firms. EDR Group estimated that about one-half of the new FTEs will stem from direct in-state spending and the balance through multiplier effects. The service sector will benefit the most with 946 FTEs. The manufacturing sector will benefit with 398 FTEs associated with purchases of Maryland-made goods. The construction sector will also benefit with 306 FTEs, mostly due to the investment in a steel manufacturing facility in 2017.

Impacts on State & Local Tax Revenue:

EDR Group estimated that the combined state and local tax revenue impacts over the 4 year construction period would be $16.2 million.

Operating Expenditures (2020-2039)

Impacts on Maryland's Spending

EDR Group ran IMPLAN for the first operating year to estimate spending, employment, and tax impacts, and then extrapolated those results for the full twenty year US Wind Project period to estimate the cumulative impacts. This is a reasonable approach because the US Wind Project is expected to operate identically in each year.

EDR Group estimated operating period total direct spending of $176.9 million for the first operating year, the expected US Wind revenues during the first operating year. Based on this, EDR estimated that Maryland's economy can expect $213.9 million in new business activity and 257 additional in-State jobs for the first year of operations. Over 80% of this increase in business activity, $176.9 million, would be in the transportation / information / public utilities sectors, followed by $30.0 million in the service sector. EDR Group used a different approach to estimate a total indirect

spending of $23.9 million for the first operating year compared to the development and construction periods.[106] EDR Group estimated total indirect and induced impacts of $37.0 million for the first operating year.

Table 20. US Wind First Year Operating Period Spending and Employment Impacts

Type	Spending (millions 2015 $)	Employment (FTEs)
Direct	$176.9	28
Indirect	$ 23.9	117
Induced	$ 13.1	82
Total	$213.9	226

Totals may differ from annual amounts due to rounding

Maryland employment, value added (GSP) and spending (sales) impacts reported above for the first year of annual O&M are expected to grow slowly over the 20-year Project Price Term as US Wind applied an escalation factor for inflation growth. The spending impacts estimated by EDR Group over the 20-year operational period are $4,278.7 million.

Impacts on Maryland's Employment

The EDR Group estimated that the first year of operation will support 226 FTEs in Maryland as shown in Table 20. Most of these FTEs will be in the service sector, including labor related to the turbine service contract. The EDR Group estimated that 28 of these FTEs will be direct and the rest will be indirect. IMPLAN results label 149 of these FTEs as direct (for repair and maintenance plus management positions) and the rest as indirect, but we believe this difference is simply a matter of presentation.

Impacts on State & Local Tax Revenue:

EDR Group estimated that the combined state and local tax revenues, primarily property taxes, would be $2.4 million in the first operating year.

Summary

Table 21 summarizes the total spending, employment and tax revenue impacts computed by EDR Group over the entire 26 year life (development, construction, and operations) of the US Wind Project. The IMPLAN model used by EDR Group cannot calculate the benefit of lower wholesale electricity prices due to the Project.

[106] EDR Group claimed that IMPLAN's direct impacts are actually first round indirect impacts.

Table 21. US Wind's Overview of Spending, Employment and Tax Revenue Impacts

Phase	Spending (million 2015 $)	Employment (FTEs)	Tax Revenue (million 2015 $)
Development	$ 33.9	210	$ 1.1
Construction	$ 460.2	1,910	$16.2
Operations	$4,278.7	4,530	$47.9
Project Lifetime	$4,772.8	6,650	$65.2

COMAR 20.61.06.03 B (1)(a)(xi)

(xi) OSW applicant's analysis of the net environmental and health impacts, including impacts on the affected marine environment based on publicly available information, to the State including impacts during construction, operation and decommissioning of the proposed project, including completeness of descriptions and documentation, verifiability of model inputs and reasonableness of outputs, and extent to which the analysis demonstrates positive net environmental and health benefits to the State;

Findings

US Wind estimated the project-related environmental impacts of reduced power plant air emissions due to the Project using 2012 DOE EIA data for in-state power generation by fuel type to calculate reductions in NO_x, SO_2, CO_2, PM_{10} and $PM_{2.5}$, and Hg. The emissions reductions calculation simplistically assumed the US Wind Project would displace 890,717 MWh of in-state coal-fired generation or in-state gas-fired generation.[107] US Wind did not run a dispatch simulation model to estimate what the actual breakdown between coal-fired and gas-fired plants would be or if the reductions would affect generators in other states so that the actual reduction could be very different than was estimated. The US Wind Project itself would not produce any air emissions.

US Wind also calculated air emissions during project construction and decommissioning. While trucks and ships will emit some pollutants for transportation and construction, US Wind anticipates that small quantities of NO_x and CO_2 will be emitted during those phases based on publicly available information for similar offshore wind projects.

US Wind discussed the health impacts of avoided NO_x, SO_2, PM_{10} / $PM_{2.5}$, and Hg due to the Project based on data from the American Heart Association and the EPA. The discussion was vague and lacking detail. There was no discussion of the impacts of the proposed project on the local marine environment due to construction, operation, and decommissioning. Those environmental impacts will be addressed during the BOEM NEPA permitting process for the Project, which will probably be completed by Q3, 2017.

[107] This generation value is equal to the net output from the 248 MW project at a 41.0% net capacity factor, a little less than the value based on the annual average 42.1% net capacity factor.

COMAR 20.61.06.03 B (1)(a)(xii)

(xii) Extent to which OSW applicant's proposed project will assist in meeting the renewable energy portfolio standard, considering the expected generation confidence level associated with the proposed OREC amount;

Findings

According to the report prepared by Amerigo Offshore LLC and AWST, the US Wind Project is estimated to produce a P50 net energy of 913,845 MWh per year which corresponds to a net capacity factor of 42.1%. Our review of the report supported this estimate. We calculated that the proposed US Wind Project will meet 53.0% of Maryland's RPS 2.5% offshore wind carve-out over the twenty-year operating period.

COMAR 20.61.06.03 B (1)(a)(xiii)

(xiii) Unique attributes that distinguish a proposed project from another;

Findings

Factors that distinguish the US Wind Project from others are presented in Risk Factors and Differentiators, the final section of the Executive Summary of this report.

COMAR 20.61.06.03 B (1)(a)(xiv) and (xv)

(xiv) Adequacy of the OSW applicant's plan demonstrating engagement of small and minority businesses, commitment to the use of skilled labor, and labor compensation plan;

(xv) Evidence of serious, good-faith efforts to solicit participation of minority investors, should the proposed project have sought capital investment, and evidence of serious, good-faith commitment to solicit minority investors in future attempts to raise capital;

Findings

US Wind conducted a number of activities to engage small and minority businesses, utilize skilled labor, and implement an appropriate compensation plan. These activities, including engaging Maryland companies and soliciting a letter of interest from a minority investor, demonstrate good-faith efforts.[108]

COMAR 20.61.06.03 B (1)(a)(xvi)

(xvi) OSW applicant's analysis of impacts on residential, commercial, and industrial retail electric customers, including consideration of whether the analysis properly reflects proposed OREC pricing and unique character of the applicant's pricing proposal; and

[108] A fuller discussion of US Wind's plan to engage small and minority businesses, utilize skilled labor, and institute an appropriate compensation plan is in our evaluation of COMAR 20.61.06.02 J.

Findings

US Wind provided a cursory analysis of rate impacts without conducting detailed calculations indicating whether the proposed Project would satisfy the rate caps. We recommend that the MDPSC rely on our independent analyses of ratepayer impacts, summarized on pages ES-35 – ES-38 of this report.

COMAR 20.61.06.03 B (1)(a)(xvii)

(xvii) OSW applicant's analysis of long-term changes to the wholesale electric market associated with the project, including consideration of the quality of analysis showing contributions to regional system reliability, fuel diversity, competition, transmission congestion, and other benefits.

Findings

We calculated the wholesale energy market benefit of the US Wind Project to have a present value of $11.2 million (2016 $) over the twenty year OREC term. DPL customers would benefit the most because of the US Wind Project's interconnection in that service territory. BGE and PEPCO customers would benefit less and APS customers may not benefit at all from reduced wholesale energy prices as that service territory is not strongly linked to DPL.

Wholesale capacity price benefits due to the US Wind Project would be greatest in EMAAC, which includes the DPL service territory. Over the 20 year OREC Term, Maryland ratepayers would save $16.4 million in present value 2016 dollars, depending on the extent of the market response to the Project.

Maryland Tier 1 REC prices are not expected to change due to the addition of the US Wind Project. However, the addition of the US Wind Project will help Maryland meet its 2.5% OREC carve-out target.

In addition to the rate impacts described above, the US Wind Project would lessen PJM's dependence upon gas for power plant fuel and would also help decrease any congestion on the Delmarva Peninsula. While congestion on the Delmarva Peninsula has been a problem in the past, we do not expect it to persist now that the 300 MW Garrison Energy Center has been completed and various transmission improvements at 230 kV (Red Lion-Cedar Creek-Milford) and at 138 kV (Townsend-Church, Glasgow-Cecil, Basin Road-Bear, Vienna-Nelson) are completed.

COMAR 20.61.06.03 B (1)(b)

(b) The qualitative analysis may result in the elimination from further consideration of an application that the Commission determines represents a significant risk of not achieving

successful commercial operation or is not likely to provide net economic, environmental, and health benefits to the State.

Findings

Based on the qualitative benefits described above and US Wind's assumption of all development, construction, and performance risks, we believe that the Project will provide net economic, environmental, and health benefits to Maryland.

QUANTITATIVE ANALYSIS – NET RATE IMPACTS

COMAR 20.61.06.03 B (2)(a)

(2) The quantitative analysis shall measure the impact of a proposed project and, as applicable, a combination of proposed projects, expressed in monetary terms.

(a) The quantitative analysis of the projected net rate impacts for an average Maryland retail electric customer based on an annual consumption of 12,000 kilowatt hours and nonresidential retail electric customers shall include consideration of the proposed OREC price schedule (including the proposed additional OREC prices for a further period of five years referenced in Regulation .02M(3) of this chapter) and proposed OREC amount, the value of energy, capacity, and ancillary services generated by the proposed project, the value of avoided Tier 1 REC costs, and any consequential impacts on wholesale market energy, capacity, ancillary service, and REC prices, to determine the following:

(i) Whether the projected net rate impact for applicable classes exceeds the limitations established in Public Utilities Article, 7-704.1(e)(1)(ii) and (iii), Annotated Code of Maryland; and

(ii) The forecasted net rate impact to ratepayers over the initial term of the proposed project;

Findings

We considered three principal elements to estimate the net rate impact for Maryland customers:

- The direct (or gross) OREC Price per the US Wind application
- The net OREC Price that subtracts the values of energy, capacity, and RECs included in the ORECs which offset a portion of the gross OREC Price
- The reduction in wholesale energy, capacity, and REC market prices

Market Price Effects

There will be three market price effects: wholesale energy prices, wholesale capacity prices, and Tier 1 REC prices.

We expect the US Wind Project to lower wholesale energy prices in DPL (and other utility customers in EMAAC), but the limited electrical connection between DPL and other Maryland energy zones limits the reduction in wholesale energy prices for non-DPL consumers. Due to the market response, i.e. the displacement of planned onshore wind resources in western PJM, energy prices in APS would actually be higher, thus partially offsetting the lower energy prices in DPL. Thus the US Wind Project will have a limited overall effect on Maryland wholesale energy prices. The overall energy cost-to-load benefit for Maryland ratepayers has a present value of $11.2 million (2016 $) over the twenty-year Study Period.

The US Wind Project is expected to add UCAP and lower wholesale capacity prices in EMAAC, while the market response will reduce UCAP and raise wholesale capacity prices in western PJM. We expect the 248 MW (nameplate rating) US Wind Project will add 64.5 MW of UCAP in EMAAC for the first six capacity delivery years (using the 26.0% CIR value accepted by PJM), rising to 71.9 MW of UCAP in subsequent years (based on the Project's estimated 29.0% performance during Summer Peak Hours).[109] We expect the 372 MW (nameplate rating) of displaced onshore wind in western PJM will reduce UCAP by 48.3 MW (based on PJM's default UCAP value of 13% for onshore wind) over the 20-year Study Period. We calculated the change in wholesale capacity prices for each Maryland zone in future Capacity Delivery Years (2020/21 through 2039/40) by shifting the supply curves in each LDA by these UCAP values, shown in Table 22.[110]

Table 22. Independent Estimate of Change in UCAP due to the US Wind Project

Capacity Delivery Years	2020/21 - 2025/26	2026/27 – 2039/40
US Wind Project	64.5 MW	71.9 MW
Onshore Wind	(48.3) MW	(48.3) MW

[109] US Wind should be able to demonstrate a year of 29.0% performance after its first year of operation, allowing it to bid a higher UCAP into the next BRA. Under current PJM rules, the increased UCAP can only be granted after the Project has made it through another interconnection process that can take about two years, thus delaying the Project's higher UCAP value until the 2026/27 Capacity Delivery Year.

[110] A Capacity Delivery Year begins on June 1 and ends on May 31 in the following year.

In the short term for Capacity Delivery Years 2020/21 – 2025/26, we expect Maryland customers will benefit from a net capacity savings of just under $1 million/year due to the US Wind Project. In the long term for future Capacity Delivery Years, we expect that higher UCAP of the US Wind Project will provide a net capacity savings of $1.3 million/year for Maryland customers. The total value of the capacity savings is $16.4 million (present value 2016 $) with most of the benefits accruing to customers in DPL (where the Project will interconnect) and in BGE (which has the most customers in Maryland). We expect no measureable impact on the market price of Tier 1 RECs, since the US Wind Project will displace planned on-shore wind facilities in western and central PJM with an equivalent annual REC output.

Utility-level ratepayer energy, capacity, and REC market price effects over the 20-year US Wind Project term are displayed in Table 23. The total effects are largest in DPL where the Project will interconnect.

Table 23. Independent Estimate of Zonal Ratepayer Price Effects for US Wind Project
(present value 2016 $ millions over 20-year OREC Term)

	DPL EMAAC	BGE SWMAAC	PEPCO SWMAAC	APS RTO	Maryland (combined)
Energy	($9.6)	($1.2)	($1.2)	$ 0.8	($11.2)
Capacity	($7.2)	($5.2)	($2.9)	($1.1)	($16.4)
RECs	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
Total	($16.8)	($6.4)	($4.0)	($0.3)	($27.6)

Zonal ratepayer effects are displayed in terms of levelized 2016 $/MWh of affected load in Table 24. Total price effects are largest for DPL ratepayers and smallest for APS ratepayers.

Table 24. Independent Estimate of Zonal Ratepayer Price Effects for US Wind Project
(levelized 2016 $/MWh of affected load)

	DPL EMAAC	BGE SWMAAC	PEPCO SWMAAC	APS RTO	Maryland (combined)
Energy	($0.092)	($0.002)	($0.007)	$0.002	($0.009)
Capacity	($0.068)	($0.008)	($0.017)	($0.003)	($0.012)
RECs	$ 0.000	$ 0.000	$ 0.000	$ 0.000	$ 0.000
Total	($0.160)	($0.010)	($0.024)	($0.001)	($0.021)

Gross and Net OREC Prices

US Wind submitted a revised 2-part OREC Price Bid that starts out at $201.57/MWh in 2020 and escalates over time to $293.04/MWh in 2039. US Wind's OREC Price Bid has a levelized value of $177.64/MWh (2012 $), thereby satisfying the OWEA levelized $190/MWh (2012 $) price cap. A portion of the US Wind's OREC Price Bid for each year is subject to adjustment based on any difference between the estimated and actual cost

of PJM network upgrades, subject to the price and net rate impact caps.[111] Total gross (before offsetting ratepayer credits) OREC payments would be $3,138.7 million (present value 2016 $).

For each OREC purchased by Maryland ratepayers, they will receive credit for one MWh of energy valued at the DPL zonal price and one REC valued at a Maryland Tier 1 price. For the annual OREC purchases, Maryland ratepayers will also receive capacity credit of 64.5 MW (UCAP) for the first six years and 71.9 MW for the remaining fourteen years. We used the AURORAxmp model to forecast the net energy credit benefits of $738.9 million (present value 2016 $) for the US Wind Project over the 20-year OREC Price Term for Maryland ratepayers. We separately forecasted the net capacity credit of $71.9 million (present value 2016 $) and a net Tier 1 REC credit of $219.1 million (present value 2016 $). The combined impact lowers the levelized gross OREC price from $189.05/MWh to a net price of $127.02/MWh (2016 $) as shown in the table below.

Table 25. Independent Estimate of Gross and Net OREC Prices for the US Wind Project
(2016 $ per OREC)

Year	1 2020	5 2024	10 2029	20 2039	1 - 20 Levelized
Gross OREC Price	$187.13	$188.15	$190.25	$191.11	$189.05
Energy Credit	($40.79)	($45.94)	($46.02)	($48.22)	($44.51)
Capacity Credit	($ 2.20)	($ 3.73)	($ 5.08)	($ 5.89)	($ 4.33)
REC Credit	($14.68)	($14.18)	($12.06)	($11.22)	($13.19)
Net OREC Price	$129.45	$124.30	$127.08	$125.77	$127.02

Net Rate Impacts

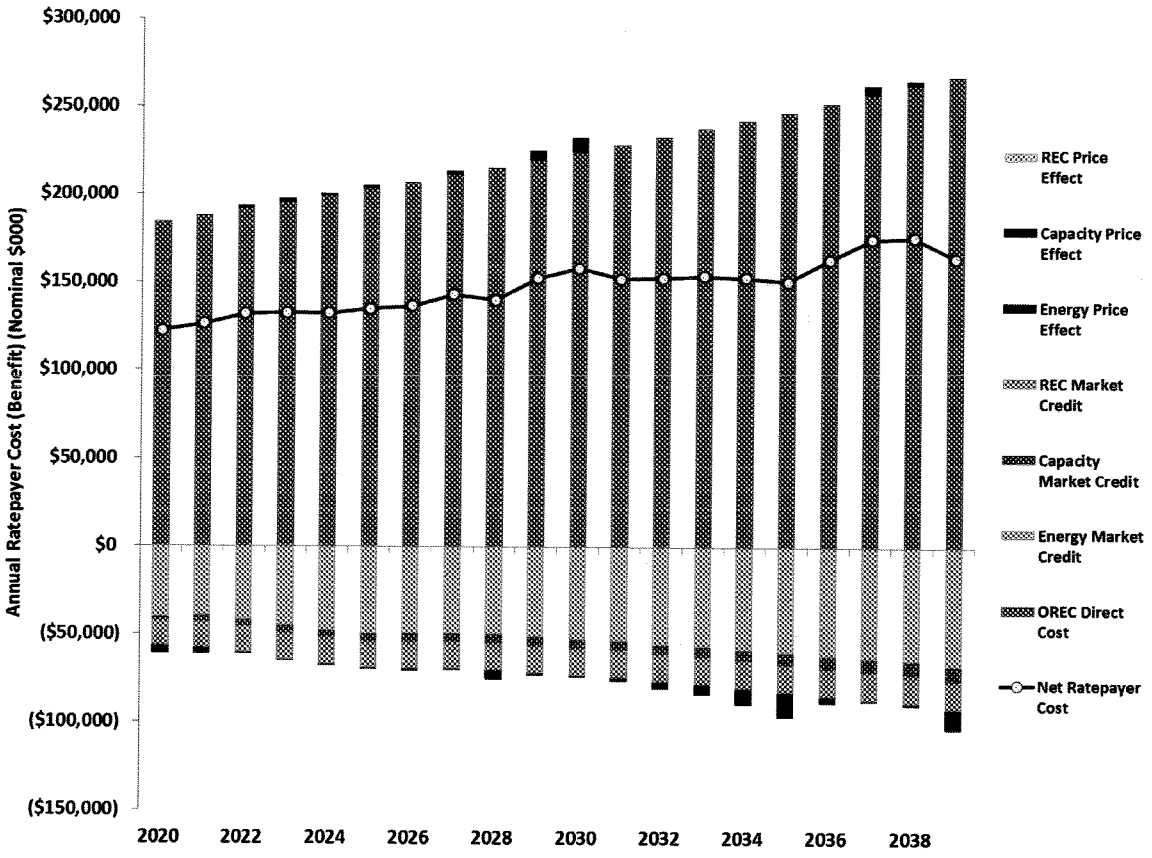
In order to calculate the net impact to Maryland ratepayers in levelized 2012 dollars per year, we combined three principal components: the gross OREC price, market credits (for energy, capacity, and RECs), and any reduction in wholesale energy, capacity and REC market prices. We calculated each component on a nominal dollar basis for each year of the OREC Price Term, and then discounted them to a present value (2012$ or 2016$) amount using the nominal discount rate. The Maryland affected load amounts for each year were also "discounted" to a present value equivalent at the real discount rate. Levelized constant dollar costs and credits were then calculated on a $/MWh of affected load basis as the quotient of the present value dollar amounts divided by the present value equivalent load amounts. Thus the Maryland net ratepayer cost was calculated as the levelized equivalent of the proposed OREC Price annual payments less the levelized equivalent of the projected stream of energy and capacity market credits, avoided Tier 1 REC purchases, and any reductions in wholesale energy and capacity

[111] According to the results of PJM's System Impact Study for the US Wind Project, no upgrades would be necessary and the second part of the 2-part bid would be adjusted to $0.00. However, US Wind may choose to request a Merchant Transmission Interconnection to avoid potential energy curtailments, which could require upgrades at some unknown cost.

prices. These were all calculated by Maryland zone – DPS, PEPCO, BGE, and APS – and combined based on their load share to calculate the overall net power market impact for ratepayers.

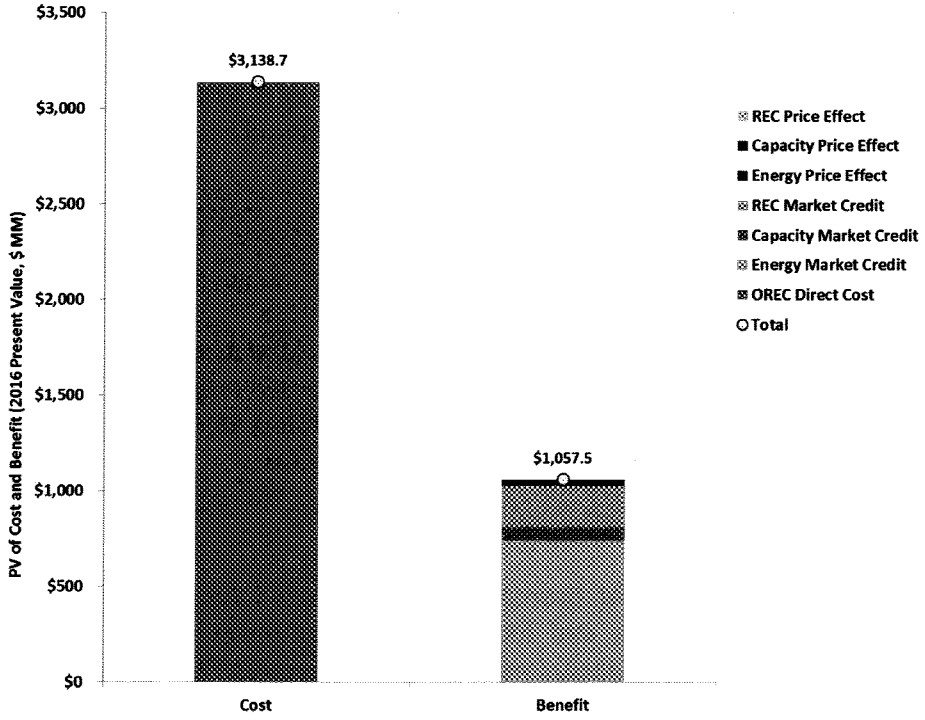
The gross US Wind Project costs are shown against the various ratepayer benefits on an annual nominal dollar basis in Figure 15 below. The energy and REC price credits provide the most benefit to Maryland ratepayers while capacity credits and market effects are minimal.

Figure 15. Indep. Estimate of Annual Ratepayer Costs & Benefits for US Wind Project
(nominal $000)



Ratepayer costs and benefits by component for all Maryland ratepayers are displayed in Figure 16. The gross OREC cost of $3.14 billion is offset by $1.06 billion (present value 2016 $) in benefits, primarily the energy price and Tier 1 REC credits.

Figure 16. Indep. Estimate of Total Ratepayer Costs & Benefits for the US Wind Project
(present value 2016 $ millions)



Net OREC and ratepayer costs broken down by category are shown in terms of a levelized $/MWH of OREC and the levelized $/MWh of load in Table 26. We calculated a net ratepayer cost of $2,081.2 million (present value 2016 $) for the US Wind Project over the 20 year period.

Table 26. Independent Estimate of Net OREC and Ratepayer Costs for US Wind Project
(20-year term)

	Total	Levelized $/MWh OREC		Levelized $/MWh Load	
	(2016 $000 PV)	(2016 $)	(2012 $)	(2016 $)	(2012 $)
OREC Direct Cost	$3,138,726	$189.05	$177.64	$2.386	$2.242
Energy Credit	($ 738,946)	($44.51)	($41.82)	($0.562)	($0.528)
Capacity Credit	($ 71,864)	($ 4.33)	($ 4.07)	($0.055)	($0.051)
REC Credit	($219,072)	($13.19)	($12.40)	($0.167)	($0.156)
Net OREC Cost	$2,108,844	$127.02	$119.35	$1.603	$1.506
Energy Price Effect	($ 11,221)	($ 0.68)	($ 0.64)	($0.009)	($0.008)
Capacity Price Effect	($ 16,399)	($ 0.99)	($ 0.93)	($0.012)	($0.012)
REC Price Effect	$ 0.00	$ 0.00	$ 0.00	$0.000	$0.000
Net Ratepayer Cost	$2,081,224	$125.35	$117.79	$1.582	$1.486

Our net ratepayer cost calculation allowed us to confirm the US Wind Project would satisfy both the net residential ratepayer impact and nonresidential ratepayer impact caps. We found the US Wind Project would have an average monthly impact of

$1.486/month (levelized 2012 $), therefore meeting the residential net ratepayer impact cap, i.e. $1.50/month in 2012 dollars assuming an average residential load of 12,000 kWh/year as proscribed by OWEA and the Regulations. We also found that the US Wind Project would increase the annual electric bills for non-residential, i.e. commercial and industrial, ratepayers by an average of 1.47%, based on 2012 EIA 826 nonresidential energy sales and revenue data, which would be below the 1.5% cap.

QUANTITATIVE ANALYSIS – ECONOMIC IMPACTS

COMAR 20.61.06.03 B (2)(b)

(b) The quantitative analysis of the economic impacts on Maryland associated with the proposed project shall assess the projected impact of the proposed project on in-state income, employment, taxes, and local spending associated with the project lifecycle including construction, operations, maintenance, and equipment purchases.

Findings

We prepared an independent estimate of the US Wind Project's impact on in-state income, employment, taxes, and local spending by reviewing US Wind's spending assumptions and making adjustments where necessary. We utilized IMPLAN, an industry-standard input-output economic model that was also utilized by US Wind's consultant, EDR Group. A detailed description of our work and results are contained in COMAR 20.61.06.03 B (1)(a)(x). Our key findings are as follows; all values are in constant 2015 dollars:

- US Wind estimated it will spend about $254.4 million in-State to develop and construct the US Wind Project, plus we included an expected $51 million investment in a steel fabrication plant and an expected $26.4 million upgrade at the Sparrows Point shipyard. We estimate that total in-State spending will provide $278.0 million in indirect and induced benefits, create over 2,935 FTE jobs, and provide over $28.7 million in tax revenues.

- During the 20-year operating phase, US Wind estimated it will spend about $21.7 million per year for O&M. We found this O&M cost to be reasonable, and we estimate that will provide an additional $15.5 million in indirect and induced benefits, support 206 FTE jobs, and provide $3.4 million in annual tax revenues.

- Over the entire development, construction, and operating period, we estimate that the US Wind Project will provide a total of $1.4 billion in direct, indirect, and induced spending in Maryland. We also estimate that the US Wind Project will provide 7,050 new FTE jobs in total.

The principal differences between our estimates and US Wind's estimates are (i) we based the operating period economic benefits on expected O&M spending, not total

operating revenues and (ii) we estimated higher tax revenues during the Project's lifetime due to higher estimated project management and meteorological tower installation costs.

Table 27. Indep. Estimate of US Wind Project Spending, Employment, and Tax Impacts
(2015 $ millions)

	Dev't and Const'n (2014-2019)	Operating Period (2020-2039)	Total (2014-2039)
Direct Expenditures	$ 331.8	$ 433.4	$ 765.2
Indirect Sales	$ 93.5	$ 91.7	$ 185.2
Induced Sales	$ 184.4	$ 219.2	$ 403.6
Total	$ 609.8	$ 744.3	$ 1,354
Direct Employment	1,298	2,282	3,580
Indirect Employment	498	480	978
Induced Employment	1,139	1,353	2,492
Total Employment (FTEs)	2,935	4,116	7,050
Taxes	$ 28.7	$ 19.5	$ 48.2

QUANTITATIVE ANALYSIS – ENVIRONMENTAL AND HEALTH IMPACTS

COMAR 20.61.06.03 B (3)

(3) The independent analysis of the environmental and health benefits on Maryland associated with the proposed project, quantitatively expressed in tons of avoided air emissions and qualitatively expressed in terms of health impacts associated with avoided air emissions and impacts on the affected marine environment based on publicly available information.

Findings

We used the AURORAxmp chronological dispatch simulation model to forecast the change in fossil fuel power plant emissions (based on a proprietary database of emissions rates) as well as to forecast the change in wholesale energy prices due to the US Wind Project. We compared the Base Case (without the US Wind Project) emissions to the US Wind Project case to calculate the change in power plant emissions over the twenty-year study term, as shown below:

Table 28. Indep. Estimate of Change in Maryland Emissions due to US Wind Project
(tons/year, 2020-2039)

CO_2	(12,809)
NO_x	(6.8)
SO_2	(3.1)

We found that carbon emissions in Maryland would decrease as in-state power plants operate less frequently due to the US Wind Project as shown in Table 28. Since the US Wind Project would be interconnected to the DPL zone, power plants in other EMAAC states, i.e. Delaware, Pennsylvania, and New Jersey, will also operate less frequently.

The market response that will displace 372 MW of planned onshore wind resources in western and central PJM will cause carbon emissions to increase in western and central PJM due to increased coal generation. Since coal generation is more than twice as carbon-intensive as gas-fired generation, the decrease in gas-fired emissions in MAAC region is outweighed by the increase in coal emissions in western PJM, and overall emissions in PJM would increase due to the US Wind Project.

EVALUATION OF THE SKIPJACK WIND FARM APPLICATION

APPLICANT INFORMATION

COMAR 20.61.06.02 E

E. An application shall include a signed and notarized statement by an officer of the OSW applicant attesting that:

(1) The officer has the authority to submit the application to the Commission;

(2) The application, including the proposed OREC price schedule and proposed OREC amount, shall remain binding until the expiration date;

(3) The information and materials contained in the application are accurate and correct; and

(4) If the application is selected, the OSW applicant will work diligently and engage in a continuous development and construction program to achieve the project COD for the qualified offshore wind project.

Findings

Skipjack provided two signed and notarized statements by Jeffrey Grybowski, CEO of Deepwater Wind Holdings, LLC, the parent company of Skipjack, attesting to the four conditions with an expiration date of March 30, 2017, later revised to June 30, 2017, and meeting the COMAR requirement. Skipjack's commitment to develop its Project is contingent on receiving "...a fully-approved, mutually-acceptable, un-appealable" order. Skipjack asserted that "...the Maryland PSC has the authority to cause the winning bidder to receive payments for the full term of the commitment approved in the Maryland PSC order, whether or not there is a subsequent successful constitutional challenge to the program, or to the Maryland PSC order, under state or federal constitutional law." We believe the MDPSC has discretion to ascertain whether these conditions are acceptable and in compliance with COMAR 20.61.06.02 E. Other conditions that could affect Skipjack's OREC prices are discussed on pages 137-138 of this report.

We expect there will be changes to the design of the Skipjack Project. COMAR 20.61.06.01 E permits applicants to submit additional project information. However, applicants are prohibited from changing the proposed OREC price schedule or quantity, or materially changing other information, after the Application Period closes, i.e. on November 18, 2016. COMAR 20.61.06.18 B requires Skipjack to inform the MDPSC of any material changes in the Project prior to the COD.

COMAR 20.61.06.02 F (1) and (2)

F. An application shall include the following information:

(1) An organizational chart that shows:

(a) Complete ownership structure of the proposed project (including all parents, subsidiaries, and other affiliates that have direct or indirect management or voting control over the proposed project); and

(b) Any lenders or entities funding the proposed project, including those entities funding on a contingent basis; and

(c) If different from the proposed project, the relationship between the OSW applicant and the proposed project.

(2) Legal name and type of business organization of each entity listed on the organizational chart described in F(1)(a) of this regulation, including certificates of formation and certificates of good standing certificated by the relevant governmental authority for each entity and, if applicable, foreign qualification certificates or other evidence that the proposed project and the OSW applicant are qualified to do business in the State;

Findings

Skipjack provided a corporate organizational chart and legal name, and business organizations for Skipjack Offshore Energy, LLC, a Delaware limited liability company authorized to do business in Maryland. Skipjack is 100% owned by Deepwater Wind New Jersey, LLC, which itself is 100% owned by Deepwater Wind Holdings, LLC (former Winergy Power Holdings, LLC). D.E. Shaw, a large, privately-held global investment management and technology development firm, is the majority owner of Deepwater.

The organizational chart did not include investors or lenders. This omission is not problematic given (i) the uncertain financial structure at this early stage and (ii) potential investors and lenders were identified in response to COMAR 20.61.06.02 K (3).

The Project's assets are, or will be, owned by wholly-owned special purpose subsidiaries of Skipjack. This structure should not be problematic as long as Skipjack informs the MDPSC of any material changes in advance, consistent with the ongoing reporting requirements detailed in COMAR 20.61.06.18.

Skipjack Offshore Energy, LLC, Deepwater Wind New Jersey, LLC and Deepwater Wind Holdings, LLC are registered in Delaware. Skipjack provided Certificates in which the Secretary of State of Delaware certified that these three companies are duly formed under the laws of the state of Delaware and are in good standing, Skipjack's annual franchise taxes have been assessed to date, and Deepwater Wind New Jersey, LLC and Deepwater Wind Holdings, LLC annual taxes have been paid to date.

COMAR 20.61.06.02 F (3)

(3) Bylaws or operating agreement of each entity listed on the organizational chart described in F(1)(a) of this regulation and relevant board resolution (or equivalent written consent) to submit an application;

Findings

Skipjack provided the operating agreement of (i) Skipjack Offshore Energy, LLC, registered in Delaware, by Deepwater Wind New Jersey, LLC, dated August 21, 2016, to pursue energy (other than oil and gas) production activities on the OCS and (ii) its parent company, Deepwater Wind New Jersey, LLC, registered in Delaware, by Deepwater Holdings, LLC, dated February 27, 2009, to pursue energy (other than oil and gas) production activities on the OCS. The Officer's Certificate described in COMAR 20.61.06.02 F (1) above effectively provides written consent to submit an application.

COMAR 20.61.06.02 F (4)

(4) Name, title, address, telephone number, email address, and curriculum vitae of each member of the OSW applicant's executive team and project team that will be responsible for the proposed project, demonstrating capability and expertise in, at a minimum, project management, development, financing, permitting, engineering, procurement, construction, operations, maintenance, decommissioning and other significant functions for ocean-based energy projects, utility-scale wind projects, or large scale generation projects;

Findings

Skipjack provided brief 1-2 page curriculum vitae for the company's key staff:

- Jeff Grybowski, Chief Executive Officer, has spent 15 years in senior corporate and legal leadership positions and 6 years in public administration. He was the lead developer of the Block Island Wind Farm and a regulatory expert for U.S. offshore wind.
- Chris van Beek, President, has spent 30 years in the offshore construction industry and 20 years managing major capital projects. He is the former COO of Heerema Marine Contractors, a leading offshore construction company.
- David Schwartz, General Counsel, has spent over 25 years in the energy industry and is a legal expert in U.S. offshore wind matters.
- David Hang, Chief Financial Officer, has spent 15 years in the private equity industry and 10 years in energy investing. He is a Senior Vice President of D.E. Shaw Group and a former Principal of J.P. Morgan Partners.
- Clint Plummer, VP - Development, has spent 10 years in renewable energy project development and 14 years in the electric power industry. He co-founded Endurant Energy, developer of three co-generation projects in New York City.
- Aileen Kenney, VP - Permitting and Environmental Affairs, has spent 12 years in the wind energy industry and 17 years in the energy industry, and has been involved in permitting over 50 wind projects.

- Paul Murphy, VP - Operations and Engineering, has spent 7 years in the energy industry and 4 years in strategic planning in NYC government, and is a contributing author to MIT's Natural Gas Report.
- Robert Billington, Project Manager, has spent 35 years in the global energy industry. He is a former Amoco and BP Project Director and has extensive experience building and operating offshore exploration and producing facilities.
- Dave Grassbaugh, Transmission Manager, has spent 40 years in the global energy industry. He is a Senior Electrical Engineer with HVAC and HVDC experience in offshore transmission.

The core Skipjack management team should be more than adequate for this project given their experience developing and managing the construction of the Block Island Wind Farm.

COMAR 20.61.06.02 F (5)

(5) For each entity that is, or has committed to, providing financing to the proposed project:

(a) The identity of the entity and a brief description of its business;

(b) Name, title, address, telephone number, and email address of the primary contact person;

(c) Most recent audited financial statements that use either generally accepted accounting principles or International Financial Reporting Standards; and

(d) Issuer or long-term senior unsecured debt ratings, or both, from at least one nationally recognized statistical ratings organization (if available);

Findings

According to the application, Skipjack intends to finance the project with $130 million (18.1%) common equity from Deepwater, $190 million (26.3%) of tax equity from an unidentified investor, and $400 million (55.6%) in debt from unidentified lenders. Skipjack believes that Deepwater's principal owner, D.E. Shaw, will be able to arrange tax equity based on its prior experience in this area, and it will be able to arrange debt financing from commercial banks, vendors, and/or export credit agencies. Deepwater Wind and D.E. Shaw are privately-held companies and do not have credit ratings.

Skipjack provided contact information for its primary contact, Clinton Plummer, VP of development.

Deepwater is actively involved in the development, construction, and operation of offshore wind projects, but as a private company does not have credit ratings. Deepwater provided audited 2015 GAAP financial statements that include its wholly-owned subsidiaries, including Skipjack. [redacted]

As a wholly-owned Deepwater Wind subsidiary with support from D.E. Shaw, we believe Skipjack has sufficient financial strength to undertake this Project.

COMAR 20.61.06.02 F (6)

(6) Name, title, address, telephone number, and email address of the primary contact at any entity with which the OSW applicant has a contract or similar agreement to perform permitting, engineering, procurement, construction, operations, maintenance, decommissioning or similar functions for the proposed project.

Findings

In its response to our requests for additional information, Skipjack confirmed it is working with the following subcontractors:

- CH2M Hill to support siting and development.
- AWST to optimize the turbine array and estimate energy production.
- Chadbourne & Parke and Rifkin, Weiner, Livingston, legal counsel.
- Mott MacDonald to design the electrical system.

Rifkin, Weiner, Livingston is the only company headquartered in Maryland. Additional contractors will be selected after Skipjack receives an MDPSC order and prior to financial close.

COMAR 20.61.06.02 F (7)

(7) Complete information about any current or prior business bankruptcies, defaults, disbarments, investigations, indictments, or any other actions against the OSW applicant and any member of the executive team, the project team, or key employee(s) of any company included in F(1) of this regulation.

Findings

Neither Skipjack nor any of its affiliates nor its employees had such actions.

COMAR 20.61.06.02 F (8)

(8) Complete information about work performed by one or more entities included in F(1) or (6) of this regulation that is similar to the proposed offshore wind project, including ocean-based energy projects, utility-scale wind projects, or other large scale generation projects.

Findings

Deepwater Wind, Skipjack's parent company, is in the process of completing the construction of the 30 MW Block Island Wind Farm, the first domestic offshore wind project, and is developing the 75 - 90 MW South Fork Wind Farm that is planned to deliver power to the eastern end of Long Island. Skipjack's engineering and permitting subcontractors all have offshore marine and/or wind experience.

PROJECT INFORMATION

COMAR 20.61.06.02 G (1)

G. An application shall include the following information about the proposed offshore wind project:

(1) A general description of the proposed offshore wind project, including but not limited to site plan, location, number of turbines, nameplate capacity, area, typical distance to shore, typical water depths, general seabed description, main competing uses, and sensitive areas.

Findings

Skipjack provided a complete description of the Skipjack Project to be located on the OCS off the Delaware coast within BOEM Lease OCS-A 0482. The Delaware WEA was determined through a multi-year stakeholder engagement process conducted by BOEM and is located between 10 and 30 miles off the Maryland coast. Skipjack provided sufficient information regarding the site plan and turbine layout.

Skipjack indicated that its Project will utilize fifteen 8-MW class wind turbines for a total nameplate capacity of 120 MW. For design basis purposes, Skipjack has assumed that a Siemens 8 MW wind turbine will be used, but the final selection will not be made until a later date.

The total acreage for the lease area is 96,430 acres, however the total area for the Skipjack Project was not explicitly provided. Based on the standard area for OCS lease blocks (approximately 5,700 acres), the Skipjack Project area is expected to cover approximately 17,000 acres in the southern portion of the Delaware WEA. The Skipjack Project will be between 17 and 21 NM (20-24 miles) off the Maryland coast. The closest turbine to shore will be approximately 15 NM (17 miles) from the Delaware coast. Skipjack indicated that the water depths across the Project site range from 60 to 90 ft (18 to 27 m). A bathymetric survey of the area where the turbines will be located has not been conducted.

[redacted]

[redacted]

In response to our queries, Skipjack indicated that competing uses and sensitive areas were taken into consideration when defining the lease area, with the objective of minimizing impacts on competing uses including fishing and marine traffic and sensitive areas including benthic habitats and dumping grounds. Wind turbines have been located at least 1 NM (just over 1 statue mile) from marine traffic lanes and outside of designated fishing grounds. Skipjack indicated that further analysis and stakeholder engagement will occur during the development, construction, and operations of the Project.

Skipjack did not provided a comprehensive assessment of competing uses and sensitive areas but it is reasonable that additional work will be required to identify potential conflicts and competing uses. Based on the information presented, there are no critical conflicts that either have not been considered or represent significant risks for the Project.

COMAR 20.61.06.02 G (2)

(2) General maps showing turbine layout, landfall and grid interconnection points, and construction layout site;

Findings

Skipjack provided several maps showing the turbine layout, export cable, landfall, and grid interconnection points. Skipjack also provided a map showing the location of the primary port, Sparrows Point Shipyard, for supporting the construction of the Project as well as the proposed sailing route from the port to the Project site. The general layout of the Project is reasonable.

COMAR 20.61.06.02 G (3)

(3) A wind resource and energy yield assessment at planned hub height with supporting data in an industry-standard report with expected gross (at generator terminals) and net (at PJM billing meter) annual energy production, including a breakdown of energy losses as well as turbine technical availability (scheduled and forced outages), uncertainty estimates of the net annual energy production at confidence intervals (P5, P10, P50, P90, and P95), and hourly energy production profiles by month (12x24 matrices) for a typical year;

Findings

We reviewed the preliminary wind resource and energy yield assessment conducted by AWST on behalf of Skipjack. The assessment provided all of the information required by the Regulations, including:

[redacted]

- Net energy (delivered to PJM) of 455,458 MWh/year (43.3% net capacity factor)
- Energy uncertainty estimates at the specified confidence intervals
- A 12x24 energy production profile indicating maximum production October-March and minimum production June-August

The assessment deviates from an industry-standard assessment in that it relies entirely on a proprietary mesoscale wind map to estimate the wind resource at the turbine hub height at the Project site. An industry-standard assessment would consist of at least some measured data, but this is an acceptable deviation given this early stage of project development.

The energy yield assessment by AWST was based on a total capacity of 120 MW for fifteen generic 8 MW turbine / 179 m rotor diameter designs created by AWST, based on existing technology and expected technological progression. This assumption is different from the Siemens 8MW turbine model with a 154 m rotor used for the Project design basis and adds substantial uncertainty to the energy production assessment. The AWST report did not detail the assumptions made regarding the individual sources of uncertainty; as such, it is not clear what level of uncertainty AWST have considered to account for this assumption.

The layout presented in the assessment was optimized for energy production and did not consider a comprehensive constraints assessment. This is reasonable at this early stage of project development.

We agree with AWST's recommendation for further investigations, including collecting high quality wind, meteorological, and oceanographic data within the Project area for a minimum of one year. We note that the Skipjack Project will not include an offshore meteorological mast, but Skipjack intends to apply the same approach that was used for Block Island Wind Farm for wind resource assessment and energy production estimation. Although Skipjack did not describe this approach, we expect that Skipjack will use floating Light Detection and Ranging (LiDAR) systems to collect onsite wind resource measurements.[112] In addition, any change in the turbine model or layout will need to be incorporated into an updated analysis.

[112] Other wind developers have used LiDAR to measure wind speeds at specific hub heights. It is less expensive than installing a meteorological tower, but the LiDAR data should be validated with high-quality data, e.g. from a nearby offshore meteorological tower.

COMAR 20.61.06.02 G (4)

(4) Wind turbine technology with turbine manufacturer, model, performance history, track record in offshore wind applications, physical dimensions and weight, hub height, rotor diameter, and nameplate capacity, design standard, turbine certification status under applicable standards and guidelines such as those developed by the International Electrotechnical Commission, service life, and design life information;

Findings

Skipjack selected 8 MW turbines, stating that models are available from a number of suppliers. The Siemens 8 MW offshore wind turbine with a 154 m rotor diameter was selected as the design basis for the Skipjack Project and Siemens has provided a letter of support (Att 2-9) relating to the supply of fifteen SWT-8.0-154 models.

In response to questions submitted in September 2016, Skipjack provided characteristics for the proposed turbine model, stating nacelle dimensions of 8 m x 8 m x 20 m (height x width x length) and weight approximately 450 t; tower diameter of 6 m and weight of approximately 400 t in three sections. Skipjack expects a 180 m rotor diameter in the final design of the 8MW machine and 114m hub height. The generic 8 MW turbine used to estimate energy production for the Skipjack Project had a 179m rotor diameter.

Skipjack stated that they are also engaged in discussions with other suppliers of purpose-built offshore turbine in the 8MW class such as General Electric, MHI Vestas, and Adwen. If there is a better offer from another supplier, they may elect to modify the Project's design to incorporate a different turbine.

Siemens' support letter (Att 2-9) refers to the SWT-8.0-154 model that was designed according to IEC61400 standard and is intended for use in offshore conditions. It has a design life of 25 years according to IEC Class IB, depending on site conditions. Siemens plans a prototype for early 2017 and expects to have type certification in accordance with IEC61400 by mid-2018. The SWT-8.0-154 builds on the existing SWT-6.0-154 machine, which is installed in commercial projects. Siemens advises that the risks associated with the certification of this turbine are very low as it is built on existing Siemens' 6.0 and 7.0-154 technology and it re-uses Siemens' existing supply chain and facilities. Both the SWT-6.0-154 and SWT-7.0-154 models are in serial production with growing operating experience and substantial order books in European offshore wind projects. While the status of the proposed Siemens 180 m diameter model (SWT-8.0-180) was not addressed, we expect this model will be type certified in time for the proposed COD.

We consider the selection by Skipjack of an 8MW model of 180 m rotor diameter is reasonable, and in line with the industry expectations of offshore turbine development in the next five years. We believe the optimum rotor diameter for an 8 MW model is in the region of 180 m rather than smaller 154 m rotor diameters. Siemens is the industry

leader in terms of the number of offshore wind turbine units in operation and is very experienced in the systematic development of new models. Modification of the Siemens 8 MW turbine design to extend from 154 m to 180 m rotor diameter will particularly require the consideration of the greater loads on the turbine machinery, especially under extreme conditions. However, we do not see this design development as a significant risk given the track record of Siemens.

As of October 2016, the MHI-Vestas V164-8.0 MW turbine with 164 m rotor diameter is the only 8MW model that is type-certified and in serial production. Construction of the first commercial offshore wind farm with 32 of these 8MW turbines is nearing completion at Burbo Bank Extension, UK. MHI-Vestas offers an 8.4MW variant of this model, with 11 units on order for the Aberdeen Offshore Wind Farm. The Adwen 8-180 machine, with 8MW capacity and 180m rotor diameter, is expected to be in serial production in 2018, with an onshore prototype being constructed in Bremerhaven. This model has been earmarked for three French offshore wind farms under development. Other turbine manufacturers are planning offshore turbines of 8MW and greater capacity, some of which may potentially be available in time for consideration for the Skipjack Project.

It is likely that an 8MW turbine with approximately 180m rotor diameter will be available to support a 2023 COD, although there is no experience to date of offshore turbines with this rotor diameter. At the time the turbine model needs to be selected, there is likely to be a choice of experienced suppliers with type-certified turbines in serial production. However, Skipjack has not fully taken into account the possible differences between 154 m and 180 m rotor diameters that could lead to larger component dimensions and greater weights due to more severe loading conditions. This does not materially affect the application at this stage, but if the Skipjack Project proceeds, the larger rotor will need to be included in the design basis for the support structures and for the installation logistics. This flexibility in turbine selection is acceptable in this early stage of project development.

COMAR 20.61.06.02 G (5)

(5) Foundation and support-structure descriptions that include explanations of why the foundation and support structures are appropriate for the site, as well as climatology information that includes wind, wave, and current data;

Findings

Skipjack stated "The Project has been designed using steel monopile foundations. Monopiles are the most cost-effective and proven wind turbine foundation technology currently in use and, due to its simplicity of both fabrication and installation, are the design basis of choice for most offshore wind farms in Europe. Monopile foundations are an appropriate foundation type due to the shallow water depths and met-ocean conditions in the Project site."

In a footnote, Skipjack stated that they are also evaluating the technical and economic potential for other foundation designs and may elect to use a different, unspecified, foundation design if it could reasonably and materially improve the Project performance. The application gave little further explanation of factors leading to the selection of monopiles. In response to questions, Skipjack provided a spreadsheet with their qualitative analysis of alternative foundations (Appendix 6-1 Foundation Evaluation) that included monopiles, several jacket concepts, and gravity base foundations, considering criteria such as suitability to site conditions, ability to manufacture and install, and cost. While the analysis and conclusions appear to be reasonable, the analysis itself is very high level.

Skipjack provided the title of a desktop geosciences study prepared for Bluewater Wind but no information on its content. [redacted]

Skipjack subsequently provided a Geotechnical and Pile Design Report and a Seafloor Scour Evaluation conducted for NRG Bluewater Wind by Fugro, a geotechnical, survey, subsea, and geosciences services company. [redacted]

Skipjack provided a draft met-ocean report (Att 2-10) but did not comment on the content. [redacted]

The application gives little information on the features of the monopile foundation design. [redacted]

Skipjack stated its plans to engage EEW Steel to supply the monopiles. However, Skipjack did not state where it will obtain the required expertise to design the individual foundations. Typically, the foundation for each turbine would be individually designed according to the local geology, water depths and loads. It is not clear whether Skipjack has identified the specialist expertise needed. We do not see this as a major risk given that there are several design engineering companies that can support this work and Deepwater Wind has experience with the foundation design process.

We agree that monopiles are the most prevalent foundation technology for offshore wind turbines. Although Skipjack provided a limited explanation of the factors that influenced its selection of foundation type, monopiles appear to be a suitable choice based on the limited information provided and general information available publicly. While Deepwater's Block Island Wind Farm utilized jacket foundations, monopiles are a very well established foundation concept in the offshore wind industry. [redacted] In addition, Skipjack clarified in its responses that it intends to integrate the OTM with a turbine on one of the foundations, which will also require an individual foundation design.

COMAR 20.61.06.02 G (6)

(6) A description of the electrical collection system and connection to the transmission grid that includes the location and description of any onshore and offshore substations, inter-array and export power cables, interconnection route, landfall and facilities (including rights of way), interconnection plans, status of the interconnection request submitted to PJM, schedule for completing the interconnection studies, and electrical one-line diagram of the facility up to the interconnection point;

Findings

Skipjack provided a high-level description of the electrical collection system and interconnection for the Project, including the key components of array cables, OTM, export cable, onshore substation, and interconnection facilities, as well as one-line diagrams for two interconnection options. For the collection system, fifteen 8 MW nominal turbines will be connected in a daisy-chain configuration with a buried 34.5 kV 3-core AC submarine cable in four strings each connecting three or four turbines. The four turbine strings will connect to a Siemens OTM substation at Turbine 15. The proposed OTM is a modular transformer design that can be mounted directly on the

same foundation as a wind turbine and would include a 84/112/140 MVA, 34.5/138 kV, two winding transformer with associated reactors, switches, and breakers.

The Project will be connected to shore by an export cable from the OTM to an onshore substation. The export cable will include between 17 to 21 miles of buried 138 kV 3-core 300 mm^2 copper core submarine cable from the OTM to a landfall location and continuing to either DPL's 138th Street Substation or Ocean Bay Substation via approximately 0.5 to 5 miles of buried onshore cable that will be located within public ROWs or on public land.

Skipjack expects the submarine export cable will go through a horizontally drilled duct and connect to a new buried onshore cable to be routed beneath roads to the interconnection point with Delmarva Power's transmission system. In addition to the two potential interconnection locations, Skipjack identified four potential landfall locations. Mott MacDonald have been contracted to prepare a feasibility assessment for the interconnection. The Skipjack application did not discuss the procurement of the cable, but there are multiple global suppliers of such cables.

Skipjack stated that the export cable and the array cables will be buried in the sea-bed. The sea-bed contains sand waves, indicating a potential for seabed mobility and for cables to become exposed. Skipjack plans to conduct a burial risk study to account for such features and ensure that an appropriate burial depth will be achieved. Based on the sea-bed conditions, we expect that scour protection around bases of foundations and/or along some stretches of cable will be required. The application did not include any description of scour protection or other cable protection that may be necessary in areas where target burial depths are not achievable. In response to queries, Skipjack indicated that a survey plan for the operational period will be implemented and where remedial work is necessary to maintain the required burial depth or level of protection, diver hand-jetting or mattress placement will be used as corrective measures.

An interconnection feasibility review was performed by Mott MacDonald, assuming a 120 MW plant interconnecting at 69 kV, 138 kV, or 230 kV. Mott MacDonald concluded that the 138 kV system along the Maryland coast represents the best option for interconnecting the Skipjack Project at the 138th Street substation or Ocean Bay substations. The review assumed minimal system upgrades would be necessary. The facilities costs detailed in the interconnection feasibility review are reasonable, and a detailed study of system upgrades and costs will be conducted through the established PJM process once Skipjack requests an interconnection.

The Skipjack Project schedule included the interconnection studies and agreement. Overall, the conceptual electrical collection system design and interconnection plan are reasonable and consistent with expectations given the early status of the Skipjack Project.

COMAR 20.61.06.02 G (7)

(7) Site-control status and plan to acquire and ensure site control for the operating term, interconnection and right-of-way status (or plans), and status of discussions with BOEM and other relevant entities;

Findings

The Skipjack Project will be located within the federal lease area off the coast of Delaware originally leased to Bluewater Wind Delaware, LLC (Lease OCS-A 0482).[113] Skipjack's parent company, Deepwater Wind, through its joint venture subsidiary, entered into an Assignment and Assumption Agreement with Bluewater Wind Delaware, LLC and its sole member NRG Bluewater Holdings, LLC for the purchase and sale of the lease. BOEM has confirmed that Deepwater Wind's subsidiary is technically and financially qualified to hold this lease. Additionally, Deepwater Wind has an agreement in principle to subdivide the lease and is in the process of negotiating the terms.

The lease provides for any necessary easements through Federal waters for export cables. Skipjack has identified a potential route for the export cable from the OTM to a DPL substation. A portion of the export cable will be located in State waters and will require a ROW grant from the Maryland Department of the Environment. Skipjack indicated that the process of obtaining this grant will commence during the permitting process. Skipjack also indicated that all of the infrastructure can be located within public ROW's or on public lands. Determination of the final upland route and site control plan for the onshore portions of the transmission system, i.e. landfall, buried cable, substation, and interconnection facilities, will be identified through the PJM process and in consultation with relevant Federal, State, and local authorities. Skipjack indicated that detailed discussions with BOEM and those authorities have not commenced but will be initiated with the permitting process after an MDPSC order.

Skipjack indicated that site control for port facilities to support the development and construction of the project will be the responsibility of contractors, which is a reasonable and common approach. Skipjack will be responsible for obtaining site control for O&M facilities. Deepwater Wind executed a similar strategy for the Block Island Wind Farm.

Although the BOEM lease assignment has not been finalized, Skipjack has demonstrated that it has a viable plan to obtain exclusive site control of the southern portion of the Delaware WEA. The level of engagement with various stakeholders is appropriate for the current stage of the Skipjack Project. Although the specific ROW for the export

[113] While the Skipjack lease area is off the coast of Delaware, it is also 10 to 30 miles off the coast of Maryland as required by the definition of a Qualified Offshore Wind Project, as discussed on pages 139-140 of this report.

cable is yet to be determined, Skipjack understands the processes for obtaining the necessary ROW and an interconnection with PJM, and has a credible permitting plan.

COMAR 20.61.06.02 G (8)

(8) A general description of balance of plant components that includes any meteorological mast, communication system, and supervisory control and data acquisition system;

Findings

Skipjack included a brief description of the primary BOP components, including the communication and control system, one-line diagrams showing 34.5kV subsea array cables linking the turbines to an OTM in four strings, and a single 138kV subsea export cable to shore. No meteorological mast is mentioned or shown on maps.

Skipjack stated that communication and SCADA systems for the Project will be provided by the turbine provider. A remote telemetry unit may be used, with similar architecture to the system used by Deepwater at the Block Island Wind Farm. In response to queries, Skipjack stated that the Project will have a single integrated SCADA system based on the core turbine system supplemented by systems to link the OTM and the remote operations center. Skipjack proposes to use proven technology as far as possible. We consider this description to be brief but reasonable.

In response to our queries, Skipjack indicated that the Project will not utilize an offshore meteorological mast to collect wind data. Skipjack indicated that it will utilize the approach that was used for Block Island Wind Farm for wind resource assessment, energy production estimation, and operations, which we know used LiDAR and not an offshore meteorological mast. Thus, we expect Skipjack will utilize a floating LiDAR system to collect onsite wind resource measurements.

COMAR 20.61.06.02 G (9)

(9) A procurement and construction plan that includes the following, with milestones:

(a) All steps from commencement of procurement and construction to testing and project COD of the proposed project;

(b) A contracting strategy and construction organizational chart;

(c) A description of laydown, storage, and assembly areas;

(d) The OSW applicant's plan to promote the prompt, efficient, and safe completion of the proposed project (particularly with regard to the construction and maintenance of the project in accordance with Public Utilities Article, 7-704.1(d)(1)(ix), Annotated Code of Maryland);

(e) Plans to comply with The Merchant Marine Act of 1920; and

(f) A framework for a construction period health and safety plan;

Findings

Schedule

Skipjack provided a Milestone Schedule (Table 2-2) in which Financial Close occurs February 2021, Offshore Construction starts April 2022, and the COD is October 2022. The Project Schedule (Attachment 2-22) has planned timings and durations of the permitting, engineering & design, procurement, construction, and commissioning phases for each major work-stream, i.e. foundations, transmission, and turbines. A revised Project Schedule (Appendix 18-1 to responses to queries provided on October 28, 2016) was also provided, with various changes including the following:

- Commencement and completion of the interconnection studies and agreement 16 months earlier than previously proposed
- Addition of a line item for port upgrades
- Reduced durations for foundation fabrication and wind turbine procurement, fabrication, and delivery
- Minor adjustments to durations for various construction and commissioning activities

The estimated durations appear reasonable, assuming that the contracts are lined up and ready for implementation at the point that financial close is reached. The Milestone and Project Schedules were based on a February 24, 2017 selection date, which is inconsistent with the expected date of an MDPSC Order. The Project Schedule could have had a more detailed breakdown for each phase, which would be reasonable even for this early stage in the development.

Skipjack also provided a 7-page Procurement & Construction Plan with descriptions of the likely marine construction operations. Additional information indicated that the sailing route from Sparrows Point to the Project site would require the vessels to pass through the Chesapeake & Delaware Canal.

Skipjack's Construction Schedule indicated offshore construction over 6 months (May to October), with foundations, cables, OTM, and turbines installed approximately in parallel using multiple construction vessels. While these durations appear reasonable (assuming competent vessels are used), relying on a single heavy-lift jack-up vessel to install foundations and turbines poses a risk that weather restrictions in the later months will delay completion until the following year. The number of vessels required and the logistics of their use will need to be carefully considered, in particular considering (i) the route from Sparrows Point to the Skipjack Project site, (ii) potential navigation restrictions through the Chesapeake-Delaware Canal, and (iii) Jones Act restrictions on non-US vessels. Skipjack stated that the bridge's 132 feet (41 m) vertical clearance on the Chesapeake-Delaware Canal is sufficient for material barges to pass

underneath, but may not be sufficient for jack-up vessels, particularly large vessels with capabilities to transport and install 8 MW turbines.[114] Vessel selection and offshore construction logistics will need to be carefully considered, and may result in a longer construction schedule.

The Construction Plan states that the heavy-lift jack-up vessel will need a crane capacity up to 1000 tons for the foundation installation. We are concerned that the 180 m rotor may require a heavier foundation that will need a greater lift capacity, after considering potential allowances for secondary steelwork, lifting gear, dynamic lifting, and uncertainties. Skipjack should have better identified and addressed the risks to the Construction Schedule, even at this early stage of project development.

Contracting Strategy

Skipjack described its contracting strategy, which we believe is reasonable and reflects typical contracting practices. Skipjack intends to design and build the Project using a limited number of discrete contracts that can each be executed with contractors having expertise in the respective field. This is now a common contracting mechanism in Europe.

The Construction Plan indicated there will be six main work packages, two for each of the main work-streams (foundations, transmission, and turbines), under the in-house Skipjack project management team to oversee and integrate the work. The application listed the benefits of this strategy, i.e. cost effectiveness, bankability, and familiarity, and takes advantage of the Skipjack team's experience with the development and construction of the Block Island Wind Farm. According to Skipjack, this approach is now common for offshore wind projects in Europe.

Skipjack has identified major contractors and we believe they can provide the capabilities required. Skipjack identified local contractors where possible, though in some areas European contractors with specialist capabilities were selected. Skipjack has identified and received expressions of interest from:

- EEW Steel (Europe) for the manufacture of very large diameter steel tubular sections
- Gulf Island Fabricators (US) for the welding assembly of monopile sections and transition pieces at Sparrows Point
- Siemens (Europe) to supply the turbines
- Montco (US) to install the foundations, including provision of some vessels

[114] The primary installation vessel for the Block Island Wind Farm (with five 6 MW turbines), the Brave Tern, had to pass under the Jamestown Bridge that has a similar clearance to the bridges over the Chesapeake-Delaware Canal.

Skipjack did not identify any contractors for the electrical components, in particular the provision of the subsea power cables or the OTM. However, Skipjack stated that during the Block Island Wind Farm project, they established relationships with key electrical component suppliers and listed major providers of subsea power cables. If approved by the MDPSC, Skipjack intends to conduct a similar competitive procurement process. While the Block Island Wind Farm did not include an OTM, this procurement approach appears appropriate.

Laydown, Storage, and Assembly areas

If selected, Skipjack will work with the State to determine the optimal location for assembly, fabrication, unloading / offloading, storage / staging and other onshore activities. Skipjack proposed to use the Sparrows Point Shipyard as the logistics hub for the Project.

Few relevant details on Sparrows Point were provided in Skipjack's application, though it recognized that development of the Maryland port and manufacturing infrastructure would be a positive outcome of the Skipjack Project. We note that the port requirements, e.g. particularly land and quayside availability for storage and logistics, for the relatively small Skipjack Project would not be as great as for a larger project that uses the entire Maryland or Delaware WEA capacity. Skipjack noted that other port facilities within Maryland are also being considered. The port requirements, however, will ultimately depend upon the selected turbine and foundation technology and Skipjack's construction and logistics strategy.

Plan to Promote the Prompt, Efficient, and Safe Completion of the Project

Skipjack provided brief descriptions on how it plans to execute the development and construction of the Skipjack Project under multiple contracts with industry-leading firms. The selection of these firms will include consideration of their Maryland workforce and/or of their Maryland subcontractors, workforce skills and capabilities, training and safety programs, and their commitment to employ skilled workers. If selected, Skipjack plans to enter discussions with Maryland-based firms and organizations, including organized labor, on the availability of skilled workers for the Project.

Skipjack stated that robust procedures and audits are in place to ensure proper procedures are followed during the construction phase. In addition, Skipjack will develop its own O&M management team led by the Asset Director that will be fully involved in Project design and construction to ensure optimum availability and energy output. The O&M Plan indicates a comprehensive range of roles and responsibilities, including mobilizing the O&M team to take over once the Project is commissioned and the safe and efficient operation of the Project.

Compliance with the Merchant Marine Act of 1920 (Jones Act)

Skipjack indicated that vessels compliant with the Jones Act will be used for all operations where necessary. Skipjack anticipated that a U.S. flagged wind turbine installation vessel with sufficient crane capacity to complete the work will be available by the time the Skipjack Project is constructed. If a foreign installation vessel is utilized, Skipjack will use US-flagged feeder barges to transport components from the onshore construction staging area to the installation vessel at the offshore construction site. We believe this approach of using US feeder vessels and a foreign installation vessel is compliant with the Jones Act, as previously shown by Deepwater for the Block Island Wind Farm.

Health and Safety Plan

We anticipate that the health and safety plan for Skipjack's construction will be developed in accordance with BOEM regulations and defined in the COP, which is typical practice.[115] In response to queries, Skipjack responded that they will develop a project-specific plan based on the equivalent plan implemented for the Block Island Wind Farm, which was an 8-page document that included responsibilities of individuals and managers, objectives and principles, responsibilities of contractors and suppliers, equipment standards, personnel competency and training, and reporting.

Summary

In summary, we find that Skipjack has presented a construction and procurement plan that is generally responsive to COMAR 20.61.06.02 G(9), though there are some key aspects that represent significant risks for the schedule and in other areas there is insufficient detail for us to make a clear appraisal. It is typical for there to be many uncertainties at this stage of project development, but it is not clear whether Skipjack has recognized and addressed the range of potential risks. The most serious risks are (i) construction delays due to relying upon a single heavy-lift vessel for foundation installation and turbine installation with the Schedule assuming these phases are overlapping, and (ii) extra costs if the 180 m rotors require a heavier foundation that will need larger vessels with a greater lift capacity. While the 120 MW Skipjack Project is larger than the 30 MW Block Island Wind Farm developed by Skipjack's parent company, Deepwater Wind, the plan to construct the Project over a single season is reasonable for the current design and should help control the costs and risks associated with procurement and construction. The OREC process was designed to accommodate COD delays and Maryland ratepayers would not be exposed to any risks due to such delays per COMAR 20.61.06.16.

[115] A developer is required to submit a COP within five years of receiving an offshore renewable energy lease from BOEM. The COP must provide a description of all proposed activities, planned facilities, and project easements. All activities must be conducted in a manner that ensures safety and prevents undue damage to archaeological or natural resources.

COMAR 20.61.06.02 G (10)

(10) An operations and maintenance plan with a schedule of principal operations and maintenance activities, locations of specific ports with operations and maintenance facilities, and estimated operations and maintenance labor divided between specialized out-of-state and in-state labor;

Findings

Skipjack prepared an O&M Plan that provided a high level overview of the planned O&M activities and facilities, along with the associated division of responsibilities. According to the O&M Plan, the turbine supplier will be responsible for turbine O&M under a Service Agreement, but it does not state the proposed term and scope for this agreement. Skipjack will be responsible for the BOP O&M that includes the monopile foundations, the array cables, the OTM, the export cable, and the onshore substation. The O&M Plan does not describe any warranty coverage other than the operator will maintain a minimum availability to assure the Project will be able to generate electric power a high percentage of the time.

Skipjack's O&M Plan mainly focuses on the description of the management staff responsibilities and lacks a description of how the plant will be operated and maintained as well as detailed information on logistics and equipment required. The O&M staffing requirements chart only covers the onshore requirements and it is unknown how many technicians will be deployed to service the turbines. In response to queries, Skipjack indicated that approximately 20 full-time employees will support Project operations, including direct employees and employees of prime contractors.

Skipjack indicated that they will use no fewer than two marine support vessels to access the wind turbines for O&M activities and will guarantee transportation service availability. However, more than one vessel is likely to be an unnecessary requirement for a project of this size. Skipjack did not provide any analysis or other information that was used as the basis for the O&M vessel plan. In response to queries, Skipjack indicated that it intends to use vessels similar to the crew transfer vessel (CTV) design being used for the Block Island Wind Farm. [redacted]
Although other factors such as current can influence the ability of a vessel to transfer crew members, the wave conditions are the key driver and based on the information provided, the proposed CTV design will allow for operability the majority of the time.

Skipjack also indicated that a floating crane vessel will be contracted as required for major component replacements. In response to queries, Skipjack indicated that a jack-up lift barge from the Gulf of Mexico or the North Sea would be contracted to support such repairs. Skipjack has not identified any specific vessel providers for these operations, and the O&M Plan does not include any description of how major

component replacements would be accomplished, an important factor for long-term performance. Skipjack should better define an equipment replacement strategy before construction.

Skipjack plans to locate its Shore Operations Center at one of the commercial marinas in Ocean City, Maryland. Skipjack indicated that a desktop evaluation of different possible options along the Ocean City waterfront was conducted based on the CTV specifications as described above. Skipjack indicated that this study addressed physical space, channel depths, marina capabilities and other limitations. Based on this evaluation, Skipjack concluded that multiple suitable locations were available for supporting routine maintenance activities using a CTV similar to the one described above. Skipjack did not provide any documentation from this desktop evaluation and did not address whether or not larger vessels, e.g. cable laying or jack-up vessels, could operate from Ocean City to facilitate repairs or replacements. This is not a major issue for the Project, since major component replacement works are infrequent and could be mobilized from alternative ports, but this consideration should ultimately be included in the O&M Plan.

Skipjack indicated that the Shore Operations Center will consist of administrative support offices, a warehouse facility, a maintenance shop, a dispatch and operational control center, and a marine terminal for the Project's CTV. Skipjack did not supply further details regarding the actual location or the planned specifications for such facilities, or whether it will develop such facilities or only operate them. According to the O&M Plan, Skipjack will develop an inspection and a preventive maintenance program for the foundations and the transmission systems, however there are no details regarding these inspections or program.

The O&M Plan indicated that Skipjack will maintain a sufficient number of spare parts and consumables required to ensure a high minimum availability as well as maintain a limited number of strategic components such as subsea cable. This is good industry practice, however the application lacked any details regarding the actual components to be stored and maintained. This is reasonable given the current early stage of Project development.

Overall, the O&M Plan is missing some relevant information that will need to be addressed but is adequate at this early stage of project development. We expect Skipjack will have to address limitations and risks of using Ocean City as its Shore Operations Center. We note that by the time the Skipjack Project reaches commercial operations (expected in late 2022), Skipjack will have the benefit of six years of Block Island Wind Farm operations.

COMAR 20.61.06.02 G (11)

(11) A permitting and approvals plan with a detailed matrix listing all required federal, state, and local environmental and regulatory permits and approvals, and setting out the schedule for obtaining the permits and approvals. This should include plans to obtain a certificate of public

convenience and necessity for a proposed qualified submerged renewable energy line and plans to conduct an environmental review in compliance with applicable statutes, such as the National Environmental Policy Act, and that include a description of the types of studies (physical, biological and socio-economic) to be performed. Plans should demonstrate compliance with the Endangered Species Act, Migratory Bird Treaty Act, and Marine Mammal Protection Act, applicable BOEM regulations and guidelines for surveying natural resources (including, but not limited to avian species, benthic habitats, fish, marine mammals, and sea turtles), local/state regulations, and the Coastal Zone Management Act, as applicable;

Findings

Skipjack provided a listing and discussion of the applicable federal, state, and local regulations along with an estimated filing date and agency review time. Our comments on each of these regulations are provided in Table 29 below. Given that Skipjack has not initiated the permitting process, our comments are primarily limited to whether or not the Skipjack application included all of the relevant permits and approvals. In order for the Skipjack Project to comply with NEPA, BOEM will conduct its environmental review through Skipjack's submission of a COP for the proposed Project.

A programmatic EIS was developed for the site by BOEM prior to issuing a lease. This programmatic EIS evaluated whether issuing a lease and approving an SAP would have an environmental impact on the OCS and established policies, best management practices, and mitigation measures. In January 2012, BOEM issued its environmental assessment (EA) report, *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment (USDOI, MMS, 2012)*, that determined there would be no significant impact for issuing of a lease or approving an SAP, thus an EIS would not be required. According to Skipjack, the Project will not include an offshore meteorological mast so an SAP will not be created. Instead, Skipjack will submit a COP to BOEM that will focus on building, installing, owning, and operating the 120 MW offshore wind farm. BOEM will be the lead federal agency and will conduct a project-specific NEPA analysis to determine if the impacts addressed in the COP are consistent with those identified in the EA and whether a project-specific NEPA EIS would be required. In its application, Skipjack stated that an EIS would most likely be required; therefore, the Project milestone schedule projects a timeframe for BOEM review and NEPA analysis to occur June 2018 -June 2020. We note that agency coordination, requests for additional information or studies, and public comment may occur during this time period which could affect this timeline.

To comply with NEPA regulations and requirements for a COP and federal, state, and local permits, Skipjack stated that it will conduct the necessary studies to assess environmental resources and potential impacts and to develop mitigation plans. Anticipated studies for the COP will include geophysical, geotechnical, marine archaeological shallow hazards survey, benthic habitat, hard bottom and topographic

features, other biological surveys (such as fish, marine mammals, sea turtles and sea birds), and protected species using existing data and new data sources as needed. The Milestone Schedule stated that a COP Survey Plan will be coordinated with federal, state, and local agencies beginning in early 2017 which would lead to on and offshore environmental data collection starting in summer 2017. Based on the data collected, the COP and all federal and state permits would be submitted in June 2018. Skipjack anticipates that all federal and state authorizations would be received by June 2020. Table 2-2 of the application indicated that all federal and state permits and authorizations will be issued by June 2020, but the revised project schedule presented as Appendix 18-1 indicates that approvals are expected by the end of January 2021. We find this schedule to be reasonable but subject to a high degree of uncertainty. Skipjack also noted that additional analysis of archeological / historic resources, transportation / navigation analyses, and wetland delineation will be completed to satisfy Maryland regulatory requirements. We note that if an EIS is required, additional studies on visual resources, air quality, noise, electromagnetic fields, environmental justice, recreation / tourism, and other socio-economic data may be required. A review of the key applicable environmental permits and approvals is provided below.

Table 29. Key Skipjack Environmental Permits and Approvals

Requirement	Permit/ Approval	Included in Application Permit Matrix/Comments
Clean Water Act, Section 404 – Nationwide Permit (33 U.S.C. 1344); Rivers and Harbors Act of 1899 (33 U.S.C. 403)	Section 10; 404 permit	Yes
Endangered Species Act (ESA) Compliance, Section 7 and Section 9 (6 U.S.C. 1531-1544; 60 C.F.R 17 and 424)	ESA Review (Section 7 consultation)	Yes

Requirement	Permit/ Approval	Included in Application Permit Matrix/Comments
Marine Mammal Protection Act (16 U.S.C. 31)	Incidental Harassment Authorization; Consultation with Nation Marine Fisheries Service and National Atmospheric Administration	Yes
Magnuson-Stevens Fishery Conservation and Management Act (50 CFR 600)	Essential Fish Habitat and NOAA consultation	Yes
Migratory Bird Treaty Act Compliance (16 U S.C. 703 – 712) and Bald and Golden Eagle Protection Act (16 U.S.C. 668 – 668d)	No permit; consultation with United States Fish & Wildlife Service	Yes
National Environmental Policy Act of 1969 (42 U.S.C. 4321)	NEPA Review after successful submission of COP	Yes
National Historic Preservation Act Section 106 Compliance (36 C.F.R. 800) and American Indian Religious Freedom Act (42 U.S.C. 1996)	Section 106 consultation with State Historic Preservation Office and tribal historic preservation office	Yes
Notice of Proposed Construction (Form 7460-1) Hazard Determination (14 C.F.R. 77.13, 77.15, 77.17)	Determination of No Hazard for turbine locations - FAA	No
Outer Continental Shelf Lands Act of 1953 (43 U.S.C.1331)	Lease	Yes
Phase I Environmental Site Assessment (ESA) (30 C.F.R. 312)	No permit	No. Phase I ESA may be needed for onshore construction; Phase I ESA was not listed on permit & approvals plan
U.S. Coast Guard Regulations (46 U.S.C. and 33 U.S.C. 30)	Private Aid to Navigation approval needed	Yes
Clean Air Act (42 U.S.C. 7627) Section 328	Outer Continental Air Quality Permit and Prevention of Significant Deterioration permit	Yes
Clean Water Act, Section 401- Water Quality Certification (33 U.S.C. 1341) – federally delegated to State	401 Water quality certification, federally delegated to Maryland Department of the Environment (MDE)	Yes
Clean Water Act, Section 402 - National Pollution Discharge Elimination System (NPDES) Permit (40 C.F.R. 122) – federally delegated to the State	NPDES permit - federally delegated to MDE	Yes
Coastal Zone Management Act	Consistency certification.	Yes

Requirement	Permit/ Approval	Included in Application Permit Matrix/Comments
(CZMA) (16 U.S.C. 1454, 1465)	Federally delegated to MDE	
Abandoned Shipwreck Act (43 U.S.C. 2101 – 2106)	Consultation with National Park Service	Yes

In reviewing the key permits and approvals for the Skipjack Project, we note that a Phase I Environmental Site Assessment (Phase 1 ESA) may be necessary for the on-shore transmission and interconnection facilities. The application states that all of the Project's permanent infrastructure will be located on public land owned by federal, state and local entities. However, if the on-shore locations change during the development process or if a lender is needed to provide a loan, then a Phase I ESA may be needed. In response to queries, Skipjack confirmed that a Phase I ESA will be conducted if warranted.

Determinations of No Hazard for turbine locations by the FAA may also be required. As mentioned above, if an EIS is required, then some additional studies would need to be completed. These studies could be done within the current timeline presented in the application. Prior to submitting a COP and as a requirement of the Lease OCS-A 0482, pre-survey coordination with BOEM is to be done 60 days prior to the initiation of the survey activities and to ensure that all areas and survey timelines will support a successful submission of a COP. Since an SAP will not be completed, the COP Survey Plan coordination will be an important step to ensure that the Project maintains the milestone schedule proposed by Skipjack.

In summary, the permitting process and milestone schedule outlined in Skipjack's application is reasonable and comprehensive. Given the limited information provided regarding environmental resource studies and permits / approvals, there is considerable uncertainty in the permitting timeline; however, we found that the schedule to achieve all surveys prior to COP submission is achievable with pre-survey consultations. The milestone schedule provides for two years of BOEM review, which is most likely achievable. If the milestone schedule is maintained, the Project could be operational in November 2022.

COMAR 20.61.06.02 G (12)

(12) A decommissioning plan that demonstrates the safe and environmentally responsible removal and disposal of the turbine structures, offshore electrical substation and other offshore facilities, and interconnection facilities, particularly those located in State waters and on State lands; a comprehensive estimate of facility and interconnection decommissioning costs; and assurance that adequate funding shall be available for complete decommissioning of the proposed project, including a detailed explanation of how adequate funding shall be assured.

Findings

Skipjack provided a one-page Decommissioning Plan outlining the general methodology for decommissioning and later provided some further information in response to questions. The offshore components of the Skipjack Project will be decommissioned in accordance with BOEM lease requirements and regulations. The Decommissioning Plan stated that the decommissioning process will involve activities comparable with the installation of the turbines and foundations but in reverse, with a heavy lift jack-up barge used for removing the components one at a time. This approach is in general appropriate.

Skipjack stated that the turbines will be fully removed and the foundations removed to a depth authorized by BOEM. Skipjack anticipates that the submarine cables would be left in place. BOEM regulations can permit certain components being left in place, so this approach is appropriate and is generally in line with industry best practices. Although the overall approach is appropriate, we would expect to see more detail overall in the Decommissioning Plan. Such detail is required even at this early stage, because BOEM requires financial assurance to be put in place before offshore construction can start.

The scope of the decommissioning operations must include not just the turbines and foundations, but also the OTM, the multiple cable ends, and scour protection. The scope of the decommissioning phase also needs to be wider than presented, for example including pre- and post-decommissioning surveys. Furthermore, we did not see any substantive recognition of the uncertainties in both the methodologies and the costs presented by Skipjack, or evidence of how safety and environmental issues will be considered.

Skipjack stated that Deepwater will provide and maintain financial assurance in accordance with BOEM regulations as required by current legislation. Skipjack estimated a gross decommissioning cost and revenue from scrap metal that would result in a lower net decommissioning cost. The details behind these estimates are very sparse and insufficient. We find that Skipjack's gross decommissioning estimate is of an appropriate magnitude based on our experience of detailed cost modelling of offshore wind farm decommissioning. However, we believe scrap metal revenue was over-estimated by Skipjack and, as a result, the net decommissioning cost is considerably under-estimated. This poses no risk for Maryland ratepayers, however, since BOEM will require Skipjack to fully fund and securitize the decommissioning.

COMAR 20.61.06.02 H

H. An application shall include a project COD and a proposed timeline for the proposed offshore wind project's development and critical path schedule that includes milestones for site assessment, engineering, permitting, turbine certification, financing, procurement,

manufacturing, construction, testing and commissioning commercial operation dates, and delivery term;

Findings

Skipjack provided a summary-level Milestone Schedule (Table 2-2) and a more detailed Project Schedule (Attachment 2-22, revised as Appendix 18-1) for the Project. However, several issues were identified: (i) the Project Schedule is based on a February 24, 2017 date, inconsistent with Skipjack's acceptance of an MDPSC Order by June 30, 2017; (ii) the critical path for the Skipjack Project is not shown, and (iii) milestones for turbine certification were not included. Although turbine selection has not been finalized, the proposed 8 MW turbine with a 180 m rotor diameter is expected to achieve type certification well before COD, so type certification is not expected to be a critical path milestone.

COMAR 20.61.06.02 I

I. An application shall indicate whether the proposed project's nameplate capacity is larger than required to provide the aggregate proposed OREC amount for the term of the proposed OREC price schedule. If the proposed project's nameplate capacity exceeds the capacity required, and the OSW applicant submits a two-part OREC price as described by M of this regulation, the application shall include a methodology for determining a reasonable allocation of the transmission upgrade costs to be included in the OREC price. The OSW applicant shall have the burden of demonstrating that its proposed allocation methodology is fair and in the interest of ratepayers.

Findings

The Skipjack Project nameplate capacity is not larger than required to provide the aggregate proposed OREC amount for the term of the proposed OREC price schedule, and, therefore, no transmission upgrade cost allocation is required. Skipjack proposed that its Project will have its own electrical collection system, OTM, export cable, and interconnection at a DPL substation; any other development in the Delaware WEA will be independent of the Skipjack Project.

COMMERCIAL INFORMATION

COMAR 20.61.06.02 J (1)

J. An application shall include the following commercial information related to the proposed offshore wind project:

(1) OSW applicant's plan for engaging small businesses;

Findings

Skipjack will require that its contractors use good faith efforts to achieve or exceed GOMA's expenditure goal of 10% for small business participation in permitting, engineering, construction and maintenance services within Maryland and for purchases of wind farm components. Given the early stage of development, Skipjack has made a reasonable commitment to engage Maryland-based small businesses and achieve GOMA's small business goal. We recommend that GOMA or another agency monitor Skipjack's future efforts to engage and utilize small businesses in Maryland.

COMAR 20.61.06.02 J (2)

(2) Subject to Regulation .06 of this chapter, OSW applicant's plan for compliance with the Minority Business Enterprise Program for the construction, manufacturing, and maintenance phases of the proposed offshore wind project;

Findings

Skipjack will require that its contractors use good faith efforts to achieve or exceed GOMA's goal of 29% MBE participation in permitting, engineering, construction and maintenance services within the State of Maryland and for purchases of wind farm components. Given the early stage of development, Skipjack has made a reasonable commitment to comply with Maryland's MBE goal. We recommend that GOMA or another agency monitor Skipjack's future efforts to engage and utilize MBE businesses in Maryland.

COMAR 20.61.06.02 J (3) and (4)

(3) OSW applicant's plan for the use of skilled labor, especially for the construction and manufacturing components of the project, including outreach, hiring, or referral systems, or all of these, that are affiliated with registered apprenticeship programs under Labor and Employment Article, Title 11, Subtitle 4, Annotated Code of Maryland;

(4) OSW applicant's plan for using an agreement designed to ensure the use of skilled labor and to promote the prompt, efficient, and safe completion of the project particularly with regard to the construction, manufacturing, and maintenance of the proposed offshore wind project;

Findings

Skipjack will build on Deepwater's experience gained through the Block Island Wind Farm to enter into agreements with local contractors to employ local skilled workers on significant elements of the project. Skipjack and each of its contractors will make good faith efforts to achieve or exceed the State's apprenticeship program objective. Skipjack's contractors will be made aware of the registered apprenticeship programs that are currently listed online through the Maryland Department of Labor, Licensing & Regulation website.

Given the early stage of development, Skipjack has an acceptable strategy to comply with Maryland's apprenticeship and training goals, as well as to utilize skilled labor to complete the project. We recommend that the appropriate Maryland agencies work with and monitor Skipjack's future efforts to train and utilize skilled laborers.

COMAR 20.61.06.02 J (5)

(5) OSW applicant's plan to provide for compensation to its employees and subcontractors consistent with wages outlined in State Finance and Procurement Article, Title 17, Subtitle 2, Annotated Code of Maryland.

Findings

As part of its contracting strategy, Skipjack will ensure that each of its major Project contractors and subcontractors performing work in the State of Maryland provides compensation for employees in accordance with the annually determined prevailing wage rate for each locality. Each major Project contractor will be required to post the prevailing wage rate at the site and to retain this post for the entirety of its business. Each major Project contractor will also be required to keep accurate and detailed payroll records which will be submitted to the Commissioner for inspection.

Given the early stage of development, Skipjack has an acceptable strategy to comply with Maryland's compensation requirements. We recommend that the appropriate Maryland agencies work with and monitor Skipjack's future efforts in this regard.

FINANCIAL INFORMATION

COMAR 20.61.06.02 K (1)

K. An application shall include the following financial information related to the proposed offshore wind project:

(1) Detailed financial analysis of the proposed project, including:

(a) A pro forma income statement, balance sheet and cash flow projection covering the development period, construction period and operating term during the term of the proposed OREC price schedule, with detailed revenues and expenses;

(b) Description and estimated benefits of any State or federal grants, rebates, tax credits, loan guarantees or other similar benefits received by the proposed project; and

(c) Estimated internal rate of return and return on equity;

Findings

Skipjack provided key financing assumptions and printed (non-active) financial income statement, balance sheet, and cash flow spreadsheets for December 1, 2022 - November 30, 2042, the expected 20-year OREC term. There appear to be some minor

mistakes in the income statement: the same OREC price was used for years 19 and 20 and certain expense data for the 11-month year of 2042 was reported for a full year. If the Skipjack Project were delayed for five years, the OREC term would be December 1, 2027 - November 31, 2044.

The pro forma income statement contained 17 line items and included key revenue and expense categories, along with provisions for depreciation and amortization, interest, and taxes. Skipjack confirmed that all operating expenses were included. The balance sheet contained 16 line items and included key asset and liability categories. The cash flow statement contained 7 line items and indicated positive cash flow after operating expenses and tax equity payments for the common equity and debt investors.

Skipjack assumed that construction would commence by year-end 2018, qualifying it for an 18% ITC and no PTC, since developers cannot utilize both credits. Current federal regulation authorizes a declining PTC or ITC for wind projects. Projects that commence construction by year-end 2016 would receive the full PTC or ITC; projects commencing in later years would lose one-fifth of these values for each year commencement is delayed. The IRS has determined that "physical work of a significant nature" must be undertaken or at least 5% of the project's cost be incurred to establish work commencement. In any event, the developer would then have four years to complete the project notwithstanding excludable disruptions.[116] We have not made any legal or tax determination whether Skipjack would in fact qualify for an 18% ITC. Skipjack provided limited IRR and ROE information that meets the COMAR requirements.

Skipjack's original application did not identify the benefits of grants, subsidies, etc. on the IRR and ROE estimates, beyond its assumptions of an 18% ITC and MACRS tax depreciation. In response to our request for additional information, Skipjack estimated the value of the ITC and accelerated tax depreciation benefits, monetized by the anticipated $190 million tax equity investment. Skipjack does not currently intend to apply for an MEA loan, a Game Changer Competitive Grant, or the Maryland Job Creation Tax Credit. Skipjack expects the last two programs will result in a "diminimis impact" on Project return and OREC price.

Skipjack has provided the financial information required by COMAR 20.61.06.02 K (1) to demonstrate its Project will be financially viable under its assumptions. As noted elsewhere in this report, Skipjack requested that its OREC price would be adjusted (i) if it receives a "fully-approved, mutually acceptable, and un-appealable order" after June 30, 2017 or (ii) if "a change in law or policy" increases or decreases its receipt of ITC.

COMAR 20.61.06.02 K (2)

(2) Proposed offshore wind project balance sheet at project COD with all capital expenditures broken down by major cost category;

[116] IRS Notice 2016-31.

Findings

Skipjack provided a balance sheet at the expected COD with assets divided into thirteen categories grouped into current and fixed assets. Liabilities were divided into nine categories grouped into liabilities and shareholder equity. Skipjack provided capital cost data for an appropriate number of categories, confirming that the Project's estimated total capital cost includes all capitalized expenditures.

The total estimated capitalized cost of $720 million is equivalent to $6,000/kW, which is at the high end of the range of other offshore wind cost estimates as discussed in the Methodology section of this report. The Skipjack cost is consistent with other project costs given its relatively small size and is therefore reasonable. [117] We expect that the first commercially-sized domestic offshore wind projects will likely cost more than European projects that have benefited from a relatively long history of actual construction experience.

COMAR 20.61.06.02 K (3)

(3) Proposed capital structure identifying equity investors, sources of debt, any other sources of capital, and written demonstration of equity and debt funding commitments, which include the following:

(a) For an OSW applicant that is seeking equity investors in a proposed offshore wind project:

(i) Documentation of the OSW applicant's serious, good-faith efforts to solicit and interview a reasonable number of minority investors, which shall include a demonstration of the OSW applicant's coordination with the Governor's Office of Minority Affairs; and

(ii) A confidential statement listing the names and addresses of all minority investors interviewed and whether or not any of those investors have purchased an equity share in the proposed offshore wind project; or

(b) For an OSW applicant that is not seeking equity investors in a proposed offshore wind project, a statement from that OSW applicant affirming that it is not seeking equity investors in the proposed offshore wind project;

Findings

Skipjack provided a proposed capital structure sufficient to fund the total Skipjack Project cost as follows. The common equity contribution of $130 million should be achievable by Deepwater Wind Holdings, based on its successful financing of the $360 million Block Island Wind Farm (plus a $100+ million underwater cable from Block Island to the mainland), the financial strength of its parent company, Deepwater Wind, and of Deepwater Wind's majority owner, D.E Shaw, and the option to bring on new equity partners. Both companies are privately held and do not have credit ratings.

[117] The Deepwater Block Island Wind Farm was excluded because it is a small, 30 MW, demonstration project.

The expected tax equity contribution of $190 million is based on the estimated value of the expected tax benefits, e.g. ITC and accelerated depreciation, which can be utilized by third parties. Skipjack assumed that project construction could commence in 2018 to qualify for an 18% ITC. Tax equity has been widely used to fund onshore wind projects. No specific tax equity investor was identified, but D.E. Shaw has arranged a number of such investments for its projects.

Skipjack intends to raise $400 million in senior secured debt from commercial banks, vendors, and/or export credit agencies. In sum, the proposed capital structure is about 44.5% equity and 55.5% debt, which should be a comfortable level of financial leverage. Certain accounts will be recorded by other entities, e.g. a debt service reserve will be funded and recorded at the holding company level.

Table 30. Skipjack Project Proposed Capital Structure

Common Equity	$ 130 million	18.1%
Tax Equity	$ 190 million	26.4%
Senior Secured Debt	$ 400 million	55.5%
Total Sources of Capital	$ 720 million	100.0%

Skipjack provided Letters of Interest from the following investors and lenders. Skipjack has not solicited interest from minority investors but attested that it will do so if it seeks outside investors.

Equity

- Deepwater Wind Holding, LLC
- D.E. Shaw & Co. (the majority investor in Deepwater Wind)

Senior Debt

- SG Americas Securities, LLC (part of the Société Générale Group)

Although Skipjack provided a limited number of expressions of interest from potential equity investors and lenders, it has provided adequate evidence of being able to fund its Project consistent with COMAR 20.61.06.02 K (3). Skipjack did not identify any minority investors that have been interviewed and did not document any efforts of coordination with GOMA.

Regarding its plan to utilize $400 million in senior secured debt, Skipjack stated "Realizing this level of cost-effective financing will require that the final OREC Order include certain provisions for project lenders including but not limited to grandfathering provisions to mitigate change in law risk." In response to our request that Skipjack clarify this statement by specifying the "certain provisions" that would be required, Skipjack submitted the following:

Lenders and investors will have difficulty accepting the risk of a constitutional challenge to the validity of the offshore wind program. Lenders will also want clarity on the priority of their lien and their ability to perfect that lien. Accordingly, language should be added, to the statute or regulations, as appropriate, that makes clear:

1) That the Maryland PSC has the authority to cause the winning bidder to receive payments for the full term of the commitment approved in the Maryland PSC order, whether or not there is a subsequent successful constitutional challenge to the program, or to the Maryland PSC order, under state or federal constitutional law.

2) That the lenders have priority in payments under the payments waterfall of the escrow account, at least at or above the second level of payments.

3) That the lenders are permitted to have a security interest over the right to receive payments from the Administrator GATS account and the reserve account, including to the proceeds from the enforcement of electricity suppliers' performance bond or other form of credit support that is securing their payment obligations (to the extent one is required).

4) That the lenders are permitted to have a security interest over the ORECs once beneficial ownership of an OREC has vested in the project company.

5) That the lenders have the right to step-in if the project company defaults under the financing documents and to enforce their security interests over their collateral (shares, assets and rights), including a right to assign the project to a successor producer or operating company that meets the qualifications of the OREC program.

6) That creditors of electricity suppliers cannot impose any liens on the OREC program accounts and that they remain, at all times, subordinated in right to the project lenders.

7) That the Maryland PSC can, in its order respecting the project, affirm the foregoing.

Except for the first provision above, we do not believe these provisions having to do with lenders' rights and the operation of the OREC escrow account are unreasonable. In any event, we believe the MDPSC has discretion to ascertain whether these conditions are acceptable and in compliance with COMAR and the Regulations.

COMAR 20.61.06.02 K (4)

(4) Year-by-year spending projections of expenses and capital expenditures by five- or six-digit NAICS code extending through the term of the proposed OREC price schedule and divided into four categories:

(a) In-State labor;

(b) In-State non-labor;

(c) Out-of-State labor; and

(d) Out-of-State non-labor;

Findings

In response to our request for additional information, Skipjack provided a year-by-year breakdown of construction period expenditures. Skipjack also provided a breakdown of the first full operating year (2023) expenditures. These expenditures were broken down by in-state labor, in-state non-labor, out-of-state labor, out-of-state non-labor and by NAICS codes. Total construction period (2017-2022) spending was estimated at $599.5 million, excluding $70.7 million in transaction costs and about $50 million in fees and related expenditures.

Table 31. Skipjack Construction Period Expenditures
(2021 $ millions)

Category	In-State	Out-of-State
Labor	$ 62.0	$ 102.2
Non-Labor	$ 142.8	$ 292.6
Total	$ 204.8	$ 394.7

COMAR 20.61.06.02 K (5)

(5) Detailed matrix, supported by documentation, demonstrating that the OSW applicant has applied for all current eligible State and federal grants, rebates, tax credits, loan guarantees, or other programs available to offset the cost of the proposed project or provide tax advantages;

Findings

Skipjack has not applied for any grants, rebates, etc. and therefore did not provide a matrix. Skipjack intends to qualify for an 18% ITC, assuming it receives a "fully-approved, mutually-acceptable, un-appealable OREC (a "Final Order") by June 30, 2017." An 18% ITC is effectively passed on to Maryland ratepayers in Skipjack's proposed OREC pricing. Qualifying for the ITC would be based on IRS guidance.

If the Skipjack Project is selected and a Final Order is received by March 30, 2017 (revised to June 30, 2017), Skipjack confirmed that it will bear the risk that it can satisfy the IRS requirements for an 18% ITC. However, Skipjack qualified its ITC assumption as

follows: "In the event of a change in law or policy that results in a different ITC eligibility, Deepwater Wind proposes to pass along those additional savings (or costs)..." Thus, even if Skipjack receives a Final Order by June 30, 2017, but a change in law or policy prohibits it from qualifying for an 18% ITC, its OREC price would be adjusted upwards.

If a Final Order is received within one year after the June 30, 2017 date, Skipjack expects to qualify for a 12% ITC and would adjust its OREC price upwards as described in our analysis corresponding to COMAR 20.61.06.02 M. We believe the MDPSC has discretion ultimately to ascertain whether these requested OREC price adjustments, and the consequential risk to Maryland ratepayers, are acceptable and in compliance with the Regulations.

COMAR 20.61.06.02 K (6)-(10)

(6) Affirmative statement of the OSW applicant's commitment to use best efforts to apply for all eligible State and federal grants, rebates, tax credits, loan guarantees, and other similar benefits as those benefits become available and to agree to pass along to retail electric customers 80 percent of the value of any State or federal grants, rebates, tax credits, loan guarantees, or other similar benefits received by the proposed project and not included in the application;

(7) Affirmative statement that the OSW applicant will execute a memorandum of understanding with the Commission that requires the OSW applicant to make serious, good-faith efforts to interview minority investors in any future attempt to raise venture capital or attract new investors to the qualified offshore wind project;

(8) Affirmative statement of the OSW applicant's commitment to deposit $6,000,000 into the Maryland Offshore Wind Business Development Fund, which shall consist of an initial deposit of $2,000,000 within 60 days of the Commission's approval of a proposed offshore wind project, $2,000,000 within 1 year after the initial deposit, and $2,000,000 within 2 years after the initial deposit;

(9) Affirmative statement by the OSW applicant that it will hold harmless the retail electric customers, OREC purchasers, and the State for any cost overruns associated with the proposed offshore wind project; and

(10) Affirmative statement that the OSW applicant will use commercially reasonable efforts to sell its electricity service attributes to the PJM markets.

Findings

Skipjack certified each commitment identified in subsections K (6) - (10) provided (i) its application is approved by the MDPSC and (ii) the project is determined to be a Qualified Offshore Wind Project. Skipjack's commitment to apply for State and federal incentives was further conditioned upon Skipjack's judgement that such incentives have a "material benefit for the Maryland ratepayers" and will "not adversely impact the ability of the Company to develop, construct, and operate the Project." Skipjack's

commitment to "make a serious, good-faith effort to interview minority investors" was further conditioned "upon receipt of a fully-approved, mutually acceptable, un-appealable OREC Order." These are not unreasonable conditions, and we believe the MDPSC has discretion to ascertain whether these conditions are acceptable and in compliance with COMAR 20.61.06.02 K (6) and (7).

COST-BENEFIT ANALYSIS

COMAR 20.61.06.02 L (1)-(3)

L. An application shall include a cost-benefit analysis that covers the following items and the assumptions and data that the OSW applicant used to generate each item:

(1) An input-output analysis describing the in-state impact on income, employment, wages, and state and local taxes, with particular emphasis on effects on manufacturing employment in the State, as well as the complete set of data and assumptions that the OSW applicant used to generate the input-output analysis;

(2) An analysis describing expected employment impacts in the State (expressed as full-time equivalent positions), including expected type and duration of employment opportunities, the expected salary range of positions, and other effects resulting from, for example, in-state construction, operations, maintenance, and equipment purchases, and supported by detailed documentation, including any binding commitments;

(3) An analysis describing the in-state business impacts of the proposed offshore wind project;

Findings

Skipjack's consultant, Boston Pacific, hired Interindustry Economic Research Fund (Inforum), to conduct an economic benefit analysis using the JEDI offshore wind module. JEDI is an economic input-output model that estimates the economic impacts of constructing and operating power plants, fuel production facilities, and other projects at the local level. JEDI's offshore wind module allows the user to project the monetary impacts of changes in direct spending or investment through local, state, and national economies. As with the IMPLAN model, JEDI's impacts include (i) indirect benefits as the direct spend recipients purchase goods and services from associated industries and (ii) induced benefits as households have more money to spend in-state.

Skipjack provided the basic activity assumptions and cost data to Boston Pacific as shown in Section 4-3, Appendix 14-1, and the Spending Projections spreadsheet. Skipjack estimated that $204.8 million, 34% of its total development and construction expenditures, will be in-state as shown in Table 32 below.

Table 32. Skipjack Development and Construction Expenditures
(millions 2021 $, excluding capitalized financing costs)

	In-State		Out-of-State	
Labor	$ 62.0	*30.3%*	$ 102.2	*25.9%*
Non-Labor	$ 142.8	*69.7%*	$ 292.6	*74.1%*
Totals[118]	$ 204.8	*100.0%*	$ 394.8	*100.0%*

In section Attachment 5-1 section II, Skipjack provided the input-output results in 2021 dollars including expected in-state impacts on income, employment, wages, and state and local taxes. In Attachment 5-1 section III, Skipjack provided expected in-state detailed employment impact results for each phase of the project including expected type and duration of employment opportunities and the expected salary range for different positions. In Attachment 5-1 section IV, Skipjack provided in-state business impact results in 2021 dollars. A high-level summary of the estimated economic impacts of the Skipjack project is provided below; more details are provided in the findings for COMAR 20.61.06.03 B (1)(a)(x).

- Total in-state development and construction phases expenditures of $204.8 million in engineering, mapping, consulting, legal, manufacturing, installation and marine transportation activities is expected to generate total (direct, indirect, and induced) in-state benefits of 1,468 FTEs, $333.1 million in new business, and $28.1 million in tax revenues.

- Annual in-state operating phase benefits were estimated based on first year benefit estimates. Annual expenditures of $4.9 million are expected to generate total (direct, indirect, and induced) in-state benefits of 52 FTEs, $8.0 million in new business, and $0.2 million in tax revenues.

In summary, Skipjack provided all of the information required under COMAR 20.61.06.02 L (1)-(3). We have no doubt that most direct in-state expenditures will produce indirect and induced effects that will magnify the overall benefit to Maryland. However, it appears that Boston Pacific and Inforum overestimated the tax revenues from direct purchases during the development and construction phases, perhaps including tax revenues from in-state and out-of-state expenditures. We recommend that the MDPSC rely on our independent IMPLAN analysis provided in COMAR 20.61.06.03 B (2)(b).

COMAR 20.61.06.02 L (4)

(4) An analysis describing anticipated environmental and health impacts, including impacts on the affected marine environment based on publicly available information, related to construction, operation and decommissioning of the proposed offshore wind project, including direct emissions impacts created by the proposed offshore wind project related to carbon

[118] Percentages may not add up to 100% due to rounding.

dioxide, oxides of nitrogen, sulfur dioxide, particulates and mercury emissions (in each case, expressed in terms of the number of tons of emissions abated per annum), as well as other relevant environmental and health impacts to the citizens of Maryland.

Findings

Skipjack hired Boston Pacific to analyze the environmental and health benefits attributable to their Project. Boston Pacific estimated the net environmental impacts, i.e. emission reductions due to displaced generation and emissions from the Project's construction, operation and decommissioning, using a top-down approach based on data for other offshore wind projects.

Construction Phase: To estimate emissions during the construction phase, Boston Pacific averaged the emissions estimates per MW from three other offshore wind projects – Cape Wind, Block Island Wind Farm Project, and Virginia Offshore Wind Technology Advancement Project – to estimate the Skipjack Project's emissions for NO_x, SO_2, CO_2, and PM.[119] Boston Pacific's methodology is flawed because the emissions rates were not first calculated and then averaged, and thus heavily favors Cape Wind, the largest project which is the most outdated and had the lowest emission rates (except SO_2).[120] Boston Pacific did not calculate any mercury (Hg) emissions for the construction phase.

Operating Phase: Boston Pacific estimated emissions due to marine vessels servicing the Skipjack Project during the 20 year operating term. They assumed that crew boats (used to bring crew to and from the site) and work boats (used to haul equipment) would be the prime sources of emissions and used an ICF study for the EPA on port emissions to calculate annual emissions for each operating year.

To calculate avoided emission reductions during the operating phase, Boston Pacific calculated an average annual emission rate for PJM generation (without the Skipjack Project) and multiplied that rate times the Project's annual generation. Boston Pacific calculated the emissions rate using the U.S. EIA's *2016 AEO* data on annual generation by fuel type and annual emissions of CO_2, SO_2, NO_x and Hg through 2040 for the RFC East region, which is essentially MAAC.[121] Boston Pacific stated that the Skipjack Project "...will displace generation on the margin..." rather than baseload capacity and that this marginal generation would be the average of RFC East gas, oil, and coal generation. Boston Pacific checked its estimated emission rates by comparing them to recent PJM marginal emission rates. Boston Pacific's rates for of CO_2 and SO_2 appear reasonable in spite of the methodological flaws; the rate for NO_x appears conservative. Boston Pacific

[119] The three documents are (i) Cape Wind's Final EIS, (ii) Tetra Tech's emissions analysis for the Block Island Wind Farm, and (iii) Tetra Tech's emissions analysis of the Virginia Project.

[120] The Cape Wind study was prepared by the DOI Mineral Management Service and published in January, 2009. Cape Wind accounted for 91.6% (= 458 / (458+ 30 + 12)) of the combined project sizes.

[121] RFC is Reliability First Corporation, one of eight FERC-approved Regional Entities, that is responsible for planning the reliability of the PJM bulk power system.

repeated its analysis for two other AEO scenarios: the Low Oil and Gas Resource and Technology Case (Low Case with less gas production, fewer gas-fired plants, and higher avoided emissions) and the High Oil and Gas Resource and Technology Case (High Case with more gas production, more gas-fired plants, and lower avoided emissions).

Since the *2016 AEO* does not include PM emission data, Boston Pacific used EPA's *2011 National Air Emissions Inventory* database and EIA's tables of Maryland generation by fuel type for 2011 to calculate average emission rates by fuel type for PM_{10} and $PM_{2.5}$.

We believe Boston Pacific used an overly simplistic approach to calculate emission reductions during the operating phase. First, Boston Pacific assumed the Skipjack Project would only displace generation in RFC East, but power plants are dispatched throughout the entire PJM market area using a security-constrained least-cost algorithm, so the displaced generation and avoided emissions would be spread throughout PJM. Second, coal plants are not "operationally flexible" compared to gas and oil plants and will be less affected by the Skipjack Project. Third, Boston Pacific used an emission rate equal to the projected blend of gas, oil, and coal generation as opposed to focusing on emissions from marginal generation. Fourth, we do not know if the comparison between Boston Pacific's average fossil-fuel emission rates for RFC East and PJM's marginal emission rates for its entire market area is valid. A more accurate way to estimate marginal emission reductions would have been to run a chronological dispatch simulation model. We recommend that the MDPSC rely on our independent emission analysis that used such a model, provided on pages 159-160 of this report.

Decommissioning Phase: To calculate emissions due to decommissioning, Boston Pacific used the U.S. Department of Interior's analysis of the Cape Wind Project to calculate an 82% ratio between emissions during decommissioning and emissions during construction. Boston Pacific used this ratio to estimate decommissioning period emissions. This method is limited by its reliance on only one data point of a significantly dated analysis.

Total: Combining the emissions from construction, operations and decommissioning, Boston Pacific estimated the following reductions for the Skipjack Project.

Table 33. Skipjack Project Total Net Emissions Reductions
(tons)

	NO_x	SO_2	CO_2	$PM_{2.5}$	Hg
Base Case	554	3,330	5,163,615	346	0.02
Low Case	493	2,880	4,964,758	291	0.02
High Case	1,870	8,171	7,412,846	707	0.05

In order to estimate the health impacts of the net emission reductions, Boston Pacific utilized recent emission allowance market prices for its Low Case, higher social cost estimates in its High Case, and lower social cost estimates (but still above allowance

prices) in its Base Case. Boston Pacific relied on a variety of sources for its Base and High Cases; the resulting emission value assumptions are as follows.

Table 34. Skipjack Project Health Values of Avoided Emissions
($/ton; base years vary from 2017 to 2020)

	NO_x	SO_2	CO_2	$PM_{2.5}$	Hg
Base Case	$20,000	$220	$ 49	$1,170	N/A
Low Case	$ 120	$0.06	$5.50	$ 250	N/A
High Case	$30,000	$4,130	$ 73	$12,400	N/A

The Base Case is the most reasonable case since it considers some level of societal health benefits of avoided emissions, particularly CO_2 emissions which might eventually be incorporated in a federal carbon tax. Boston Pacific used a range of inflation rates and discount rates for the different cases and pollutants to calculate the net present value (2016 $) of the reductions:

Table 35. Skipjack Project Health Value of Net Emission Reductions
($ 2016 present value)

	NO_x	SO_2	CO_2	$PM_{2.5}$	Hg
Base Case	$8,770,688	$408,256	$137,127,621	$224,392	N/A
Low Case	$ 33,944	$ 131	$19,304,959	$ 40,202	N/A
High Case	$33,482,681	$17,346,969	$278,550,552	$4,579,363	N/A

Boston Pacific estimated the total value of net emission reductions ($2016) at $146.5 million for the Base Case, $19.4 million for the Low Case, and $334.0 million for the High Case. Avoided CO_2 emissions accounted for almost all of the health benefits, which (according to Skipjack) include lower temperatures, less severe weather, and a reduction in disease and morbidity.

There was no detailed discussion of the impacts of the Skipjack Project on the local marine environment due to construction, operation, and decommissioning but only a blanket statement based on the BOEM conclusion that the construction of a wind farm in this area would not cause any significant environmental impact. A large offshore wind project will affect the local marine environment and will have to be described in the EIS at some future date.

COMAR 20.61.06.02 L (5)

(5) An analysis describing any other impacts on residential, commercial, and industrial retail electric customers over the life of the proposed offshore wind project;

Findings

Boston Pacific estimated the Skipjack Project's residential and non-residential retail rate impacts on electric customers by creating a "simple model" that summed up the annual cost of OREC purchases and the avoided energy, capacity, and REC costs, divided by total Maryland retail sales, assuming a January 1, 2023 COD. In Attachment 5-1, *Comprehensive Cost Benefit Report*, Boston Pacific estimated the total OREC costs (annual quantity and OREC price), less the value of energy and capacity and the avoided cost of Tier 1 REC purchases, as shown in Table 36 below.

Table 36. Skipjack Estimate of Gross and Net OREC Costs
($ millions)

	Year 1 2023	Year 20 2042
OREC Cost (Gross)	$72.3	$100.3
Energy Credit	($15.8)	($24.8)
Capacity Credit	($0.9)	($4.6)
REC Credit	($6.5)	($9.9)
Net OREC Cost	$ 49.1	$ 61.2

Energy Prices: Boston Pacific's energy price forecast, discussed in detail in the next section, is overly simplistic and is based on NYMEX monthly peak and off-peak future prices extrapolated through 2040 using EIA's *2016 AEO*.[122] This energy price forecasting methodology is flawed because it does not account for the zonal energy price differences in Maryland or the uneven hourly and daily pattern of Skipjack Project generation.

Capacity Prices: Boston Pacific assumed the Skipjack Project would earn capacity revenues based on historical capacity prices: $160/MW-day for the Base Case, $110/MW-day for the Low Case and $245/MW-day for the High Case. The Low and High Case values are consistent with historical low and high EMAAC prices (as presented in Table 9 of this report) and the Base Case value is about equal to the simple average EMAAC price for over the past thirteen years. However, Boston Pacific made no attempt to account for historical inflation or to consider capacity market dynamics that could affect the EMAAC prices in the future.

REC Prices: Boston Pacific assumed each OREC generated by Skipjack Project would decrease the Maryland utilities' need to purchase a Tier 1 REC, starting with a $14/REC price in 2020 based on current quotes and with varying annual escalation rates. Consistent with other Boston Pacific forecasts, the REC price growth rate is simplistic and does not take into account any explanatory variables.

[122] Boston Pacific did not explain how they extended its energy price forecast though 2042, the end of the 20-year term.

Gross and Net OREC Cost: The Skipjack Project OREC bid price was $166.00/MWh in 2023, escalating at a 1.5% rate to $220.27/MWh in 2042. After accounting for energy, capacity, and REC credits, Boston Pacific's data indicates net OREC cost of $135/MWh (levelized 2012 $). When wholesale market savings are included, Boston Pacific estimated an average net ratepayer cost of $0.51/MWh (nominal dollars) over the 20-year term for residential customers in the Base Case. For a residential customer with an average annual usage of 12,000 kWh, Boston Pacific calculated this is equivalent to $0.34 per month (levelized 2012 dollars) using a 2% inflation rate, below the $1.50 per month residential rate cap.

Boston Pacific also estimated the rate impacts on non-residential customers using EIA data to calculate an average non-residential bill for 2014, escalated at 2% per year from 2023 to 2042. Boston Pacific then multiplied the annual ratepayer costs per MWh by the average non-residential usage to estimate an average increase of 0.32%, well below the 1.5% non-residential rate cap. Skipjack's analysis of net ratepayer impacts is not comparable to US Wind's due to different methodologies; we recommend the MDPSC rely on our independent estimate of net ratepayer impacts discussed on pages 155-158 of this report.

COMAR 20.61.06.02 L (6)

(6) An analysis describing the long-term effect of the proposed offshore wind project on wholesale energy, capacity, and ancillary services markets administered by PJM that includes analysis of contributions to regional system reliability, fuel diversity, competition, transmission congestion, and other power market benefits;

Findings

Energy Prices: Boston Pacific calculated the long-term effect of the Skipjack Project on DPL wholesale energy prices using linear fits and extrapolations based on NYMEX future prices and EIA's 2016 AEO. Boston Pacific first projected monthly peak and off-peak DPL wholesale energy prices by applying historical (January 2010 through June 2016) average hourly energy price differentials to monthly peak and off-peak NYMEX future energy prices for the PJM Western Hub. This is a simplistic method that assumes that historical price differentials are applicable for the future, which ignores expected plant retirements or additions, the renewable buildout in western PJM, and other changes in the PJM zones. NYMEX price data only extends through December 2021, so Boston Pacific extrapolated the monthly on-peak and off-peak DPL energy prices using EIA's 2016 AEO generation rates. For example, in the reference case, the EIA forecasted about a 4% increase in the generation rate in 2022; thus, Boston Pacific escalated its 2021 prices by 4%. This is a highly unusual type of extrapolation method.

Boston Pacific next reduced each monthly on-peak and off-peak price due to the Skipjack Project based on a regression fit of the last year's average hourly prices across the four Maryland utility zones against their average loads. Using the regression

equation, Boston Pacific calculated the Skipjack Project's effect on energy prices as a load reduction of 52 MWh/hour (the Skipjack Project's average net generation) and converted that to a percent reduction in prices. For an average hourly load of 14,406 MWh and an average hourly price of $31.08/MWh, a load reduction of 52 MW would result in a price decrease of $0.16/MWh or 0.52%. Boston Pacific made no attempt to differentiate wholesale energy price impacts among the four Maryland utility zones.

We find that this approach of using average hourly loads and prices to estimate the Skipjack Project's long-term effect on wholesale energy prices is simplistic, since it ignores the Project's variation in output and how the Skipjack Project will affect each Maryland zone differently. Wholesale energy prices vary by zone and by hour throughout the year, and the Skipjack Project will produce much more energy during windy winter months compared to summer months.[123] Since wholesale energy prices are set by the last resource to satisfy load, the price can vary tremendously depending on fuel prices (typically natural gas) regardless of load. For example, gas prices can be significantly higher than average during cold snaps and interruptions. Boston Pacific did not take these price effects into account.

Boston Pacific also prepared Low and High Cases using somewhat arbitrary assumptions: the Low Case assumed a "*de minimis*", i.e. zero, effect and the High Case assumes that the entire energy price effect is restricted to Maryland. Both of these are unreasonable assumptions. Moreover, these cases have no relationship to the Low and High Oil and Gas Resource and Technology Cases previously reported.

Capacity Prices: Skipjack claimed that the Project will "have significant impacts on the capacity market." Skipjack claimed that "for the first three years of its operation, the capacity factor for the project must be assumed to be 13%" and Boston Pacific claimed its "Cost Benefit Analysis incorporates this rule." However, Boston Pacific ramped-up the capacity factor from 13.0% in year 1 to 23.1% in year 2 and 33.2% in year 3 before reaching its maximum of 43.3% in year 4 in table twelve in its report, thereby minimizing the net rate impact of the Skipjack Project. As explained in the Methodology section of this report, we do not expect Skipjack will be able to claim UCAP in excess of its expected ultimate CIR value of 34.4%, or 41.3 MW.

Boston Pacific did not estimate the beneficial effect of the Skipjack Project on wholesale capacity prices because the Skipjack Project is "relatively small" and because Skipjack may elect to offer Base Capacity rather than Capacity Performance in the RPM.[124] This ignores the zonal nature of PJM's wholesale capacity prices.

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[123] Skipjack Project generation is expected to be relatively high in the Winter months and low in the Summer months. The expected maximum hourly generation (in February) is expected to be almost triple the minimum hourly generation (in August).

[124] It is our understanding that *all* products offered into the RPM BRA after the 2020/2021 Delivery Year will be Capacity Performance.

Ancillary Services: Boston Pacific assumed that the Skipjack Project will not earn any ancillary service revenues and will not affect the ancillary services market because the Tier 1 REC market is so broad that the Skipjack Project would have "little impact." This is a reasonable assumption.

REC Market: Boston Pacific assumed that the Project will have no effect on REC markets because the REC market is large relative to the Project and it is difficult to forecast REC prices. We agree that the Skipjack Project will not affect REC prices, but for different reasons, i.e. our postulated market response keeps the number and timing of RECs unchanged and REC prices are driven by net cost, not supply and demand dynamics.

Skipjack did not enumerate potential contributions to regional system reliability, fuel diversity, competition, transmission congestion, and other power market factors.

COMAR 20.61.06.02 L (7)-(8)

(7) An analysis describing any other benefits to the State created by the proposed offshore wind project, such as in-state construction, operations, maintenance, and equipment purchases; and

(8) Other relevant considerations that the OSW applicant elects to include.

Findings

Skipjack did not present any analysis describing any other benefits to the State created by the proposed offshore wind project, such as in-state construction, operations, maintenance, and equipment purchases, or other relevant considerations.

COMAR 20.61.06.02 M

M. An application shall include a proposed OREC price schedule for the proposed offshore wind project's electricity service attributes that is subject to the following requirements:

(1) The proposed OREC price schedule shall consist of either a:

(a) Two-part OREC price in which the first component is expressed as either a single firm price for each calendar year or a series of firm prices for each calendar year and the second component is expressed as a single firm price for each calendar year subject to a true-up based upon any change between the Commission's estimated cost of transmission upgrades and PJM's actual upgrade cost as specified in the executed Interconnection Service Agreement, for a total OREC price up to and not exceeding $190 per megawatt hour (levelized in 2012 dollars) and subject to the projected net rate impact caps for residential and nonresidential customers, as described by Public Utilities Article, 7-704.1(e)(1)(ii) and (iii), Annotated Code of Maryland; or

(b) One-part OREC price, expressed as either a single firm price for each calendar year or a series of firm prices for each calendar year, that is not subject to true-up, up to and not exceeding $190 per megawatt hour (levelized in 2012 dollars) and subject to the projected net rate impact caps for residential and nonresidential customers, as described by Public Utilities Article, 7-704.1(e)(1)(ii) and (iii), Annotated Code of Maryland;

(2) The unit of OREC price on the proposed OREC price schedule must be on a dollars ($) per delivered OREC (MWh) basis by calendar year; and

(3) All proposed OREC price schedules shall propose OREC prices for each calendar year for an initial term of up to 20 years commencing on the estimated project COD and an additional schedule of OREC prices for each of the five calendar years immediately following the end of the initial term to cover potential delays in project COD.

Findings

Skipjack submitted a 1-part OREC price bid with a COD of November 2022 and an initial OREC price of $166.00/MWh. The levelized (2012 $) OREC price was $134.85/MWh assuming a January 1, 2022 COD and $134.36/MWh assuming a January 1, 2023 date that is closer to Skipjack's proposed November 2022 COD.[125] Both levelized OREC prices, allowing up to five years of delay, would be below the $190/MWh (2012 $) price cap. The 1-part bid would not be adjusted based on the actual cost of any required PJM transmission system upgrades downstream of the expected interconnection point at DPL's Ocean Bays or 138th Street substation.

Skipjack indicated the OREC Price Bid Form could not accept a November 2022 COD; this did not affect their bid prices or our evaluation. Skipjack also indicated that the bid prices should be for an operating year, e.g. November 1 - October 31. We verbally confirmed with Skipjack that the Regulations require OREC prices on a calendar year basis so that the Project would receive the first year price of $166.00/MWh for November - December 2022, the second year price of $168.49 for January - December 2023, etc. Skipjack accepted calendar year pricing of ORECs.

Skipjack's OREC price bid is subject to a number of proposed conditions that impose risks on ratepayers. We believe the MDPSC has discretion to ascertain if these conditions are acceptable.

1. According to its application, "...Deepwater Wind's proposed price assumes the receipt of a fully-approved, mutually-acceptable, un-appealable OREC ("Final Order") by June 30, 2017. If Deepwater Wind receives a fully-approved, mutually-acceptable, un-appealable order from the MD PSC after June 30, 2017, the base rate will be adjusted upward to account for the lower federal tax credits for which the Project will qualify." We confirmed that if the MDPSC Order occurs after June 30, 2017, Skipjack expects that construction will be delayed, it will qualify for a 12% ITC (not the 18% ITC assumed in its OREC price bid), and the OREC price schedule would be higher, starting at a first year, 2023, OREC price of $174.00/MWh. This would result in a levelized (2012 $) price of $138.75/MWh. An additional year of delay

[125] The small difference of $0.49/MWh between the two levelized OREC Prices (2012 $) indicates that our assumption of a January 1, 2023 COD for evaluation purposes, two months after Skipjack's proposed COD of November 2022, does not materially affect our results.

would result in the full loss of the ITC, and the OREC price schedule would begin at $184.95/MWh in 2024.

Table 37. Skipjack Proposed OREC Prices under Different ITC Assumptions

Receipt of MDPSC Order	ITC Assumed	First Year Price ($/MWh)	First Calendar Year of Price Schedule	Assumed COD for Evaluation	Levelized Price (2012 $/MWh)
by June 30, 2017	18%	$166.00	2022	1/1/2023	$134.36
July 2017 - June 2018	12%	$174.00	2023	1/1/2024	$138.24
July 2018 – June 2019	0%	$184.95	2024	1/1/2025	$144.23

2. Skipjack requested that its obligations be contingent on receiving an "un-appealable" order: "...the Maryland PSC has the authority to cause the winning bidder to receive payments for the full term of the commitment approved in the Maryland PSC order, whether or not there is a subsequent successful constitutional challenge to the program, or to the Maryland PSC order, under state or federal constitutional law." We do not know if the MDPSC can provide such an un-appealable order.

3. The Skipjack application stated "In the event that a change in law or policy results in a higher available tax credit rate, Deepwater Wind offers to lower its price to account for the increased value of the ITC. If Skipjack qualifies for a higher ITC, then the Applicant's OREC price will be reduced to accordingly." In discussions with Skipjack, we confirmed that in the event a change in law or policy resulted in a lower ITC, OREC prices would be higher as illustrated in Table 37 above, putting ratepayers at risk.

4. Skipjack will apply for state and federal grants provided Skipjack expects them to have a "material benefit for the Maryland ratepayers" and/or "do not adversely affect the ability of the Company to develop, construct, and operate the Project."

COMAR 20.61.06.02 N

N. An application shall include a proposed OREC amount that is a quantity, expressed as a single annual number on a megawatt hour per calendar year basis and fixed for the proposed term of the project's proposed OREC price schedule, and that is accompanied by the expected generation confidence level associated with that proposed OREC amount.

Findings

Skipjack proposed a 120 MW (gross turbine generator rating) Project that would generate 455,482 ORECs annually (net MWh/year) at a P-50 confidence interval, equivalent to a 43.3% net capacity factor. Skipjack estimated this OREC quantity utilizing site-specific modeled offshore wind data and turbine performance data to estimate annual gross generation of [redacted]. Skipjack then accounted for

various site-specific losses to estimate net generation as described in section COMAR 20.61.06.02 G (3) of this report. The gross and net generation values are reasonable.

MINIMUM THRESHOLD CRITERIA

COMAR 20.61.06.03 A

This section of COMAR lists the minimum threshold criteria that must be satisfied in order for an application to be eligible for further multi-part (qualitative and quantitative) review per COMAR 20.61.06.01 D(1)(a). Once we determined that the Skipjack Project was administratively complete per COMAR 20.61.06.02 A, we reviewed each minimum threshold criterion as described below.

COMAR 20.61.06.03 A (1)

A. An application must demonstrate the proposed offshore wind project meets the following minimum threshold criteria, as specified:

(1) The proposed offshore wind project complies with Public Utilities Article, 7-701(k)(1) and (2), Annotated Code of Maryland;

Public Utilities Article, 7-701(k)(1) and (2) are as follows:

"Qualified offshore wind project" means a wind turbine electricity generation facility, including the associated transmission–related interconnection facilities and equipment, that:

(1) is located on the outer continental shelf of the Atlantic Ocean in an area that:

(i) the United States Department of the Interior designates for leasing after coordination and consultation with the State in accordance with 388(a) of the Energy Policy Act of 2005; and

(ii) is between 10 and 30 miles off the coast of the State;

(2) interconnects to the PJM Interconnection grid at a point located on the Delmarva Peninsula;

Findings

The Skipjack Project would be located in the BOEM Delaware WEA lease parcel OCS-A 0482 that is on the OCS and is between 10 and 30 miles off the Maryland coast. The Project would interconnect to the PJM grid at the Ocean Bay or 138th Street substation on the Delmarva Peninsula. The BOEM lease was originally awarded to NRG Bluewater through a competitive auction and Skipjack (through its parent Deepwater) is in the process of acquiring the lease and subdividing it to accommodate the Skipjack Project. According to information provided by Skipjack and confirmed in the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia - Final Environmental Assessment* issued by BOEM in January, 2012, various Maryland agencies participated in the BOEM (part of the Department of the Interior) process to designate the Delaware

WEA. For the purpose of our evaluation, it therefore appears that the Skipjack Project meets the definition of a Qualified Offshore Wind Project under PUA §7-701(k)(1) and (2).

COMAR 20.61.06.03 A (2)

(2) The term of the proposed OREC price schedule is not longer than 20 years, and commences no earlier than January 1, 2017;

Findings

The term of the Skipjack Project will be 20 years with a target COD of November 2022, thus satisfying the requirements of PUA §7-701(k)(3).

COMAR 20.61.06.03 A (3)

(3) The OREC price on the proposed OREC price schedule do not exceed $190 per megawatt hour in levelized 2012 dollars, as measured using a nominal discount rate equal to the long-term composite Treasury Bond rate (or equivalent) and a deflation rate equal to the near-term average GDP Deflator (or equivalent), notified by the Commission to potential OSW applicants;

Findings

The Skipjack Project will have a levelized price of $135/MWh (2012 $) based on the 2-part bid submitted utilizing the placeholder value for PJM system upgrades. If the Skipjack Project is delayed for up to five years the levelized price will remain under $190/MWh (2012 $), ignoring any adjustments due to the conditions requested by Skipjack that could change the OREC price, e.g. a change in law or policy affecting receipt of the ITC.

COMAR 20.61.06.03 A (4)

(4) Demonstration that the proposed project, including the associated transmission-related interconnection facilities, will be constructed using commercially proven components and equipment available to the OSW applicant;

Findings

The Skipjack Project will be constructed using commercially proven components and equipment.

COMAR 20.61.06.03 A (5)

(5) Demonstration that the project COD is reasonable in light of the permitting, technical, construction, operational, and economic challenges generally faced by offshore wind project developers; and

Findings

The Skipjack Project's COD of November 2022 is reasonable in light of the duration of the permitting, engineering & design, procurement, construction, and commissioning phases, as proposed in the application. The risk of COD delay was explicitly recognized in designing the OREC procurement process and the OREC Bid Price Form was designed to accommodate up to a five-year COD delay without financial penalties per COMAR 20.61.06.16. Such delays should be viewed as typical for the first domestic large-scale offshore wind project and should not disqualify Skipjack under this minimum threshold criterion. Maryland ratepayers would not be penalized due to COD delay.

COMAR 20.61.06.03 A (6)

(6) Evidence of site control or demonstration of a feasible plan to obtain site control.

Findings

Skipjack (through its owner Deepwater) is in the process of acquiring the BOEM Delaware WEA site lease and satisfies the requirements of COMAR 20.61.06.03 A (6). The BOEM lease was originally awarded to Bluewater Wind, LLC, a subsidiary of NRG Energy, Inc., through a competitive BOEM auction. Deepwater is in the process of acquiring the BOEM lease through its joint venture subsidiary. BOEM has determined that the subsidiary is qualified to hold the lease, which must submit an application, annual lease payment, and financial assurance by December 1, 2016. Deepwater intends to subdivide the lease so that Skipjack can utilize the southern portion of the Delaware WEA. Any offshore wind project in the northern portion of the lease would be independent of, and would not affect, the Skipjack Project.

INDEPENDENT QUALITATIVE AND QUANTITATIVE ANALYSES

COMAR 20.61.06.03 B

B. For each application that meets the minimum threshold criteria, the Commission shall conduct independent qualitative and quantitative analyses that considers the criteria enumerated in Public Utilities Article, 7-704.1(d)(1)(i) through (xiii), Annotated Code of Maryland.

(1) The qualitative analysis shall use a ranking system to identify applications with characteristics that contribute to the likelihood of successful development and to the net economic, environmental, and health benefits to the State.

Findings

We have evaluated the qualitative aspects of the Skipjack application and applied a color-scheme ranking system to characterize our findings, as shown on page ES-31 of the Executive Summary.

QUALITATIVE ANALYSIS

COMAR 20.61.06.03 B (1)(a)(i)

(a) The following factors shall be considered as part of the qualitative analysis:

(i) Qualifications of the OSW applicant's project team, including but not limited to experience in project development, environmental permitting, engineering and construction, operations, maintenance and financing;

Findings

Skipjack is a subsidiary of Deepwater Wind New Jersey, which itself is a subsidiary of Deepwater Wind Holdings, LLC, an American offshore wind developer. Deepwater Wind has a management team with an average of over 20 years of experience and is capitalized with funding from the D. E. Shaw Group, a global investment and technology firm with $38 billion in investment capital as of July 1, 2016. Deepwater is the developer and owner-operator of the Block Island Wind Farm – a 30 MW offshore wind farm located 19 miles off the cost of Rhode Island that will be the first offshore wind farm in the U.S. when it begins operating this year.

COMAR 20.61.06.03 B (1)(a)(ii)

(ii) Project characteristics, including but not limited to project design (for example, demonstration that turbine layout is consistent with best practices for optimal output and maintainability), turbine technology (for example, commercial availability, certification status, compatibility with project service life, warranties), foundation and support structure (for example, suitability for site conditions, design standards), converter station and interconnection (for example, appropriateness of equipment for site, turbine ratings, and number of turbines; reasonableness of interconnection and delivery points; interconnection designs consistent with best practices), and reasonableness of claimed net capacity and annual energy output;

Findings

Skipjack presented a project that reflects a layout design and technology that is generally appropriate for the offshore wind project site. The technology utilized as the Project's design basis is commercially available, although the energy production estimate is based on a turbine with a larger rotor. There are still considerable design and construction uncertainties given that Skipjack has not yet made a final turbine selection. It is typical for a project at this early stage of development to still be considering different turbine models, but key project characteristics will remain uncertain until the final turbine model is selected.

COMAR 20.61.06.03 B (1)(a)(iii)

(iii) Financial plan, including but not limited to completeness and reasonableness of the plan, financial strength of the developer, sources of debt and equity and firmness of commitments, plan for addressing cost overruns and other development risks, evidence of best efforts to identify and access State or federal grants, rebates, tax credits, loan guarantees or other similar benefits available to the proposed project and future commitments to seek out future benefits;

Findings

Skipjack proposed a complete and reasonable financing plan. Skipjack plans to fund the total $720 million cost with three sources of capital: (a) common equity of $130 million from existing projects, equity subscriptions from existing and new investors, and D. E. Shaw, Deepwater's majority investor, (b) tax equity of $190 million arranged by D.E. Shaw, and (c) senior secured debt of $400 million from commercial banks, vendors, and/or export credit agencies. Skipjack provided Letters of Interest for equity and debt commitments and is confident in its ability to raise the financing required based on Deepwater's experience funding the Block Island Wind Farm. Subject to the proposed condition regarding whether it will apply for any grants, as discussed on page 138 of this report, Skipjack has committed to apply at least 80% of any proceeds from State and federal grants and other benefits to the Project's capital cost and pass them on to ratepayers.

COMAR 20.61.06.03 B (1)(a)(iv)

(iv) Demonstration of site control such as a BOEM lease or, alternatively, adequacy of plan for obtaining site control, as well as arrangements for interconnection right-of-way;

Findings

BOEM auctioned off Lease OCS-A 0482 for the Delaware WEA to Bluewater Wind Delaware on October 23, 2012. Bluewater cancelled its offshore wind project and retained possession of the lease. Deepwater Wind's joint venture subsidiary negotiated an agreement with Bluewater, executed on December 2, 2015, to purchase that lease. BOEM determined that this subsidiary is technically and financially qualified to hold the lease on July 27, 2016.

Deepwater expects to subdivide the Delaware WEA into a northern and a southern portion; the Skipjack Project would be situated in the southern portion. The BOEM lease would give Deepwater easement rights to export power to the mainland. Skipjack intends to install a 138 kV AC submarine cable from the OTM to a land-based location where it would transition to a 138 kV buried terrestrial cable to the Ocean Bays or 138th Street 138 kV substation. A desktop study conducted by Mott MacDonald concluded either substation could accommodate the Skipjack Project output and estimated the interconnection costs.

According to its application, Skipjack will have to obtain (a) a ROW grant from MDE to bury the submarine cable in State waters and (b) approvals from federal, State, and local agencies to install the terrestrial cables and equipment on public ROWs and public lands. In addition, Deepwater has a number of steps to complete the lease acquisition: (c) BOEM must determine Bluewater is in compliance with the lease terms; (d) Deepwater's subsidiary must have financial assurance in place to take over the lease; (e) Deepwater has to finalize the subdivision of the lease; and (f) BOEM may have to approve such subdivision. While we are not aware of any impediments for Skipjack and Deepwater to complete these steps, we cannot determine when they will able to obtain site control and complete arrangements for the interconnection ROW.

COMAR 20.61.06.03 B (1)(a)(v)

(v) Project COD and schedule, including but not limited to reasonableness of the proposed schedule (acknowledging, for example, weather delays), construction plan (reasonableness of plan and level of detail, for example, port, storage, lay-down and staging-areas, as well as evidence of consistency with procurement plan, supply chain descriptions, and contracting strategy), and testing and commissioning plan;

Findings

Skipjack provided a summary-level Milestone Schedule (Table 2-2), a detailed Project Schedule (Attachment 2-22, later revised as Appendix 18-1) and a Construction Plan (Attachment 2-18). They are reviewed in detail elsewhere in this report. Overall, we find that Skipjack presented a schedule that is reasonable but lacks many of the requested details, e.g. acknowledging weather delays, supply chain descriptions, etc. Both Skipjack Project Schedules assumed a February 24, 2017 MDPSC selection date, which is unrealistic. While it is typical for there to be many uncertainties at this early stage of project development, Skipjack did not propose plans to manage or mitigate those uncertainties. However, Maryland ratepayers will not bear schedule or delay risks.

COMAR 20.61.06.03 B (1)(a)(vi)

(vi) If applicable, the reasonableness of the proposed transmission upgrade cost allocation methodology, taking into account whether the proposed methodology fairly serves the interest of ratepayers;

Findings

The transmission connection for the Skipjack Project will be separate from any other transmission connections that Skipjack or Deepwater may locate in the BOEM lease area, so no allocation methodology is necessary.

COMAR 20.61.06.03 B (1)(a)(vii)

(vii) Operations and maintenance plan, including but not limited to reasonableness of proposed management plan and mitigation strategies and evidence of unique requirements in the context of a large offshore wind facility (for example, port, maintenance vessel, staffing, spare parts supplies);

Findings

Skipjack submitted an O&M Plan that provided a high-level overview of planned O&M activities and facilities, along with the associated division of responsibilities. Our detailed evaluation is provided in COMAR 20.61.06.02 G(10). Overall, the O&M Plan is missing some relevant information and presents some risks for Skipjack that will need to be addressed but is adequate at this early stage of project development. We note that by the time the Skipjack Project reaches commercial operation (expected in late 2022), Skipjack will have the benefit of six years of Block Island Wind Farm operations.

COMAR 20.61.06.03 B (1)(a)(viii)

(viii) Decommissioning plan, including but not limited to quality and completeness of plan, and assurance of available funding to decommission the plant, interconnection facilities and associated equipment;

Findings

Skipjack provided a one-page Decommissioning Plan outlining the general methodology and provided additional information in response to questions. Although the overall approach is appropriate, we would expect to see more detail in the Decommissioning Plan. Skipjack's estimated decommissioning cost before offsets is reasonable, but the expected scrap metal revenue from selling the used materials was optimistic so the net cost is considerably under-estimated. Any financial risk will be adequately mitigated by BOEM's requirements for an independent decommissioning cost estimate that will be updated and audited every year.

COMAR 20.61.06.03 B (1)(a)(ix)

(ix) Transmission improvements, including but not limited to quality and completeness of analysis, and consideration of benefits created by associated transmission and distribution upgrades such as improved reliability or reduced congestion;

Findings

Skipjack has not submitted an interconnection request with PJM. Based on PJM's System Impact Study for the US Wind Project, which found no need for reinforcements or other upgrades, we do not anticipate that the Skipjack Project will result in other reinforcements or upgrades that will help serve Maryland residents. We expect the

Skipjack Project will help meet the demand on the Delmarva Peninsula currently only served from the north, thereby reducing congestion and improving reliability.

COMAR 20.61.06.03 B (1)(a)(x)

(x) OSW applicant's input-output analysis required by Public Utilities Article, 7-704.1(c)(3)(i), Annotated Code of Maryland, including completeness of descriptions and documentation, verifiability of model inputs and reasonableness of outputs, and extent to which the analysis demonstrates positive net economic benefits to the State;

Findings

Skipjack's consultant, Boston Pacific, prepared an input-output analysis, as required by COMAR 20.61.06.03 B (2)(a), to estimate the economic changes in Maryland from new spending by or due to the Skipjack Project. Boston Pacific used the JEDI model to estimate the (i) indirect impacts on jobs and local spending created through the supply chain plus (ii) the induced impacts created by households spending additional income earned from the direct or induced spending. These indirect and induced impacts "multiply" the initial direct spending. Skipjack provided a list of JEDI input assumptions and results in its application. Skipjack's findings, all of which are reported in 2021 dollars, are reported below.

Development and Construction Period (2017-2022)

Impacts on Maryland's Spending

Boston Pacific estimated direct development and construction period spending to be $199.9 million for a variety of services, e.g. engineering, mapping, consulting, legal, manufacturing, installation and marine transportation activities. Boston Pacific estimated that Maryland would see an additional $133.2 million of in-state indirect and induced sales, for a total of $333.1 million. Close to $74.2 million of the in-state spending would occur in the government and transportation / information / public utilities sectors.

Table 38. Skipjack Development and Construction Period Spending and Employment Impacts

Type	Spending (millions 2021 $)	Employment (FTEs)
Direct	$199.9	706
Indirect	$ 77.2	405
Induced	$ 56.1	357
Total	$333.1	1,468

Totals may differ due to rounding

Impacts on Maryland's Employment

Boston Pacific estimated that Skipjack would directly create 706 FTEs in Maryland and provide an additional 762 indirect and induced FTEs for a total of 1,468 in-state FTEs, an average of 367 FTEs over the 2017-2022 development and construction periods. Boston Pacific estimated that 382 of those FTEs would be in the construction sector. The majority of these construction FTEs would be created through the direct impact. Other sectors with increased employment would be the electrical equipment and the government, trade, and transportation / information / public utilities.

Impacts on State & Local Tax Revenue:

The combined state and local tax revenues impact estimated by Boston Pacific for the 2017-2022 period across the various revenue sources total $28.1 million.

Operating Period (2023-2042)

Impacts on Maryland's Spending

Boston Pacific ran JEDI for the first operating year to estimate spending, employment, and tax impacts, and then extrapolated those results for the full twenty year OREC period to estimate the cumulative impacts. This is a reasonable approach because the Skipjack Project is expected to operate identically in each year.

Boston Pacific estimated operating period total direct spending of $5.1 million for the first operating year. Based on this, Boston Pacific estimated that Maryland's economy can expect $8 million in new business activity and 52 additional in-state FTEs for the first year of operations. Over 32% of this increase in business activity, or $2.8 million, would be in the finance, insurance and real estate sectors. Boston Pacific estimated total indirect and induced sales of $2.9 million for the first operating year.

Table 39. Skipjack First Year Operating Period Spending and Employment Impacts

Type	Spending (millions 2021$)	Employment (FTEs)
Direct	$ 5.1	37
Indirect	$ 1.6	8
Induced	$ 1.3	8
Total	$ 8.0	52

Totals may differ due to rounding

The spending impact estimated by Boston Pacific over the 20-year operational period is $160 million (2021 $).

Impacts on Maryland's Employment

Boston Pacific estimated that the first year of operation will support 52 FTEs in Maryland. Most of these positions will be plant jobs. Boston Pacific estimated that 37 of these FTEs will be direct and that the total number of FTEs over the 20-year operational period is 1,040.

Impacts on State & Local Tax Revenue:

Boston Pacific estimated that the combined state and local tax revenues will be $0.2 million in the first operating year and $4.2 million over the 20-year operational period.

Summary

Table 40 summarizes the total spending, employment and tax revenue impacts computed by Boston Pacific over the entire 26 year life (development, construction, and operations) of the Skipjack Project.

Table 40. Boston Pacific Estimated Spending, Employment and Tax Revenue Impacts

Phase	Spending (million 2021$)	Employment (FTEs)	Tax Revenue (million 2021$)
Dev't and Construction	$333.1	1,468	$28.1
Operations	$160.0	1,040	$ 4.2
Project Lifetime	$493.1	2,508	$32.3

Overall, Boston Pacific reasonably estimated that the monetary impact, i.e. spending and tax revenue, to Maryland's economy over the lifetime of the Skipjack Project will be $525.4 million and the employment impact will be the creation of 2,508 FTEs. The JEDI model used by Boston Pacific cannot calculate the benefit of lower electricity prices due to the Project.

COMAR 20.61.06.03 B (1)(a)(xi)

(xi) OSW applicant's analysis of the net environmental and health impacts, including impacts on the affected marine environment based on publicly available information, to the State including impacts during construction, operation and decommissioning of the proposed project, including completeness of descriptions and documentation, verifiability of model inputs and reasonableness of outputs, and extent to which the analysis demonstrates positive net environmental and health benefits to the State;

Findings

Boston Pacific estimated the Project-related environmental impacts of reduced power plant air emissions using the U.S. EIA's 2016 AEO data on annual generation by fuel type and annual air emissions for the RFC East (equivalent to EMAAC) region. However, the Skipjack Project will affect emissions throughout PJM. Boston Pacific's rates for CO_2 and

SO_2 appear reasonable in spite of the methodological flaws; the rate for NO_x appears conservative. We believe Boston Pacific used an overly simplistic approach to calculate emission reductions during the operating phase. Boston Pacific used a limited method that relies on only one data point from a significantly dated analysis to estimate emissions due to decommissioning.

Boston Pacific noted that, in 2012, BOEM issued a "finding of no significant impact" in its environmental assessment of the wind energy areas offshore New Jersey, Delaware, Maryland, and Virginia, and that no Environmental Impact Study was necessary. However, a large offshore wind project will affect the local marine environment and will have to be described in the EIS at some future date.

COMAR 20.61.06.03 B (1)(a)(xii)

(xii) Extent to which OSW applicant's proposed project will assist in meeting the renewable energy portfolio standard, considering the expected generation confidence level associated with the proposed OREC amount;

Findings

Skipjack hired experienced subcontractors to prepare a wind resource and net energy yield assessment of 455,458 MWh/year at P-50 confidence level, which corresponds to a net capacity factor of 43.3%. Our review of Skipjack's application supports this estimate. Over the twenty-year forecast period, we expect the Skipjack Project will meet 25.9% of Maryland's RPS 2.5% offshore wind carve-out.

COMAR 20.61.06.03 B (1)(a)(xiii)

(xiii) Unique attributes that distinguish a proposed project from another;

Findings

Factors that distinguish the Skipjack Project from other proposed Projects are presented in Risk Factors and Differentiators, the final section of the Executive Summary of this report.

COMAR 20.61.06.03 B (1)(a)(xiv) and (xv)

(xiv) Adequacy of the OSW applicant's plan demonstrating engagement of small and minority businesses, commitment to the use of skilled labor, and labor compensation plan;

(xv) Evidence of serious, good-faith efforts to solicit participation of minority investors, should the proposed project have sought capital investment, and evidence of serious, good-faith commitment to solicit minority investors in future attempts to raise capital;

Findings

Skipjack has committed to using best efforts to engage small and minority businesses, utilize skilled labor, and implement an appropriate compensation plan, but will not pursue such efforts until it receives a "...fully-approved, mutually-acceptable, un-appealable order."

COMAR 20.61.06.03 B (1)(a)(xvi)

(xvi) OSW applicant's analysis of impacts on residential, commercial, and industrial retail electric customers, including consideration of whether the analysis properly reflects proposed OREC pricing and unique character of the applicant's pricing proposal; and

Findings

Skipjack provided a comprehensive analysis of rate impacts associated with the proposed Project including the projected impact on a 2012 $ per customer per month basis. Skipjack provided tables of the residential and non-residential rate impacts on an annual basis. Additionally, Skipjack reported average impacts on rates of an increase of $0.34/month in 2012 dollars for residential ratepayers and an average increase of about 0.32% on non-residential ratepayer bills. However, we recommend that the MDPSC rely on our independent analyses of the net ratepayer impacts, summarized on pages ES-36 - ES-38 of this report, to ensure consistent evaluation between the two applications.

COMAR 20.61.06.03 B (1)(a)(xvii)

(xvii) OSW applicant's analysis of long-term changes to the wholesale electric market associated with the project, including consideration of the quality of analysis showing contributions to regional system reliability, fuel diversity, competition, transmission congestion, and other benefits.

Findings

We calculated the wholesale energy market benefit of the Skipjack Project to be $6.1 million in present value over the twenty year OREC term. DPL customers would benefit the most because of Skipjack's planned interconnection in that service territory. BGE and PEPCO customers would benefit less and APS customers may not benefit at all from reduced wholesale energy prices.

Wholesale capacity price benefits due to the Skipjack Project would be greatest in EMAAC, which includes the DPL service territory. Over the 20 year OREC Term, Maryland ratepayers would save $10.9 million.

Maryland Tier 1 REC prices are not expected to change due to the addition of the Skipjack Project. However, the addition of the Skipjack Project will help Maryland meet its 2.5% OREC carve-out target.

In addition to the rate impacts described above, the Skipjack Project would lessen PJM's dependence upon gas for power plant fuel and would also help decrease any congestion on the Delmarva Peninsula. While congestion on the Delmarva Peninsula has been a problem in the past, we do not expect it to persist now that the 300 MW Garrison Energy Center has been completed and various transmission improvements at 230 kV (Red Lion-Cedar Creek-Milford) and at 138 kV (Townsend-Church, Glasgow-Cecil, Basin Road-Bear, Vienna-Nelson) are completed.

COMAR 20.61.06.03 B (1)(b)

(b) The qualitative analysis may result in the elimination from further consideration of an application that the Commission determines represents a significant risk of not achieving successful commercial operation or is not likely to provide net economic, environmental, and health benefits to the State.

Findings

The proposed Skipjack Project presents no evident significant risks of not achieving a successful COD with one possible exception. Skipjack stated "...the Maryland PSC has the authority to cause the winning bidder to receive payments for the full term of the commitment approved in the Maryland PSC order, whether or not there is a subsequent successful constitutional challenge to the program, or to the Maryland PSC order, under state or federal constitutional law." Without such payment assurance from the MDPSC, Skipjack would not be obligated to develop its Project. We believe the MDPSC has discretion to ascertain whether this condition is acceptable and in compliance with COMAR 20.61.06.02 E and other sections.

Based on the qualitative benefits described above and Skipjack's assumption of all development, construction, and performance risks, we believe that the Skipjack Project, if developed and operational, will provide net economic, environmental, and health benefits to Maryland.

QUANTITATIVE ANALYSIS – NET RATE IMPACTS

COMAR 20.61.06.03 B (2)(a)

(2) The quantitative analysis shall measure the impact of a proposed project and, as applicable, a combination of proposed projects, expressed in monetary terms.

(a) The quantitative analysis of the projected net rate impacts for an average Maryland retail electric customer based on an annual consumption of 12,000 kilowatt hours and non-residential retail electric customers shall include consideration of the proposed OREC price schedule

(including the proposed additional OREC prices for a further period of five years referenced in Regulation .02M(3) of this chapter) and proposed OREC amount, the value of energy, capacity, and ancillary services generated by the proposed project, the value of avoided Tier 1 REC costs, and any consequential impacts on wholesale market energy, capacity, ancillary service, and REC prices, to determine the following:

(i) Whether the projected net rate impact for applicable classes exceeds the limitations established in Public Utilities Article, 7-704.1(e)(1)(ii) and (iii), Annotated Code of Maryland; and

(ii) The forecasted net rate impact to ratepayers over the initial term of the proposed project;

Findings

We considered three principal elements to estimate the net rate impact for Maryland customers:

- The direct (or gross) OREC Price per the Skipjack application
- The net OREC Price that subtracts the values of energy, capacity, and RECs included in the ORECs which offset a portion of the gross OREC Price
- The reduction in wholesale energy, capacity, and REC market prices

Market Price Effects

There will be three market price effects: wholesale energy prices, wholesale capacity prices, and Tier 1 REC prices.

We expect the Skipjack Project will have a limited overall effect on Maryland wholesale energy prices due to the offsetting market response in western and central parts of PJM. Since the Skipjack Project will be interconnected in the DPL zone, those customers (along with other customers in EMAAC) will benefit the most through lower wholesale energy prices while the limited electrical connection between DPL and other Maryland energy zones limits the reduction in wholesale energy prices for non-DPL consumers. The overall energy cost-to-load benefit for Maryland ratepayers has a present value of $6.1 million (2016 $) over the twenty-year Study Period.

The Skipjack Project is expected to add UCAP and lower wholesale capacity prices in EMAAC, while the market response will reduce UCAP and raise wholesale capacity prices in western PJM. We expect the 120 MW (nameplate rating) Skipjack Project will add 31.2 MW of UCAP in EMAAC for the first six Capacity Delivery Years (based on PJM's determination that the Skipjack Project would receive an initial CIR value based on a 26.0% net capacity factor) and rising to 41.3 MW of UCAP in subsequent years (based on

the Project's estimated 34.4% performance during Summer Peak Hours).[126] We expect the 185 MW (nameplate capacity) of displaced planned onshore wind resources in western and central PJM will reduce UCAP by 24.1 MW (based on PJM's default UCAP value of 13% for onshore wind) over the 20-year operating period. We calculated the change in wholesale capacity prices for each Maryland zone in future Capacity Delivery Years (2023/24 through 2041/42) by shifting the supply curves in each LDA by these UCAP values, shown in Table 41.[127]

Table 41. Independent Estimate of Change in UCAP due to the Skipjack Project

Capacity Delivery Years	2023/24 - 2028/29	2029/30 – 2041/42
Skipjack Project	31.2 MW	41.3 MW
Onshore Wind	(24.1) MW	(24.1) MW

In the short term for Capacity Delivery Years 2023/24 – 2028/29, we expect Maryland customers will benefit from a net capacity savings of just under $0.5 million/year due to the Skipjack Project. In the long term for all future Capacity Delivery Years, we expect that the higher UCAP of the Skipjack Project will provide a net capacity savings of $1.1 million/year for Maryland customers. The total value of these annual capacity savings is $10.9 million (present value 2016 $) with the most benefits accruing to customers in DPL (where the Project will interconnect) and in BGE (which has the most customers in Maryland). We expect no measureable impact on the market price of Tier 1 RECs, since the Skipjack Project will displace planned on-shore wind facilities in western and central PJM with an equivalent annual REC output.

Utility-level ratepayer energy, capacity, and RECs price effects over the 20-year Skipjack Project term are displayed in Table 42. The largest effect would be in DPL where the Skipjack Project will interconnect.

Table 42. Indep. Estimate of Zonal Ratepayer Market Price Effects for Skipjack Project
(present value 2016 $ millions over 20-year OREC Term)

	DPL EMAAC	BGE SWMAAC	PEPCO SWMAAC	APS RTO	Maryland (combined)
Energy	($5.3)	($0.4)	($0.5)	$ 0.1	($ 6.1)
Capacity	($3.7)	($4.0)	($2.2)	($0.9)	($10.9)
RECs	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
Total	($9.0)	($4.5)	($2.7)	($0.8)	($17.0)

[126] Skipjack should be able to demonstrate a year of 34.4% performance after its first year of operation, allowing it to bid a higher UCAP into the next BRA. Under current PJM rules, the increased UCAP can only be granted after the Project has made it through the PJM interconnection process that can take about two years, thus delaying the Project's higher UCAP value until the 2026/27 Capacity Delivery Year.

[127] A Capacity Delivery Year begins on June 1 and ends on May 31 in the following year.

Zonal ratepayer effects are displayed in terms of levelized 2016 $/MWh of affected load in Table 43. Total price effects are largest for DPL ratepayers and smallest for APS ratepayers.

Table 43. Independent Estimate of Zonal Ratepayer Price Effects for Skipjack Project
(levelized 2016 $/MWh of affected load)

	DPL EMAAC	BGE SWMAAC	PEPCO SWMAAC	APS RTO	Maryland (combined)
Energy	($0.050)	($0.001)	($0.003)	$0.000	($0.005)
Capacity	($0.036)	($0.006)	($0.013)	($0.002)	($0.008)
RECs	$ 0.000	$ 0.000	$ 0.000	$ 0.000	$ 0.000
Total	($0.086)	($0.007)	($0.016)	($0.002)	($0.013)

Gross and Net OREC Prices

Skipjack submitted a 1-part OREC Price Bid that starts out at $166.00/MWh in 2022 and escalates at 1.5% over time.[128] Skipjacks' OREC Price Bid has a levelized value of $134.36/MWh (2012$) based on a January 1, 2023 COD, thereby satisfying the OWEA levelized $190/MWh (2012 $) price cap.[129] Skipjack's OREC Price Bid is not subject to any adjustment based on the actual cost of PJM network upgrades. Total gross OREC payments (before offsetting ratepayer credits) would be $1,157.3 million (present value 2016 $).

For each OREC purchased by Maryland ratepayers, they will receive credit for one MWh of energy valued at the DPL zonal price and one REC valued at a PJM price. For the annual OREC purchases, Maryland ratepayers will also receive UCAP credit of 31.2 MW for the first six years and 41.3 MW for the remaining fourteen years. We used the AURORAxmp model to forecast the net energy credit benefits of $371.2 million (present value 2016 $) for the Skipjack Project over the 20-year OREC Price Term for Maryland ratepayers. We separately forecasted the net capacity credit of $41.6 million (present value 2016 $) and a net Tier 1 REC credit of $102.2 million (present value 2016 $). The combined impact of these credits lowers the gross levelized OREC Price from $142.99/MWh to $79.37/MWh (2016 $) as shown in the table below.

[128] Skipjack's application states that the first year price of $166.00/MWh shall escalate "...on the anniversary of the Project's commercial operations date each year...", i.e. Skipjack would receive $166.00/MWh for the twelve month period November 2022 through October 2023. However, the Regulations require the OREC price to be "...expressed as either a single firm price for each calendar year or a series of firm prices for each calendar year..." We explained to Skipjack, and Skipjack verbally accepted, that the OREC prices must be on a calendar year basis so that it would receive $166.00/MWh for the two months of November and December, 2022, then it would receive the next year's price of $168.49/MWh for January - December 2023, etc.

[129] Skipjack indicated a COD of November 1, 2022 and we evaluated the Project on a calendar year basis as close to that date as possible, i.e. assuming a January 1, 2023 COD. The resulting levelized OREC price is about $0.12/MWh lower than if we assumed a November 1, 2022 COD.

Table 44. Independent Estimate of Gross and Net OREC Prices for the Skipjack Project

(2016 $/MWh)

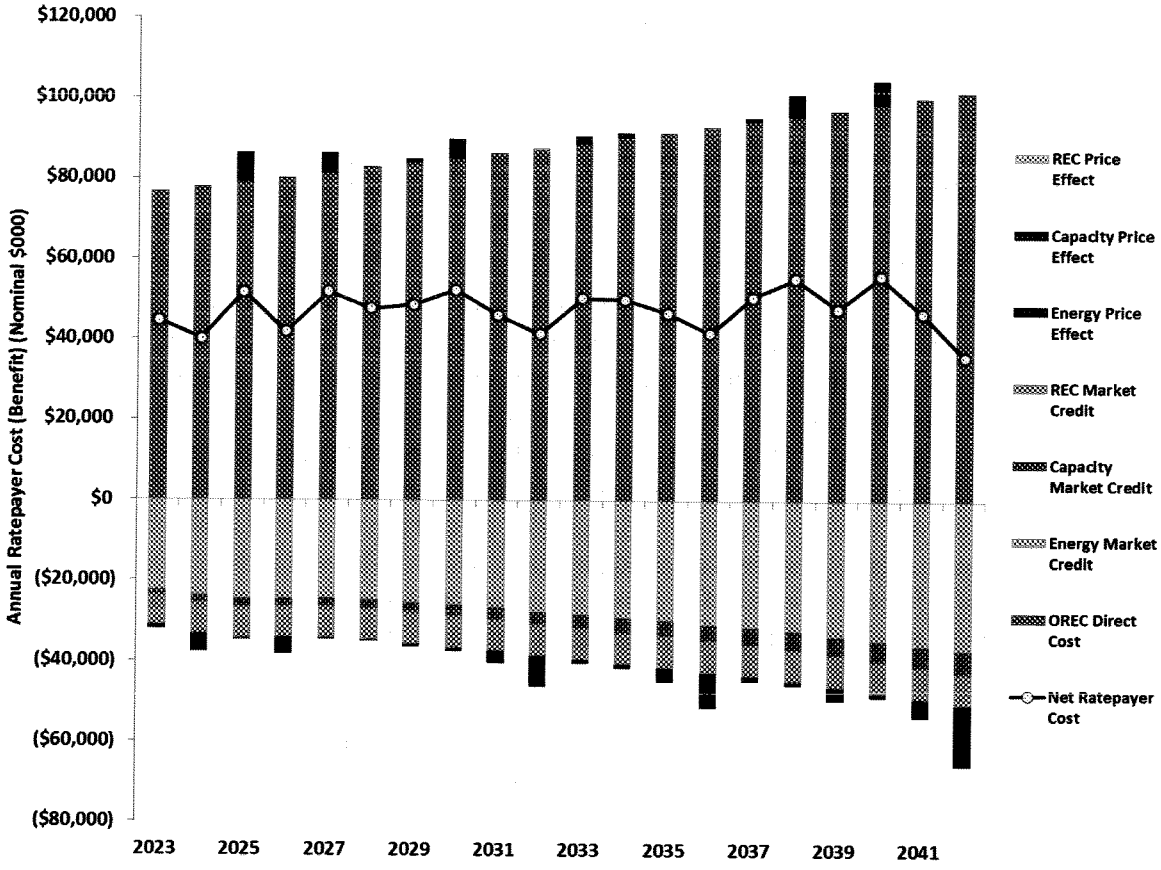
Year	1	5	10	20	1 - 20
	2023	2027	2032	2042	Levelized
OREC Price	$147.94	$146.85	$141.51	$137.90	$142.99
Energy Credit	($43.32)	($45.91)	($46.04)	($50.27)	($45.86)
Capacity Credit	($2.14)	($3.62)	($5.86)	($7.49)	($5.13)
REC Credit	($14.53)	($14.18)	($12.06)	($10.64)	($12.62)
Net OREC Cost	$87.95	$83.14	$77.57	$69.50	$79.37

Net Rate Impacts

In order to calculate the net impact to Maryland ratepayers in levelized 2012 dollars per year, we combined three principal components: the gross OREC price, market credits (for energy, capacity, and RECs), and any reduction in wholesale energy, capacity and REC market prices. We calculated each component on a total nominal dollar basis for each year of the OREC Price Term, and then discounted them to a present value (2012$ or 2016$) amount using the nominal discount rate. The Maryland affected load amounts for each year were also "discounted" to a present value equivalent at the real discount rate. Levelized constant dollar costs and credits were then calculated on a $/MWh of affected load basis as the quotient of the present value dollar amounts divided by the present value equivalent load amounts. Thus the Maryland net ratepayer cost was calculated as the levelized equivalent of the proposed OREC Price annual payments less the levelized equivalent of the projected stream of energy and capacity market credits, avoided Tier 1 REC purchases, and any reductions in wholesale energy and capacity prices. These were all calculated by Maryland zone – DPL, PEPCO, BGE, and APS – and combined based on their load share to calculate the overall net power market impact for ratepayers.

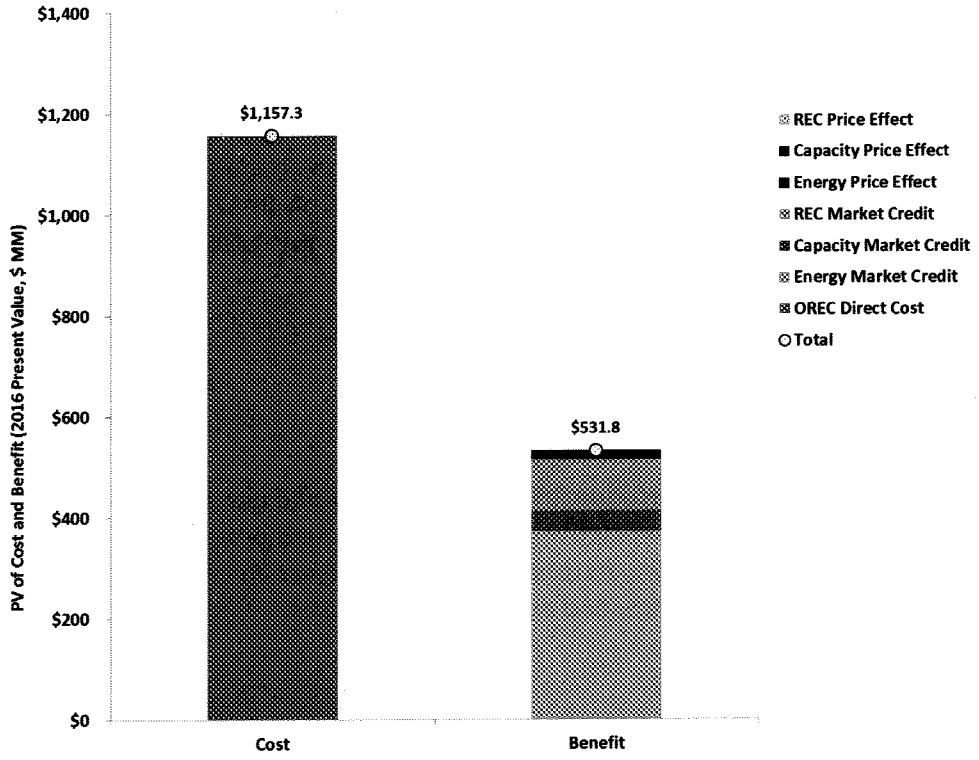
The gross Skipjack Project costs are shown against the various calculated ratepayer benefits on an annual nominal dollar basis in Figure 17 below. The energy and REC price credits provide the most benefit to Maryland ratepayers, while capacity credits and market price effects are minimal.

Figure 17. Independent Estimate of Annual Ratepayer Cost for the Skipjack Project
(nominal $000)



Ratepayer costs and benefits by component (present value 2016 $) for all of Maryland are displayed in Figure 18. The gross OREC cost of $1,157.3 million is offset by $531.8 million in benefits (all present value 2016 $), primarily the energy and Tier 1 REC credits.

Figure 18. Indep. Estimate of Ratepayer Cost and Benefits for the Skipjack Project
(2016 $ present value)



Net OREC and ratepayer costs broken down by component are shown in terms of present value 2016 $, levelized $/MWh OREC, and the levelized $/MWh of load in Table 45. We calculated a present value net ratepayer cost of $625.4 million (2016 $) for the Skipjack Project over the 20-year operating period.

Table 45. Independent Estimate of Net OREC and Ratepayer Costs for Skipjack Project
(20-year term)

	Total	Levelized $ / OREC		Levelized $/MWh Load	
	(2016 $000 PV)	(2016 $)	(2012 $)	(2016 $)	(2012 $)
OREC Direct Cost	$1,157,255	$142.99	$134.36	$0.882	$0.829
Energy Credit	($371,179)	($45.86)	($43.09)	($0.283)	($0.266)
Capacity Credit	($ 41,555)	($ 5.13)	($ 4.82)	($0.032)	($0.030)
REC Credit	($102,150)	($12.62)	($11.86)	($0.078)	($0.073)
Net OREC Cost	$642,372	$79.37	$74.58	$0.490	$0.460
Energy Price Effect	($ 6,105)	($0.75)	($ 0.71)	($0.005)	($0.004)
Capacity Price Effect	($10,854)	($ 1.34)	($ 1.26)	($0.008)	($0.008)
REC Price Effect	$ 0	$ 0.00	$ 0.00	$0.000	$0.000
Net Ratepayer Cost	$625,412	$77.27	$72.61	$0.477	$0.448

Our net ratepayer cost calculation allowed us to confirm the Skipjack Project would satisfy both the net residential ratepayer impact and non-residential ratepayer impact caps. We found the Skipjack Project would have a levelized monthly bill impact of $0.45/month (2012 $), therefore meeting the residential net ratepayer impact cap, i.e. $1.50/month levelized in 2012 dollars assuming an average residential load of 12,000 kWh/year as prescribed by OWEA and the Regulations. We also found that the Skipjack Project would increase the annual electric bills for non-residential, i.e. commercial and industrial, ratepayers by an average of 0.44%, based on 2012 EIA 826 non-residential energy sales and revenue data, which would be below the 1.5% rate impact cap on the annual electric bills of non-residential customers.

QUANTITATIVE ANALYSIS – ECONOMIC IMPACTS

COMAR 20.61.06.03 B (2)(b)

(b) The quantitative analysis of the economic impacts on Maryland associated with the proposed project shall assess the projected impact of the proposed project on in-state income, employment, taxes, and local spending associated with the project lifecycle including construction, operations, maintenance, and equipment purchases.

Findings

We prepared an independent estimate of the Skipjack Project's impact on in-state income, employment, taxes, and local spending by using Skipjack's spending assumptions to run IMPLAN, an industry-standard input-output economic model. Our key findings are as follows; all values are in constant 2021 dollars:

- We estimated Skipjack will spend $207.5 million in-State to develop and construct the Project, plus we included an expected $25 million investment in a steel fabrication facility. This in-state spending will provide $154.5 million in indirect and induced benefits, create 1,815 FTEs, and provide almost $15 million in tax revenues.

- During the operating phase, we estimated Skipjack will spend about $4.7 million per year to operate and maintain the Skipjack Project. We estimated that the Project would provide an additional $2.8 million in indirect and induced benefits, support 41 FTEs, and provide $0.6 million in tax revenues per year.

- Over the entire development, construction and operating phases, we estimated that the Skipjack Project will provide a total of $536.4 million in direct, indirect, and induced spending in Maryland. We also estimated that the Skipjack Project will provide 2,635 new FTEs.

- Boston Pacific's tax revenue estimated during development and construction phase is about double our estimate of $14.9 million, while Boston Pacific's tax

revenue estimated for the operating phase is about one-third of our estimate of $11.3 million. Our total tax revenue estimate is about one-quarter lower than Boston Pacific's estimate for the entire 2017-2042 period.

- The IMPLAN model cannot calculate the impact of lower electricity prices.

Table 46 summarizes our independent analysis results.

Table 46. Indep. Estimate of Spending, Employment, & Tax Impacts of Skipjack Project
(2021 $ millions)

	Dev't and Constr'n (2017-2022)	Operating Period (2023-2042)	Twenty Years (2017-2042)
Direct Expenditures	$ 207.5	$ 93.4	$ 300.9
Indirect Sales	$ 90.0	$ 22.6	$ 112.6
Induced Sales	$ 89.6	$ 33.3	$ 122.9
Total	$ 387.1	$ 149.3	$ 536.4
Direct Employment	913	484	1,397
Indirect Employment	344	129	473
Induced Employment	557	207	764
Total Employment (FTEs)	1,815	820	2,635
Taxes	$ 14.9	$ 11.3	$26.3

QUANTITATIVE ANALYSIS – ENVIRONMENTAL AND HEALTH IMPACTS

COMAR 20.61.06.03 B (3)

(3) The independent analysis of the environmental and health benefits on Maryland associated with the proposed project, quantitatively expressed in tons of avoided air emissions and qualitatively expressed in terms of health impacts associated with avoided air emissions and impacts on the affected marine environment based on publicly available information.

Findings

We used the AURORAxmp chronological dispatch simulation model to forecast the change in fossil fuel power plant emissions (based on a proprietary database of emissions rates) as well as to forecast the change in wholesale energy prices due to the Skipjack Project. We compared the Base Case (without the Skipjack Project) emissions to the Skipjack Project case to calculate the change in power plant emissions over the twenty-year operating period, adjusted for consistency, as shown below:

Table 47. Indep. Estimate of Change in Maryland Emissions due to Skipjack Project

	(tons/year, 2023-2042)
CO_2	(6,384)
NO_x	(3.4)
SO_2	(1.6)

We found that carbon emissions in Maryland would decrease as in-State power plants operate less frequently due to the Skipjack Project as shown in Table 47 above. Since the Skipjack Project would be interconnected to the DPL zone, power plants in other EMAAC states, i.e. Delaware, Pennsylvania, and New Jersey, will also operate less frequently.

The market response that will displace 186 MW of planned onshore wind resources in western and central PJM would cause carbon emissions to increase in western and central PJM due to increased coal generation. Since coal generation is more than twice as carbon-intensive as gas-fired generation, the decrease in gas-fired emissions in EMAAC would be outweighed by the increase in coal emissions in western PJM. Thus overall emissions in PJM would increase due to the Skipjack Project.