



119 Washington Avenue, Suite 1G
Albany, NY 12210
518.432.1405
info@aceny.org | www.aceny.org

June 4, 2018

Hon. Kathleen H. Burgess
Secretary to the Commission
New York State Public Service Commission Three Empire State Plaza
Albany, New York 12223 - 1350

Re: Case 18-E-0071 – In the Matter of Offshore Wind Energy

Dear Secretary Burgess:

Attached please find comments regarding the Offshore Wind Generating Facilities Program proposed by the Public Service Commission pursuant to the State Administrative Procedures Act and filed in the New York State Register on April 4, 2018 from the New York Offshore Wind Alliance (NYOWA) and the American Wind Energy Association (AWEA).

Sincerely,

A handwritten signature in black ink, appearing to read "Joe Martens".

Joe Martens
New York Offshore Wind Alliance

A handwritten signature in black ink, appearing to read "Nancy Soffel".

Director, Offshore Wind Policy & Siting
American Wind Energy Association

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

CASE 18-E-0071 – In the Matter of Offshore Wind Energy

**COMMENTS ON
AN OFFSHORE WIND GENERATING FACILITIES PROGRAM**

**PROVIDED BY THE

NEW YORK OFFSHORE WIND ALLIANCE
AND
AMERICAN WIND ENERGY ASSOCIATION**

June 4, 2018

I. INTRODUCTION

The New York Offshore Wind Alliance (“NYOWA”) and the American Wind Energy Association (“AWEA”) respectfully submit the following comments concerning An Offshore Wind Generating Facilities Program proposed by the Public Service Commission (“PSC”) pursuant to the State Administrative Procedures Act and filed in the New York State Register on April 4, 2018. The PSC’s Notice (the “Notice”) includes consideration of alternative procurement options for offshore wind in the Offshore Wind Policy Options Paper (“Options Paper”) filed by the New York State Energy Research and Development Authority (NYSERDA) on January 29, 2018, as well as two additional procurement options proposed in the Notice. The purpose of these comments is to explain the interests of NYOWA and AWEA in this proceeding, and to summarize what we believe to be the best of the options from a policy and legal perspective. Further, these comments address other policy and design matters of importance in the development of a market-based offshore wind procurement program that are raised in the Notice.

NYOWA is an initiative of the Alliance for Clean Energy New York (“ACE NY”) and consists of a broad and diverse coalition of thirty partner organizations, whose collective mission is to promote policies that will lead to the development of offshore wind in the Atlantic Ocean off the coast of New York State.

NYOWA is guided by a Steering Committee that includes ACE NY, Deepwater Wind, Orsted, Equinor, the National Wildlife Federation, the Natural Resources Defense Council, Sierra Club and the University of Delaware's Special Initiative on Offshore Wind.

AWEA is a national trade association representing a broad range of entities with a common interest in encouraging the expansion and facilitation of wind energy resources in the United States. AWEA members include wind turbine manufacturers, component suppliers, project developers, project owners and operators, financiers, researchers, renewable energy supporters, utilities, marketers, customers, and their advocates. ACE NY is a regional partner of AWEA¹.

NYOWA and AWEA strongly support the mandate developed by the PSC pursuant to the Clean Energy Standard proceeding by which 50 percent of New York's energy is to be provided by renewable resources by the year 2030. We agree with the premise underlying NYSERDA's Options Paper that large-scale offshore wind power is essential to achieving that mandate. In particular, we applaud Governor Cuomo's goal to require the procurement of 2,400 megawatts ("MW") of offshore wind by 2030 and the procurement of at least 800 MW of offshore wind between two solicitations to be issued in 2018 and 2019.

To assist in its analysis of the procurement options presented in the Options Paper and Notice, NYOWA commissioned a legal review of the procurement options by outside counsel and an economic analysis² of achieving 2,400 MW of offshore wind by 2030. The legal analysis concludes that all of the options presented in the Notice and Options Paper are legally viable and the economic analysis confirms the results in the Option Paper. Further, the economic analysis concludes that offshore wind procurement is likely to have significant positive net economic impacts, particularly if the PSC selects a low-cost option such as the Market or Index OREC while at the same time contributing significantly to emission reductions and public health benefits. The results of these analyses are further summarized in Sections V (1) and (2) below and the economic analysis is included in full in Appendix A.

II. PROCUREMENT OF 2,400 MW OF OFFSHORE WIND GOAL WITH COSTS SHARED BY ALL LOAD SERVING ENTITIES IS CRITICAL TO MEETING THE 50 BY 30 MANDATE

We strongly urge the PSC to follow Governor Cuomo's lead and adopt a goal that the quantity of electricity supplied by renewable resources and consumed in New York State be increased by the output of 2,400 MW of new offshore wind generation facilities as part of a strategy to reduce statewide greenhouse gas emissions by 40% by 2030. Further, that goal should be based on contributions towards achievement of the goal by each New York Load Serving Entity (LSE) serving retail customers, including the non-jurisdictional Long Island Power Authority (LIPA) and the New York Power Authority (NYPA).

¹ AWEA generally supports the comments herein but takes no position on the comments in Section III(4).

² Offshore Wind in New York, An Economic Impact Analysis, The Brattle Group, June 1, 2018

According to the “Order Establishing a Clean Energy Standard,”³ 29,200,000 annual megawatt-hours (“MWh”) of energy need to be produced from new renewable energy resources in order to meet the 50 by 30 mandate. The siting of 2,400 MW of offshore wind energy represents nearly one-third of the MWh necessary (21,024,000 MWhr x 40% capacity factor = 8,409,600) to achieve that mandate, with the remaining two-thirds to be provided by land-based resources, such as wind, solar, fuel cells, and capacity additions at existing hydropower facilities.

There are several reasons to include deployment of 2,400 MW of offshore wind as part of the 50 by 30 mandate. First, unlike land-based projects, which generally include proposed resources having capacities ranging from 20 to 200 MW, individual offshore wind projects are expected to have much larger capacities – ranging from 200 to 800 MW or more, with the highest capacity factors of any non-hydro renewable energy resource, meaning that the siting of these facilities will accelerate achievement of the 50 by 30 mandate. Second, the offshore wind facilities would be tied into the transmission systems in either or both the New York City and Long Island areas, allowing the injection of energy and capacity into New York’s highest load areas, thus making the systems more reliable during the summer peak season and reducing peak prices. Third, many of New York’s coastal communities are expected to benefit from the development of offshore wind farms given their close proximity to the federal wind energy areas.

1. 2018/2019 Procurements Critical for Supply Chain Development and Ratepayers

We strongly urge the PSC to follow Governor Cuomo’s lead and adopt a requirement to “jump start” the deployment of 800 MW of these resources in the short term through procurements scheduled for 2018 and 2019. States north and south of New York are moving forward rapidly to develop offshore wind resources. Recently, Massachusetts and Rhode Island announced awards for 800 MW and 400 MW respectively of offshore wind capacity. Maryland has also contracted for 368 MW of offshore wind. Connecticut recently released a Request for Proposals for 200 MW of offshore wind and other renewable energy projects and New Jersey codified its commitment to develop 3,500 MW of offshore wind capacity and is rapidly developing the regulations necessary to move forward with a 1,100 MW offshore wind procurement. New York must not be left behind. Indeed, a recent New York Times story illustrates that early movers in the offshore wind arena are likely to garner the most benefits (“Massachusetts Gains Foothold in Offshore Wind Power, Long Ignored in U.S.”, May 23, 2018)⁴. Therefore, to establish a strong market signal for the purposes of establishing the associated supply chain and workforce and help ensure

³ Case 15-E-0302; Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard, “Order Adopting a Clean Energy Standard,” issued and effective August 1, 2016, at pgs. 84-85.

⁴ See <https://www.nytimes.com/2018/05/23/business/energy-environment/offshore-wind-massachusetts.html?hp&action=click&pgtype=Homepage&clickSource=story-heading&module=second-column-region®ion=top-news&WT.nav=top-news>.

that New York is the hub for offshore wind, it is imperative for the PSC to order the procurement of at least 800 MW over the next two years. This is particular so in light of the recent announcements from Massachusetts and Rhode Island awarding bids for 1,200 MW of offshore wind energy.

2. Leveraging the Federal Investment Tax Credit

It is also imperative for the PSC to maximize the capacity procured in a manner that ensures commencement of construction by the end of 2019. The federal Investment Tax Credit (ITC) provides a five-year declining federal incentive for the development of offshore wind. Projects that meet the “commence construction” deadline in 2019 will receive a 12 percent credit. Thereafter, unless extended by Congress, the Federal ITC will go to zero. Every dollar of federal subsidy is one less dollar that would have to be incurred by New York ratepayers. Consequently, any delays in issuing a procurement and entering into contracts with winning bidders will jeopardize hundreds of millions of dollars to offshore wind developers that would have the effect of lowering project costs and increasing ratepayer benefits.

3. Annual Procurements Necessary to Reach 2,400 MW Goal

While meeting the Governor’s commitment to procure at least 800 MW of offshore wind in 2018 and 2019 is critical, the PSC and NYSERDA should begin immediately to plan for the next phase of procurements, beyond 2019, following the issuance of the order contemplated by this proceeding. For the orderly and efficient market development of offshore wind and its associated supply chain, NYSERDA should publish a schedule of annual offshore wind procurements, starting in 2018, to ensure that New York reaches its goal of 2,400 MW of capacity by 2030. A comprehensive, transparent and predictable procurement schedule would enable offshore developers and suppliers to refine their expectations of market size and timing, both in New York and regionally, which in turn would allow for better coordination of regional long-term investments that are necessary to achieve these expectations.

4. Flexible Solicitations

NYOWA recommends that the PSC refrain from setting a rigid limitation on the amount of capacity individual developers may bid towards the Phase I goal. Specifically, we recommend that the PSC require a standard 400 MW bid in Phase I solicitations but give developers the latitude to bid as little as 200 MW, or as much as 800 MW, in the first solicitation to be conducted in calendar year 2018. This type of flexibility would give market participants an opportunity to put forward – and bid evaluators an opportunity to review – alternative approaches for best meeting the State’s public policy objectives and would be consistent with actions in other northeast states, which have already adopted this flexible procurement approach. For example, for its first large-scale offshore wind tender held in late 2017, Massachusetts permitted bids within a capacity range of 200–800 MW, while requiring a mandatory bid of 400 MW. As noted earlier, Massachusetts selected the winner of an 800 MW bid as a result of this flexible solicitation. Similarly, we believe this is the direction New Jersey will take in its first procurement later this year; Governor Murphy’s

Executive Order 8 requires the procurement of 1,100 MW in the first solicitation as a major down payment towards the overall statewide target of 3,500 MW by 2030.

A second reason favoring the front-loading of capacity in the 2018 solicitation is the ability to take advantage of the federal ITC which, as noted above, is set to expire in 2019 (see above).

III. PHASE I ELIGIBILITY AND SCORING CRITERIA

1. Offshore Leases a Necessity

Eligibility should be limited to (i) offshore wind electric generation facilities, located in ocean waters of the United States, that become operational on or after January 1, 2015; (ii) that deliver their electric energy into the New York Control Area for consumption by New York consumers, either by direct generator lead into New York or by transmission across adjacent control areas into New York; and, (iii) that upon submission of a bid, have already obtained a lease from the offshore ocean site from the U.S. Bureau of Ocean Energy Management (BOEM). Offshore wind developers must secure a federal lease before doing the extensive due diligence that is required to ensure project viability, including characterizing the wind resource, ground conditions, cable routes, interconnection feasibility and many other factors that go into developing a project bid. The eligibility requirement related to already having a lease with BOEM is therefore critical to both increasing the probability that selected projects actually get constructed in a timely manner and reducing the administrative burden of reviewing projects that are speculative because they may never secure a lease. In short, the PSC should not open offshore wind solicitations to wasteful speculative bidding.

2. Shoreline Setbacks Unnecessary

The PSC should not require shoreline setbacks to be considered as part of any procurement process. Shoreline setback distances fall under BOEM's jurisdiction. Indeed, as part of its offshore leasing process, as well as during subsequent phases of project review, BOEM already takes into account shoreline setbacks and visual impacts based on sound science and public input. Further, since visual impacts and other aesthetic concerns will undoubtedly impinge upon overall support and project viability, developers will be highly motivated to be responsive to any concerns raised during the environmental review process.

3. Environmental and Community Benefits

As a matter of principle, we believe that offshore wind development projects should support and benefit the environment and communities they serve. As our membership includes developers, environmental and labor advocates, we urge the PSC to include consideration of environmental and local economic benefits in its procurement policy. Doing so would ensure that, among other factors, projects are not only completed in time to achieve Governor Cuomo's goal of 2,400 MW by 2030, but also in an environmental responsible manner that benefits the communities they serve.

We strongly support NYSERDA's ongoing efforts, in consultation with the Department of Environmental Conservation ("DEC"), to develop science-based Best Management Practices ("BMP") for offshore wind through its Environmental Technical Working Group ("ETWG"), as described in New York's Offshore Wind Master Plan. We applaud NYSERDA's leadership on this important issue and urge the two agencies to complete and publish their first volume of BMPs as soon as practicable.

We urge the PSC to incorporate consideration of environmental protection and, to the extent they are available, the NYSERDA BMPs, as part of its procurement policy. We believe including environmental consideration in the procurement process will position New York State as a leader in advancing responsible offshore wind development, and should be applied starting in Phase 1 and continuing forward for all projects through this program.

If implemented responsibly, the development of offshore wind in New York State can provide important and much-needed support to local communities throughout the state. Community benefit agreements can help to align the interests of a project developer with those of the local communities it serves, and help build support for the project within local communities. We believe New York's offshore wind projects will be most successful when a constructive and collaborative conversation occurs among developers, the state and local communities about how projects can help meet communities' needs. Therefore, we urge the PSC to consider local economic benefits and other commitments to community support as part of its procurement policy.

4. Labor and Supply Chain Development

As detailed in Section II.A. above, the development of offshore wind presents a unique opportunity for job creation and economic development in New York State. Accordingly, and in addition to our recommendation for frequent annual procurements set forth in Section II.C. above, we urge the PSC to incorporate consideration of factors related to labor and supply chain development in its procurement policy. Examples of such factors could include, but are not limited to, local hiring, purchasing from the local supply chain, investments in ports and commitments to the participation of local labor.

We support the PSC's consideration of labor standards in its procurement policy. In March 2018, New York State announced that all large-scale renewable energy projects will be required to pay prevailing wage. We believe this was an important step toward New York State supporting family sustaining, high wage jobs and we would support a comparable application of this requirement to offshore wind.

We recognize the important role that Project Labor Agreements ("PLA") and joint labor-management training programs can play in project construction, installation, logistics and other activities that may be executed with local labor. PLAs have the potential to bring coordinated, pro-active planning

to complex projects, provide important benefits to local labor in terms of skill training, employment opportunities and future workforce development, and ensure that the most productive and skilled craft labor is available to work on a project. We support the consideration of labor commitments in the procurement policy that will make the State a national leader in developing a successful, robust and equitable offshore wind industry.

IV. COST CONTROL

The best mechanism to achieve cost control is for the PSC to define terms of procurement that maximize competition and lower project capital cost by lowering risks. Competition will drive the lowest price for ratepayers with the highest value for New York. We support the imposition of a maximum upset price based on an analysis of bids in other states and other published industry data, and the option to not select any bids as a cost containment measure. This effective circuit breaker will give the PSC and those parties representing consumer interests comfort that the overall costs of program implementation are reasonable and consistent with expectations. However, NYOWA would caution that the maximum upset price should be established with some leeway in Phase I given the lack of publicly available contract prices in the U.S.'s emerging OSW market.

Further, NYOWA does not support a mechanism that allows the PSC to adjust pricing post-bidding based on an administratively determined view of what constitutes a reasonable return for developers. Such a mechanism would discourage developers from putting their best bid on the table in the first instance and override the benefits of a competitive bidding process in effectively and efficiently sorting out the lowest/highest value option.

In addition, the inclusion of "open book" or minimum price decrease provisions as contemplated by Staff can result in the manipulation of pricing for subsequent projects. e.g. if pricing was made available for the first round of successful projects, they may artificially inflate pricing for the second round of projects without taking advantage of rapidly declining costs in the industry.

Last, when considering pricing for procurements in other states, the PSC and NYSERDA should account for any differences in procurement terms used in other states, especially the procurement mechanisms used. As further explained below, mechanisms such as PPA's used in Massachusetts and Rhode Island will yield the lowest costs, while any other mechanism will raise costs as the risk increases.

V. LEGAL AND ECONOMIC EVALUATION OF PROCUREMENT OPTIONS

We have given careful consideration from both a policy and legal perspective to the procurement options outlined in NYSERDA's Option Paper and to the additional options included in the PSC's April 11th, 2018 State Register Notice. We address the policy basis for each of the options we examined below but address first our view that all of the options identified in the State Register Notice, as well the Bundled PPA approach identified in NYSERDA's Options Paper, remain legally viable options.

1. Legal Analysis Addresses Jurisdictional Issues

NYOWA commissioned a legal review of the jurisdictional issues, which examined the constitutionality of each of the procurement options; specifically, the risk that any of the options would be found by a court to be preempted under the Supremacy Clause of the United States Constitution. Any analysis of the constitutionality of a State-created market based on the environmental attributes of renewable energy must start with the States' significant legal authority to regulate the production of energy, subsidize certain forms of electricity, and create specialized, non-FERC regulated markets related to energy production – such as the various RECs programs adopted by States around the country. When Congress enacted the Federal Power Act (“FPA”) in 1935, States had been regulating electricity's production for decades, and Congress did not want to disturb that authority. Thus, while the FPA provides FERC with authority over wholesale electric sales and rates, it also preserves state authority over production of energy. Production of energy often goes hand-in-hand with wholesale sales because electricity must be consumed instantaneously.

This division of authority has proved to be confusing for courts and contributes to the development of legal precedent that is still evolving as to what actions States may take without interfering with those areas reserved for federal oversight. However, generally speaking, courts have not taken issue with the ability of the States to impose costs on, or provide benefits to, power plants for each megawatt-hour (“MWh”) of electricity produced. So long as such State programs do not seek to displace FERC's exclusive role in regulating the wholesale sales and rates of electricity, they do not run afoul of the Supremacy Clause of the United States Constitution and thus are not preempted.

(i) The States Have Broad Authority to Adopt Programs Related to the Creation of Renewable Energy Credits

As has long been acknowledged, FERC's authority to determine just and reasonable wholesale rates exists alongside the States' “traditional[]” authority over “the regulation of utilities” within their jurisdiction. *Ark. Elec. Coop. Corp. v. Ark. Pub. Serv. Comm'n*, 461 U.S. 375, 377 (1983). The FPA, moreover, expressly limits FERC's jurisdiction by stating that it “shall not have jurisdiction, except as specifically provided in [Subchapters II and III of the FPA], over facilities used for the generation of electric energy.” 16 U.S.C. § 824(b)(1) (emphasis added). Recently, in *Allco Fin., Ltd v. Klee*, 861 F.3d 82 (2nd Cir. 2017), the U.S. Court of Appeals for the Second Circuit explained the scope of authority that the States retain over utilities unrestrained by the FPA:

- “to direct the planning and resource decisions of utilities under their jurisdiction,” such as by “order[ing] utilities to . . . purchase renewable generation”;
- “administration of integrated resource planning and utility buy-side and demand-side decisions, including [demand-side management]”;

- to impose “utility generation and resource portfolios”; and
- to impose “non-bypassable distribution or retail stranded cost charges.”

Id. at 101 (internal citations omitted).

We point to the State’s broad authority over utilities to make three related points. First, FERC has already pronounced in *WSPP Inc.*, 139 FERC ¶ 61,061 (April 20, 2012), that the States are free to create REC-only markets that act independently of wholesale energy markets. While, as noted, the case law is still evolving, based upon this FERC precedent, a procurement option that creates an OREC-market is reasonably likely to withstand a legal challenge. Second, the PSC has broad authority based upon its traditional police powers to pursue goals related to public health and environment. See *Cahill v. Public Service Com.*, 69 N.Y.2d 265, 272 (1986) (“The PSC oversees the utilities for the public good as an exercise of the State’s police powers . . . and has exclusive authority to determine just and reasonable rates”) (internal citations omitted); *Coalition for Competitive Elec. v. Zibelman*, 2017 U.S. Dist. LEXIS 116140, at *30 (S.D.N.Y. Jan. 30, 2017) (“Regulation of retail rates, like the regulation of environmental attributes, is within the zone of state jurisdiction . . .”). Given that the PSC is acting within its traditional police powers, a court is likely to defer to its selection of a procurement mechanism in this proceeding.

Third, and most importantly, the courts have adopted a “presumption against preemption with respect to areas where states have historically exercised their police powers.” *Entergy Nuclear Vt. Yankee, LLC v. Shumlin*, 733 F.3d 393, 426 (2d Cir. 2013) (quoting *N.Y. SMSA Ltd. P’ship v. Town of Clarkstown*, 612 F.3d 97, 104 (2d Cir. 2010)); see also *Wyeth v. Levine*, 555 U.S. 555, 565 (2009) (“[I]n all pre-emption cases, and particularly in those in which Congress has ‘legislated . . . in a field which the States have traditionally occupied,’ . . . we ‘start with the assumption that the historic police powers of the States were not to be superseded by the Federal Act unless that was the clear and manifest purpose of Congress.’”) (internal citations omitted). The courts have applied this presumption in numerous instances related to a State’s regulation of utilities – an area at the core of a State’s traditional police powers. In sum, so long as the PSC adopts a program focused on creating a new commodity – ORECs – in a manner that does not establish an alternative to FERC-regulated wholesale markets, traditional preemption jurisprudence suggests that such a program would be upheld as constitutional.

(ii) FERC’s Jurisdiction to Regulate Wholesale Sales and Rates of Energy Does Not Apply to Renewable Energy Credit Programs

In contrast to the States’ inherent authority to create markets related to the environmental attributes of energy resources, FERC’s preemptive authority under the FPA is limited. The courts have consistently ruled that only FERC’s authority regarding the regulation of wholesale sales and rates of electricity is exclusive and thus has preemptive force. See generally *Hughes v. Talen Energy Marketing, LLC*, 136 S.

Ct. 1288, 1291 (2016) (FPA “vests in the Federal Energy Regulatory Commission (FERC) exclusive jurisdiction over wholesale sales of electricity in the interstate market.”).

Consistent with the cases that have interpreted FERC’s authority with respect to wholesale sales and rates of energy, FERC itself has also acknowledged that such authority does not extend to RECs-only (or by implication, ORECs-only) contracts because they “fall outside of the Commission’s jurisdiction under sections 201, 205 and 206 of the FPA.” *See WSPP Inc.*, 139 FERC ¶ 61,061, at P 18. FERC issued its decision in *WSPP Inc.* in the context of reviewing a proposed amendment filed WSPP – a power pool – for the purchase and sale of RECs both independently and bundled with electric energy. *Id.* at P 1. In explaining its role with respect to the regulation of RECs incorporated into bundled and unbundled power purchase agreements, FERC explained the limits of its jurisdiction over RECs-only programs:

RECs are state-created and state-issued instruments certifying that electric energy was generated pursuant to certain requirements and standards. Thus, a REC does not constitute the transmission of electric energy in interstate commerce or the sale of electric energy at wholesale in interstate commerce. Therefore, RECs and contracts for the sale of RECs are not themselves jurisdictional facilities subject to the Commission’s jurisdiction under FPA section 201.

Id. at P 21; *see also America Ref. Fuel*, 105 FERC ¶ 61,004, at P 23 (2003) (“States, in creating RECs, have the power to determine who owns the REC in the initial instance, and how they may be sold or traded . . .”);

Accordingly, based upon *WSPP Inc.*, *America Ref. Fuel*, and how the courts have interpreted FERC’s authority to regulate wholesale sales and rates of energy there is a strong argument that FERC lacks jurisdiction over all of the ORECs-only options proposed by the PSC in the State Register notice, namely, Options 2-6. While each of the options would base the OREC rate either directly (in Options 2-4) or indirectly (in Options 5 and 6) on a formula that considers an index based on the actual, historic or projected price of capacity and energy, resources that would be subject to a NYSERDA contract for ORECs would receive a payment based solely on the OREC rate prescribed in the contract. Because ORECs are not a “sale of electric energy at wholesale” – defined in the statute as “a sale of electric energy to any person for resale” (16 U.S.C. § 824(d) – but instead would constitute a state-created commodity that value the environmental attributes of renewable resources, FERC has no authority to regulate them. *Id.* Thus, FERC’s exclusive authority to regulate wholesale sales and rates of energy is simply inapplicable to ORECs – no matter which procurement option selected – because such a commodity does not constitute the sale of electricity at wholesale.

(iii) The Unconstitutional Procurement at Issue in Hughes is Distinguishable from the Procurement Options at Issue Here

As noted, FERC lacks exclusive authority over ORECs-only programs and thus, as a matter of law, such programs should not be found to be preempted. For the same reason, although FERC has authority to review a Bundled PPA under its “just and reasonable” standard, its review of the ORECs component of such a PPA is fairly limited and, as discussed below, the Second Circuit recently upheld a State program that requires utilities to enter into PPAs that include RECs. As discussed below, although none of the proposed procurement options are immune from constitutional scrutiny, it appears that each of the options would be found not to be preempted under the standards established in the Supreme Court’s recently issued decision in *Hughes*.

The doctrine of preemption derives from the Supremacy Clause of the United States Constitution, which establishes that “the Laws of the United States . . . shall be the supreme Law of the Land; . . . any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.” U.S. Const. Art. VI, cl. 2. As succinctly explained by the Supreme Court in *Hughes*: “Put simply, federal law preempts contrary state law.” 136 S. Ct. at 1297. Accordingly, the Court has developed some basic rules concerning the preemption of a state law: “A state law is preempted where ‘Congress has legislated comprehensively to occupy an entire field of regulation, leaving no room for the States to supplement federal law, . . . as well as ‘where, under the circumstances of a particular case, the challenged state law stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress.’” *Id.* (citations omitted). Preemption of an entire field of regulation is commonly referred to as “field preemption,” while preemption where a state law stands as an obstacle is commonly referred to as “conflict preemption.”

Following these basic rules, several courts have examined the preemptive effect of the FPA with regard to state programs that seek to incentivize certain types of energy production within its borders. As basic background, the FPA was enacted in response to the Supreme Court’s holding in *Pub. Utils. Comm’n of R.I. v. Attleboro Steam & Elec. Co.*, 273 U.S. 83 (1927) – namely, that the Commerce Clause of the U.S. Constitution (Art. 1, § 8, cl. 3) “prohibits states from regulating the rates for wholesale power sales between utilities in different states.” Accordingly, Congress enacted the FPA to encode a dual federal/State regulatory regime, whereby (i) “FERC has jurisdiction over ‘the transmission of electric energy in interstate commerce and . . . the sale of electric energy at wholesale in interstate commerce,’ but not over ‘any other sale of electric energy;” and (ii) FERC also has jurisdiction over all facilities for the transmission and wholesale sales of electric energy in interstate commerce, but not “over facilities used for the generation of electric energy.” 16 U.S.C. § 824(b)(1). At its core, the FPA provides that “FERC has exclusive authority to regulate “the sale of electric energy at wholesale in interstate commerce,” including “ensuring that [a]ll rates and charges made, demanded, or received by any public utility for or in connection with the transmission or sale of [wholesale] electric energy [are] just and reasonable.” *Hughes*, 136 S. Ct. at 1292 (quoting 16 U.S.C. §§ 824(b)(1), 824d(a)).

In *Hughes*, the Supreme Court struck down a State program that “provide[d] subsidies, through state-mandated contracts, to a new generator, but condition[ed] receipt of those subsidies on the new generator selling capacity into a FERC-regulated wholesale auction.” 136 S. Ct. at 1292, 1299. At issue in *Hughes* was an order issued by the Maryland Public Service Commission (“MDPSC”), directing certain electric utilities to enter into a “Contract for Differences” with the developer of a 661 MW power plant – CPV, Maryland, LLC (“CPV”). As in New York, Maryland utilities own the electric transmission infrastructure and purchase energy from wholesale generators, which the utilities then transmit to the state’s businesses and residents. The policy consideration underlying the order was MDPSC’s concern that the capacity auction implemented by PJM – the regional transmission operator that coordinates the movement of wholesale electricity in the mid-Atlantic region of the United States – “was failing to encourage development of sufficient new in-state generation.” *Id.* at 1294.

The Contract for Differences between CPV and the utilities in Maryland guaranteed payment of a set price for wholesale capacity, irrespective of the price established in the wholesale market overseen by PJM. The Contract required a comparison of (i) the actual revenue received by CPV for its sale of energy into the wholesale market to (ii) the set price established under the contract. If the actual revenue turned out to be less than the set price, the contract required the utility to pay the difference to CPV. On the other hand, if the actual revenue turned out to exceed the set price, the contract required CPV to pay the difference to the utility.

The Court found “fatal” the fact that MDPSC’s program “condition[ed] payment of funds on capacity clearing the auction.” *Id.* at 1299. Other aspects of the decision suggest that the reason the Court found this feature of the program to be objectionable was because, in conjunction with MDPSC’s program design, it essentially dictated a rate of wholesale electricity that differed from the rate established through PJM’s FERC-approved wholesale capacity market. For example, while affirming the decision of the court below, the Supreme Court noted that “Maryland’s program sets an interstate wholesale rate, contravening the FPA’s division of authority between state and federal regulators.” *Id.* at 1297. Then, after explaining the Contract for Differences mechanism, the Court found that Maryland “guarantees CPV a rate distinct from the clearing price for its interstate sales of capacity to PJM” and, “[b]y adjusting an interstate wholesale rate, Maryland’s program invades FERC’s regulatory turf.” *Id.*

Other courts similarly have found State action preempted when it dictates a wholesale rate that differs from the rate established through the FERC-regulated markets. For example, in *PPL EnergyPlus, LLC v. Solomon*, 766 F.3d 241 (3rd Cir. 2014), the U.S. Court of Appeals for the Third Circuit examined the New Jersey’s Board of Public Utilities’ (“NJBPUs”) implementation of a State law, requiring New Jersey’s four utilities to enter into Standard Offer Capacity Agreements with eligible generators, obligating them “to pay any differences between” the auction price offered through PJM’s wholesale capacity market

and the generators' actual development costs approved by NJBPU. *Id.* at 252. The expressed purpose of the State law was to "allow new resources to qualify and receive a guaranteed capacity price," as opposed to the variable rates available through the wholesale markets overseen by PJM. Based upon its finding that the State law "through the Standard Offer Capacity Agreements, attempts to regulate the same subject matter that FERC has regulated through PJM's Reliability Pricing Model" (i.e., the field of interstate capacity prices), the court ruled that "New Jersey's efforts to regulate the same subject matter" over which "FERC has exercised control . . . cannot stand." *Id.* at 252, 253. Thus, again the court's concern was that New Jersey dictated a wholesale capacity price that differed from the price offered through PJM's capacity auction.

Some parties that oppose State programs that subsidize renewable or zero emission resources may inappropriately use language in the *Hughes* opinion to attack such subsidy programs as preempted by the FPA; specifically the language in the latter part of the decision, where the Court states that "[n]othing in this opinion should be read to foreclose Maryland and other States from encouraging production of new or clean generation through measures 'untethered to a generator's wholesale market participation.'" 136 S. Ct. at 1299 (citing Br. for Respondents) (emphasis added). This passage does not mean that any subsidy program that is directly related, or tethered, to the wholesale price of electricity is preempted. Rather, the concern expressed by the Court in *Hughes* clearly related to the adoption of a state program tied to a generator's participation in FERC-regulated wholesale markets only, not to a program tethered generally to wholesale market prices.

Nevertheless, some parties may seek a broader application of FPA preemption than the narrow test set forth in *Hughes*. They may interpret the *Hughes* decision as forbidding a State program tethered in any way to the wholesale market price of electricity, arguing that any of several of the OREC options presented in the Options Paper are so tethered. This is the type of application sought by the Plaintiffs in *Coalition for Competitive Elec. v. Zibelman*, 2017 U.S. Dist. LEXIS 116140 (S.D.N.Y. Jan. 30, 2017), a challenge to the PSC's ZEC program adopted to subsidize nuclear power plants in New York. Under the ZEC program, a nuclear generator "is eligible for ZECs if it makes a showing [that] the facility's revenues 'are at a level that is insufficient to provide adequate compensation to preserve the zero-emission environmental values or attributes historically provided by the facility.'" *Id.* at *10 (citing CES Order at 124). The ZEC price, in turn, "is the social cost of carbon less the generator's putative value of avoided greenhouse gas emissions [through RGGI] less the amount of the forecast energy price." *Id.* at *11. As further explained by the court, "if the forecast wholesale price of electricity increases, the price of a ZEC decreases." *Id.* Thus, to be clear, the metric used to price ZECs is based on a forecast of, rather than actual, wholesale energy prices.

The Plaintiffs in *Zibelman* argued, among other things, "that the ZEC program is preempted under *Hughes* because, like the challenged Maryland program, the ZEC program is 'tethered' to the wholesale

auction.”⁵ In rejecting this argument, the Court emphasized that “*Hughes* clearly stated that the impermissible tether was ‘to a generator’s wholesale participation,’ . . . and nowhere stated, implied or even considered that a State program’s incorporation of the wholesale market price would provide a basis for preemption.” *Id.* at *26 (emphasis in the original). Thus, it appears that the court would have had no problem if the PSC’s ZECs program had incorporated the actual, rather than forecast of, wholesale market prices. The court concluded that “Plaintiffs have not provided any persuasive argument why using wholesale prices, actual, or forecast, as a metric for calculating the price of a ZEC creates a tether that leads to preemption.” *Id.*⁶

In sum, the *Hughes* decision and related cases stand for the simple proposition that the states are preempted from adopting a renewables procurement program that would adjust or establish the rate for a specific FERC-jurisdictional sale of energy or capacity.

– ***Options 2-6 Are Not Preempted Under Hughes***: The *Hughes* decision in no way prohibits the States from using an index of wholesale energy prices – whether based on actual, historic, or a projection of such prices – in the formula to create the OREC’s rate – which itself is a State-created product that values the environmental attributes associated with emissions avoidance. Since none of the OREC-based options being considered by the PSC can fairly be characterized as either being tethered to a generator’s wholesale participation in FERC-regulated wholesale markets, or providing an alternative rate from the rate provided under such markets, each such option easily complies with the standard pronounced in *Hughes*. For this reason, none of the OREC market options (Options 2-6) proposed by the PSC in the State Register should be seen as problematic from the perspective of being preempted by the FPA.

It should be of no moment that some of the OREC rates may fluctuate under Options 2-6 depending upon the price of energy and capacity, because that mechanism, along with others, was included for cost-containment purposes; i.e., to ensure lower cost of capital and associated ratepayer costs. *See, e.g.*, Options Paper at 35, 37. Indeed, as NYSERDA notes, the Market OREC provides the biggest bang for New York’s bucks. In other words, any decision by the PSC to allow the OREC rate to fluctuate based on the price of commodity is tied directly to its authority to provide “just and reasonable” rates (see Public Service Law § 65(1) (“All charges made or demanded by any . . . electric corporation . . . for . . . electricity or any service rendered or to be rendered, shall be just and reasonable . . .”)), not to for the purpose of having any impact on the price of commodity. Accordingly, this price containment mechanism in no way should put any of the OREC’s programs at risk of being preempted.

⁵ Of important note, no party challenged the Tier 1 RECs Program adopted by the PSC in the same Order as the ZECs program.

⁶ The District Court for Northern District of Illinois in *Village of Old Mill Creek v. Star*, Index Nos. 17-CV-1163 & 17-CV-1164, slip op. (July 14, 2017), similarly upheld a similar program to subsidize the State of Illinois’ nuclear power industry. That decision has been appealed to the U.S. Court of Appeals for the Seventh Circuit.

– ***Bundled PPAs Also Should Be Found Permissible:*** A court would also be unlikely to find the Bundled PPA option to be preempted. As a threshold matter, FERC found in *WSPP, Inc.* that it has authority under 16 U.S.C. § 824d to review bundled PPAs under a just and reasonable standard. 139 FERC ¶ 61,061, at P 24. Nevertheless, FERC precedent dictates that contracts arrived at through arm’s length negotiation are presumed to be “just and reasonable.” *See, e.g., Southwest Power Pool, Inc.*, 149 F.E.R.C. ¶ 61,048, at P 98 (“arm’s-length bargaining is a process in which each party pursues its individual interests” and “[s]uch pursuit of self-interest in competitive markets promotes economic efficiency, and it is for reasons such as this that the Commission ‘must presume that the rate set out in a freely negotiated wholesale-energy contract meets the ‘just and reasonable’ requirement imposed by law’”) (quoting *Morgan Stanley Capital Group, Inc. v. Pub. Util. Dist. No. 1*, 554 U.S. 527, 530 (2008)).

The United States Court of Appeals for the Second Circuit cited FERC’s authority under § 824d in *Allco, supra*, as a strong basis for finding constitutional a Request for Proposal (“RFP”) for bundled PPAs issued by the Connecticut Department of Energy and Environmental Protection (“DEEP”). In *Allco*, the Second Circuit affirmed a lower court decision dismissing the case, in part, based on plaintiffs’ failure to allege a cognizable preemption cause of action. In finding DEEP’s program constitutional, the court pointed to “important and telling distinctions between the Maryland program” at issue in *Hughes* “and Connecticut’s RFPs” at issue in *Allco*. 861 F.3d 82, 99. For example, the court found that, “[w]hile Maryland sought essentially to override the terms set by the FERC-approved PJM auction, and required transfer of ownership through the FERC approved auction, Connecticut’s program does not condition capacity transfers on any such auction.” *Id.* The court also found favorable that the PPAs at issue in *Allco* would be subject to “FERC review for justness and reasonableness.” *Id.* For these reasons, the court concluded that, “[b]ecause FERC has the ability to review any bilateral contracts that arise out of Connecticut’s RFPs, . . . Connecticut’s 2015 RFP – insofar as it allows the DEEP Commissioner to direct (but not compel) utilities to enter into agreements (at their discretion) with generators . . . is not preempted by the FPA.” *Id.* at 100.

There is no reason to expect the Second Circuit to rule otherwise with respect to the similar Bundled PPA procurement option posed in NYSERDA’s Options Paper. The Bundled PPA Option at issue here similarly would not condition capacity transfers on the resource’s participation in a FERC-regulated auction process and would be subject to FERC’s just and reasonable review. Furthermore, as noted in NYSERDA’s Options Paper (at 27-28), the Bundled PPA option would include a competitive procurement implemented by participating utilities with the utilities left to evaluate for themselves and potentially select one or more bids for award using criteria similar to those in the RES Tier 1 solicitations. The utilities would then either resell the offshore wind project’s energy and capacity to their customers or sell the offshore wind project’s energy and capacity into NYISO wholesale markets, while retaining the project’s offshore wind RECs for

compliance purposes and/or selling them to the State's LSEs. Given the maximum flexibility and discretion left to the utilities under this option and the fact that the utilities would be responsible for negotiating the PPA with the winning offshore wind bidders, there is no reason to expect that FERC would not find such a transaction to be just and reasonable.

(iv) FERC's Authority to Review Regulatory Actions "Affecting" Wholesale Rates Should Not Be Applied to Preempt the Options Under Consideration

Some parties may also cite language under 16 U.S.C. § 824d(a), providing FERC with authority to ensure that rules and regulations "affecting" wholesale rates are just and reasonable, as a basis for arguing that some or all of the options considered here are preempted. The cases do not support this view.

In *EPSA*, *supra*, the Court examined the extent of this statutory language in the context of a FERC order authorizing grid operators to adopt demand response programs and specifically found that, although § 824d(a) provided FERC with authority over demand response, the States too had inherent authority to address such a program; *i.e.*, § 824d(a) provides FERC with overlapping authority with the States. The question before the Court in *EPSA* was whether demand response is a concept tied to retail prices – over which the States have exclusive authority, and lacked an adequate connection to wholesale sales – over which FERC has exclusive authority. The Court acknowledged that the term "affecting" could be interpreted very broadly to authorize FERC regulation over a variety of everyday matters that impact electricity input, including fuel and labor costs, and other matters related to the economy. 136 S. Ct. at 774. Concluding, however, that it "cannot imagine that was what Congress had in mind," the Court adopted "a more common-sense construction of Section 824d(a), limiting FERC's 'affecting' jurisdiction to rules or practices that 'directly affect the [wholesale] rate.'" *Id.* (citing *CalISO v. FERC*, 372 F.3d 395, 403 (D.C. Cir. 2004)).

Applying this more limited interpretation, the Court ruled that FERC's demand response program had a sufficient connection to its general authority to regulate wholesale energy markets. The Court pointed, for example, to the fact that "wholesale market operators employ demand response bids in competitive auctions that balance wholesale supply and demand and thereby set wholesale rates." *Id.* It also noted that the grid operators "accept such bids if and only if they bring down the wholesale rate of electricity by displacing higher-priced generation." *Id.* The Court further noted that the role that demand response plays in wholesale markets has the effect of "ratchet[ing] down the rates wholesale purchasers pay." *Id.* at 775. Based on these characteristics of the demand response program, the Court held that "[c]ompensation for demand response thus directly affects wholesale prices" within the meaning of 16 U.S.C. § 824d(a). *Id.*

Notably, in adopting its demand response program, FERC gave States the veto power "to block whatever 'effective' increases in retail rates demand response programs might be thought to produce." *Id.* at 779-80. The Court saw the program as an example of "cooperative federalism, in which the States retain

the last word.” *Id.* at 780. Thus, the *EPSA* decision examined a FERC program that specifically accounted for the State’s traditional interest in addressing demand for electricity, thus implicitly acknowledging the States’ authority to act in this area.

The Court in *ONEOK, Inc. v. Learjet, Inc.*, 135 S. Ct. 1591 (2015), interpreted § 824d(a) in a similar manner, approving of overlapping state and federal regulation of matters affecting wholesale rates, although under the Natural Gas Act (which the Court has found to be analogous to the FPA). The Court held in *ONEOK* that state antitrust law claims were not field-preempted by the Natural Gas Act despite the fact that “FERC has promulgated detailed [antitrust] rules” that “prohibit[] the very kind of anticompetitive conduct that the state actions attack.” *Id.* at 1599, 1602-03. As in *EPSA*, the Court expressed concern about applying the doctrine of field preemption to areas regarding which the States traditionally act: “[Our] precedents emphasize the importance of considering the target at which the state law aims in determining whether that law is pre-empted.” *Id.* at 1599 (emphasis in original).

As the *EPSA* and *ONEOK* decisions demonstrate, the Court has been reluctant to apply the “affecting” language under § 824d(a) as a basis for ruling that any State action that may affect wholesale rates is preempted, instead interpreting this provision in a manner that maintains the State’s authority to act within its traditional police powers. Here, there can be little question that the PSC would be acting pursuant to its traditional authority to regulate energy production in a manner that protects the public health and environment. Moreover, it would be acting to create a State-specific commodity (ORECs) that is indistinguishable from the RECs that FERC long ago ruled is within the States’ sole province.

**(v) FERC’s Amicus Brief Filed in the Seventh Circuit is Consistent With
NYOWA’s Legal Position Here**

On May 29, 2018, the United States and FERC (collectively, “FERC”) filed a brief as *amici curiae* in response to Seventh Circuit’s February 21, 2018 order issued in the appeal from the District Court’s decision in *Village of Old Mill Creek, supra*. Although *Village of Old Creek* considered the State of Illinois’ ZECs – similar to the program at issue in *Zibelman*, FERC’s brief in numerous respects is consistent with the position that we take here. For example, FERC explained that the ZECs at issue in *Village of Old Creek* “are separate commodities that represent the environmental attributes of a particular form of power generation; they are not payments for, or otherwise bundled with, sales of energy or capacity at wholesale, and thereby fall outside of FERC’s exclusive jurisdiction over wholesale transactions.” Br. at 10 (citing *WSPP Inc.*, 139 FERC ¶ 61,011, at PP 23-24). Similarly, here, each of the OREC options would represent a separate State-created commodity distinct from the markets regulated by FERC.

FERC also easily distinguished the *Hughes* decision in a similar manner as we do here, noting that Illinois’ ZECs program “does not require participation in FERC-jurisdictional wholesale auctions as a precondition to receive ZECs” and thus “lacks the ‘fatal defect’ that undid the Maryland program in

Hughes.” Br. at 7. Indeed, as FERC further explains, “what matters, in terms of the constitutional preemption concern, is whether the challenged state laws *target* those areas reserved by Congress for federal regulation.” *Id.* at 18 (emphasis in original) (citing, *inter alia*, *Oneok*, 135 S. Ct. at 1599). Then, relying on the decision in *EPSCA*, FERC concluded that “a subsidy like the ZEC that affects (in some way) wholesale rates should not be conflated with a state law that targets the wholesale market.” *Id.* at 19. Similarly here, because each of the OREC options in no way targets any of FERC-regulated wholesale markets, and instead would simply provide a value only to the energy attributes of renewable energy, it lacks any of the characteristics found by the Court to warrant serious preemption concern.

Finally, another of FERC’s themes is that the courts need not resort to the “the extraordinary and blunt remedy of preemption” because it can exercise authority under 16 U.S.C. § 824d(a) to any actions that may have a direct impact on wholesale markets. *See* FERC Br. at 20-21. In other words, whatever procurement mechanism is ultimately selected by the PSC likely will not play a role in whether FERC applies its authority under § 824d(a). Instead, that decision likely would be based on its analysis of the economic impact of the OREC subsidy, if any, not on the procurement mechanism through which the subsidy would be provided. Accordingly, the PSC should place greater weight on which of the options provides the most bang for the buck rather than on the risk that an option may be found unconstitutional.

Based upon the foregoing, we believe that a court would likely rule that none of Options 2 through 6 proposed in the PSC’s State Register notice, or the Bundled PPA option posed in NYSERDA’s Options Papers, are preempted.

2. Economic Analysis Supports Selection of Low-Cost Option

As noted earlier, NYOWA commissioned The Brattle Group (“Brattle Study”) to conduct an independent economic analysis to estimate the economic and emissions impacts in New York of deploying 2,400 MW of offshore wind energy by 2030. The Brattle Study largely confirms the conclusions in NYSERDA’s Options Paper but also strengthens and expands them.

The Brattle Study compares the project case of adding 2,400 MWs of offshore wind into New York’s downstate grid by 2030 against two possible base cases. First, “CES Met” is the base case in which, in the absence of offshore wind, the 50% Clean Energy Standard (CES) is met with other CES-eligible resources, such as land-based wind and solar. Second, “CES Not Met” is the base case in which, in the absence of offshore wind, the 50% CES is not achieved, but rather where alternative compliance payments are being made for the quantities of energy expected from the targeted offshore wind capacity. This approach to the analysis does not designate either base case as more or less likely, but instead compares the project case to both in order to be most informative.

The Brattle Study uses the range of levelized costs of (offshore) energy (“LCOE”) as presented in the Options Paper as its starting point and projects customer costs and economic benefits for the maximum, mid-point, and minimum LCOE.

Although the study is included in its entirety as Appendix A, we highlight its findings here:

- (i) Customer costs will likely decrease under the low-cost offshore procurement mechanisms. The Brattle Study confirms NYSERDA’s determination that building 2,400 MW of offshore wind will likely reduce wholesale energy prices, especially in New York City and Long Island, where electricity prices are among the highest in the country as well as in the NYISO area as a whole. Brattle found that prices decrease in comparison to both base cases (CES Met and CES Not Met) but decrease *more* as compared to the CES Not Met case when offshore wind would likely be replacing more downstate fossil fuel plants. This decrease in wholesale energy prices will be offset by the cost of constructing offshore wind. The procurement options put forward by NYSERDA correspond to a range of LCOE. The higher the LCOE, the lower the net benefit to electricity customers. At the lower cost (“Minimum LCOE”), ratepayers in NYC/LI and in NYISO overall will save on their electric bills as compared to both base cases. That is, even if compared to the CES Met scenario, ratepayer payments will go down, with a greater reduction in NYC/LI. At the maximum LCOE, this dynamic changes, although ratepayer payments would still decrease in NYC/LI as compared to the CES Not Met case.
- (ii) Brattle’s analysis illustrates that (1) at the lower range of the LCOE, New York will have overall lower customer costs while procuring 2400 MW of offshore wind by 2030, and (2) customer costs are highly sensitive to which of the seven OREC procurement options the PSC selects. At an average LCOE,⁷ the net present value of ratepayer costs could decrease by about \$1.5B if measured against the CES Not Met base case, or increase by about \$1B if measured against the CES Met base case.
- (iii) Offshore wind will reduce pollution, even compared to CES Met Base Case. The Brattle Study also confirms that offshore wind deployment will reduce pollution: the CO₂ that contributes to climate change; the SO₂ that causes acid rain; and the NO_x and particulates that damages public health. For example, total avoided carbon emissions for the project-life is 30.9 million tons statewide. But even when compared to the CES Met case – i.e. New York would still achieve 50% renewables but using more Upstate wind and solar - total emissions decrease because

⁷ The NYSERDA Offshore Wind Options Paper puts forward seven procurement mechanisms. These options establish a range of LCOEs from \$105/MWh to \$155/MWh. The mid-point of this range is \$130/MWh, which was higher than five of the options. Only two options – the Fixed REC-only contracts and the Forward REC Conservative Case -- had a LCOE higher than this mid-point. The Brattle Report calculated both the customer electricity payments and economic benefits at this mid-point (average) LCOE.

offshore wind would replace more-polluting downstate power plants. In both cases, NYC/LI pollution would be reduced dramatically.

- (iv) The value of avoided pollution in New York State is significant: \$908 million. Brattle calculated the net present value (NPV) of pollutant damage cost reductions in 2017 dollars, relative to the CES Not Met case, as \$908 million in New York State and \$3.3 billion in the Region (*i.e.*, including surrounding ISOs). Having the pollution-free, fuel-free offshore wind power replacing fossil fuel power plants in densely populated Long Island and New York City will avoid health and environmental damages and their significant associated costs.
- (v) Construction of offshore wind would bring significant economic benefits: \$5.27 billion with greater local share, \$3.3 billion with less local share, at the average LCOE and as compared to the CES Not Met case. The Brattle Report projects economic benefits in twelve different scenarios (Tables 9 and 10, pages 28 and 31): the maximum, average, and minimum LCOE; as compared to each base case; and with more and less local share of the induced economic activity. Brattle determined that in nearly all of these scenarios, economic benefits are positive. For example, even when compared to CES Met base case and a lower local share of the offshore wind economic activity, there would still be positive economic benefit (\$1.9 billion total) at the minimum LCOE. Only in one scenario did Brattle determine there would be no positive economic benefits: the maximum LCOE as compared to the CES Met case, since there will also be economic benefits from building other wind and solar to achieve the 50 x 30 renewable energy goal in this comparison case. At average LCOE, which captures five of NYSERDA's seven procurement options, economic benefits are significantly positive.
- (vi) Deployment of Offshore Wind would create jobs in New York State, estimated in the Brattle Report at 1,200 – 6,200 direct jobs, and 11,300 – 13,200 (direct, indirect, and induced) jobs at the peak employment year of 2030. As with the other economic benefits studied, the number of jobs would depend, in part, on what portion of the induced economic activity is localized in New York State.

As illustrated in these findings, the Brattle Study demonstrates that the economic benefits of offshore wind will depend significantly on both the PSC's choice of a procurement option and the degree of localization of construction and ongoing operation and maintenance-related activities. Consequently, the Brattle analysis offers a range of economic benefits, depending on whether a low or high cost procurement option is selected (Minimum LCOE v. Maximum LCOE) or there is a modest or high use of local equipment, materials, supplies and labor (Lower Bound Local Share v. Upper Bound Local Share).

We draw several conclusions from the Brattle analysis that we hope the PSC will find persuasive. First, the degree to which lower wholesale prices result in lower customer electricity payments

depends on the procurement option selected by the PSC. Brattle concludes that, in Net Present Value (NPV) terms, the cost of adding offshore wind to electricity consumers across all scenarios and evaluated against both base cases ranges from approximately \$6 billion of savings to approximately \$6 billion in additional payments. This disparity is largely driven by offshore wind procurement costs – expressed as the levelized cost of (offshore) energy (LCOE)⁸. To ensure that offshore wind maximizes economic and ratepayer benefits, it is critical that the PSC select a low-cost procurement option.

Second, the selection of a “low-cost” procurement option will have significant economic benefits for New York. Whether measured by the number of jobs, salaries, or GDP, a low-cost procurement option such as a Market or Index OREC, will have far greater positive economic benefits than a high cost option such as a Forward, Fixed/Index, Fixed REC or Capped OREC. For example, the Value Added (GDP) of offshore wind ranges dramatically from a negative \$28.3 million (CES Met, Max LCOE, Lower Bound Local Share) to \$3.9 billion (CES Met, Min LCOE, Lower Bound Local Share) when the highest cost procurement option is compared to the lowest cost one⁹. Similarly, the number of new jobs created by offshore wind varies significantly depending on whether a low or high cost procurement option is chosen and whether the supply chain and labor force are developed locally.¹⁰ For example, Brattle estimates that total net jobs will range from 1,200 to 13,000, depending on the procurement option selected and the level of supply chain and labor localization.

Finally, the Brattle study confirms the substantial environmental benefits of achieving 2,400 MW of offshore wind by 2030. In addition to the obvious and well-documented public health benefits cited in the New York State Offshore Wind Master Plan¹¹ and Policy Paper¹² the emission benefits are important for two additional and important reasons. By delivering power into the downstate region, offshore wind will offset generally higher-emitting fossil fuel generation in these densely-populated urban areas and address air quality and environmental justice issues. Additionally, the emissions benefits of offshore wind are more clearly illustrated in the comparison to the “CES Not Met” base case, which shows levels of emissions avoidance that will absolutely be critical in helping New York achieve its greenhouse gas reduction goal of 40% reductions from 1990 levels by 2030.

VI. PROCUREMENT OPTION PREFERENCES

Informed by the legal and economic analyses, NYSERDA’s Policy Paper and the experience of our members, the following articulates our view of the options from a policy perspective, in order of preference:

⁸ Pgs. vi-vii.

⁹ Offshore Wind In New York, An Economic Impact Analysis, May, 2018, Table ES-1, pg. x.

¹⁰ Ibid. pgs., 19-22, 35,36.

¹¹ New York State Offshore Wind Master Plan, NYSERDA Report 17-25, pgs. 24-25

¹² Offshore Wind Policy Options Paper, NYSERDA, January 29, 2018 pg. 113

1. Bundled PPA – During the CES proceeding, ACE NY and a large contingent of renewable energy advocates strongly supported PPAs as the gold standard for procurement because it would produce the lowest cost, and we continue to believe that Bundled PPAs are the best choice for procuring offshore wind energy.¹³ Other states, such as Massachusetts, Connecticut and Rhode Island, have enacted statutes specifying the use of PPAs as a cost-effective mechanism and most existing wind projects under construction around the country are holding PPAs. However, in its White Paper, NYSERDA points out implementation hurdles that could complicate the use of PPAs and delay procurement implementation.¹⁴ Although we continue to consider PPAs as the most effective, low-cost procurement option, it is critical that New York State rapidly move forward with procurements in 2018 and 2019 to gain as soon as possible the economic benefits from this nascent industry, including the associated economic development benefits from creating an offshore wind supply chain in New York. In light of implementation issues raised by NYSERDA, we urge the PSC to continue to evaluate the use of Bundled PPAs for future phases of offshore wind procurement, particularly in light of information gleaned from other states that are using this approach.
2. Market OREC – This option is the most similar to a Bundled PPA in terms of its hedging benefits and is likely to be the lowest cost option.¹⁵ The States of Maryland and New Jersey have adopted this approach and, in the case of the former, have executed contracts with offshore wind developers to build 378 MW of offshore wind capacity. New Jersey is in the process of similarly adopting the administrative mechanisms to implement what is essentially a Market OREC approach. Adopting a Market OREC approach would be appealing since wind developers bidding into the New York and New Jersey markets would face similar mechanisms, which would simplify the bidding process and foster competitive proposals. Most importantly, a Market OREC would provide a fully hedged approach and revenue certainty, thus enabling offshore wind developers to submit lower bids which, in turn, would result in greater ratepayer benefits. NYSERDA estimated the incremental program cost of the Market OREC option to be \$0.2 billion and an incremental bill impact to be 0.14 percent.¹⁶ Despite the merits of this option and its use in other states, NYSERDA concluded that it would raise jurisdictional questions related to the Federal Power Act, and that the option did not offer a

¹³NYS PSC Proceeding, Case 15-E-0302, Comments on the Clean Energy Standard White Paper – Cost Study, Provided by ACE, NY, et.al. June 6, 2016.

¹⁴ NYSERDA Offshore Wind Policy Options Paper, January 29, 2018, pgs. 29-30.

¹⁵ NYSERDA's Offshore Wind Policy Paper estimated that utility-owned generation would be the most cost-effective procurement option, with the Market OREC a close second. We disagree with this conclusion. See discussion under "Utility-Owned Generation" pgs. 26-27.

¹⁶ NYSERDA Offshore Wind Policy Options Paper, January 29, 2018, pg. 40.

similar level of benefits as the other five potential options identified in the Option Paper unless the jurisdictional uncertainties were adequately addressed.¹⁷ We believe that the above legal analysis addresses fully any lingering concerns in this regard.

3. Index OREC – NYOWA also supports this option, which is similar to the Market OREC except that the periodic OREC payment would reflect the difference between the Strike Price and the Reference Price based on an index or composite index price comprised of average energy and capacity values for a period of time, or averaged across multiple nodes, such as zonal pricing. This is reflective of the time and location of generation but not the actual prices received by the offshore wind generator. Also, because the OREC pricing would be based on historical data rather than forecasting, there is less uncertainty around administratively determined pricing as in the Forward OREC options. Although this option could provide some degree of hedging, it is not without complications that need to be carefully addressed. NYOWA’s strong preference is that Index Price be established with reference to the market price at the actual point of delivery (at the nodal price, or at least at the zonal price) and at an hourly average price. If the project is not compensated for power and capacity based on the zone in which it is located at hourly pricing, substantial additional costs for hedging power and capacity will need to be built into the Strike Price and thus it would be costlier for ratepayers. We recommend that the Index for capacity prices be based on monthly capacity auction clearing prices, applicable to the prompt month, for the zone in which the generator is located. We recommend that the Index for energy prices be based on the hourly average of the Day Ahead LBMPs, for the zone in which the generator is located.
4. Split PPA – As with Bundled PPAs, we believe that this option could provide a low cost, effective mechanism for procuring offshore wind energy but agree with NYSERDA’s concerns on administration, cost and potential delays¹⁸ in moving forward with Phase 1 procurements. As with the Bundled PPA option, we recommend that the PSC not consider this option in Phase 1 but should continue to evaluate it for future offshore wind procurement phases.
5. Forward OREC – We do not support this option, which is modeled after New York’s Zero Emission Credit (ZEC) Program. Although the Forward OREC provides some hedging benefits, the two-year, forward looking adjustment mechanism is expected to add considerable cost to the procurement of offshore wind, leading to substantially increased ratepayer costs¹⁹. No other state is pursuing this option. Although this mechanism may be appropriate for

¹⁷ Ibid. pg. 7

¹⁸ Ibid. pgs. 32-33 {check}

¹⁹ Ibid. pgs. 38-40

continued operation of *existing* power generating facilities, it is ill-suited to encourage investment in new, capital intensive facilities such as offshore wind farms. There are a number of problems with this option.

- (i) Forward indices can be volatile and not accurately reflect market information. The use of forecasts to set OREC prices presents a substantially higher electricity market price exposure risk compared to the Index OREC option, which would use averaged historical wholesale pricing to determine OREC pricing. Under this option and in the scenario that actual wholesale pricing deviates significantly from the forecast, OREC prices would still be locked in until the next forecast reset, which could be up to two years (see below). Any number of events in energy markets could cause wholesale prices to be significantly lower than the forecast, which would impact a project's ability to service debt. As such, a Forward OREC is not likely to correspond to realized prices, particularly if they are set at two-year intervals. If the OREC is set based on a point when forward power prices are high, but prices come in lower, the project will not achieve its strike price. This will force developers to hedge in accordance with the tranche period to lock in margins. Hedging costs will invariably drive up the Strike Price.
- (ii) As the Options Paper warns²⁰, liquidity concerns arise if all project sponsors try to hedge in a similar timeframe. This could result in the inability to hedge due to lack of market depth. Alternatively, demand in excess of market coverage can cause forwards to be driven down. In either case, this is likely to result in the developer requiring a risk premium to be embedded into the Strike Price.
- (iii) As alluded to above, we are concerned with the PSC's straw proposal in the Notice for a two-year forward tranche and periodic reset. A forward applicable to a two-year delivery period is an arbitrary timeframe, especially since most products don't trade this way. If the PSC opts for a Forward OREC, we strongly suggest it mitigate risk of disconnect between forward estimates and realized prices by shrinking the tranche period to one month. Further, the forward forecasts or indices should be formulaic and based on actual production.
- (iv) Staff does not specify how the prescribed two-year wholesale market forecasts would be reset. It is unclear with which market data, formulas, technical experts, or other information these forecasts would be set. Without statutory certainty, NYOWA

²⁰ Ibid. pgs. 39-40

therefore assumes that forecasts would be set administratively by Staff and the PSC every two years. From a project capital investor perspective, the use of administratively determined pricing presents policy and regulatory risk, which is compounded by a process that would reoccur every two years, and which could be administratively costly for the developer to participate in. Staff also contemplates project awards of up to 25 years, which would result in up to 13 points at which the PSC could redefine forecasts based on different inputs, variables, formulas, and technical expertise. Developers cannot, therefore, rely on any continuity of OREC pricing after the initial two-year period.

- (v) We urge the PSC to maintain separation between energy and capacity sub-indices and not attempt to merge them.
- (vi) As noted in NYSERDA's Option Paper, the estimated incremental cost of a Forward OREC program may vary widely, given the many unknowns about the availability and type of hedging products.²¹

In summary, the increased risks of the Forward OREC option as described above, would have the following adverse impacts:

- The cost of debt and equity would likely be substantially higher than alternative options considered by Staff.
 - Project capital investors may require a large cash reserve fund to service debt in the case that the sum of OREC payments to the developer and wholesale revenues fall short of the debt service costs. The cost for this requirement would be significantly higher than alternative options such as a PPA, Market or Index OREC.
 - The higher costs from the first two impacts would, in turn, result in a significantly higher strike price for a project which would increase costs to ratepayers.
 - The higher capital costs and resulting higher strike price would significantly disadvantage developers who would use project finance for projects. When considering sites available for New York offshore wind development, any structural disadvantage in procurement terms would severely limit competition at the expense of ratepayers, at the expense of the Governor's goal of 2,400 MW by 2030, and at the expense of the economic benefits of offshore wind.
6. Fixed/Index OREC – This option appears to be a combination of the Fixed OREC and Forward OREC options (see above), with the OREC price fixed for a period of time, say 2 years, and

²¹ Ibid. pgs. 39-40.

- then adjusted every 2 years based on a forward index. Our serious concerns and comments regarding the Forward OREC option, above, apply here as well.
7. Capped OREC – This option is identical to the Fixed/Index OREC in every respect except that the OREC price could never exceed the original Bid Price. Consequently, developers would have to absorb additional risk if energy and capacity prices fell to a level that triggers the cap. Once again, our serious concerns and comments regarding the Forward OREC option apply here, with the additional concern that the capped OREC injects even greater risk to developers if energy and capacity prices drop to a level that cap OREC payments. Developers would have to build in the cost of hedging against this risk, unnecessarily adding to project and ratepayer expense.
 8. Fixed REC – We concur with NYSERDA’s analysis that this option involves elevated risk to the developer and would increase the cost of capital and lead to higher projected program costs than those expected under other procurement options with more far-reaching hedging benefits.²² We note that NYSERDA estimated that the Fixed REC option would be the most expensive option examined and would impose an incremental cost of \$1.2 billion to the cost of an offshore wind project. The findings of the Brattle Study (Appendix A) are relevant to this option, in that the maximum LCOE, which corresponds to the Fixed REC option, corresponds to the minimum economic benefits in terms of labor income impacts, GDP impacts, and gross output impacts.
 9. Utility-Owned Generation (UOG) – We strongly oppose UOG for procurement of offshore wind energy. UOG was rejected by the PSC in the past for a host of sound reasons identified in NYSERDA’s Options Paper²³, including concerns over vertical market power, utility bias, potential adverse impacts on the competitive market for generation, adverse ratepayer impacts and additional complexity in procurement design. UOG would be backtracking on New York’s longstanding commitment to developing competitive energy markets. We also disagree with the findings in NYSERDA’s Options Paper that UOG is potentially the lowest cost option due to the low cost of capital. Offshore wind developers include some of the largest energy companies in the world and have balance sheets that are comparable to, if not larger than, utilities that serve the New York market. This is simply no evidence suggesting that utilities can finance offshore wind projects more inexpensively than companies currently developing offshore wind projects.

²² Ibid. pg. 6.

²³ Large Scale Renewable Energy Development in New York, Options and Assessments, NYSERDA, Report 12-15, June 2015, pg. 82.

In sum, NYOWA supports adoption of either the Market or Index OREC approach for Phase 1 implementation. These two options minimize the cost of financing and therefore offer the greatest likelihood of encouraging the development of 2,400 MW of offshore wind at the lowest possible cost to ratepayers. While these two options differ in terms of their current application, complexity and risk, we do not see these differences as material and NYOWA supports either framework.

In contrast, NYOWA does not support UOG for all the reasons stated previously. Similarly, NYOWA has serious concerns with the Forward OREC approach and its variants, insofar as these constructs are more prone to yielding significant deviations between forecast and actual revenues, with the result that this risk will ultimately be reflected in higher than necessary OREC prices and ratepayer impact. Notwithstanding these serious and significant concerns, should the PSC opt for the costlier Forward OREC, we strongly suggest it mitigate risk of disconnect between forward estimates and realized prices by shrinking the tranche period to quarterly. Further, the forward forecasts or indices should be formulaic and based on actual production.

FIGURE 1: SUMMARY OF MECHANISM VIABILITY

	Procurement Option	Avoids Commodity Exposure	Avoids Admin. and Regulatory Uncertainty	Reduces Ratepayer Impact	Overall Feasibility
DPS Proposed Options	Fixed OREC	●	◐	○	◐
	Market OREC	●	◐	●	◐
	Index OREC	◐	◐	◐	◐
	Forward OREC	◐	◐	◐	◐
	Fixed/Index OREC	◐	◐	◐	◐
	Capped OREC	○	◐	◐	◐
	Other	N/A	N/A	N/A	N/A
Additional NYSERDA Proposed Options	Bundled PPA	●	●	●	●
	Utility-owned generation	●	◐	◐	◐
	Split PPA	●	◐	◐	◐

VII. ANNUAL OREC PURCHASES BY LSEs

We support the proposal in both the NYSERDA Options Paper²⁴ and the Notice that NYSERDA would purchase ORECs on behalf of load serving entities (LSEs), together with voluntary compliance by the Long Island Power Authority (LIPA) and the New York Power Authority (NYPA), and then resell them to the LSEs for compliance with the LSEs' obligation. We request that LIPA and NYPA publish their plan and schedule to achieve compliance. For the reason discussed in the Policy Paper²⁵, we recommend that the OREC procurement obligation be a standalone compliance obligation similar to the Zero Emission Credit (ZEC) Program requirement.

VIII. TRANSMISSION AND INTERCONNECTION

We understand the PSC's conclusion in the Notice that shared radial and independently-owned transmission options should not be considered for Phase 1 competitive solicitations. As pointed out in the NYSERDA Options Paper, the typical approach for large new U.S. wind development to date is that the developer is responsible for the T&I infrastructure in the form of project-specific radials and continues to maintain ownership post-construction. Maintaining this arrangement for Phase 1 projects is one way to:

- Minimize administrative and contractual complexities²⁶;
- Reduce construction timing risk²⁷;
- Minimize the possibility of stranded assets.

In Europe the question of who builds these interconnection and transmission components has been approached in two main ways, an independently-owned or segmented approach and a full-scope, developer-owned approach. In the segmented approach, responsibility for constructing the offshore wind farm and its transmission assets has been split, with developers building the wind farm and the array cables and transmission system operators ("TSOs") building the transmission assets. Examples of the segmented approach include far-from-shore offshore wind generation facilities in Denmark²⁸ and offshore wind in the Netherlands. In the full-scope, developer-owned approach, the offshore wind farm and its transmission assets are viewed as inherent parts of the same infrastructure project, and the developer therefore has the responsibility for financing and constructing all key components up to the onshore grid connection point. The United Kingdom (the world's largest offshore wind market), as well as nearshore offshore wind in Denmark, successfully apply the full-scope, developer-owned approach.

²⁴ Ibid pg. 49

²⁵ Ibid pgs. 53-54

²⁶ Ibid pg. 57

²⁷ Ibid pg. 57

²⁸ It should be noted that Denmark has just changed its policy for far-from-shore OSW such that on a going forward basis the OSW developer will also be responsible for offshore transmission. Germany, another country where the segmented ownership model prevails, is also studying the issue.

Going forward, we do not object to the PSC studying in greater detail the potential benefits and risks of shared and/or expandable transmission for offshore wind and whether any adjustment is warranted to the Phase I policy in support of future offshore transmission development in an efficient, environmentally sound manner and at the least cost and risk to ratepayers.

IX. CONCLUSION

We commend Staff and NYSERDA for their diligence and focus on this matter and urge the PSC to adopt the recommendations herein. In sum, we would like to emphasize the following points:

- Timing – It is critical that the PSC complete its review and issue an order this summer so that a procurement can be issued before the end of 2018. In light of activity in other states, New York must continue to lead in building a strong national offshore wind energy program; and
- Cost – In light of the substantial economic, environmental and ratepayer benefits documented in the Options Paper and herein, the PSC should select the Market or Index OREC to minimize program cost.

NYOWA stands ready to work closely with stakeholders to ensure a successful program that will achieve the Governor's goal of 2,400 MW by 2030 starting with the first procurement in 2018. We appreciate the opportunity to provide input and look forward to progress in this proceeding.

Respectfully submitted:



Joseph Martens
Director
New York Offshore Wind Alliance



Nancy Sopko
Director, Offshore Wind Policy & Siting
American Wind Energy Association

Offshore Wind in New York

An Economic Impact Analysis

PREPARED FOR




PREPARED BY

Mark Berkman
Jurgen Weiss
Yingxia Yang
Lily Mwalenga
Noosha Razavian
Elaine Cunha

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THE **Brattle** GROUP



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Executive Summary

The New York Offshore Wind Alliance, a project of the Alliance for Clean Energy New York (“ACE New York”), commissioned The Brattle Group to conduct an independent economic analysis to estimate the economic impact on New York of deploying 2,400 MW of offshore wind (“OSW”) energy by 2030. Our study significantly overlaps with the results of analyses prepared by the New York State Energy Research and Development Authority (“NYSERDA”) and summarized in its Offshore Wind Policy Options Paper released January 29, 2018,¹ but it provides more detail on the estimated impact of offshore wind on wholesale electricity prices and explores more macroeconomic impacts than those outlined in NYSERDA’s Wind Policy Options Paper.

Our analysis largely confirms NYSERDA’s conclusions and strengthens or expands them in several areas. Our analysis confirms that adding 2,400 MW of offshore wind to New York will have positive economic impacts on the State, even if considering net rather than only gross effects. First, we find that offshore wind would bring additional energy and capacity to New York City and Long Island and, by doing so, would help lower wholesale electricity prices in the parts of New York that face the highest levels of electricity prices and are the most densely populated. Second, by adding the costs of OSW, we assess the net impacts to customer payments and confirm that the size of these effects depends significantly on the procurement approach and resulting cost at which offshore wind can be procured. Third, we confirm that offshore wind will provide significant reductions of greenhouse gases and other pollutants potentially not easily achievable without offshore wind. Finally, we assess economic impacts and relative to NYSERDA’s analysis, we estimate higher economic impacts due to indirect and induced impacts not separately estimated by NYSERDA.

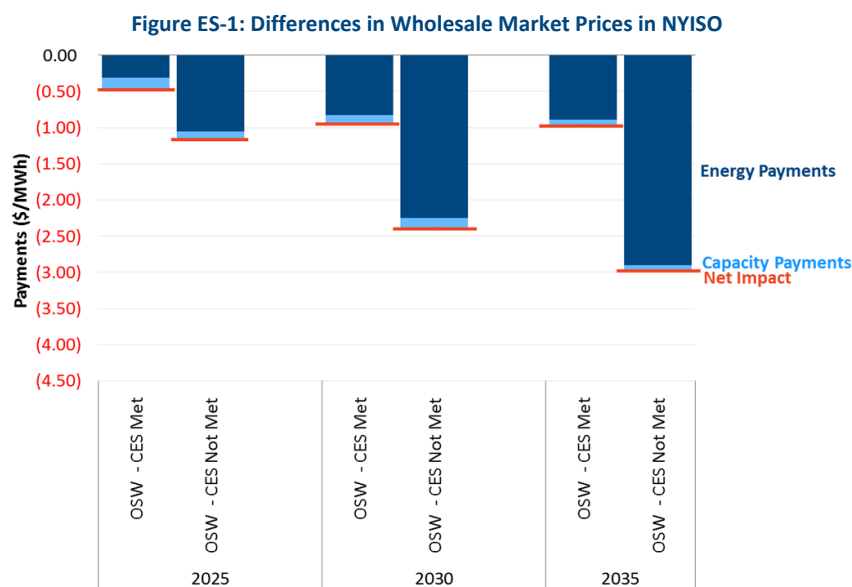
Our results are based on an analysis of the economic impact of offshore wind against two alternative “but-for-worlds”: one (“CES Met” Base Case) in which, in the absence of offshore wind, the Clean Energy Standard (“CES”) is met with other CES eligible resources such as land based wind (“LBW”) and solar PV; and a second (“CES Not Met” Base Case) in which, in the absence of offshore wind, the CES cannot be met with renewable generation, but rather where

¹ New York State Energy Research and Development Authority, “Offshore Wind Policy Options Paper,” January 29, 2018. (“NYSERDA Offshore Wind Policy Options Paper”)

alternative compliance payments are being made for the quantities of energy expected from the targeted offshore wind capacity. This second base case is to reflect the potential real difficulties of meeting the CES without offshore wind, given the amount of otherwise available alternative renewable resources and limitations of the transmission system to deliver renewable energy to downstate load centers. Rather than taking a position on which of the two base cases is the more realistic, we suggest that it is informative to assess the impact of offshore wind against both.

We find that the electricity market and broader economic and societal impacts on New York of deploying offshore wind depend substantially on the assumption about the “but-for world,” *i.e.*, what we assume would happen in the absence of deploying offshore wind; on the cost of offshore wind to electricity customers in New York, which in turn depends on the procurement approach ultimately chosen by the New York Public Service Commission; and on the degree of localization of construction and ongoing operating and maintenance related activities.

As Figure ES-1 below shows, we estimate that the addition of offshore wind would reduce average wholesale electricity prices by between approximately \$1.2–3.0/MWh relative to the “CES Not Met” Base Case and by a smaller amount when evaluated against the “CES Met” Base Case. The price reductions are more pronounced in New York City and on Long Island, where the offshore wind would be injected, where the majority of New York’s electricity customers reside and where, due to limited transmission capacity, wholesale electricity prices tend to be highest. Price impacts in Upstate New York are much smaller and either increase minimally or decline by up to \$2/MWh, depending on which base case OSW is evaluated against.

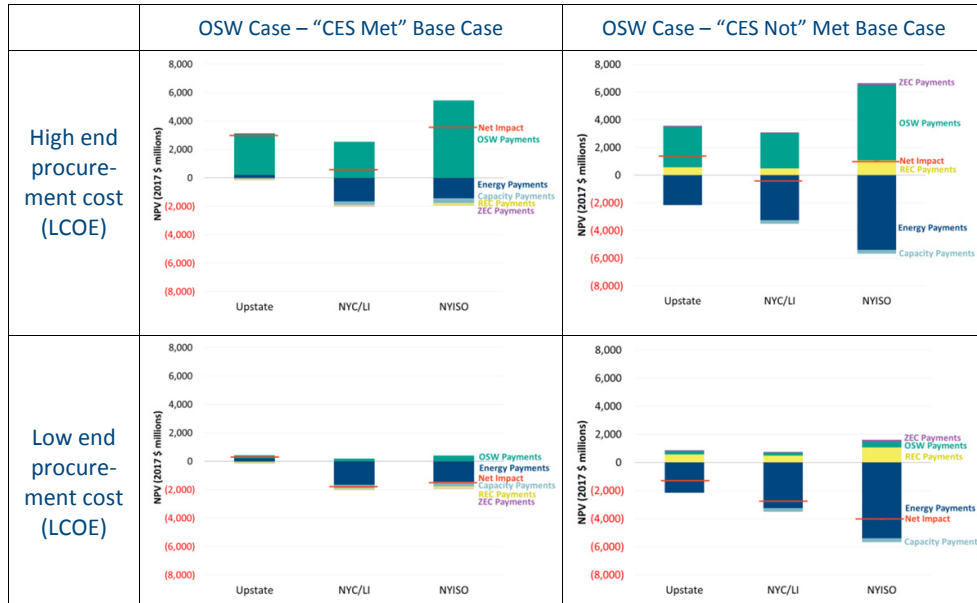


Sources and Notes: Xpand Results. We convert capacity prices to \$/MWh for ease of comparison.

Whether lower wholesale prices with offshore wind decrease or increase customer payments depends to some extent on how OSW affects renewable energy credit (“REC”) and zero emission credit (“ZEC”) payments, but primarily on the procurement cost of offshore wind, which ultimately also has to be paid by electricity customers. Figure ES-2 shows that, in net present value terms, the net cost of adding offshore wind to electricity consumers across all scenarios and evaluated against both base cases ranges from approximately \$6 billion of savings to approximately \$6 billion in additional payments, largely driven by the offshore wind procurement costs—expressed as levelized costs of (offshore) energy, or “LCOE”.²

² We use the complete range of estimated LCOE across all procurement options evaluated by NYISERDA for Phase I (which is between \$105/MWh and \$155/MWh) and apply to all procurements. Given likely cost declines for OSW between Phase I and II, this is conservative. We recognize that the decision about the procurement approach ultimately chosen will be informed by many factors, of which the estimated LCOE of procurement is only one. The estimated impact on consumer payments from procurement approaches with LCOE between the lowest and highest cost estimated by NYISERDA will be proportionally between the impacts we estimate for the low and high end of the range. See NYISERDA Offshore Wind Policy Paper, Figure 13, p. 64.

Figure ES-2: Net Present Value of Estimated Additional Customer Electricity Payments including OSW Procurement Relative to Each Base Case



Higher or lower electricity payments by ratepayers in turn have broader economic impacts—by increasing or decreasing disposable income available to make purchases—on the New York economy, as does the construction and operation of offshore wind (relative to what would be built and operated instead).

We have also measured the impact of OSW procurement on CO₂ and the criteria pollutants (SO_x, NO₂, and particulates). Consistent with the NYSERDA study, as shown by Table ES-1, we found that emission reductions are sizable with respect to both CO₂ and the criteria pollutants at the state level.

Table ES-1: Emissions Impact in New York (metric tons, 2018 – 2044)

	OSW - CES Met			OSW - CES Not Met		
	Upstate	NYC/LI	NYISO	Upstate	NYC/LI	NYISO
Average Annual						
CO2	628,658	(826,431)	(197,774)	(476,283)	(670,133)	(1,146,415)
NOx	151	(200)	(49)	57	(180)	(123)
SO2	48	0	48	(378)	0	(378)
PM 2.5	226	(271)	(45)	(182)	(212)	(394)
Total						
CO2	16,973,762	(22,313,648)	(5,339,886)	(12,859,628)	(18,093,584)	(30,953,212)
NOx	4,087	(5,402)	(1,315)	1,546	(4,857)	(3,311)
SO2	1,305	0	1,305	(10,195)	0	(10,195)
PM 2.5	6,092	(7,306)	(1,215)	(4,912)	(5,714)	(10,626)

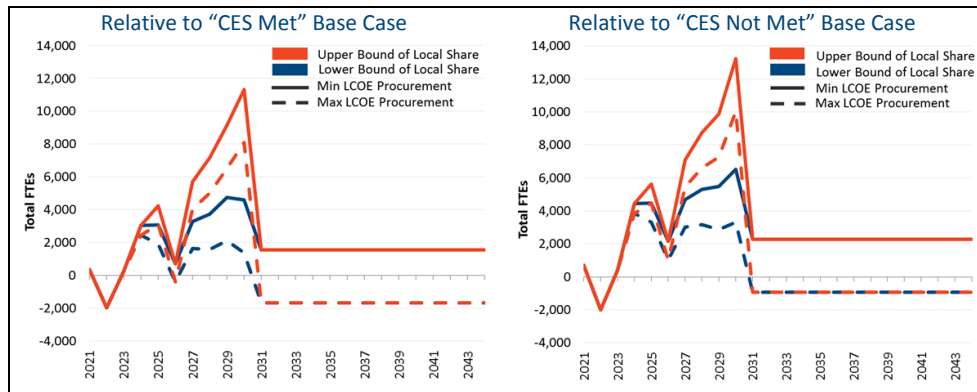
Source: Xpand Results.

Our analysis of the larger economic impact of offshore wind on New York includes direct impacts—economic activity and jobs related to the construction and operation of offshore wind farms, as does NYSERDA’s analysis. However, we estimate the net rather than the gross impact of adding offshore wind, meaning that we compare the economic impact of offshore wind to the economic impact of what would be built and operated absent OSW. We also extend NYSERDA’s analysis by including both indirect and induced effects in addition to direct impacts. We find that the net employment impacts are very sensitive to: (1) the procurement cost (LCOE) and (2) the extent to which OSW demands for equipment, materials, supplies, and labor are met by New York sources.³ The net impacts are also larger when compared to the “CES Not Met” Base Case

³ We account for the range of possible local shares of local (New York State) provision of OSW demand for equipment, materials, supplies and labor by assuming that either the current share of about 50% holds over time with some upward adjustment for operations and maintenance related demands or that 100% of OSW is met by local sources by 2030. This is an aggressive upper bound. Full localization of the supply chain is more likely to be achieved in the Northeast. It is unlikely that New York’s projects will source all labor and material inputs necessary to build and operate New York’s OSW projects in New York. More likely, some amount of specialization will occur in the region. Such specialization likely implies that for some elements of the offshore wind supply chain, New York would provide products and services in excess of the demand from New York OSW projects, but less for other elements of the supply chain. An analysis of the nature of such specialization is beyond the scope of this report. We therefore make the simplifying assumption that under full localization, New York provides all products and services for New York OSW projects (and other states would provide the full set of products and services for their state’s OSW projects in turn).

reflecting the higher costs of/inability to meet the CES absent the OSW procurements. As shown in Figure ES-3, compared to both base cases, OSW procurements support substantial additional jobs (measured in full-time equivalent positions, FTEs). The total number of additional FTEs (direct, indirect and induced) supported by OSW peaks in 2030 at between 11,300 FTEs compared to the “CES Met” Base Case and 13,200 FTEs compared to the “CES Not Met” Base Case. The OSW employment impacts are lower than the base cases in a few years/instances. For one, in the base cases, *i.e.*, absent OSW, prior to 2023, base case plant construction outstrips OSW related construction. This circumstance occurs again in 2026 when there is a gap in OSW construction. In 2031, if the procurement cost of OSW is at the maximum of the range estimated by NYSERDA and the local share is at the low end of the expected range, OSW employment levels fall below the base case levels. Our estimate of the net number of **direct** FTEs are very similar to the NYSERDA study estimate, ranging from 1,200 to 6,200 depending on the base case, the local share, and the LCOE.⁴

Figure ES-3: Annual Jobs Impact of OSW Projects (2018 – 2044)



Source: IMPLAN Results.

As shown in Table ES-2, OSW’s estimated contribution to New York State’s GDP ranges from approximately zero compared to the “CES Met” Base Case (assuming procurement will occur at

⁴ The NYSERDA Offshore Wind Policy Options Paper considered only direct employment. We estimate direct, indirect, and induced employment impacts. Indirect employment includes jobs for the suppliers of equipment, goods, and services associated with OSW construction and operations. Induced employment includes jobs for goods and services demanded by the direct and indirect job holders.

the maximum LCOE estimated by NYSERDA and assuming the lower bound of the local share in construction and O&M activity) to \$7.2 billion on a net present value basis compared to the “CES Not Met” Base Case (assuming procurement at the minimum LCOE and the upper bound of local share in construction and O&M activity).⁵

Table ES-2: Summary of Economic Impacts
Net Present Value of OSW Case Relative to Each Base Case
2018 - 2044 (thousand 2017 \$)

Impact Type		Lower Bound Local Share				Upper Bound Local Share			
		Min LCOE		Max LCOE		Min LCOE		Max LCOE	
		CES Met	CES Not Met	CES Met	CES Not Met	CES Met	CES Not Met	CES Met	CES Not Met
Labor Income (thousand \$)									
Direct	[1]	1,206,329	1,456,436	-45,936	214,686	1,450,548	1,700,655	198,283	458,905
Indirect	[2]	401,603	838,351	-150,483	290,914	953,308	1,390,057	401,223	842,619
Induced	[3]	413,936	587,577	-45,584	131,787	611,270	784,910	151,749	329,120
Total Effect	[4]	2,021,867	2,882,364	-242,003	637,387	3,015,126	3,875,622	751,255	1,630,645
Value Added (GDP) (thousand \$)									
Direct	[5]	2,490,563	3,331,594	311,016	1,170,255	2,869,315	3,710,345	689,768	1,549,007
Indirect	[6]	659,147	1,319,744	-257,866	410,402	1,446,723	2,107,320	529,711	1,197,979
Induced	[7]	740,097	1,050,398	-81,436	235,711	1,092,920	1,403,221	271,387	588,534
Total Effect	[8]	3,889,807	5,701,736	-28,286	1,816,368	5,408,959	7,220,887	1,490,865	3,335,520
Gross Output (thousand \$)									
Direct	[9]	3,846,012	6,017,587	-77,279	2,127,043	5,740,566	7,912,141	1,817,275	4,021,597
Indirect	[10]	1,072,364	2,313,658	-401,736	851,884	2,844,549	4,085,843	1,370,449	2,624,069
Induced	[11]	1,138,732	1,616,040	-125,158	362,597	1,681,616	2,158,924	417,727	905,481
Total Effect	[12]	6,057,108	9,947,285	-604,172	3,341,524	10,266,731	14,156,908	3,605,451	7,551,147

Notes:

NPV calculated with a real discount rate of 3%. The calculation assumes no construction or cash flow from 2018 – 2020 and 23 years operation thereafter.

Totals refer to the OSW Case impact less the Base Case impact and include effects of construction, operations and maintenance, the Regional Greenhouse Gas Initiative, and price effects.

Totals may not add up precisely due to rounding.

[4] = [1] + [2] + [3].

[8] = [5] + [6] + [7].

[12] = [9] + [10] + [11].

Similar to the employment estimates, these estimates depend on several factors including whether CES is met or not without OSW, the cost of OSW procurement, and the extent to which OSW demands for equipment, materials, supplies, and labor are met from New York sources. The

⁵ Throughout this report we use the period 2018 – 2044 for our net present value calculations. By doing so, we provide net present values from today’s perspective and covering 20 years of the operations of the first tranche of offshore wind projects, assumed to be operational in 2024.

highest GDP, Gross Output, and labor income effects result when procurement costs are the minimum LCOE as estimated by NYSERDA, the CES is assumed to be met absent OSW, and OSW demand is met entirely from New York sources.

I. Introduction

In 2016, New York first announced a goal to deploy 2,400 MW of offshore wind by 2030. This goal was affirmed in January 2018 in Governor Cuomo’s State of the State address, which also specified that two procurements totaling at least 800 MW (400 MW each) would take place by 2019.⁶ In late January 2018, the New York State Energy Research and Development Authority (“NYSERDA”) released a paper detailing various assumptions around the deployment of 2,400 MW of offshore wind capacity in New York by 2030, discussing procurement options, and estimating the economic impacts of the overall program under these procurement approaches.⁷ ACE New York asked the Brattle Group to further analyze the economic impact to New York of the proposed deployment of 2,400 MW in stages by 2030. In this paper, we present the results of our analysis with particular emphasis on two areas: the impact offshore wind might have on electricity prices, and secondary and induced economic impacts. As recognized by NYSERDA, the former will have the effect of at least temporarily lowering consumer costs (before accounting for the costs of paying for offshore wind procurement) even though NYSERDA argues that in economic terms this represents a transfer from electricity producers to electricity consumers and not necessarily an economic benefit to New York overall. Just like NYSERDA, we also consider environmental impacts.

Our report is organized as follows: We first provide a discussion of our approach and methodology. Next we discuss the impact of the proposed offshore wind deployment on various electricity and related markets. We then describe the environmental (emissions) impacts, followed by the discussion of the impact of offshore wind on jobs and other economic metrics before providing some concluding remarks.

II. Approach and Methodology

For our assessment, we use two models to capture the impact of adding offshore wind to the New York power system. First, we use the Xpand model, a proprietary power system simulation model that incorporates capacity expansion and retirement as well as dispatch to capture the dynamics

⁶ 2018 New York State of the State Policy Book, pp. 218 – 220.

⁷ New York State Energy Research and Development Authority, “Offshore Wind Policy Options Paper,” January 29, 2018. (“NYSERDA Offshore Wind Policy Options Paper”)

of power system operation. With it, we estimate the impact offshore wind will have on New York power markets, including how wholesale electricity prices, revenues received by generators, and costs paid by consumers across all customer classes could change. Second, we use IMPLAN, a commercially available macroeconomic model, to assess how economic activity associated with the construction and operation of offshore wind as well as the changes in electricity costs to consumers and revenues received by power generators translate into broader economic effects such as employment and state gross domestic product (“GDP”).⁸ The IMPLAN model uses the results from Xpand, in particular the impact of offshore wind on electricity prices and customer payments for electricity.

Estimating the impact of offshore wind both on electricity markets and on the broader New York economy requires a number of assumptions. It also requires assumptions about how the New York electricity system would evolve absent the deployment of offshore wind, *i.e.*, how the “OSW Case” (2,400 MW of offshore wind added to the New York power system by 2030) compares to a “base case” without the addition of offshore wind.

Both the OSW Case and the base cases represent a departure from today’s NY electricity system. To show how the economic impacts of offshore wind may differ based on reasonable alternative assumptions about how the NY electric system would evolve in the absence of offshore wind deployment, we develop two Base Cases:

- Base Case 1 (“CES Met”) assumes that even in the absence of offshore wind, the Clean Energy Standard (“CES”), which requires that by 2030 50% of electricity consumed in New York be produced by CES-eligible resources, will be fully met with other qualifying renewable resources, primarily land based wind (“LBW”) and solar PV. This base case is consistent with an assumption that New York is committed to achieving the CES even if doing so becomes difficult or very costly, for example, because LBW resources deployed

⁸ The IMPLAN (Impact analysis for PLANing) economic impact modeling system is developed and maintained by the IMPLAN Group LLC, which has continued the original work on the system done at the University of Minnesota in close partnership with the U.S. Forest Service’s Land and Management Planning Unit. IMPLAN divides the economy into over 500 sectors and allows the user to specify the expenditure allocations associated with a given expansion in demand to all relevant parts of the local economy in order to derive the economic impacts—changes in employment, earnings, and economic output.

in upstate New York require large additional investments in transmission to deliver energy downstate.

- By contrast, Base Case 2 (or “CES Not Met”) assumes that in the absence of offshore wind, the CES will not be fully met with renewable energy. Rather, for this alternative base case we assume that the amount of CES qualifying resources developed fall short of the CES goals by the assumed generation of the offshore wind in the OSW Case. In contrast to the “CES Met” Base Case, evaluated against the “CES Not Met” Base Case offshore wind does not displace other Tier 1 renewable energy resources, but instead displaces whatever would be most economical to build and operate, which is primarily natural gas fired generation. In this alternative, load serving entities (“LSEs”) meet the shortfall of renewable energy production under their CES obligation by making alternative compliance payments (“ACP”). The level of economic activity in this base case depends on what happens with the funds collected from ACP payments. Since an assumption that the ACP would be used to fund renewable energy projects is inconsistent with the assumption of this “CES Not Met” Base Case, we assume that the ACP funds (which are based on the price of renewable energy credits, or “RECs”) would not flow back to the electric sector during the period we evaluate.⁹

At a high level the impacts of offshore wind on the electric system and on the broader economy can be summarized as follows:

⁹ Our analysis assumes that the CES will remain unchanged even if its 2030 target cannot be met without OSW. With this assumption, any shortfall of renewable energy procurement relative to the CES would need to be made up with ACP related payments. As a consequence, by paying for ACP payments, electricity customers would still pay to support renewable energy even if those payments don’t directly result in more renewable energy. This assumption could overstate the economic impact of OSW relative to the “CES Not Met” Base Case since it is reasonable to expect that at least some of the ACP funds would flow back to the New York economy over the next 20 years in a form that creates economic activity. Put differently, the ACP funds would stimulate economic activity in the “CES Not Met” Base Case that would partially offset economic activity in the OSW case. If all ACP funds supported the construction of CES qualifying resources during the time horizon of our analysis (which is unlikely since it contradicts the premise of this base case), and using our assumptions concerning the NY share of spending for such resources, the economic impact of ACP funds in the “CES Not Met” Base Case on the New York economy would be approximately an additional \$500 million in economic activity in NPV terms through 2044, so that the GDP benefits to New York we estimate in the OSW Case relative to this base case may be overstated by a maximum of an amount in this range.

Procuring offshore wind will have an impact on the wholesale electricity market and ultimately the cost ratepayers are paying for electricity.

On the one hand, offshore wind will tend to increase supply and thus reduce the price of wholesale energy and capacity, and renewable energy credits. On the other hand, customers may need to pay an “out-of-market” cost to procure offshore wind if total payments to the selected offshore wind projects exceed the market value of the power output from those projects. Also, to the extent OSW reduces wholesale energy and capacity prices, zero emissions credit (“ZEC”) prices for upstate nuclear plants could increase, which could partially offset the effect on lower wholesale prices.¹⁰ We evaluate the net impact on the total electricity cost to rate payers by taking all of these factors into account.

The net effect of these factors can be positive or negative. Higher total payments for electricity would lower the disposable income available to purchase other goods and services, some of which would be purchased in New York (or from New York entities). Hence, changes in total spending for electricity become one important determinant of the broader economic impact of offshore wind on New York. The other driving factor is related to the economic activities associated with the construction and operation of the offshore wind facilities themselves, relative to the activities that would occur in the absence of offshore wind, *i.e.*, compared to either of the two base cases, as well as indirect and induced economic activity. Most important among those activities are jobs and expenditures on capital and labor during the construction phase of offshore wind farms. The impacts on New York’s economy depend on how much of the construction activities (and to a lesser extent the operating activities) occur in New York, or employ New York State residents.

III. Electricity Market and Ratepayer Impacts

The addition of 2,400 MW of offshore wind to the electric system delivering electricity to New York will have impacts on electricity markets. At the most fundamental level, adding offshore

¹⁰ As we explain in more detail below, we make a conservative assumption that even though at present the ZEC price for Tranche 1 is at the ZEC price cap, future wholesale prices are such that the ZEC price may not be at the cap, in which case reductions to wholesale energy and capacity prices could lead to corresponding increases in ZEC prices for future tranches. Given the relative magnitude of ZEC payments and the estimated change in wholesale energy and capacity prices, this assumption does not materially affect our results.

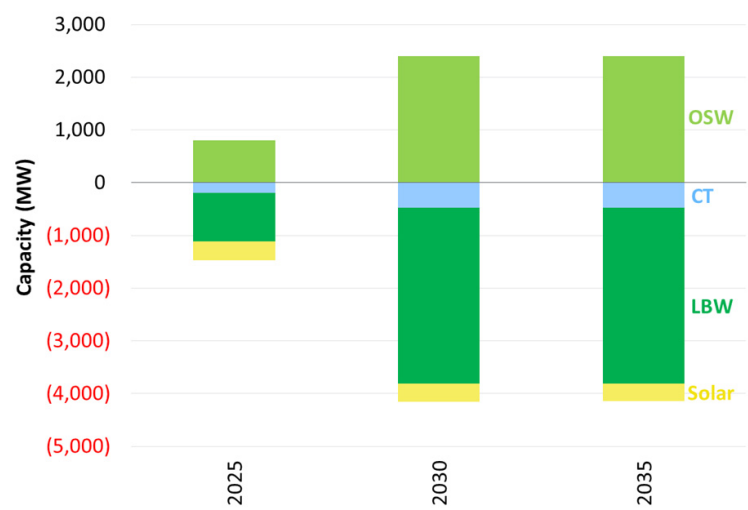
wind supply will affect market prices for energy, capacity, RECs, ZECs, and Regional Greenhouse Gases Initiative (“RGGI”) allowance prices, all of which, directly or indirectly, affect customer expenditures for electricity, generator revenues. It would also potentially affect government revenues and expenditures. The changes in spending and revenues in turn are one of the factors that determine the economic impact of offshore wind. Changes in what producers and consumers must spend for electricity mean more (or less) income is available for expenditures on other investments, goods and services, some of which may be produced or provided by New York businesses. Changes in revenues to power generators in New York may lead to changes in employment or purchases of goods and services with further impacts on the New York economy. To better understand how offshore wind affects market prices, it is helpful to first review how adding offshore wind will affect the generation capacity mix in New York.

A. GENERATION CAPACITY MIX

Compared to the “CES Met” Base Case, adding 2,400 MW of offshore wind delivered into New York City and Long Island generally reduces the need to procure other technologies to provide the renewable energy attributes required to meet the CES as well as the energy and capacity provided by offshore wind.

Figure 1 below shows the resulting differences in the resource mix over time. The addition of 2,400 MW of offshore wind replaces about 3,600 MW LBW and solar and 480 MW of natural gas combustion turbines by 2035. Offshore wind has higher capacity factors and higher capacity value than LBW and solar, so less installed capacity is required to provide the same amount of energy and capacity value.

Figure 1: Changes in Installed Capacity in NYISO (OSW Case Relative to “CES Met” Base Case)



Source: Xpand Results.
Notes: OSW=Offshore Wind, CT=Combustion Turbine, LBW=Land Based Wind.

Figure 2 shows the difference in capacity resource mix between the offshore wind case and the “CES Not Met” Base Case. Since this alternative base case has less renewable energy in the absence of offshore wind, offshore wind primarily displaces natural gas fired capacity here.

Figure 2: Changes in Installed Capacity in NYISO (OSW Case Relative to “CES Not Met” Base Case)



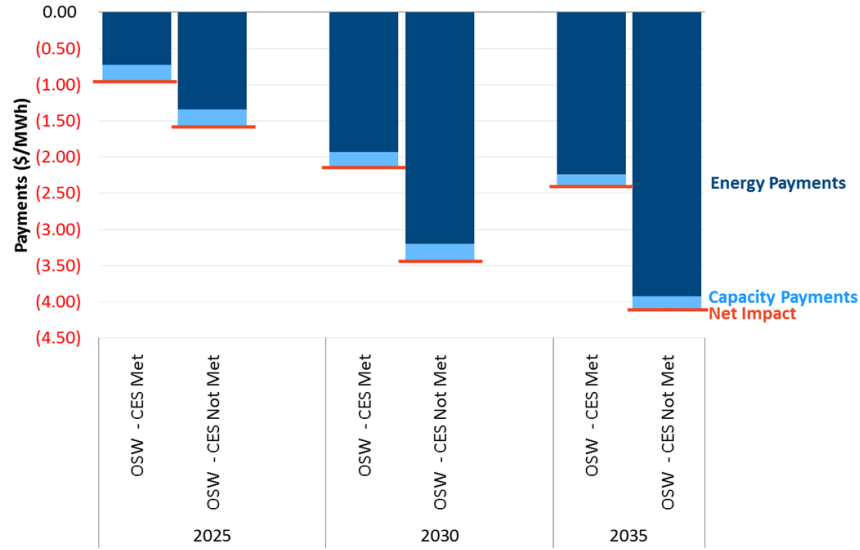
Source: Xpand Results.

B. WHOLESALE ELECTRICITY MARKET IMPACTS

Adding offshore wind to the New York energy mix potentially affects both the levels and the geographic distribution of energy prices in New York.

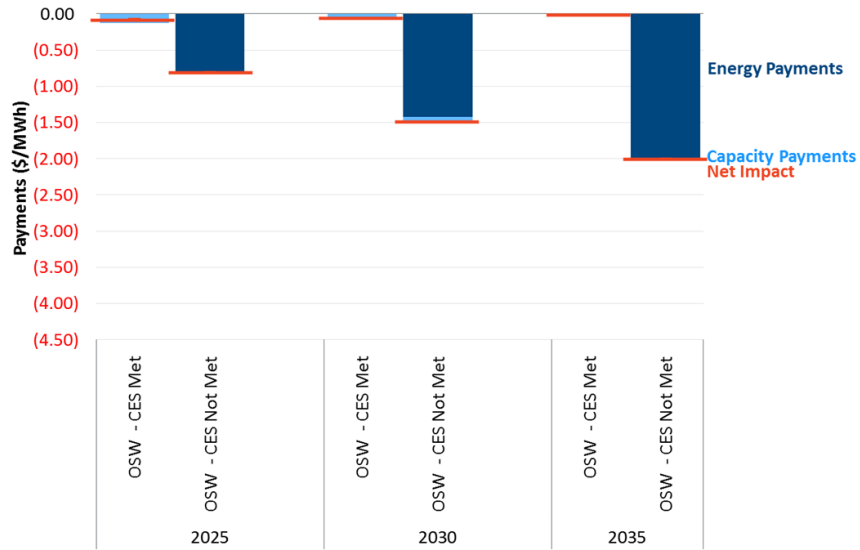
Figure 3, Figure 4, and Figure 5 below show the change in wholesale market prices of the offshore wind case relative to the two alternative base cases for New York City and Long Island (Zones J and K), upstate Zones A-H, and New York overall (*i.e.*, the load-weighted average payments across all load zones), respectively. These figures show the combined effect of changes in both energy and capacity prices, but do not include any out-of-market cost of offshore wind, which depends on the procurement approach and is discussed below.

Figure 3: Differences in Wholesale Prices in New York City & Long Island

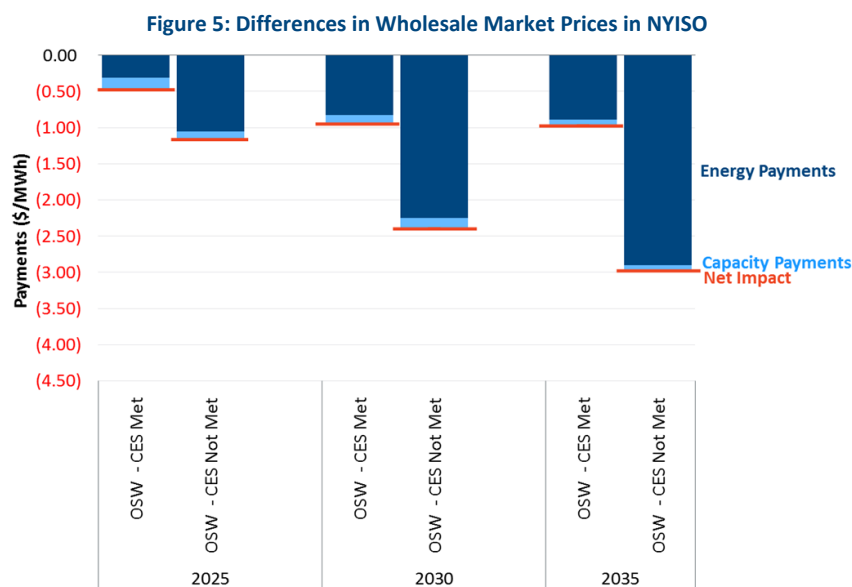


Sources and Notes: Xpand Results. We convert capacity prices to \$/MWh for ease of comparison.

Figure 4: Differences in Wholesale Market Prices in Upstate New York



Sources and Notes: Xpand Results. We convert capacity prices to \$/MWh for ease of comparison.



Sources and Notes: Xpand Results. We convert capacity prices to \$/MWh for ease of comparison.

In comparison to the “CES Met” Base Case, wholesale energy prices for New York City and Long Island are reduced by adding offshore wind to these two regions, since adding supply reduces the market price of energy in these high-priced areas. Adding offshore wind also increases the supply of capacity, which all else equal would reduce capacity prices, but this effect is partially offset. Capacity prices are influenced by energy prices, so the lower energy price causes some upward pressure on capacity prices; the net effect is that capacity prices decrease only slightly. The net impact on wholesale prices in New York City and Long Island is a reduction of about 2.2%, or \$2.4/MWh, by 2035. On the other hand, adding offshore wind to downstate New York City and Long Island offsets additions of renewables in upstate New York (to meet the CES), leading to slightly higher upstate energy prices compared to the “CES Met” Base Case, though upstate prices remain materially below downstate prices. Average wholesale prices across all of New York are dominated by the changes in New York City and Long Island (given the large share of demand located in that part of the State) so that on average across the entire State customers experience about a \$1.0/MWh reduction in wholesale electricity prices by 2035.

These impacts differ from those of comparing offshore wind to the “CES Not Met” Base Case. Because the CES requirement is assumed not to be met with renewable generation in this alternative base case, more fossil units (and less zero-variable cost generation) are added over

time in the absence of offshore wind, leading to higher energy prices for both upstate and downstate New York in this base case relative to the “CES Met” Base Case. Therefore, the impact of offshore wind measured against this alternative base case is larger than when compared to the “CES Met” Base Case. Downstate capacity prices are slightly lower, netting the offsetting effects of lower energy prices (which push capacity prices up) and reduced capacity procurement needs (pushing capacity prices downward). Measured against this alternative base case, offshore wind reduces wholesale electricity prices in New York overall by about \$3.0/MWh on average by 2035.

C. A DISCUSSION OF WHOLESALE MARKET EFFECTS

Since the impact of renewable energy on wholesale prices is a frequent topic in discussions of the economic benefit of renewable energy resources, in this section we provide a brief overview of the issue and some thoughts on how to interpret such effects.

Standard economic theory suggests that adding supply to a market otherwise in equilibrium through out-of-market incentives results primarily in a shift of surplus from producers to consumers and not in a (significant) societal benefit. For this reason, New York has adopted the position that such effects should not be considered benefits.¹¹ Nonetheless, as NYSERDA acknowledges in its Offshore Wind Policy Options Paper, the effect of lower wholesale prices will still be to reduce customer payments for electricity at least temporarily, with corresponding broader economic impacts. It is also clear that lower prices to consumers mean lower revenues to generators, which can also have broader economic impacts, for example, in the form of reduced fuel purchases or potentially the retirement of generating plants with corresponding employment losses. Finally, it is often acknowledged that lower wholesale prices may be a temporary phenomenon. As long as some combination of plant retirement and load growth ultimately requires new market-induced entry, wholesale prices may (at some point in the future) have to rise to levels sufficient to encourage such entry.

While this standard model is basically sound, it does make certain assumptions. First, while the statement is true for fully competitive markets, a market can only be fully competitive in the absence of externalities (or if those externalities are fully internalized). Although proposals

¹¹ NYSERDA Offshore Wind Policy Options Paper, p. 115.

currently exist to modify New York's wholesale power markets to more fully reflect at least the carbon externality, the present wholesale market structure is likely not free of all material externalities. Therefore the welfare implications of adding non-emitting resources to the power system through mechanisms such as the procurements of OSW by NYSEERDA are less clear and could represent a net welfare gain when considering the externality effect.

Second, whether or not prices need to rise to attract entry depends on the evolution of technology over time. The standard argument that wholesale price reductions are temporary often relies on the assumption that the entry technology and its cost remain unchanged. Today, the most frequently used assumption is that new market-based entry in New York will be from either single cycle combustion turbines or combined cycle natural gas fired power plants. However, the assumption that the default entry technology will be fossil-fired is at least potentially at odds with long-term decarbonization commitments. It could also be at odds with observable technological change, which continues to reduce the cost gap between natural gas fired and renewable generation technologies (and/or storage or demand side resources). In some parts of the United States, renewable technologies are approaching cost parity with traditional fossil generation and could, at some point, be entering the market at prices below those required for new natural gas-fired generation to enter. At that point, wholesale prices would not necessarily need to return to higher levels to attract new entry, or at least not to the prices required by natural gas-fired generation.

This second point is closely related to a third observation. The standard model is essentially static and does not directly take into account innovation. If innovation lowers the marginal cost of production, a new market equilibrium with lower market prices will emerge. In such a new equilibrium, existing producers earn lower revenues (and may ultimately exit the market), but social welfare increases because the total cost of production falls. This process was dubbed "creative destruction" by economist Joseph Schumpeter and is generally viewed as beneficial for society. Even in the short run, this process increases social welfare if the new product can be produced at lower (social) cost than existing products, and it certainly does so in the long run as newer, lower cost technology displaces old higher cost technology.

Deploying offshore wind in New York likely has elements of both the "classic Schumpeterian" innovation and shifting benefits from one group (existing generators delivering into New York) to another (consumers in New York), because under at least some procurement approaches it requires compensation above prevailing market prices, even acknowledging that those market

prices do not fully internalize relevant externalities.¹² For these reasons we include a discussion of price effects, but don't classify them explicitly as benefits. We do include the impacts of lower wholesale prices on both consumers and generators in our macroeconomic analysis.

D. CUSTOMER ELECTRICITY COSTS

Wholesale electricity price changes are only one component of the impact of offshore wind on consumer electricity payments. The other determinant is the cost of procuring offshore wind. In its Offshore Wind Policy Options Paper, NYSERDA laid out a number of procurement options and estimated how these options are expected to affect the levelized cost of energy ("LCOE") required to procure offshore wind. If, ultimately, the LCOE under the chosen procurement approach exceeds the wholesale market value of the products provided by offshore wind, any cost above wholesale market values is ultimately recovered from electricity consumers.

Furthermore, the addition of offshore wind may have implications for REC prices. Figure 6 and Figure 8 below show that, as expected, REC prices are essentially unchanged relative to the "CES Met" Base Case. REC payments are somewhat higher in the OSW Case relative to the "CES Not Met" Base Case, which is largely a result of lower wholesale energy and capacity prices since REC prices are essentially representing the gap between renewables cost and energy and capacity market revenues.

Finally, New York has committed to making ZEC payments potentially above wholesale market revenues to upstate nuclear plants.¹³ ZEC prices are set based on a formula. The formula caps ZEC prices at the "net" social cost of carbon, *i.e.*, the social cost of carbon net of the value of carbon captured in RGGI prices, converted into a price per MWh of nuclear generation, where the conversion rate represents an assumed marginal emissions rate, which may change over time. The ZEC cap increases over time as the estimate of the social cost of carbon increases. The ZEC price can be below the cap if energy and capacity prices exceed a benchmark level, but cannot

¹² It should be noted that even if offshore wind is an innovation that lowers the (social) cost of power supply relative to existing power generation technologies, it is not clear that such a technology would enter the market by itself. As NYSERDA's analysis of various offshore wind procurement option shows, procurement itself has an important impact on total cost (including financing cost), reflecting different risk profiles of technologies with different fixed/variable cost splits.

¹³ State of New York Public Service Commission, Order Adopting the Clean Energy Standard, August 1, 2016. ("CES Order")

exceed the cap. It is set for six consecutive two-year tranches.¹⁴ The Tranche 1 price is set at the ZEC cap, indicating that the forecasts of energy and capacity prices used to set Tranche 1 ZEC values were at or below the benchmark. Hence, under the current ZEC pricing formula, any further decreases in wholesale prices would not have an impact on the Tranche 1 ZEC price.

However, we conservatively model a case where New York nuclear generation is shielded from decreases in energy and capacity prices. This approach represents a potential future where wholesale prices are higher than those forecast for setting the Tranche 1 ZEC price.¹⁵

In sum, any reduced customer payments from lower wholesale electricity prices caused by adding offshore wind could be partially or entirely offset by the combination of “above market” payments as a consequence of the specific procurement approach chosen by NYSERDA, as well as increased payments due to higher REC prices and through higher ZEC prices. Of the three factors, OSW procurement costs are by far the more important factor. The offsetting ZEC payments to compensate nuclear generation for lower wholesale energy and capacity prices we conservatively assume only represent a net present value of \$149 million, which represents 0.06% of total customer payments for electricity. Consequently, whether or not payments to nuclear generation would be adjusted in response to lower wholesale prices as a result of OSW does not have a material impact on our results.

Figure 6, Figure 7, and Figure 8 below show the overall impact on customer electricity costs for the wholesale electricity market and the out-of-market payments, for the low, average, and high end of the LCOE for offshore wind presented in the NYSERDA Offshore Wind Policy Options Paper. The NYSERDA LCOE resulting from various procurement approaches ranges from \$105/MWh to \$155/MWh (2017 dollars) for Phase I deployment, depending on procurement structure.¹⁶ Unsurprisingly, the net impact depends on the cost of offshore wind development. If

¹⁴ CES Order, pp. 129–147.

¹⁵ We note that our own modeling projects energy and capacity prices that result in future benchmark values above the \$39/MWh.

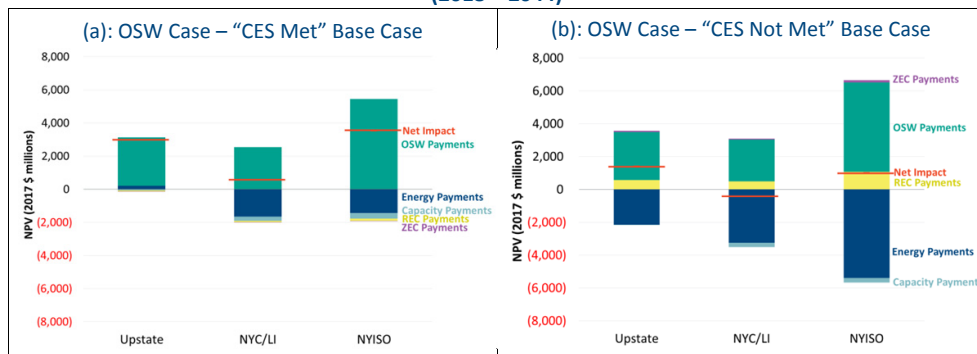
¹⁶ NYSERDA Offshore Wind Policy Paper, Figure 13, p. 64. We use the complete range of estimated LCOE across all procurement options evaluated by NYSERDA for Phase I and apply to all procurements. Given likely cost declines for OSW between Phase I and II, this is conservative. We recognize that the decision about the procurement approach ultimately chosen will be informed by many factors, of which the estimated LCOE of procurement is only one. The estimated impact on

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the offshore wind procurement cost is on the high end of the range developed in NYSERDA's Offshore Wind Policy Options Paper, the net present value of ratepayer cost could increase by about \$1.0–\$3.5 billion, depending on which base case it is measured against (an average annual increase of \$60–\$225 million in 2017 dollars, or between 0.4% and 1.6% of average annual ratepayer costs of approximately \$15 billion per year). If the offshore wind cost is around the average of the high and low end of the range developed in NYSERDA's Offshore Wind Policy Options Paper, the net present value of ratepayer cost could decrease by about \$1.5 billion if measured against the “CES Not Met” Base Case or increase by about \$1.0 billion if measured against the “CES Met” Base Case. If, on the other hand, the offshore wind cost is on the low end of the range developed in NYSERDA's Offshore Wind Policy Options Paper, ratepayer cost could decrease by \$1.5–\$4.0 billion in net present value (an average annual decrease of \$90–\$260 million in 2017 dollars, or between 0.6% and 1.8% of average annual ratepayer costs).

Figure 6: Differences in NPV of Ratepayer Payments in NYISO using the Maximum LCOE (2018 – 2044)

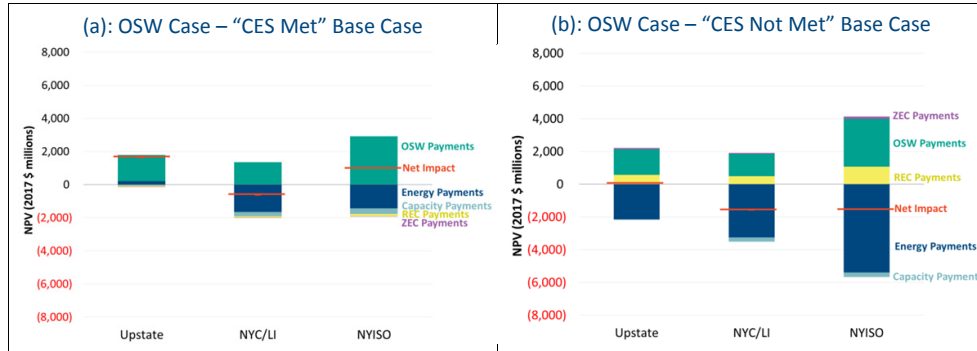


Source: Xpand Results.

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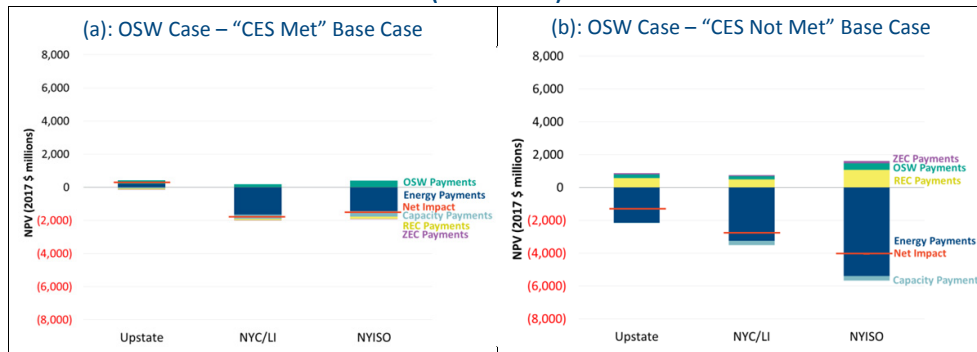
consumer payments from procurement approaches with LCOE between the lowest and highest cost estimated by NYSERDA will be proportionally between the impacts we estimate for the low and high end of the range.

Figure 7: Differences in NPV of Ratepayer Payments in NYISO using the Average LCOE (2018 – 2044)



Source: Xpand Results.

Figure 8: Differences in NPV of Ratepayer Payments in NYISO using the Minimum LCOE (2018 – 2044)



Source: Xpand Results.

E. EMISSIONS IMPACTS

We also analyze the impact of adding offshore wind on the emissions of various pollutants, including emissions of carbon dioxide (“CO₂”), criteria pollutants sulfur dioxide (“SO₂”), nitrogen oxides (“NO_x”), and particulate matter (“PM 2.5”). As with electricity price impacts, the changes in pollutant emissions attributable to adding offshore wind to the New York power system need to be expressed in relation to each of our two base cases. Table 1 and Table 2 below summarize the impact by pollutant and base case for emissions in New York and on a broader regional basis, respectively. Since New York is a net importer of electricity, it is not surprising that emissions

impacts are substantially larger when regional rather than only New York emissions are considered.

Table 1: Emissions Impact in New York (metric tons, 2018 – 2044)

	OSW - CES Met			OSW - CES Not Met		
	Upstate	NYC/LI	NYISO	Upstate	NYC/LI	NYISO
Average Annual						
CO2	628,658	(826,431)	(197,774)	(476,283)	(670,133)	(1,146,415)
NOx	151	(200)	(49)	57	(180)	(123)
SO2	48	0	48	(378)	0	(378)
PM 2.5	226	(271)	(45)	(182)	(212)	(394)
Total						
CO2	16,973,762	(22,313,648)	(5,339,886)	(12,859,628)	(18,093,584)	(30,953,212)
NOx	4,087	(5,402)	(1,315)	1,546	(4,857)	(3,311)
SO2	1,305	0	1,305	(10,195)	0	(10,195)
PM 2.5	6,092	(7,306)	(1,215)	(4,912)	(5,714)	(10,626)

Source: Xpand Results.

Table 2: Emissions Impact in All Modeled Regions (metric tons, 2018 – 2044)

	OSW - CES Met	OSW - CES Not Met
Average Annual		
CO2	(187,153)	(3,592,381)
NOx	(219)	(780)
SO2	1,806	(657)
PM 2.5	(40)	(1,207)
Total		
CO2	(5,053,118)	(96,994,275)
NOx	(5,923)	(21,067)
SO2	48,759	(17,737)
PM 2.5	(1,088)	(32,597)

Sources and Notes: Xpand Results. Modeled regions include NYISO, ISO-NE, PJM, Hydro-Québec, and IESO.

Our estimated emissions impacts depend significantly on the base case against which emissions in the OSW Case are evaluated. Measured against the “CES Met” Base Case, the net impact of offshore wind on emissions is understandably modest and mostly due to the location of renewable energy resources and the emissions intensity of the fossil resources they displace. The fact that aggregate emissions are lower at all relative to the CES Met base case reflects that, by

delivering power into New York City and Long Island, offshore wind offsets generally higher-emitting fossil generation in these urban areas than the alternative land-based wind and solar resources would offset in upstate New York.

And of course this modest overall impact on emissions does not mean that offshore wind does not make an important contribution to meeting the emissions targets of the CES. This is illustrated by the impact of offshore wind against a base case where offshore wind largely displaces fossil generation (the “CES Not Met” Base Case).

These emissions impacts can also be expressed in monetary equivalents. The Social Cost of Carbon (“SCC”) is a frequently used measure of the damages caused by CO₂ emissions. There are multiple measures of the SCC, depending on the choice of discount rate, the year of assumed emissions, whether total or only domestic impacts are considered, and whether or not average or 95th percentile damages resulting from an incremental ton of CO₂ emissions are estimated. The SCC used for policy making purposes can range from \$1 per metric ton to \$212 per metric ton in 2007 dollars.¹⁷ Given the wide range of estimates and typical values of the SCC often used, we use the 2020 SCC value assuming a 3% discount rate, equal to \$42 per metric ton in 2007 dollars, for our analysis.¹⁸

We also estimate the net present value of criteria pollutant reductions. Table 3 below shows the assumed damages caused per ton of criteria pollutant. The damage values for SO₂ and PM_{2.5} are location specific. We rely on National Research Council values to provide a basis for discussion. Actual values are highly dependent on location and the associated ambient air quality conditions that we cannot readily account for in this analysis, but given that the air quality improvements would occur in some of the most densely populated areas of the world (New York City), it is

¹⁷ Interagency Working Group on Social Cost of Greenhouse Gases, “Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis, Under Executive Order 12866,” August 2016, Table ES-1. For a broader discussion of the application of the SCC at the federal level, see Executive Office of the President, Council on Environmental Quality, “Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews, August 1, 2016. The EPA, under the Trump administration, has lowered the SCC to between \$1/metric ton and \$7/metric ton (2011 dollars), primarily by considering only domestic impacts and using higher discount rates. This range is not widely accepted by academics or several state governments. See U.S. EPA, Regulatory Impact Analysis for the Review of the Clean Power Proposal, 2017 Appendix, Section C.3.

¹⁸ Note that since the SCC is expected to rise over time, this value is relatively conservative.

possible that average estimates of damages from criteria pollutants would understate the value of their reduction in our analysis.

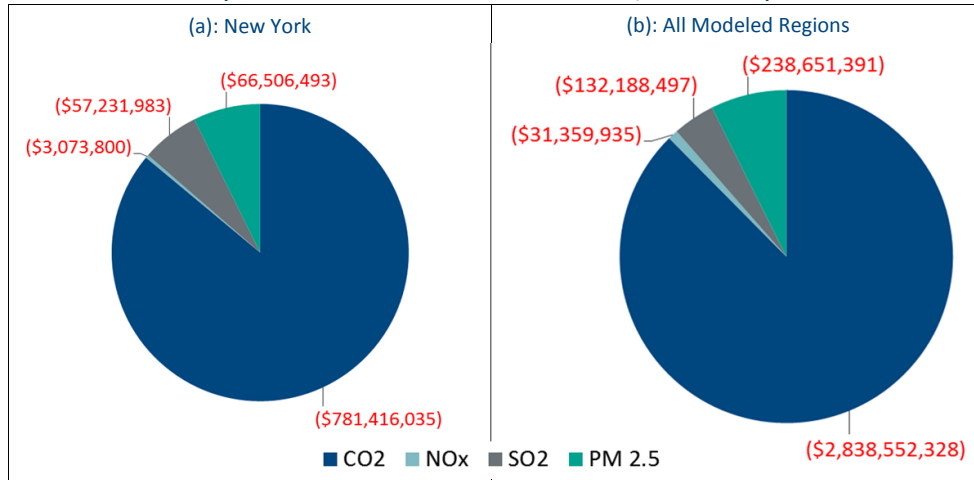
Table 3: Estimated Damages per Ton of Criteria Pollutant

Damages (2017 \$/ metric ton)	
CO2	49
NOx	2,082
SO2	7,546
PM 2.5	12,360

Sources: Social cost of carbon is from the Interagency Working Group on Social Cost of Greenhouse Gases, "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis, Under Executive Order 12866," August 2016, Table ES-1. Costs of other pollutants are from National Research Council, "Hidden Cost of Energy: Unpriced Consequences of Energy Production and Use," 2010. Damage estimates are inflated to 2017 \$.

Using these damage estimates, Figure 9 shows the net present value of criteria pollutant damage cost reductions for emissions reductions in New York (left panel) and the entire modeled region (right panel). We also include avoided damages related to CO₂ in the figure. The net present value of all avoided pollutants (including CO₂) from 2018 to 2044 is about \$908 million, consisting of \$781 million attributable to CO₂ reductions, and approximately \$127 million from criteria pollutant reductions using New York emissions only. Across all modeled regions the net present value of emissions reductions is \$3.24 billion, of which \$2.84 billion are attributable to CO₂ emissions related cost reductions.

**Figure 9: Net Present Value of Pollutant Damage Cost Reductions in 2017 \$
(OSW Case Relative to “CES Not Met” Case, 2018 – 2044)**



Source: Xpand Results. Modeled regions include NYISO, ISO-NE, PJM, Hydro-Québec, and IESO.

IV. Jobs and Economic Activity Impacts

A. INTRODUCTION

We utilize IMPLAN, a commercially available macroeconomic model, to estimate the economic impacts of the proposed offshore wind procurements in New York State. As with electricity market impacts, these impacts, expressed as gross output, value added (GDP), and employment, are measured against the two base cases described above (“CES Met” and “CES Not Met”), over the period 2018 – 2044. We have made these comparisons reflecting both the minimum and maximum LCOE described above and by accounting for the extent to which the demands for OSW equipment, materials, supplies and labor are assumed to be met from New York sources, *i.e.*, dependent on the degree of “localization” of the OSW supply chain. Following a description of the methodology employed and the underlying data sources and assumptions, this section reviews the results for both the “CES Met” Base Case and the “CES Not Met” Base Case. Both cases in turn consider two scenarios representing a lower bound and an upper bound local share. This range accounts for uncertainties regarding how quickly and completely New York sources will be able to meet the demands for equipment, materials, supplies, and labor. We then compare

our employment impacts with those presented in the New York State Offshore Wind Master Plan Appendix T report, “The Workforce Opportunity of Offshore Wind in New York.”¹⁹

B. METHODOLOGY

Economic impacts are estimated by combining both the Xpand and IMPLAN models. Figure 10 illustrates the relationship between the models.

Figure 10: Relationship between the Xpand Capacity and Dispatch Model and the IMPLAN Economic Model

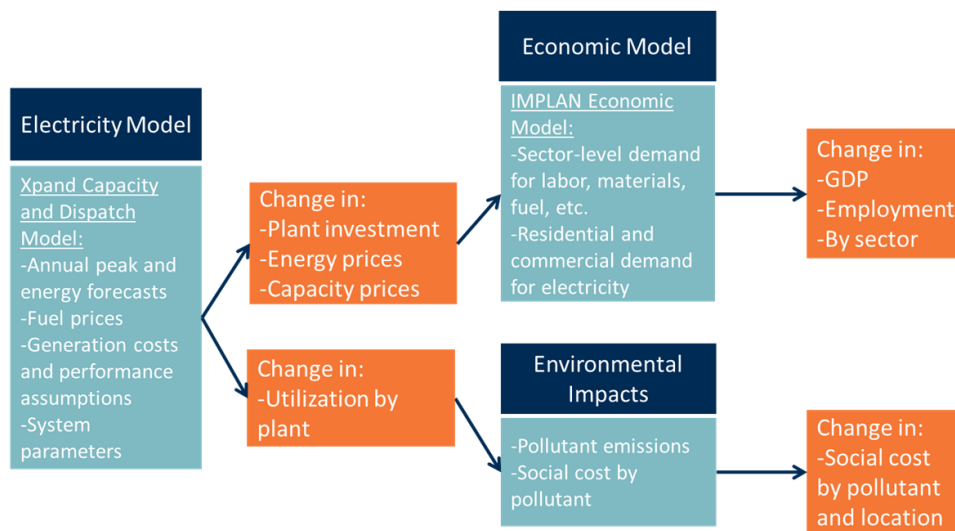


Table 4 summarizes the OSW project costs we introduce to IMPLAN. Capital and operating costs for OSW projects are based on the NYSERDA Offshore Wind Policy Options Paper.²⁰ The allocation of these costs by economic sector is based on the National Renewable Energy Laboratory’s (“NREL”) Jobs and Economic Development Impacts (“JEDI”) offshore wind model. We use Xpand to determine non-renewable capacity additions and JEDI models (by capacity

¹⁹ BVG Associates, Stantec, & GLWN, “New York State Offshore Wind Master Plan: The Workforce Opportunity of Offshore Wind in New York,” NYSERDA Report 17-25, December 2017.

²⁰ NYSERDA Offshore Wind Policy Options Paper, Table 17. The annual construction schedule for the OSW Case and both base cases is presented in Table 14 in the Appendix.

type) to determine costs and sector allocations for these additions. Xpand also provides the changes in electricity price and thus the consumption expenditure changes, described in the previous section, that we introduce to IMPLAN.

Table 4 also presents lower and upper bound assumptions on the level of local (New York) sourcing for the input demands for OSW construction, to demonstrate the important influence of this factor. There are many indicators suggesting that if the current offshore wind deployment goals in the Northeastern United States result in actual procurements to meet those goals, the annual volume of offshore wind deployment should be sufficient to develop a full regional supply chain.

Rather than attempting to estimate which elements of the supply chain will locate in which state, we assume that all of the supply chain for the 2,400 MW of offshore wind procured in New York will be localized in New York (by 2030). This includes capital and O&M. We refer to this as an upper bound local share scenario.

It is important to note, however, that since the supply chain will likely be distributed across the Northeast, the local share of economic impacts will be influenced by the location decisions of supporting industries. We are unable to predict with any reasonable certainty whether some industries will choose to locate in New York rather than Massachusetts, for example. It may also be the case that some components will continue to be manufactured outside the region or abroad. Consequently, the local shares assumed here are subject to some uncertainty and could be lower or higher.

The lower bound analysis reflects the assumption that New York sources meet a modest share of demand for equipment, materials, supply and labor during the construction phase, but that the local O&M supply chain share of OSW demand will grow from about 50% initially to 100% by 2030.²¹

Comparing the impacts under these assumptions provides a useful range for the likely outcomes.

²¹ We account for this in IMPLAN by adjusting local purchase percentages (“LPPs”) for offshore wind generation’s O&M costs in IMPLAN. The LPPs begin around 50% in 2024, based on the local shares included in the JEDI model. We then increase the LPPs by 10% each year, until they reach 100% in 2030.

**Table 4: Summary of Offshore Wind Construction and O&M Assumptions
(million 2017 \$)**

		2024	2025	2026	2027	2028	2029	2030
General Inputs								
Total Project Size (MW)	[1]	400	400	-	400	400	400	400
Turbine Size (kW)	[2]	9,500	9,500	-	11,000	13,000	13,000	13,000
Total Construction Cost (million \$)	[3]	\$1,290	\$1,228	-	\$1,194	\$1,044	\$1,002	\$1,043
Total O&M Cost (million \$)	[4]	\$41	\$80	\$80	\$116	\$151	\$185	\$218
Lower Bound Local Share Analysis								
Local Construction Cost (million \$)	[5]	\$140	\$138	-	\$127	\$104	\$102	\$106
Local Percentage	[6]	11%	11%	-	11%	10%	10%	10%
Local O&M Cost (million \$)	[7]	\$20	\$47	\$55	\$92	\$135	\$183	\$218
Local Percentage	[8]	49%	59%	69%	79%	89%	99%	100%
Upper Bound Local Share Analysis								
Local Construction Cost (million \$)	[9]	\$140	\$329	-	\$500	\$597	\$730	\$1,043
Local Percentage	[10]	11%	27%	-	42%	57%	73%	100%
Local O&M Cost (million \$)	[11]	\$20	\$47	\$55	\$92	\$135	\$183	\$218
Local Percentage	[12]	49%	59%	69%	79%	89%	99%	100%

Sources and Notes:

[1] - [4]: NYSDORA Offshore Wind Policy Options Paper, Tables 7 & 17.

[5], [7], [9] & [11]: Local cost assumptions are from the NREL's JEDI offshore wind model.

[6]= [5]/[3].

[8]= [7]/[4].

[10]= [9]/[3].

[12]= [11]/[4].

C. ECONOMIC IMPACTS

Economic impacts, defined as employment, labor income, value added (GDP), and gross output, are presented here under the two scenarios reflecting the degree with which OSW related demands for investment and labor are met by New York sources. The influence of procurement costs, represented by the LCOE realized through whatever procurement approach is chosen, are also captured.

1. Lower Bound Local Share Scenario

Table 5 provides detail regarding the source of these impacts relative to the “CES Met” Base Case. Construction accounts for the majority of jobs supported by the OSW projects over the period 2018 – 2044. Fewer operations and maintenance jobs are supported, although these jobs will continue well beyond the period calculated here. Note that procurement at the max LCOE results in fewer jobs than in the base case because it increases consumer costs for procurement, resulting in reduced spending on goods and services. The impact on labor is shown by changes in labor income. Under the lower bound local share scenario, jobs supported by the OSW projects, described as Full-Time Equivalents (FTEs) relative to the “CES Not Met” Base Case range from 3,311 to 6,515 in the peak employment year. The higher number reflects the assumption that the minimum LCOE is achieved. Jobs supported by the OSW projects compared to the “CES Met” Base Case range from 1,357 assuming the maximum LCOE to 4,587 assuming the minimum LCOE.²²

²² The peak employment year is 2030. Annual employment impacts are presented in Table 10 in the Appendix.

**Table 5: Net Present Value of OSW Case Relative to
“CES Met” Base Case by Component
Lower Bound Local Share Analysis 2018 – 2044
(thousand 2017 \$)**

Impact Type		Construction	O&M	RGGI	Price Effects:		Total Difference: Min LCOE	Total Difference: Max LCOE
					Min LCOE	Max LCOE		
		[A]	[B]	[C]	[D]	[E]	[F]	[G]
Labor Income (thousand \$)								
Direct	[1]	\$528,759	\$271,146	-\$10,419	\$416,843	-\$835,421	\$1,206,329	-\$45,936
Indirect	[2]	\$41,580	\$176,853	-\$620	\$183,789	-\$368,297	\$401,603	-\$150,483
Induced	[3]	\$148,472	\$115,398	-\$2,821	\$152,887	-\$306,634	\$413,936	-\$45,584
Total Effect	[4]	\$718,812	\$563,397	-\$13,860	\$753,519	-\$1,510,352	\$2,021,867	-\$242,003
Value Added (GDP) (thousand \$)								
Direct	[5]	\$805,027	\$972,750	-\$12,629	\$725,415	-\$1,454,132	\$2,490,563	\$311,016
Indirect	[6]	\$79,005	\$276,002	-\$1,043	\$305,184	-\$611,829	\$659,147	-\$257,866
Induced	[7]	\$265,471	\$206,183	-\$5,039	\$273,483	-\$548,051	\$740,097	-\$81,436
Total Effect	[8]	\$1,149,502	\$1,454,934	-\$18,711	\$1,304,081	-\$2,614,012	\$3,889,807	-\$28,286
Gross Output (thousand \$)								
Direct	[9]	\$1,012,708	\$1,541,935	-\$14,554	\$1,305,923	-\$2,617,368	\$3,846,012	-\$77,279
Indirect	[10]	\$131,341	\$452,054	-\$1,646	\$490,616	-\$983,484	\$1,072,364	-\$401,736
Induced	[11]	\$408,384	\$317,383	-\$7,746	\$420,711	-\$843,178	\$1,138,732	-\$125,158
Total Effect	[12]	\$1,552,433	\$2,311,372	-\$23,946	\$2,217,250	-\$4,444,030	\$6,057,108	-\$604,172

Notes: NPV calculated with a real discount rate of 3%. The calculation assumes no construction or cash flow from 2018-2020 and 23 years operation thereafter. Totals may not add up precisely due to rounding.

[4] = [1] + [2] + [3].

[8] = [5] + [6] + [7].

[12] = [9] + [10] + [11].

[F]: [A] + [B] + [C] + [D]. Total Difference refers to the OSW Case impact less the Base Case impact.

[G]: [A] + [B] + [C] + [E]. Total Difference refers to the OSW Case impact less the Base Case impact.

The table (and subsequent ones) shows a modest negative impact due to RGGI when evaluated against the “CES Met” Base Case and a more significant negative impact when evaluated against the “CES Not Met” Base Case. This result is due to the fact that the addition of OSW reduces RGGI prices, much more so when compared against the “CES Not Met” Base Case. Lower RGGI prices contribute to lower wholesale energy prices, which we include in our estimated wholesale energy price impacts. However, since RGGI allowances are auctioned and the receipts flow back to RGGI member states to fund various economic activities, lower RGGI prices also mean lower RGGI auction related revenues flow back to the RGGI member states including New York and hence lower economic activity as a result of the spending of RGGI funds.

Table 6 shows that while OSW construction and operations produce substantial positive impacts, they are partially offset by lower RGGI revenues recycled into the economy due to lower RGGI

prices in the OSW Case and in the case of Maximum LCOE, higher electricity prices, for the reasons described above.

**Table 6: Net Present Value of OSW Case Relative to
“CES Not Met” Base Case by Component
Lower Bound Local Share Analysis 2018 – 2044
(thousand 2017 \$)**

Impact Type		Construction	O&M	RGGI	Price Effects: Min LCOE	Price Effects: Max LCOE	Total Difference: Min LCOE	Total Difference: Max LCOE
		[A]	[B]	[C]	[E]	[F]	[G]	[H]
Labor Income (thousand \$)								
Direct	[1]	\$685,245	\$404,819	-\$467,624	\$833,996	-\$407,754	\$1,456,436	\$214,686
Indirect	[2]	\$243,262	\$256,580	-\$29,277	\$367,787	-\$179,650	\$838,351	\$290,914
Induced	[3]	\$236,956	\$170,459	-\$125,929	\$306,090	-\$149,700	\$587,577	\$131,787
Total Effect	[4]	\$1,165,463	\$831,858	-\$622,830	\$1,507,872	-\$737,105	\$2,882,364	\$637,387
Value Added (GDP) (thousand \$)								
Direct	[5]	\$1,016,912	\$1,428,699	-\$566,027	\$1,452,009	-\$709,329	\$3,331,594	\$1,170,255
Indirect	[6]	\$358,672	\$397,280	-\$47,190	\$610,981	-\$298,360	\$1,319,744	\$410,402
Induced	[7]	\$423,654	\$304,639	-\$225,109	\$547,213	-\$267,474	\$1,050,398	\$235,711
Total Effect	[8]	\$1,799,238	\$2,130,619	-\$838,325	\$2,610,204	-\$1,275,163	\$5,701,736	\$1,816,368
Gross Output (thousand \$)								
Direct	[9]	\$1,848,702	\$2,206,625	-\$651,755	\$2,614,014	-\$1,276,529	\$6,017,587	\$2,127,043
Indirect	[10]	\$763,065	\$642,703	-\$74,281	\$982,171	-\$479,603	\$2,313,658	\$851,884
Induced	[11]	\$651,777	\$468,745	-\$346,401	\$841,919	-\$411,525	\$1,616,040	\$362,597
Total Effect	[12]	\$3,263,545	\$3,318,073	-\$1,072,436	\$4,438,104	-\$2,167,657	\$9,947,285	\$3,341,524

Notes: NPV calculated with a real discount rate of 3%. The calculation assumes no construction or cash flow from 2018-2020 and 23 years operation thereafter. Totals may not add up precisely due to rounding.

[4] = [1] + [2] + [3].

[8] = [5] + [6] + [7].

[12] = [9] + [10] + [11].

[F]: [A] + [B] + [C] + [D]. Total Difference refers to the OSW Case impact less the Base Case impact.

[G]: [A] + [B] + [C] + [E]. Total Difference refers to the OSW Case impact less the Base Case impact.

2. Upper Bound Local Share Scenario

Table 7 and Table 8 present the results of our economic impact analysis of the OSW projects compared to both base cases reflecting the assumption that full localization of the OSW supply chain, as described above, is reached by 2030. Not surprisingly, under this scenario, employment and other economic impacts are substantially higher. The impact on labor is shown by changes in labor income. Jobs supported by the OSW projects, described as FTEs relative to the “CES Not Met” Base Case range from 10,035 to 13,238 in the peak employment year. The higher number

reflects the assumption that procurement of OSW is achieved at the minimum LCOE. Jobs supported by the OSW projects compared to the “CES Met” Base Case range from 8,080 assuming the maximum LCOE to 11,310 assuming the maximum LCOE.²³

**Table 7: Net Present Value of OSW Case Relative to
“CES Met” Base Case by Component
Upper Bound Local Share Analysis 2018 – 2044
(thousand 2017 \$)**

Impact Type		Construction	O&M	RGGI	Price Effects: Min LCOE	Price Effects: Max LCOE	Total Difference: Min LCOE	Total Difference: Max LCOE
		[A]	[B]	[C]	[D]	[E]	[F]	[G]
Labor Income (thousand \$)								
Direct	[1]	\$772,978	\$271,146	-\$10,419	\$416,843	-\$835,421	\$1,450,548	\$198,283
Indirect	[2]	\$593,286	\$176,853	-\$620	\$183,789	-\$368,297	\$953,308	\$401,223
Induced	[3]	\$345,806	\$115,398	-\$2,821	\$152,887	-\$306,634	\$611,270	\$151,749
Total Effect	[4]	\$1,712,070	\$563,397	-\$13,860	\$753,519	-\$1,510,352	\$3,015,126	\$751,255
Value Added (GDP) (thousand \$)								
Direct	[5]	\$1,183,779	\$972,750	-\$12,629	\$725,415	-\$1,454,132	\$2,869,315	\$689,768
Indirect	[6]	\$866,581	\$276,002	-\$1,043	\$305,184	-\$611,829	\$1,446,723	\$529,711
Induced	[7]	\$618,294	\$206,183	-\$5,039	\$273,483	-\$548,051	\$1,092,920	\$271,387
Total Effect	[8]	\$2,668,654	\$1,454,934	-\$18,711	\$1,304,081	-\$2,614,012	\$5,408,959	\$1,490,865
Gross Output (thousand \$)								
Direct	[9]	\$2,907,262	\$1,541,935	-\$14,554	\$1,305,923	-\$2,617,368	\$5,740,566	\$1,817,275
Indirect	[10]	\$1,903,526	\$452,054	-\$1,646	\$490,616	-\$983,484	\$2,844,549	\$1,370,449
Induced	[11]	\$951,268	\$317,383	-\$7,746	\$420,711	-\$843,178	\$1,681,616	\$417,727
Total Effect	[12]	\$5,762,056	\$2,311,372	-\$23,946	\$2,217,250	-\$4,444,030	\$10,266,731	\$3,605,451

Notes: NPV calculated with a real discount rate of 3%. The calculation assumes no construction or cash flow from 2018-2020 and 23 years operation thereafter. Totals may not add up precisely due to rounding.

[4] = [1] + [2] + [3].

[8] = [5] + [6] + [7].

[12] = [9] + [10] + [11].

[F]: [A] + [B] + [C] + [D]. Total Difference refers to the OSW Case impact less the Base Case impact.

[G]: [A] + [B] + [C] + [E]. Total Difference refers to the OSW Case impact less the Base Case impact.

Table 8 presents the impacts relative to the “CES Not Met” Base Case.

²³ The peak employment year is 2030. Annual employment impacts are presented in Figures 10 and 11 below and in Table 11 in the Appendix

**Table 8: Net Present Value of OSW Case Relative to
“CES Not Met” Base Case by Component
Upper Bound Local Share Analysis 2018 – 2044
(thousand 2017 \$)**

Impact Type		Construction	O&M	RGGI	Price Effects:		Total Difference: Min LCOE	Total Difference: Max LCOE
					Min LCOE	Max LCOE		
		[A]	[B]	[C]	[E]	[F]	[G]	[H]
Labor Income (thousand \$)								
Direct	[1]	\$929,464	\$404,819	-\$467,624	\$833,996	-\$407,754	\$1,700,655	\$458,905
Indirect	[2]	\$794,967	\$256,580	-\$29,277	\$367,787	-\$179,650	\$1,390,057	\$842,619
Induced	[3]	\$434,290	\$170,459	-\$125,929	\$306,090	-\$149,700	\$784,910	\$329,120
Total Effect	[4]	\$2,158,721	\$831,858	-\$622,830	\$1,507,872	-\$737,105	\$3,875,622	\$1,630,645
Value Added (GDP) (thousand \$)								
Direct	[5]	\$1,395,664	\$1,428,699	-\$566,027	\$1,452,009	-\$709,329	\$3,710,345	\$1,549,007
Indirect	[6]	\$1,146,249	\$397,280	-\$47,190	\$610,981	-\$298,360	\$2,107,320	\$1,197,979
Induced	[7]	\$776,477	\$304,639	-\$225,109	\$547,213	-\$267,474	\$1,403,221	\$588,534
Total Effect	[8]	\$3,318,390	\$2,130,619	-\$838,325	\$2,610,204	-\$1,275,163	\$7,220,887	\$3,335,520
Gross Output (thousand \$)								
Direct	[9]	\$3,743,256	\$2,206,625	-\$651,755	\$2,614,014	-\$1,276,529	\$7,912,141	\$4,021,597
Indirect	[10]	\$2,535,250	\$642,703	-\$74,281	\$982,171	-\$479,603	\$4,085,843	\$2,624,069
Induced	[11]	\$1,194,661	\$468,745	-\$346,401	\$841,919	-\$411,525	\$2,158,924	\$905,481
Total Effect	[12]	\$7,473,168	\$3,318,073	-\$1,072,436	\$4,438,104	-\$2,167,657	\$14,156,908	\$7,551,147

Notes: NPV calculated with a real discount rate of 3%. The calculation assumes no construction or cash flow from 2018-2020 and 23 years operation thereafter. Totals may not add up precisely due to rounding.

[4] = [1] + [2] + [3].

[8] = [5] + [6] + [7].

[12] = [9] + [10] + [11].

[F]: [A] + [B] + [C] + [D]. Total Difference refers to the OSW Case impact less the Base Case impact.

[G]: [A] + [B] + [C] + [E]. Total Difference refers to the OSW Case impact less the Base Case impact.

D. COMPARISON OF OSW CASE TO BOTH BASE CASES

Table 9 presents a comparison of the economic impacts by scenario, base case and procurement cost assumption. As shown in the table, OSW labor income is very similar relative to both base cases. GDP increases more in the OSW Case relative to the “CES Not Met” Base Case. This is largely the result of higher labor income associated with construction and operations relative to the case where the CES is not met.

Table 9: Summary of Economic Impacts
Net Present Value of OSW Case Relative to Each Base Case
2018 – 2044 (thousand 2017 \$)

Impact Type		Lower Bound Local Share				Upper Bound Local Share			
		Min LCOE		Max LCOE		Min LCOE		Max LCOE	
		CES Met	CES Not Met	CES Met	CES Not Met	CES Met	CES Not Met	CES Met	CES Not Met
Labor Income (thousand \$)									
Direct	[1]	1,206,329	1,456,436	-45,936	214,686	1,450,548	1,700,655	198,283	458,905
Indirect	[2]	401,603	838,351	-150,483	290,914	953,308	1,390,057	401,223	842,619
Induced	[3]	413,936	587,577	-45,584	131,787	611,270	784,910	151,749	329,120
Total Effect	[4]	2,021,867	2,882,364	-242,003	637,387	3,015,126	3,875,622	751,255	1,630,645
Value Added (GDP) (thousand \$)									
Direct	[5]	2,490,563	3,331,594	311,016	1,170,255	2,869,315	3,710,345	689,768	1,549,007
Indirect	[6]	659,147	1,319,744	-257,866	410,402	1,446,723	2,107,320	529,711	1,197,979
Induced	[7]	740,097	1,050,398	-81,436	235,711	1,092,920	1,403,221	271,387	588,534
Total Effect	[8]	3,889,807	5,701,736	-28,286	1,816,368	5,408,959	7,220,887	1,490,865	3,335,520
Gross Output (thousand \$)									
Direct	[9]	3,846,012	6,017,587	-77,279	2,127,043	5,740,566	7,912,141	1,817,275	4,021,597
Indirect	[10]	1,072,364	2,313,658	-401,736	851,884	2,844,549	4,085,843	1,370,449	2,624,069
Induced	[11]	1,138,732	1,616,040	-125,158	362,597	1,681,616	2,158,924	417,727	905,481
Total Effect	[12]	6,057,108	9,947,285	-604,172	3,341,524	10,266,731	14,156,908	3,605,451	7,551,147

Notes:

NPV calculated with a real discount rate of 3%.

Totals refer to the OSW Project impact less the Base Case impact and include effects of construction, O&M, RGGI, and price effects.

The calculation assumes no construction or cash flow from 2018-2020 and 23 years operation thereafter.

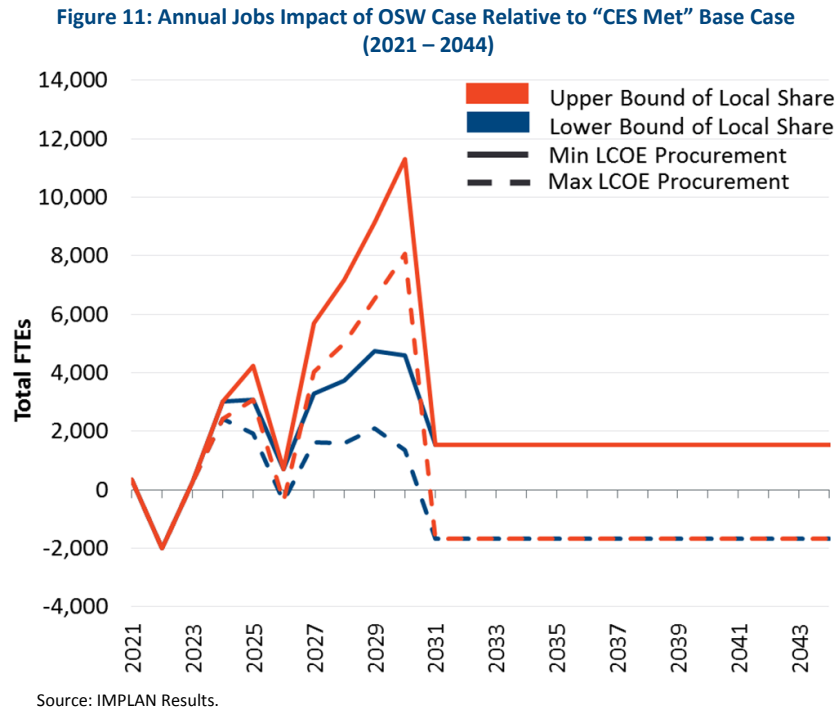
[4] = [1] + [2] + [3].

[8] = [5] + [6] + [7].

[12] = [9] + [10] + [11].

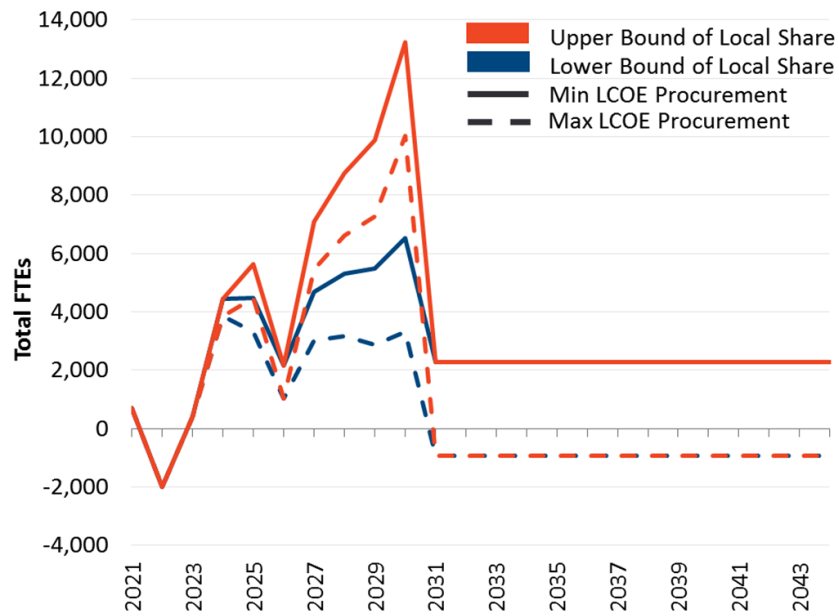
Figure 10 presents the FTE's expected to support the OSW procurements by year compared to the CES Met Base Case reflecting the influence of both the LCOE and local share of equipment, materials, supplies, and labor demand met by New Sources. Figure 11 does the same relative to the "CES Not Met" Base Case. As shown in the figures, OSW procurements support substantially more jobs (measured in FTEs) than either base case under most circumstances. The total number of additional FTEs (direct, indirect and induced) supported by OSW peaks in 2030 at between 11,300 FTEs compared to the "CES Met" Base Case and at 13,200 FTEs compared to the "CES Not Met" Base Case. The OSW employment impacts are lower than in the base cases in a few instances. Prior to 2023, base case plant construction outstrips OSW related construction. This circumstance occurs again in 2026 when there is a gap in OSW construction. In 2031, if the LCOE is at the maximum of the range and local share is at the low end of the expected share, the OSW employment levels fall below the base case levels. The net number of direct FTEs is very

similar to the NYSERDA study estimate, ranging from 1,200 to 6,300 depending on the base case, the local share, and the LCOE.²⁴



²⁴ The NYSERDA study considered only direct employment. We estimate direct, indirect, and induced employment impacts. Indirect employment includes jobs for the suppliers of equipment, goods, and services associated with OSW construction and operations. Induced employment includes jobs for goods and services demanded by the direct and indirect job holders.

Figure 12: Annual Jobs Impact of OSW Case Relative to “CES Not Met” Base Case (2021 – 2044)



Source: IMPLAN Results.

E. THE IMPORTANCE OF THE PROCUREMENT METHOD SELECTED

As discussed above, we have studied the economic impacts account for a minimum and a maximum levelized cost of electricity (LCOE) to capture the range of possible procurement structures. These structures were outlined in NYSERDA’s Offshore Policy Options Paper.²⁵ NYSERDA estimated that these structures would result in levelized prices (2017 dollars) of between \$105/MWh and \$155/MWh for Phase I deployment in 2024. Although we cannot predict which structure will be implemented, the actual LCOE could be at or near the average value of \$130/MWh. We have used this value to provide an alternative estimate of employment and economic impacts for the OSW plan. As shown in Table 10, the economic impacts measured

²⁵ NYSERDA Offshore Wind Policy Options Paper, Section 3.2. NYSERDA identifies seven procurement structures.

by labor income, value added, and gross output are the average of our upper and lower bound LCOE results under both cases. Table 11 presents the employment impacts under the midpoint LCOE in 2030, the peak employment year.

Table 10: Summary of Economic Impacts
Net Present Value of OSW Case Relative to Each Base Case
Average LCOE
2018 – 2044 (thousand 2017 \$)

		Lower Bound Local Share		Upper Bound Local Share	
Impact Type		CES Met	CES Not Met	CES Met	CES Not Met
Labor Income (thousand \$)					
Direct	[1]	580,196	835,561	824,415	1,079,780
Indirect	[2]	125,560	564,633	677,265	1,116,338
Induced	[3]	184,176	359,682	381,510	557,015
Total Effect	[4]	889,932	1,759,875	1,883,190	2,753,133
Value Added (GDP) (thousand \$)					
Direct	[5]	1,400,790	2,250,925	1,779,541	2,629,676
Indirect	[6]	200,640	865,073	988,217	1,652,650
Induced	[7]	329,330	643,054	682,154	995,878
Total Effect	[8]	1,930,760	3,759,052	3,449,912	5,278,204
Gross Output (thousand \$)					
Direct	[9]	1,884,367	4,072,315	3,778,921	5,966,869
Indirect	[10]	335,314	1,582,771	2,107,499	3,354,956
Induced	[11]	506,787	989,318	1,049,671	1,532,202
Total Effect	[12]	2,726,468	6,644,405	6,936,091	10,854,028

Notes:

NPV calculated with a real discount rate of 3%.

Totals refer to the OSW Project impact less the Base Case impact and include effects of construction, O&M, RGGI, and price effects, assuming the average levelized cost of energy.

The calculation assumes no construction or cash flow from 2018-2020 and 23 years operation thereafter.

[4] = [1] + [2] + [3].

[8] = [5] + [6] + [7].

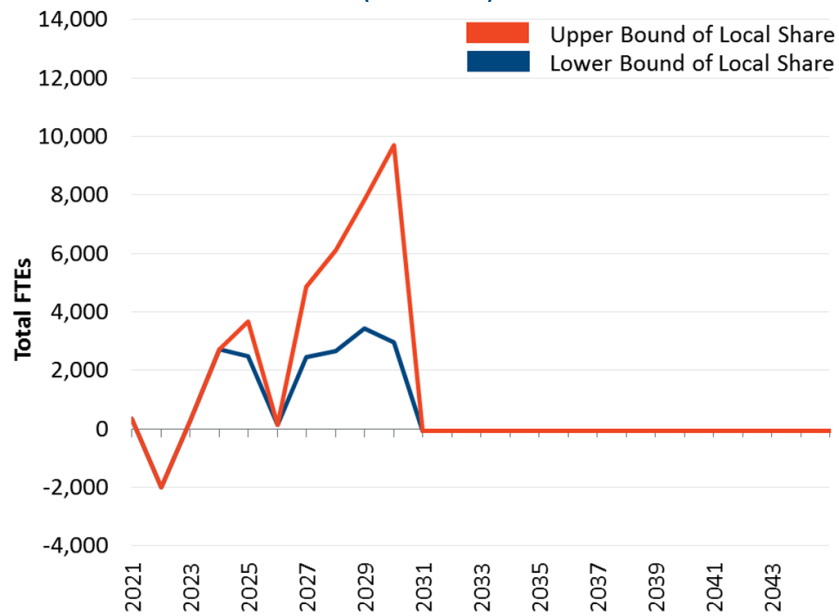
[12] = [9] + [10] + [11].

Table 11: Annual Jobs Impact of OSW Project Relative to Base Case for 2030, Average LCOE

	Lower Bound Local Share		Upper Bound Local Share	
	CES Met	CES Not Met	CES Met	CES Not Met
Direct FTEs	2,200	3,032	4,387	5,219
Direct, Indirect, and Induced FTEs	2,972	4,913	9,695	11,636

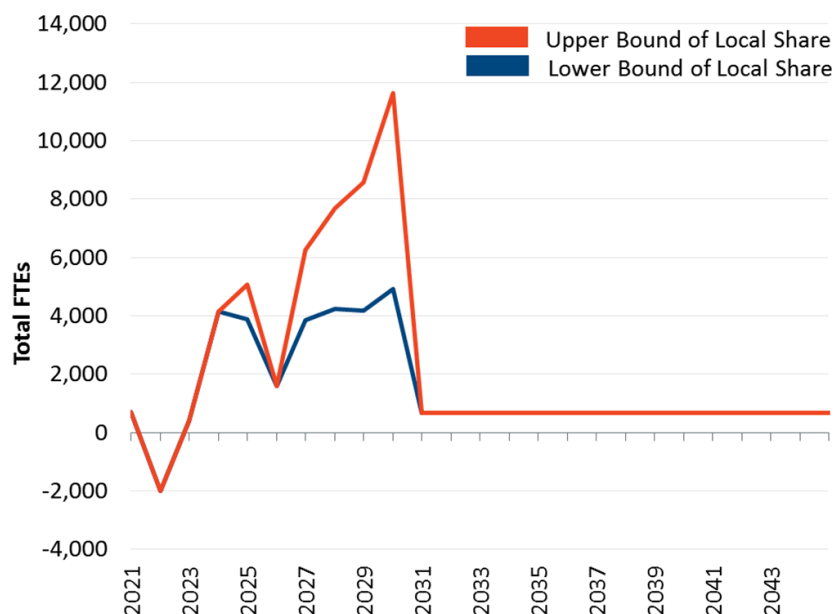
Figure 13 and Figure 14 present employment impacts for the period 2021 – 2044 applying the average LCOE for both base cases.

Figure 13: Average Annual LCOE Jobs Impact of OSW Case Relative to “CES Met” Base Case (2021 – 2044)



Source: IMPLAN Results.

Figure 14: Average Annual LCOE Jobs Impact of OSW Case Relative to “CES Not Met” Base Case (2021 – 2044)



Source: IMPLAN Results.

F. COMPARISON TO NYSERDA EMPLOYMENT IMPACT ESTIMATES

Our employment estimates must be compared carefully to the NYSERDA estimates because they reflect different methodologies. Our approach measures **net** employment impacts. As described previously, we compare projected employment attributable to the 2,400 MW offshore wind plan to a base case reflecting the absence of this plan, where additional electricity demands and greenhouse gas emissions goals are met without offshore wind. While the NYSERDA workforce study also estimates employment demands attributable to offshore wind, it does not account for employment increases absent offshore wind investment. Consequently, the comparison is between a gross estimate (NYSERDA) and a net estimate (Brattle) of employment impacts. In addition, our estimates account for changes in electricity price attributable to the offshore wind plan. These price changes also have an impact on overall employment levels, including beyond those industrial sectors directly affected by offshore wind development and operations. Unlike NYSERDA, we estimate indirect and induced jobs impacts in addition to the direct job impacts

estimated by NYSERDA. Direct jobs reflect jobs at new energy facilities during both construction and operating phases and are consistent with the NYSERDA's estimates. Indirect jobs reflect demands for goods and services during construction and operations. Induced jobs reflect spending by the direct employees. Accounting for price effects and local share assumptions, our total jobs estimate in the peak year ranges from 1,360 to 12,000. Consequently, our employment estimates are considerably larger than NYSERDA's.²⁶ However, we can compare our direct job estimates with the NYSERDA study. We estimate that between 1,200 and 6,200 direct jobs will be supported by the OSW projects, depending on which Base Case the OSW Case is evaluated against. The NYSERDA estimate falls within this range.

V. Conclusions

Our analysis largely confirms that adding offshore wind to the New York State electricity mix and to the New York State economy will likely be net beneficial, even though the magnitude of benefits depends on which procurement approach is ultimately chosen and on assumptions regarding the development of New York's electricity mix if offshore wind were not added and the degree of localization of the OSW supply chain. The range of benefits represents a small percentage of New York's almost \$1.5 trillion annual economy, but represents real economic benefits to certain industries. It also means that other benefits, such as lower emissions, can be achieved not only without imposing material costs on the New York economy, but rather while making a positive contribution to it.

Across all of our cases studied, we find that offshore wind moderately reduces wholesale prices. These lower prices dampen the impact on customers of above market payments for offshore wind if the procurement approach chosen does not achieve costs at the lower end of the range of offshore wind costs, recognizing of course that lower wholesale prices also reduce payments to New York generators. If procurement does result in costs at the low end of the range, this would further enhance the economic benefits of adding offshore wind.

When combining the impacts of adding offshore wind on both producers and consumers of electricity, the net impacts on the New York economy are positive. These findings are consistent with the narrower findings in NYSERDA's Offshore Wind Policy Options Paper, which was limited to examining direct (and gross) effects. We find that on a net basis the direct jobs impacts

²⁶ Prices are also affected by RGGI and REC treatment.

we estimate are similar to those estimated by NYSERDA, ranging from 1,200 to 6,200 compared to NYSERDA's estimate of 5,000.

In sum, we estimate that adding offshore wind will have a positive net impact on New York's economy. This result is largely driven by the substantial cost reductions for offshore wind that have been achieved over the past decade. Offshore wind farms deployed in New York by 2024 and thereafter will be significantly lower priced than the earliest proposed and completed offshore wind projects in the United States. As a consequence, even if the procurement approach chosen results in a somewhat higher acquisition cost, the net impact of adding offshore wind on electricity costs for consumers in New York would be modest and would largely be outweighed by increased economic activity caused by the construction and operation of offshore wind. If procurement achieves a cost of offshore wind at the low end of the possible range, electricity costs for New York consumers could actually fall and the net benefits to New York consumers would be larger. Net benefits will also be enhanced if, as expected, instate markets are established to provide much of the equipment, materials and supplies necessary to construct and operate OSW facilities.

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VII. Appendix

A. MODELING APPROACH AND ASSUMPTIONS IN XPAND

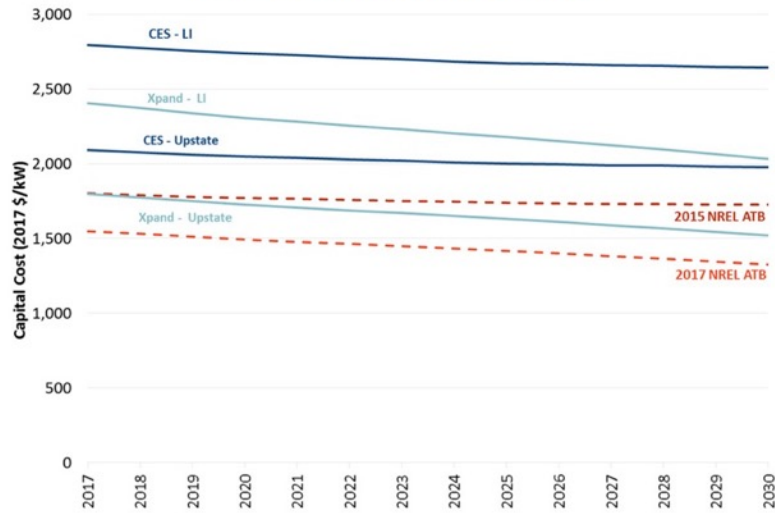
Xpand is a least-cost optimization model that simulates long-term generation expansion and short-term dispatch over a modeling horizon of several decades. It accounts for fixed and variable costs of existing and new generation units, future energy and peak demand conditions, planning reserve requirements, renewable portfolio standards, outages for each generation technology, and transmission limits between regions, among other factors that affect future mix of generation. Xpand's transmission representation uses a "pipes and bubbles" model approach that simulates flow between defined sub-regions, limited by available transfer capabilities. Within sub-regions, transmission is assumed to be unconstrained. Although it is not an hourly model, Xpand simulates considerable temporal granularity using a load duration curve approach.

Default data inputs in Xpand are derived from public and proprietary sources, including the U.S. Energy Information Administration's Annual Energy Outlook ("AEO"), the Environmental Protection Agency ("EPA"), the National Renewable Energy Laboratory ("NREL"), and ABB Inc.'s Velocity Suite. For this project, we substitute specific assumptions on cost and technical characteristics of generation technologies in New York with data and information from the studies done specifically for New York, as described below:

- **Land Based Wind ("LBW") and Solar PV:** We rely on the Clean Energy Standard ("CES") cost study²⁷ conducted by the New York State Energy Research and Development Authority ("NYSERDA") in 2016 for the New York State Department of Public Service ("DPS") for assumptions on capital cost, financing cost, and fixed O&M, and make an adjustment to the reported capital cost to reflect updated industry trends. Specifically, the assumptions for LBW and solar in the CES Cost Study were based on the 2015 NREL Annual Technology Baseline ("ATB"). Since the 2017 NREL ATB was released later in time, we apply cost ratios between the DPS CES Cost Study and the 2015 NREL ATB to the 2017 NREL ATB costs. Figure 15 and Figure 16 show the capital costs for LBW and solar in the CES Cost Study and as modeled in Xpand.

²⁷ New York State Energy Research and Development Authority & New York State Department of Public Service, "Clean Energy Standard White Paper – Cost Study," April 8, 2016 ("DPS CES Cost Study").

Figure 15: Land Based Wind Capital Costs

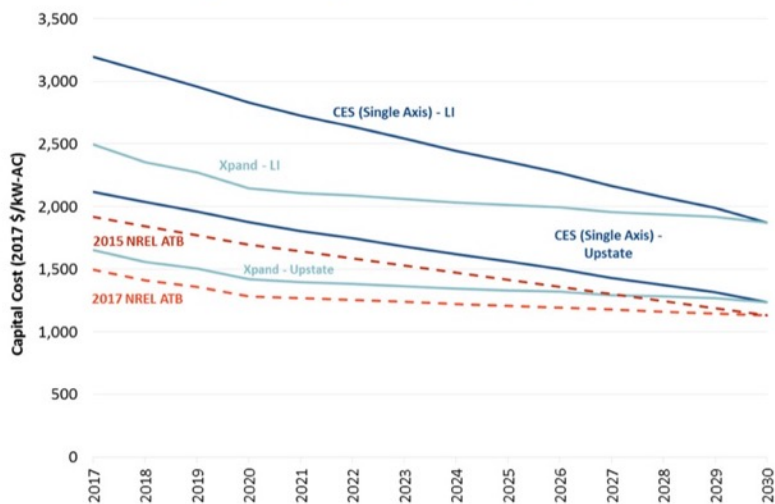


Sources: 2015 NREL ATB; 2017 NREL ATB; DPS CES Cost Study.

Notes:

The "CES – Upstate" line represents the cost for LBW in Upstate NY based on the average of four topographies (see DPS CES Cost Study, p. 127).

Figure 16: Utility-Scale Solar PV Capital Cost



Sources: 2015 NREL ATB; 2017 NREL ATB; DPS CES Cost Study.

Notes:

The single axis tracking technology is modeled in Xpand as cost data on fixed tilt technology is not available in the NREL ATB.

- **Combined Cycle and Combustion Turbine:** For capital costs, financing costs, fixed O&M, and heat rates of combined cycle units and combustion turbines in New York, we rely on a study performed to determine the New York installed capacity demand curve parameters in 2016,²⁸ along with the New York Independent System Operator's ("NYISO") final recommendations.²⁹ Since the 2016 ICAP Demand Curve Parameters Study does not publish variable O&M on a \$/MWh basis, we rely on default Xpand assumptions based on AEO 2017.³⁰

B. CALCULATION OF NET PAYMENT IMPACT FOR CONSUMERS

Below we summarize the logic for calculating the impact of adding offshore wind on net payments made by electricity consumers.

1. Consumers pay less due to lower energy prices, capacity prices, and Renewable Energy Credit ("REC") prices
 - a. Load-weighted average energy price difference between project and base cases, multiplied by total load (energy)
 - b. Load-weighted capacity price difference between project and base cases, multiplied by total capacity required to meet reserve margins
 - c. REC price difference in OSW Case and base cases, multiplied by the CES requirement
2. Consumers have to pay for the "out of market cost" of offshore wind
 - a. Levelized Cost of Energy ("LCOE") from the NYSERDA Offshore Wind Policy Options Paper per project, multiplied by the total offshore wind generation in each year provides gross payments per year across all years and projects
 - b. Less energy revenue, calculated as the zonal energy prices multiplied by the total offshore wind generation

²⁸ Analysis Group, Inc. & Lummus Consultants International, Inc., "Study to Establish New York Electricity Market ICAP Demand Curve Parameters – Values for the 2017/18 ICAP Demand Curves; With data for the period September 1, 2013 through August 31, 2016," September 13, 2016 ("2016 ICAP Demand Curve Parameters Study").

²⁹ New York Independent System Operator, "Proposed NYISO Installed Capacity Demand Curves for Capability Year 2017/2018 and Annual Update Methodology and Inputs For Capability Years 2018/2019, 2019/2020, and 2020/2021," September 15, 2016.

³⁰ U.S. Energy Information Administration, "Cost and Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2017," January 2017.

- c. Less capacity revenue, calculated as the zonal capacity prices multiplied by the total offshore wind generation
- d. Less renewable energy value, calculated as the REC price in OSW Case multiplied by the total offshore wind generation
- 3. Consumers have to pay more Zero Emissions Credit (“ZEC”) payments
 - a. Difference in energy and capacity revenues between project and base cases

The sum of 1, 2, and 3 is the net impact on ratepayers.

C. ADDITIONAL IMPLAN RESULTS

Below we provide several tables to provide further detail regarding the estimated economic impacts. Table 12 and Table 13 provide annual employment (full-time equivalent positions, “FTEs”) estimates relative to both base cases and the lower and upper bound local share scenarios. Table 14 presents the construction schedule for new capacity with respect to the OSW Case and both base cases.

**Table 12: Annual Jobs Impact by Component
OSW Case Relative to “CES Met” Base Case
Lower and Upper Bound Local Share Analysis, 2021 – 2044**

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Average Annual 2031-2044
Lower Bound Local Share Analysis												
Direct FTEs												
Construction	[1]	85	-919	188	2,137	1,917	-1	1,913	2,303	2,377	2,423	0
O&M	[2]	1	-33	-29	-17	2	10	38	73	113	133	133
RGGI	[3]	-5	-5	-5	-5	-5	-6	-6	-6	-6	-6	-6
Price Effects (Min LCOE)	[4]	-2	-67	-124	171	365	393	465	376	563	632	632
Price Effects (Max LCOE)	[5]	-2	-67	-124	-199	-345	-294	-544	-933	-1,043	-1,333	-1,333
Total Difference (Min LCOE)	[6]	79	-1,024	30	2,285	2,278	397	2,410	2,746	3,048	3,183	760
Total Difference (Max LCOE)	[7]	79	-1,024	30	1,915	1,569	-290	1,401	1,436	1,441	1,217	-1,206
Direct, Indirect, and Induced FTEs												
Construction	[8]	355	-1,814	517	2,771	2,428	-3	2,345	2,834	3,403	3,039	0
O&M	[9]	2	-60	-45	-9	56	83	179	297	435	519	519
RGGI	[10]	-6	-6	-7	-7	-7	-8	-8	-8	-8	-8	-8
Price Effects (Min LCOE)	[11]	-2	-105	-198	276	597	643	762	614	924	1,038	1,038
Price Effects (Max LCOE)	[12]	-2	-105	-198	-325	-564	-479	-893	-1,534	-1,716	-2,193	-2,193
Total Difference (Min LCOE)	[13]	349	-1,985	268	3,031	3,073	715	3,278	3,738	4,754	4,587	1,548
Total Difference (Max LCOE)	[14]	349	-1,985	268	2,430	1,912	-407	1,623	1,589	2,115	1,357	-1,682
Upper Bound Local Share Analysis												
Direct FTEs												
Construction	[15]	85	-919	188	2,137	2,174	-1	2,557	3,441	3,859	4,610	0
O&M	[16]	1	-33	-29	-17	2	10	38	73	113	133	133
RGGI	[17]	-5	-5	-5	-5	-5	-6	-6	-6	-6	-6	-6
Price Effects (Min LCOE)	[18]	-2	-67	-124	171	365	393	465	376	563	632	632
Price Effects (Max LCOE)	[19]	-2	-67	-124	-199	-345	-294	-544	-933	-1,043	-1,333	-1,333
Total Difference (Min LCOE)	[20]	79	-1,024	30	2,285	2,536	397	3,054	3,884	4,530	5,370	760
Total Difference (Max LCOE)	[21]	79	-1,024	30	1,915	1,826	-290	2,045	2,574	2,923	3,405	-1,206
Direct, Indirect, and Induced FTEs												
Construction	[22]	355	-1,814	517	2,771	3,603	-3	4,755	6,269	7,800	9,762	0
O&M	[23]	2	-60	-45	-9	56	83	179	297	435	519	519
RGGI	[24]	-6	-6	-7	-7	-7	-8	-8	-8	-8	-8	-8
Price Effects (Min LCOE)	[25]	-2	-105	-198	276	597	643	762	614	924	1,038	1,038
Price Effects (Max LCOE)	[26]	-2	-105	-198	-325	-564	-479	-893	-1,534	-1,716	-2,193	-2,193
Total Difference (Min LCOE)	[27]	349	-1,985	268	3,031	4,248	715	5,689	7,173	9,151	11,310	1,548
Total Difference (Max LCOE)	[28]	349	-1,985	268	2,430	3,088	-407	4,034	5,025	6,511	8,080	-1,682

Notes:

The analysis assumes no difference in construction, O&M, RGGI or price effects from 2018-2020, resulting in 0 FTEs for those years.

[6] = [1] + [2] + [3] + [4].

[7] = [1] + [2] + [3] + [5].

[13] = [8] + [9] + [10] + [11].

[14] = [8] + [9] + [10] + [12].

[20] = [15] + [16] + [17] + [18].

[21] = [15] + [16] + [17] + [19].

[27] = [22] + [23] + [24] + [25].

[28] = [22] + [23] + [24] + [26].

**Table 13: Annual Jobs Impact by Component
OSW Case Relative to “CES Not Met” Base Case
Lower and Upper Bound Local Share Analysis, 2021 – 2044**

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Average Annual 2031-2044
Lower Bound Local Share Analysis												
Direct FTEs												
Construction	[1]	85	-978	202	2,626	2,408	487	2,406	2,803	2,642	2,906	0
O&M	[2]	1	-45	-40	-18	11	30	67	112	161	202	202
RGGI	[3]	-248	-254	-260	-266	-272	-277	-282	-287	-291	-296	-296
Price Effects (Min LCOE)	[4]	445	231	183	453	613	663	694	687	928	1,193	1,193
Price Effects (Max LCOE)	[5]	445	231	183	83	-94	-19	-310	-616	-667	-754	-754
Total Difference (Min LCOE)	[6]	283	-1,046	84	2,794	2,761	903	2,885	3,315	3,440	4,005	1,099
Total Difference (Max LCOE)	[7]	283	-1,046	84	2,425	2,054	221	1,880	2,013	1,844	2,058	-848
Direct, Indirect, and Induced FTEs												
Construction	[8]	355	-1,929	555	4,103	3,760	1,309	3,660	4,159	3,780	4,240	0
O&M	[9]	2	-73	-58	13	113	176	307	461	628	757	757
RGGI	[10]	-374	-383	-392	-401	-410	-418	-426	-433	-440	-447	-447
Price Effects (Min LCOE)	[11]	729	377	296	743	1,006	1,090	1,140	1,127	1,525	1,964	1,964
Price Effects (Max LCOE)	[12]	729	377	296	133	-150	-28	-507	-1,012	-1,097	-1,239	-1,239
Total Difference (Min LCOE)	[13]	712	-2,009	402	4,458	4,469	2,158	4,682	5,315	5,492	6,515	2,274
Total Difference (Max LCOE)	[14]	712	-2,009	402	3,848	3,312	1,040	3,035	3,176	2,871	3,311	-929
Upper Bound Local Share Analysis												
Direct FTEs												
Construction	[15]	85	-978	202	2,626	2,666	487	3,050	3,941	4,124	5,093	0
O&M	[16]	1	-45	-40	-18	11	30	67	112	161	202	202
RGGI	[17]	-248	-254	-260	-266	-272	-277	-282	-287	-291	-296	-296
Price Effects (Min LCOE)	[18]	445	231	183	453	613	663	694	687	928	1,193	1,193
Price Effects (Max LCOE)	[19]	445	231	183	83	-94	-19	-310	-616	-667	-754	-754
Total Difference (Min LCOE)	[20]	283	-1,046	84	2,794	3,018	903	3,529	4,453	4,922	6,192	1,099
Total Difference (Max LCOE)	[21]	283	-1,046	84	2,425	2,311	221	2,524	3,151	3,326	4,245	-848
Direct, Indirect, and Induced FTEs												
Construction	[22]	355	-1,929	555	4,103	4,935	1,309	6,070	7,595	8,176	10,964	0
O&M	[23]	2	-73	-58	13	113	176	307	461	628	757	757
RGGI	[24]	-374	-383	-392	-401	-410	-418	-426	-433	-440	-447	-447
Price Effects (Min LCOE)	[25]	729	377	296	743	1,006	1,090	1,140	1,127	1,525	1,964	1,964
Price Effects (Max LCOE)	[26]	729	377	296	133	-150	-28	-507	-1,012	-1,097	-1,239	-1,239
Total Difference (Min LCOE)	[27]	712	-2,009	402	4,458	5,644	2,158	7,092	8,751	9,889	13,238	2,274
Total Difference (Max LCOE)	[28]	712	-2,009	402	3,848	4,488	1,040	5,445	6,612	7,268	10,035	-929

Notes:

The analysis assumes no difference in construction, O&M, RGGI or price effects from 2018-2020, resulting in 0 FTEs for those years.

[6] = [1] + [2] + [3] + [4].

[7] = [1] + [2] + [3] + [5].

[13] = [8] + [9] + [10] + [11].

[14] = [8] + [9] + [10] + [12].

[20] = [15] + [16] + [17] + [18].

[21] = [15] + [16] + [17] + [19].

[27] = [22] + [23] + [24] + [25].

[28] = [22] + [23] + [24] + [26].

D. SUMMARY OF IMPLAN INPUTS

Table 14: Plant Construction Schedule (MW)

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
		[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]
OSW Project												
Offshore Wind	[1]	0	0	0	400	400	0	400	400	400	400	2,400
Onshore Wind	[2]	229	467	1,297	510	494	1,079	551	573	573	134	5,906
Natural Gas	[3]	133	163	180	14	449	609	448	444	1,363	255	4,058
Solar	[4]	600	460	0	0	0	0	0	0	0	690	1,750
Total MW	[5]	962	1,091	1,476	924	1,343	1,688	1,399	1,417	2,336	1,479	14,114
CES Met Base Case												
Offshore Wind	[6]	0	0	0	0	0	0	0	0	0	0	0
Onshore Wind	[7]	224	467	1,082	1,073	1,069	1,079	1,147	1,165	1,170	762	9,238
Natural Gas	[8]	21	163	180	166	601	609	600	596	1,250	347	4,533
Solar	[9]	600	816	0	0	0	0	0	0	0	680	2,096
Total MW	[10]	845	1,446	1,261	1,239	1,670	1,688	1,746	1,761	2,420	1,789	15,866
CES Not Met Base Case												
Offshore Wind	[11]	0	0	0	0	0	0	0	0	0	0	0
Onshore Wind	[12]	224	467	1,066	510	499	510	568	573	576	177	5,171
Natural Gas	[13]	21	163	180	166	601	609	600	596	1,590	413	4,940
Solar	[14]	600	841	0	0	0	0	0	0	0	654	2,095
Total MW	[15]	845	1,472	1,245	676	1,100	1,119	1,168	1,169	2,166	1,245	12,206

Sources: NYSERDA Offshore Wind Policy Options Paper; Xpand results.

Notes:

[5] = [1] + [2] + [3] + [4].

[10] = [6] + [7] + [8] + [9].

[15] = [11] + [12] + [13] + [14].

[K]: Sum of [A] through [J].

Totals may not add up precisely due to rounding.



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