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Economic Impacts of the New England Aqua Ventus (Phases I and II) Offshore Wind Power Program in Maine

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Appendix 4

Economic Impact

ECONOMIC IMPACTS OF THE NEW ENGLAND AQUA VENTUS (PHASES I AND II) OFFSHORE WIND POWER PROGRAM IN MAINE[1]

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Executive Summary:
The purpose of this study is to examine the statewide economic impacts of the New England Aqua Ventus offshore wind power program in Maine. Phase I of this program involves the planning and construction, and ongoing operations of a 12 MW pilot project; and Phase II of Aqua Ventus involves a 500 MW offshore wind power installation along with the production of VolturnUS floating platforms & towers that could be used in other offshore wind projects.

Including multiplier effects, the planning and construction of the 12 MW pilot offshore wind power installation would have an annual economic impact—for the three years of the project—of an estimated $37.4 million to $51.9 million in output, 341 to 475 full- and part-time jobs, and $13.6 million to $18.9 million in labor income. The ongoing operations and maintenance of the 12 MW Aqua Ventus pilot project would have an annual economic impact, including multiplier

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effects, of an estimated $1.9 million in output, 14 full- and part-time jobs, and $625,741 in labor income. The ongoing annual employment impact of 14 jobs is within a range of employment impacts found in other recent U.S. offshore wind power studies. Phase I of the Aqua Ventus program would have a long-term impact (over a 23-year period: 3 years of construction and 20 years of operations) of an estimated $150.2 million to $193.9 million in total economic output, and a total of 1,303 to 1,705 job-years.

Including multiplier effects, the planning and construction of Phase II of the Aqua Ventus program would have an annual economic impact—for the five years of the project—of an estimated $338.0 million in output, 3,077 full- and part-time jobs, and $123.1 million in labor income. This employment impact of 3,077 jobs falls within a range of employment impacts found in other recent studies of U.S. offshore wind power projects. If the turbines used in the 500 MW offshore wind power installation were assembled in Maine, the annual statewide economic impact would increase to an estimated $791.1 million in output, 4,663 full- and part-time jobs, and $229.6 million in labor income.

The ongoing operations of the Aqua Ventus Phase II program—assuming the production of about 17 VolturnUS platforms & towers per year—would have an annual statewide economic impact, including multiplier effects, of an estimated $240.4 million in output, 1,602 full- and part-time jobs, and $72.6 million in labor income. A scenario that involved the production of about 83 VolturnUS platforms & towers per year, based on more robust demand for the technology, would have an annual statewide economic impact, including multiplier effects, of an estimated $565.4 million in output, 4,303 full- and part-time jobs, and $184.2 million in labor income. This economic impact would increase, if the turbines were assembled in Maine, to an estimated $1.0 billion in output, 5,890 full- and part-time jobs, and $290.6 million in labor income.

Although this report focuses on the economic impacts surrounding the planning and construction, and ongoing operations of the 12 MW and 500 MW offshore wind power installations, the results of the analysis can provide an idea of how the impacts would "scale up" to larger projects. Study findings indicate annual employment impacts of well over an estimated 10,000 full- and part-time jobs in a scenario involving the installation of 5,000 MW of offshore wind power generation capacity in Maine.

ECONOMIC IMPACTS OF THE NEW ENGLAND AQUA VENTUS (PHASES I AND II) OFFSHORE WIND POWER PROGRAM IN MAINE

1. BACKGROUND AND INTRODUCTION

The New England Aqua Ventus offshore wind power program, led by the University of Maine along with a consortium of Maine companies, is working to develop a 12 MW offshore wind power facility (Phase I) near the coast of Maine—with an ultimate goal of having a 500 MW offshore wind power installation (Phase II) operational by 2030. These projects could be followed by additional offshore wind power installations in Maine, which would help the state meet its target of 5,000 MW of offshore wind power capacity. The 12 MW facility, consisting of two floating 6 MW turbines, would cost between an estimated $120 million and $166.7 million to plan (e.g., R&D and permitting) and construct. The University of Maine and its Aqua Ventus industry partners have pledged to purchase goods and services from Maine companies, when possible, in an effort to maximize the program's in-state expenditures and job creation.

A key thrust of the Aqua Ventus program is the development and production of floating platforms & towers made of concrete and composite materials, which are designed to outperform traditional steel-based platforms & towers that are more subject to corrosion caused by salt water. The floating platforms & towers (and attached turbines) used in the Aqua Ventus program are named *VolturnUS*. Along with building the 12 MW pilot and 500 MW utility-scale wind

power installations (and, possibly, additional projects to reach Maine's target of 5,000 MW of offshore wind power capacity), a goal of the Aqua Ventus program is to manufacture in Maine these floating platforms & towers (and, potentially, assemble the turbines) that could be used in other offshore wind projects along the U.S. Atlantic coast. This continued production of VolturnUS platforms & towers would be made possible by the extensive knowledge base in Maine—and, specifically, the Aqua Ventus team—about offshore wind power.

The waters located off the coast of Maine and the broader north Atlantic region provide an ideal location for offshore wind facilities, as well as a strong potential market for the sales of VolturnUS floating platforms & towers. A 2013 study prepared for the U.S. Department of Energy found that 33 offshore wind projects have been announced in the United States, with the greatest activity along the Atlantic Coast (Navigant Consulting, Inc. 2013). This study (p. 9) also notes the particularly strong potential for offshore wind power in the north Atlantic region, concluding that "This region of the U.S. has the highest offshore wind potential in water depths that are accessible with current technology, with class 5 and 6 winds throughout."

Other recent analysis shows that the North Atlantic region, covering Maine to Maryland, is poised to experience 2 GW per year of additional electrical power generation capacity (from all sources), and the expected new generation capacity increases to 5 GW per year when the South Atlantic region, Virginia to Georgia, is included (Kopits 2012). The U.S. Department of Energy's goal of "20% wind energy by 2030" includes a target of 50 GW of additional offshore wind generation capacity, with the installations located "mostly along the northeastern and southeastern seaboards" (U.S. Department of Energy—Energy Efficiency and Renewable Energy 2008, p. 8). Reaching this goal would require the installation of about 5 GW of new offshore wind power generation capacity per year (assuming a period of 2020 to 2030). The large

amount of new power generation capacity expected in the region, in general, and the interest in the expansion of offshore wind power, in particular, means that—even if only a modest amount of new power generation capacity uses the VolturnUS technology—future market conditions could be favorable for the products (e.g., floating platforms & towers) and expertise (e.g., research and development) that are being developed in Maine.

The amount of economic activity and number of jobs in Maine that could be supported by the Aqua Ventus program will vary as the project evolves over time—e.g., the planning and construction of the 12 MW pilot facility (Phase I) in the first three years will have a smaller impact than the development of a 500 MW installation (Phase II) occurring later—and depend on a supportive climate for offshore wind power investment in the United States, the northeast region and Maine. To provide an idea of the number of jobs that could be supported by the planning and construction of the 500 MW Aqua Ventus Phase II project, Table 1 shows the employment impacts reported in recent (since 2010) studies of other proposed U.S. offshore wind projects. These studies consider projects of different sizes and time periods, so the employment estimates are adjusted to a common metric of "job-years" and a common capacity of 500 MW. After making these adjustments, the four recent U.S. studies highlighted in Table 1 have an employment impact range of between 6,000 and 18,110 job-years, with an average of 10,580 job-years.

Table 1. Employment Impacts from Other Recent U.S. Offshore Wind Economic Impact Studies

Study	Authors (Year)	Capacity	Construction Period	Employment Impact	Impact Adjusted to 500 MW
Potential Economic Impacts from Offshore Wind in the Southeast Region	U.S. Department of Energy—Energy Efficiency & Renewable Energy (2013)	252 MW	1 Year	4,210 jobs	8,353 job-years
Offshore Wind Market and Economic Analysis	Navigant Consulting, Inc., Prepared for the U.S. Department of Energy (2013)	500 MW	2 Years	3,000 jobs	6,000 job-years
South Carolina Wind Energy Supply Chain Survey and Offshore Wind Economic Impact Study	Colbert-Busch et al. (2012)	1,000 MW	10 Years	3,622 jobs	18,110 job-years
Economic Impact Assessment: Long Island – New York City Offshore Wind Project	AWS Truepower, LLC and Camoin Associates, Inc. (2010)	350 MW	3 Years	2,300 jobs	9,857 job-years
				Average	10,580 job-years

The purpose of this study is to examine the statewide economic impact of the New England Aqua Ventus offshore wind power program in Maine. Economic impact is defined as the output (i.e., sales revenue), employment and labor income (e.g., wages and salaries) that are directly supported by the construction and operations of the Aqua Ventus wind power installations, as well as the multiplier effects supported by the spending of the Maine companies and workers that are associated with their development. The study will consider in separate economic impact assessments several key components of the VolturnUS program: (a) planning and construction of the 12 MW pilot project (Phase I); (b) operations and maintenance of the Aqua Ventus Phase I project; (c) planning and construction of a 500 MW utility-scale offshore wind facility (Phase II); and (d) the economic activity related to the operations and maintenance of the Phase II installation, along with the continued production of VolturnUS platforms & towers that could be used in other offshore wind projects.

Table 2 shows a potential timeline for the Aqua Ventus program. The planning and construction of the Phase I 12 MW pilot project would take place, provided it receives financial support, over the three-year period of 2015 to 2017. The operations of Aqua Ventus Phase I would begin in 2018. Given sufficient support for offshore wind power in Maine and elsewhere, construction of a VolturnUS platform & tower facility could take place in 2018 and 2019. Using information gained from the pilot project, the Phase II 500 MW offshore wind installation would have a five-year planning and construction period of 2020 to 2024. Aqua Ventus Phase II would begin operations in 2025 and, given sufficient demand in the region for additional offshore wind power facilities, the production of VolturnUS platforms & towers used in Phase II could continue into the future.

Table 2. Potential Timeline for the Aqua Ventus Program, Phases I and II

	Phase I: 12 MW Pilot Project		Phase II: 500 MW Installation and Production of VolturnUS Platforms		
Year	Planning and Construction	Ongoing Operations	Planning and Construction	Ongoing Operations	VolturnUS Platforms & Towers
2015	X				
2016	X				
2017	X				
2018		X	**		
2019		X	**		
2020		X	X		
2021		X	X		
2022		X	X		
2023		X	X		
2024		X	X		
2025		X		X	X
2026		X		X	X
2027		X		X	X
2028		X		X	X
2029		X		X	X
2030		X		X	X
Beyond		X		X	X

Note: The symbol ** denotes a two-year construction period for a VolturnUS platform & tower manufacturing and assembly plant. This facility would produce the VolturnUS platforms & towers used in the Phase II 500 MW installation in Maine, and—in later years—platforms & towers used in other offshore wind power facilities.

2. ECONOMIC IMPACTS OF AQUA VENTUS PHASE I

Planning and Construction

Tables 3 and 4 present information on the estimated statewide economic impact of the planning and construction of the pilot-scale 12 MW Aqua Ventus Phase I offshore wind power installation. The facility would require an estimated $120 million (Table 3) to $166.7 million (Table 4) in capital investment.[2] For the purposes of this analysis, these expenditures are spread evenly over the three-year planning and construction period. Actual expenditures will likely be different in each year of the project. This means that the employment and labor income impacts will also vary by year, but the impacts over the entire planning and construction project will be similar to those implied in Tables 3and 4.[3]

The direct output of $22.8 million (Table 3) is equivalent to 57 percent of the projected annual spending on planning and construction, implying that Maine companies would receive as revenue this share of expenditures.[4] This does not suggest, however, that 57 percent of the project's entire supply chain (e.g., expenditures made by the companies that supply goods and services used in the Aqua Ventus pilot project) would be located in Maine. The extent to which Maine-based companies (receiving the $22.8 million in revenue) purchase their inputs from other in-state suppliers is estimated by the Maine IMPLAN model. The $22.8 million in annual

[2] This range represents a "low" and "high cost" scenario for the annual economic impacts associated with the planning and construction of the 12 MW offshore wind power installation.

[3] Impacts over the entire three-year period could be estimated by multiplying the output and income figures by 3.0. The employment impacts should not be multiplied by 3.0, because some of the jobs could last over the entire project. Instead, the employment impacts for the entire project should be reported as a yearly average, as shown in Tables 3 and 4.

[4] The in-state spending estimate is based on the assumption of Aqua Ventus team members that 70 percent of the non-turbine (e.g., platform construction, research and development) expenditures will take place in Maine.

spending would support 211 full- and part-time jobs (direct employment in Table 3) that provide $8.7 million in labor income (direct income in Table 3).

The multiplier effects shown in Table 3 are the additional output (i.e., sales revenue), employment and labor income (e.g., wages and salaries) in Maine that are supported by the purchases of businesses and workers that are impacted by the Aqua Ventus pilot project's planning and construction. The IMPLAN model, used to estimate the multiplier effects, is an input-output framework that traces the flows of expenditures and income through the Maine economy with a complex system of accounts that are uniquely tailored to the region.[5] Underlying these accounts is information regarding transactions occurring among businesses located in Maine, the spending patterns of households, and transactions occurring between Maine business and households and the rest of the world. Some of the data sources used to develop the IMPLAN model include County Business Patterns of the U.S. Census Bureau, Regional Economic Information System (REIS) data and input-output accounts from the U.S. Bureau of Economic Analysis, and ES-202 statistics from the U.S. Bureau of Labor Statistics.

Including multiplier effects, the planning and construction of the Phase I Aqua Ventus pilot-scale offshore wind power installation (based on a total investment of $120 million) would have an annual economic impact—for the three years of the project—of an estimated $37.4 million in output, 341 full- and part-time jobs, and $13.6 million in labor income.[6] These figures indicate that the workers directly and indirectly involved in the Aqua Ventus 12 MW facility's planning and construction would earn an average of $39,954 in labor income per year.

[5] Version 3.0 of the IMPLAN model has information on 440 sectors of the economy.

[6] The IMPLAN model is based on an employment headcount, which does not distinguish between full- and part-time workers.

Table 3. Annual Statewide Economic Impact of a 12 MW Offshore Wind Power Project in Maine: 3-Year (2015-2017) Planning and Construction Period (Assuming $120 Million in Capital Expenditures)

	Direct Impact	Multiplier Effects	Total Impact
Output	$22,775,166 Per year	$14,597,213 Per year	$37,372,379 Per year
Employment	211 Per year	130 Per year	341 Per year
Income	$8,663,230 Per year	$4,961,086 Per year	$13,624,316 Per year
Output	$68,325,498 Entire project	$43,791,639 Entire project	$112,117,137 Entire project
Employment	211 Average jobs	130 Average jobs	341 Average jobs
Income	$25,989,690 Entire project	$14,883,258 Entire project	$40,872,948 Entire project
Job-Years	634 Job-years	390 Job-years	1,024 Job-years

Notes: The economic impact analysis is based on a total investment of $120 million, spread evenly over the 3-year planning and construction period ($40 million per year). The direct output of $22.8 million per year—and $68.3 million over the entire project—is interpreted as the amount of this spending that will take place in Maine. This in-state spending estimate is based on the assumption of Aqua Ventus team members that 70 percent of the non-turbine (e.g., platform & tower construction, research and development) direct expenditures will take place in Maine. The direct employment and income figures, as well as the multiplier effects, are estimated using an economic impact model (IMPLAN) of the state of Maine. Output and income impacts over the 3-year project are estimated by multiplying the annual figures by 3.0. The average number of jobs shown in the center panel should be used to report the employment impact over the entire project, because some of the jobs could last all three years. "Job-years" are shown in the bottom panel to facilitate comparisons to other studies (that are based on construction periods different than the three years used in this analysis).

Table 4. Annual Statewide Economic Impact of a 12 MW Offshore Wind Power Project in Maine: 3-Year (2015-2017) Planning and Construction Period (Assuming $166.7 Million in Capital Expenditures)

	Direct Impact	Multiplier Effects	Total Impact
Output	$31,657,480 Per year	$20,290,125 Per year	$51,947,605 Per year
Employment	294 Per year	181 Per year	475 Per year
Income	$12,041,889 Per year	$6,895,909 Per year	$18,937,798 Per year
Output	$94,972,440 Entire project	$60,870,375 Entire project	$155,842,815 Entire project
Employment	294 Average jobs	181 Average jobs	475 Average jobs
Income	$36,125,667 Entire project	$20,687,727 Entire project	$56,813,394 Entire project
Job-Years	882 Job-years	543 Job-years	1,425 Job-years

Notes: The economic impact analysis is based on a total investment of $166.7 million, spread evenly over the 3-year planning and construction period ($55.56 million per year). The direct output of $31.7 million per year—and $95.0 million over the entire project—is interpreted as the amount of this spending that will take place in Maine. This in-state spending estimate is based on the assumption of Aqua Ventus team members that 70 percent of the non-turbine (e.g., platform & tower construction, research and development) direct expenditures will take place in Maine. The direct employment and income figures, as well as the multiplier effects, are estimated using an economic impact model (IMPLAN) of the state of Maine. Output and income impacts over the 3-year project are estimated by multiplying the annual figures by 3.0. The average number of jobs shown in the center panel should be used to report the employment impact over the entire project, because some of the jobs could last all three years. "Job-years" are shown in the bottom panel to facilitate comparisons to other studies (that are based on construction periods different than the three years used in this analysis).

Table 4 shows the annual economic impact associated with the planning and construction of the 12 MW offshore wind power facility, based on a total investment of $166.7 million over the three-year project. Including multiplier effects, the planning and construction of the Phase I Aqua Ventus pilot-scale offshore wind power installation, under the "high cost" scenario, would have an annual statewide economic impact of an estimated $51.9 million in output, 475 full- and part-time jobs, and $18.9 million in labor income.

Operations and Maintenance

After the planning and construction of the 12 MW offshore wind power installation is complete, the Aqua Ventus Phase I project would provide an ongoing economic impact through its in-state expenditures on operations and maintenance (see Table 5). The direct output of $1.2 million is based on $40/MWh in O&M costs per year, a capacity factor of 41 percent, and in-state spending estimates from the Maine IMPLAN model. This amount of direct spending would support 9 full- and part-time jobs, providing an estimated $383,857 in labor income. Including multiplier effects, the ongoing operations and maintenance of the 12 MW Aqua Ventus pilot project would have an annual economic impact of an estimated $1.9 million in output, 14 full- and part-time jobs, and $625,741 in labor income.

To put these figures into perspective, Table 6 shows the operations and maintenance employment figures from other recent U.S. offshore wind power economic impact studies—the same ones highlighted in Table 1. Due to differences in the projects analyzed, the employment

impacts are adjusted to a common capacity—in this case, the 12 MW of the Aqua Ventus pilot project. After making these adjustments, the four recent U.S. studies shown in Table 6 have an ongoing operations and maintenance employment impact range of between 3 and 20 jobs supported per year, with an average of 10 jobs. The employment impact calculated in this study for the operations and maintenance of a 12 MW facility in Maine—14 jobs, as shown in Table 5—is within the range of employment impacts estimated in these other studies.

Table 5. Annual Statewide Economic Impact of a 12 MW Offshore Wind Power Project in Maine: Ongoing (2018 into the future) Operations and Maintenance

	Direct Impact	Multiplier Effects	Total Impact
Output	$1,192,668	$710,590	$1,903,258
Employment	9	5	14
Income	$383,857	$241,884	$625,741

Notes: The direct output is based on $40/MWh in O&M costs per year, a capacity factor of 41 percent, and in-state spending estimates from the Maine IMPLAN model. Direct employment and income figures, as well as the multiplier effects, are estimated using an economic impact model (IMPLAN) of the state of Maine.

Table 6. Operations and Maintenance Employment Impacts from Other Recent U.S. Offshore Wind Economic Impact Studies

Study	Authors (Year)	Capacity	Employment Impact	Impact Adjusted to 12 MW
Potential Economic Impacts from Offshore Wind in the Southeast Region	U.S. Department of Energy—Energy Efficiency & Renewable Energy (2013)	252 MW	410 jobs	20 jobs
Offshore Wind Market and Economic Analysis	Navigant Consulting, Inc., Prepared for the U.S. Department of Energy (2013)	500 MW	678 jobs	8 jobs
South Carolina Wind Energy Supply Chain Survey and Offshore Wind Economic Impact Study	Colbert-Busch et al. (2012)	1,000 MW	313 jobs	8 jobs
Economic Impact Assessment: Long Island – New York City Offshore Wind Project	AWS Truepower, LLC and Camoin Associates, Inc. (2010)	350 MW	85 jobs	3 jobs
			Average	10 jobs

3. ECONOMIC IMPACTS OF AQUA VENTUS PHASE II

This section of the report examines the economic impacts of Phase II of the Aqua Ventus program. As shown in the project timeline (Table 2), the first part of Phase II (2018 to 2024) involves the construction of a manufacturing facility for VolturnUS platforms & towers, and the planning and construction of a 500 MW offshore wind power installation in Maine.[7] The second part of Aqua Ventus Phase II (2025 and beyond) would involve the operations and maintenance of the 500 MW wind power facility, and the production of VolturnUS platforms & towers that are used in other offshore wind installations.

Planning and Construction of 500 MW Offshore Wind Power Facility

The 500 MW utility-scale offshore wind power facility would cost an estimated $1.8 billion to plan and construct and, as in the previous analysis of the 12 MW pilot project (see the notes at the bottom of Tables 3 and 4, and footnote 4), it is assumed that 70 percent of the non-turbine direct expenditures will take place in Maine. For the purposes of the analysis, once again, the planning and construction expenditures are spread evenly across the project's duration—in this case, five years. The $1.8 billion investment in planning and construction amounts to $3,621 per kW of capacity, which is similar to (but slightly lower than) the $3,921 in capital costs per kW for proposed U.S. offshore wind projects between 2010 and 2015 (National Renewable Energy Laboratory 2010).

[7] Cost data for the construction of the VolturnUS platform & tower production facility are not currently available; thus, the economic impacts associated with this part of Phase II are not analyzed in this report.

Table 7. Annual Statewide Economic Impact of a 500 MW Offshore Wind Power Project in Maine: 5-Year (2020-2024) Planning and Construction Period

	Direct Impact	Multiplier Effects	Total Impact
Output	$206,172,202 Per year	$131,836,284 Per year	$338,008,486 Per year
Employment	1,903 Per year	1,174 Per year	3,077 Per year
Income	$78,335,207 Per year	$44,802,007 Per year	$123,137,214 Per year
Output	$1,030,861,010 Entire project	$659,181,420 Entire project	$1,690,042,430 Entire project
Employment	1,903 Average jobs	1,174 Average jobs	3,077 Average jobs
Income	$391,676,035 Entire project	$224,010,035 Entire project	$615,686,070 Entire project
Job-Years	9,513 Job-years	5,869 Job-years	15,382 Job-years

Notes: The economic impact analysis is based on a total investment of $1.8 billion, spread evenly over the 5-year planning and construction period ($362.1 million per year). The direct output of $206.2 million per year—and $1.0 billion over the entire project—is interpreted as the amount of this spending that will take place in Maine. This in-state spending estimate is based on the assumption of Aqua Ventus team members that 70 percent of the non-turbine (e.g., platform & tower construction, research and development) direct expenditures will take place in Maine. The direct employment and income figures, as well as the multiplier effects, are estimated using an economic impact model (IMPLAN) of the state of Maine. Output and income impacts over the 5-year project are estimated by multiplying the annual figures by 5.0. The average number of jobs shown in the center panel should be used to report the employment impact over the entire project, because some of the jobs could last all five years. "Job-years" are shown in the bottom panel to facilitate comparisons to other studies (that are based on construction periods different than the five years used in this analysis).

The direct output of $206.2 million in Table 7 is the estimated in-state expenditures per year on the planning and construction of the 500 MW offshore wind power installation, and this amount of spending would support an estimated 1,903 full- and part-time jobs providing $78.3 million in labor income. Including multiplier effects, the planning and construction of Phase II of the Aqua Ventus program would have an annual economic impact—for the five years of the project—of an estimated $338.0 million in output, 3,077 full- and part-time jobs, and $123.1 million in labor income. The total "job-year" employment equivalent is 15,382 full- and part-time jobs, which is higher than the average of 10,580 job-years from other recent studies of U.S. offshore wind power projects (see Table 1), but within the range of 6,000 to 18,110 job-years.[8]

Continuing Operations of Aqua Ventus Phase II

After the planning and construction of the 500 MW offshore wind power installation is completed, the Aqua Ventus Phase II program would provide an ongoing impact to the Maine economy through the sales of electricity, expenditures on operations and maintenance to maintain the 500 MW facility, and the continued production of VolturnUS platforms & towers.[9] Although the future market for offshore wind power platforms & towers is unknown,

[8] The job estimate in this study is higher than the average due to the assumption that 70 percent of the non-turbine direct expenditures will be made in Maine. By comparison, the Navigant Consulting (2013) report listed in Table 1 assumes a "near term domestic" supply chain of 40 percent. The Navigant Consulting (2013) study assumes that non-turbine inputs such as engineering, legal services, marine transportation, management, and basic construction are available in the region, but equipment (e.g., blades and towers) providers are not present. The Aqua Ventus program involves the development of the VolturnUS platforms & towers, which would be produced in Maine. Thus, the assumption in this study is that non-turbine inputs such as engineering, legal services, marine transportation, etc. are available in Maine—this is similar to the Navigant Consulting (2013) study—but this study assumes that platforms & towers can be produced in Maine as well.

[9] Unlike the analysis of the operations and maintenance of the 12 MW pilot-scale facility, the analysis of the operations and maintenance stage of the 500 MW offshore wind power installation assumes that electricity sales operations will be established in Maine.

we can estimate the economic activity that would be supported if the state were to capture certain percentages of the expected market for new power generation capacity.[10]

As discussed earlier in the report, the Atlantic coast region is expected to experience 5 GW of additional power generation capacity per year (from all sources), and the north Atlantic region—which includes Maine—is expected to have 2 GW (out of the 5 GW) of this new power generation capacity (Kopits 2012). Furthermore, the United States has a target of an additional 50 GW of offshore wind power generation capacity by 2030 (U.S. Department of Energy—Energy Efficiency and Renewable Energy 2008), which could require the deployment of about 5 GW of capacity per year.

The two scenarios considered in the analysis are a "low" market for VolturnUS platforms & towers that would provide 100 MW of offshore wind power generation capacity per year, and a "high" market that would provide 500 MW of generation capacity. The "low" demand scenario can be thought of as 5 percent of the expected expansion of power generation capacity in the north Atlantic region (Kopits 2012)—that is, 5 percent of 2 GW is equal to 100 MW of capacity—and the "high" market scenario can be conceptualized as 10 percent of the targeted expansion of U.S. offshore wind power generation capacity (U.S. Department of Energy—Energy Efficiency and Renewable Energy 2008). The 100 MW per year scenario is equivalent to producing about 17 VolturnUS platforms & towers per year, while about 83 platforms & towers—along with the wind turbines—could provide 500 MW of additional power generation capacity.

[10] In this section, the economic impact analysis is based on the assumption that the additional offshore wind power generation capacity is installed outside of Maine. If the VolturnUS platforms & towers produced during the "continuing operations" of Aqua Ventus Phase II were installed in Maine, there would be additional economic impacts associated with the planning and construction of these facilities.

Table 8 presents information on the annual economic impacts associated with the continued operations of the Aqua Ventus Phase II program under two scenarios: (1) production of about 17 VolturnUS platforms & towers per year, and (2) production of about 83 VolturnUS platforms & towers per year. The direct output of $160.0 million in the top panel of Table 8 is the estimated amount of revenue earned per year by Maine companies involved in the ongoing operations and maintenance of the Aqua Ventus II 500 MW offshore wind power facility in Maine, and the production of about 17 VolturnUS platforms & towers that would be used in other offshore wind power installations. This amount of revenue would support an estimated 898 full- and part-time jobs in Maine providing $45.8 million in labor income. Including multiplier effects, the ongoing operations of the Aqua Ventus Phase II program—assuming the production of about 17 VolturnUS platforms & towers per year—would have an annual statewide economic impact of an estimated $240.4 million in output, 1,602 full- and part-time jobs, and $72.6 million in labor income.[11]

The bottom panel of Table 8 presents information on the estimated statewide economic impact of the continued operations of the Aqua Ventus Phase II program, assuming the annual production of about 83 VolturnUS platforms & towers that (along with the turbines) would provide 500 MW of additional offshore wind power capacity—this is equivalent to about 10 percent of the new capacity per year that would be needed to achieve the U.S. Department of Energy's goal of 50 GW of additional offshore wind power generation capacity by 2030. Including multiplier effects, the ongoing operations of the Aqua Ventus Phase II program—

[11] Of the direct and total employment impacts of 898 and 1,602 jobs, respectively, the operations and maintenance activities alone (not counting the production of VolturnUS platforms & towers) account for 490 direct jobs and a total, including multiplier effects, of 928 full- and part-time jobs. The total operations and maintenance employment impact of 928 jobs is outside a range (adjusted to a 500 MW facility) of 121 to 813 jobs implied by the impact studies for other recent U.S. wind power projects (see Table 5, and footnote 8).

assuming the production of about 83 VolturnUS platforms & towers per year—would have an annual statewide economic impact of an estimated $565.4 million in output, 4,303 full- and part-time jobs, and $184.2 million in labor income.

Table 8. Annual Statewide Economic Impact of Continued Operations of Aqua Ventus Phase II: Ongoing (2025 into the future) Operations and Maintenance of 500 MW Facility, and Production of VolturnUS Platforms & Towers

	Direct Impact	Multiplier Effects	Total Impact
	Production of 17 VolturnUS Platforms & Towers per Year		
Output	$159,981,242	$80,404,995	$240,386,237
Employment	898	704	1,602
Income	$45,767,156	$26,789,029	$72,556,185
	Production of 83 VolturnUS Platforms & Towers per Year		
Output	$363,762,775	$201,624,527	$565,387,302
Employment	2,533	1,770	4,303
Income	$116,563,404	$67,651,625	$184,215,029

Notes: The direct output includes in-state expenditures on operations and maintenance, and revenue generated from the sales of electricity and VolturnUS platforms & towers used in other offshore wind energy projects. The operations and maintenance impacts are based on $40/MWh in O&M costs per year, a capacity factor of 41 percent, and in-state spending estimates from the Maine IMPLAN model.

Aqua Ventus Phase II Economic Impacts Assuming Wind Turbines are Assembled in Maine

Up to this point in the report, the economic impact analysis has been based on the assumption that 70 percent of non-turbine direct expenditures (e.g., floating platform & towers, research and development) are made in Maine, while the spending on wind turbines would take place outside the state. If Maine were to have a turbine assembly plant along with the

VolturnUS platform & tower production facility, the state would be able to capture substantial amounts of the direct expenditures associated with Phase II of the Aqua Ventus program. To conclude this section of the report, we re-examine the economic impacts from the planning and construction of the 500 MW offshore wind power installation, and the continued operations (i.e., operations and maintenance, and manufacturing of VolturnUS platforms & towers) of Phase II of the Aqua Ventus program; this time, however, we assume that the turbines are assembled in Maine.

Table 9 presents economic impact results associated with the construction of a wind turbine assembly facility in Maine. The economic impact analysis is based on a total investment of $75 million, spread evenly over a 2-year construction period ($37.5 million per year). Information on the cost of constructing the assembly facility, which would be designed to produce about 83 turbines per year, is from the Maine Ocean & Wind Industry Initiative. The analysis is based on the assumption that facility construction makes up two-thirds of the total investment, and equipment accounts for one-third of the $75 million in costs.

The direct output of $26.8 million is the estimated amount of annual expenditures, based on the Maine IMPLAN model, that would take place in the state in each of the two years of facility construction. This amount of direct spending on (mostly) construction would support an estimated 303 full- and part-time jobs providing $10.5 million in labor income. Including multiplier effects, the construction of a turbine assembly facility in Maine would have an annual economic impact—for the two years of construction—of an estimated $41.0 million in output, 426 full- and part-time jobs, and $15.2 million in labor income.

Table 9. Annual Statewide Economic Impact of the Construction of a Wind Turbine Assembly Facility: 2018 and 2019

	Direct Impact	Multiplier Effects	Total Impact
Output	$26,817,710	$14,134,723	$40,952,433
Employment	303	123	426
Income	$10,453,024	$4,762,928	$15,215,952

Notes: The economic impact analysis is based on a total investment of $75 million, spread evenly over a 2-year construction period ($37.5 million per year). Information on the cost of constructing the assembly facility, which would be designed to produce about 83 turbines per year, is from the Maine Ocean & Wind Industry Initiative (this cost estimate is for an 80 turbine facility). The analysis is based on the assumption that facility construction makes up two-thirds of the total investment, and equipment accounts for one-third of the $75 million in costs. The direct employment and income figures, as well as the multiplier effects, are estimated using an economic impact model (IMPLAN) of the state of Maine.

Table 10 presents information on the estimated statewide economic impact of the planning and construction of the 500 MW Aqua Ventus Phase II offshore wind power installation, assuming that the turbines are assembled in Maine. It should be noted that, although a 500 MW offshore wind power installation that is constructed over five years would require about 17 turbines per year, the analysis is based on a turbine assembly facility that would be capable of producing about 83 units per year. This scale of a facility is larger than what would be needed to outfit a 500 MW offshore wind power facility over a 5-year period, but this amount of production (i.e., turbine assembly) would likely be required to attract a facility to Maine. Including multiplier effects, the planning and construction of Phase II of the Aqua Ventus program, along with the assembly of wind turbines in Maine (including units that would, presumably, be exported out of state), would have an annual economic impact—for the

five years of the project—of an estimated $791.1 million in output, 4,663 full- and part-time jobs, and $229.6 million in labor income.

Table 10. Annual Statewide Economic Impact of a 500 MW Offshore Wind Power Project in Maine: 5-Year (2020-2024) Planning and Construction Period (Assuming Turbines are Assembled in Maine)

	Direct Impact	Multiplier Effects	Total Impact
Output	$544,013,578 Per year	$247,047,287 Per year	$791,060,865 Per year
Employment	2,473 Per year	2,190 Per year	4,663 Per year
Income	$145,214,715 Per year	$84,349,776 Per year	$229,564,491 Per year
Output	$2,720,067,890 Entire project	$1,235,236,435 Entire project	$3,955,304,325 Entire project
Employment	2,473 Average jobs	2,190 Average jobs	4,663 Average jobs
Income	$726,073,575 Entire project	$421,748,880 Entire project	$1,147,822,455 Entire project
Job-Years	12,365 Job-years	10,949 Job-years	23,314 Job-years

Notes: The economic impact figures are similar to those presented in Table 7, with the addition of a turbine assembly facility that would be capable of producing about 83 units per year. This scale of a facility is larger than what would be required to outfit a 500 MW offshore wind facility over a 5-year period, but this amount of production (i.e., turbine assembly) would likely be required to attract a facility to Maine. "Job-years" are shown in the bottom panel to facilitate comparisons to other studies.

Table 11 presents information on the estimated statewide economic impact of the continued operations of the Aqua Ventus Phase II program under the "high" demand scenario (i.e., about 83 units per year) for the VolturnUS platforms & towers, assuming that the turbines are also assembled in Maine. Including multiplier effects, the ongoing operations of the Aqua Ventus Phase II program—based on the in-state production of about 83 VolturnUS platforms & towers per year and their accompanying turbines—would have an annual statewide economic impact of an estimated $1.0 billion in output, 5,890 full- and part-time jobs, and $290.6 million in labor income.

Table 11. Annual Statewide Economic Impact of Continued Operations of Aqua Ventus Phase II: Ongoing (2025 into the future) Operations and Maintenance of 500 MW Facility, and Production of VolturnUS Platforms & Towers, and Turbines

	Direct Impact	Multiplier Effects	Total Impact
Production of 83 VolturnUS Platforms & Towers per Year, and Turbines			
Output	$701,604,151	$316,835,531	$1,018,439,682
Employment	3,104	2,786	5,890
Income	$183,442,913	$107,199,394	$290,642,307

Notes: The direct output includes in-state expenditures on operations and maintenance, and revenue generated from the sales of electricity, VolturnUS platforms & towers used in other offshore wind energy projects, and turbines assembled in Maine. The operations and maintenance impacts are based on $40/MWh in O&M costs per year, a capacity factor of 41 percent, and in-state spending estimates from the Maine IMPLAN model.

4. SUMMARY AND CONCLUSIONS

The purpose of this study was to examine the statewide economic impacts of Phases I and II of the New England Aqua Ventus program in Maine. Aqua Ventus I involves the development of a 12 MW pilot-scale offshore wind facility using VolturnUS platforms & towers, and Phase II is a 500 MW utility-scale offshore wind facility using similar technologies to be developed and improved as part of Phase I. In addition, Phase II of the Aqua Ventus program involves the production of VolturnUS platforms & towers that could be used in other offshore wind power installations.

Two scenarios for additional VolturnUS platform & tower production are considered: (1) a "low" demand scenario of about 17 platforms & towers manufactured per year, and (2) a "high" demand scenario of about 83 platforms & towers per year. The amounts of additional offshore wind power generation capacity associated with these scenarios are equivalent to 5 percent of the expected new power generation capacity in the north Atlantic region and 10 percent of the targeted new U.S. offshore wind power generation capacity, respectively.

Results of the analysis, conducted using data from a variety of sources and the Maine IMPLAN model, show that during a three-year planning and construction stage—based on an overall investment of between $120 million and $166.7 million, and assuming that 70 percent of the non-turbine direct expenditures will be made in Maine—the statewide economic impact, including multiplier effects, would be an estimated $37.4 million to $51.9 million in output, 341 to 475 full- and part-time jobs, and $13.6 million to $18.9 million in labor income. After the 12 MW Aqua Ventus Phase I project is operational, it would have an ongoing annual economic impact, including multiplier effects, of an estimated $1.9 million in output, 14 full- and part-time jobs, and $625,741 in labor income.

Phase II of the New England Aqua Ventus program—a utility-scale 500 MW offshore wind installation—would have an annual economic impact, including multiplier effects, during its five years of planning and construction of an estimated $338.0 million in output, 3,077 full- and part-time jobs, and $123.1 million in labor income. If the turbines were assembled in Maine (and some were exported out of state) along with the VolturnUS platforms & towers, this economic impact would increase to an estimated $791.1 million in output, 4,663 full- and part-time jobs, and $229.6 million in labor income.

The ongoing operations of the Aqua Ventus Phase II program, assuming a "low" demand scenario and the production of about 17 VolturnUS platforms & towers per year, would have an annual statewide economic impact—including multiplier effects—of an estimated $240.4 million in output, 1,602 full- and part-time jobs, and $72.6 million in labor income. A "high" demand scenario, assuming the annual production of about 83 VolturnUS platforms & towers, would generate an ongoing economic impact, including multiplier effects, of an estimated $565.4 million in output, 4,303 full- and part-time jobs, and $184.2 million in labor income. This "high" demand scenario for VolturnUS platforms & towers, as well as the assembly of wind turbines in Maine, would have an annual statewide economic impact, including multiplier effects, of an estimated $1.0 billion in output, 5,890 full- and part-time jobs, and $290.6 million in labor income.

As a way to summarize the results of the various economic impact assessments presented in this report, Table 12 shows the total number of jobs—including multiplier effects—that are associated with each year of the Aqua Ventus program. The employment impacts in Table 12 correspond with the activities shown in the tentative timeline, presented in Table 2.

Table 12. Estimated Employment Impacts, Including Multiplier Effects, Associated with the New England Aqua Ventus Program: Phases I and II

Year	Employment Impact of Aqua Ventus I	Employment Impact of Aqua Ventus Phase II: 17 Platforms & Towers	Employment Impact of Aqua Ventus Phase II: 83 Platforms & Towers	Employment Impact of Aqua Ventus Phase II 83 Platforms & Towers, & Turbines
2015	341 to 475 (P&C)	0	0	0
2016	341 to 475 (P&C)	0	0	0
2017	341 to 475 (P&C)	0	0	0
2018	14 (O&M)	**	**	426**
2019	14 (O&M)	**	**	426**
2020	14 (O&M)	3,077 (P&C)	3,077 (P&C)	4,663 (P&C)
2021	14 (O&M)	3,077 (P&C)	3,077 (P&C)	4,663 (P&C)
2022	14 (O&M)	3,077 (P&C)	3,077 (P&C)	4,663 (P&C)
2023	14 (O&M)	3,077 (P&C)	3,077 (P&C)	4,663 (P&C)
2024	14 (O&M)	3,077 (P&C)	3,077 (P&C)	4,663 (P&C)
2025	14 (O&M)	1,602 (Ongoing)	4,303 (Ongoing)	5,890 (Ongoing)
2026	14 (O&M)	1,602 (Ongoing)	4,303 (Ongoing)	5,890 (Ongoing)
2027	14 (O&M)	1,602 (Ongoing)	4,303 (Ongoing)	5,890 (Ongoing)

Table is continued on the following page.

Table 12. Continued

Year	Employment Impact of Aqua Ventus I	Employment Impact of Aqua Ventus Phase II: 17 Platforms & Towers	Employment Impact of Aqua Ventus Phase II: 83 Platforms & Towers	Employment Impact of Aqua Ventus Phase II 83 Platforms & Towers, & Turbines
2028	14 (O&M)	1,602 (Ongoing)	4,303 (Ongoing)	5,890 (Ongoing)
2029	14 (O&M)	1,602 (Ongoing)	4,303 (Ongoing)	5,890 (Ongoing)
Beyond	14 (O&M)	1,602 (Ongoing)	4,303 (Ongoing)	5,890 (Ongoing)
Average:				
2015 to 2024	112 to 152	NA	NA	NA
2020 to 2029	NA	2,340	3,690	5,277

Notes: The symbol ** denotes a two-year construction period for a VolturnUS platform & tower manufacturing and assembly plant. This facility, which is different than a wind turbine assembly plant, would produce the VolturnUS platforms & towers used in the Phase II 500 MW installation in Maine, and—in later years—platforms & towers used in other offshore wind power facilities. Cost data for the construction of the VolturnUS platform & tower production facility are not currently available; thus, the economic impacts associated with this part of Phase II are not analyzed in this report. The labels P&C, O&M and Ongoing indicate the planning and construction, operations and maintenance, and ongoing—that is, operations and maintenance, and production of VolturnUS platforms & towers, and turbines—portions of the projects, respectively.

Phase I of the Aqua Ventus program—that is, the 12 MW pilot facility—would have an employment impact of an estimated 341 to 475 full- and part-time jobs during its planning and construction, followed by an ongoing impact of 14 full- and part-time jobs starting in 2018. The 10-year average employment impact between 2015 and 2024 would be an estimated 112 to 152 full- and part-time jobs. The utility-scale 500 MW offshore wind power installation proposed as Phase II of the Aqua Ventus program would have an annual employment impact during its planning and construction of an estimated 3,077 full- and part-time jobs, followed by an ongoing annual impact of 1,602 to 4,303 full- and part-time jobs under the "low" and "high" demand scenarios, respectively, for the production of VolturnUS platforms & towers. The 10-year average employment impact between 2020 and 2029 would range from an estimated 2,340 to 3,690 full- and part-time jobs. Under the assumption that wind turbines are assembled in Maine, this 10-year average employment impact increases to an estimated 5,277 full- and part-time jobs based on the production of about 83 units (i.e., VolturnUS platforms & towers, and turbines).

APPENDIX

Economic Impact of 5,000 MW of Offshore Wind Power Generation Capacity in Maine

Although this report focuses on the economic impacts surrounding the planning and construction, and ongoing operations of the 12 MW and 500 MW offshore wind power installations (Aqua Ventus Program Phases I and II), the results of the analysis can provide an idea of how the impacts would "scale up" to larger projects. To conclude the study, we examine the economic impact associated with the installation of 5,000 MW of offshore wind power generation capacity in Maine. This amount is selected because it represents the target set in 2009 by the Maine Ocean Energy Task Force (Maine Ocean Energy Task Force 2009).

Table A1 presents information on the annual statewide economic impact associated with the planning and construction of an additional 4,500 MW of offshore wind power capacity in Maine (assuming that the turbines are assembled in state). The analysis is based on a 15-year time frame, which assumes the installation of 300 MW of additional offshore wind power capacity per year. This amount of offshore wind power capacity installed between 2025 and 2039, in addition to the 500 MW offshore wind power facility planned in Aqua Ventus Phase II, would achieve the state's target of 5,000 MW of offshore wind power capacity. Including multiplier effects, the planning and construction of an additional 4,500 MW of offshore wind power capacity in Maine would have an annual economic impact—for the 15 years of the project—of an estimated $1.5 billion in output, 10,815 full- and part-time jobs, and $475.8 million in labor income.

Table A1. Annual Statewide Economic Impact of an Additional 4,500 MW Offshore Wind Power Capacity in Maine: 15-Year (2025-2039) Planning and Construction Period (Assuming Turbines are Assembled in Maine)

	Direct Impact	Multiplier Effects	Total Impact
Output	$956,357,998 Per year	$510,719,874 Per year	$1,467,077,872 Per year
Employment	6,278 Per year	4,537 Per year	10,815 Per year
Income	$301,885,130 Per year	$173,953,800 Per year	$475,838,930 Per year
Output	$14,345,369,970 Entire project	$7,660,798,110 Entire project	$22,006,168,080 Entire project
Employment	6,278 Average jobs	4,537 Average jobs	10,815 Average jobs
Income	$4,528,276,950 Entire project	$2,609,307,000 Entire project	$7,137,583,950 Entire project
Job-Years	94,169 Job-years	68,055 Job-years	162,224 Job-years

Note: 4,500 MW of offshore wind power capacity installed between 2025 and 2039, in addition to the 500 MW offshore wind power facility planned in Aqua Ventus Phase II, would achieve the state's target of 5,000 MW of offshore wind power capacity. The "job-year" employment figure of 162,224 full- and part-time jobs would be equivalent to 18,025 job-years for the installation of 500 MW of offshore wind power capacity, which is in the range of employment impacts from other recent studies of U.S. offshore wind power projects (see Table 1).

Table A2. Annual Statewide Economic Impact of Continued Operations: Ongoing (2040 into the future) Operations and Maintenance of 5,000 MW Facility, and Production of VolturnUS Platforms & Towers, and Turbines

	Direct Impact	Multiplier Effects	Total Impact
Production of 83 VolturnUS Platforms & Towers per Year, and Turbines			
Output	$1,682,926,851	$767,736,548	$2,450,663,399
Employment	7,509	6,729	14,238
Income	$436,055,758	$256,359,816	$692,415,574

Notes: The direct output includes in-state expenditures on operations and maintenance, and revenue generated from the sales of electricity, VolturnUS platforms & towers used in other offshore wind energy projects, and turbines assembled in Maine. The operations and maintenance impacts are based on $40/MWh in O&M costs per year, a capacity factor of 41 percent, and in-state spending estimates from the Maine IMPLAN model.

The economic impact of operations and maintenance would vary considerably between 2025 and 2040, depending on the amount of offshore wind power capacity installed to date. Table A2 presents economic impact results for the operations and maintenance of the 5,000 MW offshore wind power installation (and ongoing production of 83 VolturnUS towers & platforms, and turbines) after the facility is completed in 2040. Including multiplier effects, the operations and maintenance of a 5,000 MW wind power facility in Maine (and ongoing production of 83 VolturnUS towers & platforms, and turbines) would have an annual economic impact—starting in 2040—of an estimated $2.5 billion in output, 14,238 full- and part-time jobs, and $692.4 million in labor income.

Table A3 shows a timeline of employment impacts, between 2025 and 2040, that are associated with reaching the target of 5,000 MW of offshore wind power capacity in

Maine. The 14,238 full- and part-time jobs shown at the bottom of Table A3 (copied from Table A2) represent the total employment impact in 2040, including multiplier effects, associated with the operations and maintenance of a 5,000 MW offshore wind power installation in Maine and the ongoing production of 83 VolturnUS platforms & towers, and turbines.

During the period of 2025 to 2039, the employment impacts associated with the production of VolturnUS platforms & towers (50 units, based on an additional capacity of 300 MW per year) and turbine assembly (83 units required to attract a facility to Maine) are included in the planning and construction estimate of 10,815 full- and part-time jobs. The employment impacts associated with the production of an additional 33 VolturnUS platforms & towers are included in Table A3 to make the total impacts (far right column) comparable to those presented in Tables 8, 11 and A2 of the report, which are based on the production of 83 VolturnUS platforms & towers. The 2025 operations and maintenance impact of 928 jobs—which does not include employment impacts associated with the production of VolturnUS platforms & towers, or turbines (see footnote 11)—is based on a power generation capacity of 500 MW; that is, the Aqua Ventus II offshore wind power installation.

The operations and maintenance employment impacts shown in Table A3 for the years 2025 to 2039—which, unlike the analysis of "continued operations" presented elsewhere in the report, do not include employment impacts associated with the production of VolturnUS platforms & towers, or turbines—increase annually based on the assumption of 300 MW of additional offshore wind power capacity. The operations and maintenance employment impact increases sharply between 2039 and 2040 because,

as described above, the total employment impact in 2040 is based on the operations and maintenance of a 5,000 MW offshore wind power installation in Maine and the production of 83 VolturnUS platforms & towers, and turbines.

The economic impact results summarized in Table A3 show total annual employment numbers, including all of the elements described above, of over an estimated 15,000 full- and part-time jobs during the period of 2029 to 2039.

Table A3. Timeline of Employment Impacts Associated with a Target of 5,000 MW of Offshore Wind Power Capacity in Maine: 2025 to 2040

Year	Planning and Construction	Operations and Maintenance	Production of about 33 VolturnUS Platforms & Towers	Total Impact
2025	10,815	928	1,348	13,091
2026	10,815	1,485	1,348	13,648
2027	10,815	2,042	1,348	14,205
2028	10,815	2,598	1,348	14,761
2029	10,815	3,155	1,348	15,318
2030	10,815	3,712	1,348	15,875
2031	10,815	4,269	1,348	16,432
2032	10,815	4,826	1,348	16,989
2033	10,815	5,382	1,348	17,545
2034	10,815	5,939	1,348	18,102
2035	10,815	6,496	1,348	18,659
2036	10,815	7,053	1,348	19,216
2037	10,815	7,610	1,348	19,773
2038	10,815	8,166	1,348	20,329
2039	10,815	8,723	1,348	20,886
2040	NA	14,238^	NA	14,238

Note: The operations and maintenance employment figure in 2040, indicated with a ^, includes the jobs associated with the production of 83 VolturnUS towers & platforms, and turbines.

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