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UNTAPPED WEALTH:

OFFSHORE WIND CAN DELIVER CLEANER, MORE AFFORDABLE ENERGY AND MORE JOBS THAN OFFSHORE OIL

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EXECUTIVE SUMMARY

Interest in offshore drilling—and the public's perspective on it—has ebbed and flooded like the tides over the years. In 2008, with long-standing moratoria on new offshore drilling in place, public and political interest seemed at an all-time low. High gasoline prices later that year led to a public demand to "drill, baby, drill", and those long-term protections were ended in the fervor of heated elections. Oil fever seemed to persist until April, 2010, when the tides turned again, following what has become known as the worst environmental disaster in U.S. history. In the wake of the Deepwater drilling disaster and its images of oiled beaches and struggling Gulf of Mexico wildlife, public opinion has returned to a stronger-than-ever opposition to offshore drilling.

It is past time for a close examination of the role our offshore areas play in providing us with the energy we need. Do we continue to expand offshore drilling, in spite of its now-undeniable risks, or are there better options?

This report looks closely at that question, especially as it pertains to the Atlantic Coast. The moratoria that once protected this coast no longer do so, and President Obama has spotlighted the Mid and South Atlantic for oil and gas exploration. Our analysis shows clearly that focusing our investments on clean energy—specifically offshore wind energy—would be more cost effective, more beneficial in job creation, and better for the environment in a variety of ways than offshore oil exploration and development.

FINDINGS

Offshore Wind Potential

- A small fraction of U.S. renewable energy resources[1] is enough to power the country several times over. This could be done in a cost-effective way that minimizes carbon dioxide emissions which drive climate change and threaten our oceans.
- A modest investment in offshore wind could supply almost half the current electricity generation on the East Coast.
- Delaware, Massachusetts and North Carolina could generate enough electricity from offshore wind to equal current electricity generation, entirely eliminating the need for fossil fuel based electric generation.
- New Jersey, Virginia and South Carolina could supply 92%, 83% and 64% of their current electricity generation with offshore wind, respectively. In all these states, wind could provide more energy than the states currently get from fossil fuels.
- Offshore wind power offers more environmental benefits and fewer impacts than traditional fuels such as nuclear power, natural gas, coal and oil.

Offshore Wind Energy Could Supply Nearly Half of the East Coast's Current Electricity Generation [26]

Rank by Percent of Electricity Wind Can Provide	State	Percent of State Electric Generation Potentially Supplied by Offshore Wind	Economically Recoverable Offshore Wind Resource (MW)	Percent of State Electricity Supplied by Fossil Fuel (2008)	Primary Source of Electric Energy (2008)
1	**Delaware**	137%	2,850	91.3%	Coal (70%)
2	**Massachusetts**	130%	13,800	80.6%	Natural Gas (50.6%)
3	**North Carolina**	112%	37,900	64.1%	Coal (60.5%)
4	**New Jersey**	92%	16,000	47.3%	Nuclear (50.6%)
5	**Virginia**	83%	16,000	58.1%	Coal (43.7%)
6	**South Carolina**	64%	19,200	47.0%	Nuclear (51.3%)
7	**Rhode Island**	38%	739	97.8%	Natural Gas (97.4%)
8	**Maryland**	36%	4,680	62.3%	Coal (57.5%)
9	**Florida**	16%	10,300	82.1%	Natural Gas (47.1%)
10	**New York**	12%	4,730	47.7%	Natural Gas (31.3%)
11	**Georgia**	3%	1,190	73.2%	Coal (62.8%)
	Total	**48%**	**127,389**	**64.9%**	**Coal (39%)**
	Maine	913%	38,900	48.4%	Natural Gas (43.2%)
	New Hampshire	21%	1,230	46.6%	Natural Gas (30.9%)

OFFSHORE WIND VS. OFFSHORE OIL

For the East Coast, we found that offshore wind would provide much greater potential than offshore oil and gas combined. This includes potential to power home heating, power generation or transportation. Based on conservative assumptions for offshore wind and generous assumptions for offshore oil and natural gas, this study found that by investing in offshore wind on the East Coast, rather than offshore oil and gas, Americans would get more energy for less money. We show in this report that offshore wind can generate at least 127 GW of power conservatively. This would equal current electricity generation in states where it is located, almost as much as is generated using fossil fuels in those states. The assumptions and methodology are described in the Oceana Technical Notes (available at www.oceana.org/cleanenergy).

- On the Atlantic Coast, offshore wind could generate about 30 percent more electricity than could be generated by the technically available offshore oil and gas.
- The Atlantic Coast's offshore wind energy potential could generate enough electricity to heat more homes than exist in that region. In fact, the Atlantic Coast's offshore wind potential is so great, that it could supply enough electricity to heat every home in the country, and then some.
- Offshore wind from the Atlantic could power nearly twice as many vehicles as new offshore oil and gas from the same area. The Atlantic Coast's offshore wind energy potential is so great that it could power more cars than exist in the region. More than 112.5 million electric cars could be powered by wind, which is about half of all the cars and trucks on the road in the entire country. Accelerating both the wind transition and vehicle electrification now could allow vehicles to begin to use the offshore wind power as soon as it becomes available on the grid.
- On the Atlantic Coast alone, the United States could install at least 127 gigawatts of wind power, an amount roughly equivalent to European projections for that continent by 2030.
- Developing 127 gigawatts offshore wind energy capacity over 20 years would provide energy at a cost of about $36 billion less than the production of economically recoverable new offshore oil and natural gas.
- Clean energy production creates three times more jobs per dollar invested than fossil fuel production.
- Offshore wind development off the Atlantic coast could create between 133,000 and 212,000 jobs annually in the United States –more than three times as many jobs than new offshore oil and natural gas development is expected to create.
- In the South Atlantic, offshore wind could heat more homes than offshore oil and natural gas resources combined for less than half of the price. Electricity from offshore wind could displace an amount equivalent to the electricity generated by 100% of the oil and nearly 75% of the natural gas in the South Atlantic states.
- In the Mid-Atlantic, offshore wind could provide an amount of electricity equivalent to the electricity generated by all fossil fuels used in that region. Wind from offshore could heat about seven times more homes, produce three times more power, or power four times more cars as the new offshore oil and gas resources combined.
- In the North-Atlantic, offshore wind could provide an amount of electricity equivalent to the electricity generated by oil and natural gas as well as some of coal powered generation. The wind from offshore could heat four times more homes than offshore oil and gas resources combined. Offshore wind energy in the North Atlantic could power more cars or generate more electricity than new offshore oil and gas resources combined.

Offshore Wind – Doing the Work of Oil and Natural Gas Better, for Less

Annual Fuel Cost	Oil	Natural Gas	Wind
Heating One Home	$1,683	$627	$307
Electrifying One Home	$2,259	$1,360	$1,341
Powering One Car	$2,261	$544	$503

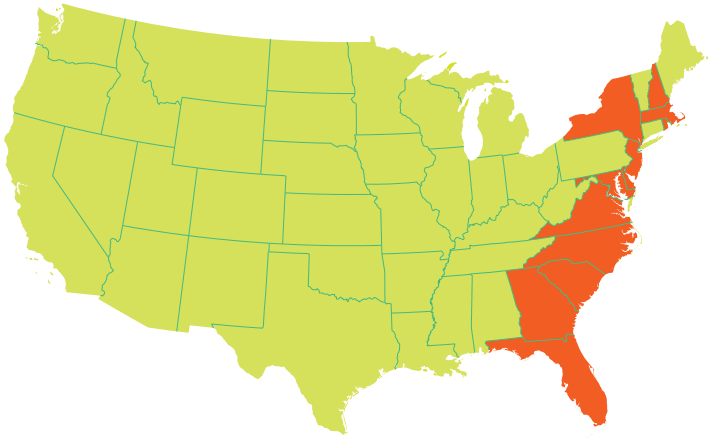
Source: Oceana.
Based on MMS estimates of undiscovered, economically recoverable oil and gas resource at $110/barrel, $11.74/mcf, and DOE estimates for offshore wind costs ranging from 10.6 – 13.1 ¢/kWh. Heating based on DOE data for average homes and primary space heating fuels. Electrifying based on 10,810 BTU per kWh from oil and gas and 11,020 kWh consumed per home annually. Car estimates based on 31.5 MPG gasoline, 121.5 cubic feet natural gas per gallon equivalent, 2.9 miles per kilowatt hour and 12,000 miles driven annually per car. See Oceana Technical Notes for methodology, available at www.oceana.org/cleanenergy.

GENERAL FINDINGS

- Offshore wind power is located near population centers where electricity demand is highest. Coastal states account for more than three-quarters of U.S. electricity consumption. Other renewable energy is further from these high-demand areas.
- Offshore wind power is less expensive than many alternatives. In some cases, offshore wind could actually lower electric bills.
- Offshore wind creates more jobs than offshore drilling. Long-term jobs would be created to support offshore wind development for skilled workers and scientists, including electricians, meteorologists, welders, and turbine operators just to name a few.
- Offshore wind technology can help build the U.S. economy. While the U.S. has not yet installed any offshore wind farms, Europe has been doing so for 20 years and has become the leading supplier of offshore wind turbines. Building our own domestic manufacturing base would strengthen our economy, allow U.S. expenditures to remain here at home, and allow the U.S. to become an offshore wind technology exporter.
- Offshore wind projects should be designed to minimize environmental impacts by using new techniques and technology in the construction, operation and decommissioning process, and by protecting the environment in the siting process.
- Choosing wind instead of oil and gas, rather than taking an "all-of-the-above" approach, will increase efficiency and lower costs for power production overall.

OFFSHORE WIND ENERGY

STATE BY STATE HIGHLIGHTS



Delaware

Delaware could generate more electricity from offshore wind energy than the state currently generates from all other sources. Offshore wind from the state's waters could power approximately 937,000 average homes annually. At least 2.8 GW of offshore wind potential is available in Delaware waters. That's enough energy to meet the current household energy generation of Delaware and Rhode Island combined with an energy surplus. While there is an initial investment cost for installation of offshore wind farms, eliminating fossil fuel consumption for electricity generation in Delaware would save the state $274 million annually on fuel costs.

Massachusetts

Massachusetts has the third highest electricity rates on the East Coast. The state could generate more electricity from offshore wind power than its total current power generation. Massachusetts' coastline would allow for the development of 13.8 gigawatts of offshore wind power. This offshore wind power could generate at least 130 percent of Massachusetts' current electricity generation, powering approximately 5 million average homes annually. With approximately 2.5 million homes, offshore wind power would be enough to supply Massachusetts with double the amount of energy needed to power all of its households. The offshore wind potential off the coast of Massachusetts could eliminate fossil fuel consumption for electricity generation in the state. While there is an initial investment cost for installation of offshore wind farms, eliminating the use of fossil fuel consumption would save about $2.1 billion annually on fuel costs. In addition, offshore wind could displace about 77 million metric tons of carbon dioxide.

North Carolina

North Carolina ranks first on the East Coast for offshore wind energy potential with at least 38 GW of potential offshore wind energy waiting to be developed. The federal waters off the state's coast represent nearly 22 percent of the East Coast's offshore wind generating capacity, and could supply nearly 12.7 million homes with clean, offshore wind power—or all the homes in North Carolina, South Carolina, Georgia and Virginia combined. Offshore wind power off North Carolina waters could generate more electricity than is currently generated in the entire state from all fuels combined. By investing in this resource the state could move away from coal, oil and natural gas altogether and save $2.6 billion annually on fuel costs.

New Jersey

New Jersey has the third best offshore wind resource on the East Coast based on total energy potential with at least 16 GW of wind energy. The state could generate 92 percent of its electricity from offshore wind—which would eliminate its fossil fuel consumption for electricity generation. In addition, offshore wind would create enough energy to power approximately 5.3 million average homes annually, almost twice the number of households currently in the state, and could displace about 81.4 million metric tons of carbon dioxide.

Virginia

Offshore wind from Virginia's coast could generate enough electricity to eliminate the need for all of the state's fossil fuel power plants. Virginia's 16 GW could generate at least 83 percent of the state's current electricity generation, enough to power approximately 5.5 million average homes annually, almost twice the number of households currently in the state.

South Carolina

South Carolina ranks second on the East Coast for offshore wind potential. Enough electricity could be generated by offshore wind off South Carolina to eliminate all of its fossil fuel power plants. South Carolina's coastline would allow for the development of 19.2 gigawatts of offshore wind power, approximately 64 percent of the state's current electricity generation, and enough to power about 5.9 million average homes annually—five times the number of households currently in the state. In addition, offshore wind could displace about 46.9 million metric tons of carbon dioxide.

Rhode Island

Rhode Island has the fourth highest electricity rates on the East Coast and the state gets 97 percent of its electricity from natural gas. Even the small amount of area available for offshore wind development could supply 700 megawatts of power, at least 38 percent of Rhode Island's electricity, and enough to power approximately 253,000 average homes annually. With a about 400,000 households as of 2000, offshore wind energy could provide enough power to supply at least half of Rhode Island homes. In addition, offshore wind power could displace about 1.1 million metric tons of carbon dioxide.

Maryland

Maryland could generate more than a third of its electricity from offshore wind power. This would be enough to eliminate the use of oil and natural gas for power generation in the state. Maryland's coastline would allow for the development of 4.7 gigawatts of offshore wind power. This offshore wind power could generate at least 36 percent of Maryland's current electricity generation, enough to meet the electricity generation of all the homes in the state. In addition, offshore wind power would displace about 23.7 million metric tons of carbon dioxide.

Florida

Offshore wind power could supply more than 10 GW, or enough energy to more than replace petroleum use in Florida's electric industry. Florida spends nearly $1.5 billion annually on oil for electricity generation, and consumes more oil for electricity generation than any other state in the country.[2] Florida's Atlantic coastline would allow for the development of at least 10.3 gigawatts of offshore wind energy, enough to power approximately 3.1 million average homes annually, about half the number of homes in the state. In addition, offshore wind power could replace about 24.7 million metric tons of carbon dioxide.

New York

In New York, more than $658 million is spent annually on petroleum for electricity generation—the second highest amount on the East Coast. Offshore wind could more than eliminate New York's petroleum-based electricity generation. New York's coastline would allow for the development of 4.7 gigawatts of offshore wind power in economically recoverable areas of the Atlantic Ocean. This offshore wind power could generate at least 12 percent of New York's current electricity generation, displace about 23.6 million metric tons of carbon dioxide and power approximately 1.5 million average homes annually.

RECOMMENDATIONS

Offshore oil and gas drilling poses major risks to diverse economies, such as fishing and tourism, as well as to marine ecosystems, and it does so in exchange for few benefits. While the risks of spills are tremendous as we have seen in the Gulf of Mexico, the benefits of offshore oil and gas are small in comparison to lower risk alternatives such as offshore wind. Investing in offshore wind is therefore a more truly cost-effective approach to generating energy from the oceans. Since developing "all of the above" only increases the costs and delivery times for both wind and oil and gas, we recommend that the United States begin the transition away from offshore fossil fuel development by taking the following steps:

- Eliminate federal subsidies for fossil fuels and redirect these funds to renewable energies and energy efficiency programs.
- Stop all new offshore oil and gas drilling to prevent future spills and minimize competition for resources and expertise that will slow the development of offshore wind energy.
- Require leasing of installation vessels for offshore wind turbine construction be given priority so that it is not impeded by offshore oil and natural gas development.

Renewable energy projects and manufacturers are more likely to proceed if there are consistent, predictable signals from governments and private markets to stimulate investments. Over the past several decades, onshore wind energy in the United States has periodically had access to tax benefits. Unfortunately, these have been short-term commitments, renewed annually, which provide inadequate assurance to those considering long-term investments. When these renewals end, the industry will likely constrict. As a result, fewer planned projects have been completed than what might otherwise occur with a more consistent signal from the government.[3] This boom-and-bust, year-to-year uncertainty harms the onshore wind industry and must not be allowed to extend offshore. In order to create a consistent and predictable environment for offshore wind energy, the United States must:

- Increase and make permanent the tax credit for investment in advanced energy property outlined in the American Recovery and Reinvestment Tax Act of 2009. This legislation extends the 30 percent credit for investment in qualified property used in a qualified advanced energy manufacturing project, but ends in 2012.[4] In addition, these tax credits should be extended to manufacturers of offshore wind turbine components and turbine installation vessels.
- Increase and make permanent the Innovative Technology Loan Guarantee Program for opening, expanding or modernizing facilities to manufacture offshore wind turbine components and extend this program to turbine installation vessel manufacturing.
- Use policy mechanisms that increase the long-term demand for and supply of renewable energies, such as a robust Renewable Electricity Standard or Feed-in Tariffs, Production and Investment Tax Credits, Loan Guarantee programs for renewable energy projects and technology manufacturers and training programs.
- Accelerate the electrification of the transportation fleet through incentives to automobile manufacturers and purchasers and by building the needed infrastructure such as charging stations to allow maximal use of this new technology.

> *"Even a small fraction of the United States' renewable energy resources is enough to power the country several times over."*

INTRODUCTION

Most of the energy generated in the United States comes from fuel sources that must be mined, drilled, or extracted from deep within the Earth—each of which comes with its own set of negative environmental, economic, and sociological side-effects. In 2009, the United States Department of Energy (DOE) reported that 85 percent of all of the country's energy was coming from fossil fuels like oil, natural gas, and coal.[5] Continued use of fossil fuels is very risky: prices of these non-renewable resources are highly volatile; reliance on oil creates a dependence on countries that may pose threats to national security; and much of the environmental damage done by mining, drilling, and burning fossil fuels is irreversible.

In addition, fossil-fuel based energy production has hidden costs, including climate change. The carbon dioxide emissions from the fuels burned to produce energy are warming the planet, which results in a long list of associated impacts, ranging from melting sea ice and rising sea level to changes in patterns of food production and water availability. Carbon dioxide from burning fossil fuels alters the planet's climate systems, and it affects the oceans as well.

Ocean acidification, or the decline in the pH of ocean water due to the absorption of carbon dioxide from the atmosphere, is a major threat to marine ecosystems and species, as well as about one billion people who rely on the seas for food. Solving the global climate crisis requires a global transformation in energy production and consumption methods, including changes in transportation and electricity generation. The vast majority of our electricity comes from nonrenewable resources that have major environmental impacts, while they also weaken national security, and have a wide range of economic and social costs.

Fortunately there is time to modernize these systems and minimize these threats to the planet. Clean energy, energy efficiency, and hybrid or electric transportation are all part of a new energy economy that is being built right now. Thousands of people are employed in "green collar" jobs relating to clean energy, and billions of dollars are being invested annually in renewable energy. Even a small fraction of the United States' renewable energy resources is enough to power the country several times over[6], and one of the least expensive and easiest ways to produce clean energy that will decrease carbon emissions and help save the oceans comes from the seas themselves—offshore wind power.

CLEAN, RENEWABLE, AND WELL-POSITIONED

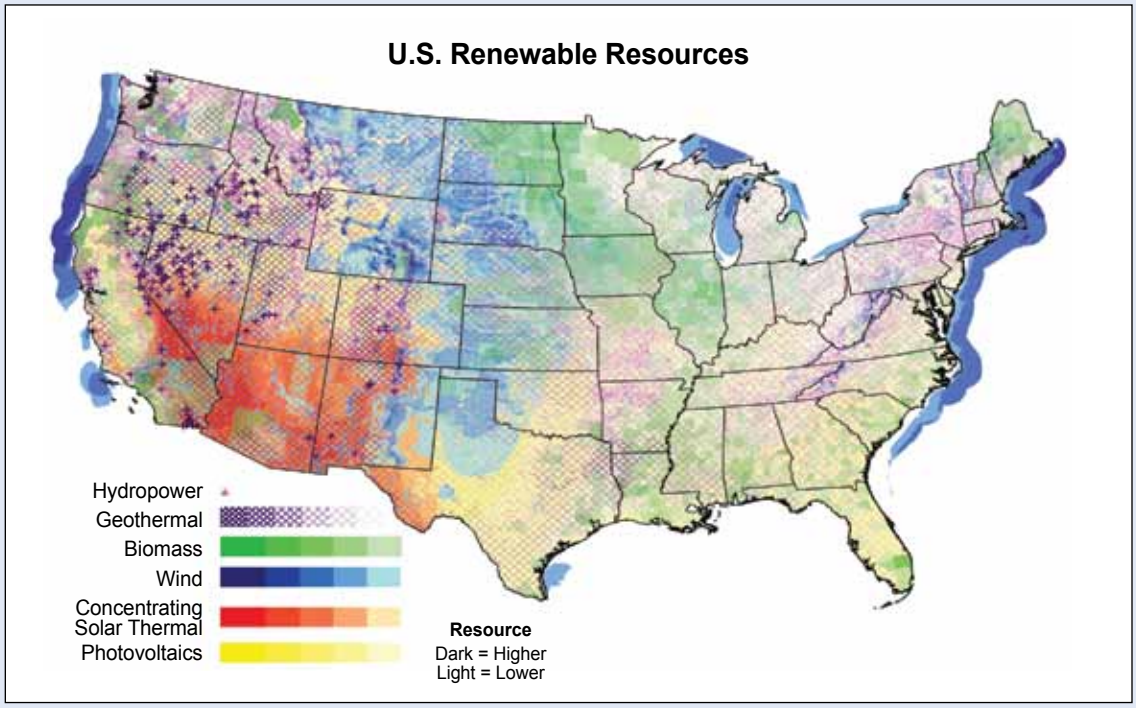
Offshore wind energy has existed commercially for almost two decades and is uniquely positioned to overcome obstacles faced by other renewable energy technology. Offshore wind farms can be placed close to large populations – where the need for clean electricity is highest. Bringing in substantial amounts of clean, renewable energy to major population centers on the East Coast or in the Great Lakes from land-based energy sources would require thousands of miles of electricity transmission lines to be upgraded or built – a process that could take decades, crisscross dozens of states, and cost tens of billions of dollars.[7]

Additionally, offshore winds are stronger and steadier than onshore winds; thus, more electricity is generated and offshore wind energy is more consistent (less variable) than onshore wind farms.[8] All of these factors could expedite a transition to a clean energy economy, while at the same time reducing electricity costs.

Offshore wind offers more than just clean electricity. It also can be a major source of jobs. Manufacturing, installing, operating, and maintaining offshore wind farms can provide thousands of local jobs in coastal states. These include positions that require unique engineering, manufacturing and maritime expertise. For example, offshore wind production requires oceanographic and ecological expertise. Experts in these fields would be needed to collect and analyze data on areas of interest to offshore wind developers. New or retrofitted heavy manufacturing facilities would need to be built in the United States to supply offshore turbines. Installing offshore turbines also would require maritime expertise and ships, similar to those needed by the offshore oil and natural gas industry. Specialized undersea cables would be needed to transmit electricity from the farm to the shore. Manufacturing and installation needs in each of these areas these would create additional jobs. As a result, a variety of long-term jobs would be created by offshore wind energy development, including electricians, meteorologists, welders, and operators among other general maintenance laborers.

Due to their size, offshore wind turbines (which currently tend to be much larger than onshore turbines) must be built in coastal areas so that they can be shipped out to sea. Offshore turbines are too large to transport by train or tractor trailer. Several European ports have been revitalized due to increased investments in offshore wind in Europe[9] and similar benefits could be achieved in the United States if the U.S. begins to invest in this growing industry.

Figure 1: Offshore Wind Power is Near Large Cities



Source: Department of Energy, National Renewable Energy Laboratory[6]

> *"Offshore wind potential is best where population is largely focused – along the East Coast."*

Table 1: Offshore Wind Can Power Much of East Coast

Rank by Wind Energy Potential	State	Offshore Wind Resource (MW)	Offshore Wind Potential as % of 2008 Electric Generation	Oil and Natural Gas as % of 2008 Electric Generation
1	NC	37,900	112%	4%
2	SC	19,200	64%	6%
3	NJ	16,000	92%	33%
4	VA	16,000	83%	14%
5	MA	13,800	130%	56%
6	FL	10,300	16%	53%
7	NY	4,730	12%	34%
8	MD	4,680	36%	5%
9	DE	2,850	137%	21%
10	RI	739	38%	98%
11	GA	1,190	3%	10%
12	ME*	38,900	913%	46%
13	NH*	1,230	21%	32%

*Source: Oceana and Department of Energy[6]. *Maine and New Hampshire are not considered in Oceana's 127 GW total due to water depth in those states.*

The most opportune areas for offshore wind generation lie along the East Coast and the Great Lakes. While the West Coast also has strong winds, the deeper waters make it more difficult to place wind turbines with current technology. Nonetheless, more than 75 percent of the country's electricity consumption occurs in 28 coastal states, much of that is on the East Coast.[11] About 81 percent of the population, an estimated 245 million people[12], live in these coastal areas. While most of our potential renewable resources, like solar, biomass and onshore wind, are located in remote regions, far from major population centers, offshore wind potential is best where population is largely focused—along the East Coast.

Many coastal states consume large amounts of electricity (Table 1.) In fact, eight out of the top ten states with the greatest electricity consumption are located along the Great Lakes and East Coast.[13] In these regions, offshore wind power represents a valuable local renewable resource.

Besides offshore wind, other renewable resources in the US are far from these major population centers, situated instead in the Great Plains (particularly wind power), the Rocky Mountains (geothermal), the Pacific Northwest (hydroelectric) and the Southwest (solar). Thousands of miles of new transmission lines must be built in order to harness these great renewable resources. In some areas, construction and placement of those lines may be delayed by public resistance despite the necessity to modernize the electrical transmission system.

Table 2: The Highest Consuming States are Coastal States

Rank	State	Electric Consumption (MWh, 2008)	State Electricity CO2 emissions (million metric tons, 2007)[14]	Region
1	TX	347,059,227	230.0	Gulf Coast
2	CA	268,155,219	50.1	West Coast
3	FL	226,172,795	125.0	East Coast
4	OH	159,388,807	131.1	Great Lakes
5	PA	150,400,589	126.6	Great Lakes
6	IL	144,619,914	97.1	Great Lakes
7	NY	144,052,936	49.7	Great Lakes/ East Coast
8	GA	135,173,514	91.6	East Coast
9	NC	130,054,113	77.8	East Coast
10	VA	110,106,337	41.9	East Coast

Source: Department of Energy[15]

Despite the plentiful wind resource available along the coasts, the United States has not installed a single offshore wind farm. Meanwhile, Europe has been installing offshore wind farms for nearly 20 years and is the largest global market for supplying and installing offshore wind turbines. To become a leader in offshore wind power and the technology that supports it, the United States will need to overcome challenges that have already been identified by the European offshore wind industry. These include supply-chain and installation bottlenecks—the limited number of manufacturers and turbine installation vessels hamper offshore wind development and unnecessarily increase project costs. Competition between European and American projects for turbines and ships will delay offshore wind projects and will also increase project costs. By building up a domestic offshore wind technology manufacturing base, the United States can equip this developing global industry while at the same time strengthening its own economy.

OFFSHORE WIND – CHEAPER THAN ALTERNATIVES

Offshore wind power is nothing new. For nearly 20 years, offshore wind farms have been operating in Europe.[16] Since 1991, more than two gigawatts (GW)[1] of offshore wind power capacity have been installed in Europe[17]—preventing the release of 3.9 million tons of carbon dioxide that would otherwise be generated every year.[18] By 2030, offshore wind power in some areas could provide the European Union with enough electricity for about 13 to 18 percent of its electrical needs.[19]

Table 3: Europe and China Are Taking the Lead in Offshore Wind Power

Country	Total Installed Wind Capacity 2009 (MW)[20]	Offshore Wind Installed Capacity 2009 (MW)[21]
UK	4,051	882.8
Denmark	3,465	639.2
China	25,805	102
Germany	25,777	42
United States	35,064	0
Spain	19,149	0
India	10,926	0
Italy	4,850	0
France	4,492	0
Portugal	3,535	0
Rest of World	21,391	491.9
Total	**158,505**	**2,157.9**

Source: Global Wind Energy Council and European Wind Energy Association, 2010[22]

Wind power is often the least expensive alternative energy resource, especially where hydropower from dams is unavailable.[23] In some areas of the United States onshore wind power would already be less expensive than electricity generated using natural gas or other petroleum products.[24] In areas that rely heavily on natural gas for electricity, offshore wind power could actually reduce electric bills for residents due to the high price of natural gas.[25] By 2030, offshore wind power in some areas could provide electricity for as little as 5.4 cents per kilowatt hour (kWh)—or about the same price as current wholesale electricity in the United States.[26]

In the near term, the DOE estimates that offshore wind could be cost competitive with fossil fuels and nuclear power. The Agency estimates that offshore wind could generate electricity for 10.6 cents to 13.1 cents per kWh or cheaper if the Production Tax Credit (a federal tax incentive) is continued. This could reduce offshore wind costs to 8.3 to 10.8 cents per kWh. Comparatively, electricity from a new gas power plant would range from 7.7 to 19.6 cents per kWh.[27] Although electricity from a new coal-fired power plant is estimated to range from 6.8 cents per kWh to 9.1 cents per kWh[28], this price does not include the cost of carbon sequestration—a necessary technology to reduce carbon dioxide emissions. Adding carbon sequestration technologies to coal-fired power plants would double the cost of coal-based electricity.[29] Notably, the external costs of electricity to the environment and public health from coal are also not considered in this type of a price comparison.

Table 4: Wind Power is a Source of Cheap, Plentiful Renewable Energy[30]

Energy Source	Theoretical US Potential (GW)[31]	US Installed Capacity (MW)	Cents per kWh
Solar	217,000	1,111	12¢ - 81¢
PV	206,000	1,106	21¢ - 81¢
CSP[32]	11,100	5	12¢- 18¢
Wind	14,000	35,239	4¢ - 15¢
Onshore Wind	8,000	35,159	4¢ - 7¢
Offshore Wind	6,000 [33]	0	10.6¢ - 13.1¢ [34]
Small wind	140 [35]	80 [36]	15¢ [37]
Geothermal	563	3,040	6¢ - 10¢
Wave	240 [38]	0.12 [39]	24¢ - 86¢
Hydropower	140	77,450	2¢ - 5¢
Biomass	78	11,943	5¢ - 12¢
Tidal	30 [40]	0	18¢ - 35¢
Ocean Current[41]	25	0	Unknown

Like other energy generating technologies, not all offshore wind farms will be economically viable. Some projects have already been cancelled in the United States due to their costs. Others, like Bluewater Wind's 450 megawatt project off the coast of Delaware, show that offshore wind energy can compete against traditional fossil fuel power plants and still provide electricity at a low rate. Delmarva Power agreed to purchase Bluewater Wind's electricity at a base rate of 10.4 cents per kilowatt (in 2007 dollars)[42]—or about the same rate as the average retail price of electricity.

Offshore wind power in Europe is already providing considerable amounts of clean energy at reasonable prices and it could provide more energy and at even lower prices in the future. Based on Europe's experience with offshore wind, the United States stands to benefit as well, especially building on the technological developments already achieved elsewhere. Offshore wind power represents a key opportunity to help the U.S. transition to a clean energy economy. Offshore wind is well positioned to supply the energy needs of major population centers, offering less expensive energy than many more polluting alternatives. By replacing the carbon-dioxide generating sources, it can also help combat climate change.

**One gigawatt (GW) is one thousand megawatts (MW).*

OFFSHORE WIND ENERGY

"Offshore wind is well positioned to supply the energy needs of major population centers, offering less expensive energy than many more polluting alternatives. By replacing the carbon-dioxide generating sources, it can also help combat climate change."

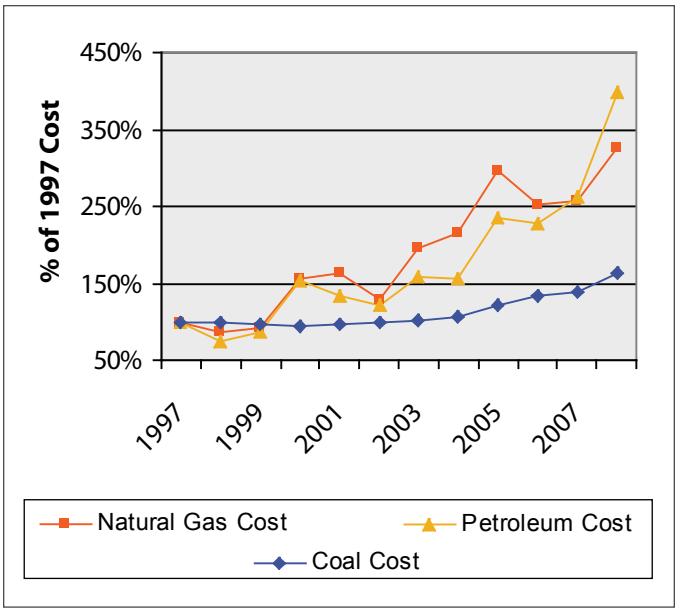
THE BENEFITS OF OFFSHORE WIND

Offshore wind power is an affordable, clean, domestic energy resource. Ratepayers and businesses would not have to guess at how much their wind-based electric rates will increase from month-to-month, or year-to-year—unlike the highly volatile costs associated with fossil fuels. Also, wind power does not emit harmful air pollutants, like greenhouse gases and mercury.

Free Fuel Forever – Eliminating Volatile Prices

Offshore wind energy would reduce the financial risks associated with fossil fuel energy production. For example, natural gas and oil, both used in electricity generation in the United States, have highly volatile prices. Prices in the United States can be affected by hurricanes that limit oil and gas production in the Gulf of Mexico, or geopolitical conflicts, particularly in the Middle East and Africa. Oil prices are also affected by market speculation, which artificially drives the price higher.

Chart 1: Fuel Costs for Electricity Generation 1997-2008



Source: Energy Information Administration, 2010[43]
Sources: US Energy Information Administration, Form EIA-423, "Monthly Cost and Quality of Fuels for Electric Plants Report," Federal Energy Regulatory Commission, FERC Form 423, "Monthly Report of Cost and Quality of Fuels for Electric Plants," Form EIA-923, "Power Plant Operations Report."

Like other renewable energy technologies, offshore wind power is insulated from fuel price volatility since its fuel, the wind, is free. The major costs associated with offshore wind farms, like most renewable energy projects, are set-up costs, from purchasing the parts and installing them. Since operation and maintenance costs are relatively low compared to the upfront costs, offshore wind energy costs can be estimated over the 20-30 year lifespan of the turbines, and energy prices tend to remain more constant for decades.

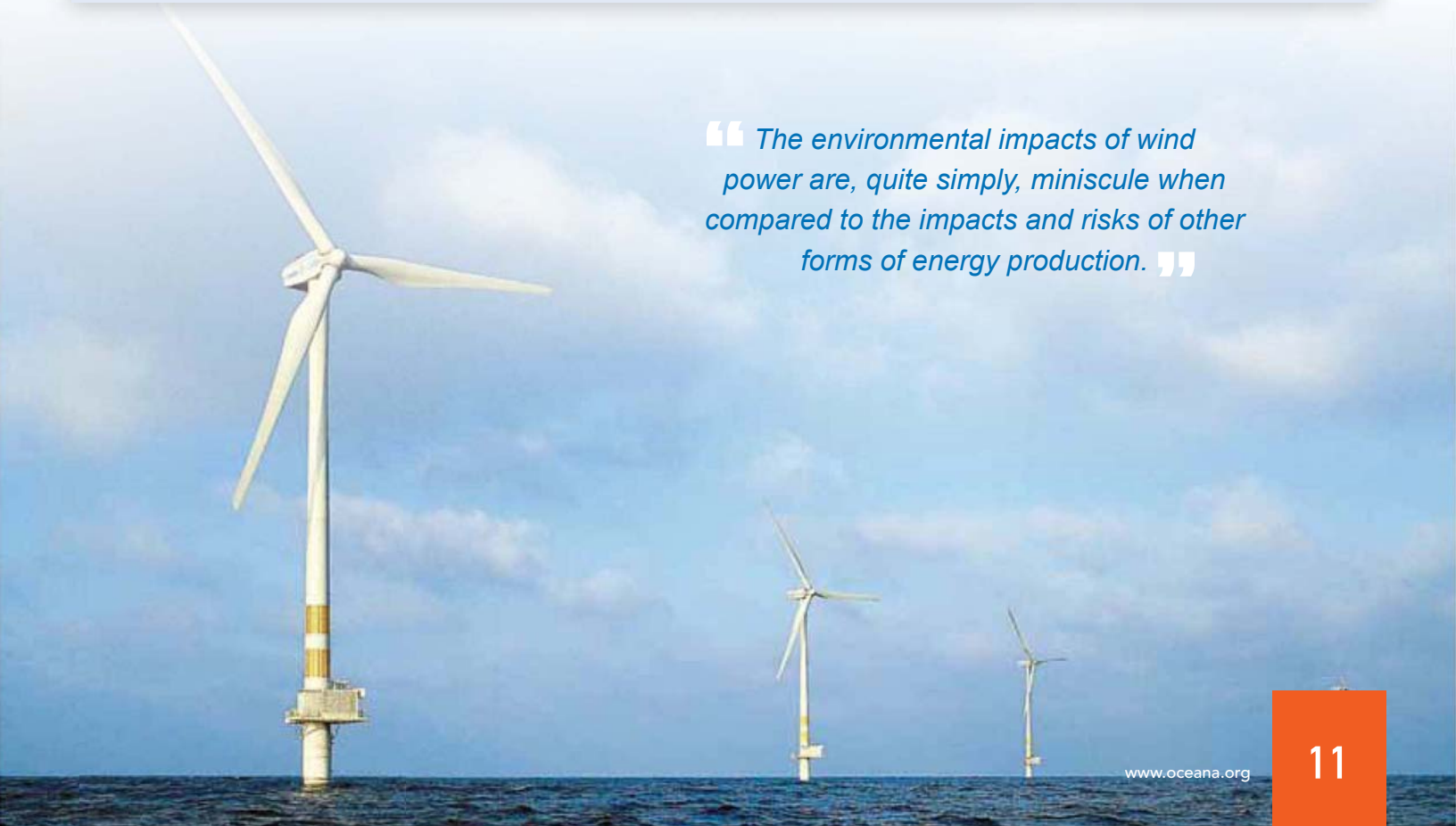
ENVIRONMENTAL BENEFITS OF WIND OVER TRADITIONAL FUELS

There's never been a wind blowout. No wind meltdowns. Not a single wind-mining disaster. No ground water contamination from wind fracking. No clean up needed from a wind spill. The point is simple—the environmental impacts of wind power are, quite simply, minuscule when compared to the impacts and risks of other forms of energy production, particularly oil, coal, natural gas, and nuclear. And wind, unlike fossil fuels, does not cause climate change or acidification of the oceans.

This report is focused primarily on the direct economic comparison of wind versus oil and natural gas as an energy source. But direct costs paid by consumers are not the only costs associated with different forms of energy generation. Some of those costs are obvious—the Deepwater Drilling Disaster in the Gulf of Mexico is expected to have costs in the tens of billions—while some are much less obvious. In addition to the increasingly obvious consequences of climate change, fossil fuels contribute to air pollution that is responsible for hundreds of thousands of deaths each year. Electricity generation from these fuels is responsible for the consumption of over a trillion gallons a year of increasingly scarce and valuable water.

Offshore wind has none of these impacts. In fact, the "fuel" has no impacts whatsoever. Overall, most of the negative effects of constructing wind turbines in a marine environment are temporary and localized. Construction and installation appear to be the most disruptive activities associated with offshore wind farm development.[44] Driving monopiles into the seabed (similar to planting a stake in the ground) is noisy and disruptive to sediments.[45] Fortunately, practices to minimize disturbance during construction are available (see "Doing Offshore Wind Right" section below).

In short, the wind is a fuel that, unlike fossil fuels and nuclear power, is cost free in every sense. There are no costs to drill, dig, mine, transport or dispose of wind. There are no costs to using wind—no smog, no acid rain, no climate change, no ocean acidification. In comparison to the environmental costs of these traditional forms of energy, offshore wind energy is indeed "free as the wind."



"The environmental impacts of wind power are, quite simply, miniscule when compared to the impacts and risks of other forms of energy production."

OFFSHORE WIND ENERGY

"For nearly two decades, offshore wind farms have been operating in European waters – producing considerable amounts of clean energy with minimal impact on the ocean environment."

DOING OFFSHORE WIND RIGHT

For nearly two decades, offshore wind farms have been operating in European waters—producing considerable amounts of clean energy with minimal impact on the ocean environment. Thanks to the pioneering environmental assessments done in Europe, offshore wind farms can use new techniques and technology to reduce the already minimal environmental impacts even further.[46]

Siting Considerations

The single best way to minimize the effects of offshore wind farms is to properly choose a suitable location. Appropriate siting of offshore wind farms is essential to ensure that impacts on nature and the environment will be limited. For example, proper turbine placement can reduce the risks to birds and other highly migratory animals.[47] Special precautions should be used to protect animals that are slow to reproduce, as well as those species that are threatened or endangered.[48]

Habitat

Limit or avoid construction of offshore wind farms in important ecological areas, including feeding, breeding and spawning areas and major migratory routes.[49]

Species

Limit or avoid construction of offshore wind farms where development will result in excess stress or unacceptable mortality rates especially for species that are long-lived with slow reproductive and maturation rates. Special care should be taken with regard to threatened or endangered species.[50]

Ecosystems

Limit or avoid construction of offshore wind farms in highly diverse ecosystems or those with low resilience. Alternatively, resilient areas with low diversity, like some soft-bottom communities, are likely to be better sites for development.[51]

Following these general siting criteria, offshore wind farms can avoid or reduce some of the most severe impacts on the environment. With each project, however, specific measurements of the ecological state of the selected site must be taken in order to develop proper construction and operation techniques.

Mitigation Efforts

While research shows few significant impacts on the vast majority of wildlife and ecosystems from offshore wind farms, many of the impacts that will occur can be mitigated.[52] Construction and decommissioning of wind farms present the greatest risk to local wildlife, but these effects are localized, temporary and in some cases preventable. Operation and maintenance of offshore wind farms have limited negative impacts and these can even be reduced or eliminated.

Such negative effects depend on the species present as well as the type of substrates in the area, therefore, great care should be taken to study a proposed site prior to taking action.[53] In addition to following all local, state and federal laws, offshore wind farms can take additional steps to mitigate any negative effects. Mitigation efforts include, but are not limited to:

Construction and Decommissioning

- **Monitoring** – It is necessary to monitor wildlife and ecosystems continuously throughout the project's life.[54]
- **Pile-driving warnings and dampening** – Pile-driving offshore wind turbine monopiles into the seafloor can be extremely noisy. There are quite a few ways to warn nearby wildlife to temporarily leave the area, and to dampen the noise. For instance, noise generators (pingers) could scare off nearby animals and bubble curtains can dampen noise from hammering the monopiles into the seabed.[55] Other mitigation technologies, such as modifications to the piling hammer, pile sleeves and telescopic tubes can also reduce noise.
- **Wide Stance** – Spacing turbines far enough from one another can allow space for animals to navigate around the pilings.[56]
- **Jet Bury** – Using technology that minimizes sea floor disturbance, like jet plows for undersea electric cable installation can limit the impacts to bottom-dwelling animals.[57]

Operation

- **Low/Diffuse light** - Intermittent and low level lighting reduces the chance that wildlife will become attracted to the farms and venture too close.[58]
- **Slow ships** – Slowing ships reduces the risk of impacting wildlife that spend time at the surface, like sea turtles and marine mammals.[59] Slower ships also make less noise, and use less fuel.[60]
- **Replace displaced plants and animals** – After determining which plants and animals are likely to be displaced by the offshore wind farm, efforts should be made to replace them (especially shellfish and sea grasses).[61]
- **Slow or stop rotors from spinning during major events** – If site specific studies show there may be large numbers of migrating birds near offshore wind farms, slowing or stopping turbines could reduce impacts to birds.[62]

By using smart siting criteria to prevent environmental impacts and following up with mitigation efforts to minimize the negative side effects that all human activity in the oceans causes, offshore wind farms can be built with minimal impacts to marine ecosystems.

HOW MUCH CAN WIND DO?

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of East Coast current electricity generation—while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

The "Saudi Arabia" of Offshore Wind – America's East Coast

Although onshore wind power in the United States currently supplies enough electricity for nearly seven million homes annually, to date no wind turbines have been installed offshore.[63] However, a handful of offshore wind projects are planned to be built in American waters representing a combined 2.5 gigawatts (GW) of electrical capacity.[64] These projects alone, if developed, could produce enough electricity to power nearly 800,000 American homes annually—and eliminate over 6 million metric tons of carbon dioxide each year.

However, there is much more offshore wind potential available. This analysis found that conservatively, 127 gigawatts (GW) of offshore wind energy are currently economically available off the East Coast of the United States. Of the thirteen East Coast states measured[2], six could supply more than 50 percent of their own electricity with offshore wind power. Excluding New Hampshire's and Maine's potential (see note below Table 4), offshore wind could supplant 70 percent of the East Coast's fossil-fuel based electricity. Providing this quantity of clean energy could cut 335 million metric tons of carbon dioxide emissions annually—while limiting the risk of exposure to highly volatile energy expenses.

This analysis used the following conservative criteria to identify areas that would be suitable and could be used for wind power generation given current technology and economic limitations:

- Areas with wind resources that average 15.7 miles per hour or greater (generally, these resources are referred to as "Class 4" or above); and,
- Within areas that lie 3-24 nautical miles from shorelines; and,
- Water depths of no more than 30 meters; and,
- Of the total area identified, 67 percent of the areas were assumed to be unavailable for development, due to competing area usage or environmental suitability that would prevent offshore wind development; and,
- An area carrying capacity of 8 megawatts per square kilometer; and,
- Capacity factors ranging between 38 percent and 50 percent, based on wind class.

Using these guidelines, areas were identified that would be suitable for wind power generation with existing offshore wind technology.

These parameters are meant to highlight the most economically viable and technically feasible areas for offshore wind development while being extremely conservative. For further discussion, see Oceana Technical Notes, Available at www.oceana.org/cleanenergy. Despite this conservative approach, the US still possesses a very large amount of offshore wind power potential.

Table 5: Offshore Wind Energy Could Power Half of the East Coast

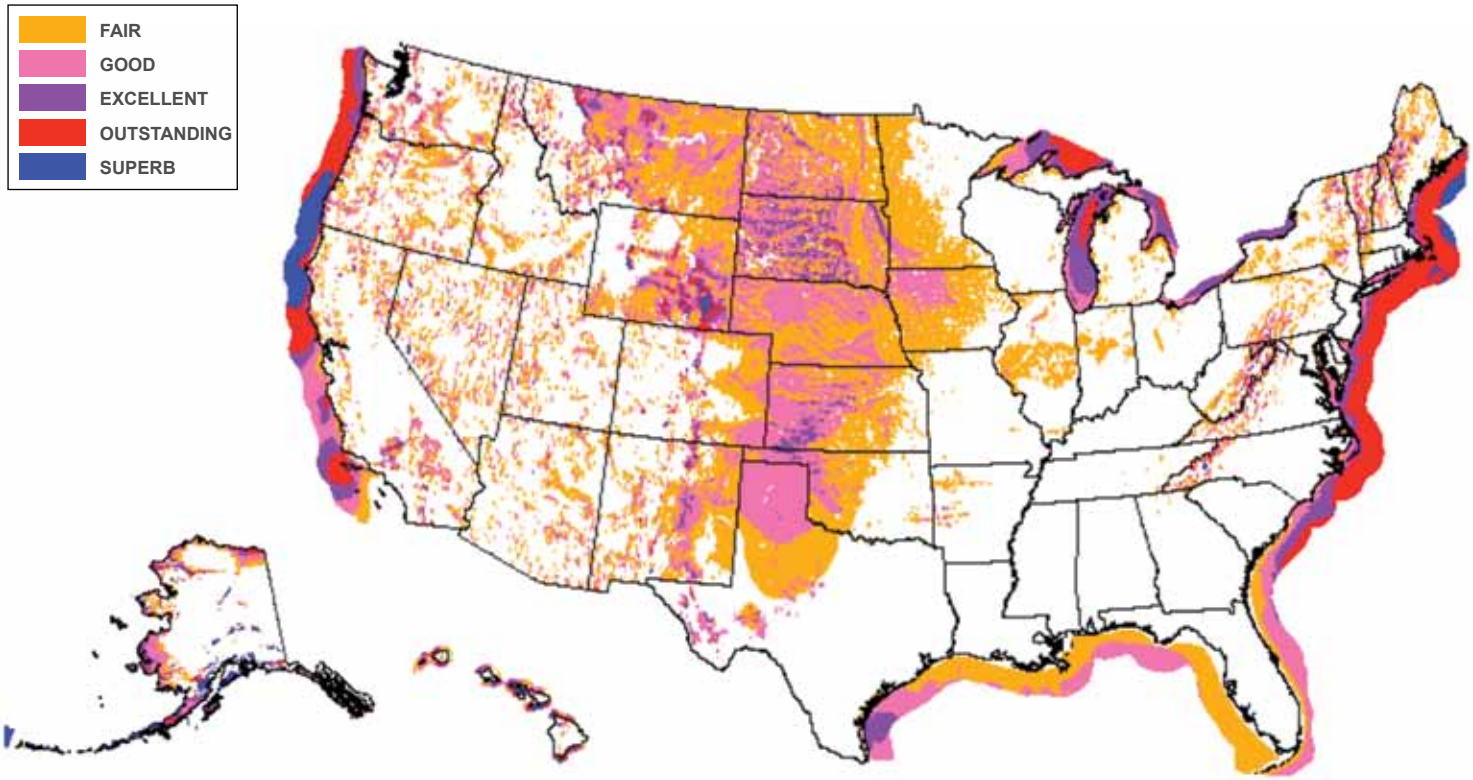
	Economically Recoverable Offshore Wind Resource (MW)	Offshore Wind State Electric Generating Potential	Fossil Fuel Electricity State Supply (2008)	Primary Electric Energy Source (2008)
DE	2,850	137%	91.3%	Coal (70%)
MA	13,800	130%	80.6%	Natural Gas (50.6%)
NC	37,900	112%	64.1%	Coal (60.5%)
NJ	16,000	92%	47.3%	Nuclear (50.6%)
VA	16,000	83%	58.1%	Coal (43.7%)
SC	19,200	64%	47.0%	Nuclear (51.3%)
RI	739	38%	97.8%	Natural Gas (97.4%)
MD	4,680	36%	62.3%	Coal (57.5%)
FL	10,300	16%	82.1%	Natural Gas (47.1%)
NY	4,730	12%	47.7%	Natural Gas (31.3%)
GA	1,190	3%	73.2%	Coal (62.8%)
US East Coast**	**127,389**	**45%**	**64%**	
ME*	38,900	913%	48.4%	Natural Gas (43.2%)
NH*	1,230	21%	46.6%	Natural Gas (30.9%)

Source: Oceana and Department of Energy[114]
**New Hampshire and Maine have deep near shore shelves. Practically no area between 3-24 nautical miles from shore contained waters with depths less than 30 meters. The figures reported here consider the 3-24 nautical mile limits but not bathymetry, and represent developable area based on deep water turbine technology that Maine will be researching in the near future.*
***Excludes offshore wind capacity for CT, NH and ME, but includes CT, NH and ME electric demand.*

WIND POTENTIAL BY STATE

See Appendix 1 for State-by-State Profiles

U.S. Wind Power Classification Map



Delaware

Delaware could generate more electricity from offshore wind energy than the state currently generates from all other sources. Offshore wind from the state's waters could power approximately 937,000 average homes annually. At least 2.8 GW of offshore wind potential is available in Delaware waters. That's enough energy to meet the current household energy generation of Delaware and Rhode Island combined with an energy surplus. While there is an initial investment cost for installation of offshore wind farms, eliminating fossil fuel consumption for electricity generation in Delaware would save the state $274 million annually on fuel costs.

Massachusetts

Massachusetts has the third highest electricity rates on the East Coast. The state could generate more electricity from offshore wind power than its total current power generation. Massachusetts' coastline would allow for the development of 13.8 gigawatts of offshore wind power. This offshore wind power could generate at least 130 percent of Massachusetts' current electricity generation, powering approximately 5 million average homes annually. With approximately 2.5 million homes, offshore wind power would be enough to supply Massachusetts with double the amount of energy needed to power all of its households. The offshore wind potential off the coast of Massachusetts could eliminate fossil fuel consumption for electricity generation in the state. While there is an initial investment cost for installation of offshore wind farms, eliminating the use of fossil fuel consumption would save about $2.1 billion annually on fuel costs. In addition, offshore wind could displace about 77 million metric tons of carbon dioxide.

North Carolina

North Carolina ranks first on the East Coast for offshore wind energy potential with at least 38 GW of potential offshore wind energy waiting to be developed. The federal waters off the state's coast represent nearly 22 percent of the East Coast's offshore wind generating capacity, and could supply nearly 12.7 million homes with clean, offshore wind power—or all the homes in North Carolina, South Carolina, Georgia and Virginia combined. Offshore wind power off North Carolina waters could generate more electricity than is currently generated in the entire state from all fuels combined. By investing in this resource the state could move away from coal, oil and natural gas altogether and save $2.6 billion annually on fuel costs.

New Jersey

New Jersey has the third best offshore wind resource on the East Coast based on total energy potential with at least 16 GW of wind energy. The state could generate 92 percent of its electricity from offshore wind—which would eliminate its fossil fuel consumption for electricity generation. In addition, offshore wind would create enough energy to power approximately 5.3 million average homes annually, almost twice the number of households currently in the state, and could displace about 81.4 million metric tons of carbon dioxide.

Virginia

Offshore wind from Virginia's coast could generate enough electricity to eliminate the need for all of the state's fossil fuel power plants. Virginia's 16 GW could generate at least 83 percent of the state's current electricity generation, enough to power approximately 5.5 million average homes annually, almost twice the number of households currently in the state.

South Carolina

South Carolina ranks second on the East Coast for offshore wind potential. Enough electricity could be generated by offshore wind off South Carolina to eliminate all of its fossil fuel power plants. South Carolina's coastline would allow for the development of 19.2 gigawatts of offshore wind power, approximately 64 percent of the state's current electricity generation, and enough to power about 5.9 million average homes annually—five times the number of households currently in the state. In addition, offshore wind could displace about 46.9 million metric tons of carbon dioxide.

Rhode Island

Rhode Island has the fourth highest electricity rates on the East Coast and the state gets 97 percent of its electricity from natural gas. Even the small amount of area available for offshore wind development could supply 700 megawatts of power, at least 38 percent of Rhode Island's electricity, and enough to power approximately 253,000 average homes annually. With a about 400,000 households as of 2000, offshore wind energy could provide enough power to supply at least half of Rhode Island homes. In addition, offshore wind power could displace about 1.1 million metric tons of carbon dioxide.

Maryland

Maryland could generate more than a third of its electricity from offshore wind power. This would be enough to eliminate the use of oil and natural gas for power generation in the state. Maryland's coastline would allow for the development of 4.7 gigawatts of offshore wind power. This offshore wind power could generate at least 36 percent of Maryland's current electricity generation, enough to meet the electricity generation of all the homes in the state. In addition, offshore wind power would displace about 23.7 million metric tons of carbon dioxide.

Florida

Offshore wind power could supply more than 10 GW, or enough energy to more than replace petroleum use in Florida's electric industry. Florida spends nearly $1.5 billion annually on oil for electricity generation, and consumes more oil for electricity generation than any other state in the country.[2] Florida's Atlantic coastline would allow for the development of at least 10.3 gigawatts of offshore wind energy, enough to power approximately 3.1 million average homes annually, about half the number of homes in the state. In addition, offshore wind power could replace about 24.7 million metric tons of carbon dioxide.

New York

In New York, more than $658 million is spent annually on petroleum for electricity generation—the second highest amount on the East Coast. Offshore wind could more than eliminate New York's petroleum-based electricity generation. New York's coastline would allow for the development of 4.7 gigawatts of offshore wind power in economically recoverable areas of the Atlantic Ocean. This offshore wind power could generate at least 12 percent of New York's current electricity generation, displace about 23.6 million metric tons of carbon dioxide and power approximately 1.5 million average homes annually.

> *"Currently, 43.7 million barrels of oil are consumed annually to generate electricity across the country. This amount of electricity could easily be generated by offshore wind."*

COULD WIND DISPLACE OIL?

The development of a clean energy economy will not happen overnight. As time goes on, renewable energy resources can replace more and more of our fossil fuel use. However, as discussed earlier, expanded development of traditional fossil fuel options will compete with and slow the success of clean energy, making renewable energies more expensive and slower to market.

There is increasing interest in expanding offshore drilling for oil and gas, especially on the Atlantic Coast and in the Eastern Gulf of Mexico. In these areas, offshore wind power has the potential to generate more energy at a lower cost, and create more jobs in the process.

Currently, wind energy may not be seen as a viable replacement for oil and gas because the two types of energy are largely used for different things. Oil is most commonly used in transportation to fuel cars, trucks and other vehicles. Wind energy, on the other hand, is used to generate electricity which is most commonly used to power homes and businesses, although some transportation uses do currently rely on electricity. Less than 1 percent of electricity generated nationwide is fueled by petroleum[70], while 99 percent of the petroleum used is consumed by cars and trucks. Less than 1 percent of our electricity is used for transportation, while 95 percent is used in the residential, business and industrial sectors.[71]

Despite this apparent disconnect, wind power can directly offset oil consumption in the electricity generation and home heating sectors. Currently, 43.7 million barrels of oil are consumed annually to generate electricity across the country.[72] This amount of electricity[73] could easily be generated by offshore wind.

Approximately 7 gigawatts (GW) of offshore wind power would be needed to replace the oil currently used in power generation.[74] While this may seem like a small amount it would be an important step in moving away from fossil fuels and cutting down climate change pollution—and it is clearly achievable. The U.S. already has about 35 GW of onshore wind in place and more on the way. The U.S. could have 20 GW of offshore by 2020 if it made the commitment to do so—the United Kingdom, which has made such a commitment, plans to install 33 GW of offshore wind by 2020. The sooner renewable energies begin to replace oil in the electricity generating sector, the sooner carbon dioxide emissions and petroleum demand can begin to be reduced.

Another immediate way offshore wind energy can cut oil and natural gas consumption is through heating. Many homes and buildings still use fuel oil and natural gas for heating purposes such as space heating, cooking, and water heating.[75] On the East Coast, nearly 7 million homes rely on fuel oil as the primary source of heating, representing about 88 percent of the country's heating oil demand.[76] Switching these homes from fuel oil to electric heating (nearly 16.6 million homes on the East Coast already use electricity for their primary source of heating), almost 123 million barrels of oil would be conserved annually. About 5 GW of wind power would be needed to provide the electricity to heat these 7 million homes, an amount that is well in line with the projected 20 GW of offshore wind that could be in place by 2020.

Installing 20 GW of offshore wind power with the explicit purpose of offsetting domestic oil consumption would generate enough energy to eliminate nearly 167 million barrels of oil demand annually—more than is currently used in home heating and electricity generation.

CAN OFFSHORE WIND POWER THE FUTURE?

To truly assess the degree to which wind can take the place of new offshore oil and natural gas development in the foreseeable future, it is necessary to consider a realistic time frame in which new offshore drilling or new offshore wind would be developed. Neither new offshore wind turbines nor new offshore oil and gas production will spring up overnight. It is likely to take at least two decades to build the necessary infrastructure to reach peak production from new offshore oil and natural gas drilling from the entire United States east and west coasts - areas that were previously protected and are being considered for expanded drilling.

The following analysis compares the potential of offshore oil, natural gas and offshore wind power in the areas being considered for expansion of oil and gas exploration and development. The analysis includes the Eastern Gulf of Mexico, South Atlantic, Mid-Atlantic and North Atlantic planning areas. To do the analysis, we compared offshore wind to offshore oil and gas in terms of use for electricity generation, residential heating and residential transportation over 20 years.

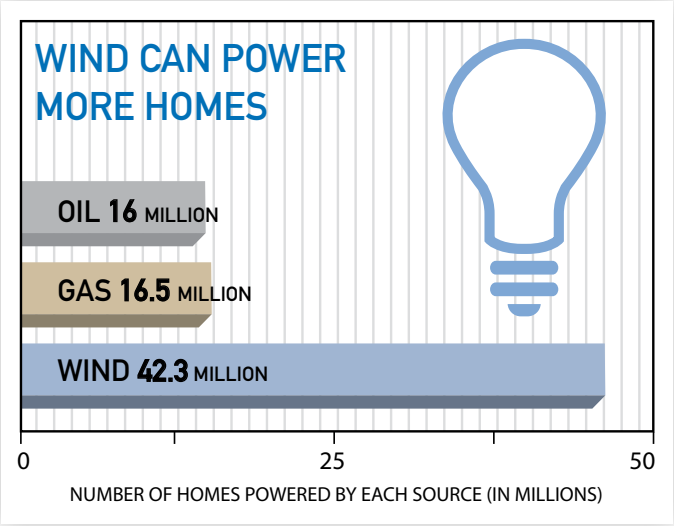
In this and the other comparisons in this report, we consistently used conservative assumptions to predict wind potential. As a result, our analysis likely understates offshore wind potential at 127 gigawatts (GW) just for the Atlantic Coast. Conversely, we used more generous assumptions to estimate the potential of offshore oil and gas resources, which likely overstates the potential of the offshore oil and gas in the areas considered. Despite our effort to overstate the case for oil and gas against offshore wind, offshore wind consistently proved the superior alternative.

Photo courtesy: A2SEA

OFFSHORE WIND ENERGY

"Offshore wind power could generate nearly 30 percent more electricity than offshore oil and gas resources, combined."

OFFSHORE WIND ENERGY COULD POWER MORE HOMES THAN NEW OFFSHORE OIL AND GAS COMBINED



Oil, natural gas and wind can all be used to create electricity. While we recognize that oil and natural gas are not always used for this purpose, to compare their energy potential to that of wind, we estimated the potential of each to generate electricity assuming that each resource was devoted exclusively to that purpose.

As a whole, 127 gigawatts of offshore wind power from these areas could generate nearly 30 percent more electricity than offshore oil and gas resources, combined. According to estimates from the Minerals Management Service (MMS)[77] and figures from DOE on electricity generation from thermal generation units[78], the East Coast offshore oil resource could generate approximately 176 billion kilowatt hours (or 176 terawatt hours, TWh) of electricity over 20 years - or almost enough electricity for 16 million homes. The offshore natural gas resources could generate enough electricity for approximately 16.5 million homes annually or almost 182 TWh over that time period. In contrast, economically recoverable offshore wind power could supply 466 TWh of electricity—enough to power over 42 million homes annually. Electricity generated by offshore wind power would be more than the East Coast's oil and natural gas resources, combined. For comparison, the United States total electrical demand for 2008 was approximately 3,764 TWh.[79]

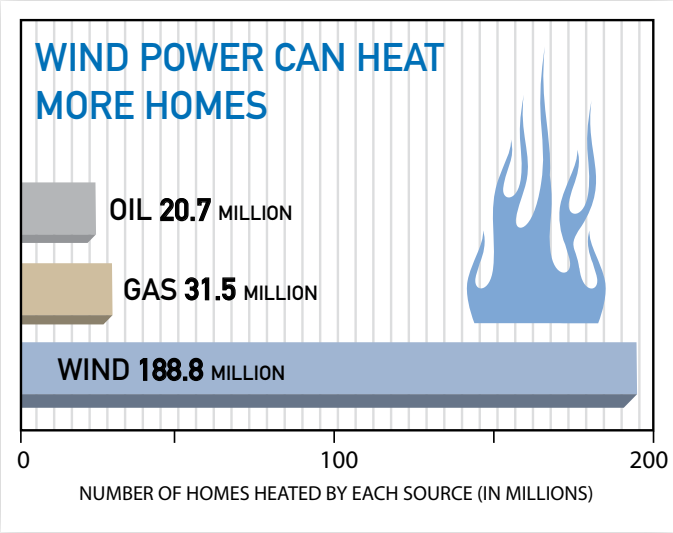
Table 6: Offshore Wind could Produce More Electricity than New Offshore Oil and Gas

Electricity Generation as # of Average Homes Powered by Offshore Resource (in millions)			
Planning Area	**Oil**	**Gas**	**Wind**
North Atlantic	3.8	4.7	12.1
Mid-Atlantic	2.8	3.7	20.7
South Atlantic	0.9	1.1	8.0
Eastern Gulf	8.4	7.1	1.3
Total	**16**	**16.5**	**42.3**

Source: Oceana
Based on MMS undiscovered, economically recoverable oil and gas resource at $110/barrel equiv., 10,810 btu per kWh thermal conversion, 11,020 kWh per "average" home, and annual extraction of resource over 20 year period. See Oceana Technical Notes for methodology, available at www.oceana.org/cleanenergy.

"Offshore wind power could provide enough electric heat for every home in the country – and then some."

OFFSHORE WIND ENERGY COULD HEAT MORE HOMES THAN NEW OFFSHORE OIL AND GAS COMBINED



Homes use heat for space heating, water heating, cooking and a variety of other functions. Currently, electricity, oil and natural gas are all used in the residential heating sector; however, these fuels could be replaced with electricity, and thus could rely on wind power instead. Based on the estimates in this report, 127 gigawatts of offshore wind power could provide enough electric heat for every home in the country—and then some.

According to MMS estimates the East Coast contains approximately 6.5 billion barrels of oil—or enough oil to heat about 21 million homes for 20 years. MMS has estimated offshore natural gas resource on the East Coast at approximately 38.23 trillion cubic feet which could provide enough heating for 35.8 million homes for 20 years. Economically recoverable offshore wind power could supply enough heating energy for 184 million homes annually—more than three times more than the offshore oil and gas resources on the East Coast combined. For comparison, the United States Census Bureau estimates that there are currently about 129 million homes nationwide.[80]

Table 7: Offshore Wind Energy Could Heat More Homes than New Offshore Oil and Gas

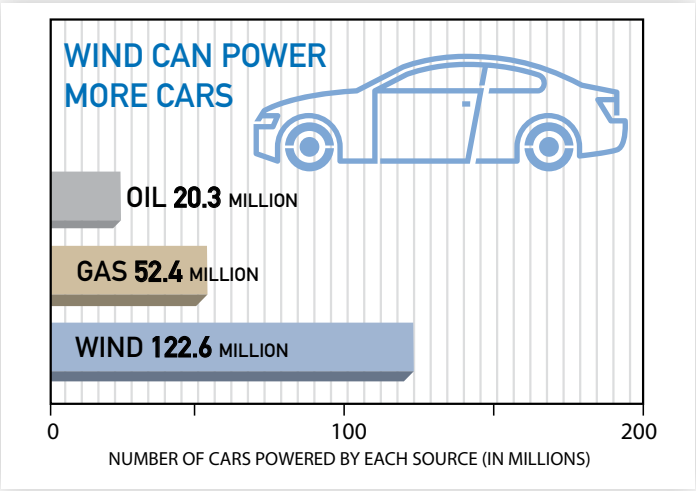
Average Homes that Could be Heated by Offshore Resource			
Planning Area	**Oil**	**Gas**	**Wind**
North Atlantic	4.5 million	7.3 million	55.0 million
Mid-Atlantic	3.8 million	6.6 million	72.6 million
South Atlantic	1.3 million	2.8 million	48.8 million
Eastern Gulf	11.8 million	19.0 million	8.1 million
Total	**21.4 million**	**35.8 million**	**184.4 million**

Source: Oceana
Based on MMS undiscovered, economically recoverable oil and gas resource assuming $110/barrel equiv. and annual extraction of resource over 20 year period. See Oceana Technical Notes for methodology, available at www.oceana.org/cleanenergy.

OFFSHORE WIND ENERGY

"With an electrified car fleet, offshore wind could power nearly twice as many vehicles as new offshore oil and gas combined."

OFFSHORE WIND ENERGY COULD POWER MORE CARS THAN NEW OFFSHORE OIL AND GAS COMBINED



Making a comparison between miles-per-gallon of gasoline (MPG), natural gas miles-per-gallon equivalent (MPGe) and miles per kilowatt hour (MPkWh), shows the potential for offshore wind to replace oil and natural gas in the transportation sector. Nearly 99 percent of all US cars and trucks use oil as an energy source.[81] Vehicles that operate from natural gas are commercially available and currently in use, although in limited numbers. Plug-in hybrid-electric vehicles, like Chevrolet's Volt[82], and completely electric vehicles, like Nissan's Leaf[83] and THINK's City[84], will begin to be sold commercially in the US within the next year. Tesla is already selling plug in electric cars, and the electrification of the fleet is a key component of the needed transition to clean energy. Therefore, it is reasonable to consider the role that offshore resources might play in the transportation sector in the next decade or two. Estimates of how many miles could be driven by fully utilizing each of the offshore energy resource available are provided in MPG, MPGe and MPkWh to compare the potential for each form of energy in terms of miles driven.

With an electrified car fleet, 127 gigawatts of offshore wind could power nearly twice as many vehicles as new offshore oil and gas development combined. According to MMS estimates, East Coast offshore oil resource could fuel approximately 16 million gasoline vehicles annually for 20 years, while the natural gas resource could fuel an estimated 41.3 million compressed natural gas cars over the same time. In contrast, this analysis shows that the economically recoverable offshore wind resource on the East Coast could power approximately 112.5 million electric cars—about twice as many vehicles than the East Coast's offshore oil and natural gas resources combined. For comparison, DOE estimates that in 2010, there were about 227 million light-duty vehicles on the road in the United States.[85]

Nissan, Chevrolet, Ford, Tesla and a variety of other companies are preparing to sell plug-in hybrid-electric vehicles (PHEV), or completely electric vehicles on an increasingly larger scale. According to a study by the National Renewable Energy Laboratory, if half of all light-duty vehicles are PHEV by 2050, gasoline consumption would decrease by between 35 billion and 53 billion gallons annually.[86] If this scenario takes place by 2050, by 2055, the United States will have conserved more gasoline in just those five years than the entire oil resource available off the East Coast. This figure doesn't even begin to assess the savings that would occur between now and 2050.[87]

As homes, heating and cars become more and more electrified, wind will become even better able to displace oil use. Ultimately, it is this shift to clean energy and away from fossil fuels that will turn back the clock on climate change.

Table 8: Offshore Wind could Power Nearly Twice as Many Cars as Offshore Oil and Gas Combined

Number of Cars powered by Offshore Resource			
Planning Area	**Oil**	**Gas**	**Wind**
North Atlantic	3.8 million	11.7 million	32.3 million
Mid-Atlantic	2.8 million	9.2 million	55.2 million
South Atlantic	0.9 million	2.6 million	21.4 million
Eastern Gulf	8.4 million	17.7 million	3.6 million
Total	**15.9 million**	**41.2 million**	**112.5 million**

Source: Oceana
Based on MMS undiscovered, economically recoverable oil and gas resource at $110/barrel equiv., 18.56 gallons of gasoline per barrel of oil, 121.5 cubic feet of natural gas per gallon of gasoline equivalent, 40 miles per gallon, 2.9 miles per kWh and annual extraction of resource over 20 year period. See Oceana Technical Notes for methodology, available at www.oceana.org/cleanenergy.

"By investing in offshore wind on the East Coast, instead of offshore oil and gas, Americans would get more energy for less money."

OFFSHORE WIND POWER IS LESS EXPENSIVE THAN NEW OFFSHORE OIL AND GAS

As shown in the three previous examples, offshore wind energy can create more electricity, heat more homes or power more cars than the offshore oil and gas that is being considered for production on the East Coast and in the eastern Gulf of Mexico. Offshore wind energy potential is much greater than that of new offshore oil and gas and the cost is much lower. Developing the 127 gigawatts of offshore wind energy described above would cost about $36 billion less over 20 years than the estimated cost of producing the economically recoverable oil and natural gas combined. Better still, unlike the oil and natural gas resources, offshore wind is not finite and, unlike the oil and gas, will not become depleted. However, the estimated lifetime of an offshore wind turbine is about 20 years and a new turbine will eventually need to be installed in order to continue to capture wind energy. Therefore a comparison of costs and benefits over 20 years is an appropriate one.

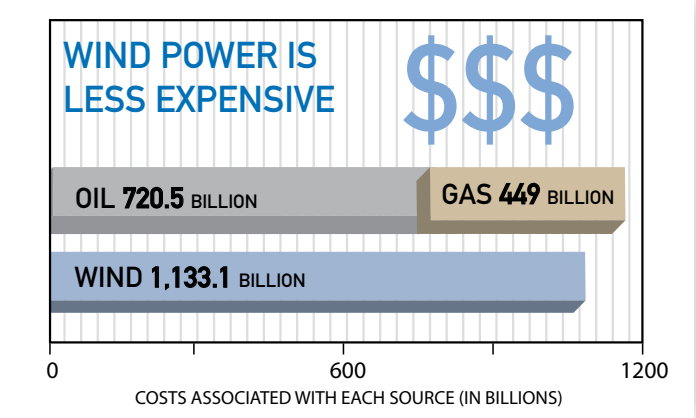


Table 9: Offshore Wind – Doing the Work of Oil and Natural Gas Better, for Less

Annual Fuel Cost	Oil	Natural Gas	Wind
Heating One Home	$1,683	$627	$307
Electrifying One Home	$2,259	$1,360	$1,341
Powering One Home	$2,261	$544	$503

Source: Oceana.
Based on MMS estimates of undiscovered, economically recoverable oil and gas resource at $110/barrel, $11.74/mcf, and DOE estimates for offshore wind costs ranging from 10.6 – 13.1 ¢/kWh. Heating based on DOE estimates of average homes using this fuel as primary space heating fuel. Electrifying based on 10,810 BTU per kWh from oil and gas and 11,020 kWh consumed per home annually. Car estimates based on 31.5 MPG gasoline, 121.5 cubic feet natural gas per gallon equivalent, 2.9 miles per kilowatt hour and 12,000 miles driven annually per car. See Oceana Technical Notes for methodology, available at www.oceana.org/cleanenergy.

According to MMS, 20 years worth of East Coast offshore oil at $110 per barrel would cost consumers $720 billion, and the natural gas would cost $449 billion. After the East Coast's offshore oil and gas have been extracted, nearly $1.17 trillion will have been transferred from consumers to the oil and gas industry, and then no more energy will be available. Developing the 127 gigawatts of offshore wind energy described above – instead of drilling for oil and gas, would cost about $1.13 trillion, $36 billion less than the oil and gas costs over 20 years. Notwithstanding the cost savings, as described above the wind investment also produced more energy in every scenario considered. By investing in offshore wind on the East Coast, instead of offshore oil and gas in the areas that were previously protected in the Atlantic and eastern Gulf, Americans would get more energy for less money.

There is another downside to high oil and gas prices. As oil and gas prices increase, the industry can use the proceeds to extract resources that were previously not cost-effective to recover – for instance, deep water oil and gas resources. In turn, the oil and gas companies sell these harder-to-extract resources at higher prices to customers. Thus, high oil prices not only increase the cost at the pump, they also increase the risks and potential harm to marine life from more extreme production processes.

Table 10: Offshore Wind Costs $36 Billion Less than Offshore Oil and Gas Combined

Offshore Wind Costs			
Planning Area	**Oil**	**Gas**	**Wind**
North Atlantic	$172.7 billion	$127.4 billion	$316.4 billion
Mid-Atlantic	$126.5 billion	$100.5 billion	$548.6 billion
South Atlantic	$40.7 billion	$28.8 billion	$229.5 billion
Eastern Gulf	$380.6 billion	$192.3 billion	$38.6 billion
Total	**$720.5 billion**	**$449.0 billion**	**$1,133.1 billion**

Source: Oceana.
Based on MMS estimates of undiscovered, economically recoverable oil and gas resource at $110/barrel, $11.74/mcf, and DOE estimates for offshore wind costs ranging from 10.6 – 13.1 ¢/kWh with 127 gigawatts of offshore wind energy. See Oceana Technical Notes for methodology, available at www.oceana.org/cleanenergy.

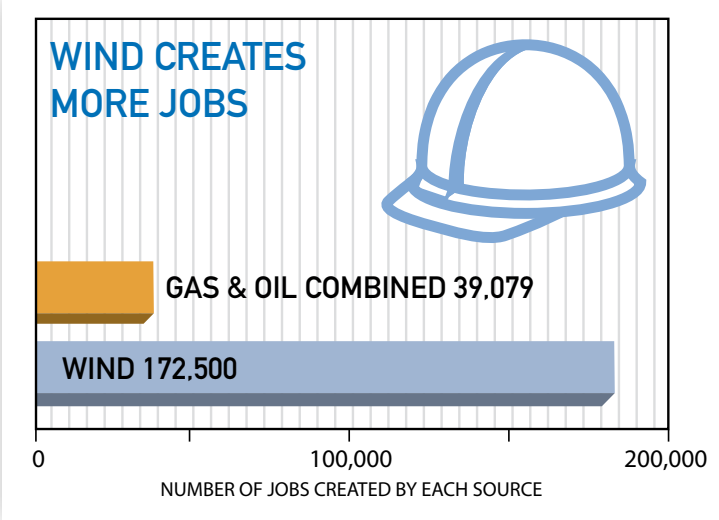
OFFSHORE WIND POWER CAN CREATE MORE JOBS THAN OFFSHORE OIL AND GAS DRILLING

> *"Offshore wind would create about three times as many jobs as would the offshore oil and gas industries."*

Besides the sheer quantity of offshore wind energy compared to the offshore oil and natural gas resource, offshore wind power will also create many more jobs than the oil and gas industries.

According to the American Petroleum Institute (API), the oil and gas sectors of the United States directly employ 2.1 million people. API asserts that by opening up previously protected offshore areas (including the entire East and West Coasts), the natural gas and oil industry would create 39,079 jobs in 2030.[88] The permanence of these jobs is in question, since oil and gas supplies are finite, unlike renewable sources.

The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[89] If only 127 gigawatts of offshore wind farms are installed in the United States by 2030, similar to Europe's ambitious plan,[90] this could create between 133,000 and 212,000 permanent American jobs annually. Offshore wind would create about three times as many jobs as would the offshore oil and gas industries. This comparison is consistent with studies conducted by the PERI Institute, which show a 3-to-1 ratio between jobs created by clean energy versus those created by fossil fuel industries[91].



The American Wind Energy Association (AWEA) estimates that currently in the United States, 85,000 people are employed by the wind industry.[92] In Europe, 19,000 people are already employed in the offshore wind industry.[93] Installing, operating and maintaining offshore wind farms employ more people per megawatt of capacity installed than onshore wind power.[94]

HOW TO MAKE OFFSHORE WIND PART OF THE SOLUTION

Current federal and state policies have thus far focused on increasing renewable energy generation rather than on renewable energy supply-chain. A major impediment to US offshore wind power development is a severely underdeveloped supply chain. There are not enough offshore wind turbine manufacturers, engineers, and installation ships to install already planned projects. Increasing the demand for renewable energy through additional federal programs and subsidies without the corresponding increase in supply has delayed projects and increased costs. Additionally, offshore wind farms compete with offshore oil and natural gas development for installation vessels and marine expertise – slowing turbine installations and increasing project costs.

The current supply of offshore wind turbines is dominated by two manufacturers. Approximately 90 percent of all installed offshore wind farms use turbines manufactured by either Vestas (Denmark) or Siemens (Germany).[95] Until additional turbine manufacturing capacity is built, the industry will be dominated by a limited number of players which could slow project installations and increase costs.

Since no offshore wind turbine manufacturers exist in the United States, promoting development of American offshore turbine manufacturing will create thousands of new jobs in the United States and keep billions of dollars in local economies, while also helping to facilitate the shift to the cleaner, more cost-effective energy option.

Only a handful of offshore wind farm installation companies exist. A2SEA, based in Denmark, has installed more than 60 percent of the world's offshore turbines and has a fleet of four installation vessels. Specialized installation vessels, such as Sea Power and Sea Energy, can quickly and efficiently install turbines. These vessels installed 91 turbines over 183 days for the Horns Rev 2 offshore wind project (Denmark) in 2009.[102]

Such vessels are designed specifically for installing marine turbines. In Europe, these turbine installation vessels, sometimes called jack-up barges, have primarily come from the offshore oil and natural gas industry.[103] Globally, only about ten vessels are equipped specifically to install offshore wind turbines.[104] The British Wind Energy Association has noted that the market price of oil, and in turn, the demand for these vessels, can divert them away from offshore wind farm installation when oil and gas prices go up.[105] Therefore, an approach that develops "all of the above" energy sources, including continuing to develop offshore oil and gas in the United States is likely to divert equipment and expertise away from developing offshore wind energy. Ultimately, offshore oil and gas will compete with offshore wind, and the result will be anything but "all of the above".

By encouraging offshore wind turbine and turbine installation vessel manufacturing in the United States, jobs would be created here, and the new market for clean energy technology could be powered by US goods. The products could be used for US offshore wind development, to alleviate the European supply chain problems and to increase the economic benefits to the United States. Choosing wind over oil and gas, rather than taking an "all-of-the-above" approach will increase efficiency and reduce costs for wind installations. Offshore oil and natural gas production should not be allowed to continue at the expense of offshore wind turbine installations.

Table 11: Most Offshore Turbine Manufacturers are not US Based

Manufacturer	Offshore Wind Turbine Capacity	Notes
Clipper Windpower (United States)	10 MW	Currently developing a 10 MW turbine and plans to have a prototype by 2011 for UK use.
AREVA/ Multibrid (Germany)	5 MW	Developed a specific offshore design based on a permanent magnet generator.[97] This design is meant to limit operating and maintenance costs.
REpower (Germany)	5 MW	Manufactures the largest wind turbines in the world.
BARD Engineering (Germany)	5 MW	Developed specific offshore design. BARD has planned three 400 MW wind farms using 5 MW turbines.[98]
General Electric (United States)	4 MW	GE is the second largest wind turbine manufacturer, and just recently announced its newest offshore wind turbine design.
Siemens (Germany)	3.6 MW	Prepared to reserve up to 1/3 of its production capacity for offshore wind turbines.[99]
Vestas (Denmark)	3 MW	Has the second largest cumulative market share of offshore wind turbines (42.1%).[100]
Nordex (Denmark)	2.5 MW	The N90 offshore turbine is an adaptation to their onshore turbine. [101]

RECOMMENDATIONS

Offshore oil and gas drilling poses major risks to diverse economies, such as fishing and tourism, as well as to marine ecosystems, and it does so in exchange for few benefits. While the risks of spills are tremendous as we have seen in the Gulf of Mexico, the benefits of offshore oil and gas are small in comparison to lower risk alternatives such as offshore wind. Investing in offshore wind is therefore a more truly cost-effective approach to generating energy from the oceans. Since developing "all of the above" only increases the costs and delivery times for both wind and oil and gas, we recommend that the United States begin the transition away from offshore fossil fuel development by taking the following steps:

- Eliminate federal subsidies for fossil fuels and redirect these funds to renewable energies and energy efficiency programs.
- Stop all new offshore oil and gas drilling to prevent future spills and minimize competition for resources and expertise that will slow the development of offshore wind energy.
- Require leasing of installation vessels for offshore wind turbine construction be given priority so that it is not impeded by offshore oil and natural gas development.

Renewable energy projects and manufacturers are more likely to proceed if there are consistent, predictable signals from governments and private markets to stimulate investments. Over the past several decades, onshore wind energy in the United States has periodically had access to tax benefits. Unfortunately, these have been short-term commitments, renewed annually, which provide inadequate assurance to those considering long-term investments. When these renewals end, the industry will likely constrict. As a result, fewer planned projects have been completed than what might otherwise occur with a more consistent signal from the government.[106] This boom-and-bust, year-to-year uncertainty harms the onshore wind industry and must not be allowed to extend offshore. In order to create a consistent and predictable environment for offshore wind energy, the United States must:

- Increase and make permanent the tax credit for investment in advanced energy property outlined in the American Recovery and Reinvestment Tax Act of 2009. This legislation extends the 30 percent credit for investment in qualified property used in a qualified advanced energy manufacturing project, but ends in 2012.[107] In addition,, these tax credits should be extended to manufacturers of offshore wind turbine components and turbine installation vessels.
- Increase and make permanent the Innovative Technology Loan Guarantee Program for opening, expanding or modernizing facilities to manufacture offshore wind turbine components and extend this program to turbine installation vessel manufacturing.
- Use policy mechanisms that increase the long-term demand for and supply of renewable energies, such as a robust Renewable Electricity Standard or Feed-in Tariffs, Production and Investment Tax Credits, Loan Guarantee programs for renewable energy projects and technology manufacturers and training programs.
- Accelerate the electrification of the transportation fleet through incentives to automobile manufacturers and purchasers and by building the needed infrastructure such as charging stations to allow maximal use of this new technology.

APPENDIX
REGIONAL AND STATE BY STATE ANALYSIS

SOUTH ATLANTIC AND EASTERN GULF

Approximately 30.7 gigawatts of offshore wind power could be developed in this region. This offshore wind power could generate at least 23 percent of the region's current electricity generation, displace about 74.4 million metric tons of carbon dioxide and power approximately 9.4 million average homes annually.

This amount of offshore wind power in the South Atlantic could provide the same amount of electricity as the region's oil-generated electricity and 74% of the natural gas-based electricity.

Offshore Wind From the South Atlantic and Eastern Gulf Could Replace Most Oil and Gas in Electricity Generation

Offshore Wind Potential	Offshore Wind as Percent of Electricity Generation
30.7 GW	23%

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Offshore Wind – Better than Offshore Oil and Natural Gas

When compared to offshore oil and gas resources in the South Atlantic, offshore wind provides more power. Offshore wind energy could heat more homes than oil and gas combined.

Over 20 Years, Offshore Wind Can Heat More Homes Than Oil and Gas

	Oil*	Natural Gas*	Wind
Homes Heated	13.1 million	21.9 million	56.9 million
Homes Powered	9.3 million	8.1 million	9.4 million
Cars	9.3 million	20.3 million	25 million
Total Cost	**$421.3 billion**	**$221.1 billion**	**$268.1 billion**

**The reported costs here rely on price per barrel and cubic foot resource estimates and do not consider refining, transportation and other costs associated with actual end-use.*

Oil and Gas Greenhouse Gas Emissions

If the offshore oil and gas reserves from this region were drilled and subsequently burned, substantial quantities of greenhouse gas pollutants would be generated. Combined, the oil and natural gas resource off the South Atlantic and Eastern Gulf would generate 2.6 billion metric tons of carbon dioxide – or more than emitted from all the power plants in the United States in 2008.[108]

OFFSHORE WIND ENERGY

MID-ATLANTIC

Approximately 61.4 gigawatts of offshore wind power could be developed in the Mid-Atlantic. This offshore wind power could generate at least 90 percent of the region's current electricity generation, displace about 164.5 million metric tons of carbon dioxide and power approximately 20.7 million average homes annually.

This amount of offshore wind power in the Mid-Atlantic could provide more electricity than the region's fossil-fuel based electricity.

Offshore Wind from the Mid-Atlantic Could Replace Most Oil and Gas in Electricity Generation

Offshore Wind Potential	Offshore Wind as Percent of Electricity Generation
61.4 GW	90%

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Offshore Wind – Better than Offshore Oil and Natural Gas

When compared to offshore oil and gas resources in the Mid-Atlantic, offshore wind provides more power at a lower cost. Depending on how it's used, offshore wind energy could generate more electricity, heat more homes or power more cars.

Over 20 Years, Offshore Wind Can Provide More Power at a Lower Cost Per Unit

	Oil*	Natural Gas*	Wind
Homes Heated	3.8 million	6.6 million	72.6 million
Homes Powered	2.8 million	3.7 million	20.7 million
Cars	2.8 million	9.2 million	55.2 million
Total Cost	**$126.5 billion**	**$100.5 billion**	**$548.6 billion**

**The reported costs here rely on price per barrel and cubic foot resource estimates and do not consider refining, transportation and other costs associated with actual end-use.*

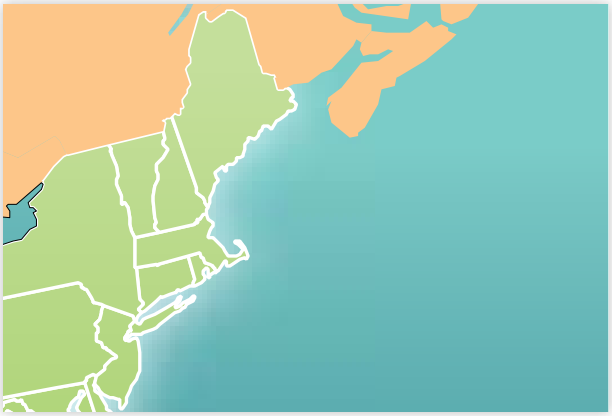
Oil and Gas Greenhouse Gas Emissions

If the Mid-Atlantic's offshore oil and gas reserves were drilled and subsequently burned, substantial quantities of greenhouse gas pollutants would be generated. Combined, the oil and natural gas resource off the Mid-Atlantic would generate 934.5 million metric tons of carbon dioxide – or about the same amount as 243 coal-fired power plants. [109]

NORTH ATLANTIC

Approximately 35.3 gigawatts of offshore wind power could be developed in the North Atlantic. This offshore wind power could generate at least 41 percent of the region's current electricity generation, displace about 54.2 million metric tons of carbon dioxide and power approximately 12.1 million average homes annually.

This amount of offshore wind power in the North Atlantic could provide more electricity than currently generated by the region's oil and gas-generated electricity in addition to nearly 22 percent of the coal-based electricity.



Offshore Wind in the North Atlantic Could Replace Oil and Gas in Electricity Generation

Offshore Wind Potential	Offshore Wind as Percent of Electricity Generation
35.3 GW	41%

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep. Excludes offshore wind capacity for CT, NH and ME, but includes electrical demand for those states.

Offshore Wind – Better than Offshore Oil and Natural Gas

When compared to offshore oil and gas resources in the North Atlantic, offshore wind provides more power. Depending on how it's used, offshore wind energy could generate more electricity, heat more homes or power more cars.

Over 20 Years, Offshore Wind Can Provide More Power Than Oil and Gas Combined

	Oil*	Natural Gas*	Wind
Homes Heated	4.5 million	7.3 million	55 million
Homes Powered	3.8 million	4.7 million	12.1 million
Cars	3.8 million	11.7 million	32.3 million
Total Cost	**$172.7 billion**	**$127.4 billion**	**$316.4 billion**

**The reported costs here rely on price per barrel and cubic foot resource estimates and do not consider refining, transportation and other costs associated with actual end-use. **Excludes CT, NH and ME offshore wind resource potential.*

Oil and Gas Greenhouse Gas Emissions

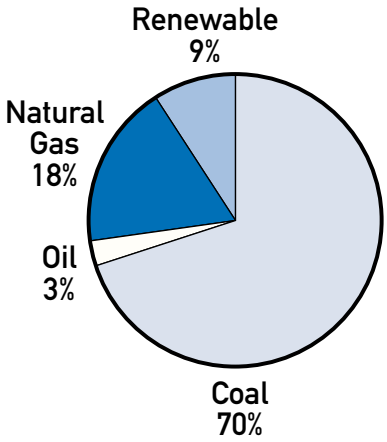
If the North Atlantic's offshore oil and gas reserves were drilled and subsequently burned, substantial quantities of greenhouse gas pollutants would be generated. Combined, the oil and natural gas resource off the North Atlantic would generate 1.2 billion metric tons of carbon dioxide – or about the same amount as 320 coal-fired power plants. [110]

OFFSHORE WIND ENERGY

DELAWARE

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

137%
Of Delaware's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$145.4 Million
Natural Gas	$108.3 Million
Petroleum	$19.9 Million
Nuclear	$0
Average Residential Cost per kWh	13.9¢
Average Offshore Wind Cost per kWh	12.3¢

Wind Potential

Delaware's coastline would modestly allow for the development of 2.9 gigawatts of offshore wind power in economically recoverable areas. This offshore wind power could generate at least 137 percent of Delaware's current electricity generation, displace about 14.3 million metric tons of carbon dioxide and power approximately 937,000 average homes annually.

- Offshore wind power could supply 137 percent of Delaware's electricity – more than from all fossil fuel-based electric generation.
- Delaware has the highest offshore wind generating potential, as a portion of state demand, of any east coast state.
- More than $273 million are spent annually on fossil fuels for electricity generation in Delaware annually.[129]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
2.9 GW	137%	7.4 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in Delaware Relies Heavily on Fossil Fuels

Delaware's electricity generation created 6.6 million metric tons of carbon dioxide in 2008. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. Nearly 91% of Delaware's electricity comes from fossil-fuels.[130]

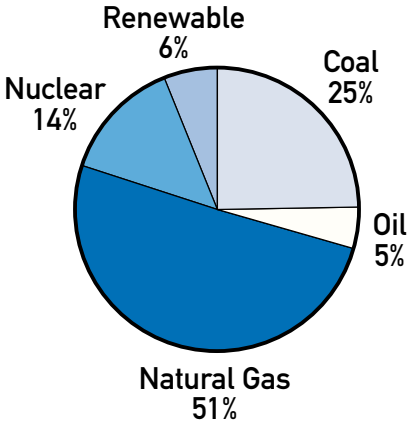
Offshore Wind offers Thousands of Jobs and Billions of Dollars for Delaware

The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[131] If only 2.9 gigawatts of offshore wind farms are installed off Delaware's coast, approximately 3,000 to 4,800 permanent jobs could be created in Delaware. This amount of offshore wind energy would represent $7 billion in clean energy investments in Delaware.

MASSACHUSETTS

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

130%
Of Massachusetts's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$326.2 Million
Natural Gas	$1.0 Million
Petroleum	$307.1 Million
Nuclear	$30.9 Million
Average Residential Cost per kWh	17.7¢
Average Offshore Wind Cost per kWh	11.3¢

Wind Potential

Massachusetts' coastline would modestly allow for the development of 13.8 gigawatts of offshore wind power in economically recoverable areas. This offshore wind power could generate at least 130 percent of Massachusetts' current electricity generation, displace about 77 million metric tons of carbon dioxide and power approximately 5 million average homes annually.

- Offshore wind power could supply 130 percent of Massachusetts' electricity – more than from all fossil fuel-based electric generation.
- Massachusetts' depends heavily on natural gas power – more than 50% of the state's power comes from natural gas.[143]
- Massachusetts has the second highest offshore wind generating potential, as a portion of state generating potential, after Delaware.
- More than $2.1 billion are spent annually on fossil fuels for electricity generation in Massachusetts annually.[144]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
13.8 GW	130%	39.9 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in Massachusetts Relies Heavily on Fossil Fuels

Massachusetts' electricity generation created 22.2 million metric tons of carbon dioxide in 2008. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. Nearly 81% of Massachusetts' electricity comes from fossil-fuels.[145]

Offshore Wind offers Thousands of Jobs and Billions of Dollars for Massachusetts

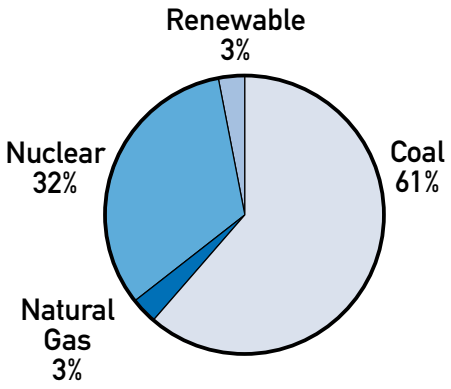
The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[146] If only 13.8 gigawatts of offshore wind farms are installed off Massachusetts' coast, approximately 14,500 to 23,000 permanent jobs could be created in Massachusetts. This amount of offshore wind energy would represent $33.1 billion in clean energy investments in Massachusetts.

OFFSHORE WIND ENERGY

NORTH CAROLINA

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

112%
Of North Carolina's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$2.2 Billion
Natural Gas	$322.8 Million
Petroleum	$45.6 Million
Nuclear	$170.2 Million
Average Residential Cost per kWh	09.5¢
Average Offshore Wind Cost per kWh	12.0¢

Wind Potential

North Carolina's coastline would modestly allow for the development of 37.9 gigawatts of offshore wind power in economically recoverable areas. This offshore wind power could generate at least 112 percent of North Carolina's current electricity generation, displace about 101.2 million metric tons of carbon dioxide and power approximately 12.8 million average homes annually.

- Offshore wind power could supply 112 percent of North Carolina's electricity – more than from all fossil fuel-based electric generation.
- North Carolina has the largest offshore wind capacity potential on the east coast.
- More than $2.5 billion are spent annually on fossil fuels for electricity generation in North Carolina annually.[120]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
37.9 GW	112%	101.2 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in North Carolina Relies Heavily on Fossil Fuels

North Carolina's electricity generation created 75.2 million metric tons of carbon dioxide in 2008. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. Nearly 64% of North Carolina's electricity comes from fossil-fuels.[121]

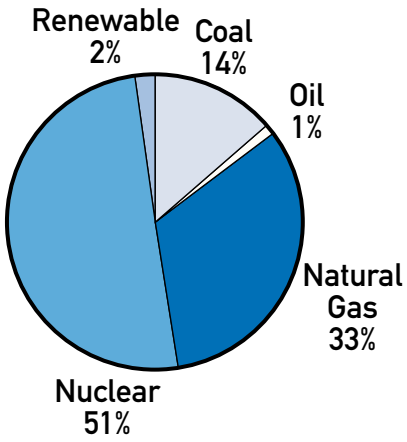
Offshore Wind offers Thousands of Jobs and Billions of Dollars for North Carolina

The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[122] If only 37.9 gigawatts of offshore wind farms are installed off North Carolina's coast, approximately 39,800 to 63,300 permanent jobs could be created in North Carolina. This amount of offshore wind energy would represent $91 billion in clean energy investments in North Carolina.

NEW JERSEY

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

92%
Of New Jersey's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$322.7 Million
Natural Gas	$1.3 Billion
Petroleum	$28.3 Million
Nuclear	$155.7 Million
Average Residential Cost per kWh	15.7¢
Average Offshore Wind Cost per kWh	12.2¢

Wind Potential

New Jersey's coastline would modestly allow for the development of 16 gigawatts of offshore wind power in economically recoverable areas. This offshore wind power could generate at least 92 percent of New Jersey's current electricity generation, displace about 81.4 million metric tons of carbon dioxide and power approximately 5.3 million average homes annually.

- Offshore wind power could supply 92 percent of New Jersey's electricity – more than from all fossil fuel-based electric generation.
- New Jersey has the third highest offshore wind capacity potential on the East Coast.
- More than $1.6 billion are spent annually on fossil fuels for electricity generation in New Jersey annually.[132]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
16 GW	92%	42.2 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in New Jersey Relies Heavily on Fossil Fuels

Nearly 51% of New Jersey's electricity comes from nuclear power plants, keeping the state's carbon dioxide emissions lower than other states. Despite this, New Jersey's electricity generation created 20.1 million metric tons of carbon dioxide in 2008.[133] Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification.

Offshore Wind offers Thousands of Jobs and Billions of Dollars for New Jersey

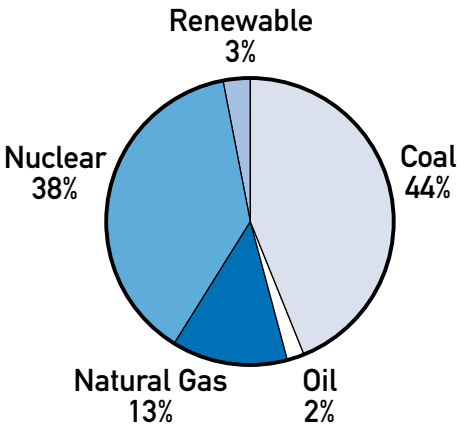
The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[134] If only 16 gigawatts of offshore wind farms are installed off New Jersey's coast, approximately 16,800 to 26,700 permanent jobs could be created in New Jersey. This amount of offshore wind energy would represent $38.4 billion in clean energy investments in New Jersey.

OFFSHORE WIND ENERGY

VIRGINIA

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

83%
Of Virginia's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$926.5 Million
Natural Gas	$762.6 Million
Petroleum	$196.5 Million
Nuclear	$147.7 Million
Average Residential Cost per kWh	09.6¢
Average Offshore Wind Cost per kWh	11.8¢

Wind Potential

Virginia's coastline would modestly allow for the development of 16 gigawatts of offshore wind power in economically recoverable areas. This offshore wind power could generate at least 83 percent of Virginia's current electricity generation, displace about 82 million metric tons of carbon dioxide and power approximately 5.5 million average homes annually.

- Offshore wind power could supply 83 percent of Virginia's electricity – more than from all fossil fuel-based electric generation.
- Virginia has the fourth largest offshore wind capacity potential on the east coast.
- More than $1.8 billion are spent annually on fossil fuels for electricity generation in Virginia annually.[123]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
16 GW	83%	43.6 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in Virginia Relies Heavily on Fossil Fuels

Virginia's electricity generation created 41.4 million metric tons of carbon dioxide in 2008. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. Nearly 58% of Virginia's electricity comes from fossil-fuels.[124]

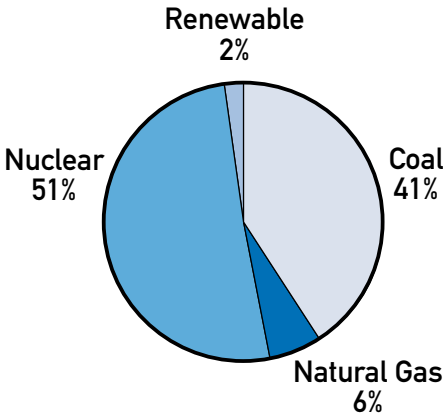
Offshore Wind offers Thousands of Jobs and Billions of Dollars for Virginia

The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[125] If only 16 gigawatts of offshore wind farms are installed off Virginia's coast, approximately 16,700 to 26,600 permanent jobs could be created in Virginia. This amount of offshore wind energy would represent $38.4 billion in clean energy investments in Virginia.

SOUTH CAROLINA

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

64%
Of South Carolina's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$956.5 Million
Natural Gas	$413.8 Million
Petroleum	$32 Million
Nuclear	$213.2 Million
Average Residential Cost per kWh	09.9¢
Average Offshore Wind Cost per kWh	12.9¢

Wind Potential

South Carolina's coastline would modestly allow for the development of 19.2 gigawatts of offshore wind power in economically recoverable areas. This offshore wind power could generate at least 64 percent of South Carolina's current electricity generation, displace about 46.9 million metric tons of carbon dioxide and power approximately 5.9 million average homes annually.

- Offshore wind power could supply 64 percent of South Carolina's electricity – and eliminate all fossil fuel consumption from electric generation.
- South Carolina has the second largest offshore wind capacity potential on the east coast after North Carolina.
- More than $1.4 billion are spent annually on fossil fuels for electricity generation in South Carolina annually. [117]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
19.2 GW	64%	46.9 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in South Carolina Relies Heavily on Fossil Fuels

Nearly 51% of South Carolina's electricity comes from nuclear power plants, keeping the state's carbon dioxide emissions lower than other states. Despite this, South Carolina's electricity generation created 42.5 million metric tons of carbon dioxide in 2008.[118] Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification.

Offshore Wind offers Thousands of Jobs and Billions of Dollars for South Carolina

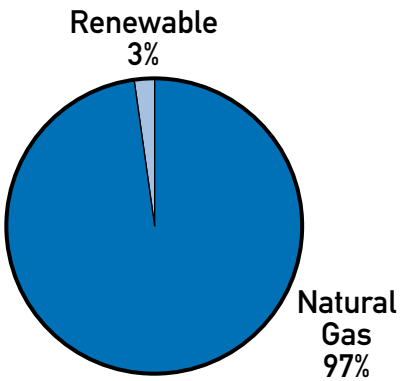
The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[119] If only 19.2 gigawatts of offshore wind farms are installed off South Carolina's coast, approximately 20,100 to 32,000 permanent jobs could be created in South Carolina. This amount of offshore wind energy would represent $46 billion in clean energy investments in South Carolina.

OFFSHORE WIND ENERGY

RHODE ISLAND

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

38%
Of Rhode Island's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$0
Natural Gas	$414.3 Million
Petroleum	$3.2 Million
Nuclear	$0
Average Residential Cost per kWh	17.5¢
Average Offshore Wind Cost per kWh	11.9¢

Wind Potential

Rhode Island's coastline would modestly allow for the development of 700 gigawatts of offshore wind power in economically recoverable areas. This offshore wind power could generate at least 38 percent of Rhode Island's current electricity generation, displace about 1.1 million metric tons of carbon dioxide and power approximately 253,000 average homes annually.

- Offshore wind power could supply 38 percent of Rhode Island's electricity.
- Rhode Island depends heavily on natural gas power – more than 97% of the states' power comes from natural gas.[139]
- More than $400 million are spent annually on fossil fuels for electricity generation in Rhode Island annually.[140]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
700 MW	38%	2.0 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in Rhode Island Relies Heavily on Fossil Fuels

Rhode Island's electricity generation created 3 million metric tons of carbon dioxide in 2008. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. Nearly 98% of Rhode Island's electricity comes from fossil-fuels.[141]

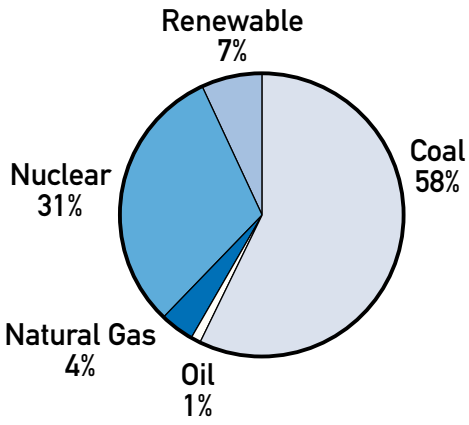
Offshore Wind offers Thousands of Jobs and Billions of Dollars for Rhode Island

The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[142] If only 700 megawatts of offshore wind farms are installed off Rhode Island's coast, approximately 800 to 1,200 permanent jobs could be created in Rhode Island. This amount of offshore wind energy would represent $1.7 billion in clean energy investments in Rhode Island.

MARYLAND

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

36%
Of Maryland's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$631.3 Million
Natural Gas	$182.1 Million
Petroleum	$126.2 Million
Nuclear	$69.7 Million
Average Residential Cost per kWh	13.8¢
Average Offshore Wind Cost per kWh	12.2¢

Wind Potential

Maryland's coastline would modestly allow for the development of 4.7 gigawatts of offshore wind power in economically recoverable areas. This offshore wind power could generate at least 36 percent of Maryland's current electricity generation, displace about 23.7 million metric tons of carbon dioxide and power approximately 1.6 million average homes annually.

- Offshore wind power could supply 36 percent of Maryland's electricity – an amount equivalent to oil and natural gas-based electricity, as well as 54% of coal-based power.
- Maryland spends the fifth-most on the east coast for oil for electricity generation.
- More than $900 million are spent annually on fossil fuels for electricity generation in Maryland annually.[126]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
4.7 GW	36%	12.3 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in Maryland Relies Heavily on Fossil Fuels

Maryland's electricity generation created 29.1 million metric tons of carbon dioxide in 2008. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. Nearly 62% of Maryland's electricity comes from fossil-fuels.[127]

Offshore Wind offers Thousands of Jobs and Billions of Dollars for Maryland

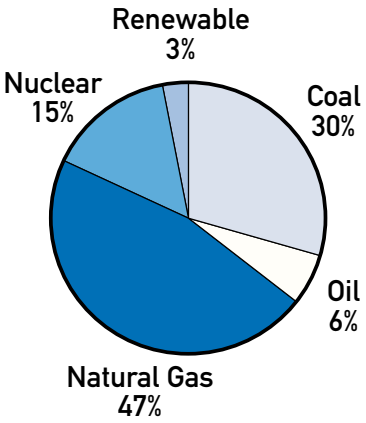
The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[128] If only 4.7 gigawatts of offshore wind farms are installed off Maryland's coast, approximately 4,900 to 7,800 permanent jobs could be created in Maryland. This amount of offshore wind energy would represent $11.3 billion in clean energy investments in Maryland.

OFFSHORE WIND ENERGY

FLORIDA

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

16%
Of Florida's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$1.8 Billion
Natural Gas	$7.2 Billion
Petroleum	$1.5 Billion
Nuclear	$156.9 Million
Average Residential Cost per kWh	11.7¢
Average Offshore Wind Cost per kWh	13.1¢

Wind Potential

Florida's long Atlantic coastline would allow for the development of at least 10.3 gigawatts of offshore wind power in economically recoverable areas. This offshore wind power could generate at least 16 percent of Florida's current electricity generation, displace about 24.7 million metric tons of carbon dioxide and power approximately 3.1 million average homes annually.

- More oil is consumed in Florida for electricity generation than any other state.[111]
- Offshore wind power could supply 16 percent of Florida's electricity – or about three times the amount of electricity produced from oil in the state.
- More than $1.5 billion are spent annually on oil for electricity generation in Florida – more than all the other east coast

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
10.3 GW	16%	24.7 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in Florida Relies Heavily on Fossil Fuels

In 2008, Florida's electricity generation created more than 120 million metric tons of carbon dioxide. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. More oil is burned in Florida for electricity than any other state.

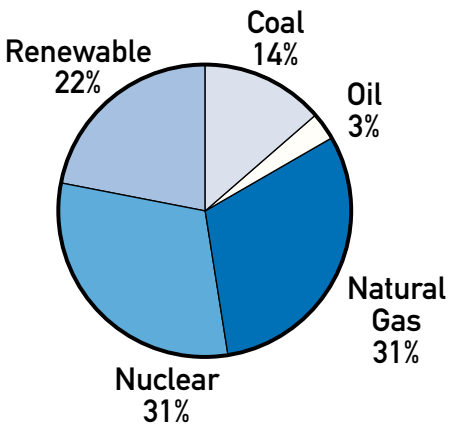
Offshore Wind offers Thousands of Jobs and Billions of Dollars for Florida

The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[112] If only 10.3 gigawatts of offshore wind farms are installed off Florida's coast, approximately 10,200 to 17,300 permanent jobs could be created in Florida. This amount of offshore wind energy would represent $24.5 billion in clean energy investments in Florida.

NEW YORK

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

12%
Of New York's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$527.8 Million
Natural Gas	$3.4 Billion
Petroleum	$658.8 Million
Nuclear	$205.5 Million
Average Residential Cost per kWh	18.3¢
Average Offshore Wind Cost per kWh	12.3¢

Wind Potential

New York's coastline would modestly allow for the development of 4.7 gigawatts of offshore wind power in economically recoverable areas of the Atlantic Ocean. This offshore wind power could generate at least 12 percent of New York's current electricity generation, displace about 23.6 million metric tons of carbon dioxide and power approximately 1.5 million average homes annually.

- Offshore wind power could supply 12 percent of New York's electricity – or nearly the same amount as coal-fired power plants in the state.
- New York spends the second most on oil for electricity generation on the east coast – nearly $660 million annually.[135]
- More than $4.4 billion are spent annually on fossil fuels for electricity generation in New York annually.[136]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
4.7 GW	12%	12.3 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles and less than 30 meters deep.

Electricity Generation in New York Relies Heavily on Fossil Fuels

New York's electricity generation created 47.1 million metric tons of carbon dioxide in 2008. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. Nearly 48% of New York's electricity comes from fossil-fuels. New York generates the most hydroelectric power on the East Coast, a renewable, carbon-free energy resource.[137]

Offshore Wind offers Thousands of Jobs and Billions of Dollars for New York

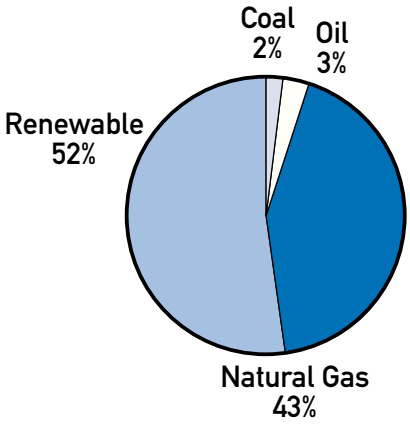
The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed. [138] If only 4.7 gigawatts of offshore wind farms are installed off New York's coast, approximately 5,000 to 7,900 permanent jobs could be created in New York. This amount of offshore wind energy would represent $11.3 billion in clean energy investments in New York.

OFFSHORE WIND ENERGY

MAINE

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

913%
Of Maine's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$10.2 Million
Natural Gas	$274.7 Million
Petroleum	$39.8 Million
Nuclear	$0
Average Residential Cost per kWh	16.2¢
Average Offshore Wind Cost per kWh	11.3¢

Wind Potential

All areas between 3-24 nautical miles from Maine's coastline are in water greater than 30 meters depth – or the typical maximum depth for offshore wind farms. So-called "deepwater" offshore wind turbine technology is currently in development that would make Maine's coast available for development. When deepwater offshore wind turbine technology becomes commercially available, Maine's coastline would modestly allow for the development of 38.9 gigawatts of offshore wind power in deepwater areas. This offshore wind power could generate at least 913 percent of Maine's current electricity generation, displace about 216.8 million metric tons of carbon dioxide and power approximately 14.2 million average homes annually.

- Deepwater offshore wind power could supply 913 percent of Maine's electricity - and eliminate fossil fuel consumption in the state for electric generation.
- More than half of Maine's electricity comes from renewable energy resources, like wood waste and biomass.[151]
- More than $324.7 million are spent annually on fossil fuels for electricity generation in Maine annually.[152]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
38.9 GW	913%	112.4 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles.

Electricity Generation in Maine Relies Heavily on Fossil Fuels

Maine's electricity generation created 5.3 million metric tons of carbon dioxide in 2008. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. Nearly 48% of Maine's electricity comes from fossil-fuels.[153]

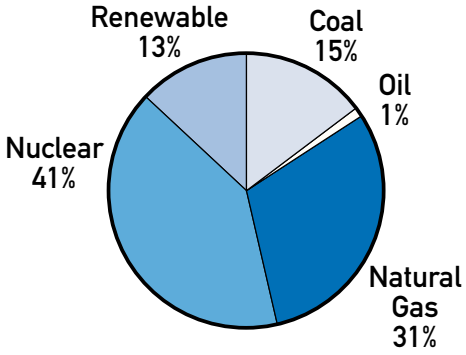
Deepwater Offshore Wind offers Thousands of Jobs and Billions of Dollars for Maine

The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[154] If only 38.9 gigawatts of offshore wind farms are installed off Maine's coast, approximately 40,900 to 65,000 permanent jobs could be created in Maine. This amount of offshore wind energy would represent $94.4 billion in clean energy investments in Maine.

NEW HAMPSHIRE

In addition to the environmental benefits over traditional energy sources, like coal, oil, natural gas and nuclear power, a significant amount of offshore wind energy potential exists on the Atlantic coast. If developed even modestly, offshore wind energy could supply almost half of the East Coast's current electricity generation – while creating thousands of jobs, stabilizing electric costs, cutting fossil fuel consumption and reducing harmful air emissions. The prospects of offshore wind power are too large to ignore, even at this early stage of the industry's development.

Current Energy Mix



Offshore Wind Potential

21%
Of New Hampshire's Electricity Generation

Annual Electricity Fuel Costs	
Coal	$129.8 Million
Natural Gas	$308.8 Million
Petroleum	$36.5 Million
Nuclear	$51.9 Million
Average Residential Cost per kWh	15.7¢
Average Offshore Wind Cost per kWh	11.8¢

Wind Potential

All areas between 3-24 nautical miles from New Hampshire's coastline are in water greater than 30 meters depth – or the typical maximum depth for offshore wind farms. So-called "deepwater" offshore wind turbine technology is currently in development that would make New Hampshire's coast available for development. When deepwater offshore wind turbine technology becomes commercially available, New Hampshire's coastline would modestly allow for the development of 1.2 gigawatts of offshore wind power in deepwater areas. This offshore wind power could generate at least 21 percent of New Hampshire's current electricity generation, displace about 6.5 million metric tons of carbon dioxide and power approximately 426,000 average homes annually.

- Deepwater offshore wind power could supply 21 percent of New Hampshire's electricity – about half the electricity from all fossil fuel-based electric generation.
- No fossil fuel reserves are found in New Hampshire, and so the state imports all its fossil fuels.[147]
- More than $475 million are spent annually on fossil fuels for electricity generation in New Hampshire annually.[148]

Offshore Wind Potential	Offshore Wind as Percent of Electric Generation	Carbon Dioxide Displaced
1.2 GW	21%	3.4 million metric tons

Note: Wind potential considers only one third of waters between 3 and 24 nautical miles.

Electricity Generation in New Hampshire Relies Heavily on Fossil Fuels

New Hampshire's electricity generation created 6.8 million metric tons of carbon dioxide in 2008. Carbon dioxide is a greenhouse gas that can cause climate change and ocean acidification. Burning fossil fuels, like coal, oil and natural gas causes climate change and ocean acidification. Nearly 47% of New Hampshire's electricity comes from fossil-fuels.[149]

Deepwater Offshore Wind offers Thousands of Jobs and Billions of Dollars for New Hampshire

The United Kingdom expects to create between 1 and 1.7 full-time equivalent jobs for each megawatt of offshore wind power installed.[150] If only 1.2 gigawatts of offshore wind farms are installed off New Hampshire's coast, approximately 1,300 to 2,100 permanent jobs could be created in New Hampshire. This amount of offshore wind energy would represent $2.9 billion in clean energy investments in New Hampshire.

OFFSHORE WIND ENERGY

NOTES

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OFFSHORE WIND ENERGY

ENDNOTES

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