# Contention 1: The World Today

### Though the impetus for offshore wind exists, it is being hampered by lack of investment security which inhibits economic growth modeled by other countries

Caperton et al 12

Encouraging Investment Is Key to U.S. Offshore Wind Development Congress Should Push Targeted Incentives By [Richard W. Caperton](http://www.americanprogress.org/about/staff/caperton-richard-w/bio/), [Michael Conathan](http://www.americanprogress.org/about/staff/conathan-michael/bio/), and [Jackie Weidman](http://www.americanprogress.org/about/staff/weidman-jackie/bio/) | January 12, 2012 <http://www.americanprogress.org/issues/green/news/2012/01/12/10951/encouraging-investment-is-key-to-u-s-offshore-wind-development/> Richard W. Caperton is the Director of Clean Energy Investment, Michael Conathan is the Director of Ocean Policy, and Jackie Weidman is a Special Assistant for the Energy Opportunity team at American Progress

#### 2011 was pretty good for advancing the U.S. offshore wind industry in many ways. The Cape Wind project proposed for the waters off Massachusetts [received its final permits](http://www.doi.gov/news/pressreleases/Salazar-Announces-Approval-of-Cape-Wind-Energy-Project-Construction-and-Operations-Plan.cfm) from the Department of the Interior, theoretically paving the way to begin construction on America’s first offshore wind farm. The Obama administration advanced its “[Smart from the Start](http://www.whitehouse.gov/blog/2011/02/10/smart-start-building-clean-energy-future)” initiative, designating wind energy areas off the coasts of five Atlantic coast states, and it is actively pursuing leases with potential developers. And projects in state waters off New Jersey, Texas, and Ohio took important steps and cleared hurdles in the planning and permitting stages. Unfortunately, as has been the case throughout the history of offshore wind in this country, it soon became another example of three steps forward, two steps back. Less than a month after Interior gave Cape Wind the green light, the Department of Energy informed the company it would not be eligible for a loan guarantee. Then, in the waning days of the year, another offshore wind pioneer, NRG Bluewater Wind, announced that it would [back out of a three-year-old power-purchase agreement](http://www.delawareonline.com/article/20111228/NEWS08/112280330/Bluewater-terminates-Delmarva-contract) with Delmarva Power because it couldn’t generate sufficient investor interest. Meanwhile, developers in the United Kingdom, Denmark, Germany, Spain, France, Norway, China, South Korea, and other countries are proving that offshore wind is a viable economic model. They have permitted [more than 40,000 MW of offshore wind energy capacity](http://www.americanprogress.org/issues/green/report/2011/06/01/9720/clean-energy-from-americas-oceans/). The United States has only issued permits for 488 MW. (see table) Not only does this delay reduction in greenhouse gas emissions and our transition to renewable energy sources, but it also prevents American innovators from taking advantage of the design, manufacturing, and construction jobs that go along with it. In Europe, where more than 4,000 MW of offshore wind capacity is already installed, developers expect to create [169,000 jobs by 2020 and 300,000 by 2030](http://www.renewableenergymagazine.com/energias/renovables/index/pag/wind/colleft/colright/wind/tip/articulo/pagid/18097/botid/48/).

## Plan: The United States federal government should; increase financial incentives for wind based energy production by passing House Resolution 3238

The Library of Congress 11

H.R.3238 -- Incentivizing Offshore Wind Power Act (Introduced in House - IH) HR 3238 IH 112th CONGRESS 1st Session H. R. 3238 To amend the Internal Revenue Code of 1986 to provide for an investment tax credit related to the production of electricity from offshore wind. IN THE HOUSE OF REPRESENTATIVES October 18, 2011 http://thomas.loc.gov/cgi-bin/query/z?c112:H.R.3238:

#### `(a) In General- For purposes of section 46, the qualifying offshore wind facility credit for any taxable year is an amount equal to 30 percent of the qualified investment for such taxable year with respect to any qualifying offshore wind facility of the taxpayer. `(b) Qualified Investment- `(1) IN GENERAL- For purposes of subsection (a), the qualified investment for any taxable year is the basis of eligible property placed in service by the taxpayer during such taxable year which is part of a qualifying offshore wind facility. `(2) CERTAIN QUALIFIED PROGRESS EXPENDITURES RULES MADE APPLICABLE- Rules similar to the rules of subsections (c)(4) and (d) of section 46 (as in effect on the day before the enactment of the Revenue Reconciliation Act of 1990) shall apply for purposes of this section.

# Solvency

### The key to unlocking US offshore wind energy is Investment tax credits

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Encouraging Investment Is Key to U.S. Offshore Wind Development Congress Should Push Targeted Incentives By [Richard W. Caperton](http://www.americanprogress.org/about/staff/caperton-richard-w/bio/), [Michael Conathan](http://www.americanprogress.org/about/staff/conathan-michael/bio/), and [Jackie Weidman](http://www.americanprogress.org/about/staff/weidman-jackie/bio/) | January 12, 2012 <http://www.americanprogress.org/issues/green/news/2012/01/12/10951/encouraging-investment-is-key-to-u-s-offshore-wind-development/> Richard W. Caperton is the Director of Clean Energy Investment, Michael Conathan is the Director of Ocean Policy, and Jackie Weidman is a Special Assistant for the Energy Opportunity team at American Progress

#### While NRG Bluewater Wind would clearly benefit from a production tax credit extension, other incentives may be more useful for this project. For onshore wind projects—with relatively predictable performance over the life of the project—the production tax credit is very valuable. For offshore wind, however, the credit is less valuable to the project developer. Because offshore wind turbines are relatively new technology and are deployed in environments that have never been used for energy generation, developers can’t predict how much power a turbine will generate as accurately as they can with onshore wind. Thus, developers aren’t as certain about how big their tax credits will be, which affects the profitability of the project. Congress could fix this problem by making offshore wind eligible for the [investment tax credit](http://www.americanprogress.org/issues/green/report/2012/01/10/10956/good-government-investments-in-renewable-energy/). Instead of getting a tax credit as power is generated, the investment tax credit would allow offshore wind developers to get an upfront credit for 30 percent of their initial investment, encouraging more to invest. This is much more useful for technologies with more performance uncertainty—like offshore wind—and would be a smart example of matching the tax code to the unique circumstances facing innovative industries.

### Planned offshore sites will be able to create 45% more energy than is being used while avoiding heavy traffic waters and out of the way of migratory birds

Pratson 10

[The Herald-Sun - Wind power should play a bigger role in debate over energy production](http://www.heraldsun.com/view/full_story/7813284/article-Wind-power-should-play-a-bigger-role-in-debate-over-energy-production#ixzz26wlpOMSS) Wind power should play a bigger role in debate over energy production 2 years ago Lincoln F. Pratson is a professor at the Nicholas School of the Environment at Duke University.

#### The case for offshore oil in these waters does not look promising. The Minerals Management Service estimates about 4 billion barrels of technically recoverable reserves exist off the East Coast. According to Energy Information Administration (EIA) data, this would satisfy a little more than 200 days of current U.S. oil consumption, but only if all the oil was discovered and produced instantly. This is unlikely. From exploration to production, a successful offshore well takes 10 or more years to bring on line. Based on federal drilling data for the Gulf of Mexico, it could take 40 years to find all the estimated reserves in East Coast waters and still longer to produce those that are in fact commercially viable. Even if we get lucky and are able to produce the oil as fast as we find it, the amount produced would only satisfy 1.5 percent of current U.S. annual consumption and just 0.3 percent of global annual consumption. The second figure is the more relevant one because oil is a commodity sold on the world market, so any East Coast oil will not be for the exclusive use of the U.S. What all this means is that unless East Coast oil supplies are not only significantly larger than current estimates but also can be found and produced much faster than they have been in the Gulf of Mexico, they will not appreciably affect the price of oil or meaningfully improve U.S. energy security. Offshore wind resources, however, appear much more promising. A team of scientists, led by University of Delaware Professor Willett Kempton, has estimated the amount of potential wind power that could be harnessed in the Mid-Atlantic Bight -- a region extending from Massachusetts to North Carolina. The team found that using existing wind turbine technology, deployed over appropriate water depths and excluding areas of heavily trafficked waters and paths of migratory birds, offshore wind in this region could annually supply about 45 percent more energy than the Mid-Atlantic states currently use for electricity plus the energy the region uses for heating buildings, and for cars and light-duty trucks.

### Govt incentives are needed to stimulate investors to create better turbines which cuts costs to make OWE cost competitive with traditional energy with a larger population access.

Trabish 11

<http://www.greentechmedia.com/articles/read/how-much-will-offshore-wind-really-cost/> How Much Will Offshore Wind Really Cost? A leading U.S. researcher explains how and why deep ocean offshore wind can be the cost-effective renewable energy answer. HERMAN K. TRABISH: MARCH 17, 2011 The cost of harvesting offshore wind energy may be a lot lower than the early numbers from controversial projects suggest.

There are “almost 4,000 gigawatts of capacity within 50 nautical miles of U.S. coasts,” said Dr. Habib J. Dagher, Director of both the Composite Center and the U.S. Department of Energy (DOE)-funded DeepC Wind Consortium at the University of Maine, “and the total U.S. electricity capacity is around 1,000 gigawatts.” It is, Dagher said, “the largest single opportunity we have in renewable energy.” And, he added, “the majority of our population lives in the coastal states and has access to this resource.” The real question, however, is whether the resource can be harvested competitively. Dagher says his research consortium’s findings suggest it can if it is done right. “It’s unfortunate,” Dagher said, discussing the small Block Island shallow water offshore wind project off Rhode Island and the controversial Cape Wind offshore project off Massachusetts, “that people say that’s the price of offshore wind.” The five-to-eight-turbine Block Island’s power purchase agreement (PPA), currently under legal challenge, is priced at 24.4 cents per kilowatt-hour. The 130-turbine Cape Wind’s PPA is priced at 18.7 cents per kilowatt-hour. The average price of electricity in New England vacillates in the 15 to 17 cents per kilowatt-hour range. The cost of electricity from those emerging offshore projects is, Dagher said, very expensive because they have “large uncertainties and a large learning curve. Those costs do not truly reflect where this industry will be in ten years if we scale up the industry properly.” They are, he added, “pioneering projects.” “Deep offshore wind and shallow or medium depth offshore wind are completely different technologies,” Dagher explained of the DeepC Consortium’s thrust. “The basic difference is the cost of construction offshore.” Europe has built more than 20 shallow and medium-depth projects using heavy equipment to put turbines and other infrastructure in place. "The jack-up barges and cranes will cost you $150,000 to $200,000 a day to run. Building offshore is very costly. And there is the cost of capital, as well,” Dagher said. “The more building you do in the water, the more the capital costs go up.” Dagher and his group want to build floating turbines that can be towed out to sea and anchored, eliminating the costs and risks of construction. “Our approach is to do as much as we can on land, pre-assemble these units, and do very little in the water. That’s how we’re going to save money.” Funded by DOE after being chosen in open competition, Dagher’s DeepC Consortium has evaluated fourteen proprietary floating turbine proposals and selected six to study in detail.

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Careful comparisons indicate that five-megawatt floating turbines will require no more “material costs” than fixed turbines, but will eliminate the costs of ocean construction. According to turbine manufacturers’ rule-of-thumb, Dagher said, “If you’re going to build something on land and it’s going to cost you a dollar, if you’re going to build it at quay-side, it might cost you three or four dollars and if you’re going to go out and build it twenty miles offshore, it might cost you six to ten dollars.” Instead of “being at the mercy of the elements” in the “two or three months of the year you can do this kind of work” and paying hundreds of thousands of dollars in barge and crane costs, a quay-side-built, five-megawatt floating turbine can be towed twenty miles offshore with a twenty-ton tugboat in ten hours. Using this strategy, Dagher’s group has concluded, offshore wind-generated electricity can almost match the price of electricity consumers are now paying, exclusive of the costs for delivering it. “Half of the price is transmission and distribution, the other half is generating electrons,” Dagher said. “If I’m paying sixteen cents, eight cents is used to make the electrons.” The goal of Dagher’s consortium is to get the cost of generation “to ten cents per kilowatt-hour, plugged into the grid, by 2020, if we scale up to a thousand megawatts.” The crucial assumption, he stipulated, is that the industry matures enough by 2020 to the point where it achieves the capacity to build 1,000-megawatt projects. At that size, economies of scale will make it possible to build floating wind farms at costs that will meet the ten cents goal. That goal includes the cost of transmitting the electricity generated at sea to the grid, a cost that will be considerable for early and small projects like Block Island and Cape Wind. When projects such as the Google-led Atlantic Wind Development consortium’s Atlantic Wind Connection transmission backbone are in place off the coasts, the costs of getting electricity to the grid will go down. “Transmission and distribution is a key barrier,” Dagher said. “I think it’s a critical project.” Separating the building of transmission from the building of the wind farm “takes a huge load off the investors, the developers and the capital.” One other thing is needed, however. “Everything starts with government policy,” Dagher said. "The U.S. needs a goal, a target,” he insisted. “Industry is ready to move but they need a stable policy.” And the policy, he added, must have incentives that ease the burden of taking on the enormous risks of entirely new and unproven technologies -- like floating wind turbines.

# ADV 2: The Grid

### Offshore wind projects are key to reducing the strain on overstretched energy grids

NWF 12

THE TURNING POINT FOR ATLANTIC OFFSHORE WIND ENERGY: Time for Action to Create Jobs, Reduce Pollution, Protect Wildlife, and Secure America’s Energy Future N A T I O N A L W I L D L I F E F E D E R A T I O N 2 0 1 2 <http://www.nwf.org/~/media/PDFs/Global-Warming/Policy-Solutions/NWF_2012OffshoreWind.ashx>

#### America’s East Coast is an ideal location for offshore wind energy because of the region’s high electricity demand and population density. This massive power source lies in close proximity to America’s largest demand centers, providing an opportunity to meet the region’s growing energy needs with clean power.A diverse energy portfolio includingoffshore wind can reduce the strain on existing sources of powerand alleviate congestionduring peak demand periods. And wind is there when we need it most: specifically,offshore winds blow strongest during the day and at other times of high demand –- such as heat waves38 –-providing a steady stream of much-needed clean power to the grid in areas already suffering from poor air quality**.** 39 Innovative approaches to offshore transmission can enhance these benefits, by linking up multiple wind energy projects and providing opportunities to connect into several energy markets.

### Offshore wind can sustain energy grids through new lines to meet demand in the peak moments of the year

Deepwater Wind 12

<http://dwwind.com/news/as-temperatures-soar-in-the-northeast-offshore-wind-farm-would-produce-massive-amount-of-electricity> As Temperatures Soar in the Northeast, Offshore Wind Farm Would Produce Massive Amount of Electricity July 18, 2012

#### Hot temperatures are a boon for offshore wind energy**.** Deepwater Wind today released data showing that its planned Deepwater Wind Energy Center **(**DWEC**),** a 900 MW offshore wind farmplanned 30 miles east of Montauk and 20 miles south of the Massachusetts and Rhode Island mainland**,** would reach maximum output on the hottest days of summer in the Northeast, just when electric grids need it. Deepwater Wind has proposed to sell power from DWEC to the Long Island Power Authority via a new transmission system that connects, for the first time, Long Island and southeastern New England. Deepwater Wind also intends to market power from DWEC to Massachusetts and Rhode Island.During the first heat wave of the season, in late June, temperatures and the electric demand on Long Island surged. For example, on June 21, a new high for the date was set on Long Island as the temperature peaked at 95 degrees in the late afternoon. Electric demand followed that temperature rise. Likewise, demand for electricity in New England also soared during the heat wave.Datamodeledby Deepwater Wind’s meteorological experts, AWS Truepower, show that DWEC would have been operating near its maximum output during the afternoons of both June 20 and June 21,when the heat wave was at its peak. While the wind farm is projected to produce at an average of approximately 45% capacity over the course of a full year, it would have been producing much more – in the range of 65 – 90% capacity— during most of the hottest hours of the heat wave. “One of the great benefits of offshore wind power is that its output surges during those hot afternoons in the dog days of summer**,”** said Deepwater Wind CEO Bill Moore. “This is because of the well-known ‘sea breeze’ effect**.** When temperatures rise on shore and heat the air, that hot air rises. The resulting drop in air pressure on shore causes cooler air from the ocean to accelerate toward the coast. Those cooler ocean breezes also produce steady wind that powers our offshore wind turbines.”

### Unless the grid is stabilized, it costs the US 200 billion dollars in GDP by 2020 and destroys the US economy

ASCE 11

FAiluRE to ACt The economic impacT of current Investment trends In ElEctr icity Infrastructure <http://www.asce.org/uploadedFiles/Infrastructure/Failure_to_Act/SCE41%20report_Final-lores.pdf>

#### Three key factors affect the sufficiency and reliability of electricity infrastructure: (1) the age of infrastructure, (2) the capacity of infrastructure, and (3) the spatial pattern of infrastructure relative to the locations of electricity generation and consumption. All three affect requirements for future investment in electricity infrastructure.This study examined the magnitude of expected need for future investment in electricity infrastructure and compared it to recent investment trends (assuming a continuing evolution of technologies). Although recent investment trends show a distinct improvement in infrastructure investment over earlier decades, evencontinuing the rate of average annual investment seen over the past decade is not expected to cover all of the increase in demand for electricity**.** This report, conducted after significant annual investment increases by privately-owned utilities since 2005 were made, estimates the annual cost to businesses, households, and institutions at about $16 billion in 2012 and averaging $33 billion annually through 2040 under current investment trends.This analysis showed that if current trends are to continue, then the nation will face a cumulative electricity infrastructure funding gap of $107 billion by 2020, rising to $732 billion by 2040. In turn, an investment shortfall of that magnitude will cost businesses and households a cumulative $197 billion by 2020 and $998 billion by 2040. These costs are passed into the U.S. economy in the form of increased business and household expenses, which will also affect the nation’s competitiveness in economic trade. Economic models indicate that this could ultimately result in a $500 billion cumulative loss in GDP by 2020 and about $2.5 trillion by 2040.

### We control timeframe – ASCE predicts the system will break down by 2020

Dade 12

Published: July 07, 2012 by Corey Dade <http://m.npr.org/story/156402499> Gridlock: Storms, Blackouts Expose Power Problems

#### As hundreds of thousands swelter without power a week after a violent storm pummeled the Midwest and Mid-Atlantic**,** energy experts say the future will look even worse if the nation's aging, congested electrical grid isn't upgraded. Customers chafe at rising utility bills, but the energy industry warns that the alternative is even scarier: Unless $673 billion is invested in the system, it could break down by 2020**,** according to an American Society of Civil Engineers report released in April. The grid's dependability has become an increasing concern as the system strains to meet increased demand. Bottlenecks in the grid and equipment failures are causing more brownouts and blackouts, energy experts say. The civil engineers say that if investment in the system isn't increased by at least $1 billion a year, service interruptions between now and 2020 will cost $197 billion. "The consequences of the brownouts and power surges will cost more than the rising rates," says Steven Landau, an economic consultant who was the lead author of the ASCE report. "It's a problem that's important to solve because, more and more, we evolve as a technological society by plugging things into the wall."

### Economic collapse goes global; globalization is the culprit

Royal 10

Jedediah, Director of Cooperative Threat Reduction at the U.S. Department of Defense, “Economic Integration, Economic Signaling and the Problem of Economic Crises,” in Economics of War and Peace: Economic, Legal and Political Perspectives, ed. Goldsmith and Brauer, p. 213-215

#### On the one hand, financial liberalization tends to relax borrowing constraints, leading to higher investment and higher average growth; on the other hand, it encourages risk-taking, generates financial fragility and increases the probability of financial crises, which often have severe recessionary consequences. As bank regulations are liberalized, banks have incentives to accept greater risk in their financial portfolio, resulting in structural fragility that gives way when economic conditions deteriorate. Traditional economic theory would suggest that investors, or even states, could reduce their vulnerability through investment diversification. Interestingly, Goldstein and Pauzner (2004) find that diversification between countries becomes less useful as a measure of protection against global downturns because of an increase in the likelihood that markets will co move or co vary. They write: The fact that different countries share the same group of investors leads to the transmission of negative shocks from one part of the world to another. Thus, the realization of a financial crisis in one country can induce a crisis in other countries as well. This generates a positive correlation between the returns on investments in different countries and thus reduces the effectiveness of diversifying investments across countries. (Goldstein & Puazner, 2004, p. 152; see also Quinn & Voth, 2008) Pro cyclical financial flows have also been linked to a lack of clarity in international financial markets that can lead to substantial market imperfections. Calvo and Mendoza (2000), for example, argue that globalization as it exists today leads to the possibility of crisis by weakening incentives to gain costly information and by widening the range of portfolios in which investors mimic patters. Because investors have less information and are more willing to follow the herd, the global system will have large capital flows and pro-cyclical patters, leading to broad volativity among all participants in the global system. Furthermore, the history of state responses to economic crises would appear to exacerbate the problem of opacity in the global financial system. Bailouts, stimulus packages and international crisis lending create a moral hazard problem that has the long-term impact of encouraging the inflation of bubbles, increasing the incentives for unsustainable short term capital flows. (Corsetti, Pesenti & Roubini, 1999) This leads to a second contention common among contemporary economic research: that interdependence leads to economic crises becoming contagious. The ‘contagion’ hypothesis suggests that the linkages created through global integration for the purposes of economic efficiency are the very same linkages through which economic and financial crises are transmitted from one state to another. In times of relative economic independence, an economic shock remains localized, affecting only or at least primarily the state where the shock originates. Yet in times of economic interdependence, shocks become contagious and are spread within the system, often in unpredictable ways. As such, states that are dependent on the global ecosystem are vulnerable to its ups and downs.

# Advantage 1 is Industry Shift

### Offshore wind energy projects now set the stage for more and larger scale wind projects in the future and trade off with natural gas demands

EARPC 12

<http://www.environmentamerica.org/reports/ame/turning-point-atlantic-offshore-wind-energy> Released by: Environment America Research and Policy Center Release date: Thursday, September 13, 2012

#### America’s immense offshore wind resource lies in close proximity to some of our biggest cities, presenting an opportunity to utilize clean energy to meet the growing demand for power along the East Coast.  Offshore winds blow strongest during the day and at other times of peak demand such as heat waves, as documented by real-time wind monitors off Massachusetts and Rhode Island. Plugging offshore wind into the grid will lead to lower, more predictable energy prices over time. For example, the New York Independent System Operator has found that for every 1,000 MW of wind on the system, consumers save $300 million in wholesale energy costs. While natural gas prices are currently at historical lows, the region needs to make energy investment decisions for the next several decades. By diversifying the region’s energy portfolio, offshore wind energy presents an opportunity for utilities to lock in at a known price for the long term, creating a hedge to protect against future fossil fuel price spikes. Industry trends driving down the cost of offshore wind energy include moving toward larger projects farther offshore in order to access economies of scale, a higher wind resource, and areas with fewer conflicts.

### Industry shift comes from price stability

Holland 12

BY ANDREW HOLLAND ON MAR 2, 2012 Andrew Holland is a Washington-based expert on energy, climate change, and infrastructure policy. He currently serves as Senior Fellow for Energy and Climate Policy at the American Security Project, a non-partisan think tank based in Washington, DC. Why U.S. Energy Policy is Poised for a Fundamental Shift <http://www.consumerenergyreport.com/2012/03/02/why-u-s-energy-policy-is-poised-for-a-fundamental-shift/>

#### If the U.S. was to shift its emphasis away from consumers, and instead become a real energy producer, that would imply some significant policy shifts. First, low prices cannot be the sole policy goal, as we hear from [politicians](http://www.kansascity.com/2012/02/28/3457514/as-i-see-it-on-energy-obama-is.html) on both sides. Instead, the industry doesn’t demand high energy prices, but stable energy prices. Only when prices are predictable over the long-term can the real investments be made that promote an industry.

### Natural Gas prices are more volatile than other energy types

#### Energy Information Agency 98

Natural Gas 1998 Issues and Trends Why Do Natural Gas Prices Fluctuate So Much? http://www.eia.gov/pub/oil\_gas/natural\_gas/analysis\_publications/why\_do\_prices\_fluctuate/html/ngbro.html

#### The term “price volatility” is used to describe rapid price fluctuations of a commodity. Volatility is measured by the day-to-day percentage difference in the price of the commodity. The degree of variation defines a volatile market, not the level of prices. Prices of basic energy (natural gas, electricity, heating oil) are generally more volatile than prices of other commodities.  One reason that energy prices are so volatile is that many consumers are extremely limited in their ability to substitute between fuels when the price of natural gas, for example, fluctuates. Residential users often cannot replace their heating system quickly—and in the long run, it may not be economical to do so.  So, while consumers can substitute readily between food products when relative prices shift, most do not have that option in heating their homes. Price Volatility Has Grown With More Competition The wellhead price, or the price of natural gas produced from domestic wells, has moved  from a  relatively stable but high price environment during the early 1980’s to one with a great deal of price volatility but at lower price levels (Figure 2).  Since price ceilings on natural gas were removed (beginning in 1979 and fully deregulated on January 1, 1993), there has been more competition in the supply market.  This competition has created a more dynamic system that responds quickly to changes in the amount of natural gas consumed or supplied.  Adjusted for inflation, the annual wellhead price declined by more than 50% between 1983 and 1998.

### Gas Drilling has a laundry list of devastating environmental impacts

Chase and Waage 09

Protecting Our Ocean and Coastal Economies: Avoid Unnecessary Risks from Offshore Drilling <http://www.nrdc.org/oceans/offshore/files/offshore.pdf> Alison Chase and Melissa Waage Natural Resource Defense Council September 09

#### Spills Aside, Drilling Operations are a Major Source of Pollution In addition to environmental damage from oil spills, the routine operations associated with offshore drilling produce many toxic wastes and other forms of pollution. For example, each drill well generates tens of thousands of gallons of waste drilling muds (materials used to lubricate drill bits and maintain pressure) and cuttings.12 Drilling muds contain toxic metals such as mercury, lead, and cadmium that may bioaccumulate and biomagnify in marine organisms, including in our seafood supply.13 The water that is brought up from a given well along with oil and gas, referred to as “produced water,” contains its own toxic brew of benzene, arsenic, lead, toluene, and varying amounts of radioactive pollutants. Each oil platform can discharge hundreds of thousands of gallons of this produced water daily, contaminating both local waters and those down current from the discharge.14 An average oil and gas exploration well spews roughly 50 tons of nitrogen oxides, 13 tons of carbon monoxide, 6 tons of sulfur oxides, and 5 tons of volatile organic chemicals.15 Drilling Exploration Activities Harm Marine Life Seismic surveys designed to estimate the size of an oil and gas reserve generate their own environmental problems. To carry out such surveys, ships tow multiple airgun arrays that emit thousands of high-decibel explosive impulses to map the seafloor.16 The auditory assault from seismic surveys has been found to damage or kill fish eggs and larvae and to impair the hearing and health of fish, making them vulnerable to predators and leaving them unable to locate prey or mates or communicate with each other. These disturbances disrupt and displace important migratory patterns, pushing marine life away from suitable habitats like nurseries and foraging, mating, spawning, and migratory corridors.17 In addition, seismic surveys have been implicated in whale beaching and stranding incidents.18 Offshore Drilling Results in Onshore Damage Offshore drilling requires the construction of significant onshore infrastructure such as new roads, pipelines, and processing facilities, which are often built on formerly pristine beaches. Thanks in part to drilling operations, Louisiana is losing roughly 24 square miles of coastal wetlands each year, eating away at natural storm barriers and increasing the risks of storm damage, including damage from oil spills.19

### Offshore wind provides ocean habitats which protect key species and prevent habitat loss

Science Daily 10

Offshore Wind Power and Wave Energy Devices Create Artificial Reefs ScienceDaily (Jan. 19, 2010) <http://www.sciencedaily.com/releases/2010/01/100118132130.htm>

#### ScienceDaily (Jan. 19, 2010) — Offshore wind power and wave energy foundations can increase local abundances of fish and crabs. The reef-like constructions also favour for example blue mussels and barnacles. What's more, it is possible to increase or decrease the abundance of various species by altering the structural design of foundation. This was shown by Dan Wilhelmsson of the Department of Zoology, Stockholm University, in a recently published dissertation. "Hard surfaces are often hard currency in the ocean, and these foundations can function as artificial reefs. Rock boulders are often placed around the structures to prevent erosion (scouring) around these, and this strengthens the reef function," says Dan Wilhelmsson. A major expansion of offshore wind power is underway along European coasts, and the interest is growing in countries such as the US, China, Japan, and India. Moreover, wave power technologies are being developed very rapidly. Many thousand wind and wave power plants grouped in large arrays that each cover several square kilometers can be expected. How marine life will react to this is not clear, but several research projects investigating the impacts of noise, shadows, electromagnetic fields, and changes in hydrology etc. are underway. Dan Wilhelmsson studied how offshore wind turbines constitute habitats for fish, crabs, lobsters, fouling animals, and plants. He shows that wind turbines, even without scour protection, function as artificial reefs for bottom dwelling fish. The seabed in the vicinity of wind turbines had higher densities of fish compared to further away from the turbines and in reference areas. This was despite that the natural bottoms were rich in boulders and algae. Blue mussels dominated on the wind turbines that appeared to offer good growth conditions. Wave power foundations, too, constituting massive concrete blocks, proved to attract fish and large crabs. Blue mussels fall down from the surface buoys and become food for animals on the foundations and on the adjacent seabed. Lobsters also settle under the foundations. In a large-scale experiment, holes were drilled in the foundations, and this dramatically increased numbers of crabs. The position of the holes also proved to be of importance for the crabs. However, aggregations of certain species may have a negative impact on other species. The number of predatory animals on artificial reefs can sometimes become so large that the organisms they prey on, such as sea-pens, starfish, and crustaceans, are decimated in the surroundings, and certain species can disappear entirely. "With wind and wave energy farms, it should be possible to create large areas with biologically productive reef structures, which would moreover be protected from bottom trawling. By carefully designing the foundations it would be possible to favour and protect important species or, conversely, to reduce the reef effects in order minimize the impact on an area," says Dan Wilhelmsson.

### Artificial reefs are key to increase bio density and biodiversity in areas where they are formed.

Inger et al 9

Marine renewable energy: potential benefits to biodiversity? An urgent call for research Richard Inger1, Martin J. Attrill2, Stuart Bearhop1, Annette C. Broderick1, W. James Grecian2, david J. Hodgson1, Cheryl Mills1, Emma Sheehan2, Stephen C. Votier2, Matthew J. Witt1, Brendan J. Godley1,\* Article first published online: 15 SEP 2009 http://onlinelibrary.wiley.com/doi/10.1111/j.1365- 2664.2009.01697.x/full

#### The proposed construction of MREI will increase the amount of hard substrate in coastal environments and thus may have a significant impact (Petersen & Malm 2006). Man-made structures placed on the sea bed attract many marine organisms. These ‘artificial reefs’ are often used to enhance fisheries, for habitat rehabilitation, for coastal protection and to attract ecotourists (Clark & Edwards 1999; Jensen 2002). Other anthropogenic structures fixed to the seabed whose primary function is not to act as artificial reefs, such as oil platforms and piers, have also been reported to attract marine organisms (Rilov & Benayahu 1999; Love, Caselle, & Snook 1999; Helvey 2002), and have been called secondary artificial reefs. The presence of novel structures effectively creates new habitat capable of supporting more epibiota and fish, and have consistently been demonstrated to increase both the density and biomass of fish when compared with surrounding soft bottom areas and even local natural reefs (Bohnsack et al. 1994; Wilhelmsson et al. 1998; Wilhelmsson & Malm 2008). The species composition of artificial reefs may, however, not be the same as natural reefs, and their presence may also influence the biodiversity of surrounding areas (Connell & Glasby 1999; Rilov & Benayahu 2000;Connell 2001). Artificial reefs may also promote the establishment and spread of non-native species (Bulleri & Airoldi 2005; Page et al. 2006) and harmful algal blooms (Villareal et al. 2007). In addition it remains unclear whether the artificial reefs facilitate recruitment in the local population, or whether the effects are simply a result of concentrating biomass from surrounding areas. If the latter is true then it has been suggested (Grossman, Jones & Seaman 1997) that artificial reefs may perhaps have deleterious effects by increasing both fishing effort and catch rates and by causing exploitation of previously unexploited stock segments, and concentration of currently exploited stock. However, this point becomes less significant if the artificial reefs are out of bounds to fisheries. Again, we would call for a systematic review process (Roberts et al. 2006) to be carried out to accurately assess the impacts of artificial reefs, and highlight the need for more targeted research.

### Even apart from an industry tradeoff – using offshore wind trades off with fossil fuels and decreases emissions

Bisbee 4

NEPA REVIEW OF OFFSHORE WIND FARMS: ENSURING EMISSION REDUCTION BENEFITS OUTWEIGH VISUAL IMPACTS Dorothy W. Bisbee Visiting Assistant Professor, Southern New England School of Law. http://www.bc.edu/dam/files/schools/law/lawreviews/journals/bcealr/31\_2/06\_FMS.htm

#### A rudimentary understanding of the regional power grid and the mix of different energy sources it uses, otherwise known as the “fuel mix,” is a prerequisite to estimating the change in emissions attributable to wind power. When wind power is providing electricity to the grid, less fossil fuel is burned, and harmful emissions are reduced accordingly.63 The direct offsets are difficult to calculate in light of the complexity of the grid, the response time required to change coal or nuclear power generation, variations in pollutants from different power sources, and the bid system used to determine which power source fuels the grid at a given moment.64 Estimates are possible, however, based on a look at the projected average fuel mix. One study found that, if 246 megawatts of wind energy supplied 32% of Cape [\*PG361]Cod and Martha’s Vineyard’s energy needs in 2015, carbon dioxide emissions would be reduced by 415,203 tons that year, nitrogen oxides by 279 tons, and sulfur dioxide by 200 tons.65 Perhaps the greatest obstacle to adequate NEPA analysis of an offshore wind farm is that, due both to the nature of the grid and the way that air pollutants are dispersed, the project’s perceived adverse visual impacts will be largely limited to the wind farm’s viewshed, while attendant emission reductions will occur over a broad area that barely overlaps with the project site.66 The electricity used in one area may come from a far away source, and so the benefits of power generation are geographically separated from its detriments. In Massachusetts, for example, electricity comes from diverse power plants throughout the Northeast. Determining the broad geographic impacts of emissions is complex, but it is far more feasible today than it was a decade ago.67 With energy deregulation, many states now require utilities to disclose information on the sources and types of fuels used in particular areas and their emissions.68 An agency or private entity preparing an EIS can easily determine the average fuel mix of a particular state and pinpoint emissions from each source.69 Identifying the impacts that a new renewable energy source will have on the mix requires multiple simulations, since factors like price and availability are the basis for daily decisions about which power source to use.70 Still, since wind [\*PG362]power emits no pollutants, even the most conservative finding of emission reductions from a large-scale wind farm will be significant.

### In Nantucket alone, offshore wind could eliminate 4642 tons of sulfur dioxide emissions, which are the primary contributor to acid rain

Ransom 4

WIND POWER DEVELOPMENT ON THE UNITED STATES OUTER CONTINENTAL SHELF: BALANCING EFFICIENT DEVELOPMENT AND ENVIRONMENTAL RISKS IN THE SHADOW OF THE OCSLA Elizabeth A. Ransom\*Symposium Editor and Solicitations Editor, Boston College Environmental Affairs Law Review, 2003–04. http://www.bc.edu/dam/files/schools/law/lawreviews/journals/bcealr/31\_2/10\_FMS.htm

#### The wind farm is said to generate “clean” electricity because, unlike oil and gas, it will produce no harmful emissions, which could eliminate up to 4642 tons of sulfur dioxide, 120 tons of carbon monoxide, 1566 tons of nitrous oxides, over one million tons of greenhouse gases, and 448 tons of particulates from being released into the air.27 In [\*PG470]addition, unlike oil or coal, whose prices are volatile, the cost of wind is “forever free,” and its supply is inexhaustible, which could help to reduce U.S. dependence on conventional, increasingly scarce, energy sources and help stabilize energy prices in the long term.28

### The ocean is on the brink of irreversible environmental devastation on par with the mass extinctions of prehistory.

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<http://www.independent.co.uk/environment/nature/oceans-on-brink-of-catastrophe-2300272.html> Tuesday 21 June 2011 Oceans on brink of catastrophe Marine life facing mass extinction 'within one human generation' / State of seas 'much worse than we thought', says global panel of scientists By Michael McCarthy , Environment Editor

#### The world's oceans are faced with an unprecedented loss of species comparable to the great mass extinctions of prehistory, a major report suggests today. The seas are degenerating far faster than anyone has predicted, the report says, because of the cumulative impact of a number of severe individual stresses, ranging from climate warming and sea-water acidification, to widespread chemical pollution and gross overfishing. The coming together of these factors is now threatening the marine environment with a catastrophe "unprecedented in human history", according to the report, from a panel of leading marine scientists brought together in Oxford earlier this year by the International Programme on the State of the Ocean (IPSO) and the International Union for the Conservation of Nature (IUCN). The stark suggestion made by the panel is that the potential extinction of species, from large fish at one end of the scale to tiny corals at the other, is directly comparable to the five great mass extinctions in the geological record, during each of which much of the world's life died out. They range from the Ordovician-Silurian "event" of 450 million years ago, to the Cretaceous-Tertiary extinction of 65 million years ago, which is believed to have wiped out the dinosaurs. The worst of them, the event at the end of the Permian period, 251 million years ago, is thought to have eliminated 70 per cent of species on land and 96 per cent of all species in the sea. The panel of 27 scientists, who considered the latest research from all areas of marine science, concluded that a "combination of stressors is creating the conditions associated with every previous major extinction of species in Earth's history". They also concluded: \* The speed and rate of degeneration of the oceans is far faster than anyone has predicted; \* Many of the negative impacts identified are greater than the worst predictions; \* The first steps to globally significant extinction may have already begun. "The findings are shocking," said Dr Alex Rogers, professor of conservation biology at Oxford University and IPSO's scientific director. "As we considered the cumulative effect of what humankind does to the oceans, the implications became far worse than we had individually realised. "This is a very serious situation demanding unequivocal action at every level. We are looking at consequences for humankind that will impact in our lifetime, and worse, in the lifetime of our children and generations beyond that." Reviewing recent research, the panel of experts "found firm evidence" that the effects of climate change, coupled with other human-induced impacts such as overfishing and nutrient run-off from farming, have already caused a dramatic decline in ocean health. Not only are there severe declines in many fish species, to the point of commercial extinction in some cases, and an "unparalleled" rate of regional extinction of some habitat types, such as mangrove and seagrass meadows, but some whole marine ecosystems, such as coral reefs, may be gone within a generation. The report says: "Increasing hypoxia [low oxygen levels] and anoxia [absence of oxygen, known as ocean dead zones], combined with warming of the ocean and acidification, are the three factors which have been present in every mass extinction event in Earth's history. "There is strong scientific evidence that these three factors are combining in the ocean again, exacerbated by multiple severe stressors. The scientific panel concluded that a new extinction event was inevitable if the current trajectory of damage continues." The panel pointed to a number of indicators showing how serious the situation is. It said, for example, that a single mass coral bleaching event in 1998 killed 16 per cent of all the world's coral reefs, and pointed out that overfishing has reduced some commercial fish stocks and populations of "bycatch" (unintentionally caught) species by more than 90 per cent. It disclosed that new scientific research suggests that pollutants, including flame-retardant chemicals and synthetic musks found in detergents, are being traced in the polar seas, and that these chemicals can be absorbed by tiny plastic particles in the ocean which are in turn ingested by marine creatures such as bottom-feeding fish. Plastic particles also assist the transport of algae from place to place, increasing the occurrence of toxic algal blooms – which are also caused by the influx of nutrient-rich pollution from agricultural land. The experts agreed that when these and other threats are added together, the ocean and the ecosystems within it are unable to recover, being constantly bombarded with multiple attacks.