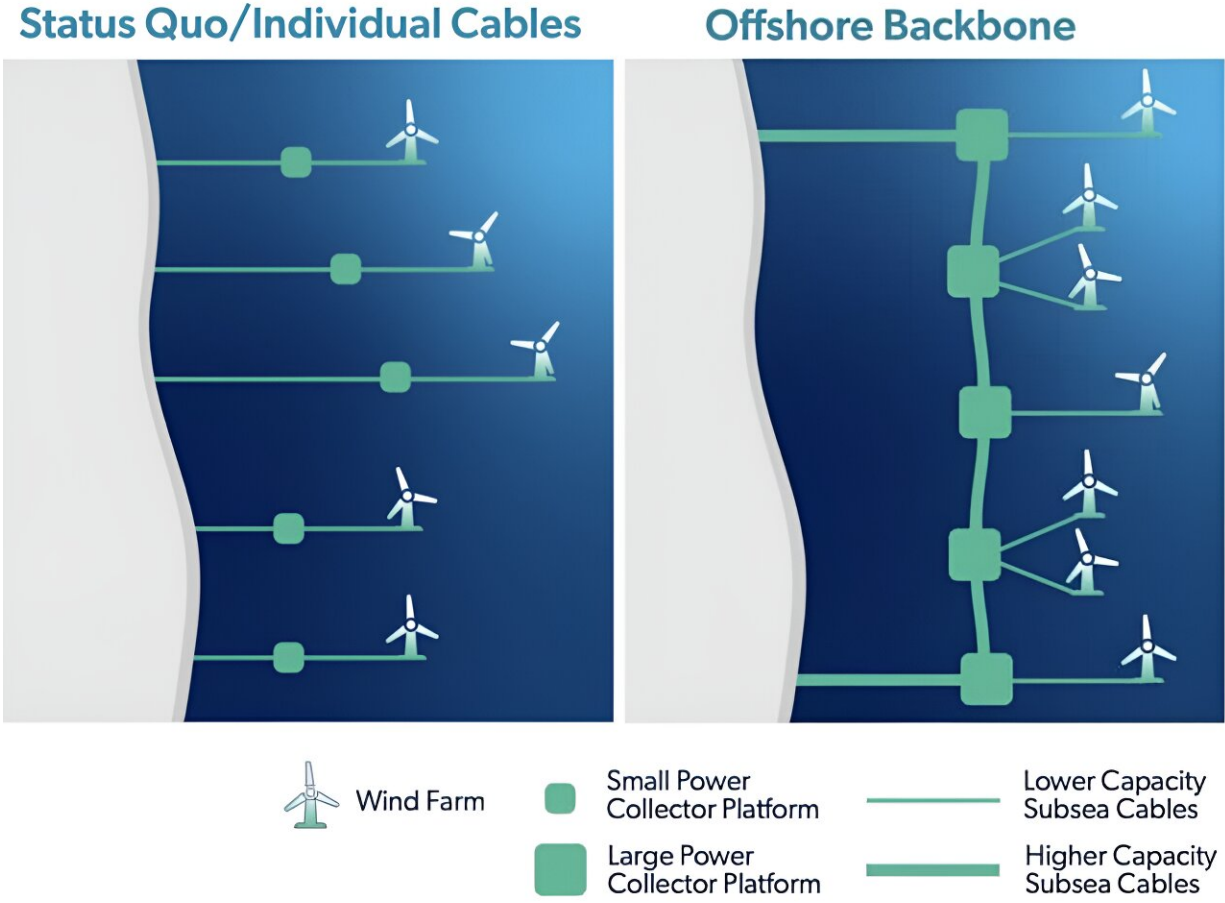


Offshore wind farms connected by an underwater power grid for transmission could revolutionize East Coast energy

July 31 2024, by Tyler Hansen, Abraham Silverman, Elizabeth J. Wilson and Erin Baker



How an offshore transmission backbone could reduce the number of transmission lines and land crossings. Credit: [Illustrations by Billy Roberts, NREL](#)

Strong offshore winds have the potential to supply coastlines with [massive, consistent flows of clean electricity](#). One study estimates offshore wind farms could meet [11 times the projected global electricity demand](#) in 2040.

The U.S. East Coast is an ideal location to capture this power, but there's a problem: getting electricity from ocean wind farms to the cities and towns that need it.

While everyone wants reliable electricity in their homes and businesses, few support the construction of the [transmission](#) lines necessary to get it there. This has always been a problem, both [in the U.S.](#) and [internationally](#), but it is becoming an even bigger challenge as countries [speed toward net-zero carbon energy systems](#) that will use more electricity.

The U.S. Department of Energy and 10 states in the Northeast States Collaborative on Interregional Transmission are working on a potentially transformative solution: plans for an [offshore electric power grid](#).

At the core of this [grid](#) would be backbone transmission lines off the East Coast, from North Carolina to Maine, where dozens of offshore wind projects are already in the pipeline.

The plans envision it supporting at least 85 gigawatts of offshore [wind power](#) by 2050—close to the [U.S. goal of 110 GW](#) of installed wind power by mid-century, enough to power 40 million homes and up from 0.2 GW today. The Department of Energy and the Northeast States Collaborative formalized their goals in July 2024 through a multistate [memorandum of understanding](#).

Emerging research from the [Department of Energy](#), the research company [Brattle](#) and [other groups](#) suggests that an offshore electric power grid could mitigate key challenges to building new transmission lines on land and reduce the costs of offshore wind power.

Cutting costs would be welcome news—offshore wind project costs rose [as much as 50%](#) from 2021 to 2023. While some of the underlying causes have subsided, [such as inflation](#) and [global supply chain disruptions](#), [interest rates remain high](#), and the industry is still trying to find its footing in the U.S.

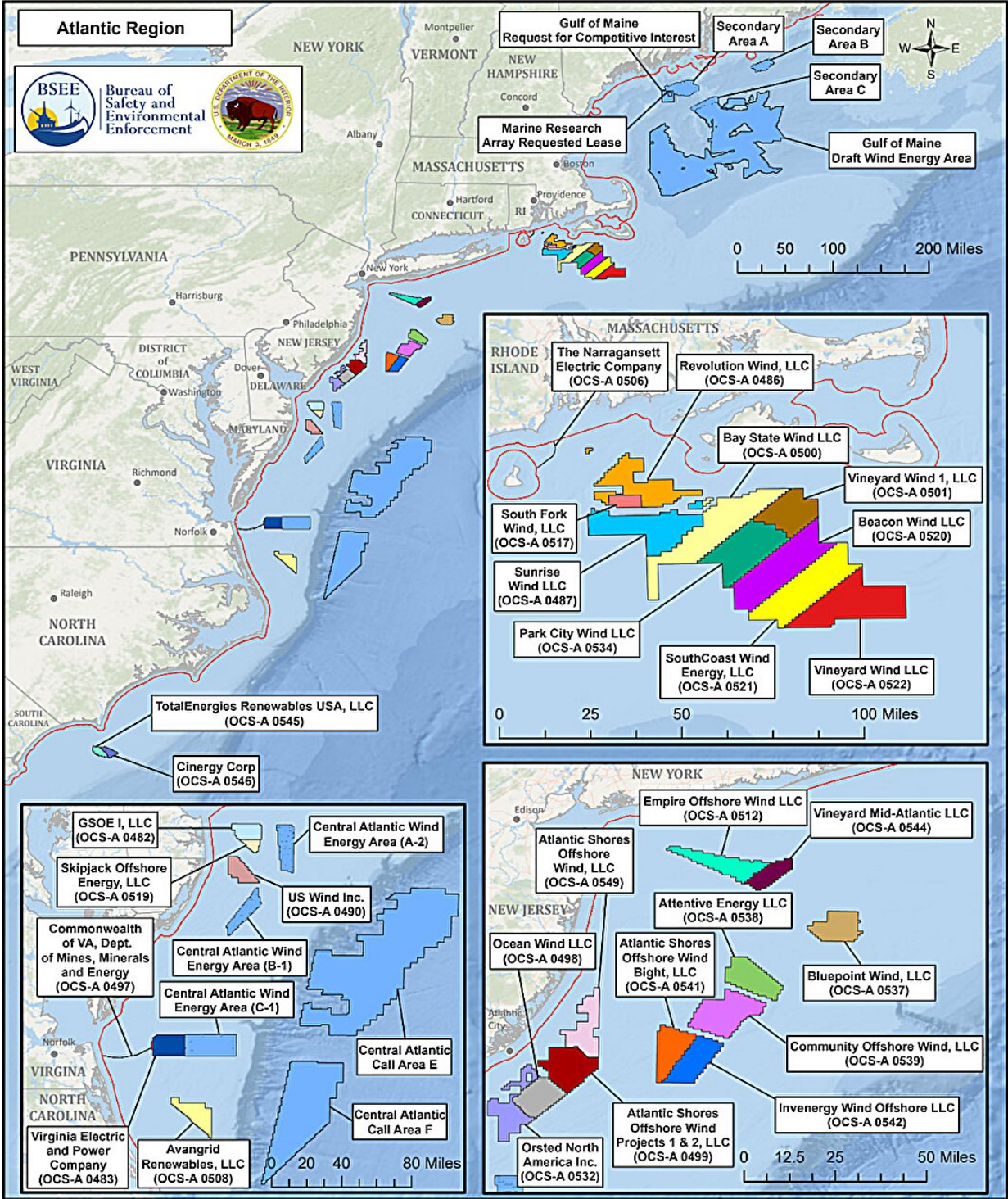
What is an offshore electric power grid?

Today's offshore wind projects use a [point-to-point, or radial design](#), where each offshore wind farm is individually connected to the onshore grid.

This method works if a region has only a few projects, but it quickly becomes more expensive due to the cabling and other infrastructure. Its lines are also disruptive to communities and marine life. And it requires more costly onshore grid upgrades.

Coordinated offshore transmission can avoid many of those costs with what the Department of Energy calls ["meshed" or "backbone" designs](#).

Rather than individual connections to land, many [offshore wind farms](#) would be connected to a shared transmission line, which would connect to the onshore grid through strategically placed "points of interconnection." This way, electricity produced by an offshore wind farm would be transmitted to where it is most needed, up and down the East Coast.



Several areas along the Atlantic continental shelf have been leased for wind power development. Credit: [U.S. Department of the Interior, 2024](https://www.doi.gov/press/2024/03/2024-03-01-01)

Even better, electricity generated onshore could also be transmitted through these shared lines to move energy to where it is needed. This could improve the resilience of power grids and reduce the need for new transmission lines over land, which have been [notoriously difficult to gain approval for](#), especially on the [East Coast](#).

Coordinated offshore transmission was part of [early U.S. discussions](#) on offshore wind planning and development. In the late 2000s when [Google and partners first proposed](#) the [Atlantic Wind Connection, an offshore transmission project](#), the benefits in both offshore renewables and the entire energy system were intriguing. At the time, the U.S. had just one utility-scale offshore wind project in the pipeline, and it [ultimately failed](#).

Today, the U.S. has [53 GW of offshore wind projects](#) being planned or developed. As [energyresearchers](#), [we believe](#) coordinated offshore transmission is important for the industry to succeed at scale.

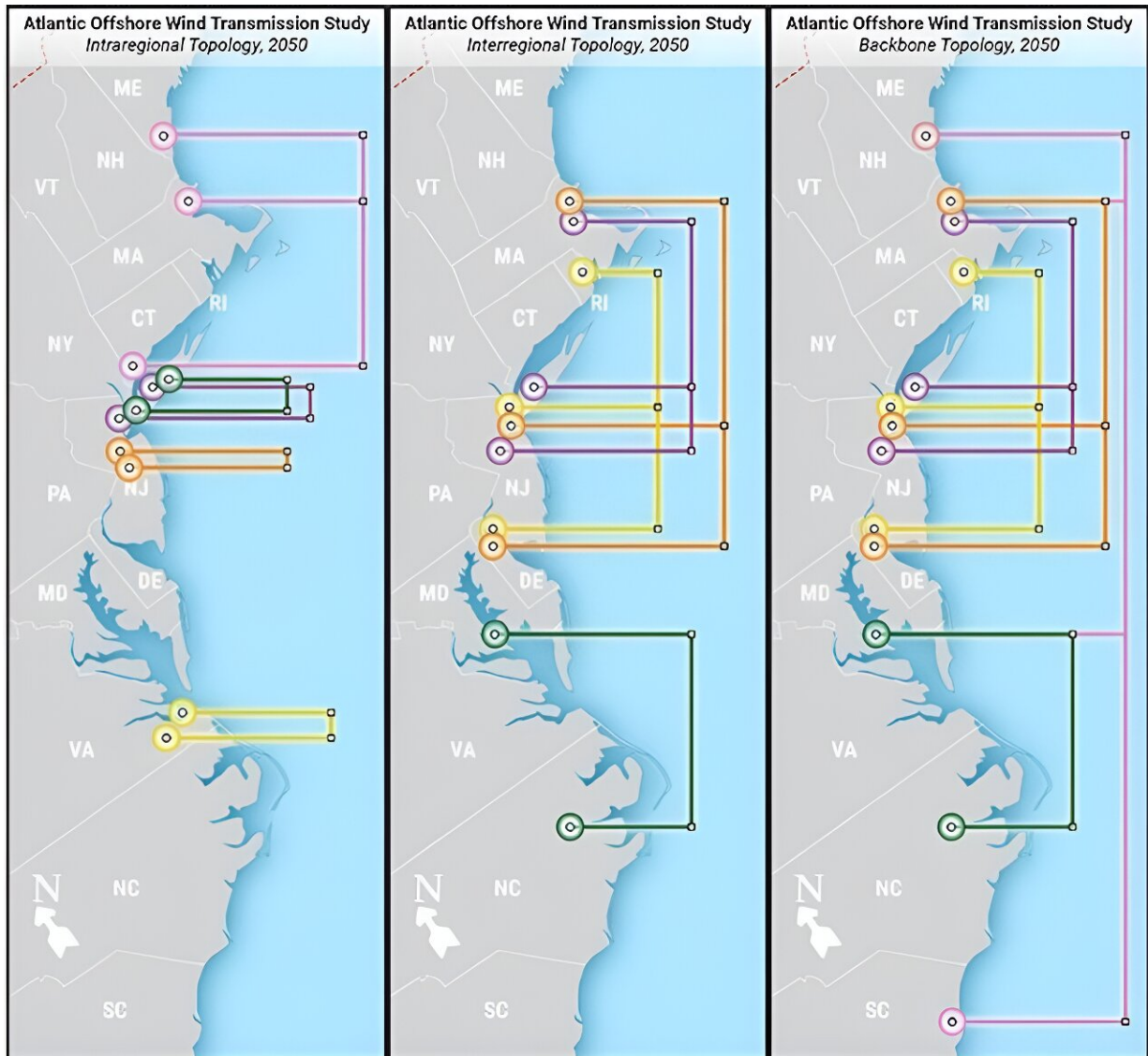
Offshore grid could save money, reduce impacts

By enabling power from offshore wind farms and onshore electricity generators to travel to more places, coordinated transmission can enhance grid reliability and enable electricity to get to where it is most needed. This reduces the need for more expensive and often more polluting power plants.

A 2024 [report from the National Renewable Energy Lab](#) found the benefits of a coordinated design are nearly three times higher than the costs when compared with a standard point-to-point design.

Studies [from Europe](#), [the U.K.](#) and [Brattle](#) have pointed to additional benefits, including reducing planet-warming carbon emissions, cutting the number of [beach crossings](#) by a third and reducing the miles of

transmission cables needed by 35% to 60%.



Several areas along the Atlantic continental shelf have been leased for wind power development. Credit: [U.S. Department of the Interior, 2024](#)

In the U.S., offshore transmission lines would be almost entirely in federal waters, potentially avoiding many of the conflicts associated with

onshore projects, though it would still face challenges.

Challenges and next steps

Building an offshore grid will require some important changes.

First is changing government incentives. The federal investment tax credit for offshore wind, which covers at least 30% of the upfront capital cost of a [project](#), [does not currently help pay for](#) coordinated transmission designs.

Second, planning needs to take everyone's concerns into account from the beginning. While the overall benefits of coordinated transmission designs [outweigh overall costs](#), who receives the benefits and who bears the costs matters. For example, more expensive power generators could earn less, and some [communities feel threatened by offshore development](#).

Third, greater coordination will be needed among everyone involved to dispatch power to and from the regional grids. The Federal Energy Regulatory Commission's recent [Order 1920](#), requiring power providers to plan for future needs, may serve as a blueprint, but it does not apply to interregional projects, such as an offshore transmission backbone connecting over a dozen states across three regions.

The U.S. reached an important milestone in March 2024 with the completion of South Fork Wind, the country's [first utility-scale wind farm](#), bringing U.S. offshore wind power capacity to nearly 200 megawatts. Eight more projects are under construction or approved for construction. Once built, they would bring installed capacity to over [13 gigawatts](#), roughly the same as [three dozen coal-fired power plants](#).

An offshore transmission backbone could support offshore wind

development and the East Coast's [energy](#) needs for generations to come.

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