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Volume 48, Number 16 - April 12, 2024 • Written by: [Mr. P. Barton DeLacy, CRE](#)



REAL ESTATE ISSUES®
Published by THE COUNSELORS OF REAL ESTATE®



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Background: The Counselors of Real Estate® announced their Top Ten Issues Affecting Real Estate® for 2024. When presented at their annual conference there was some dismay that Global Climate Change did not make the list. In fact, climate indirectly affects a number of the topics, including Infrastructure (#10). But in a real estate context, if climate change is a problem, how might real estate effect a solution? Here, we suggest that, without a robust electricity transmission infrastructure, the “grid,” more ephemeral goals seeking to cool the planet may remain elusive.



High Voltage Transmission Lines and Towers near Boardman, Oregon

Introduction

Energy can be said to power the world's economies; from agriculture to housing through any type of good or service produced. Yet, while there has been much effort to *generate* energy, renewable or otherwise, getting such power from its source to the load it feeds requires *transmission*. This article focuses on the need to invest in electricity transmission infrastructure (the "grid") before we can build more generation capacity.

According to a recent Princeton University study, the pace of energy transmission expansion must more than double the rate of expansions over the last decade. That expansion rate was comparable to the long-term average rate of transmission additions from 1978-2020.[1] As will be discussed, transmission capacity expansion severely lags projections for renewable energy generation growth at both the regional and national level.

The subset of infrastructure at issue here is the regionalized transmission grid; the network of lattice towers and high voltage power lines connecting power plants to substations to local distribution connections.

New transmission lines require acquisition of broad swaths of land over which overhead high-voltage lines traverse. Most public and investor-owned utilities may invoke eminent domain to acquire such. Land owners must be paid just compensation in a process similar to how local governments encumber land for roads and municipal utility lines. However, the taking of private land is justifiably fraught with layers of protection for property rights. Most zoning and land use restrictions intend to protect local community interests. Regional energy needs or national climate concerns are seldom considered even at the state level.

Expanding the Grid as a Real Estate Problem

Expanding and even just upgrading transmission lines is as much about real estate, as it is regulatory and financial constraints. Effective electricity transmission, given current technology, requires overhead easements encumbering thousands of acres across hundreds of miles all throughout the U.S.

This article explains how the electricity transmission grid fails to meet the needs of new renewable power generation is, in fact, a real estate problem.

Shift to Remote Renewables, Data Centers Overwhelms Grid Capacity

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Climate change concerns and goals to decarbonize the atmosphere now drive many legislative and regulatory mandates at the state and federal level. Coal plants are being retired, dams are being breached and gas-powered cars are being phased out. Taking its place? Renewable energy power generation.

Further, the parallel rise of artificial intelligence (AI) requires dedicated data centers that further consume as much electricity as small cities. According to a McKinsey study, in the US market alone, demand, measured by power consumption to reflect the number of servers a data center can house, is expected to reach 35 gigawatts (GW) by 2030, up from 17 GW in 2022. For perspective, a gigawatt is 1,000 megawatts. A single megawatt of solar power can supply over 160 homes. Hence, 35 GW can power 5.6 million homes.

Projected data center consumption will only put more stress on the grid.

Renewable energy today is epitomized by massive utility-scale wind and solar farms, massively subsidized and slated to expand further through the next decade^[2]. Yet why are places like Texas^[3] and the Dakotas putting new renewable generation projects on hold? Why are there moratoriums on new solar projects in California? Inadequate electricity transmission infrastructure is why^[4].

According to Grid Strategies, a power sector consulting firm specializing in integrating clean energy with the electric grid, the U.S. electric transmission system is not prepared for significant load growth.

Consider:

- The U.S. installed 1,700 miles of new high-voltage transmission miles per year on average in the first half of the 2010s but dropped to only 645 miles per year on average in the second half of the 2010s.
- Low transfer capability between regions is a key risk for reliability if load growth outpaces deployment of new generation in some regions.

Over the past year, grid planners nearly doubled the 5-year load growth forecast.

Thus, it is clear, renewable electricity *generation* alone is not enough without significant upgrades to the power transmission grid. The grid carries renewable energy from point of generation, often in remote areas to the load it serves, cities hundreds of miles away.

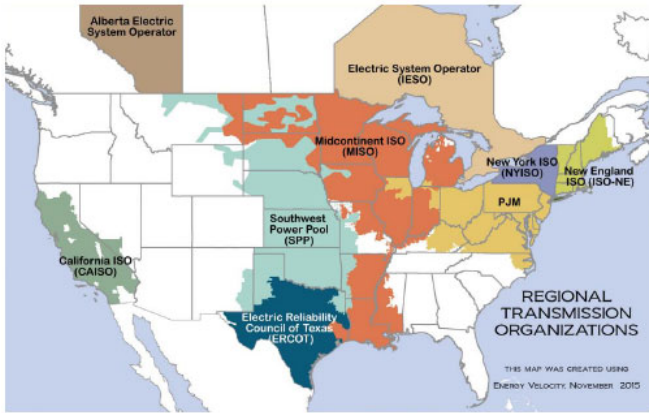
The continental United States has seen remarkable progress in the development and deployment of utility-scale wind and solar-powered projects over the past decade. Typically referred to as “farms” because of their rural locations on agricultural sites, renewables may be reaching a point of diminishing returns without better energy storage and electricity transmission facilities. ^[5]

Often impeded by environmental disputes, there are four areas where U.S. policymakers must work cooperatively with the renewables industry to achieve ambitious climate change goals. These include:

- Overcome entitlement hurdles such as land use constraints and environmental impact studies
- Expand and improve the connectivity of regional power grids
- Improve process for linking offshore wind to land-based infrastructure
- Accelerate development of Battery Energy Storage Systems.

In the U.S., the so-called rust belt states of the Midwest and Eastern Seaboard have languished for decades with population declines and loss of base industries. This region is also most dependent on carbon-based fuels such as coal and natural gas for electric power generation. The challenge is to bring renewable power generated from the resource-rich Great Plains and Texas to the hungry loads east of the Mississippi.





Russell Gold, who chronicled the efforts of Clean Wire, a thwarted national grid effort, noted, “Building an electricity system that is reliable, safe, affordable and clean is one of the great challenges of this generation... If we connect regional markets, we can share inexpensive renewable power in a way that makes the power grid more reliable and cleaner, and keeps costs low.” [6]

The map above depicts the patchwork of transmission zones across the continental U.S. They are properly termed “Regional Transmission Operators” or RTOs. However, there are also Independent System Operators or ISOs who work within a narrower region and some within a single state such as in California and Texas. While all fall within the purview of the Federal Energy Regulatory Commission (FERC), their shared purpose is to promote economic efficiency, reliability, and non-discriminatory practices while reducing government oversight.

However, each regime controls its own marketplace for pricing and manages congestion across the wires. Utility companies, which actually sell the power, are all regulated at the state level. Sending power from one state to another, or across a state to get to another state gets complicated.

At the end of World War II, the United States embarked on an ambitious interstate highway system that linked the coasts and efficiently connected every major population center to each other. A similar effort to build a truly interstate national transmission grid is now necessary to realize both the Biden Administration’s infrastructure and clean energy goals. Such a program needs to override all the local fiefdoms at the state level that have frustrated the building of a truly national grid.

How are transmission lines real estate?

The concept of real estate encompasses more than just land and buildings. It involves our entire built environment but also all the laws, rules, and conventions that tell us how we can use or develop the land. These regulations reflect the history, politics and people as much as the geography that defines the land on which we live.

High voltage transmission lines (HVTL) or wires, as well as the towers and poles suspending them would constitute personal property under most jurisdictions.

Yet, consider the wide swaths of land encumbered by right of way (ROW) easements to string lines from tower to tower. These rights of way can run hundreds of miles and be as much as 200 feet in width. Much of the existing HVTL network was built mid-century before many of the environmental and land use protections enacted from the 1970s onward were in place.

Aside from what has been described as a byzantine morass of regulatory hurdles, real estate interests and eminent domain principles of just compensation remain the major obstacles confronting extension of transmission lines.

Today the regulatory and eminent domain process necessary to assemble a corridor can take the better part of two decades. Grid Strategies counts thirty-six planned high-capacity lines, from the New England Clean Power Link, in Vermont, to the TransWest Express out west. These projects total ten thousand miles



of “shovel ready” lines. Together they could increase wind and solar generation in the U.S. by eighty-seven per cent. But only ten projects have even broken ground.

And shovel ready does not mean such projects have cleared all regulatory hurdles. A handful of case studies underscore the layered challenges confronting grid expansion.

Clean Line Energy: A Cautionary Tale

Clean Line Energy Partners spent over a decade and perhaps \$100 million assembling rights of ways, permits and agreements to build the Plains and Eastern interstate transmission line. Clean Line envisioned sending wind-powered energy from the Oklahoma Panhandle to Memphis and an intertie to the Tennessee Valley Authority (TVA). The TVA boasts a dense grid network throughout the Southeast where obsolete coal-fired power plants could be decommissioned freeing up capacity for green energy from the west.

Ultimately, the Plains and Eastern project was canceled, blocked by state laws requiring transmission carriers to be licensed as state utilities.

Other interstate Clean Line projects were planned for the Southwest and upper Midwest. These projects were sold to investors and larger utility interests and are still in the planning and permitting stages, perhaps years away from being built and actually transmitting power.

Texas Storm Uri and ERCOT Grid Failure

The Electric Reliability Council of Texas, Inc. (ERCOT) pioneered the ISO concept in the United States and was long heralded for its independence from Federal oversight – and its effective performance. At the onset of the 2020s Texas led the nation in wind farm installations.

Texas Storm Uri swept through the state in February 2021 and destabilized power transmission by damaging pipelines, substations and some wind projects. Nearly 70% of Texans lost power at some point, with the storm also contributing to over 200 deaths and financial losses estimated to be between \$80 and \$130 billion.^[7]

In Texas, the power grid, electricity and natural gas lines are co-dependent. Most of the power plants in Texas run on natural gas. Imbalances in demand and pricing cost the system as much as \$10 billion. More robust interconnection with other regions might have alleviated the damage. The storm underscored the weakness inherent with insular or isolated systems, even in a region the size of Texas.

Is B2H a Best Case Scenario?

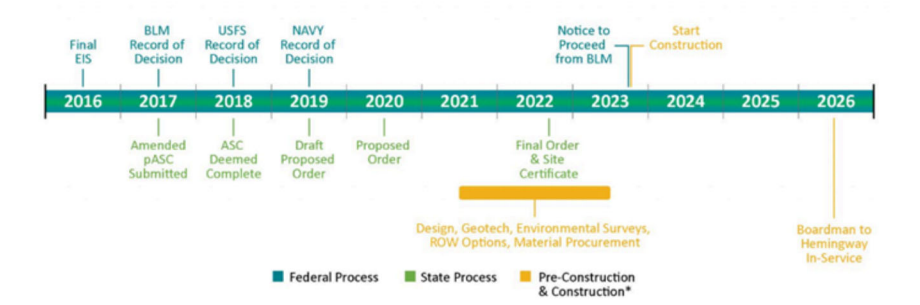
Out in the Pacific Northwest, where clean energy goals are easily achieved because hydro-power dominates, a 290-mile interstate line is finally proceeding apace. Yet planning began almost 20 years ago!

Boardman to Hemingway, or “B2H,” is a proposed 500-kilovolt high voltage transmission line sized to carry up to a 1000 MW of power. The transmission line will run approximately 290 miles across eastern Oregon and southwestern Idaho. It will connect the proposed Longhorn Substation four miles east of Boardman, Oregon, to Idaho Power’s existing Hemingway Substation in Owyhee County, Idaho.

The chart below shows the timeline. Note that the projected in-service date of 2026 will be almost a decade after a Final Environmental Impact Statement (EIS) was issued.



Boardman to Hemingway Timeline



For perspective, B2H is a fraction of the length and capacity of the now canceled 720-mile 4000 MW Plains and Eastern Clean Line.

Conclusion

Within this context, one might ask, how does real estate affect climate, and more importantly, what can be done to mitigate any adverse impacts? While a good deal of scholarship has gone into the concept of “green” buildings and the sources of energy consumed to use them, this article has focused on the real estate necessary to transmit or carry power from its source to that use.

The energy transmission network in the U.S. is often referred to as a grid. Much like a highway system, it connects energy generators, say power plants, to users, or in industry parlance, “the load.” Most often this conveyance is through wires or cables to points of “distribution.”

Politicized land use planning coupled with complex environmental regulations have slowed if not canceled implementing carbon-free energy production and now these same issues are now imperiling the transmission of carbon-free energy across much of the continental U.S. Ironically, some of the very environmental constraints, which have blocked expansion of thermal power, now severely slow the consequent conversion to carbon-free renewables.

Unfortunately, the power grid remains regionalized in a quasi-regulated Federal system that lacks the seamless fluidity of U.S. Interstate Highways. Efforts to nationalize the grid or at least connect wind energy generated from the sparsely populated interior to the densely settled East Coast have been effectively blocked by the states. This has left states with little room to improve power transmission. This situation is exemplified by California and Texas; now stymied with grid congestion.

It may take an Act of Congress, but some land use solutions may be available at the Federal Level:

1. Nationalize the transmission grid like the interstate highway system
2. Support super siting authorities at the state level to override local land use constraints
3. Expedite environmental review to balance ecological concerns with climate mandates.

Finally, recognize that our energy transmission grid serves all real estate as it both encumbers land and connects our communities.

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