Edison Electric INSTITUTE

Electric Transmission

Enabling the Clean Energy Transformation

INTRODUCTION

President Biden has made climate change and clean energy infrastructure a priority for his Administration. Through numerous executive orders issued during the first week of his Presidency, President Biden has committed his Administration to "ensure we meet the demand of science, while empowering American workers and businesses to lead a clean energy revolution."[1] As part of his Build Back Better platform, President Biden confirmed that building modern, climate-resistant infrastructure and a clean energy future is key to his economic plan.[2]

Electric transmission infrastructure is the backbone of the nation's energy grid and will play an important role in facilitating the continued transition to clean energy. The transmission system has enabled electric companies to integrate more clean energy resources and technologies into the grid affordably and reliably. Exercising cost discipline in building transmission facilities—through, for example, competitive solicitations for equipment, construction, and labor—ensures that electric companies provide the most cost-effective transmission solutions. The transmission system also lowers the cost of delivering energy and helps to keep electricity affordable by optimizing the grid's performance, reducing congestion, enabling the deployment of new technologies, and enhancing reliability and resiliency.

EEI's member companies—America's investor-owned electric companies—are vital to transmission development. They also are committed to getting the energy they provide as clean as they can as fast as they can, without compromising on the reliability and affordability that are essential to the customers and communities they serve. Each year, EEI's members invest more than $110 billion, on average, to make the energy grid stronger, smarter, cleaner, more dynamic, and more secure while working to ensure that customer rates are just and reasonable.

In addition to integrating more clean energy, these investments create jobs and provide a range of other benefits. They offer communities access to lower-cost, cleaner sources of electricity that often are located far from densely populated urban centers.[3] They support the economic viability of clean energy projects by reducing costly curtailments of service due to congested pathways and overproduction, which allows more clean energy to reach more end-use customers.[4] Electric transmission investments also are essential to enabling greater transportation electrification.[5]

This paper reviews the role of EEI's member companies in the clean energy transformation and reinforces the important role that transmission plays and will continue to play in the success of this transformation.

ELECTRIC COMPANIES ARE LEADING THE CLEAN ENERGY TRANSFORMATION

EEI's member companies are leading a profound clean energy transformation. Today, nearly 40 percent of the nation's electricity comes from clean, carbon-free sources, including nuclear energy, hydropower, wind, and solar energy. Carbon emissions from the electric power sector are at their lowest level in more than 30 years and continue to fall.

Collectively, EEI's member companies are on a path to reduce their carbon emissions at least 80 percent by 2050, compared to 2005 levels, with many companies pledging to reduce their emissions even further and faster.

Much of the clean energy transformation is being driven by investments in renewable energy. According to the U.S. Energy Information Administration (EIA), 70 percent of new electric generation capacity additions in 2021 will be wind and solar, in addition to 3 gigawatts (GW) of new, carbon-free nuclear energy. EIA expects that universal (or large-scale) solar additions will set a record, with more than 15 GW integrated into the energy grid in 2021.[6]

1 *See* https://www.whitehouse.gov/priorities.

2 Remarks by President Biden Before Signing Executive Actions on Tackling Climate Change, Creating Jobs, and Restoring Scientific Integrity (Jan. 27, 2021), https://www.whitehouse.gov/briefing-room/speeches-remarks/2021/01/27/remarks-by-president-biden-before-signing-executive-actions-on-tackling-climate-change-creating-jobs-and-restoring-scientific-integrity/ (Biden Remarks on Climate Change).

3 *See e.g.*, American Council on Renewable Energy (ACORE), Macro Grid Initiative, https://acore.org/macro-grid-initiative/#1601561682191-976f8114-ec26.

4 *See* World Economic Forum, *Why transmission and distribution are the clean energy transition's secret weapons* (Jul. 16, 2020), https://www.weforum.org/agenda/2020/07/transmission-distribution-clean-energy-transition/.

5 *See* Weiss et al., *The Coming Electrification of the North American Economy – Why We Need A Robust Transmission Grid*, prepared for WIRES (Mar. 6, 2019), https://wiresgroup.com/the-coming-electrification-of-the-north-american-economy/.

6 *See* EIA, *Renewables Account for Most New U.S. Electricity Generating Capacity in 2021* (Jan. 11, 2021), https://www.eia.gov/todayinenergy/detail.php?id=46416. Note that this is not a forecast but based on data reported to EIA and available publicly.

Renewable deployment will continue, and EIA projects that the country will add 117 GW of new wind and solar capacity through 2023. EIA also forecasts electricity from renewables will surpass nuclear and coal generation in 2021 and will comprise 38 percent of the fuel mix for electric generation by 2050.[7]

TRANSMISSION'S ROLE IN THE CLEAN ENERGY TRANSFORMATION

The transition to a clean energy future depends on a flexible and robust electric transmission system to incorporate increasing amounts of renewable energy in the coming years. According to the National Renewable Energy Laboratory:

> As renewable electricity generation increases, additional transmission infrastructure is required to deliver generation from cost-effective remote renewable resources to load centers, enable reserve sharing over greater distances, and smooth output profiles of variable resources by enabling greater geospatial diversity.[8]

The energy grid originally was designed to deliver safe, reliable electricity to customers 24 hours a day/7 days a week. Today, new technologies enable customers to generate and sell electricity back to the energy company. This necessitates a more flexible transmission system. Traditionally, energy flowed in one direction—from a power plant or generator facility directly to customers. Today, newer technologies (e.g., private (or rooftop) solar, battery storage, and electric vehicles) can draw energy from, and inject energy into, the grid at different times of the day requiring two-way energy flows.

Understandably, a necessary shift toward more proactive load management through energy efficiency and energy storage initiatives at the local level will need to go hand-in-hand with significant investments in the nation's transmission assets.

Renewable resources provide valuable energy to the grid, but they can be variable. Transmission provides critical balancing and flexibility options for operators by connecting alternate resources for wind and solar when conditions are not suitable for output (i.e., when there is inadequate sun or wind) or when there are unexpected changes in the weather. While EEI's member companies are making strides in forecasting weather and customer demand, it is inevitable there will be times where the weather changes quickly or unpredictably, creating challenges for safe operations of generation resources (e.g., when wind gusts are too strong to safely operate a wind turbine).

Despite the gains in electric storage technology, battery storage is not, at this time, able to store the amount of energy needed to meet customer needs for 24/7 electricity. The variability of renewable resource output and the interruptions created by unfavorable weather conditions can be smoothed through geographic dispersion of generation with transmission as the conduit.

In addition to potential variability, large-scale renewable installations generally are in remote areas far from load centers, due in part to the amount of land required to site such large installations. Demand is often greatest in densely populated areas that lack the space and topology required for renewable development.

Geographically, wind-rich regions tend to be sparsely populated, such as in the Midwestern plains, or completely unpopulated, such as offshore along the Eastern seaboard. Transmission infrastructure enables urban areas to access these remote resources. Transmission also promotes resource diversity so that states benefit from clean energy they otherwise may not be able to access; for example, offshore wind benefits land-locked states, and hydropower from Canada benefits the Northeast. These renewable resources are less capital-intensive to build and manage, which results in lower sourcing and operational costs and lower rates.

An integrated transmission system helps create market efficiencies by incorporating the most cost-effective resources and which provide operational efficiencies by including a wide array of resources with different operational characteristics.

7 *See* EIA, *EIA expects U.S. electricity generation from renewables to soon surpass nuclear and coal* (Jan. 30, 2020), https://www.eia.gov/todayinenergy/detail.php?id=42655#:~:text=In%20the%20latest%20long%2Dterm,surpass%20natural%20gas%20in%202045. EIA's base case assumes no new changes in policy or other regulatory efforts to accelerate renewables deployment or reduce CO_2 emissions. As a result, these estimates are conservative.

8 National Renewable Energy Laboratory, *Renewable Electricity Futures Study: Executive Summary*, p. 3 (2012), https://www.nrel.gov/docs/fy13osti/52409-ES.pdf.

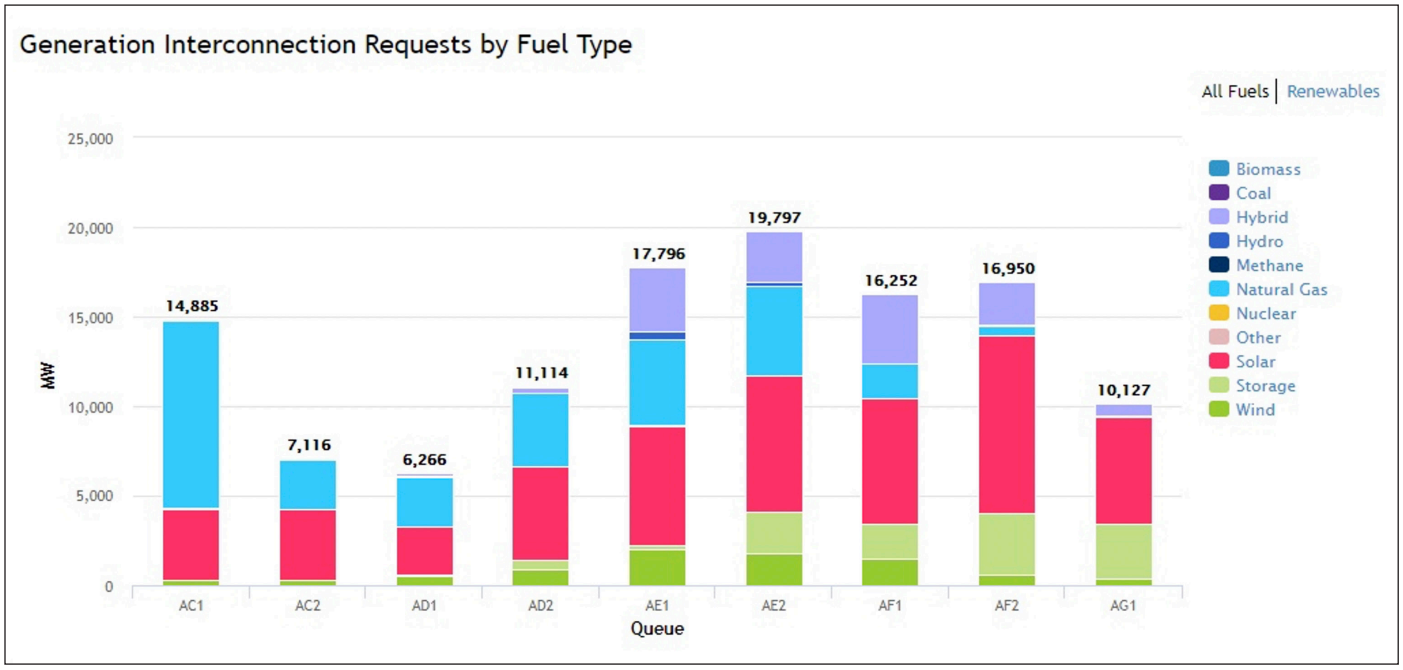
This reduces the need for stability service requirements and can result in lower costs for renewable generation across energy markets.[9]

Thus, interconnecting markets through transmission diversifies resources and significantly reduces costs related to load uncertainty, variable generation, and unexpected outages. Through transmission-provided diversification of resources, system operators have access to a broader fleet of resources, providing insurance against supply challenges and, ultimately, lowering the costs of managing uncertainty.[10]

Consistent with the increasing deployment of renewable energy, many areas of the country have seen an increase in the number of generators seeking to interconnect to the transmission system. These interconnections have implications for the development and operation of the transmission system.

For example, in PJM Interconnection (PJM), which covers the Mid-Atlantic region, more than 85 percent of all interconnection requests are either renewable resources, natural gas-based generation, or a combination of both (*see Figure 1*).

Figure 1:
PJM Generation Interconnection Requests by Fuel Type as of Third Quarter 2020;
Courtesy of PJM Interconnection.



In New England, 95 percent of interconnection requests, representing nearly 21 GW, are wind, solar, or battery resources.[11] Offshore wind accounts for 13.5 GW of this total.[12] These offshore wind interconnection requests are directly attributed to the northeastern coastal states' ambitious offshore wind goals: New York has a goal of 9,000 MW of offshore wind by 2035; New Jersey has a goal of 7,500 MW by 2035; and Massachusetts has a goal of 3,200 MW by 2035. It is estimated that 20 to 30 GW of offshore wind capacity will be operational by 2030 and will represent between $28 billion and $57 billion of investment injected into the nation's economy providing additional economic output of $25 billion per year.[13]

9 Boston University Institute for Sustainable Energy, *The Value of Diversifying Uncertain Renewable Generation through the Transmission System*, pp. 15-19 (Sept. 2020).

10 *Id.*, p. 23.

11 ISO-NE, 2020 Regional Electricity Outlook, p. 13.

12 *Id.*

13 American Wind Energy Association (AWEA), *U.S. Offshore Wind Power Economic Impact Assessment,* p. 1 (Mar. 2020).

However, as with other interconnection requests, the development of offshore wind will require new transmission networks, as well as upgrades to existing networks, to connect these resources to the onshore grid. Due to the increasing interest in offshore wind development in some areas of the country, the Federal Energy Regulatory Commission (FERC) held a technical conference on October 27, 2020, to consider whether and how existing regional transmission organization and independent system operator (RTO/ISO) interconnection, merchant transmission, and transmission planning frameworks can accommodate anticipated growth in offshore wind generation in an efficient or cost-effective manner.

Among the concepts discussed during the technical conference was the need for a "transmission-first" planning approach, which would mean identifying favorable geographic areas offshore to build transmission with the expectation that these resources will interconnect to the onshore grid. Another idea discussed was whether to consider the benefits of open access flexibility to ensure onshore transmission facilities developed to support offshore wind are reserved solely for offshore wind.[14]

The Midwest also saw a large number of new interconnection requests over the summer of 2020 adding 36 GW of solar comprising 64 percent of the 116 GW in the interconnection queue. The Midcontinent Independent System Operator (MISO) expects this trend to continue, and predicts that future interconnection requests from natural gas, wind, and solar resources will account for 148 GW to as much as 352 GW of new resources going into service over the next two decades.[15]

The Southwest also is seeing an influx of renewable and energy storage resources in its generator interconnection queue. As of July 2, 2020, there were 131,024 MW of new generation in the Southwest Power Pool (SPP) interconnection queue, of which 75,572 MW (57.7 percent) was wind; 37,812 (28.9 percent) MW was solar, and 8,569 MW (6.5 percent) was energy storage. New requests are overwhelmingly for renewable resources (wind: 48 GW, solar: 28 GW, and storage: 7 GW) with non-renewable requests accounting for less than 1 percent of the total interconnection requests received.[16]

In addition, recent FERC orders have enabled distributed energy resources connected to the distribution system to aggregate and to participate in wholesale electricity markets operated by RTOs/ISOs.[17]

To accommodate these interconnection requests and to prepare for increasing market participation by aggregated resources, additional electric transmission planning, investment, and development is needed.

Transmission projects typically take 7 to 10 years to plan, site, permit, construct, and energize. Issues related to siting and permitting, as well as allocation of costs, need to be addressed to facilitate needed transmission development. Among the challenges—state and local governments often oppose long transmission lines crossing their territories.

THE ECONOMIC BENEFITS OF BUILDING A CLEAN ENERGY FUTURE

According to a study by Princeton University, to achieve a zero-carbon future by 2050, the existing high voltage transmission capacity will need to expand by approximately 60 percent by 2030 and triple compared to 2020 capacity through 2050 to connect wind and solar. Total capital investment in transmission will need to reach $360 billion through 2030 and $2.4 trillion by 2050.[18]

14 *See* Federal Energy Regulatory Commission, Docket No. AD20-18-000.

15 RTO Insider, "MISO Processing Heftiest Interconnection Queue Ever" (Aug. 14, 2020).

16 SPP, Strategic & Creative Re-engineering of Integrated Planning Team slide presentation "Generation Interconnection Deep Dive," p. 9 (Oct. 23, 2020).

17 *Participation of Distributed Energy Resource Aggregations in Markets Operated by RTOs/ISOs*, Order No. 2222, 172 FERC ¶ 61,247 (2020).

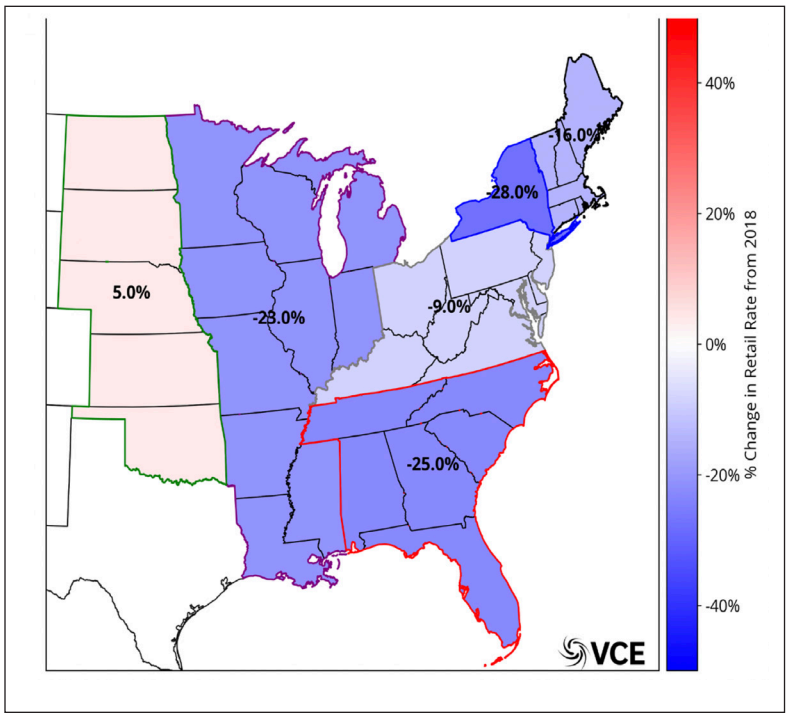
18 E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala, R. Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley, E. Leslie, K. Paustian, and A. Swan, *Net-Zero America: Potential Pathways, Infrastructure, and Impacts*, interim report, Princeton University, Princeton, NJ, p. 106 (Dec. 15, 2020).

The Brattle Group, meanwhile, estimates that, to meet ambitious clean energy goals and low-carbon solutions around the country, $300 to $700 in transmission investment is needed per each kilowatt (kW) of large-scale renewable capacity added to the system.[19] In addition to integrating renewable resources and other new technologies, the transmission investment also will create economic benefits in the form of jobs and tax revenues, among others.

Americans for a Clean Energy Grid estimates that needed transmission and clean energy investments could create more than 1 million new jobs by 2030 and 6 million by 2050 in the eastern United States alone. In higher-emission reduction scenarios compared to "business as usual," 2.5 million additional jobs are created by 2050, including 1.5 million jobs for building and maintaining transmission infrastructure.[20]

In addition, expanding the transmission grid to meet clean energy goals could bring $7.8 trillion in investment to rural states and save customers more than $100 billion by lowering retail rates (*see Figure 2*).[21] And, in general, expanding the transmission grid will reduce the costs of achieving deep carbon reduction across the electric sector.[22]

Figure 2:
Change in Retail Electric Rates from Present to 2050;
Courtesy of Americans for a Clean Energy Grid.



Offshore wind development, in particular, provides an extraordinary opportunity for job growth along the coastal United States with the potential to support between 19,000 and 45,000 jobs by 2025 and a cumulative 45,000 to 83,000 jobs by 2030.[23]

These are highly skilled jobs representing an estimated 74 occupations, including electricians, welders, turbine technicians, longshoremen, truck drivers, crane operators, ironworkers, pipefitters, pile drivers, engineers, mechanics, scientists, and offshore equipment and vessel operators.[24]

These new jobs already are being seen today. For example, investments in clean energy are underway at Ameren, and "communities in Missouri are already seeing the benefits of economic expansion driven by the availability, construction and ongoing operation of renewable resources," said Marty Lyons, Chairman and President of Ameren Missouri. Ameren Missouri projects the plan will create thousands of new construction jobs. The benefits of these investments extend throughout the local economy, leading to greater levels of opportunity for many stakeholders, including diverse suppliers.

19 The Brattle Group, prepared for WIRES, *The Coming Electrification of the North American Economy: Why We Need a Robust Transmission Grid*, p. 16 (Mar. 2019).

20 Americans for a Clean Energy Grid, *Consumer, Employment, and Environmental Benefits of Electricity Transmission Expansion in the Eastern U.S.*, p. 11 (Oct. 2020).

21 *Id.* at p. 26.

22 *See*, e.g., Brown and Botterud, *The Value of Inter-Regional Coordination and Transmission in Decarbonizing the US Electricity System*, Joule (2020), https://doi.org/10.1016/j.joule.2020.11.013. In particular, the authors, both from the Massachusetts Institute of Technology, find that new and existing long-distance transmission development significantly reduces the costs of electricity and the amount of storage required for reliable zero-emissions electricity.

23 AWEA, *U.S. Offshore Wind Power Economic Impact Assessment*, p. 1.

24 *Id.*, p. 4.

EEI MEMBER COMPANIES – LEADING THE CLEAN ENERGY TRANSFORMATION THROUGH TRANSMISSION

As highlighted in the following examples, EEI member companies are working to ensure the transmission system can accommodate the energy transformation flexibly and cost-effectively.

MIDWEST

As the largest independent electricity transmission company in the U.S., ITC Holdings Corp. (ITC) is playing an important role in the nation's transition to a cleaner energy future. ITC focuses solely on upgrading, replacing, and expanding transmission infrastructure across the Midwest, giving the company a unique, neutral view of the energy grid and its current and future needs, including connecting remotely located renewable energy resources to the interstate grid and population centers.

To date, ITC has connected 54 wind generator projects, representing more than 7,000 MW of wind capacity, on its transmission systems in Iowa, Kansas, Michigan, and Minnesota. Another 1,750 MW of wind interconnections are under construction or awaiting construction with ITC.

ITC is actively involved in planning an integrated energy network to serve its customers, communities, and the greater grid, benefitting customers ranging from homeowners to small businesses to hospitals.

Several Midwest investor-owned electric companies, electric cooperatives, and public power utilities that serve load in several Upper Midwest states[25] formed the CapX2020 collaboration[26] to plan, develop, and build $2.1 billion worth of new high-voltage transmission lines in Minnesota, North Dakota, South Dakota, and Wisconsin. These coordinated efforts ushered in a new era of multi-state transmission planning and development that is re-shaping the electric power industry.

Begun in 2004, CapX2020 enabled the planning and construction of the transmission facilities necessary to maintain electric reliability and to supply additional capacity for load growth while also providing transmission capacity for the development of variable resources within the operating areas of the CapX2020 energy companies.

The $2 billion expansion, consisting of approximately 800 miles of new 161 kilovolt (kV), 230kV, and 345kV transmission lines and 22 substations created a high-voltage transmission backbone necessary for a robust grid in the Upper Midwest. In total, the transmission lines enabled the interconnection of approximately 3,600 MW of wind generation, which powers more than 1.5 million homes and avoids 6.3 million tons carbon dioxide emissions per year. At present, approximately 50 new generation projects have requested to interconnect to these new transmission facilities.[27] The CapX2020 projects are the largest development of new transmission in the area in more than 40 years and have changed the energy landscape of the region.

MID-ATLANTIC

As ITC plans for the energy grid of the future, the company has proposed a 1,000 MW bi-directional high-voltage direct current (HVDC) line that would provide the first direct link between Ontario and PJM (*see Figure 3*). This project will help deliver more affordable electricity to customers as a result of increased energy trading between these power markets. The ability to import, on demand, from non-emitting generators has the potential to reduce emissions profiles in both regions. The Lake Erie Connector offers significant support to goals laid out in the North American Climate, Clean Energy and Environment Partnership between Canada, the United States, and Mexico, including the continental goal to achieve 50 percent clean energy generation by 2025.[28]

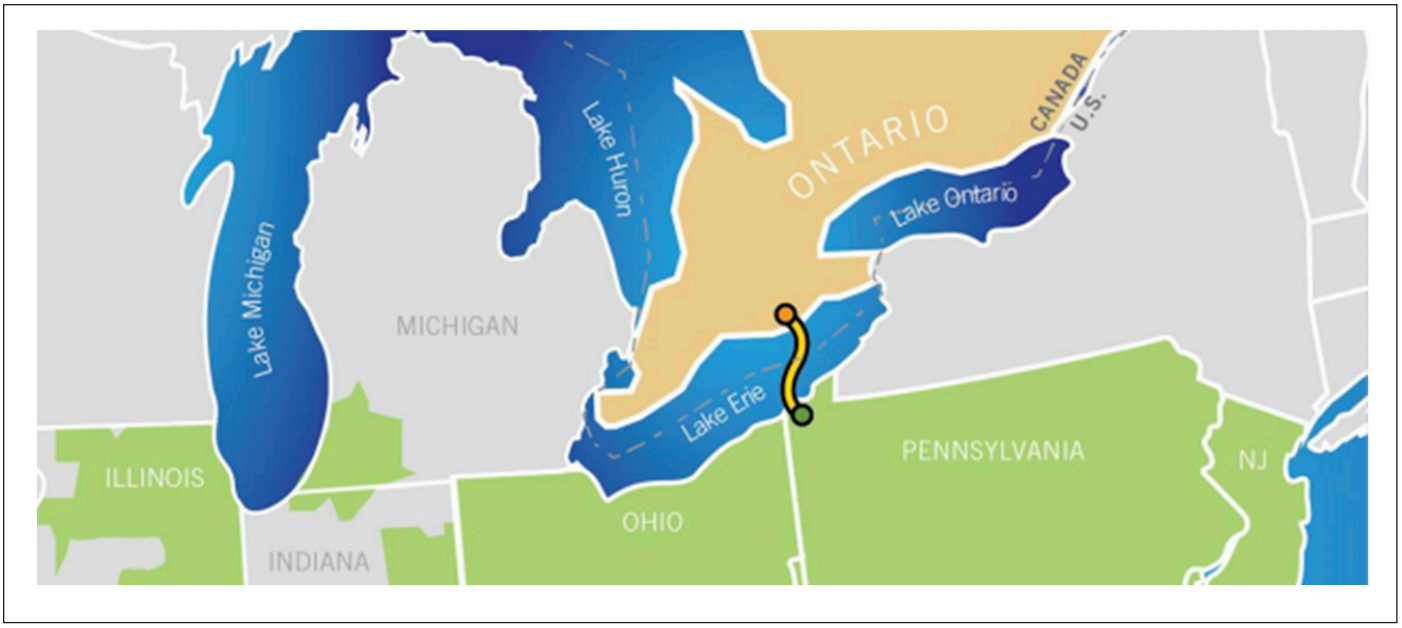
25 Central Municipal Power Agency/Services, Dairyland Power Cooperative, Great River Energy, Minnesota Power, Missouri River Energy Services, Otter Tail Power Company, Rochester Public Utilities, Southern Minnesota Municipal Power Agency, WPPI Energy, and Xcel Energy.

26 CapX2050 Transmission Vision Report, pp. 7-8, (Mar. 2020), http://www.capx2020.com/documents/CapX2050_TransmissionVisionReport_FINAL.pdf.

27 *Id.*

28 https://obamawhitehouse.archives.gov/the-press-office/2016/06/29/north-american-climate-clean-energy-and-environment-partnership-action.

Figure 3:
Map of Lake Erie Connector project;
courtesy of ITC Holdings, Corp.



Specifically, the Lake Erie Connector can help provide a cleaner energy mix by reducing Ontario's greenhouse gas (GHG) emissions in the electricity sector by 2 to 3 million tons per year. For PJM participants, load-serving entities and large electricity customers will be positioned to obtain energy from non-emitting wind, solar, hydropower, and nuclear energy resources during periods of surplus generation in Ontario with a resulting reduction in PJM's emissions profile.

Studies and historical data show that the value from trading across the intertie can create substantial financial benefits and savings of approximately $100 million per year. Further, the Lake Erie Connector offers substantial economic benefits by providing approximately 383 jobs per year during its 3-year construction period, and an additional 78 per year once in operation. The project is fully permitted in Canada and the United States. Remaining key milestones include completing project cost refinements and securing a transmission service agreement. Upon completion of these steps, ITC plans to begin construction in 2021.

NEW YORK

In November 2020, New York electric companies (Central Hudson Gas & Electric Corp., Consolidated Edison Company of New York, Inc., Long Island Power Authority, National Grid, New York State Electric & Gas Corp., Orange and Rockland Utilities, and Rochester Gas & Electric Corp.) developed a comprehensive plan[29] to transform their local transmission and distribution planning processes and make investments necessary to support the state's climate change policy. In recent years, New York passed some of the most progressive climate change laws in the United States: 70 percent of New York's generation fleet must be emissions free by 2030, 100 percent of generation must be emissions free by 2040, including the addition of 9,000 MW of offshore wind and 3,000 MW of storage. A 2020 study by the New York Independent System Operator (NYISO) demonstrated that changes in local transmission investment are necessary to avoid overloads, congestion, and renewable curtailments that will harm customers and increase costs.

29 New York Public Service Docket: 20-E-0197, http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=20-E-0197&CaseSearch=Search.

In response, the New York companies jointly filed recommendations (including specific projects)[30] based on a collaborative working group process with representatives from the New York State Department of Public Service, NYISO, New York State Research and Development Authority, New York Power Authority, and the Electric Power Research Institute. The report focuses on three areas:

1. Transmission Policy: evolve utility planning processes to reflect New York State energy policy mandates.
2. Technical Analysis: study and identify local transmission and distribution projects.
3. Advanced Technologies: identify commercially viable transmission and distribution technologies in support of high renewable penetration on the grid.

New Transmission Planning Process: Climate Leadership Community Protection Act Investment Criteria

The New York State climate laws will transform the state's energy supply portfolio, and electric companies are well-positioned to help determine how to accommodate, in a cost-effective manner, the integration of such large quantities of clean energy resources and to deliver the electricity to their customers. In their filing, the New York energy companies introduced new clean energy planning and investment criteria, which will be considered in conjunction with traditional planning criteria. If approved, these criteria will be incorporated into companies' local transmission and distribution planning processes.

The New York companies also recommended a new capital prioritization process for local transmission investment. The new prioritization process layers the criteria explained above on top of traditional criteria to measure benefits and to demonstrate the value of a project to meeting state climate goals. The introduction of these criteria will help guide investment choices by adding the customer value of reduced renewable curtailments to project planning and prioritization and will result in the identification of Multi-Value Transmission (MVT)[31] projects (i.e., projects that satisfy both traditional and clean energy planning criteria). With the new clean energy investment criteria and prioritization processes, the energy companies are elevating the importance of renewable deliverability in their planning processes for the first time.

CALIFORNIA

Pathway 2045 is Southern California Edison's (SCE's) roadmap for enabling a clean energy future for California, laying out a path for the growth of carbon-free energy resources needed both on the supply side and demand side.[32] Just as important as the blueprint to mitigate climate change is the need for an energy grid that enables the efficient integration of these clean energy resources while ensuring climate adaptation and broader resilience.

One of the pillars of *Pathway 2045* is to decarbonize the electric power supply. Compared to today's levels, 2045 will see a 60-percent increase in electricity demand and a 40-percent increase in peak load that will have to be met by carbon-free generation sources.

To satisfy this growth and to deliver this electricity to customers across California, the energy grid will need to integrate 80 GW of wind and solar and 30 GW of storage at the bulk power level via existing and new transmission infrastructure, equating to approximately $170 billion in clean energy resource investments and up to $75 billion in grid investments by 2045.

Reimagining the Grid is SCE's comprehensive assessment to address how the grid must change to support California's carbon reduction goals and to meet the imperative for electricity to be carbon-free by 2045—while also adapting to other needs driven by customers and climate change.

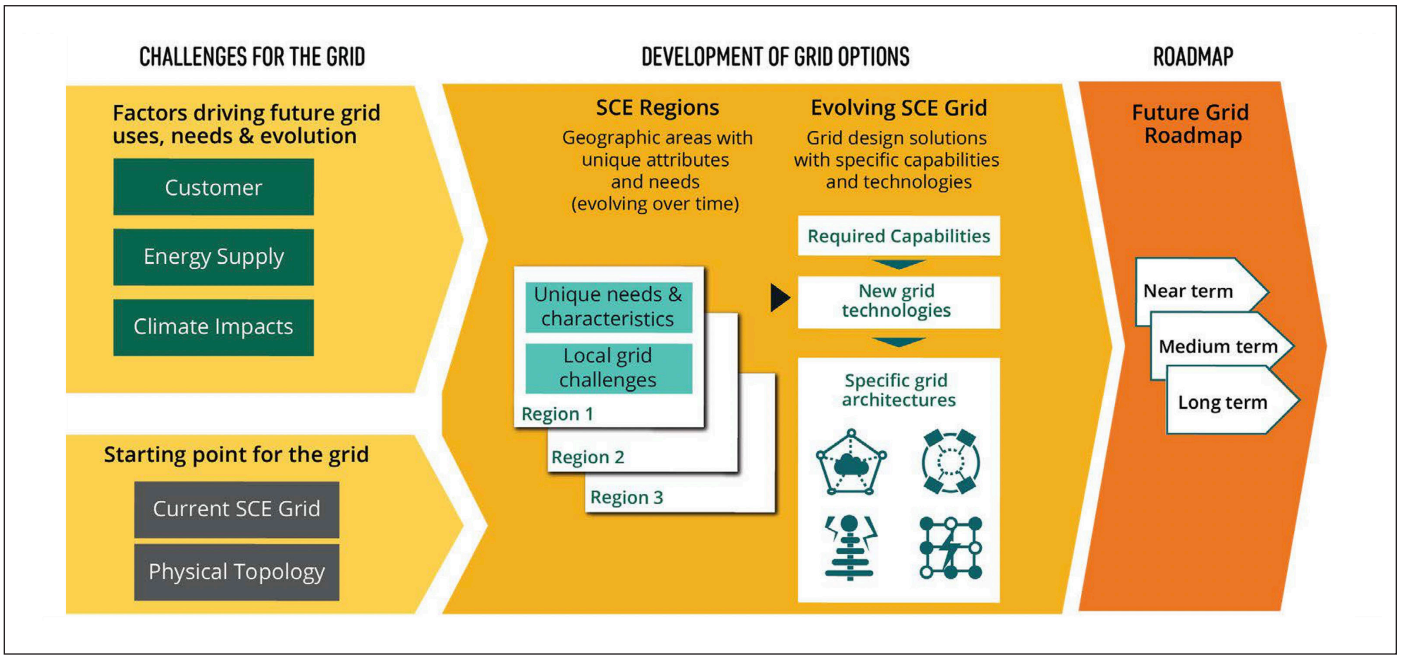
30 *Id.*

31 National Grid's New York Transmission Planning and Asset Management group developed the MVT concept and its underlying methodology in cooperation with the renewable development community. Its first public appearance is in National Grid's 2020 Niagara Mohawk rate review (currently pending before the New York Public Service Commission).

32 https://www.edison.com/home/our-perspective/reimagining-the-grid.html.

SCE's systematic approach starts with understanding what customers will need from the energy grid, how the supply mix will change, and the regional climate change effects that the grid will need to endure (*see Figure 4*). SCE will look at the unique needs of different regions, recognizing their varied energy uses, climate, and existing infrastructure; will prioritize the specific grid objectives most relevant for each region; and will determine which technologies and solutions best address those objectives. While *Reimagining the Grid* is rooted in analysis tailored to SCE's footprint, this blueprint generally can be applied to the rest of California (and beyond).

Figure 4:
Overview of Reimaging the Grid;
Courtesy of Southern California Edison.



SUPPORTING TRANSMISSION DEVELOPMENT FOR THE ENERGY FUTURE

President Biden's clean energy goals and actions to establish "a whole-of-government approach to put climate change at the center of our domestic, national security, and foreign policy" and to achieve a "100 percent carbon-pollution-free electric sector by 2035"[33] will require investment in the nation's transmission infrastructure and energy grid. As noted by the Natural Resource Defense Council (NRDC), "[n]early all federal and state policies affecting clean-electricity production and use—from energy-efficiency incentives to carbon-pollution rules for power plants to renewable energy standards—impact the grid."[34]

The nomination of former Michigan governor, Jennifer Granholm, as the Secretary of Energy, who has committed to working with FERC to expedite the development of transmission lines to connect clean energy resources to the energy grid demonstrates the Administration's recognition of transmission's role in a clean energy future.[35]

EEI's member companies continue to invest in and to develop cost-effective transmission to meet the goals of their states and, in some cases, to achieve their own individual clean energy goals. Despite the clear need for transmission to help achieve a clean energy future, challenges remain.

One barrier is the siting and permitting of transmission facilities that cross state lines or are on federal land. President Biden's Executive Order recognized this challenge by instructing his Administration to review siting and permitting processes and "identify steps that can be taken, consistent with applicable law, to accelerate the deployment of clean energy and transmission projects in an environmentally stable manner."[36]

Industry leaders, academics, and non-governmental organizations have recommended several regulatory initiatives to alleviate these challenges while keeping community interests at the forefront. Recommendations for building the transmission system include upgrading transmission in a way that increases utilization of existing transmission rights-of-way by reconductoring existing lines, increasing line voltage, or adding additional circuits; converting the standard alternate current design (AC) to direct current (DC); identifying transmission corridors with significant clean energy potential; and increasing community-engagement and environmental stewardship in all communities through public and community ownership.[37]

In addition, reforms in transmission planning, cost allocation, reliability criteria, and generator interconnection also may be needed to create a more holistic, national view of transmission system requirements to enable the integration of clean energy resources and meet carbon reduction goals.

To support the cost-effective transition to clean energy, state regulators and FERC should continue to enact regulatory frameworks that incentivize and support the investment and development of the transmission infrastructure needed to deliver a clean energy future. Together, EEI's member companies and its regulators can foster the robust deployment of transmission solutions through collaboration, regional and interregional planning efforts, and thoughtful public policies that encourage, enable, and support infrastructure investments, while ensuring reliability and operational efficiency and keeping energy affordable for all customers.

With the right policies and the right technologies, a 100-percent clean energy future can be more than a goal. It can be a reality. EEI's member companies are vital to transmission development, and we look forward to working with policymakers and regulators to get this critical energy infrastructure built more quickly to support the clean energy transformation.

33 Biden Remarks on Climate Change, https://www.whitehouse.gov/briefing-room/speeches-remarks/2021/01/27/remarks-by-president-biden-before-signing-executive-actions-on-tackling-climate-change-creating-jobs-and-restoring-scientific-integrity/.

34 NRDC, *Promote Efficient Renewable Energy Transmission* (Aug. 6, 2015), https://www.nrdc.org/resources/promote-efficient-renewable-energy-transmission.

35 Kelsey Tamborrino, Politico, "It's the climate economy, stupid" (Jan. 28, 2021).

36 Executive Order on Tackling the Climate Crisis at Home and Abroad, Section 213(a) (Jan. 27, 2021), https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/.

37 Brown and Botterud, *The Value of Inter-Regional Coordination and Transmission in Decarbonizing the US Electricity System*, Joule, p. 17 (2020), https://doi.org/10.1016/j.joule.2020.11.013; see also ACORE Macro Grid Initiative.

The **Edison Electric Institute** (EEI) is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for about 220 million Americans, and operate in all 50 states and the District of Columbia. As a whole, the electric power industry supports more than 7 million jobs in communities across the United States. In addition to our U.S. members, EEI has more than 65 international electric companies with operations in more than 90 countries, as International Members, and hundreds of industry suppliers and related organizations as Associate Members.

Organized in 1933, EEI provides public policy leadership, strategic business intelligence, and essential conferences and forums.

For more information, visit our Web site at www.eei.org.

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