

SOO Green HVDC Link

A New Transmission Model to Build a Clean Energy Grid

2 October 2024

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Session on Transmission Capacity
Illinois Renewable Energy Conference
Bloomington-Normal, Illinois



The Need: Illinois and the Midwest

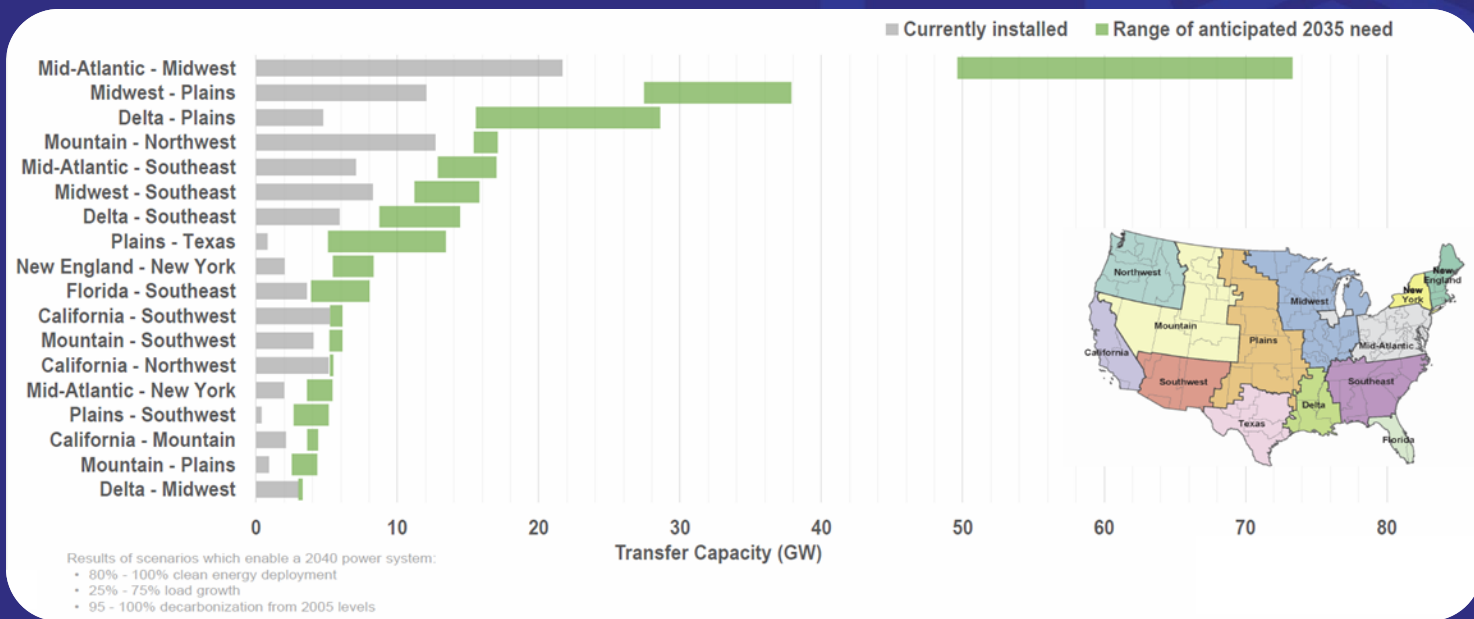
Improving Grid Reliability and Helping Meet CJEA Goals



Needs

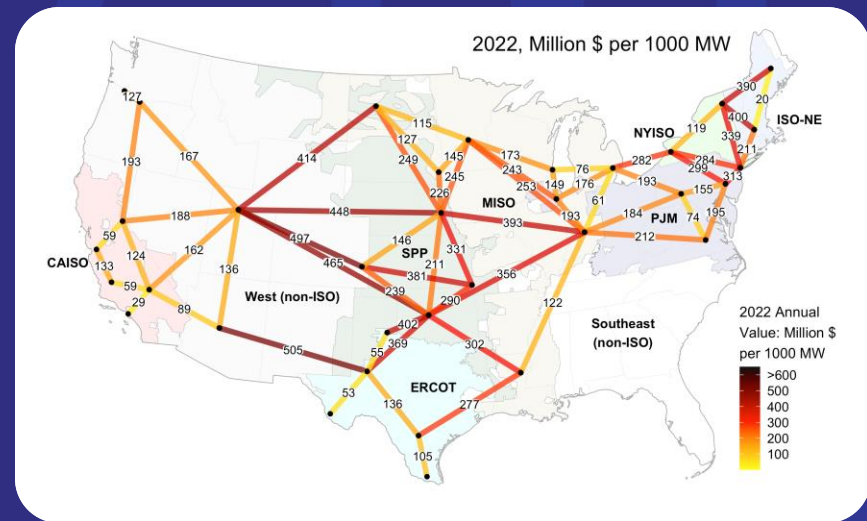
2023 National Transmission Congestion Study

- Data from six capacity expansion studies analyzed, to identify *future* regional and interregional transmission needs.
- Biggest inter-regional 2035 Tx needs gap: Midwest <-> Mid-Atlantic (28-52 GW)



2023 Transmission Congestion Values

- The latest market data show that the potential savings from new electric transmission was higher than at any point in the last decade.
- Extreme conditions and high-value periods disproportionately boost the value of new transmission- not always adequately considered in forward-looking assessments.
- The most valuable 5% and 10% of hours accounted for a substantial portion of total annual transmission value.



MID-GRID 2035

Regional Transmission Initiative for America's Smartland

ILLINOIS
GOVERNOR
JB PRITZKER
Chair's Agenda



“Better Connections Between RTOs – Improving Transmission Seams Reliability in the Midwest”.

Bringing Midwestern regulators and policymakers together to position the Midwest as a modern energy producer and low-cost energy provider, with a goal of establishing a long-term transmission grid vision for the region.

2021 CEJA

Groundbreaking legislation to decarbonize Illinois' grid



“Comprehensive energy legislation that centers equity and puts Illinois on track to achieve 100 percent renewable energy by 2050”.

Reach 40% renewable energy by 2030, 50% by 2040.

Achieve a carbon-free power grid by 2045, closing all fossil-fuel power plants.

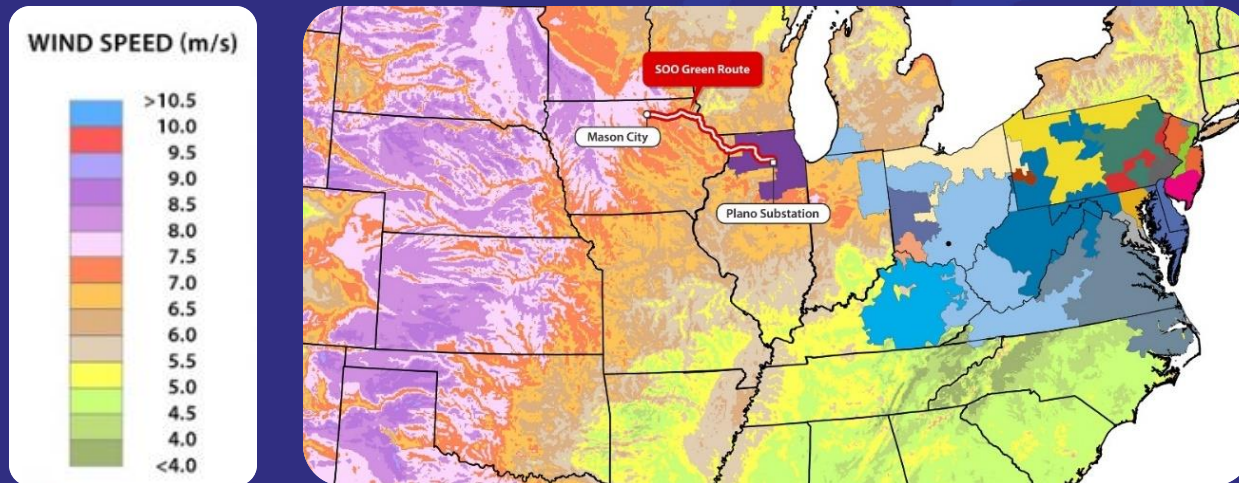
Equitably grow the clean energy workforce to meet the demand.

A New Model

Inter-Regional HVDC: Underground in Transport ROW

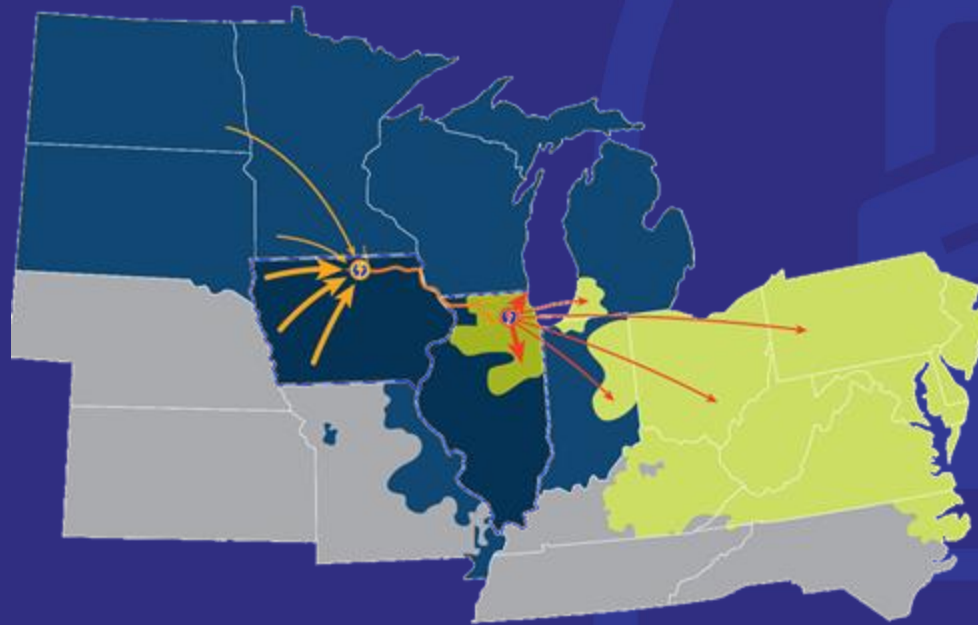


The Inherent Value of High Wind Speeds



- The grid-system market value of wind tends to decline with wind penetration, impacted by generation profile, transmission congestion, and curtailment.
- Variable renewable generation can have important impacts to pricing patterns, obscured when looking at regional average annual pricing trends.
- Access to wider geographies of renewable generation and sourcing from high wind regions can help stabilize and reduce wholesale electricity prices.

SOO Green HVDC Link – Connecting Markets



- SOO Green will source low-cost, renewable generation from MISO, which serves 15 states and 42 million customers.
- SOO Green will interconnect on a robust point in the Illinois ComEd zone of PJM, which serves 13 states and 65 million customers.

The Project

SOO Green HVDC Link- Mason City IA to Plano IL



Technology Innovation

- VSCs boost grid **RELIABILITY** by providing extremely responsive utility-scale reactive power, black start and other ancillary services historically provided by centralized fossil-fueled generators
- VSCs strengthen grid **RESILIENCY** by accurately controlling power dispatch, avoiding cascading outages and improving power quality via dynamic voltage, frequency and reactive power control
- XLPE cables enable long-distance delivery of renewable energy with **EFFICIENCY** (lower line loss) and allow for simpler and less expensive UG-HVDC installation with high-power transfer capability

Siemens 2100 MW Voltage Sourced Converter Station Technology



Implementation Innovation

- **Avoids eminent domain** and contentious siting and permitting issues that have hindered overhead transmission development
- **Minimizes environmental impacts** through underground installation
- **Eliminates visual impacts** from overhead transmission facilities
- **Enhances grid reliability and resiliency** by providing a lifeline to neighboring states
- **Accelerates development** by lowering project risk and shortening development timeframe
- **Enables new energy development** where it's most efficient to build and operate
- **Delivers energy over long distances** with low line loss using modern digital HVDC technology
- Locating underground in a policed rail corridor **enhances grid security**



The Impacts

Economics, Environment, Grid, and Society



Economic Benefits- Illinois

Tx Construction

3,800 job-years
\$515 MM+ earnings
\$780 MM+ state output

30-yr Tx Ops

4,200 job-years
\$520 MM+ earnings
\$2 Bn+ state output

New Component Manufacturing

2,000+ job-years
\$180 MM+ earnings
\$560 MM+ state output

Economic Benefits- National

Tx Construction

22,000+ job-years
\$2.3 Bn+ earnings
\$4.9 Bn+ GDP output

30-yr Tx Ops

13,000+ job-years
\$1.2 Bn+ earnings
\$5.7 Bn+ GDP output

New Generation Construction + Component Manuf.

45,000+ job-years
\$3.6 Bn+ earnings
\$9.9 Bn+ GDP output

New Generation Operations

64,000+ job-years
\$4.5 Bn+ earnings
\$15 Bn+ GDP output

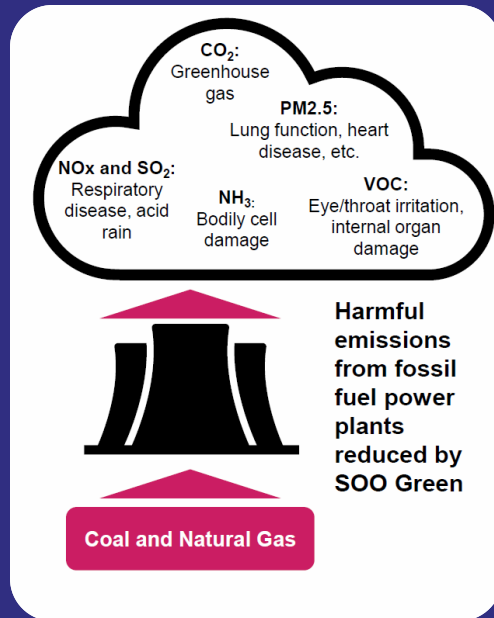
\$4Bn

Private Sector Investment
to Boost Grid Resiliency

\$1Bn

Avoided Daily Costs of
Major Grid Interruption

Environmental Benefits- Illinois



By displacing electricity generated by fossil fuel power plants, SOO Green will lower emission of greenhouse gases and other harmful pollutants, reducing damage caused by climate change, reducing healthcare costs, and saving lives.

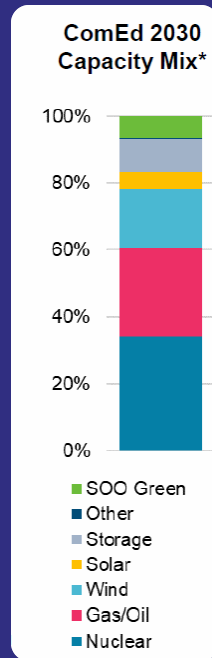
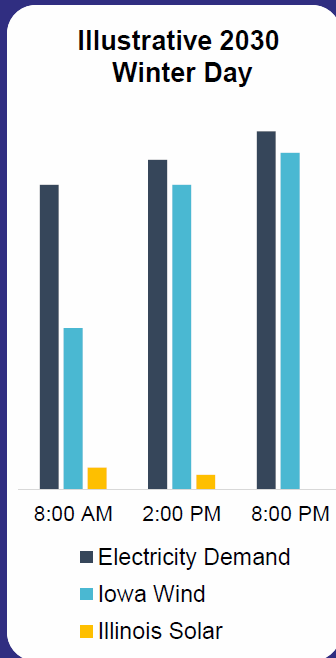
\$9.8Bn

Avoided Social Costs of GHG Emissions
In Illinois

\$9.7Bn

Illinois' Health Benefits, mainly
in disadvantaged communities

Grid Benefits (Reliability)- Illinois



SOO Green's generation resource diversity will contribute to additional system reliability, as Illinois shifts towards a winter peaking demand, and step in to fill unserved demand in the instance of low-probability high-impact events.

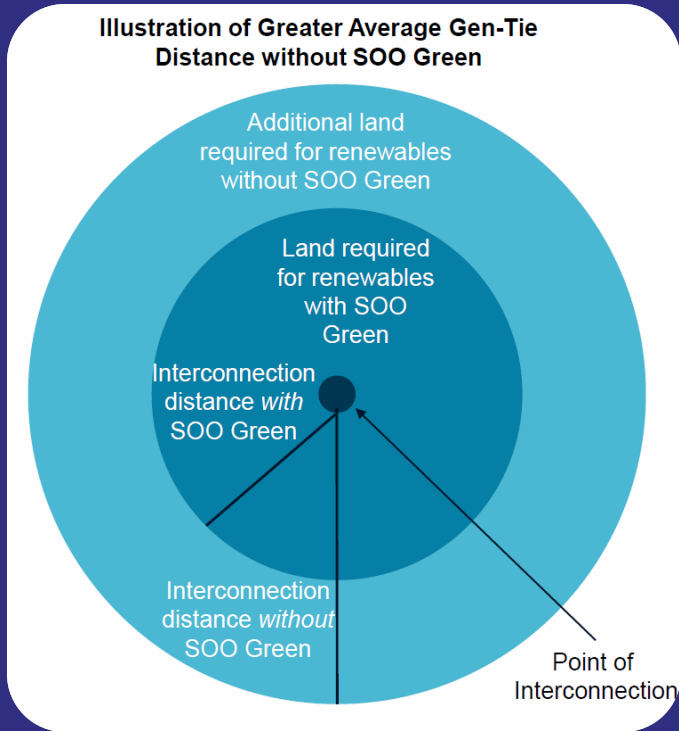
190GWh

Avoided Unserved Demand from Potential Summer 2030 Outage Scenario Without SOO Green

\$6Bn

Value of Unserved Demand in Summer 2030 Generation Outage Scenario Without SOO Green

Grid Benefits (Cost Effectiveness)- Illinois



SOO Green's high output single point of interconnection in PJM Illinois will help avoid costs of Grid Upgrades and Interconnections for multiple in-state renewable generation projects, while still allowing for 13 GW of new Illinois solar and wind projects through 2040.

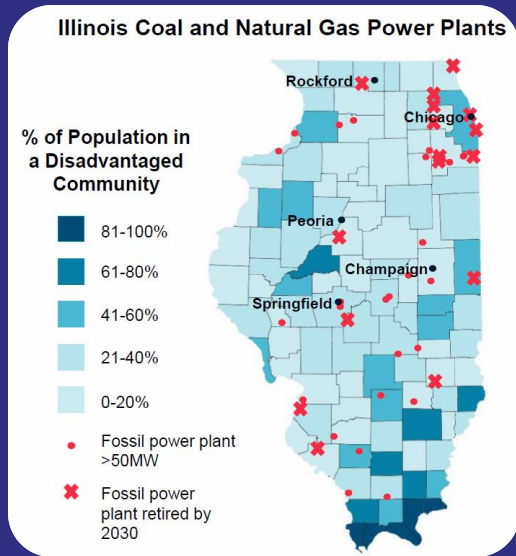
\$561M

Avoided Bulk System Upgrade Costs without SOO Green over 25 years

\$458M

Avoided Interconnection Costs without SOO Green over 25 years

Community Benefits- Illinois



SOO Green's delivery of 13 TWh/yr of reliable clean energy will help enable the retirement of 14 high-emissions fossil power plants located within 3 miles of Disadvantaged Communities identified by the State of Illinois.

88

Estimated Number of IL Wind and Solar Projects to Replicate Clean Power to be Delivered by SOO Green

144,000

IL Acres Needed for Wind and Solar Projects to Replicate Clean Power to be Delivered by SOO Green

Key Takeaways

.. a significant portion of the energy delivered by SOO Green would contribute to generation and **resource adequacy**

..the project would benefit ratepayers by **impacting wholesale energy costs**, lowering those costs for Illinois ratepayers by \$5.85 billion over 20 years

.. the monetized value of the **avoided emissions** from SOO Green over the 20-year period is in the range of \$2.5 billion to \$23.7 billion

96%

ELCC for SOO Green in 2030 based on generation profiles submitted by the project

92%

ELCC for SOO Green in 2040 based on generation profiles submitted by the project

Thank you!

SOOGreen.com

