SOO Green

Inter-RTO UG-HVDC Tx Within Transportation Corridors

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HVDC Design Workshop- Lunch Speaker ISU Electric Power Research Center Ames, Iowa



What?



Neighboring States -> Connecting Supply & Demand



- 1st US State to Enact RPS (1983)
- Regulated Retail Power Market
- 1st in %Wind Power Gen- 59% (41 TWh)
- 2nd in Installed Wind Capacity (13K MW)
- Potential Wind Capacity 280K MW
- Stated 2011 goal to develop Gen and Tx to export wind power

- 1st US State to create a comprehensive Environmental Protection Act (1970)
- Competitive Retail Power Market
- 5th in Installed Wind Capacity (8K MW)
- Potential Wind Capacity 191K MW
- Stated 2021 goal of carbon-free power grid by 2045

Grid Tied– Connecting Wholesale Markets



With enough Tx, can Iowa's Terrestrial Wind Replace Off-shore Atlantic Wind in the Eastern Seaboard?



- Source low-cost renewable generation from MISO, which serves 15 states and 42 million customers.
- Interconnect on a robust injection point in the Illinois ComEd zone of PJM, which serves 13 states and 65 million customers.

Why?



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)





Source: Draft National Transmission Needs Study, Dr. Adria Brooks, DOE/GDO [April 2023 @MIDGRID35 meeting]

MID-GRID 2035 *Regional Transmission Initiative for America's Smartland*

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.

Started by Iowa Governor Kim Reynolds and continued by Minnesota Governor Tim Walz and Illinois Governor JB Pritzker

https://midwesterngovernors.org/chairs-agenda/

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.

https://dceo.illinois.gov/content/dam/soi/en/web/dceo/ceja/documents/ceja-networking-fair-presentation.pdf

Disclaimer!



Perspective of An Environmental Professional

Evolution in Value Creation

- Oops! [Legacy Services]
- Check the Box. [Compliance Services]
- Show me the Money! [Internal Business Case]
- Who is Picking up the Tab? [Quantifying and Internalizing Unintended Externalities]

Sustainable Multi-Capital Accounting

• Financial, Human, Social, and Natural Capital

How?



Project Details

- 525 kV Underground HVDC
- 2100 MW
- 350+ Miles
- Entirely in Transportation ROW
- Symmetric Bipole Configuration
- VSC Converter Stations
- XLPE Submarine Grade Cables

Financial Capital

- Spread in Wholesale Electric Prices +
- Spread in REC Values +
- Spread in Capacity Markets +
- Value of Ancillary Services

= Opportunity for Merchant Tx Project

Leverage Spread -> Alleviate Tx Congestion



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.

Source: Land-Based Wind Market Report: 2022 Edition Executive Summary [Office of Energy Efficiency & Renewable Energy, DOE]

Human Capital

- Economic Development [Jobs, Earnings, GDP]
- Commitment to Organized Labor [LiUNA, Operating Engineers, IBEW]
- Commitment to Workforce Development [Community Colleges and Local/Regional Economic Development Authorities]
- Train to Hire Programs Prioritizing local hiring from disadvantaged segments of Community [Hire 360 in IL and Competitive Edge in IA]

Social Capital

- Economic Impacts at Scale
- Community Development Projects along project corridor
- Not relying on eminent domain authority for site control of project corridor
- Active engagement with community on physical alignment of project
- State-of-the art Technology Transfer from Overseas w/ focus on Onshoring Manufacturing

Economic Benefits- Iowa

Tx Construction \$1 Bn+ state output

30-yr Tx Ops \$2 Bn+ state output

New Generation Construction + Component Manuf. \$3 Bn+ state output New Generation Operations

\$7 Bn+ state output

Economic Benefits- Illinois

Tx Construction \$780 MM+ state output

30-yr Tx Ops \$2 Bn+ state output

New Component Manufacturing

\$560 MM+ state output

New Downstream Industrial Activities

\$26 Bn state output

Source: Strategic Economic Research, Dr. David Loomis [Feb 2023, Mar 2024]

Economic Benefits- National

Tx Construction \$4.9 Bn+ GDP output **30-yr Tx Ops** \$5.7 Bn+ GDP output

New Generation Construction + Component Manuf. \$9.9 Bn+ GDP output New Generation Operations

\$15 Bn+ GDP output

\$4Bn

Private Sector Investment to Boost Grid Resiliency \$1Bn

Avoided Daily Costs of Major Grid Interruption

Source: Strategic Economic Research, Dr. David Loomis [Feb 2023]

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



Natural Capital

- Narrow Permanent Impact Corridor (10 feet) -Limited Environmental Impacts
- Extreme Weather Resilience through in-conduit Underground Installation
- Low-impact Construction Methods in environmentally sensitive areas
- Limiting Environmental Impacts to only construction and not during operations
- Environmental justice considerations in logistics

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

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

*Illinois Decarbonization Study: Climate and Equitable Jobs Act and Net Zero by 2050, Prepared for Commonwealth Edison (ComEd) by Energy and Environmental Economics, Inc. (E3), December 2022

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 from IPA Policy Study

.. 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

0.01%

Estimated LOLE reduced from 0.1% in ComEd Territory with SOO Green 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

Another Enviromental Analogy



Thank you!

SOOGreen.com

