Before electricity is distributed to consumers, it is first transmitted from its generation source to the grid. The U.S. electric grid currently contains over 642,000 miles of high-voltage transmission lines. Expanding transmission capacity is instrumental in sourcing new and high-quality renewable energy resources. Preventing region-wide blackouts and ensuring consistent, equitable access to electricity depends on updated transmission infrastructure and advanced transmission technologies.

**Key Technologies**
- High-voltage transmission lines
- Sensor and software solutions
  - Dynamic line rating
  - Topology optimization controls
- Actuators and hardware solutions
  - AC and DC power flow controllers

**Potential Market Size & Timing**
- To meet net-zero scenarios, the capacity of the transmission system will need to at least double by 2030 and possibly triple by 2050. Even in lower transmission estimate scenarios where construction is more difficult and costly, current domestic transmission capacity will still need to increase by approximately 26%.
- The most successful low-cost net-zero scenarios demonstrate a clear relationship between transmission and wind, as wind generation is most dependent on new transmission capacity.

**Barriers**
- Siting and permitting challenges
- Aging infrastructure
- High infrastructure and technology costs
- System congestion

**Accelerators**
Governments globally are funding grid improvement and reliability projects.
- Permitting reform (including eminent domain or similar tools) to ensure projects can be built in a commercially reasonable time.
- **Full implementation of Bipartisan Infrastructure Law** provisions accelerating transmission:
  - Transmission Facilitation Program - $2.5 billion for high-capacity transmission projects
  - Energy improvements in rural or remote areas provision provide funding for cost-effectiveness and siting for transmission systems.
- Full implementation of an estimated $20 billion globally allocated for transmission and distribution systems spending between 2020-2023.
- DOE’s Building a Better Grid Initiative focuses on domestic deployment of “new and upgraded high-capacity electricity transmission lines.”

**Relevant NEMA Technologies**
- Transmission and distribution voltage regulators
- Power & control cables
- High voltage insulators

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1 [Advanced Transmission Technologies Report - final as of 12.3 - FOR PUBLIC 0.pdf](energy.gov)
2 [Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035](nrel.gov)