Electric Energy Challenges of the Future
A National Transmission Overlay

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Research objectives

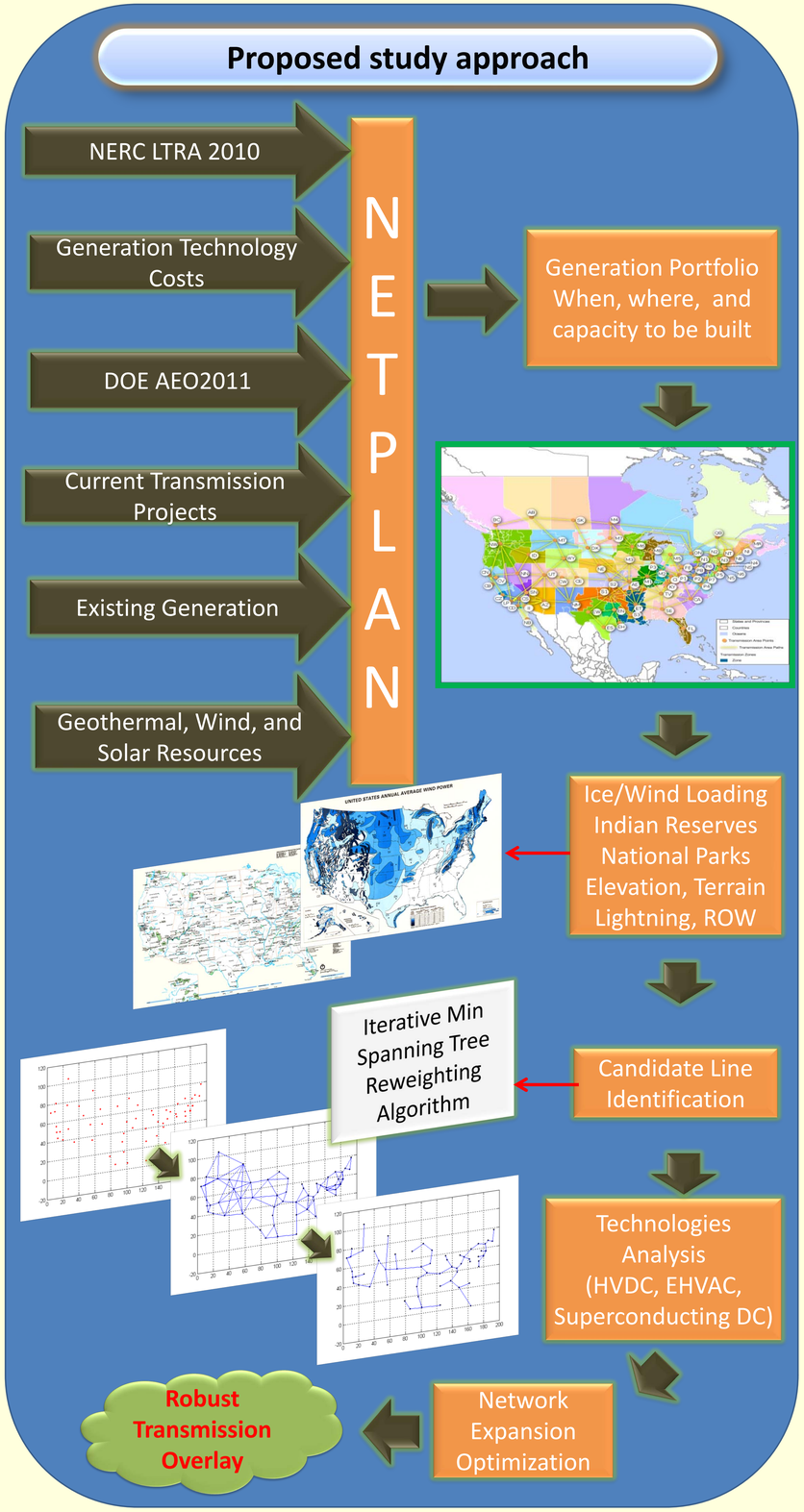
- Develop a design process for a **Robust Transmission Overlay** that facilitates the growth of wind, solar, nuclear, geothermal, clean-coal, natural gas, and other low-CO_2 emitting generation technologies over the next 40 years.

Importance for the future grid

- Facilitate growth of most economic renewable resources and therefore decrease energy costs.
- Reach U.S. CO_2 emission reduction target at least cost.
- Increase resilience in energy prices to catastrophic Katrina-like events that affect wide geographic areas.
- Obtain flexibility in generation portfolio to future conditions .
- Relieve transmission congestion and enable interregional power exchange.

Research deliverables

- A design process for a National Transmission Overlay.
- A summary of recommended transmission overlay designs for several futures.
- Robustness analysis showing performance of each design under all developed futures.



Accomplishments to date

- Development of a process to identify candidate lines, including the iterative minimum spanning tree reweighting algorithm, which accounts for load and resource centers, ice/wind loading, Indian reserves, national parks, elevation, terrain, lightning, ROW availability, and high congestion.
- Development of a U.S./Canada electric system model containing 75 nodes, 162 lines and 418 generators, and initial NETPLAN runs to determine generation futures.

Research approach continued

- Different “futures” in terms of load growth and generation investment are under development. High inland wind/solar, high off-shore (wind/ocean), high geothermal, high nuclear, high clean-coal, high natural gas, and high distributed generation.
- Different transmission technologies (±600/±800kV DC, 765kV AC, superconducting ±200kV DC, & integration).
- Obtain industry involvement and input.
- Consider reliability (rule of three).
- For each generation future, determine cost, resilience, emissions, & robustness with and without transmission expansion.

Potential uses of this research

- This work suggests “good” transmission overlay designs in terms of cost, emissions, resilience, and robustness.
- It provides a process for performing high-capacity interregional transmission planning and design.
- It contributes to the discussion of long-term national energy policy and addresses the grand challenge of charting a 40-year investment path.