Power of Place and Transmission

National Association of State Energy Officials
Annual Meeting
October 17, 2023

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The Buildout Challenge

- 10x buildout of our current renewable energy capacity
- Wind and solar require a lot of land
- Potential for widespread buildout conflicts — environmental, social, and land-use
- This could slow progress toward a low carbon future

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Power of Place: A National Vision for Clean & Green Decarbonization

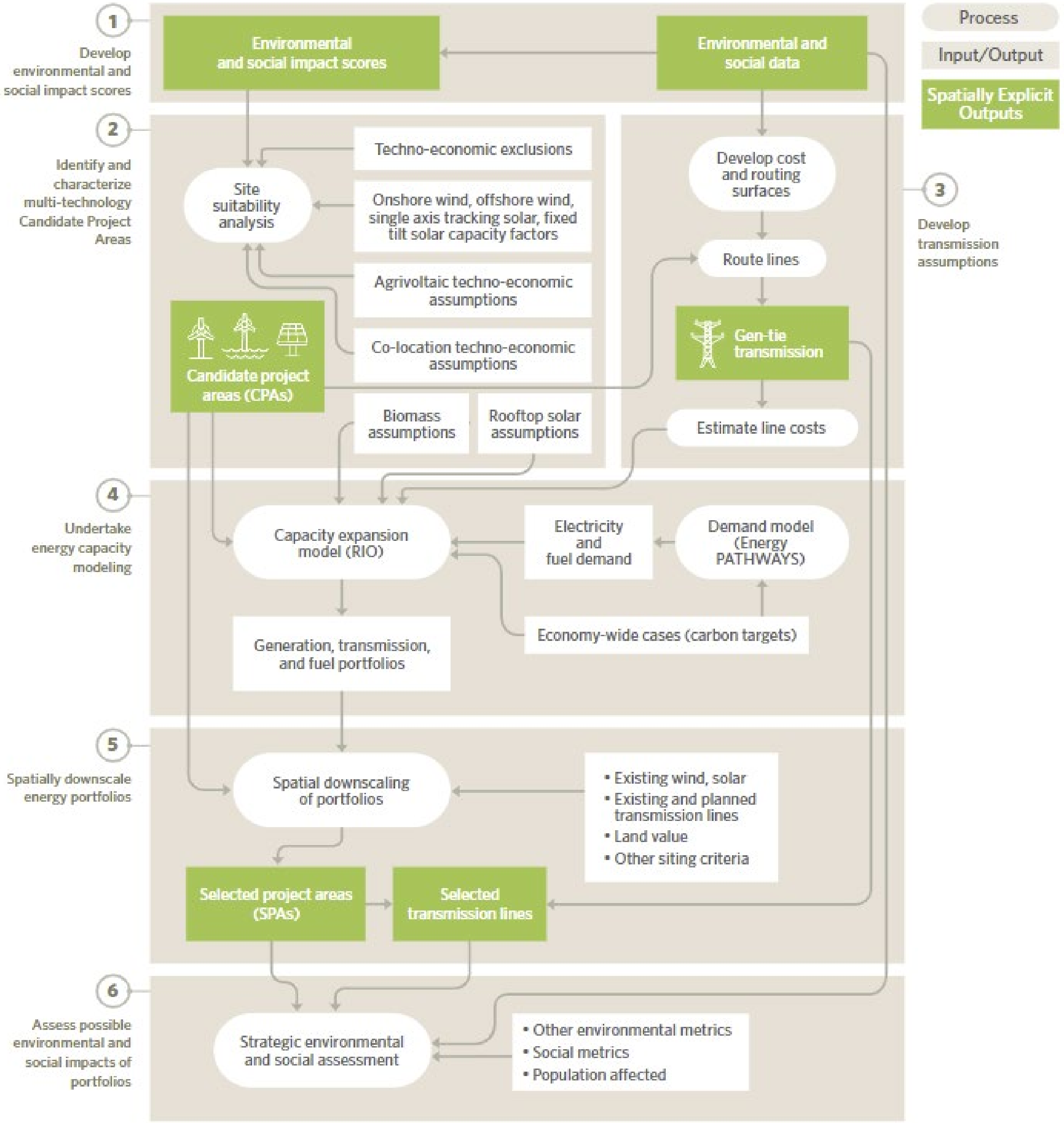
Methodology for identifying pathways to get to net-zero, economy-wide decarbonization by 2050 under different social and conservation constraints

Scaling Up Power of Place

- California - 2019
- Western U.S. - Sept 2022
- Nationwide - May 2023

nature.org/powerofplace

Methods



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EVOLVED ENERGY RESEARCH

UNIVERSITY OF CALIFORNIA SANTA BARBARA

Montara Mountain Energy

American Farmland Trust

1. **Siting-as-Usual** — Current trajectory
2. **Decarbonization Pathways** — Select a pathway that optimizes for climate, conservation, and communities
3. **Plan with Environmental and Social Data** — Include environmental and social data in energy planning
4. **Technology Shifting** — Shift clean energy technology to encourage a mix that minimizes impacts on natural and working lands and waters, and communities
5. **Land-Saving Approaches** — Maximize opportunities for agrivoltaics, fixed tilt solar photovoltaics, and co-location of wind and solar

Energy planning steps for reducing environmental and social impacts

Energy modeling identifies different pathways — the mix of technologies and amount of each technology — that will be needed to meet specific goals, such as net-zero emissions, economy-wide by 2050. The Power of Place–National *model also takes into account environmental and social considerations.*

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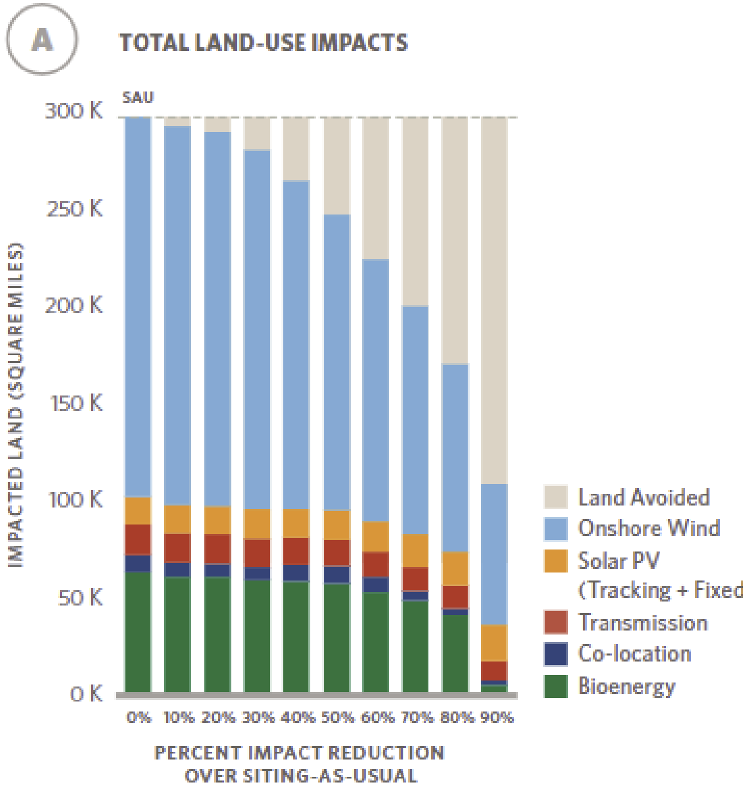
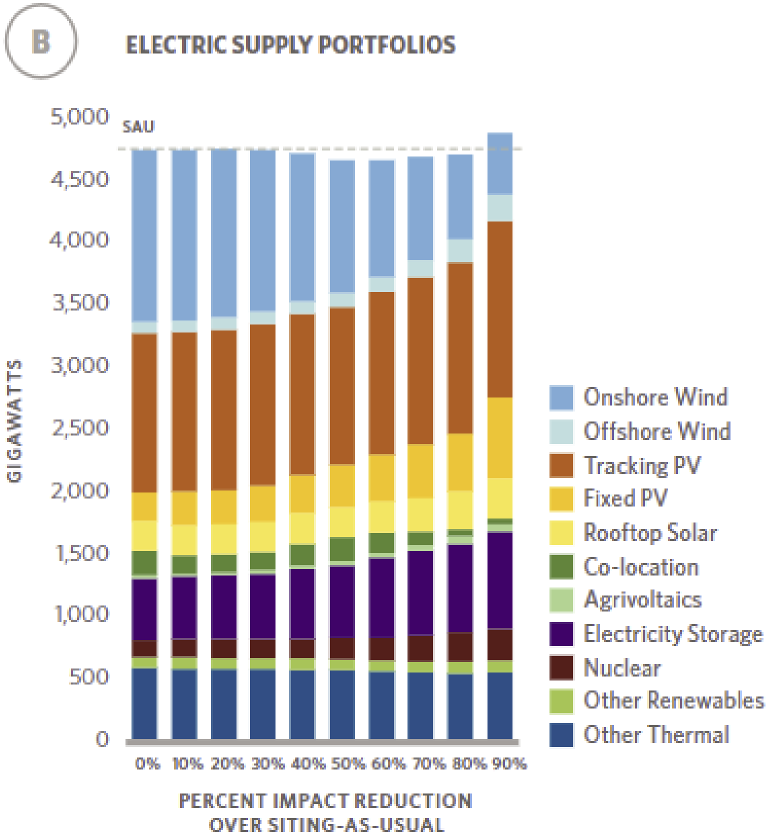
We can significantly reduce negative environmental and community impacts of development projects

Reducing impacts shifts clean energy portfolios

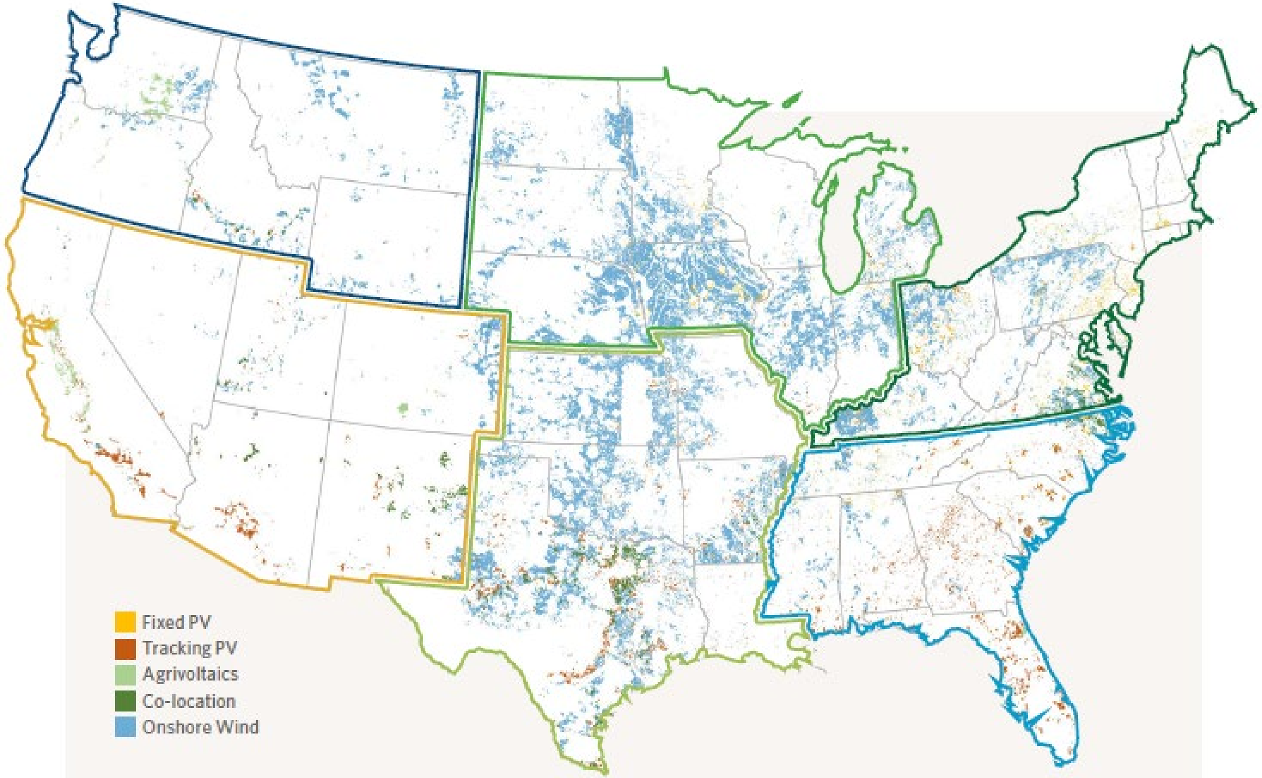
(A) Total (direct and indirect) land use impacts (see Methods for definition) of the 2050 net-zero emissions reduction energy system under a siting-as-usual scenario (0% reduction threshold) and in 10% increments of increasing environmental and social impact reductions. By shifting technologies, land use impacts are reduced. "Bioenergy" refers to land used for biomass.



(B) Electric supply portfolios of the energy system under the different impact reduction scenarios. As impacts are reduced, the energy portfolio shifts to less onshore wind and more offshore wind, solar, storage, and nuclear. "Co-location" refers to the deployment of wind and solar in the same project area. "Agrivoltaics" refers to co-production of food and solar electricity via tracking PV on agricultural lands. "Electricity Storage" includes utility scale battery systems and pumped storage hydropower. "Other Renewables" includes geothermal and hydroelectricity. "Other Thermal" includes existing coal, existing natural gas, new natural gas with carbon capture, existing petroleum, biomass, landfill gas, and municipal waste, all of which are abated.



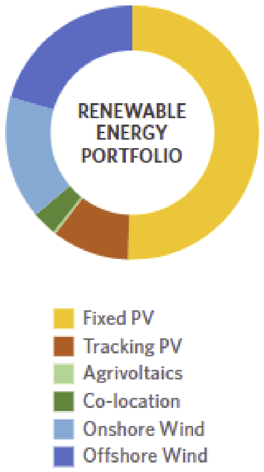
Renewable Buildout By Region

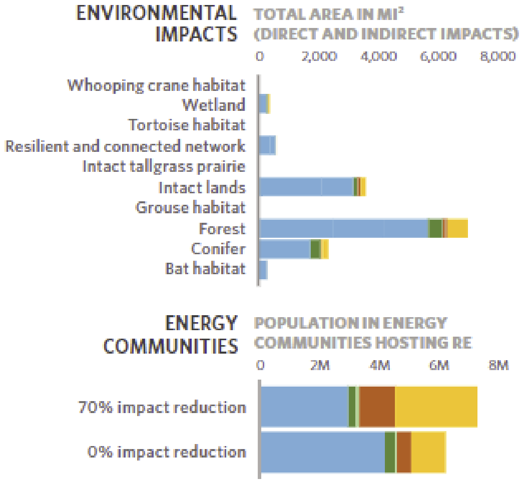


Renewable energy distribution under 70% impact reduction scenario

Under the 70% impact reduction scenario, renewable technologies will be widely distributed across all six regions of the United States.

Northeast





Modeled inter-regional and gen-tie GW-miles are reduced as impacts are reduced

- All scenarios require major expansions (2.5 to 3X current capacity) of inter-regional transmission capacity, but lower-impact scenarios require less infrastructure.
- Inter-regional transmission is reduced by ~30% between the 70% impact reduction scenario and SAU
- Because available transmission capacity can be a driving force in renewable energy development siting decisions, a well-planned transmission system can be an enabling factor in fostering low-impact buildout

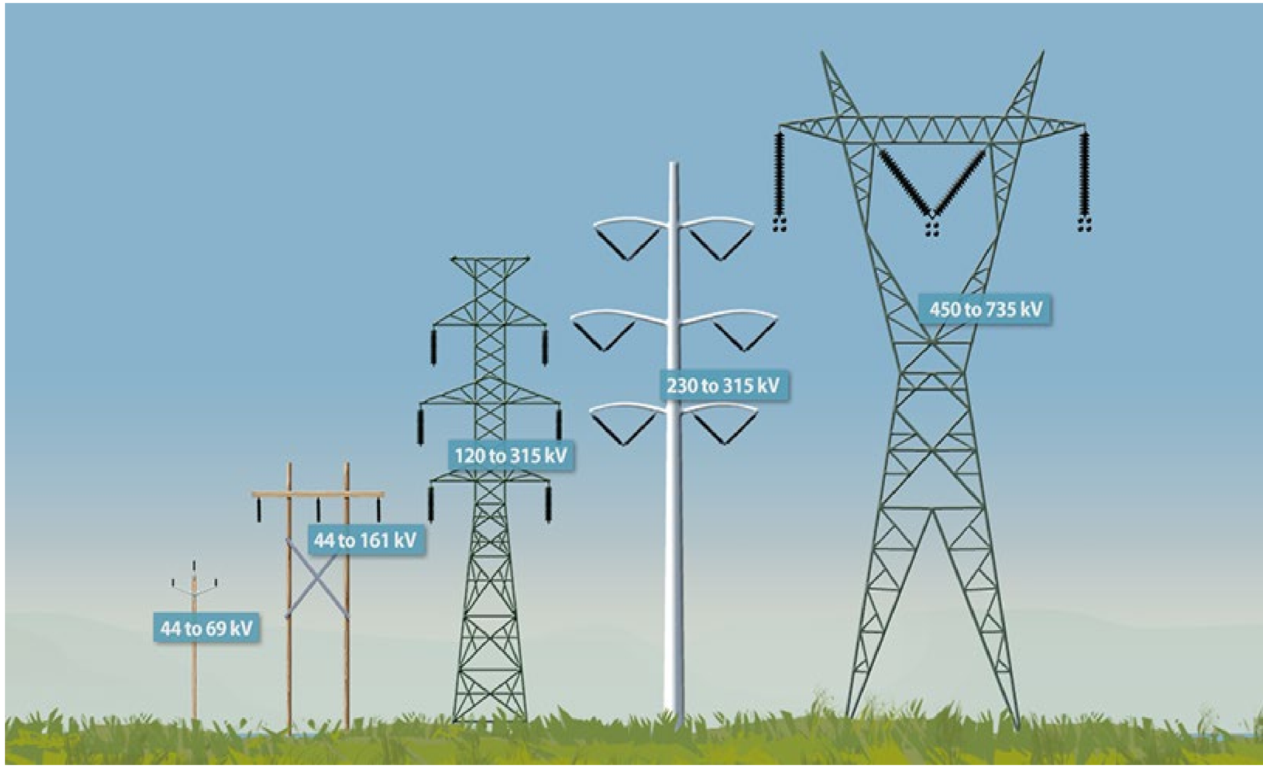
REDUCTION IN ENVIRONMENTAL IMPACT	GW-MILES *inter-regional transmission*	GW-MILES *gen-tie transmission*
0%	283,000	27,000
10%	279,000	27,000
20%	272,000	26,000
30%	264,000	26,000
40%	248,000	25,000
50%	233,000	24,000
60%	219,000	23,000
70%	202,000	22,000
80%	191,000	21,000
90%	144,000	22,000

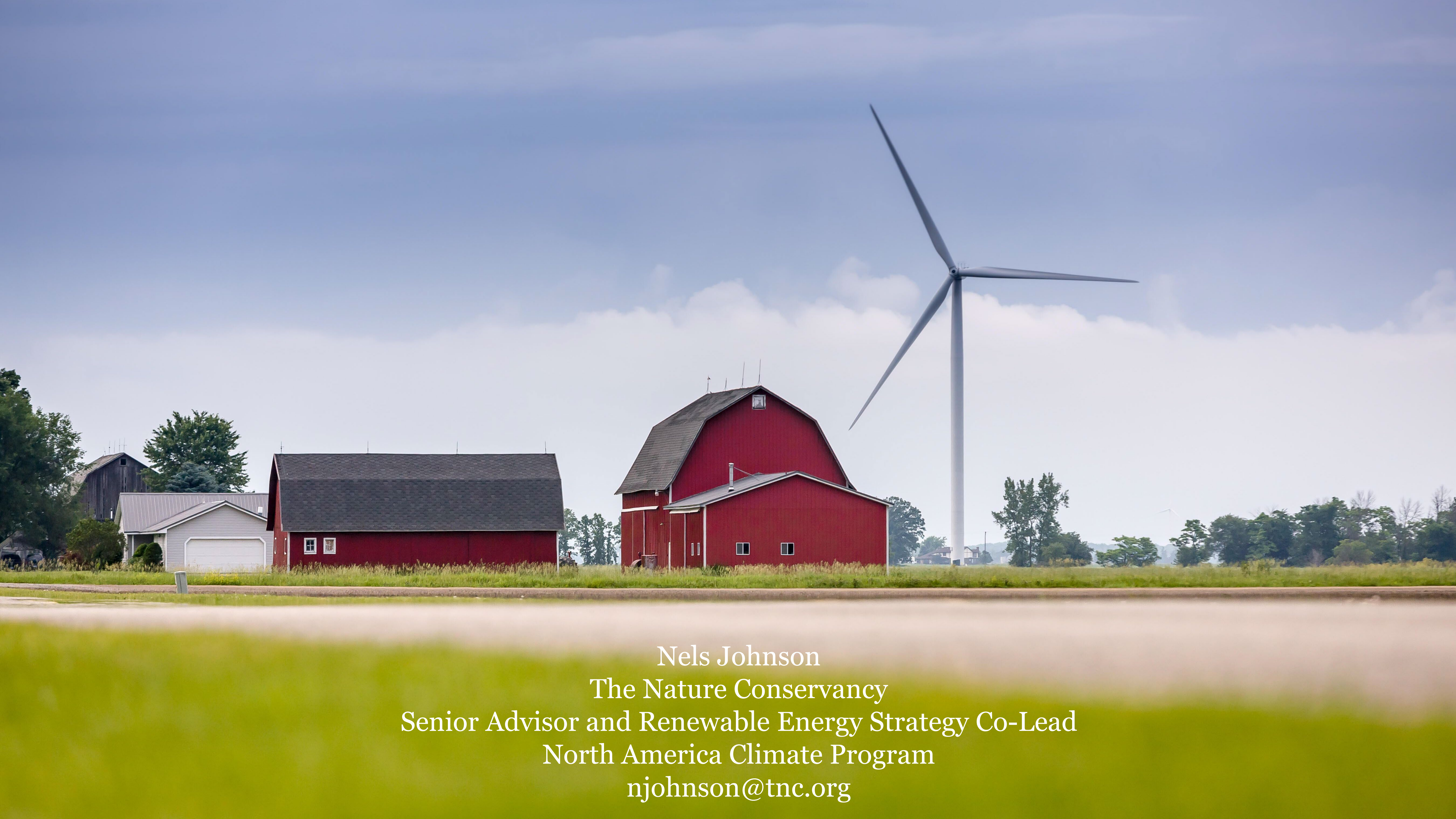
Transmission expansion needs can be meet through a combination of co-location, reconductoring, and strategically sited new transmission corridors

Transmission	Length (miles)
Existing (>=230 kV)	86,323
Reconductor	4,093
Co-locate	2,638
New	6,259

Transmission Planning Possibilities

- Sub-station analysis
  - TNC San Joaquin Analysis
  - Montara Mtn Energy CA analysis
  - TNC Westwide Analysis
- Co-location, reconductoring, and GETTs
- Transportation ROWs
- New strategic ROWS
  - GridLab Connected West Study





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