



## *Accelerating Transmission Capacity Expansion*

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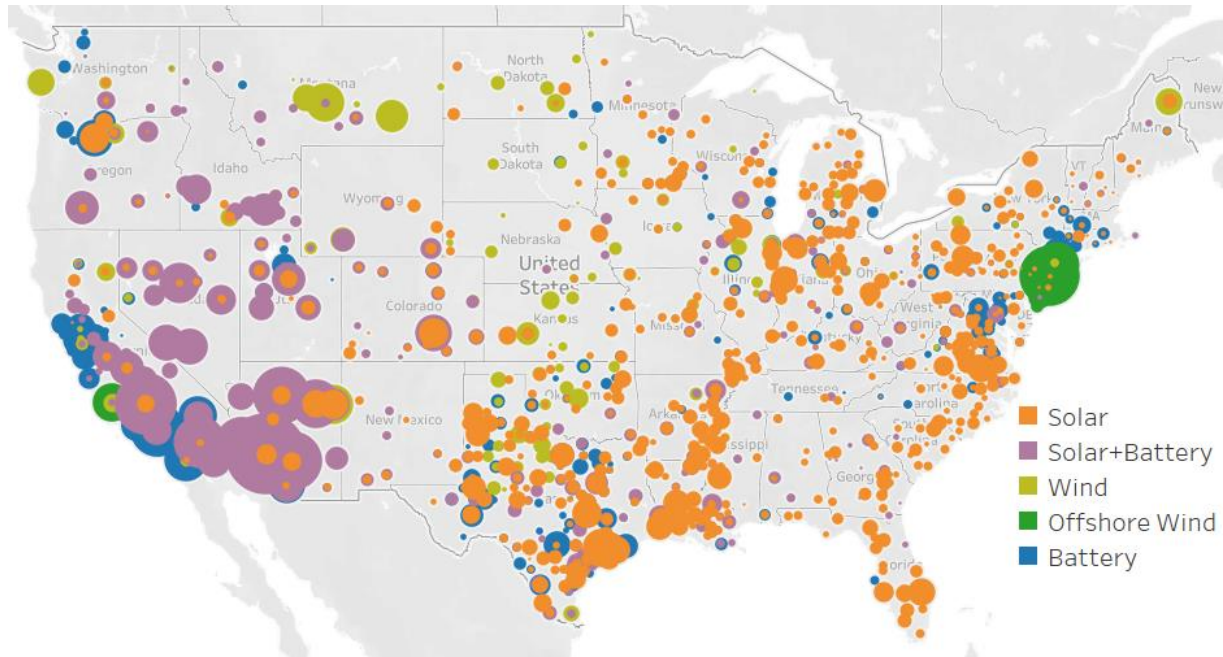
India Energy and Climate Center  
University of California, Berkeley

at Asia Clean Energy Forum, June 2026



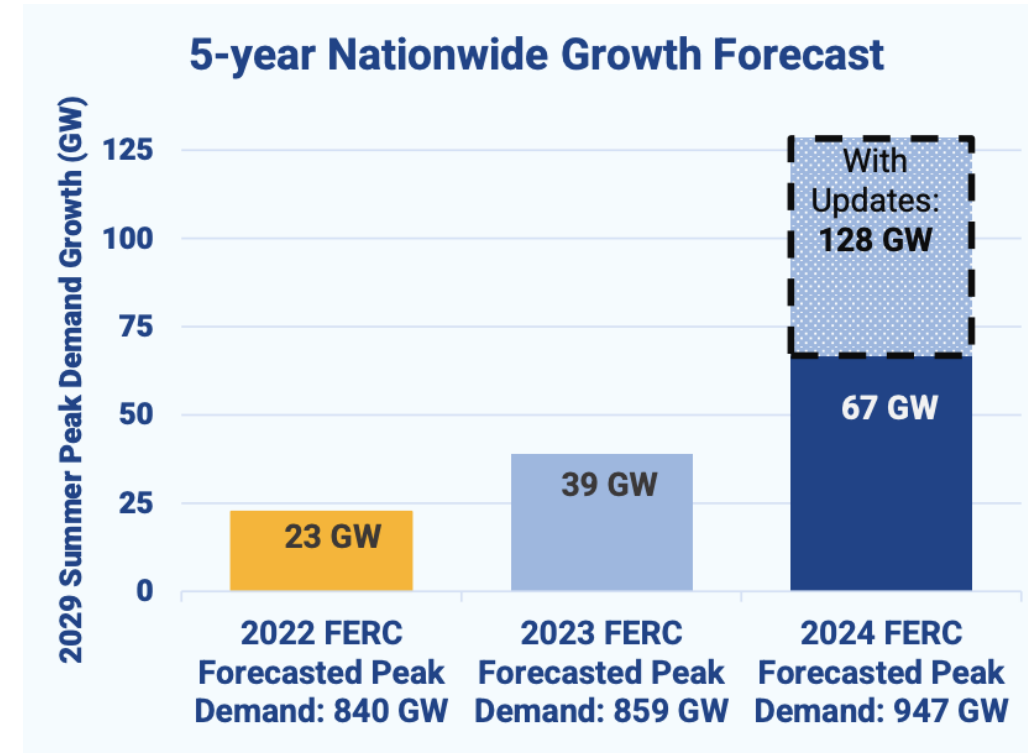
# Large interconnection queue and rapid demand growth in the United States

US interconnection queue is over 2000 GW of RE



Data Source: Rand et al (2024)

US electricity demand is forecast to increase by over 125 GW, partly due to AI data centers

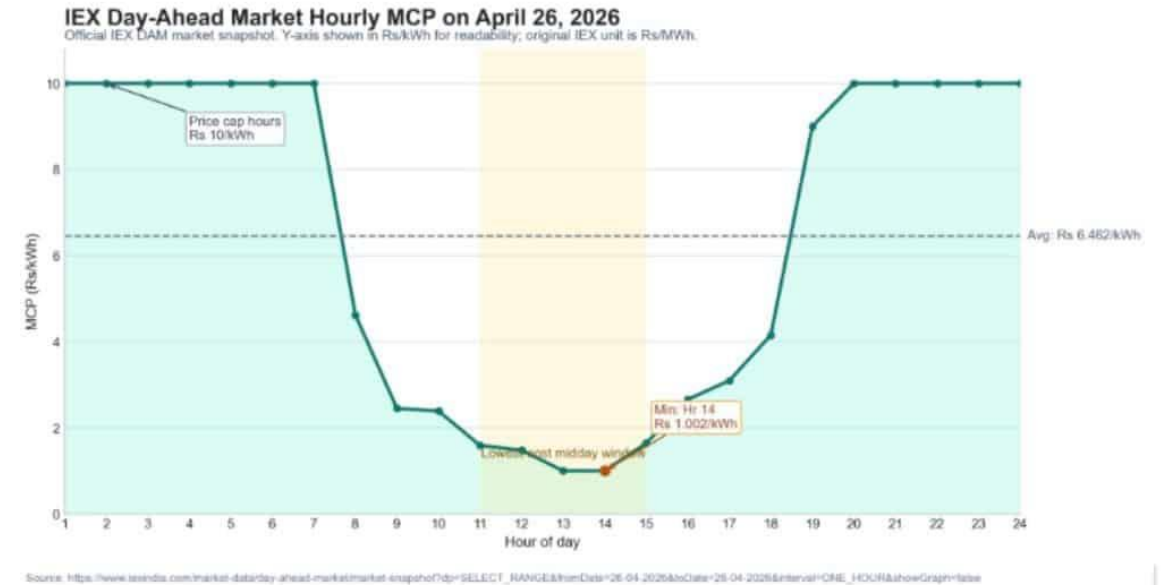
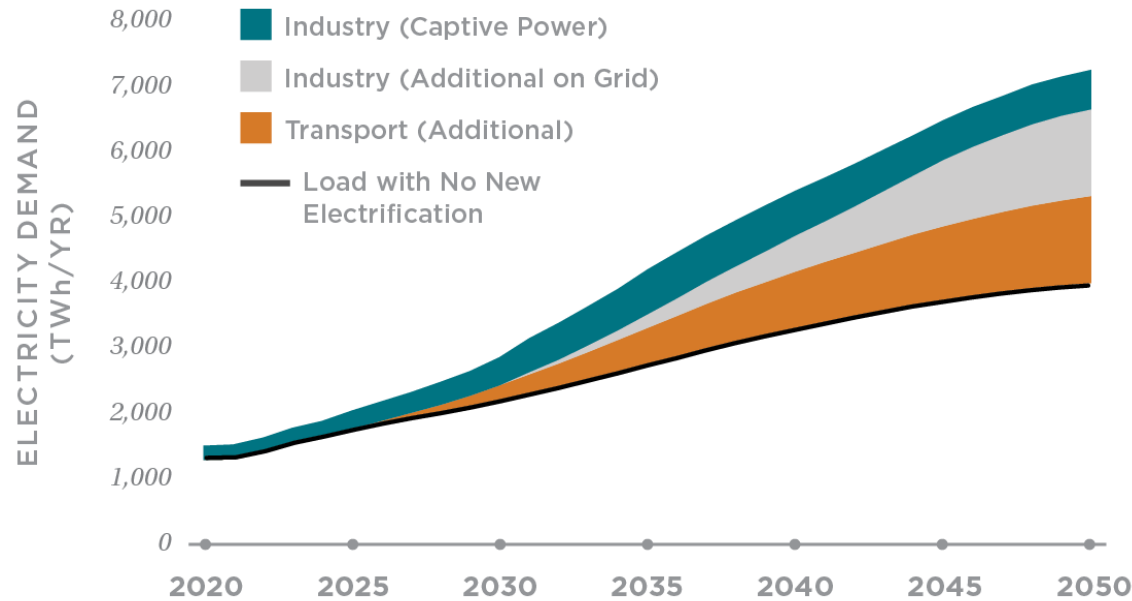


Source: Grid Strategies (2024)

Both will need massive new transmission buildout, which is choked

# In India, demand will increase 3-4X by 2050, while RE curtailment is already a problem

## India's Electricity Demand (TWh/yr)



- India's electricity demand will increase by 3-4X by 2050. India has already overtaken the US to become the second largest RE market in the world, installing ~50 GW/yr.
  - RE curtailment is already a major issue. Even on peak demand days, solar is curtailed in the afternoon, and wholesale prices routinely collapse to near-zero.
- ➔ A massive grid expansion will be critical for meeting the demand and integrating the RE.

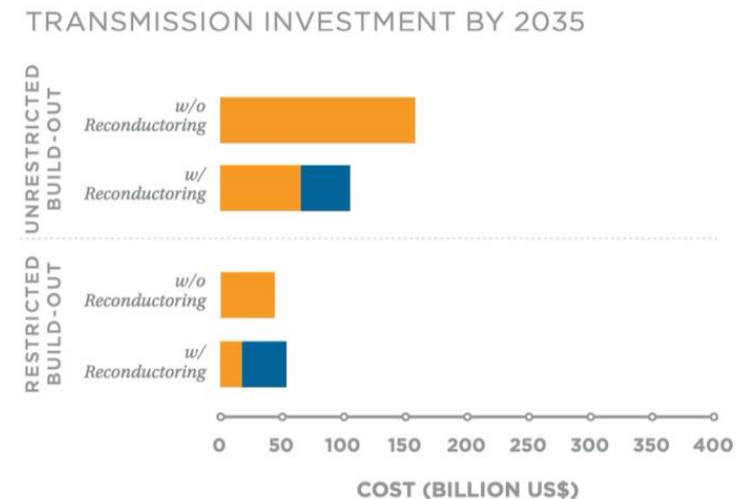
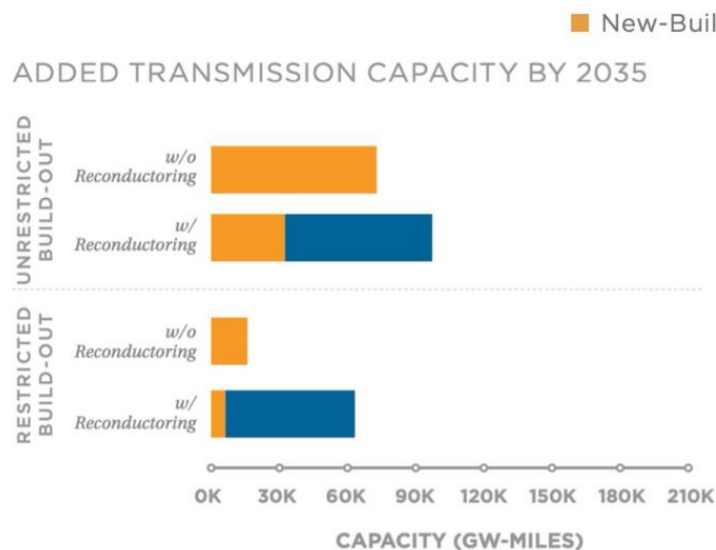
# Maximize the utilization of existing transmission infrastructure

- New transmission is unavoidable at 3–4× demand growth
- Maximize the existing network first, then build greenfield to close the gap → build less, faster, cheaper
- Invert the siting logic: put renewables where transmission already exists
- Cheap RE makes this work — a second-best site next to the grid beats a premium site a decade away: small LCOE hit, huge transmission savings
- One of the key levers to expand what exists: reconductoring with advanced HTLS / ACCC conductors

# Our US study: given lower costs & constraints on acquiring new ROW, the model reconductors when possible, enabling more interzonal capacity by 2035

In the restricted build-out case, **4x interzonal transmission capacity is added at similar cost** by allowing reconductoring, meeting a **majority** of the transmission needs for **>90% clean energy**

The transmission capacity increase is therefore not only **larger** but also **distributed over more corridors**, accessing lower cost & higher quality RE, enabling \$85 billion in system cost savings by 2035



ADDED CAPACITY: RESTRICTED BUILD-OUT, W/O RECONDUCTORING



ADDED CAPACITY: RESTRICTED BUILD-OUT, W/ RECONDUCTORING



Source: Chojkiewicz et al. (2024)

# India's \$100B Grid Plan — A Chance to Future-Proof

## India's Transmission Expansion plan (by 2032, over 2022 levels)

- Transmission length: **+191,474 ckm (+40%)**
- Substation capacity: **+1,274,185 MVA (+118%)**
- Most of these new lines are slated for conventional **ACSR** conductors

## The question:

- Given HTLS benefits, is there an opportunity to future-proof this build-out — at what cost and benefit?

## Our finding — what if all planned AC greenfield lines used HTLS?

- +\$15.5B** in conductor cost
- Loss savings pay it back in **< 2-3 years** (50% load factor, ₹5.5/kWh)

Transmission voltage (kV)	ckm in 2022	ckm in 2032	2022-32 addition	First yr loss savings (billion USD)	HTLS cost premium (billion USD)
765	51,023	114,719	63,696	5.8	9.5
400	193,978	249,585	55,607	2.3	3.8
230	192,340	248,999	56,659	1.2	2.2
<b>Total.....</b>	<b>437,341</b>	<b>613,303</b>	<b>175,962</b>	<b>9.3</b>	<b>15.5</b>

Source: Chojkiewicz et al. (2025)

# Two additional levers

- **Surplus interconnection** — inject more at existing grid connection points
  - Add storage to existing RE plants, which enables additional RE injection. E.g. India's CERC requires adding storage at existing solar projects
  - Inject RE at underutilized, expensive coal/gas plants running at low capacity factors. E.g. ~250 surplus interconnection projects already proposed in the US
  - *Why?* solar runs at ~25% capacity factor — the interconnection sits idle ~75% of the time.
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- **Storage as a transmission asset**
  - Raises line utilization → lowers overall Tx cost and defers new Tx investment
  - Adds ancillary services and system-resilience value



# Thank you

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