Resource Adequacy for the Energy Transition

June 13th, 2024

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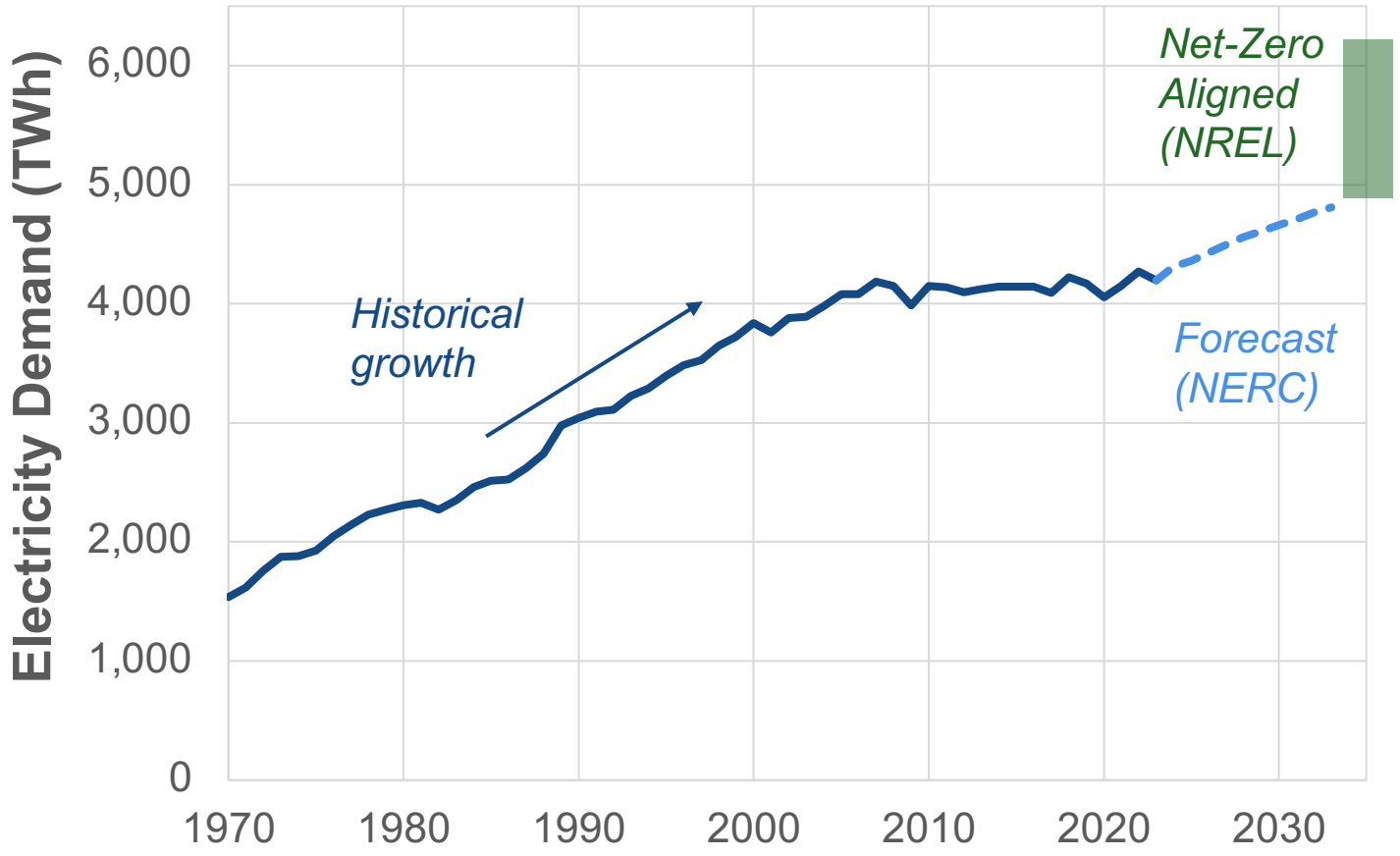
Key Messages

- Rapid transition is happening in the power sector fueled **by electrification, manufacturing, and data centers**
- **The U.S. has historically managed *double* the projected rate of electricity demand growth** in the 1990s to early 2000s.
- **Data center load growth is estimated to be 4-6% of current electricity demand**, and is projected to grow to be 9-12% of demand in 20230
- **Solutions exist to meet predicted demand growth,** particularly technologies and tools that were not available two decades ago.

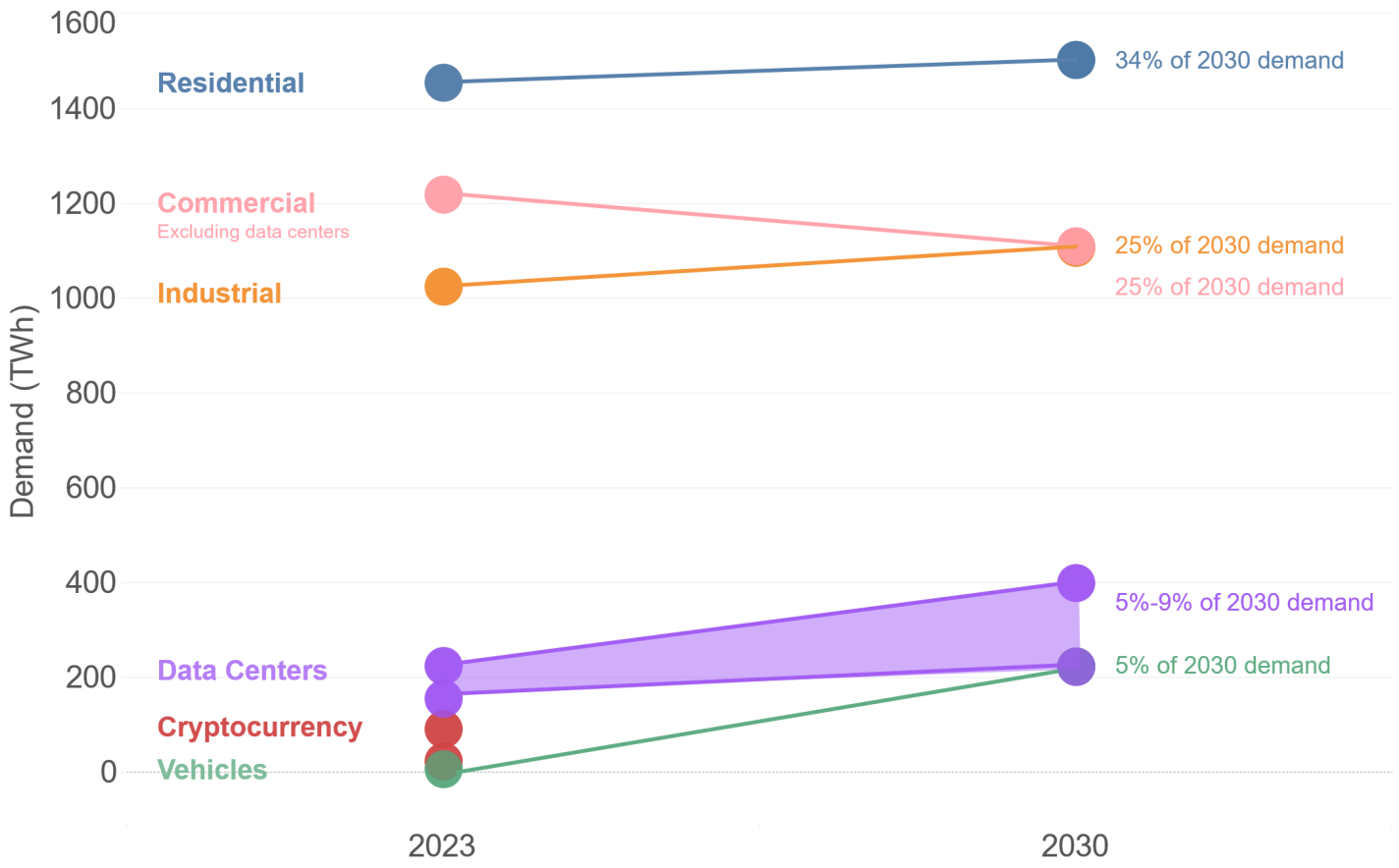
Historical Load Growth was Faster; Today's Load Growth is Consistent with Net-Zero Emissions Pathway



- **Load growth is not unprecedented**. Previous 10-year load growths of ~30% were common prior to 2005
- **NERC (2023) forecasts 15% load growth** over the next 10 years
- **DOE has anticipated and studied high load growth futures**, aligned with electrification needed for net-zero emissions

Sources: NERC Electricity Supply and Demand Data, 2023; EIA, Monthly Energy Review; NREL Pathways to 100% Clean Electricity, 2022. Note that electricity demand here includes transmission losses and direct use.

Demand Growth Is Driven By Three Main Drivers

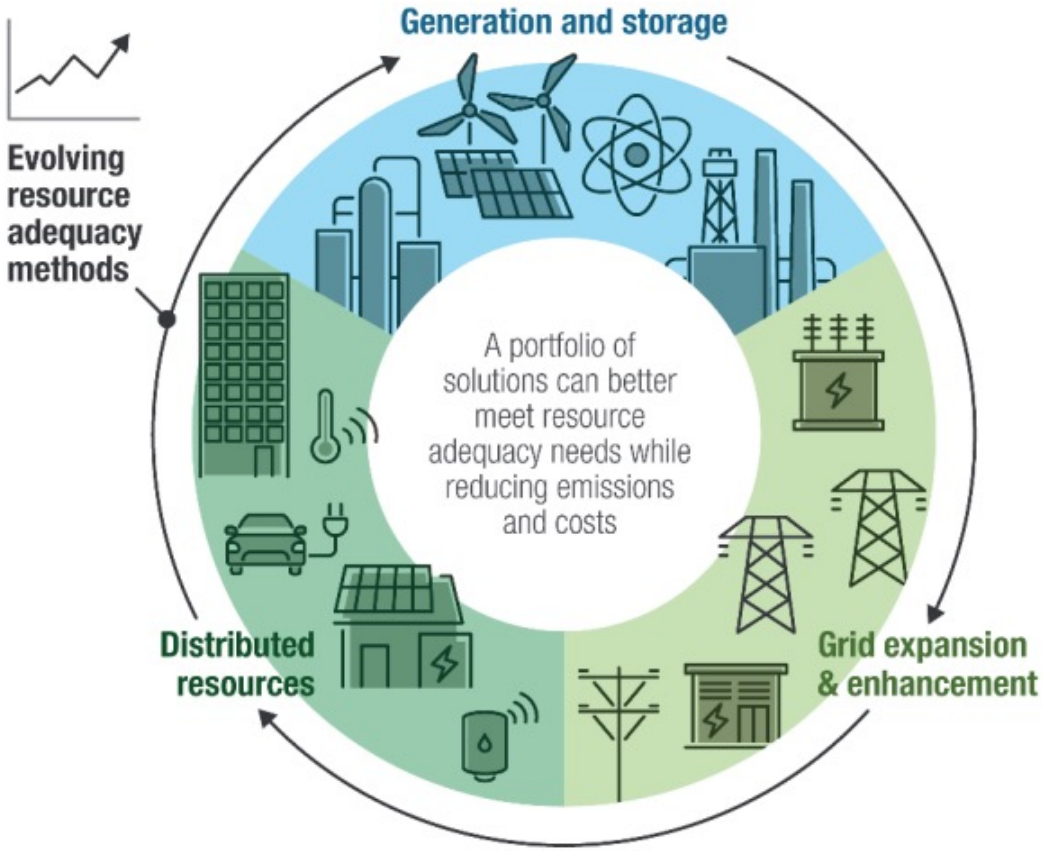


- **Data centers** - Most of the growth anticipated to arise from AI use
- **Electrification** - Primarily transportation, secondarily from buildings and industrial uses
- **New manufacturing** - Including semiconductor fabs and EV battery production facilities

Sources: LBNL, S&P Global, BCG, McKinsey (data centers); EIA, OP-NEMS (other sectors); NERC Electricity Supply & Demand projections (2030 total load)
Note: Data Center load subtracted out of Commercial sector to avoid double counting.

Solutions Exist To Meet Growing Demand

- **We have lots of tools in the toolkit** – many more than we had 20 years ago
- **We have lots of incentives to support deployment of those tools** – tax credits, loans, infrastructure programs, provided through BIL and IRA
- **Planners should assess all these tools and incentives** – otherwise they are leaving options on the table
- **A portfolio approach is best to reduce costs and maintain reliability** – relying only on one type of resource is risky

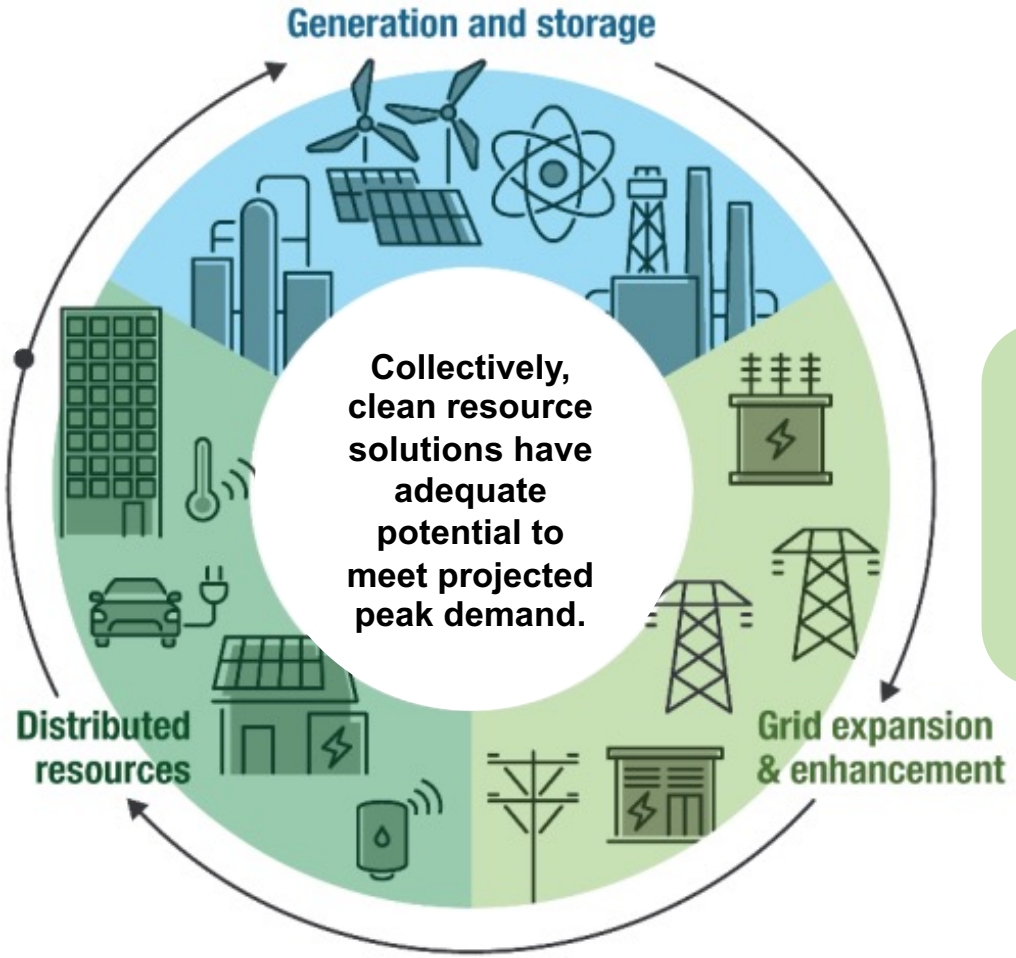


Scale of Solutions Can Meet Estimated Demand

Clean power resources: at least **136 GW** planned (to come online by 2027)
Source: EIA

Projection from IRA and BIL over time: Solar and Wind
350 – 750 GW
Energy Storage
40 – 100 GW
Source: DOE IRA publication

Virtual Power Plants (VPPs)
80-160 GW
(by 2030)
Source: VPP Lift-off Report



Grid Enhancing Technologies (GETs) and advanced reconductoring:
20-100 GW
(can be deployed within 3 - 5 years)
Source: Grid Lift-off Report

Sources: EIA Monthly Electric Generator Inventory, DOE Power Sector Transitions Fact Sheet, DOE Innovative Grid Deployment Liftoff Report, DOE Virtual Power Plants Liftoff Report, and NREL 100% Clean Electricity Study; DOE Future of Resource Adequacy

Portfolio Example: Xcel – Northern States Power

- Initial plan to retire 1,879 MW Sherco coal plant in MN in stages through 2030, replace with one large natural gas combined cycle plant running at high utilization levels
- After IRP review and comment – updated plan:
  - 710 MW of Solar at site of retired plant
  - 10-MW/1,000 MWh long duration storage from energy battery at site
  - 2 GW new transmission line interconnecting at the site, supporting 1,200 MW of new wind
  - Two smaller 400 MW natural gas combustion turbines with low utilization

"[The revised plan] is projected to reduce customer costs over the planning period, achieve substantially greater carbon reduction, and allow us to move faster in pursuing a more renewable and carbon-free generation system, all while preserving reliability…" – Xcel Energy

https://www.utilitydive.com/news/xcel-seeks-1200-mw-of-new-minnesota-wind-sherco-coal/697584/