



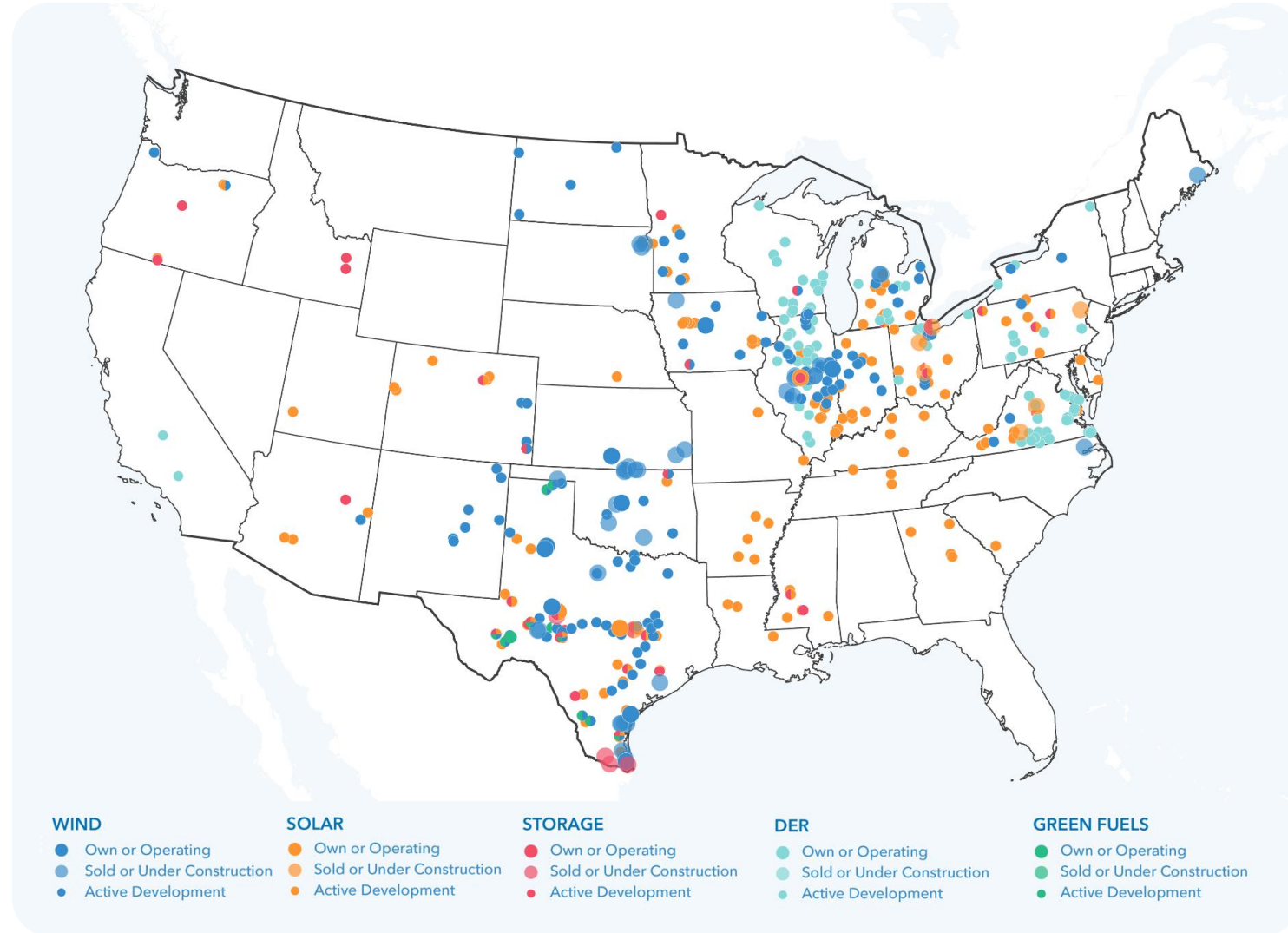
Energy and the Economy: Meeting Rising Energy Demand

Apex Clean Energy



Apex Is a Clean Energy Company

Apex is leading the renewable energy transition across the United States



60+ GW

clean energy development portfolio, one of the largest in the United States



\$10+ billion

of utility-scale projects completed, in construction, or financed



9+ GW

of commercialized production capacity across more than 40 financed projects

Clean Energy Is Investing in the Economy

Since August 2022, the utility-scale clean energy industry has announced



\$500B

of planned investment



42

new manufacturing facilities
online and operating



100K+

new manufacturing jobs



300+ GW

of clean power capacity



160+

new manufacturing facilities
or expansions



\$75B

invested in clean power built
in past two years

Clean Energy Opportunity

A clean energy system is more efficient and cheaper to run. It can also relieve cost-of-living pressures more broadly.

Cost Savings

“The data makes it clear that **the quicker you move on clean energy transitions**, the more **cost-effective** it is for governments, businesses, and households.”

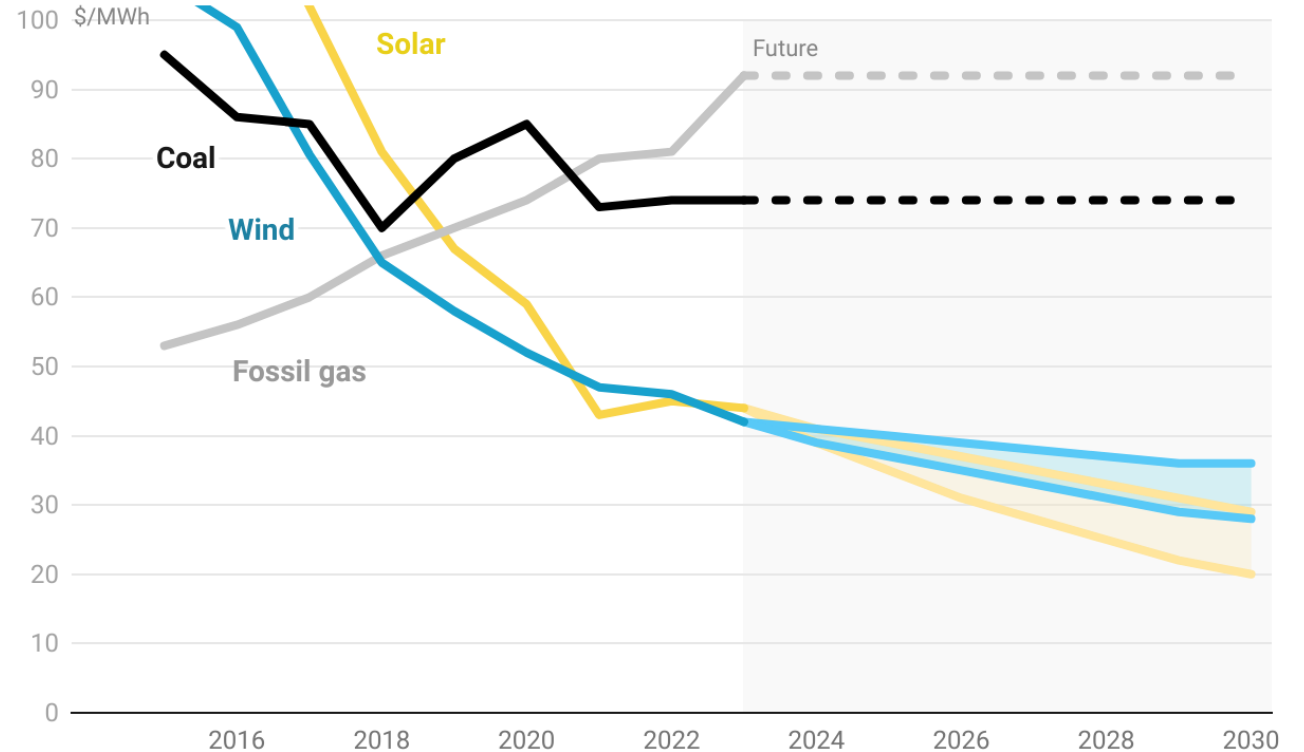
–IEA Executive Director Fatih Birol

Why?

- Reduced operating costs
- More predictable costs than oil commodities
- Inflation and energy prices are closely linked

Renewables will keep beating fossil fuels on cost

Analysts project that wind and solar will continue to get cheaper, falling further below coal and gas costs globally this decade.



Note: Shown is the levelized cost of energy, or a power plant's lifetime costs divided by its energy production. (\$/MWh)

Chart: Canary Media • Source: BNEF, RMI X-Change: Electricity 2023

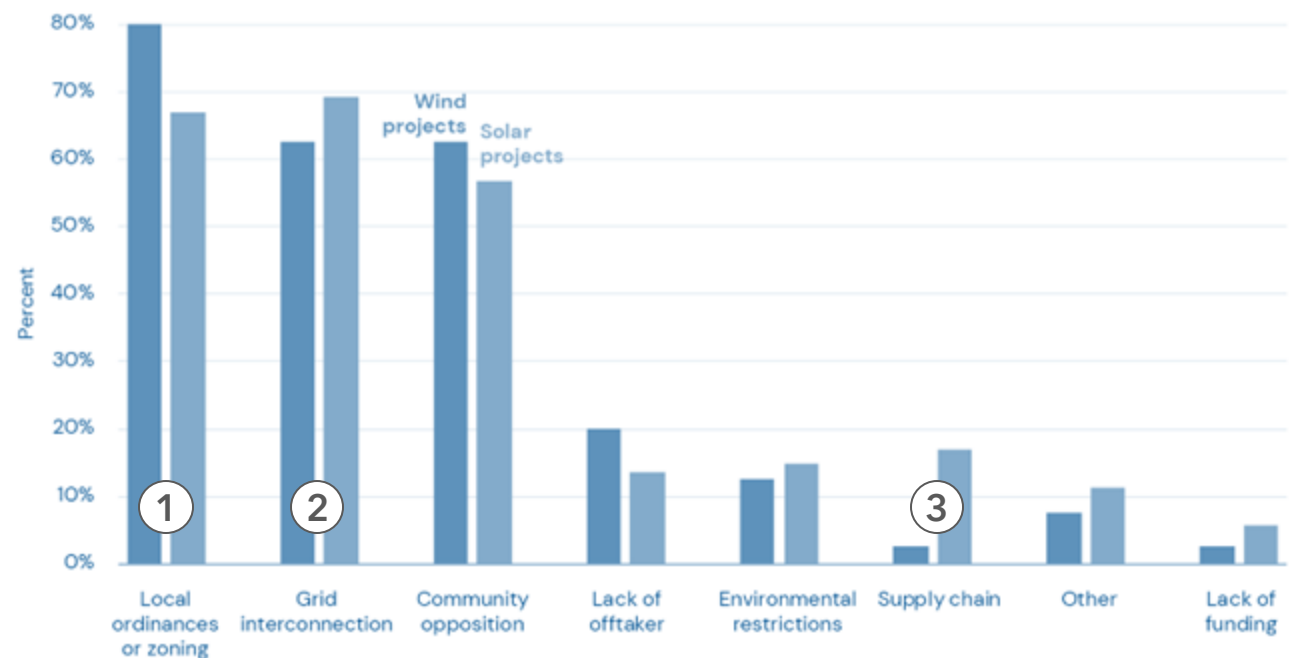
Clean Energy Challenges

The current time frames **needed to permit, build, and interconnect** clean energy projects **are not aligned** with the **current federal target of decarbonizing the power sector by 2035**.

Top causes of project cancellation*

1. Local Ordinances/Zoning (**Permitting** 📋)
2. Grid (**Interconnection** ⚡)
3. For Solar: Supply Chain (**Tariffs** 💰)
–Energy Markets and Policy, Berkeley Lab

FIGURE A.
Leading causes of cancellation for wind and solar projects, 2016–23



Source: Nilson, Hoen, and Rand 2023, p. 11.

Note: The sample consists of responses from 123 industry professionals from 62 companies, together responsible for about half of wind and solar capacity from 2016 to 2023. There are 88 solar projects and 44 wind projects. Respondents reported the top three reasons that a project was cancelled.

THE HAMILTON PROJECT
BROOKINGS

* Developers found that increased engagement results in fewer project cancellations (75%), and local concerns can be adequately addressed before project construction (66%).



Challenge: Right now, 100 GW of U.S. clean energy projects, representing \$100+ billion dollars of investment are at risk of significant permitting delay

- Most clean energy projects require approval from **local, state, interstate, and federal authorities**
- Multiple permit requirements + complex review processes = delayed timelines

Consequences of Permitting Delays



33% / 50%

Approximately one-third of wind and solar siting applications submitted in the past five years were canceled, while about half experienced delays of 6 months or more



\$2M / \$7.5M

Project cancellations result in average sunk costs (expenses spent on the project that could not be recovered) of more than \$2 million per project for solar and \$7.5 million for wind



\$200K per MW

Wind and solar projects for which developers report delays are estimated to cost approximately \$200,000 per MW *more*

–Energy Markets & Policy

From the Local Perspective

The permitting process can be arduous for everyone involved.

Some critiques include:

- Local folks don't feel like their voices are heard
- Organized, nationally funded clean energy opposition influences local processes
- Misinformation can cause confusion and local disagreement

Thus, local officials are forced to navigate contradictory information and passionate viewpoints.

With one Indiana wind farm, Apex took an unprecedented approach, seeking to engage the Vermillion County community and leadership in a collaborative, civil permitting process.

Exploring Wind Vermillion

Vermillion County appeared a strong candidate for both a wind farm and this experiment, with:

- Supportive early conversations
- An industrial history
- Experience with energy production
- Proximity to active wind facilities
- Fantastic wind resource
- Access to transmission

Proposal Features

Apex hired an independent expert to facilitate this process within the local community.

Beyond significant tax revenue and landowner payments, Apex offered the community:

- **Royalties** in the project's output
- A say in project **siting and design**



Lessons Learned

Despite attempts at building a novel collaborative approach to siting, several factors challenged the process and revealed fundamental challenges, including:

- Lack of state policy backstop allowing local opposition to block development through restrictive ordinances
- Limited effectiveness of financial benefits and community input when faced with values-based opposition

This experiment revealed the crucial nature of permitting reform.

Permitting



An Opportunity for Prosperity

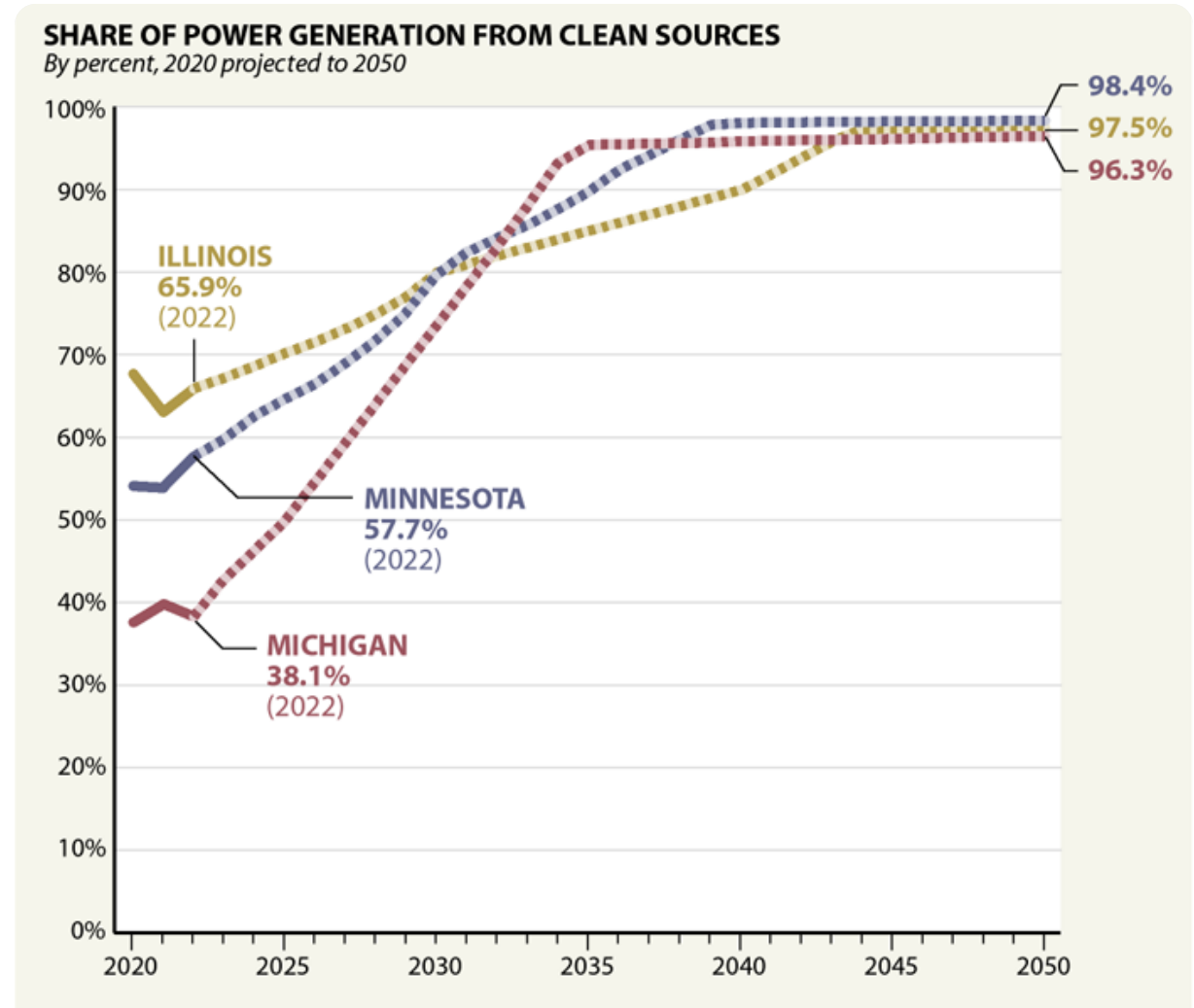
For local communities in the U.S., clean energy development offers tangible benefits:

- \$2 billion annually in tax and land-lease payments
- Supply chain and manufacturing activities
- Local job creation
- Direct investment in local priorities or programs
- Other community benefit agreements

Emerging Permitting Stability

In 2023, both Illinois and Michigan passed legislation providing state-level support for renewable energy development.

With stronger assurances on paths to permitting, Apex can be more confident investing in projects located in both states.



SOURCE: RMI and Energy Innovation

PAUL HORN / Inside Climate News

Transmission



State of Transmission

For transmission projects, **the average time to get a permit is 6.5 years**—and often can take over 10 years.

According to American Clean Power's 2023 Market Report, only **255 miles of transmission** were delivered last year.

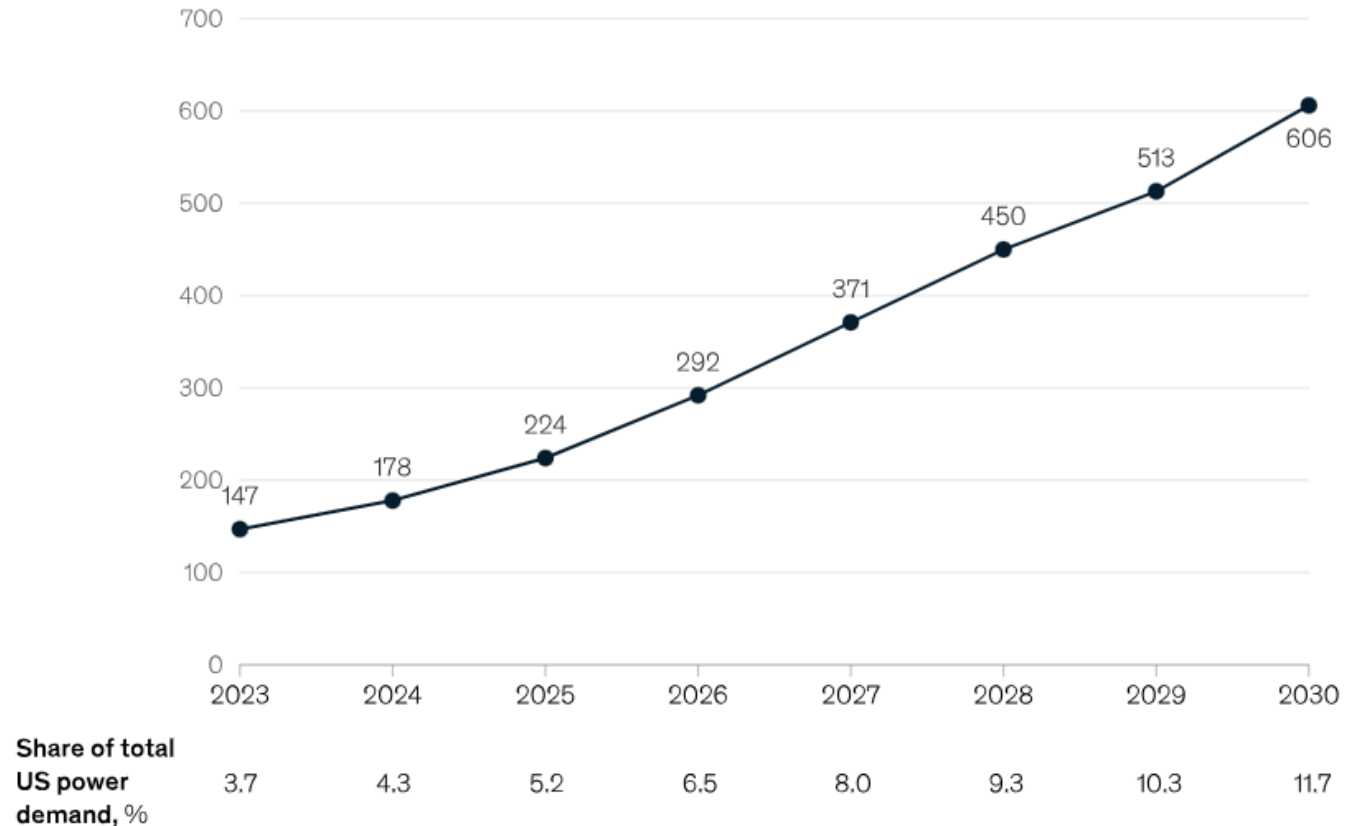
Demand Growth

Electricity demand is expected to grow dramatically due to three primary factors:

- AI/data centers
- Onshoring of manufacturing
- Electrification of many sectors

Terawatt-hours (TWh) of electricity demand, medium scenario

US data center energy consumption, TWh



Source: *Global Energy Perspective 2023*, McKinsey, October 18, 2023; McKinsey analysis

Transmission



Opportunity: Developers are pursuing **10,000 miles** of transmission through 2030.

State of Transmission



\$1.60-\$1.80

approximate amount saved for every dollar spent on transmission



10-11 billion

metric tons of CO2 emissions could be reduced through 2050 by accelerating transmission expansion

For Scale

Visualization of the 10,000 miles of transmission currently being pursued in the United States.



NREL National Transmission Planning Study

Four Transmission Frameworks

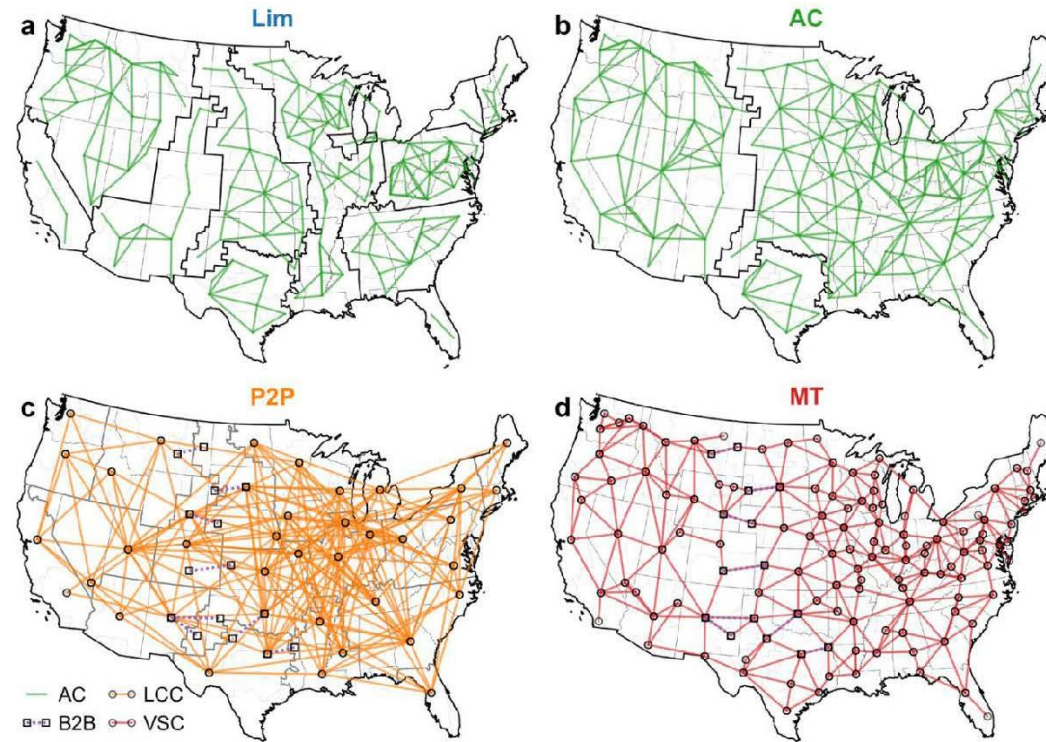


Figure 2. Expandable transmission interfaces in the four transmission frameworks considered in this study

Maps show interfaces where transmission capacity can be expanded under the corresponding transmission framework. AC interfaces in the AC framework are also allowed to be expanded in the point-to-point (P2P) and multiterminal (MT) frameworks but are not shown for clarity. Existing transmission interfaces are not shown. Allowable transmission types are AC (green), high-voltage direct current (HVDC) with line-commutated converters (LCC, orange), HVDC with voltage source converters (VSC, red), and back-to-back inerties (B2B, purple dashed).

Tariffs and Supply Chain



Challenge: Unpredictable price and delivery timelines

Price Volatility

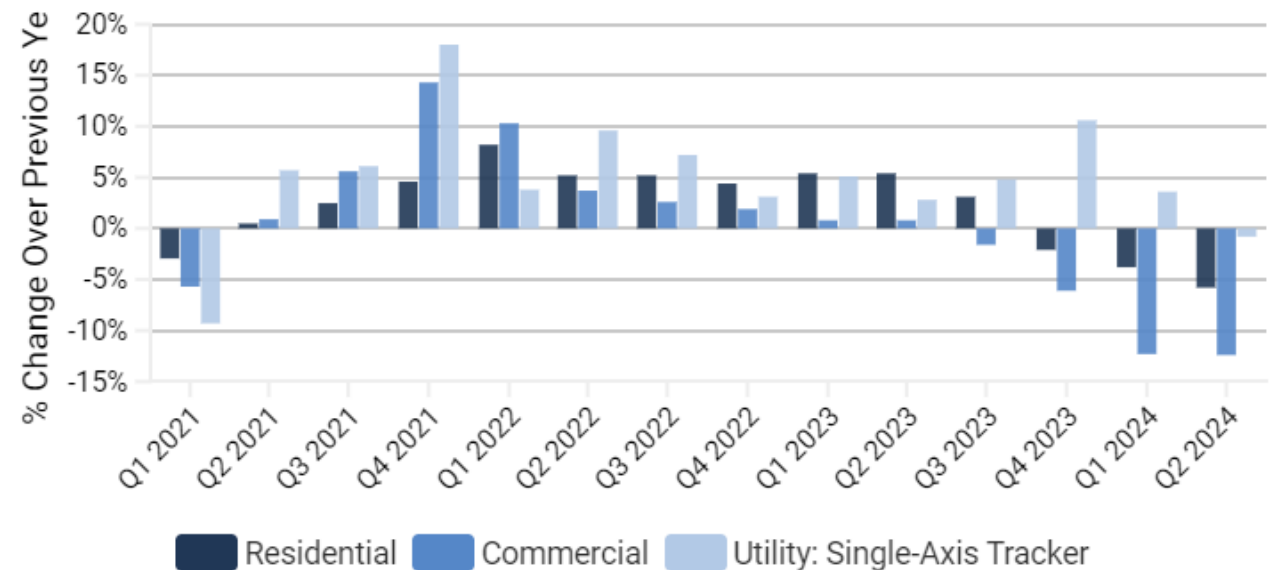
Unpredictability in the solar supply chain has challenged utility-scale solar development since 2020.

Impacts since the pandemic have been compounded by

- Price volatility
- Varying tariff rates
- Unpredictable detention times

The fluctuating regulatory climate is difficult to plan for, causing delays that result in financial penalties and restrict the flow of dollars.

Year-Over-Year Changes in U.S. Solar PV Installed Price by Segment



Source: [SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q3 2024](#)



Financing and Inflation



Challenge and Opportunity

Projects Are More Capital-Intensive

Inflation has made renewable project construction more expensive.

High interest rates have also driven up the cost of capital for developers.

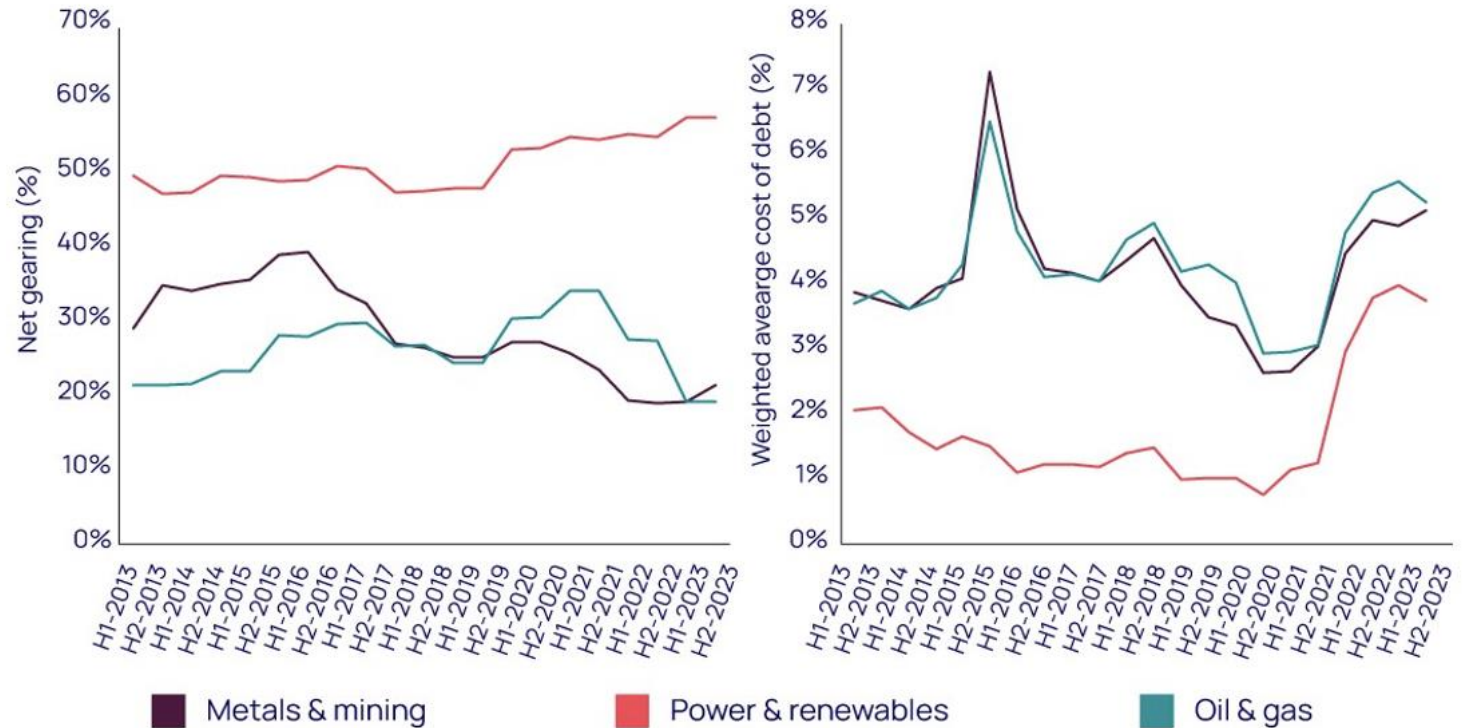
As prices have risen, developer equity is not sufficient to meet renewable goals

Opportunity: Long-Term Focus

The long-term outlook for the clean energy industry is incredibly bright.

- The cost of solar power fell by 85% from 2010 to 2020; wind fell by 56%
- The IEA predicts that by 2030, clean energy will power 50% of global demand
- The Inflation Reduction Act created long-term policy runway for this industry

Cost of debt rising fastest for the highly geared power and renewables sector



Source 1: Wood Mackenzie Corporate Strategy and Analytics Service, Factset Net gearing represents net debt over book value. Sector averages are weighted to companies' book value. Source 2: Wood Mackenzie Corporate Strategy and Analytics Service, Factset Sector averages are weighted to total debt, in US dollars.