



US renewable energy outlook 2025

An industry snapshot in six key themes



01

Market forces are hard at work

Corporations, local utilities and rate payers now more often seek renewable energy out of want and need than sustainability mandates or goals. After years of flat electricity demand due to efficiencies and declining domestic manufacturing, data centers for burgeoning technologies, including artificial intelligence and cloud computing combined with broad electrification across sectors, could help fuel total energy demand growth as high as 15 to 20 percent over the next decade, according to forecasts.²

The opportunity to provide renewable energy and to participate in the growth of the industry is open to industries and sectors with the innovation and foresight to anticipate customer needs. Conventional energy companies, including US oil and gas producers, continue to expand alternative energy and fuels solutions in their portfolios.

The industry has been in wait-and-see mode ahead of US elections given the differing views of the two major political parties. The outcome could impact tariffs, labor supply, incentives and inflation.³

Many investors are among those staying on the sidelines, but even within a muted deal market, the push toward renewable energy has continued to support M&A activity as demand for reliable operations and maintenance providers has grown.⁴ Energy demand growth also has attracted nontraditional players to the industry like large corporations that are starting to buy and sell energy credits in complicated and often unique transactions. But these require a learning curve to manage tax and other risks.

72%

of US renewables executives say **customers have the greatest influence** on their pipeline strategies⁵

70%

of new renewable energy deployment is **driven by corporations** rather than by government⁶

Data centers are on track to consume as much as **9%** of US electricity generation annually by 2030⁷

² Energy.gov, "Clean Energy Resources to Meet Data Center Electricity Demand," August 12, 2024

³ KPMG, "Consolidations continue; M&A trends in energy, natural resources, and chemicals Q2'24" (2024)

⁴ KPMG, "Consolidations continue; M&A trends in energy, natural resources, and chemicals Q2'24" (2024)

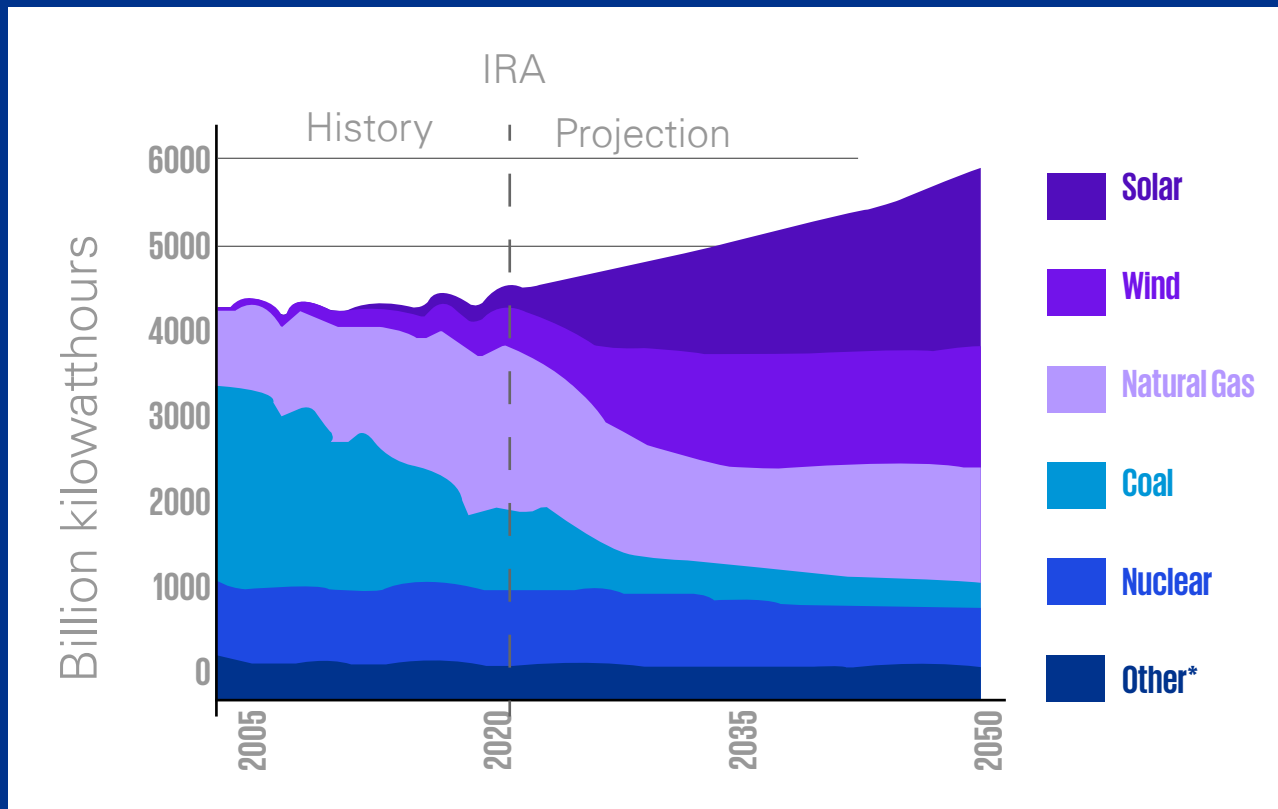
⁵ KPMG, "High energy expectations for renewables," 2024

⁶ Berkeley Lab, "State Renewables Portfolio & Clean Electricity Standards: 2024 Status Update," August 2024

⁷ EPRI, "Powering Intelligence; Analyzing Artificial Intelligence and Data Center Energy Consumption," 2024

US net electricity generation by fuel source

The majority of US electricity generation will come from solar and wind by 2050



* Includes utility-scale and end-use photovoltaic generation and excludes off-grid photovoltaics

**Includes petroleum, conventional hydroelectric power, geothermal, wood and other biomass, pumped storage, non-biogenic municipal waste in the electric power sector, refinery gas, still gas, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies, U.S. Energy Information Administration, Annual Energy Outlook 2023



02 Impending changes to government incentives and regulation

The lifespan of renewable energy policies in a new presidential administration will be an open question into 2025. Undeniable customer demand for renewable sources could keep some worries in check, but long-term planning is tricky.

Renewable energy industry leaders believe continued government and agency support is critical to keep projects attractive and feasible by lowering barriers to entry, enhancing returns, and expediting payback.⁸ Even technologies that can stand on their own in the marketplace will benefit greatly from tax credits should interest rates

remain high, making renewable energy more affordable for ratepayers. While settling down, the high costs related to financing and materials price inflation could still be a negative. Energy companies have already written off hundreds of millions of dollars due to financial complications.⁹

Meanwhile, the ability to secure permits and connect to the grid is a ceiling on US renewable energy expansion. Application and permitting red tape is a primary industry challenge, affecting project pipelines and financing. The political

environment could play a role here if the party in control becomes friendlier toward permitting, whether that's less red tape for wind and solar projects or for projects across the energy spectrum, including natural gas and nuclear. Next year the industry will also begin to see how the US Supreme Court's overturning of the Chevron doctrine will impact permitting for projects across energy, mining and infrastructure. The ruling presents both opportunities and risks, and for now, a high degree of uncertainty.¹⁰

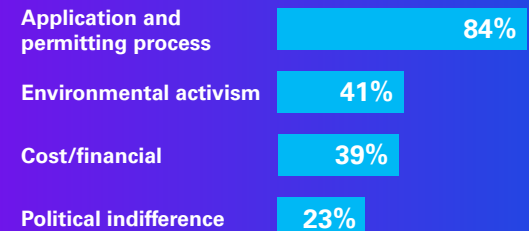
55%

of renewables executives say their investment decisions are **not impacted by shifting political winds**¹¹

43%

of renewables executives think government incentives and financing programs for renewable projects should **stay in place at least 10 years**¹²

Barriers to renewable energy transmission



⁸ KPMG, "High energy expectations for renewables," 2024

⁹ IEA, "Financial headwinds for renewables investors: What's the way forward?" December 8, 2023

¹⁰ White & Case, "U.S. Supreme Court Strikes Down Chevron Doctrine—What You Need to Know," July 8, 2024

¹¹ KPMG, "High energy expectations for renewables," 2024

¹² KPMG, "High energy expectations for renewables," 2024

03

Transmission and interconnection backlogs

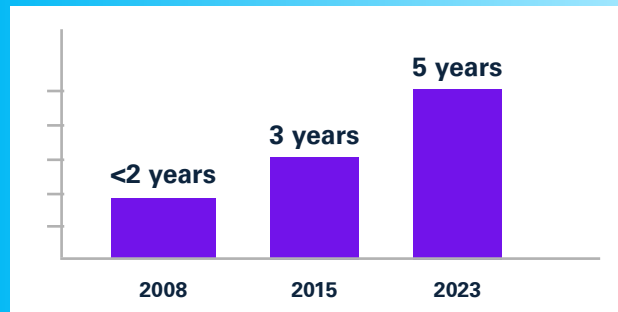
The US is struggling mightily to make the energy transition on the back of an old grid. Renewable projects are still coming online faster than utilities can connect them, and the wait times experienced over the last few years will likely continue. A significant portion of proposed capacity will not be built, although FERC Order No. 2023 to address interconnection bottlenecks is a step in the right direction.

Progress has been made and some relief is on the way due to federal agency efforts designed to speed grid access and to expedite and incentivize transmission, which historically expands just one percent per year. In addition to permitting reform and financial assistance for transmission projects, particularly for interregional transmission, technologies such as power flow control devices and dynamic line readings could also help bring more projects online faster.

To meet grid needs and achieve 2035 clean energy goals, **US transmission capacity** must expand 2–3x, and interregional transfer capacity needs to expand 4x

World Resources Institute, "State of the US Clean Energy Transition: Recent Progress, and What Comes Next," February 7, 2024

The average time projects spent from interconnection request to commercial operations



Berkeley Lab, "Queued Up: 2024 Edition; Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2023"

12,000

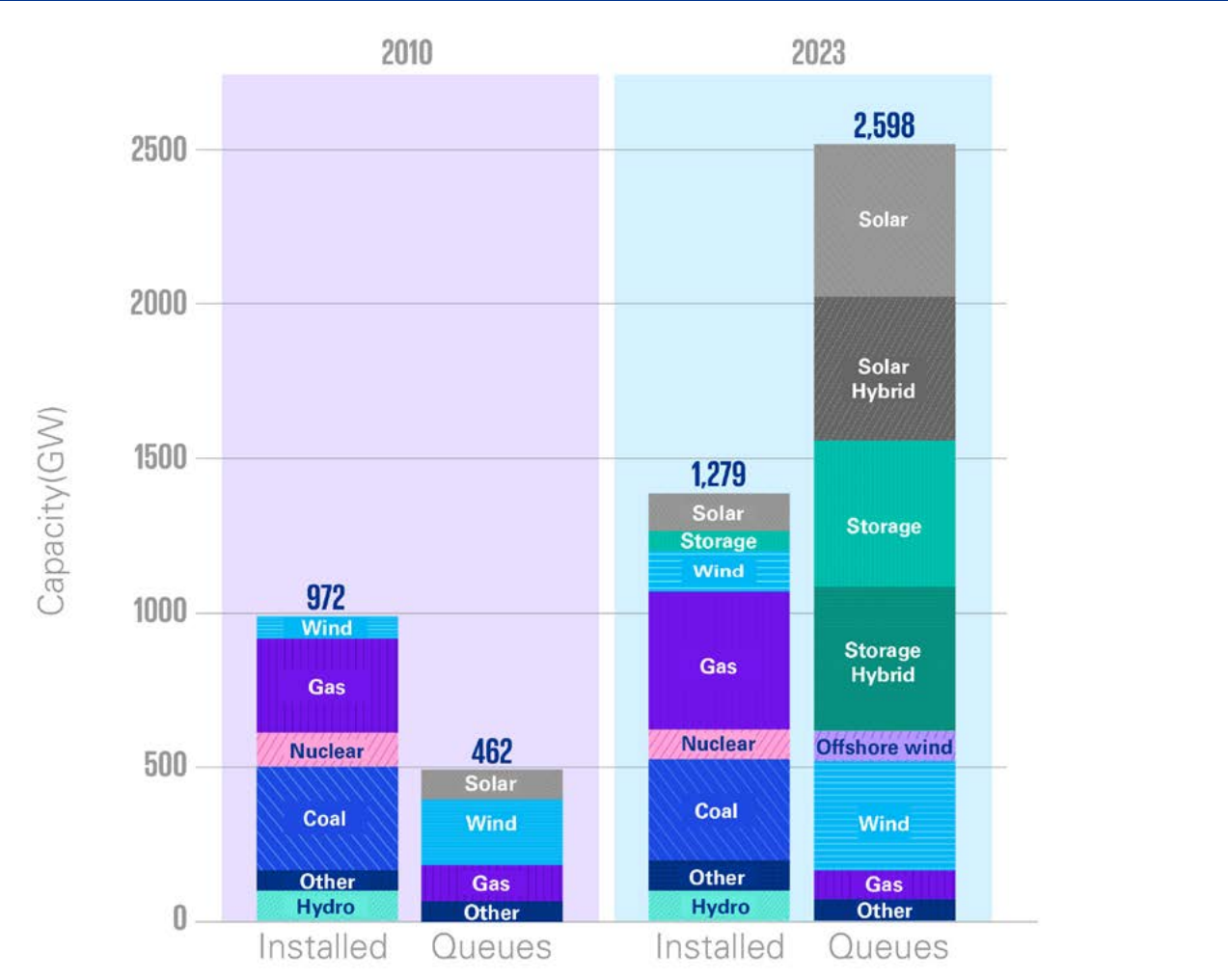
projects representing 1,570GW of primarily wind and solar capacity and 1,030GW of storage were **actively seeking interconnection** as of year-end 2023

80%

of those projects **did not reach commercial operation**, leaving **86% of potential capacity** on the table

Berkeley Lab, "Queued Up: 2024 Edition; Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2023"

Installed US electric generation capacity compared to interconnection queue capacity, 2010 and 2023



Berkeley Lab data and analysis



04

Supply chains and global competition

Renewables companies have largely reshaped their supply chains since COVID-19 but are still playing catch-up. The impact on transformer manufacturing alone has been severe due to unmet high demand from increasing global electrification, growing renewable energy generation, and the needs of data centers and other heavy-use customers. Wait times for new transformer delivery are up to four years compared to a few months prior to the pandemic, and costs have risen in tandem.¹⁸

Both major parties are inclined, although not identically, toward import tariffs and antidumping policies around energy projects, the degree to which will be determined after the November 2024 election. Regardless of the outcome, policymakers will continue to try to counter China's dominance and protect US interests, and companies will be challenged to determine and prove the provenance of their raw materials and parts to comply with tariff regimes. Incomplete or inaccurate paperwork can hold up solar panels and other materials for months.

Some industry players are investing in or partnering with entities that can help secure access to battery

minerals and other resources typically concentrated in a handful of global locations. Others are forming joint ventures to participate in an emerging domestic supply chain girded by the Inflation Reduction Act (IRA).

Solar installations are at a record pace, but so are solar cell and panel imports despite tariff and trade regimes. The US government and solar manufacturing industry will look for stronger protections that could have unintended consequences. The higher price of US-manufactured parts can boost overall project costs, impacting the end user.

63%

of renewable energy executives expect **supply chain bottlenecks to continue** for several more years¹⁹

4 out of 5

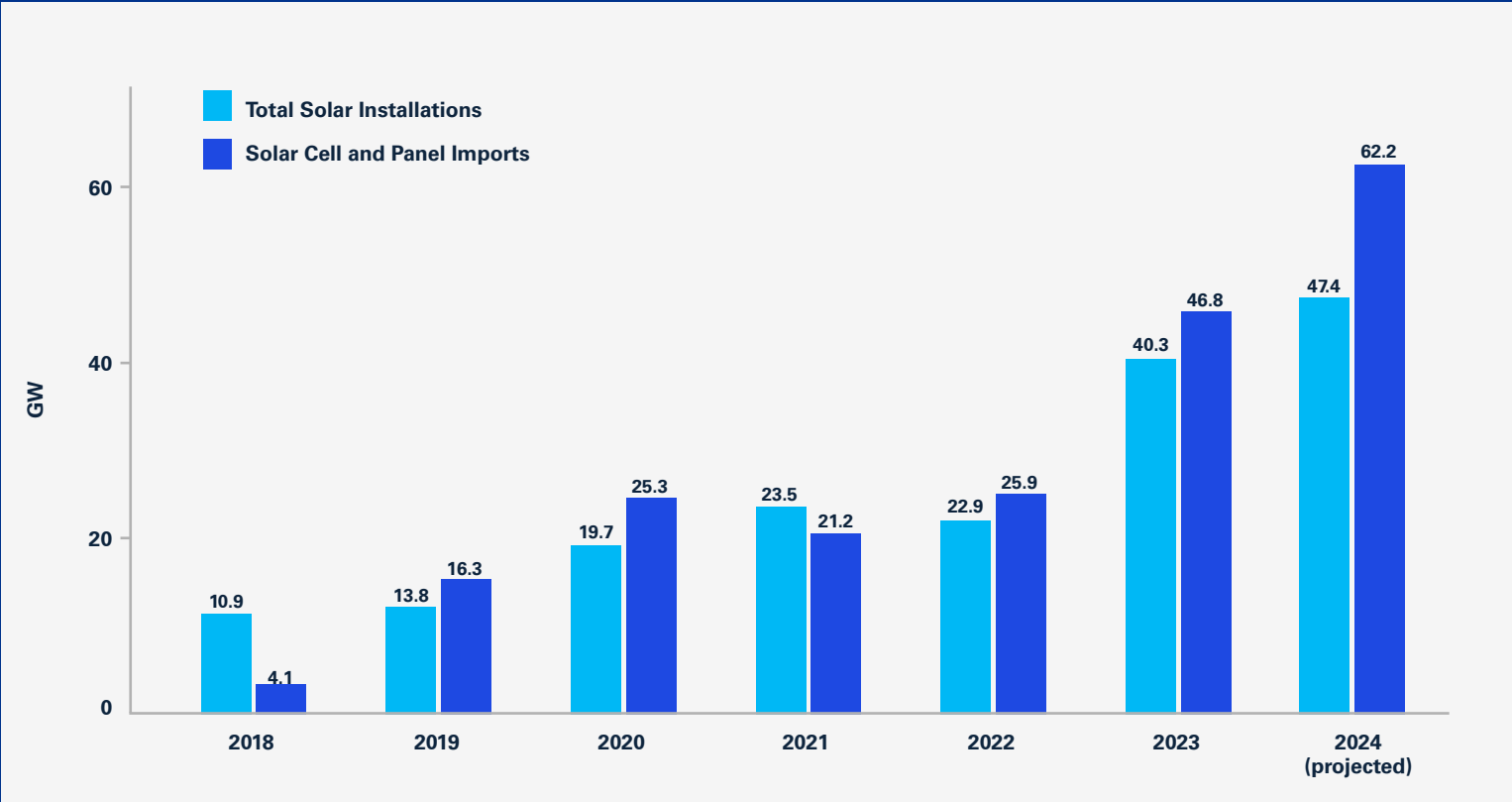
renewable executives say their companies have **diversified their supply chains** since COVID-19; **1 in 5** have established **partnerships** to access materials²⁰

¹⁸ The National Infrastructure Advisory Council, "Addressing the Critical Shortage of Power Transformers to Ensure Reliability of the U.S. Grid," June 2024

¹⁹ KPMG, "High energy expectations for renewables," 2024

²⁰ KPMG, "High energy expectations for renewables," 2024

US solar imports versus installations



Wood Mackenzie and SEIA Solar Installation Data, US Census Import Data

05 Labor shortages and skills gaps

The number of workers pursuing the vocational certifications and degrees energy companies seek is far behind the need, and the shortfall will take time to correct.²¹ Energy companies have had the extra burden in a continuing tight labor market of competing for talent, particularly for younger generations who don't see the same innovation and opportunities for which other industries are credited. More than half of renewables companies surveyed by KPMG,

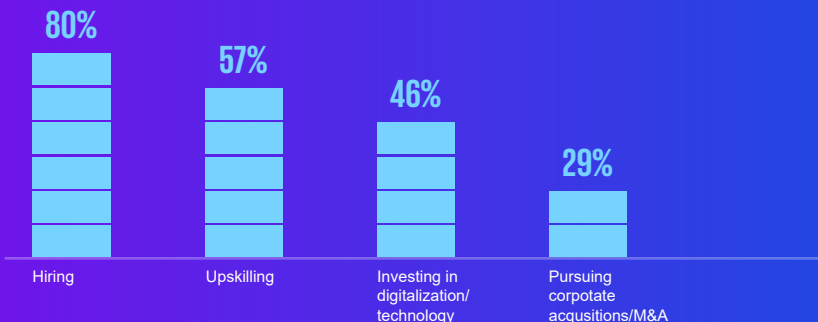
57 percent, are training their workforces to develop necessary expertise to try to meet clean energy demands.

The nuclear energy industry offers just one example the challenge. Nuclear is projected to expand to 15 percent of the global energy mix by 2050, requiring a US nuclear energy workforce of more than 200,000 compared to 68,000 employees today. The number of students graduating with bachelor's degrees in nuclear engineering declined 25 percent in a decade.²²

For entry-level workers, the energy industry is on its way to becoming more attractive as apprenticeship roles expand and pay is higher relative to other sectors. While a primary goal of the IRA is to create clean energy jobs, the prevailing wage and apprenticeship requirements kicked off new and strenuous recordkeeping and compliance requirements. Companies will need more automation, more people—or both—to ensure they receive related tax credits.

Renewables companies are hiring new employees and upskilling their workforce...

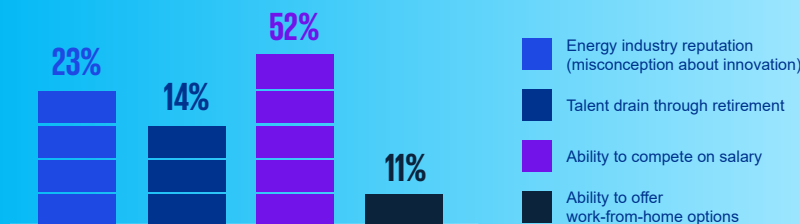
To meet critical human capital, are you:



KPMG, "High energy expectations for renewables," 2024

...but more than half say the ability to compete with other industries on salary is a challenge

What are the greatest challenges to establishing the right talent pool?

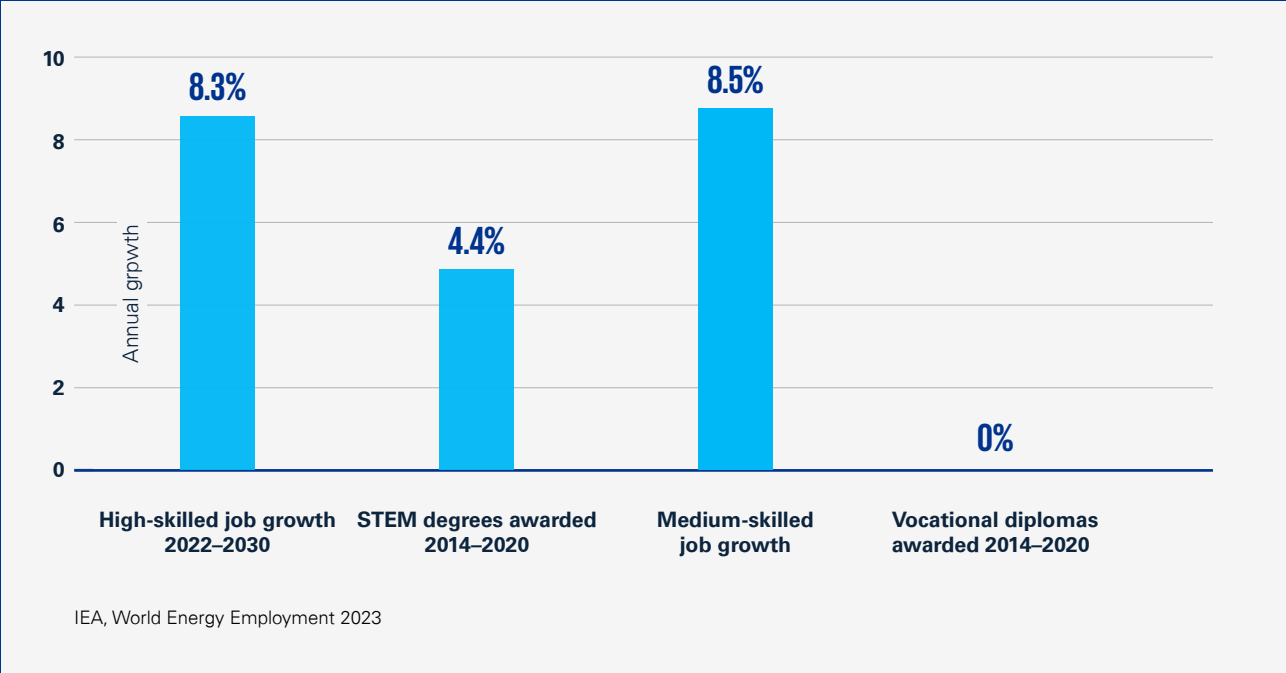


Note: Responses may not equal 100 percent due to rounding
KPMG, "High energy expectations for renewables," 2024

²¹IEA, World Energy Employment 2023

²²The Wall Street Journal, "Shortfall in Young Engineers Threatens Nuclear Renaissance" (September 11, 2024)

US energy sector jobs: Degrees/certifications lagging demand



06

An expanding mix of low-carbon technologies

The IRA extended tax credits to new technologies, which will further boost investment beyond wind and solar, supporting commercialization for a broader mix of energy sources and storage necessary to meet increased demand.

Renewable natural gas is coming back into favor as a necessary energy source despite questions about its emissions profile. Nuclear energy, including small nuclear reactors, also is

fast becoming a larger part of the clean energy conversation. This is especially the case in parts of the country with fewer wind, solar and hydro power capabilities.

All of these technologies will need investment to improve, build, and make cost-effective for consumers. Start-ups that don't reach size to continue independently will consolidate or get bought up.

64%
of US renewable energy executives expect to see **significant growth in nuclear energy**, including **1 out of 4** that anticipate expanding use of **small nuclear reactors**

KPMG, "High energy expectations for renewables," 2024

Since the IRA was passed, **>\$380 billion** has been invested in renewable technologies, including:

- Battery manufacturing and energy storage **\$141 billion**
- Solar **\$114 billion**
- Wind **\$31 billion**
- Carbon capture **\$29 billion**
- Hydrogen **\$23 billion**

US Department of the Treasury, Inflation Reduction Act, Impact and Stories

Are you considering expanding your projects to include new technologies, such as hydrogen, battery storage (whether as an add-on to existing projects or as a stand-alone asset), fuel cell renewable fuels, etc.?

Technology	Percentage
Solar paired with battery storage	73%
On-site solar	50%
Green hydrogen	46%
Onshore wind	38%
EV charging	32%
Microgrid	29%
Biofuels	27%
Carbon capture	21%
Offshore wind	18%

KPMG, "High energy expectations for renewables," 2024

About KPMG

Amid booming demand for renewable energy, KPMG is at the forefront of helping organizations navigate the global energy transition. With an industry-based structure, we bring together versatile, multidisciplinary teams comprising audit, advisory and tax professionals who have the precise skill sets needed to serve the sector as it grows and matures. This approach gives us a broader view to look at challenges and opportunities from falling renewable costs, innovative new technologies, changing asset valuations, pressure on suppliers, the many changes driven by the Inflation Reduction Act, and more. We look forward to speaking with you about the future of the energy industry and your important role in it.

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Contact us

Todd Fowler

Partner, Audit Sector Leader—Energy

T: 917-327-1213

E: toddfowler@kpmg.com



Kim Sucha

Renewable Energy Partner, Tax

T: 402-661-5220

E: ksucha@kpmg.com



Robert Wilson

Renewable Energy Partner, Audit

T: 267-446-4570

E: rgwilson@kpmg.com



Glenn Todd

Principal Tax Sector Leader—Energy

T: 724-316-1713

E: gtodd@kpmg.com



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