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WHITEPAPER

U.S.A: Moving forward with Renewable Energy





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The United States produces around 4 trillion kilowatt hours (kWh) of electricity each year and consumes some 3.8 trillion kWh of electricity per annum. The [U.S. Energy Information Administration \(EIA\)](#) reported that renewable energy sources provided 21% of the country's total electricity production in 2020, overtaking both coal and nuclear energy production for the first time in history. The greatly varied landscapes of the United States clearly offer plenty of opportunities for the different types of renewable energy. Encouraging signs, but where is the U.S. renewables sector heading?



Where are we now?

During COP26 in November 2021, President Biden pledged that the United States would cut its greenhouse gas emissions 50-52% by 2030 (compared with 2005 levels), committed the U.S. to net zero emissions by 2050, and wants an emissions-free power grid by 2035. While there are various plans to achieve these goals and spending on climate-related matters has significantly increased in recent years, the pledges and policies are yet to become law, and the polarizing political landscape of the U.S. offers significant risk to achieving them.

The U.S. renewable energy sector has been expanding. The country's energy generation mix has quickly folded in renewables over the last decade, particularly in solar and wind. Solar generation at the end of 2021 was 20 times that of 2011, and wind power production has more than doubled. Indeed, wind has overtaken hydro to become [the country's top renewable source](#), providing some 338 billion kWh in 2020, 28% of the total U.S. renewable energy output, and contributing to renewable energies overtaking coal and nuclear production in 2020.



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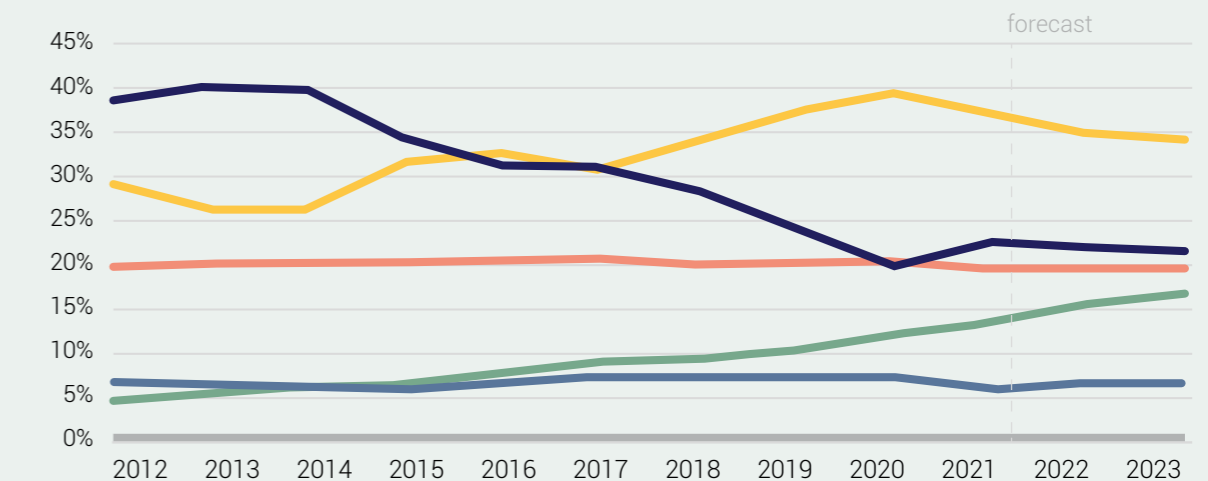
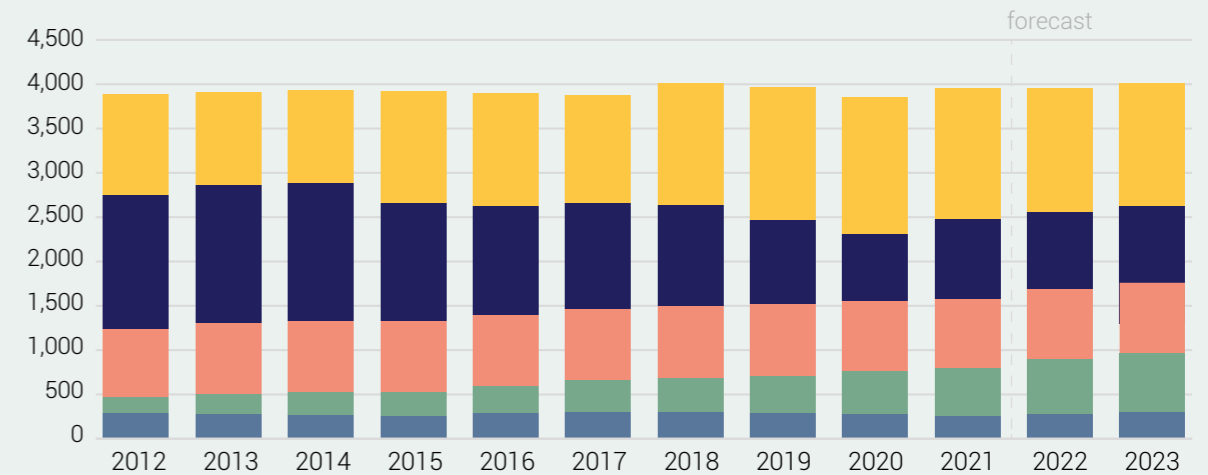
While coal-fired plants still contribute a respectable share of the United States' total energy production (around 20% according to EIA), the coal-based generation percentage has steadily dropped since its peak in 2007 and natural gas has increased (today just under 40%). Though natural gas price jumps in 2021 are expected to slow or level natural gas consumption, the EIA estimates natural gas usage will grow.

In the EIA's latest [Short-Term Energy Outlook](#) (Jan 2022), they predict that generation from non-hydro renewable sources (i.e. solar and wind) will increase to 17% in the next two years, while natural gas will drop 3% and coal will drop 1%.



Annual U.S. electric power sector generation by energy source (2012-2023)

Source: EIA



Legend: Natural gas (yellow), Coal (dark blue), Nuclear (red), Renewables (non-hydro) (green), Hydropower (light blue), Other sources (grey)

It's also clear that the people are in support of the president's goals. When asked in a [New York Times/Siena College Research Institute survey](#) (October 2020) whether respondents support or oppose "A two trillion dollar plan to increase the use of renewable energy and build energy-efficient infrastructure", 66% were in support and 26% opposed. There was +60% support across all gender/age demographics, with the highest support was from the 18-29-year-olds (80%). Support did vary along political lines, though—Democrats showing 89% and Republicans showing 45% (46% of respondents identifying as Republican opposed and 9% don't know/refused).

Meanwhile, the [Climate Action Tracker](#) (an independent scientific body that analyzes government climate action in line with the Paris Agreement) states that, "The U.S. has made progress on climate policies ... although its emissions reduction target and provision of climate finance are not enough to make up its fair share." More needs to be done.



Setting standards



Movement continues, though.

The EIA reports that, at the end of 2021, 31 states and the District of Columbia had renewable portfolio standards (RPS) or clean energy standards (CES)—which require electricity suppliers to provide a set amount from designated renewable sources or carbon-free technologies. These 31 states collectively accounted for 67% of the total retail electricity sales in 2020. An additional seven states have non-binding renewable goals.

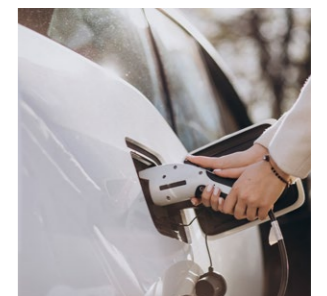
States use different terms to define their RPS policies, however, and definitions can vary from state to state, allowing the use of technologies that may not be generally considered renewable to count towards their targets (such as nuclear energy, or shale gas/fracking).

There is also wide variation in standards. For example, while New York State requires 70% renewable energy by 2030 and 100% zero-emissions electricity by 2040, Texas requires 10,000 MW of renewable energy by 2025.

While RPS requirements can only apply to investor-owned utilities, many states include municipalities and electric cooperatives, sometimes with a lower target. Utilities subject to RPS mandates must obtain renewable energy credits or certificates (RECs)—which represent the environmental benefits of one megawatt-hour of renewable energy generation sent to the grid. RECs are used to verify that utilities are meeting their targets.

Further, states have established carve-outs and REC-multipliers to promote renewable diversity and encourage specific renewable technologies. Carve-outs require a specific percentage of the overall energy requirements to be met with a specific technology, while REC-multipliers offer additional credits for energy produced by certain technologies. At least 21 states and the District of Columbia have carve-outs and REC-multipliers within their RPS policies.

The [National Conference of State Legislatures \(NCSL\) has an interactive map](#) that details both renewable portfolio standards and voluntary targets across the United States.



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Current energy infrastructure

One of the biggest challenges to increasing renewable energy use in the U.S. is the improvements required to the country's power grid.

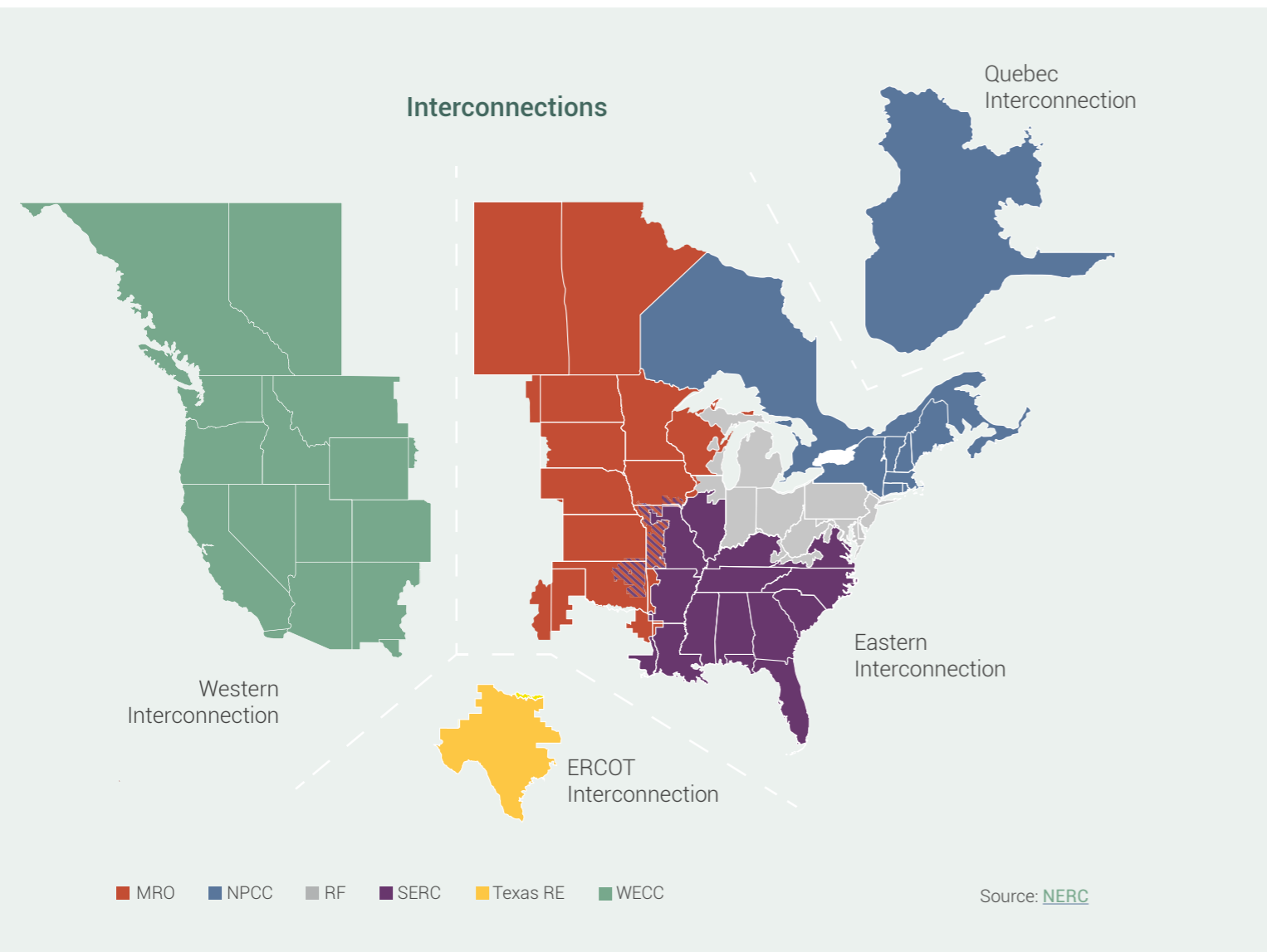
Complex, overworked and burdened with age, the U.S. energy grid suffers regular outages, the number of which doubled between 2015 and 2020. Age-related equipment failures, increased energy requirements for 21st century society, and the increase in natural disasters all put added stress on a system built in the 1950-60's with an estimated 50-year life expectancy.

The grid also suffers from transmission issues. The U.S. national power grid grew from two isolated geographic grids, the eastern interconnection (EI) and western interconnection (WI) grids.



While these two grids hold 950 gigawatts (GW) of power between them (EI=700 GW, WI=250 GW) only just over 1 GW can currently transfer between the grids. Given that renewable energy production is generally location-specific (the production of a solar farm in Florida will eclipse that of a farm in Washington state, for example), improving the connections between these hubs is essential to ensure the country can fully exploit the energy wealth renewables provide. Linking in the third grid, ERCOT in Texas, would bring an additional boost from the solar and wind assets located there. (The ERCOT grid was founded in 1970 and has minimal connectivity to the other interconnections; which, arguably, contributed to the length of 2020/21's major winter blackout in Texas. Texas has excellent renewable energy production statistics; it produces around 30% of the U.S.'s total wind energy, and its installed solar farms produce over 4,600 MW.)

2021's Infrastructure Bill includes a designated \$65 billion to improve the country's power grid, with a portion dedicated specifically to transmission upgrades and expansion.





Opportunities and incentives for renewable energy production

While some initiatives are federal, like the [USDA Biorefinery, Renewable Chemical and Biobased Product Manufacturing Assistance Program](#), the states and territories offer incentives to encourage in-state investment.

States have diversified incentive programs that target specific energy types, and the offers vary from state to state and technology to technology. These programs include direct cash incentives (grants, rebates, and performance-based initiatives), tax incentives, loans and financing programs (revolving loans, credit enhancement), and more.

The very number of state incentive programs available can make it difficult to find specific information.

[DSIRE](#) is, specifically, a Database of State Incentives for Renewable Energy. Established in 1995 and searchable by Zip Code, DSIRE offers detailed information on the policies, rebates and incentives offered by all state governments and the federal government, and provides regularly updated information, policy maps and technical assistance to stakeholders.



Specific federal opportunities

Further to the USDA funding program mentioned, there are many funding and tax credit opportunities available at a federal level.

- On offer till the end of 2023, the [Renewable Energy Tax Credit](#) aims to encourage residential renewable energy installations, and offers a 22-30% tax credit for installation of geothermal heat pumps, residential wind turbines, solar systems, fuel cell and microturbine systems, and biomass fuel stoves.
- For corporations, the [Investment Tax Credit \(ITC\)](#) can fund a significant percentage of installation costs via a dollar-for-dollar tax credit. Though the percentage on offer is scaling down through to 2024, the ITC remains one of the most useful and lucrative incentive programs encouraging businesses to go renewable.
- The [Alternative Fuels Data Centre](#) outlines laws and incentives promoting alternative fuels and advanced fuel technologies, which are federally supported through grants, studies, loans, fleet funding and the like.
- The [Department of Energy](#) (DOE) supports grant, loan and financing programs over various renewable sectors—including the Loan Programs Office (LPO) offering loan guarantees for renewable energy and efficient energy projects, and the Office of Science Funding. The DOE also offers [open funding, prizes and competitions](#).
- The DOE has also announced up to \$27 million in funding available for R&D focused on wave energy, wave energy converter tech and designs and research through the [PacWave facility](#).
- The [Advanced Research Projects Agency-Energy](#) (ARPA-E) provides R&D grant funding opportunities. For example, *Seeding critical advances for leading energy technologies with untapped potential 2021* is supporting innovative 'early-stage transformational energy technologies that need proof-of-concept.'
- The [International Energy Agency](#) notes plans for nine Carbon Capture, Usage and Storage (CCUS) facilities, which could see retrofitted coal plants operate with a 95% CO2 capture rate. The U.S. has significant benefits on offer for CCUS investment, providing tax credit of up to \$50 per ton of CO2 permanently stored in geological formations, and \$35 per ton of CO2 used for other industrial uses (if emissions reductions can be clearly demonstrated). The Infrastructure Bill included \$9 billion support for CCUS.



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The ITC offers a dollar-for-dollar tax credit for businesses going renewable

The EIA also provides an [Energy Atlas](#), mapping all energy infrastructure assets and resources across the United States.



Conclusion

While there are various plans to achieve the ambitious emissions/net-zero goals pledged by President Biden and spending on climate-related matters has significantly increased, the pledges and policies are yet to become law, and the polarizing political landscape of the U.S. offers significant risk to achieving them.

Americans clearly want renewable energy and the funding and incentives are available, but the characteristics of the current energy grid mean that significant improvements are required before the country, as a whole, can fully integrate renewable energies.

On a state level, though, there are significant opportunities for renewables and the sector's attractiveness is growing every day—even on the residential side, with the popularity of personal wind turbines, solar panels and heat sinks constantly growing.

The United States clearly wants more renewable energy and is actively working to achieve it.

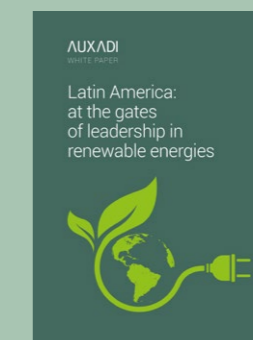


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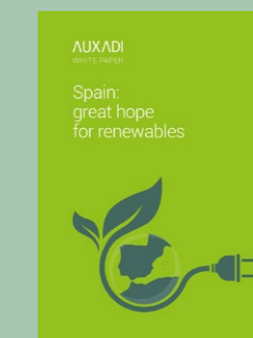
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March 2022