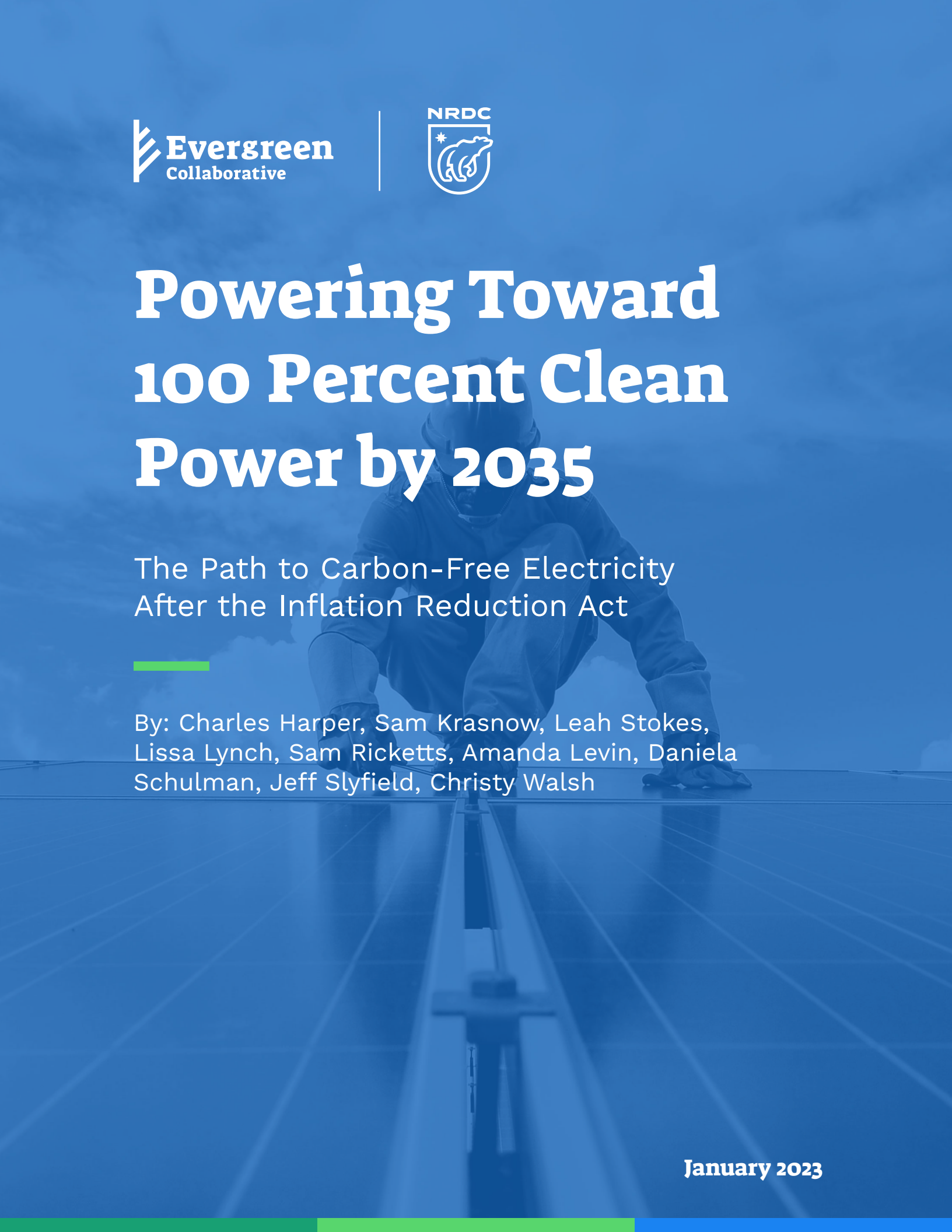

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Powering Toward 100 Percent Clean Power by 2035

The Path to Carbon-Free Electricity After the Inflation Reduction Act

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Executive Summary

President Joe Biden entered office with a commitment to the American people: that the United States would achieve 100 percent clean, carbon-free electricity by 2035. Clean electricity is essential to America's response to the climate crisis. And reaching 80 percent clean power by 2030 is key to achieving the U.S. economy-wide goal of at least halving carbon pollution this decade.

Decarbonizing the power sector is a major task requiring both federal legislative and executive action. Accordingly, the Biden Administration has promised a whole-of-government response that includes robust performance standards, significant investment, and a commitment to justice. The U.S. took an important step on clean energy investment in 2022, when Congress and President Biden enacted the Inflation Reduction Act (IRA). This historic climate legislation contains over $370 billion in investments towards building America's clean energy economy.

However, according to new modeling in this report, the U.S. must take further action to meet its clean energy goals this decade. The IRA's investments are projected to increase carbon-free electricity in the U.S. from approximately 40 percent in 2022 to 66 percent clean power by 2030. This falls short of the 80 percent target that's consistent with the path to 100 percent clean electricity by 2035. The bill is also estimated to help cut economy-wide greenhouse gas (GHG) pollution to 40 percent below 2005 levels by 2030—an important step, but short of America's 50–52 percent commitment under the Paris Agreement.

To close the gaps between our climate and clean power targets and our current trajectory, and to further advance President Biden's critical climate and environmental justice commitments, the Biden Administration must take decisive executive action to cut pollution and advance clean electricity in the power sector over the next two years. More states must also continue to step up and lead on 100 percent clean energy.

To stay within reach of 100 percent clean electricity by 2035 and address harmful pollution from fossil generation, the U.S. must:

- **Set ambitious carbon pollution standards for new and existing power plants** under the Clean Air Act, through the Environmental Protection Agency (EPA), and set EPA pollution standards that reduce traditional air and water pollutants and improve public health;
- **Expand transmission capacity, speed up interconnections,** and **create market parity for clean energy** at the Federal Energy Regulatory Commission (FERC);
- **Implement the Inflation Reduction Act effectively,** with timely federal guidance on the IRA's tax credits and grant programs and the distribution of funds in a way that maximizes carbon reductions and equitable economic opportunity; and
- **Advance climate action at the state level,** including through accelerated 100 percent clean electricity and pollution standards that align with 80 percent clean power by 2030 and heightened oversight of polluting utilities.

New modeling in this paper from NRDC (Natural Resources Defense Council) finds:

> The Biden Administration can take action over the next two years that will put 80 percent clean energy by 2030 within reach—in line with President Biden's goals. This modeling shows that strong carbon standards for power plants in combination with the IRA could cut power-sector carbon pollution 77 percent below 2005 levels, and achieve a 76 percent clean grid by the end of this decade.

Add in other robust action from the federal executive branch, plus accelerated state policy, and the President's goal is in sight.

This paper outlines a roadmap towards 80 percent clean power by 2030 and 100 percent clean electricity by 2035, building on the passage of the IRA. With two years remaining in his first term, President Biden must continue to fill out his agenda using standards, investments, and justice to tackle the climate crisis and build a thriving, just, and inclusive clean energy economy.

1. Introduction: Taking Stock of the Transition

1.1 Confronting the Climate Crisis with Clean Electricity

President Joe Biden took office in January 2021 with a commitment to the American people: that the United States would achieve 100 percent clean, carbon-free electricity by 2035. We must meet this goal by rapidly advancing toward a clean energy future to prevent the worst impacts of climate change.

Cleaning up the electricity sector is the linchpin of an economy-wide decarbonization strategy. The power sector produced 25 percent of U.S. GHG pollution in 2020. Further, the path to cleaning up other sectors of the economy—including transportation, buildings, and some industrial sub-sectors—relies heavily on clean electrification. Reducing pollution in the power sector is therefore key to decarbonizing nearly all areas of the economy: **clean electricity combined with electrification could ultimately cut 70 to 80 percent of current U.S. GHG pollution. Electricity represents the best opportunity to achieve the United States's near-term international pledge of a 50–52 percent reduction in GHG pollution by 2030.** Pollution from the power sector also overwhelmingly impacts disadvantaged communities—low-income communities and communities of color that suffer disproportionate burdens of pollution and disinvestment—which means that cleaning up the power sector is a significant opportunity to advance environmental justice.

Decisive action this decade is paramount to achieve President Biden's goal of 100 percent carbon-free electricity by 2035. A crucial first-order goal is to achieve 80 percent clean power by 2030.[1] To meet these clean energy commitments, the Biden administration must take critical steps over the next two years: setting pollution standards for the power sector under existing laws, pursuing grid reforms to facilitate clean energy deployment, and effectively implementing the IRA and other new federal legislation. State leadership, too, is vital: states have laid the foundation for a 100 percent clean power future and must now continue their leadership and ratchet up their ambition.

Achieving 80 percent clean power by 2030 would deliver massive economic gains, including job creation, GDP growth, and energy cost reductions for American consumers. Investing in energy efficiency at the same time as increasing clean power will boost affordability and reliability. Acting on climate is popular, too. A 2021 poll from Data for Progress found that 70 percent of voters think America should take "ambitious actions to address climate change" and lead the world in reducing its climate pollution.

Reducing power sector pollution would also create massive benefits for public health. Reducing deadly air pollutants like soot, smog, and mercury, can prevent hundreds of thousands of premature deaths in the

[1] For reference, in 2021 clean sources generated 39 percent of total U.S. electricity, with the remaining 61 percent coming from fossil fuels.

U.S. Air pollution from the power sector is also a key driver of environmental injustice. Eliminating this pollution can help reduce the disproportionate health impact of pollution that low-income and communities of color have borne for decades.

These benefits will only be realized if the administration takes concerted action. While the IRA will put the country on a path to cutting GHG pollution by about 40 percent below 2005 levels this decade, this cut still falls short of President Biden's goal of reducing GHG pollution by 50–52 percent. In short, there is a gap. This paper lays out the additional policies and actions in the power sector that are needed to close the pollution gap and make progress toward achieving our country's climate, clean air, and environmental justice goals.

1.2 Legislative Progress on Clean Electricity

In August 2022, Congress passed and President Biden signed into law the IRA, the largest investment in clean energy and climate action in U.S. history. This builds on earlier progress in 2021 and 2022, when Congress and President Biden enacted the $1.2 trillion Infrastructure Investment and Jobs Act (IIJA) and the CHIPS and Science Act, focused on technological innovation and U.S. manufacturing. These three bills together mark a massive investment towards building America's clean energy economy.

The IRA's climate investments are projected to reduce GHG pollution well beyond any other policy passed by Congress or implemented under executive authority. These investments—in clean energy tax credits, energy efficiency, energy storage, building electrification, clean manufacturing, climate-smart agriculture, and more—are projected to reduce economy-wide GHG emissions around 40 percent below 2005 levels by 2030, compared to 25 percent below 2005 levels without the law, according to modeling by Energy Innovation.[2] The IRA will deliver major progress towards the 50–52 percent GHG emissions cut by 2030 that the United States has pledged in its Nationally Determined Contribution (NDC) under the Paris Agreement. But it will not fully meet that goal.

In addition, the IIJA is making historic investments toward repairing and building new transportation infrastructure, expanding access to clean drinking water and broadband internet, and, critically, improving our nation's electricity transmission system. The CHIPS and Science Act, meanwhile, focuses on building regional economic clusters and stepping up U.S. investment in technology research and innovation. Together, the IRA, IIJA, and the CHIPS and Science Act deliver on a transformational agenda to invest in building a more just, thriving, and inclusive clean energy economy.

Now, these laws must be implemented efficiently, effectively, and equitably. Federal agencies, including the Treasury, the Department of Energy (DOE), and EPA should ready themselves to deploy these new funds and programs to maximize policy impact. These investments must be implemented in line with the administration's Justice40 initiative, prioritizing benefits in disadvantaged communities. Section 2.3 of this paper provides a more detailed look at the importance of policy implementation for the clean power transition and outlines the role of the federal government in that effort.

Even assuming all three laws should be successfully implemented, a gap remains

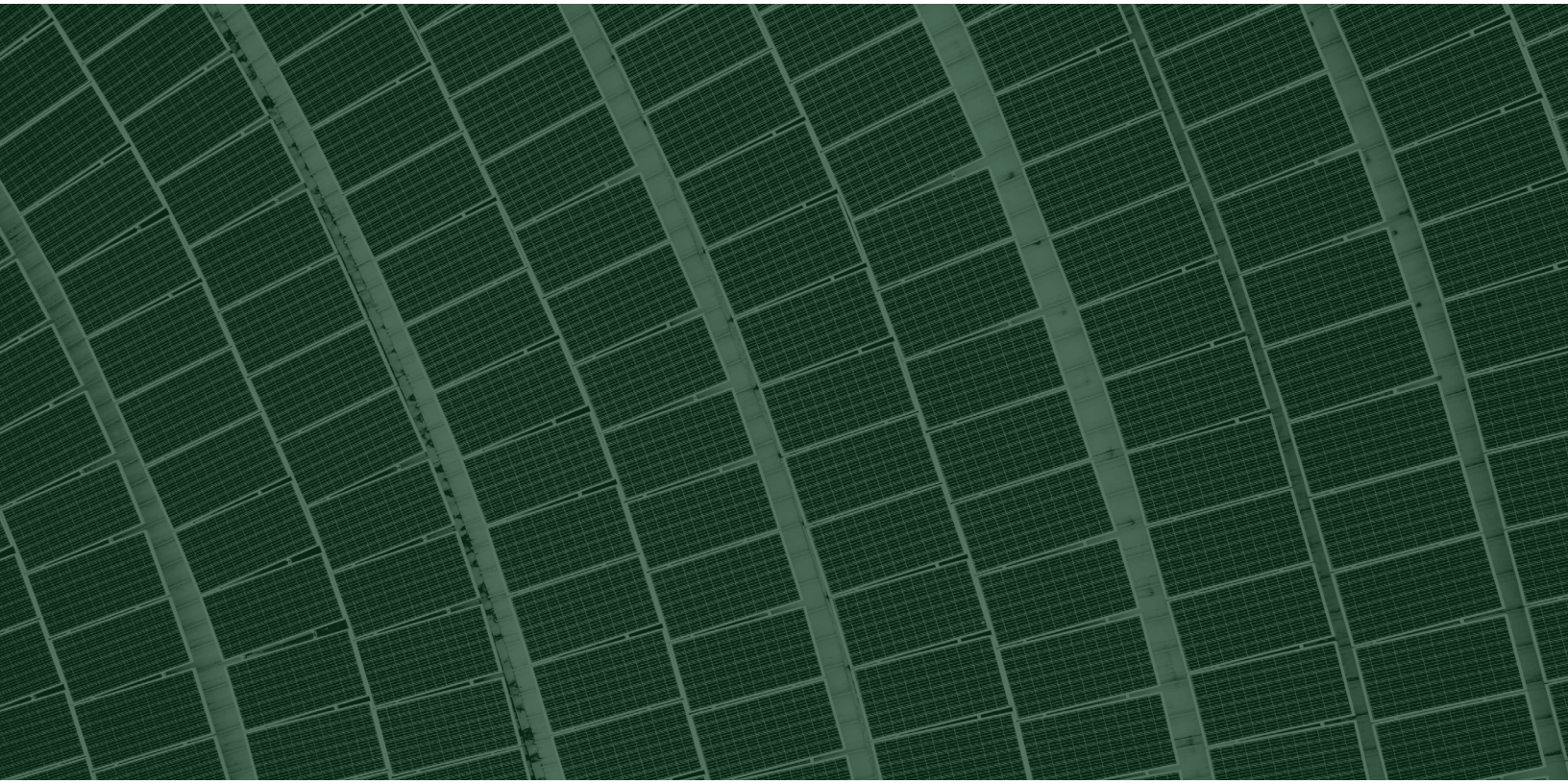
[2] The range in estimates is between 37 to 43 percent below 2005 levels by 2030, with a central estimate of 39 percent.

between our climate and clean power targets and our current trajectory. This gap calls for action by future Congresses, especially to advance provisions that were left on the IRA's cutting room floor, like a Transmission Investment Tax Credit and a Clean Electricity Standard (CES)—or something akin to the Clean Electricity Performance Program (CEPP) that could be consistent with budget reconciliation. Congress should return to these issues, as highlighted by the December 2022 capstone report released by the House of Representatives Select Committee on the Climate Crisis. Federal legislators can investigate changes in permitting systems to facilitate the deployment of transmission and clean energy infrastructure.

Even as new federal legislation has delivered critical investments towards achieving 100 percent clean electricity by 2035, additional federal policy action is essential to fulfilling that goal. Fortunately, additional federal policy action is possible, even without further timely action from Congress.

1.3 The Clean Electricity Gap

While the power sector has historically demonstrated the most progress on achieving emissions reductions, it remains the second largest source of climate pollution in the U.S., emitting 1.55 billion metric tons of carbon dioxide (CO_2) in 2021—approximately 32 percent of U.S. CO_2 emissions. Eliminating power sector carbon pollution through clean electrification is the cornerstone to decarbonizing the economy by 2050. As cleaner energy technologies have become more cost-effective and the dirtiest power plants have shuttered their doors, carbon emissions from the power sector have already fallen significantly, alongside other public health pollutants. Since 2005, carbon pollution from the power sector has declined by 33 percent. Still, much more can and must be done. Reaching 80 percent clean power this decade is essential to achieving both our 2030 NDC target and President Biden's campaign promise of 100 percent clean



power by 2035. Meeting this goal, however, will require additional action at all levels.

Modeling from NRDC finds that the tax incentives, grants, and other provisions of **the IRA can bring down power sector carbon emissions to 66 percent below 2005 levels by 2030** (Figure 1). The IRA also directs EPA to issue new carbon pollution standards for power plants, and the law's incentives dramatically reduce the cost of such standards for power companies and their customers. As fossil-fueled power shrinks, renewable energy sources can grow. Under an ambitious policy scenario, the U.S. could see nearly 900 gigawatts (GW) of renewable and storage capacity operating nationwide by 2035 (Figure 2). **Pairing the IRA with strong EPA carbon standards for power plants, the Biden Administration could cut power sector carbon pollution to 77 percent below 2005 levels and achieve a 76 percent clean grid by the end of this decade.**

Combining bold federal executive action with accelerated state policy puts 80 percent clean energy in 2030 within reach, consistent with President Biden's goal.

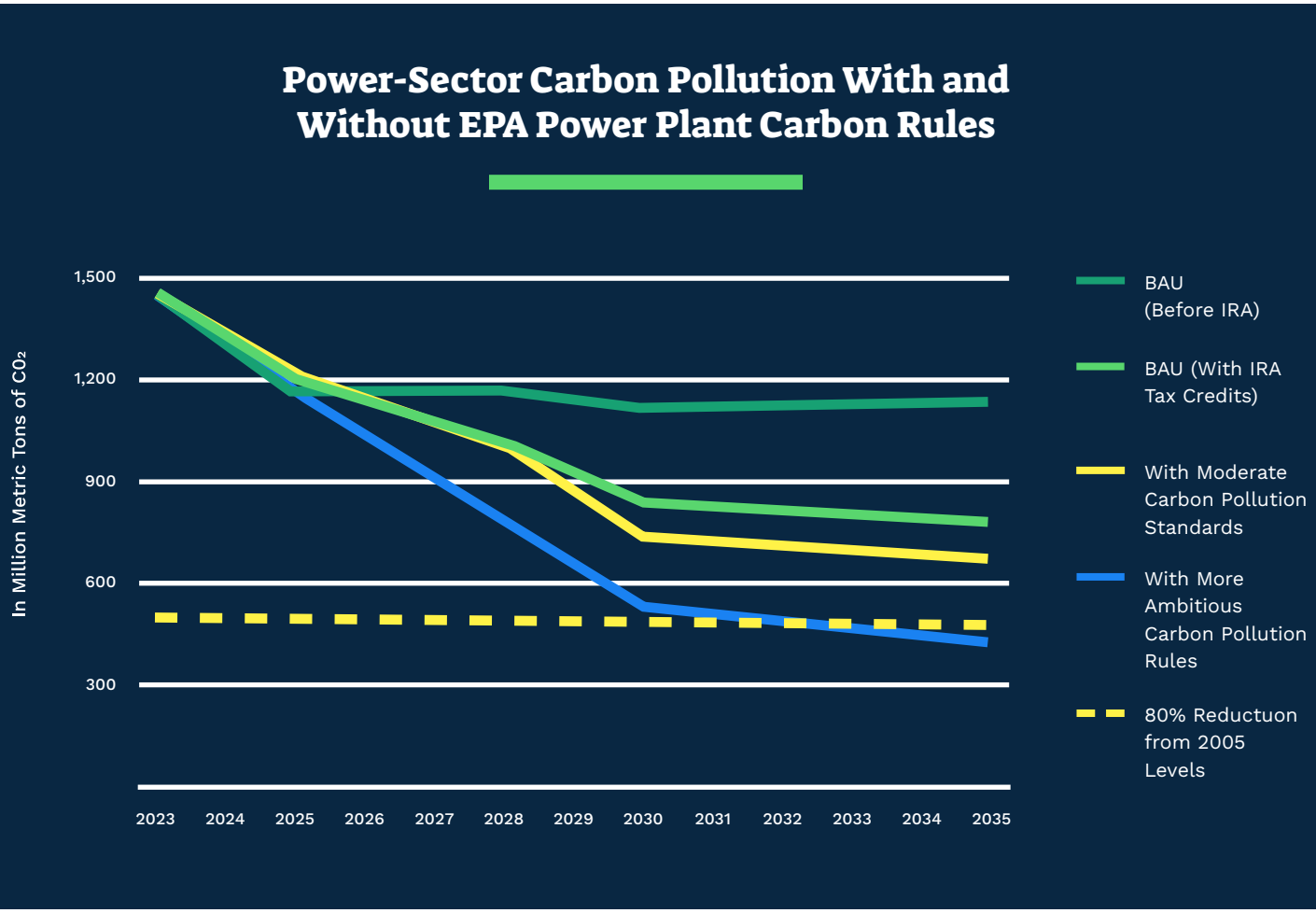


Figure 1: *Total U.S. power sector emissions under various scenarios, including Business-as-Usual (BAU) before the IRA, BAU with the IRA clean energy tax credits, and two scenarios that include either the IRA plus moderate carbon pollution standards for power plants (which includes standards for new gas and existing coal plants) or the IRA plus more ambitious power plant carbon standards (which also includes a standard on existing gas plants).*

Cumulative Renewable Energy Capacity Under Two EPA Carbon Rule Scenarios

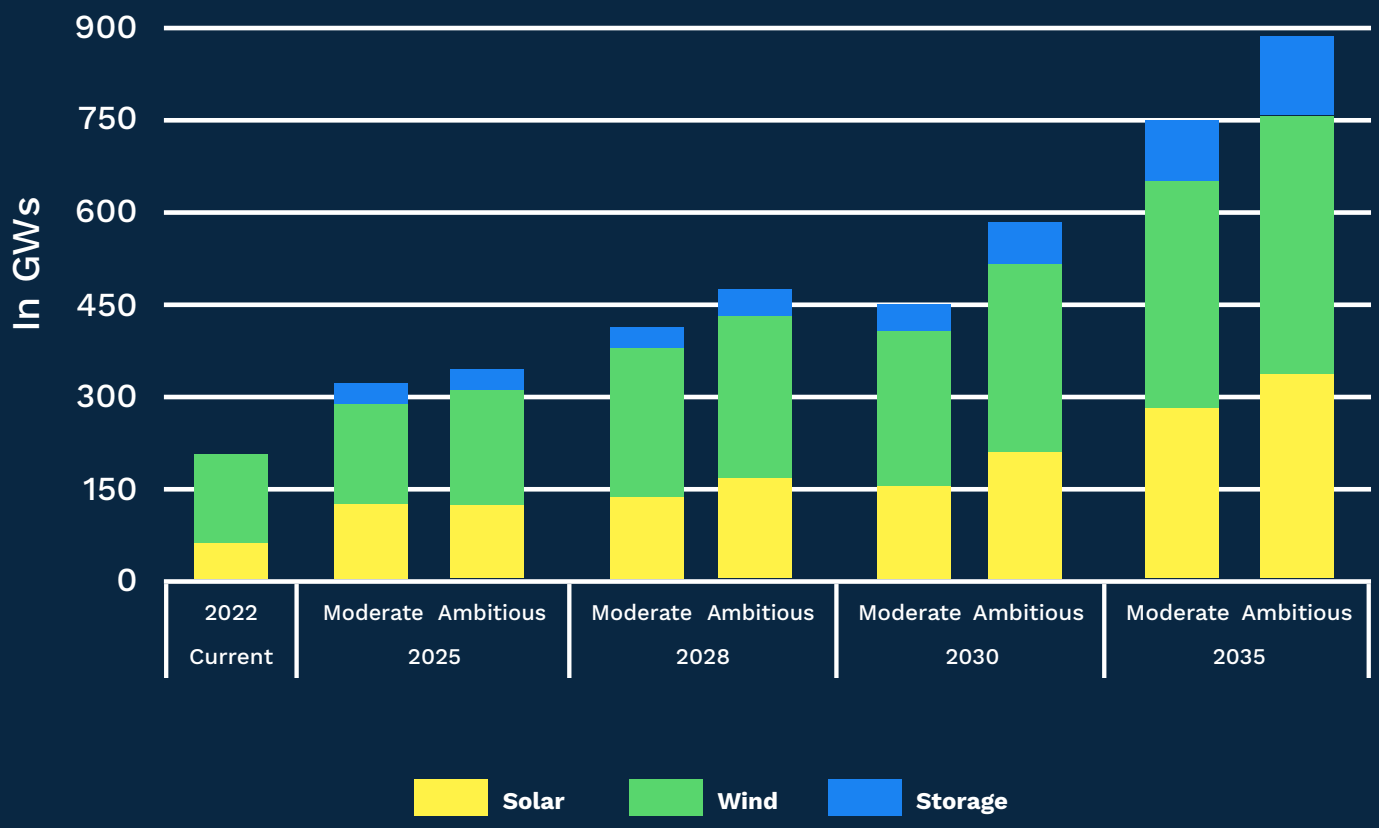


Figure 2: *Cumulative installed capacity of solar, wind, and storage through 2035 under two scenarios. These scenarios include moderate power plant carbon pollution standards (inclusive of IRA tax credits) and more ambitious power plant carbon standards (inclusive of IRA tax credits), illustrating that renewable capacity could roughly triple from 2022 to 2030 and quadruple from 2022 to 2035. For reference, total installed capacity from all generation sources was 1080 GW in 2021.*

2. A Federal Pathway to Progress: EPA, FERC, and other Executive Branch Actions

To close the gap between current policies and those necessary to achieve our climate, clean power, and public health goals, President Biden must take bold executive actions over the next two years. These fall into four primary categories:

1. Issue stringent new pollution standards at the Environmental Protection Agency (EPA).
2. Finalize new rules addressing transmission and power markets at the Federal Energy Regulatory Commission (FERC).
3. Ensure efficient, equitable and effective implementation of the IRA and IIJA.
4. Take other executive branch actions to deploy clean energy.

2.1 EPA Regulations

In the 1960s, the environmental movement gained attention due to the clear evidence of harmful pollution, from oil spills to flaming rivers and deadly smog. The sitting president, Richard Nixon, responded to public concerns by recommending the development of a new agency, the EPA, to monitor and reduce pollution through regulations and conduct research on emerging threats to the environment and public health. Since its creation in 1970, EPA has grown and been tasked with both abating pollution from specific sources, such as power plants, and regulating specific pollutants in air, water, and communities that impact public health and contribute to environmental degradation.

EPA has long-standing legal authority to regulate sources of air, water, and other pollution under key environmental laws, including the Clean Air Act (CAA), the Clean Water Act (CWA), and the Resource Conservation and Recovery Act (RCRA). Through these laws, Congress has charged the agency with protecting the environment and public health by limiting pollution that is produced within states and that crosses state lines. The CAA is a foundational law that has successfully protected Americans from air pollution for 50 years. CAA regulations have prevented hundreds of thousands of premature deaths, while also supporting economic growth by promoting technological innovation. The CWA protects water sources from raw sewage and toxic waste contamination by controlling water pollution with wastewater standards. RCRA has long protected communities from exposure to hazardous sources of solid waste, including in the transportation, storage, and disposal of waste. These three laws can and should now be enforced in a coordinated manner to maximize pollution reductions from the electricity sector and promote the health and welfare of American communities.

EPA should act quickly to execute an agenda that harmonizes many of the regulations authorized through the CAA, CWA, and RCRA

in a multi-pollutant strategy to decrease pollution from the power sector, as called for in a letter sent by NRDC, Evergreen, and other environmental organizations to EPA Administrator Michael Regan in April 2021. In March 2022, Administrator Regan indicated that EPA would move forward with such a coordinated, multi-pollutant approach to addressing power plant pollution. However, EPA is falling behind schedule on nine out of ten crucial rules. Without further concerted effort, the agency risks leaving this crucial business undone at the end of the first term. Issuing final rules in the months before the 2024 election also leaves them open to possible repeal by the Congressional Review Act, meaning EPA could not issue any rule "substantially the same" without new legislation.

Rule	Original Target Date (Fall 2021 Reg Agenda)	Interim Target Date (Spring 2022 Reg Agenda)	Current Status (Fall 2022 Reg Agenda)
CO_2 Standards for New Plants	Proposal target June 2022	Proposal delayed to March 2023	Proposal further delayed to April 2023
CO_2 Rules for Existing Plants	Proposal target July 2022	Proposal delayed to March 2023	Proposal further delayed to April 2023
$PM_{2.5}$ (Soot) NAAQS	Proposal target August 2022	Proposal target August 2022 missed	Proposal issued January 2023
Ozone (Smog) NAAQS	Target date not set	Proposal target April 2023	On track for April 2023 Proposal
Mercury & Air Toxics Standards - Risk and Technology Review	Proposal target June 2022	Proposal delayed to February 2023	Proposal further delayed to March 2023
Good Neighbor Plan	Proposal issued March 2022	Final Rule target March 2023	On track for March 2023 Final Rule
Regional Haze Rule	No plans to strengthen rule announced		
Startup Shutdown and Malfunction - Affirmative Defense Removal	Final July 2022	Final Rule target August 2022 missed	Final Rule delayed to March 2023
Coal Ash Legacy Impoundments Rules	Proposal September 2022	Proposal delayed to November 2022	Proposal further delayed to June 2023
Effluent Limitation Guidelines	Proposal target November 2022	Proposal target November 2022 missed	Proposal delayed to January 2023

Target delayed multiple times

Target delayed or missed

On track for original target date

1. Carbon Pollution Standards for New and Existing Power Plants

The Clean Air Act, as amended by the IRA, directs EPA to establish limits on CO_2 from new and existing fossil fuel-fired power plants. Under CAA Section 111(b), EPA sets New Source Performance Standards (NSPS) for new plants. These standards limit the amount of air pollution that can be emitted by a newly built plant. Existing sources are regulated under Section 111(d)—for those, EPA must issue Emission Guidelines, which set emission limits for existing plants and direct states to develop plans for the existing power plants in their state to meet EPA's emission limits.

For both new and existing plants, standards must be based on the emission reductions achievable by the "best system of emission reduction" (BSER) that is available to the plants, as evaluated by EPA on a technical basis. EPA's considerations for new plants, which are designed with the latest technology, may be somewhat different from those for existing plants, which are already in operation and must reduce their current emissions.

EPA first issued power plant CO_2 Section 111 rules in 2015 under the Obama administration. The 2015 Section 111(b) NSPS for new coal plants is based on a BSER that includes partial carbon capture and sequestration (CCS); the standard for new gas plants is based on efficient combined cycle technology. Although the NSPS was challenged in court, the litigation has yet to be completed and the standard remains in effect. While the Trump EPA proposed to amend the NSPS in 2018, it never finalized the proposal, leaving the 2015 standard in place.

The 2015 Section 111(d) rule for existing fossil plants, known as the Clean Power Plan (CPP), was based on the emission reductions achievable through the replacement of dirtier generation with cleaner generation, for example through building zero-emitting renewable generation to replace a retiring coal plant. The CPP was challenged in court and stayed by the Supreme Court before it could be implemented.

In 2019, the Trump administration repealed the CPP and replaced it with a new rule based on minor improvements to coal plants' operating efficiency. Litigation challenging the CPP repeal culminated in the Supreme Court's recent decision in *West Virginia v. EPA*, which constrained—but did not eliminate—EPA's Section 111(d) authority. The Court held that EPA may not base Section 111(d) emission limits on the reductions that could be achieved by replacing dirtier fossil generation with cleaner generation, as EPA had done in the CPP.

Now, EPA must proceed with new rulemakings that conform to *West Virginia v. EPA*'s constraints, by setting standards based on technology that causes individual plants to "operate more cleanly." Such standards could be based on the emission reductions achievable through improvements to the operating efficiency of the plant; co-firing with a cleaner fuel, such as co-firing coal with gas, or gas with hydrogen; or installing CCS. Although EPA must set the level of the standard based on pollution-control measures that can be installed at the plant itself (sometimes called "inside-the-fenceline" measures), states and companies will have flexibility to determine how best to meet the standard—which may include other measures such as ramping down fossil plant generation and investing in zero-emitting generation.

EPA has said that new proposed rules under both 111(b) and 111(d) will be released by April 2023.

> Relying on adequately demonstrated and cost-reasonable technologies that conform to the mandates of West Virginia v. EPA, such as CCS, emission reductions of 90 percent are achievable for both coal-fired and gas-fired power plants. Since significant carbon abatement is possible using inside-the-fenceline measures, EPA's 111(b) NSPS for new gas plants and 111(d) Emission Guidelines for existing coal and gas plants can and must require substantial carbon pollution reductions.

NRDC's modeling projects that rules reflecting just partial application of such measures could reduce power sector carbon emissions to 77 percent below 2005 levels by 2030 (see Figure 1).

It is important that EPA build upon the standards that have existed for new coal-fired power plants since 2015 by setting limits for all three remaining types of plants: new gas plants, existing coal plants, and existing gas plants. **Rules that only address existing coal and new gas facilities but neglect existing gas plants would leave more than half of the potential emissions reductions on the table**—achieving only a 70 percent emissions cut by 2030, instead of 77 percent, according to NRDC modeling.[3]

The Biden administration must move with urgency on these standards by issuing draft rules in April 2023, as it has committed to doing, and publishing a final rule for all three rules—111(b) for new gas, 111(d) for existing coal, and 111(d) for existing gas sooner than the June 2024 target recently announced. If not finalized by early 2024, EPA risks leaving these crucial measures unfinished at the end of President Biden's first term.

2. Air Quality Rules to Protect Public Health

In addition to its important legal obligations under the CAA to limit carbon pollution from power plants, EPA must also take bold steps to confront a range of other traditional and hazardous air pollutants under the statute. These rules are critical for better protecting Americans' health and advancing environmental justice in communities already overburdened by pollution. These rules will also have the co-benefit of further reducing carbon pollution.

National Ambient Air Quality Standards (NAAQS)

The CAA requires EPA to establish standards for certain major air pollutants, called "criteria pollutants," that endanger public health and welfare. These pollutants are ground-level ozone, particulate matter (PM, commonly known as soot), carbon monoxide, lead, and sulfur dioxide (SO_2) and nitrogen dioxide (NO_2), which each contribute to the formation of smog. The CAA regulates all of these pollutants under the National Ambient Air Quality Standards (NAAQS) program, due to the health impacts and welfare (crop and ecosystem) harms they cause, including impaired lung function, heart and lung diseases, and even premature death. Power plants are a leading source of many of the criteria pollutants.

[3] See Figure 1 in Section 1.3 of this paper—and the difference between the Moderate and Ambitious scenarios therein—for an illustration of this difference.

The NAAQS must be reviewed by EPA every five years to ensure that the standards are informed by the most up-to-date science and continue to adequately protect public health and welfare. After evaluating the scientific evidence and the health risks of exposure to each pollutant, EPA determines whether it is necessary to update or revise the standards. The Trump administration failed to update any of the NAAQS, leaving the NO_2 and SO_2 standards unchanged for over a decade. In 2021, EPA stated its intent to reconsider the Trump administration's last-minute decisions to maintain the 2012 standards for fine particulate matter ($PM_{2.5}$), as well as the 2015 ozone standards.

In early January 2023, EPA issued a proposal that would strengthen the $PM_{2.5}$ annual health standard from 12 micrograms per cubic meter ($\mu g/m^3$) to between 9 and 10 $\mu g/m^3$, but would leave in place the current insufficiently-protective daily health standard of 35 $\mu g/m^3$—despite considerable scientific evidence demonstrating that stronger standards are needed to protect public health and prevent premature deaths. **EPA must finalize stronger $PM_{2.5}$ standards no greater than 8 $\mu g/m^3$ (annual) and 25 $\mu g/m^3$ (daily),** consistent with the expert recommendations of EPA's own independent scientific advisors.

EPA is also currently considering whether to revise the ozone health standard based on the latest science, which shows that a tighter standard is necessary to protect public health. **EPA should set the new ozone health standard at a level no higher than 60 parts per billion (ppb).** We also strongly urge EPA to accelerate the rulemaking process for both of these reconsiderations, given the extensive research demonstrating the health risks of exposure to $PM_{2.5}$ and ozone, so that final versions of each rule are released this year.

As the remaining criteria pollutant standards come up for review in the coming years, we urge EPA to expedite the processes for strengthening regulations to protect the public from these pollutants. In an effort to provide transparency for stakeholders, EPA should proactively announce rulemakings for all outstanding and upcoming reviews of standards for the other criteria pollutants.

Mercury and Air Toxics Standards (MATS)

In 2000, EPA determined that it was "appropriate and necessary" to limit emissions of hazardous air pollutants like mercury, arsenic, benzene, and cadmium emitted from power plants that burn coal and oil. The resulting Mercury and Air Toxics Standards (MATS) require coal- and oil-fired power plants producing 25 MW or more of electricity to use control technologies to limit these hazardous air pollutants. Since they took effect in 2015, the MATS safeguards have reduced mercury emissions from coal-fired power plants by more than 90 percent. Upon adoption of the standards, coal-fired power plants were the largest industrial source of mercury pollution, which increases heart attack risks, compromises immune function, and damages developing fetuses, especially for vulnerable populations.

Despite the appropriate and necessary finding being well-supported in 2012 and reaffirmed in 2016, the Trump administration reversed the 2016 finding using flawed methods of review—knowingly leaving the safeguards vulnerable to lawsuits by coal companies, which followed immediately. Under the Biden administration, EPA is now in the process of restoring the appropriate and necessary finding, reaffirming the need for the MATS safeguards. EPA has also announced plans to initiate a rulemaking on the MATS Risk and Technology Review which should demonstrate that current emissions control

technologies and practices can further lower emissions of toxic air pollutants. The results of the Risk and Technology Review should result in more protective standards, which are still sorely needed in communities and ecosystems suffering from excessive hazardous air pollution from power plants. **EPA must quickly finalize restoration of the appropriate and necessary finding, undertake a thorough review of available pollution control technologies and practices, and strengthen standards to limit mercury and air toxics** emitted from coal- and oil-fired power plants.

Good Neighbor Rule (Ozone Transport)

EPA also monitors and regulates transboundary interstate pollution to ensure that states downwind of pollution are not overburdened by poor air quality due to emissions originating in upwind states. Since the mid-1990s, EPA has issued several generations of "cross-state" air pollution rules that have regulated SO_x and NO_x emissions from coal-burning electric power plants that contribute to the formation of ground-level ozone (smog) by setting pollution limits and budgets for power plants in the responsible upwind states.

The goal of regulating emissions across state lines is to ensure all states are responsible for controlling air pollution sources that cause or contribute to violations of NAAQS health standards, whether in their own states or other states. Currently 27 states across the eastern U.S. must comply with the latest versions of these rules, the Cross-State Air Pollution Rule (CSAPR) and its updates, to limit either SO_2 or NO_x emissions that contribute to the formation of ozone pollution. Ground-level ozone is a lung irritant that most impacts children and individuals with existing respiratory illnesses. The Obama administration reviewed and updated the NAAQS ozone health standard in 2015, but the Trump administration failed to require the needed reductions from pollution sources in upwind states to enable downwind states to meet the stronger standard.

The Biden EPA has proposed a new Good Neighbor rule to further reduce NO_x emissions from coal-burning power plants in 25 upwind states and other industrial sources in 23 upwind states, to help meet the 2015 ozone health standard. **This Good Neighbor rule is already overdue, so the Biden EPA should finalize the proposed rule by its own March 2023 deadline to restore common sense policies that protect communities from pollution.** Furthermore, once EPA strengthens the ozone NAAQS in a new rulemaking—as we advocate above—the agency should act quickly to ensure that upwind states reduce their pollution in line with the new health standard.

Regional Haze Rule

EPA also ensures that Americans get to enjoy the natural beauty of national parks and wilderness areas. For over 20 years, EPA has worked with the National Park Service, the U.S. Fish and Wildlife Service, and the U.S. Forest Service to implement air quality protection plans to reduce pollution that impairs visibility in designated national parks and wilderness areas, also known as haze. Haze is a visual representation of air pollution that comes primarily from power plants, vehicles and heavy industry. Particulate matter is a major cause of haze, and it develops as a result of chemical reactions from pollutants like SO_2 and NO_x. By regulating power plant pollution, visibility in natural parks and wilderness areas will improve.

EPA has identified 156 national parks and wilderness areas as "Mandatory Class I Areas" that are protected through the Regional Haze Rule, primarily concentrated in the western part of the country. States with Mandatory Class I Areas must produce implementation

plans that address regional haze by identifying and tracking sources of emissions and using appropriate emissions control measures. States and Tribes submitted the first regional haze State Implementation Plans (SIPs) to EPA in 2008, with periodic revisions due every 10 years. However, the Trump administration extended the 2018 revision to 2021, and gave power plant operators and states permission to forgo more effective available control technologies. The Biden administration is now attempting to correct these rollbacks through clarified guidance.

EPA is currently reviewing SIPs submitted in July 2021; **39 states have failed to submit revised regional haze SIPs at all, despite the requirements of the CAA and the Regional Haze Rule. EPA must uphold the law and promulgate Federal Implementation Plans for these states.** The Biden administration should move to protect our national parks and wilderness areas by revising the Regional Haze Rule to drive greater pollution reductions from power plants.

Startup, Shutdown, and Malfunction (SSM) Policy

Power plants and other industrial sources often emit higher levels of air pollution during periods of startup, shutdown, and malfunction (SSM). As EPA has long recognized, these emissions can harm nearby communities. However, many EPA and state clean air protections have loopholes that allow power plants to emit excess air pollution during SSM periods without facing legal consequences.

In 2008 and 2014 the courts determined that SSM exemptions from regulations governing hazardous air pollutants violate the CAA. The Obama administration responded to these court rulings by clarifying and updating EPA's SSM policy in 2015 and ordering 36 states to update their SIPs to comply with the CAA. The Trump administration rolled back the 2015 update with revised guidance, and allowed North Carolina, Texas, and Iowa to retain the loopholes in their SIPs.

The Biden administration has since reinstated the 2015 SSM policy and is revoking the Trump EPA's approved exemptions for three states' SIPs. EPA is further requiring 12 more states that failed to remove the loopholes to correct their state plans, or become subject to a Federal Implementation Plan. EPA also plans to remove a closely related "emergency affirmative defense" loophole—which could allow industrial polluters like power plants to avoid liability for violating emissions limits—from its regulations. EPA should promptly finalize these proposed actions and **move to close any remaining SSM loopholes in EPA's clean air safeguards** to protect all communities from illegal, excessive emissions.

3. Water Quality and Solid Waste Rules

Closing Coal Ash Disposal Loopholes

Pollution from coal-fired power plants not only affects air quality, it also has lasting impacts on groundwater quality and drinking water safety. Coal ash, the waste product of burning coal to produce electricity, contains toxic chemicals including mercury, arsenic, and cadmium. Coal ash is typically disposed of in pits, ponds, or landfills, many of which are unlined because they were constructed prior to EPA regulations. Toxic coal ash leaks from these pits into the soil and groundwater, causing severe health impacts such as cancer, birth defects, and kidney and heart disease in nearby communities. Toxic coal ash sites are most often located in low-income communities and communities of color, resulting in disproportionate negative health outcomes for these communities. Coal ash is a leading source of water contamination in the U.S.: 91 percent of the coal ash ponds that report data are polluting groundwater with toxic chemicals that exceed federal standards for safe drinking water, according to a November 2022 report by the Environmental Integrity Project and Earthjustice.

The Obama administration first regulated the disposal of coal ash in 2015 under RCRA, establishing minimum criteria for existing and new coal ash facilities, including groundwater monitoring. Subsequent litigation led to additional rulemaking that required unlined coal ash ponds that contaminated groundwater to stop receiving coal waste, or retrofit or close operations by 2021. The Trump administration weakened the initial rule by allowing extensions for compliance deadlines and suspending groundwater monitoring requirements. Now the Biden administration is enforcing the coal ash rule for the first time since the rules were promulgated by denying compliance extension requests or requiring compliance from coal-fired power plants with leaking and dangerous coal ash ponds.

EPA must address the widespread harm caused by coal ash disposal by eliminating exemptions from safeguards—currently, about half of all coal ash waste in the U.S. remains unregulated, amounting to half a billion tons. In 2022, EPA announced its plans to **issue a new coal ash rule addressing legacy storage ponds**—coal ash impoundments at power plants that were inactive at the time of the 2015 rule. While this is a step in the right direction, **this new rule needs to cover all types of facilities exempted from the 2015 rule.** Updating the coal ash rule to eliminate these exemptions would increase protections for millions of Americans who are at risk of exposure to dangerous coal ash through their drinking water.

Effluent Limitation Guidelines

Coal-fired power plants also generate wastewater that poisons rivers and streams, carrying toxic chemicals through American waters. Coal-fired steam electric power plants are a major source of water pollution, dumping millions of tons of toxic metals like lead, arsenic, and mercury into waterways every year. EPA regulates this wastewater discharge under the CWA through the Effluent Limitation Guidelines. These guidelines use technology-based standards to regulate water pollution across many industries and cover over 100 priority pollutants, including those discharged by power plants. Strict regulation of power plants' wastewater will reduce exposure to harmful pollutants and improve the aquatic environment.

The Obama administration issued the first Effluent Limitation Guidelines for power plants in 2015. The Trump administration weakened the rules in 2020, allowing for exemptions and extending compliance

deadlines. In 2021, the Biden administration reviewed the Trump-era standards and committed to a new rulemaking. **EPA is expected to issue a new proposal updating the Effluent Limitation Guidelines in early 2023 (having missed its original November 2022 deadline)**; until a new rule is finalized, the insufficiently-protective 2015 and 2020 rules remain in effect and toxic coal plant wastewater will continue to pollute our streams and rivers.

It is imperative that EPA act quickly to update the Effluent Limitation Guidelines using currently available science and technology to better protect the public from toxic heavy metals—and at the same time not allow further delays in the deadlines to implement these long-overdue public health protections.

2.2 Federal Energy Regulatory Commission (FERC)

The Federal Energy Regulatory Commission (FERC) also has an essential role to play in powering towards 100 percent clean electricity for America.

The Federal Power Act provides FERC with the authority to ensure that clean energy has equal access to wholesale power markets and that there is sufficient transmission to get clean energy to consumers. Lack of sufficient transmission is a major bottleneck to the large levels of clean energy deployment necessary to reach our national goals for clean energy and economy-wide decarbonization—especially now that the IRA has made wind and solar the cheapest source of new power in the country.

FERC action in 2023 and 2024 is therefore key to achieving these targets. FERC must exercise its regulatory authority over utilities to reform planning in two key areas: transmission and interconnection, and resource adequacy.

The Need to Confirm a Fifth Commissioner

To implement these reforms effectively, the Commission needs a full slate of five commissioners and a permanent chair. Former Chair Rich Glick's term expired at the end of 2022, leaving FERC split 2-2 between Democratic and Republican appointees. **President Biden and the U.S. Senate must confirm a new FERC commissioner and establish a permanent chair quickly** so that the Commission can address its transmission, interconnection, and other priorities at full strength. While some of the rules detailed below could possibly advance through a 2-2 FERC, a strong climate and clean energy majority on FERC is essential to finalizing the strongest rules possible. President Biden and the Senate must prioritize this vacancy. Without a fully-staffed FERC able to finalize much-needed rules reforming transmission planning, interconnection, and power markets, many of the climate benefits enabled by the IRA would be left unrealized. Other priorities, including intervenor compensation to boost public participation, might also go undone.

Transmission and Interconnection

FERC must reform transmission planning to better plan for new generating resources, many of which are clean, low-cost renewables sited far from the areas where electricity load is concentrated. Large-scale regional and interregional transmission will be needed to bring this clean energy to consumers. A recent study by the Princeton REPEAT Project found that high-voltage transmission needs to expand at a rate of 2.3 percent per year to achieve the full carbon reduction potential of the IRA, similar to the historical rate of expansion from 1978–2020 (~2 percent)—but far beyond the 1 percent annual expansion this last decade. Further, as extreme weather becomes more common, large interregional

transmission lines can allow a region suffering from extreme weather to import power from its neighbors, providing needed reliability and resilience to keep the lights on.

FERC's current transmission planning rules provide perverse incentives for transmission owners to plan the system to meet local, rather than regional, needs. Because of this, data show that most transmission is built outside of regional planning processes in regional transmission organizations (RTOs). In non-RTO regions, regional transmission planning is essentially nonexistent. Transmission projects planned outside of the regional transmission planning process are not subject to meaningful review. Interregional coordination processes, in particular, have been unsuccessful, with no meaningful interregional transmission developed to date.

One successful example of regional planning is in the Midwest, where the Midcontinent Independent System Operator (MISO) approved in July 2022 the largest investment in transmission lines ever in the United States. This opens the door to an estimated 53 gigawatts (GW) of new wind and solar energy, plus storage and battery projects—enough to power 12 million homes. According to the Union of Concerned Scientists, this transmission will prevent 400 million metric tons of carbon emissions between 2030 and 2050. Moreover, it's good for consumers—providing, on average, $2.60 in benefits for every dollar spent. However, additional policy action will be required to realize these gains. The approved lines will now go to states for approval, where the fights to get these built will get tougher and localized. Additionally, MISO still has three more tranches of transmission lines to approve in the next few years, including building lines in the South and expanding the connection between MISO North and MISO South. Even these tranches will not be sufficient to meet the need: there is a total of 112 GW of clean energy and storage sitting in the MISO interconnection queue and many fossil fuel plants retiring in the coming years. However, MISO's leadership on transmission is a critically important start.

This kind of progress can be replicated in the other areas of the country. In April 2022, FERC issued a proposed rule to improve regional transmission planning. This rule would require RTOs to conduct long-term, forward-looking scenario planning to meet the needs driven by changes in the resource mix and consumer demand. In the proposed rule, FERC outlined the multiple benefits of transmission development but did not require transmission planners to actually plan for these benefits. **FERC needs to move forward quickly with a final regional transmission rule that requires transmission regions to plan for a minimum set of benefits.** While this proposed rule did not include a requirement to plan large, interregional lines, several FERC Commissioners indicated in public statements that they are still considering reforms to interregional planning, too.

This is the first time in a decade that FERC is reviewing its transmission planning rules. FERC needs to be bold to finalize rules that spur the transmission desperately needed for reliability, for resilience, and to bring clean energy resources onto the grid. FERC must finalize its regional transmission planning rule, and then issue a rule addressing interregional transmission, too. An interregional planning rule should address minimum transfer capability requirements, which FERC is publicly considering and which would spur a minimum level of transmission capacity between grid regions. However, **the Commission should go further and reform interregional transmission planning and cost allocation more comprehensively,** as its April 2022 proposed rule would for regional transmission.

To meet our emissions reduction goals, we must also ensure that clean energy can be connected to the grid. Right now, there are over 8,100 active projects in interconnection queues, totalling 1,000 GW of generation and 400 GW of storage. Projects currently take an average of 3.7 years to get through the interconnection queue, and only 23 percent of generators ultimately make it all the way through. Getting even a fraction of this power, which is mostly clean energy, onto the grid faster would help ensure reliability and resilience, and reduce consumer costs by allowing access to low-cost power sources. In June 2022, FERC proposed rules to streamline the processing of projects in the interconnection queue, reforms that could help get more solar, wind, and storage connected to electric grids nationwide. Rather than considering interconnection requests one-by-one, as occurs now, FERC's proposal would require a "first-ready, first-served cluster study process" that groups projects together and prioritizes those closest to commercial operation.

FERC needs to move quickly to finalize these interconnection rules so that the thousands of solar, wind and storage projects waiting for approval can get connected to the grid. FERC's rule should include strict deadlines for interconnection studies and fines for utilities and transmission providers that fail to meet them. Without FERC dramatically reforming the interconnection process, the U.S. has little hope of meeting its clean energy and climate targets. The grid operator in the Mid Atlantic, PJM, recently proposed (and FERC reluctantly approved) reforms designed to start working through the backlog of wind and solar projects trying to connect to the grid. However, even if these reforms work as planned, PJM is unlikely to be able to connect projects quickly enough to meet the state clean energy goals already on the books. FERC must finalize a new interconnection rule quickly so that the Commission can begin to reject inadequate proposals like PJM's.

Resource Adequacy

Resource adequacy is the process of ensuring that sufficient supply of electricity is available at all times. It is a jurisdictionally complex field, with intertwined federal, state, and private roles. Roughly 142 million Americans live in regions where FERC-jurisdictional rules, known as "capacity markets," play a key role in maintaining resource adequacy. Each year, these rules direct the collection of billions of dollars from electricity consumers to support power plants and other electricity-sector resources. FERC-jurisdictional capacity market rules must be reformed to adapt to the changing technologies of a low-carbon power system, and to remove explicit barriers to state clean energy policy.

Between 2016 and 2020, FERC implemented a series of rules that aim to preempt state energy policy by limiting how resources subsidized by state or local policy are considered in capacity markets. These rules—PJM's Minimum Offer Price Rule (MOPR), New England ISO's Competitive Auctions with Sponsored Policy Resources, and New York ISO's Buyer-Side Mitigation (BSM)—have the effect of protecting fossil-fueled resources, especially gas-fired combined cycle power plants, from competition with state-supported energy resources, typically clean energy. More recently, FERC has begun to roll these rules back—although these actions will not take effect until 2025 in the case of New England, after that region's grid operator requested and FERC approved a two-year transition period. FERC must hold New England's grid operator accountable to this deadline with no further delays and should move expeditiously to ensure that capacity market rules designed to undermine state energy policies are entirely replaced as quickly as possible.

More generally, resource adequacy rules have been designed for the characteristics of traditional power plants, and are in need of reforms to accurately reflect an increasingly low-carbon grid. Accuracy is paramount: resource adequacy planning must both ensure that the power system remains reliable as it transitions to new sources of supply and allow clean resources to displace fossil resources to the maximum extent consistent with maintaining reliability.

In particular, current resource adequacy rules are designed around power plants that are dispatchable, available at most times, and located nearby. In contrast, some clean sources of electricity operate differently, with limits on when they are available and how much power they can produce. Many resource adequacy constructs also assume fossil resources can provide electricity at all times, when time after time it has been shown that they struggle in extreme heat and cold. Currently, resource adequacy rules are overly conservative in assessing what grid services low-carbon sources of electricity can provide, essentially punishing renewables and electric storage for their characteristics while not acknowledging the ways newer resources, particularly energy storage, can be more responsive than fossil generation. FERC should address these issues by reforming market rules so that they:

- Accurately consider the resource adequacy value of all technologies instead of setting arbitrary limits on participation and using accreditation methods that undervalue clean energy resources.
- Allow for resource adequacy to be achieved through combinations of complementary resources, such as demand-side management combined with renewables.
- Incorporate the effects of flexible and price-responsive load.
- Recognize diurnal and seasonal differences in the need for and supply of power.
- Remove barriers to interregional trade in capacity.

FERC and the regional transmission organizations (RTOs) are currently removing some of the hidden subsidies for fossil fuels and barriers to renewable energy from electricity market rules. In April 2022, FERC issued an order that required each of the RTOs to comprehensively assess their current system needs over the next 5–10 years given recent changes in resource mixes and load profiles, and detail how they plan to reform their markets to meet expected system needs. FERC explicitly required that market reforms cannot discriminate against any type of generation. This proceeding put pressure on the RTOs to make sure that their markets appropriately value new clean energy resources and flexible demand and continue to serve load reliably. FERC also indicated that it may use the information it received to propose further market reforms. At a minimum, FERC must use the information provided by the RTOs to ensure that they allow all resources that are technically capable of providing ancillary services to do so, and send price signals that reflect the full value of needed services—by compensating resources for the full cost of producing and generating electricity and for being available at the right time and place. Advocates should closely follow the RTO processes that this order started to ensure the RTOs

appropriately value clean energy resources and demand flexibility as more of these resources come online.

These resource adequacy rules, while important, only affect the areas currently in an RTO. Utilities in the western United States, with the exception of those in California, are not currently in an RTO. Efforts are underway to consider various market mechanisms in the West. A recent report by Advanced Energy United highlights the benefits of an integrated western market, including $2 billion in annual energy cost savings, adding up to 4.4 GW of additional clean energy to the Western grid, and adding 657,000 new permanent, high-paying jobs to the West. Advocates need to work with utilities and states in the West to move to market structures that can take advantage of these market benefits. Similarly, utilities in the southeastern United States are not in an RTO. While southeastern states have recently moved to increase competition through the Southeast Energy Exchange Market, the creation of a full RTO would drive substantial benefits. A southeastern RTO is estimated by Energy Innovation and Vibrant Clean Energy to create $384 billion in economic savings through 2040 and to reduce customer bills and carbon emissions substantially—with retail costs 29 percent lower in 2040 compared to business as usual.

2.3 Implementation of the Inflation Reduction Act (IRA) and the Infrastructure Investment and Jobs Act (IIJA)

In August 2022, Congress passed and President Biden signed into law the Inflation Reduction Act (IRA), the largest investment in clean energy and climate action in U.S. history. The IRA contains groundbreaking federal financial support for renewable, clean, and energy storage tax credits and other investments that will transform the nation's power grid away from fossil to clean generation.

Implementing the historic clean power provisions in the IRA, and to a smaller extent in the Infrastructure Investment & Jobs Act (IIJA) and the CHIPS and Science Act, will be key to decarbonizing the power sector. These laws—if implemented efficiently, effectively, and equitably—can slash emissions and contribute significantly toward setting the U.S. on track to achieve 80 percent clean power by 2030, on the way to 100 percent clean by 2035. Key areas and agencies of focus in the IRA include:

1. **Clean Energy Tax Credits:** The IRA provides long-term, full-value extension of the federal investment and production tax credits (ITC and PTC) for clean electricity generation. The credits were expanded to cover energy storage and interconnection costs, as well as to promote projects that pay prevailing wages, utilize registered apprentices and Made-in-America technologies, and benefit disadvantaged communities. The incentives are also made more accessible, with the option for non-profit utilities to receive an elective payment in lieu of a tax credit.
2. **DOE Loan Guarantee Program:** The IRA provides $8.6 billion for DOE clean energy loan guarantees, enabling $290 billion in loan guarantee authority. The Loan Guarantee Program is a powerful tool for leveraging major private sector investment in clean and innovative energy technologies, especially for grid decarbonization.
3. **USDA Rural Utilities Financing:** The IRA's $12.8 billion for USDA financing programs will help rural communities deploy more clean energy. These funds could be used to help rural co-ops retire their coal-fired power plants through debt forgiveness, and to build out renewable energy and energy storage through grants and loans.

4. **EPA "Force Multiplier" Programs:** These EPA programs, including the Greenhouse Gas Reduction Fund, State Climate Grants, and Environmental and Climate Justice Block Grants, will be key to both emissions reductions and delivering on environmental justice through President Biden's Justice40 goals.
5. **DOE Transmission Funding:** The IIJA and IRA both contain funding for DOE to allocate grants and loans to build new transmission lines and facilitate their siting. These programs are contained within DOE's new Grid Deployment Office.

IRA implementation will get an additional boost from programs and funding in the IIJA. By boosting supply to meet higher demand for clean technology, IIJA manufacturing support programs will help deliver the best possible IRA tax incentive outcomes. For IIJA implementation, agencies must heed President Biden's executive order setting an agenda: avoiding waste, upholding "Made-in-America" and prevailing wage requirements, equitably investing in disadvantaged communities, and partnering with State, local, and Tribal governments. This should include application of Justice40 requirements to IIJA and IRA programs.

This paper focuses on reducing pollution in the U.S. power sector. Of course, the scope of IRA climate provisions extends well beyond that. So, for the sake of clarity and concision, we chose to define the scope of discussion in this paper to the IRA provisions that directly relate to clean electricity.

1. Clean Energy Tax Credits

Long-term Extension of Clean Energy Tax Credits

The IRA delivers historic support for clean power. Major new federal investment and production tax credits provide the innovative, long-term support needed for power sector planning and deployment. Over the next 15 years, these tax credits are projected to cut around 2.6 billion metric tons (or 2.9 billion short tons) of carbon pollution (Figure 3). IRA clean power provisions extend wind and solar tax credits, create new technology-neutral clean energy tax credits (that include storage) and nuclear tax credits, expand carbon sequestration tax credits, and fund programs to support local clean investment.

Prior to the IRA's passage, the solar investment tax credit (ITC) was in the process of being phased, down and the wind production tax credit (PTC) had expired. Now both the ITC and PTC will get expanded and extended through 2024. Then, beginning in 2025, the solar ITC and wind PTC morph into the innovative, technology-neutral Clean Electricity Investment Credit (CEIC) and the Clean Energy Production Credit (CEPC) that can support wind, solar, geothermal, battery storage, and any new net-zero power generation technology for the next 10 years or more. Facilities can choose to take either the CEIC or the CEPC, and the credit applies to any qualified facility that begins construction through 2032, or when power sector greenhouse gas emissions fall to 25 percent of 2022 levels, whichever occurs later. This marks the first time that the duration of a tax credit has been tied to greenhouse gas targets. This climate-focused credit will support any new power generation technology that is net-zero, spurring massive deployment of existing renewables and private sector development and innovation in new power sector technologies.

In addition, throughout the tax incentives, strong labor provisions encourage high-quality jobs. These provisions include apprenticeship and prevailing wage requirements to qualify

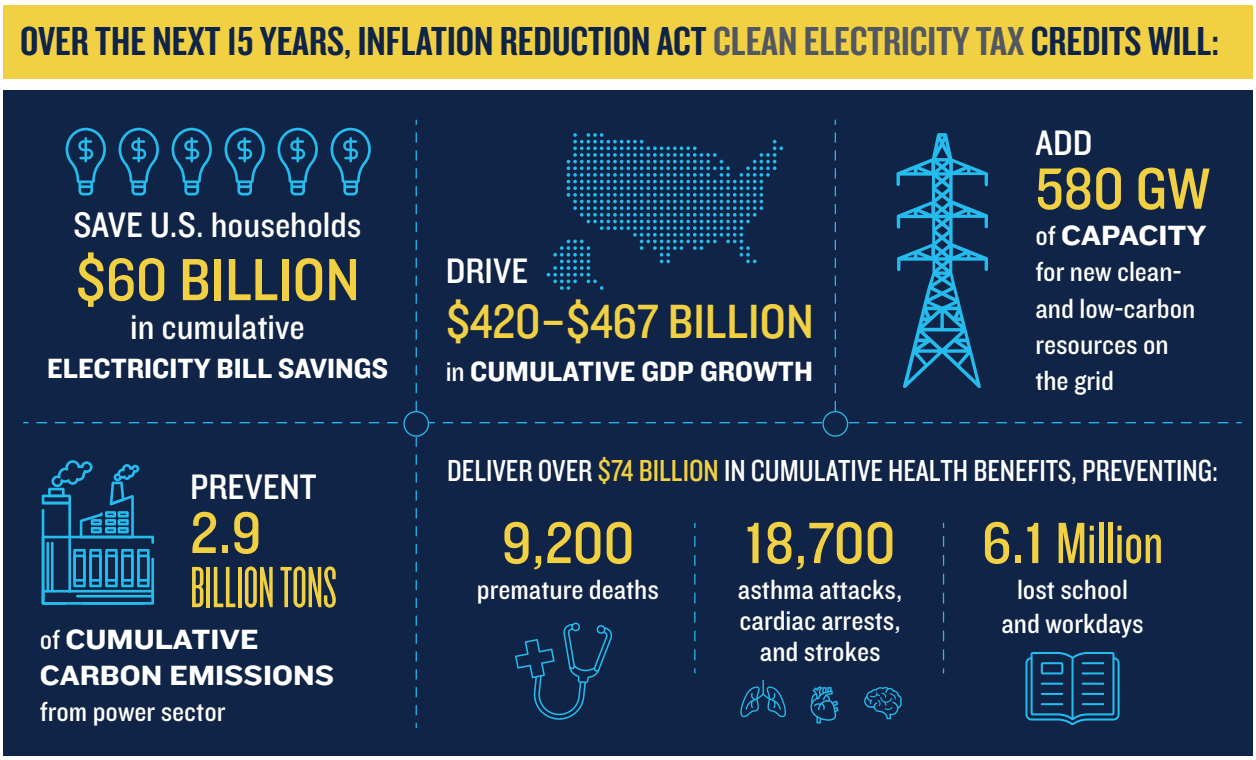


Figure 3: *Estimated cumulative benefits of the IRA clean energy tax credits over the next 15 years*

for the full tax credits (receiving only 20 percent of the credit otherwise). The base rates for the CEIC and CEPC are 6 percent and 0.3 cents per kWh, respectively. But assuming labor requirements are met, the base rate increases by 5 times to 30 percent and 1.5 cents per kWh.

Furthermore, all the clean energy credits rise in value if projects meet certain justice and just transition standards. Projects receive a 10 percent increase for locating the project in former fossil energy communities, in or near brownfield sites, or communities suffering from high unemployment in fossil sectors—helping with justice and just transition goals. If the facility produces less than 5 MW, projects can receive a 10 percent increase in value for siting projects in disadvantaged communities, or a 20 percent total increase if in qualified affordable residential housing. Projects can also receive an additional 10 percent ITC (or a 10 percent increase in equivalent PTC) by using a certain percentage of domestically produced steel, iron, or manufactured products. Taking advantage of these incentives in combination means that a qualified clean energy project could receive up to a 50–70 percent tax credit. This structuring can help to ensure well-paying domestic jobs and equitable access to clean energy resources. Each of these adders and bonus credits are essential in targeting investment to the communities that have experienced the most economic pain from the transition to clean energy, as well as those that have suffered the most from disproportionate fossil fuel pollution.

The IRA also expands which utilities can use the tax incentives, with direct payments in lieu of tax credits available to municipal and cooperative utilities, Tribes, and nonprofits. Direct pay substantially widens access to these incentives by allowing organizations without tax liability to take advantage of them. Another key aspect is the law's transferability

provision for companies that do pay taxes (and are therefore not eligible for direct pay). Through transferability, project owners can sell their credits to another party for cash, allowing more companies to access the full benefits of credits regardless of federal tax liability. Transferability prevents an artificial ceiling on the volume of projects that can use the credits and avoids a big haircut (~25 percent of the value) going to Wall Street, unnecessarily. IRA tax incentives are more flexible and accessible, which will allow for the fastest renewables build-out in the U.S. to date.

NRDC's modeling projects that the tax credits could support 280 GW of new clean and low-carbon resources by 2030, growing to over 580 GW of new clean and low-carbon capacity by 2035. This would be more than a doubling of U.S. renewable and battery storage capacity between now and the end of this decade, with almost a quadrupling of capacity by 2035 (Figure 4).

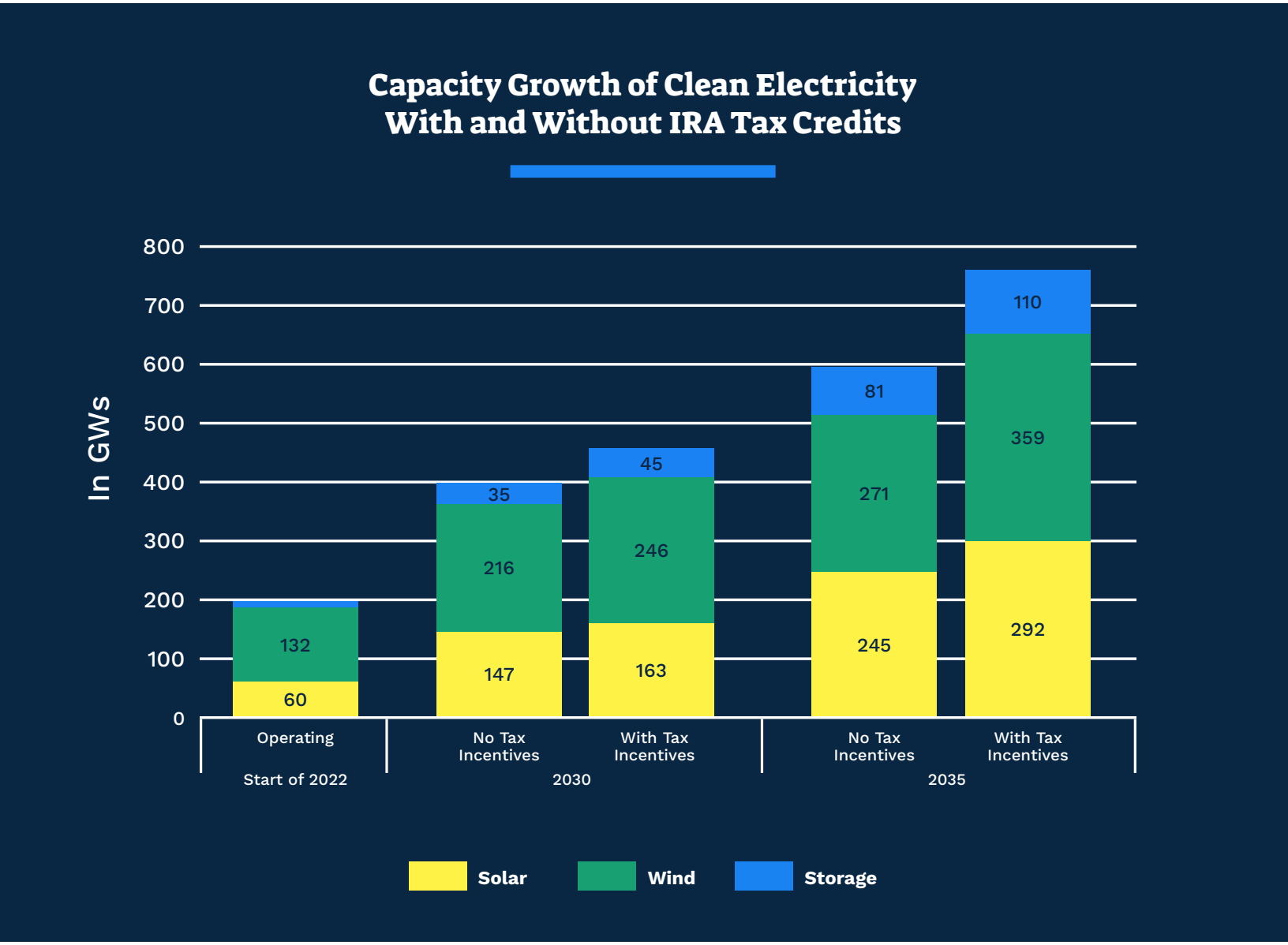


Figure 4: *Capacity growth of clean electricity capacity in the years 2022, 2030, and 2035—with and without the IRA's clean energy tax credits.*

NRDC's modeling finds that the clean electricity tax credits could cut about 250 million metric tons of CO_2 from the power sector in 2030 as compared to without the tax credits (Figure 5). This is equal to the carbon pollution from every power plant in Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia in 2021. **By 2030, carbon pollution from the power sector is projected to fall to 66 percent below 2005 levels due to the IRA's tax credits.** Over the next 15 years, these tax credits are projected to cut around 2.6 billion metric tons of CO_2 pollution compared to a case without these tax credits.

This cleaner, low-carbon grid will reduce power prices by decreasing U.S. reliance on fossil fuels and their historically volatile prices. According to NRDC modeling, the tax credits are projected to cut the average residential bill

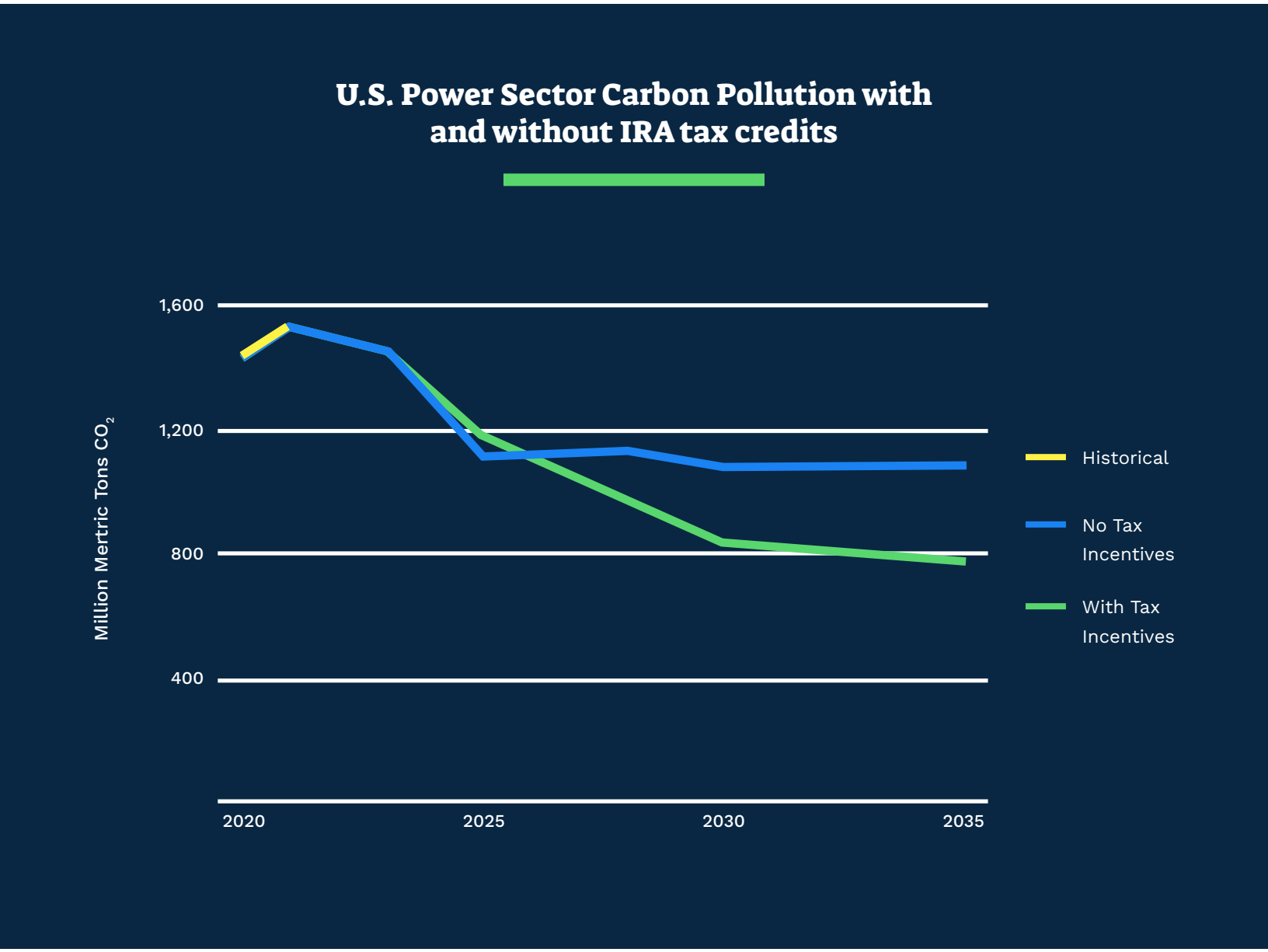


Figure 5: *U.S. power sector carbon pollution before and after passage of the IRA's clean energy tax credits through 2035 (assuming pre-IRA policies otherwise remain constant).*

by 3.4 percent in 2030 and 4.6 percent in 2035, relative to a scenario without these credits (Figure 6). These savings have been found to be progressive, with low-income households seeing much larger relative benefits. In total, U.S. households are expected to see $60 billion in electricity bill savings over the next 15 years. Saving consumers money makes it even more imperative to get to 80 percent by 2030 on the way to 100 percent clean power.

The IRA's tax credits will also reduce exposure to health-harming air pollutants. The annual national health benefits from power sector-related reductions in nitrogen oxides (NO_x) and sulfur dioxide (SO_2) stemming from the tax credits amount to $8.6–$9.0 billion by 2030, growing to $9.5–$10.1 billion annually by 2035. These figures represent the monetized benefits of avoided health issues, including avoided premature deaths, fewer ER visits and hospital admissions, fewer lost workdays and school days, and reduced childhood asthma attacks.

At the same time, the clean energy tax credits significantly increase and accelerate efforts by the federal government to catalyze development, commercialization, and deployment of clean energy technologies to address climate change. Because of these numerous innovations, the Treasury Department must continue to issue guidance in a timely manner—and do it well. To that end, the department should work closely with DOE, the White House and Office of Management and Budget (OMB), and others who have experience and perspective on the full intent of the clean energy tax incentives.

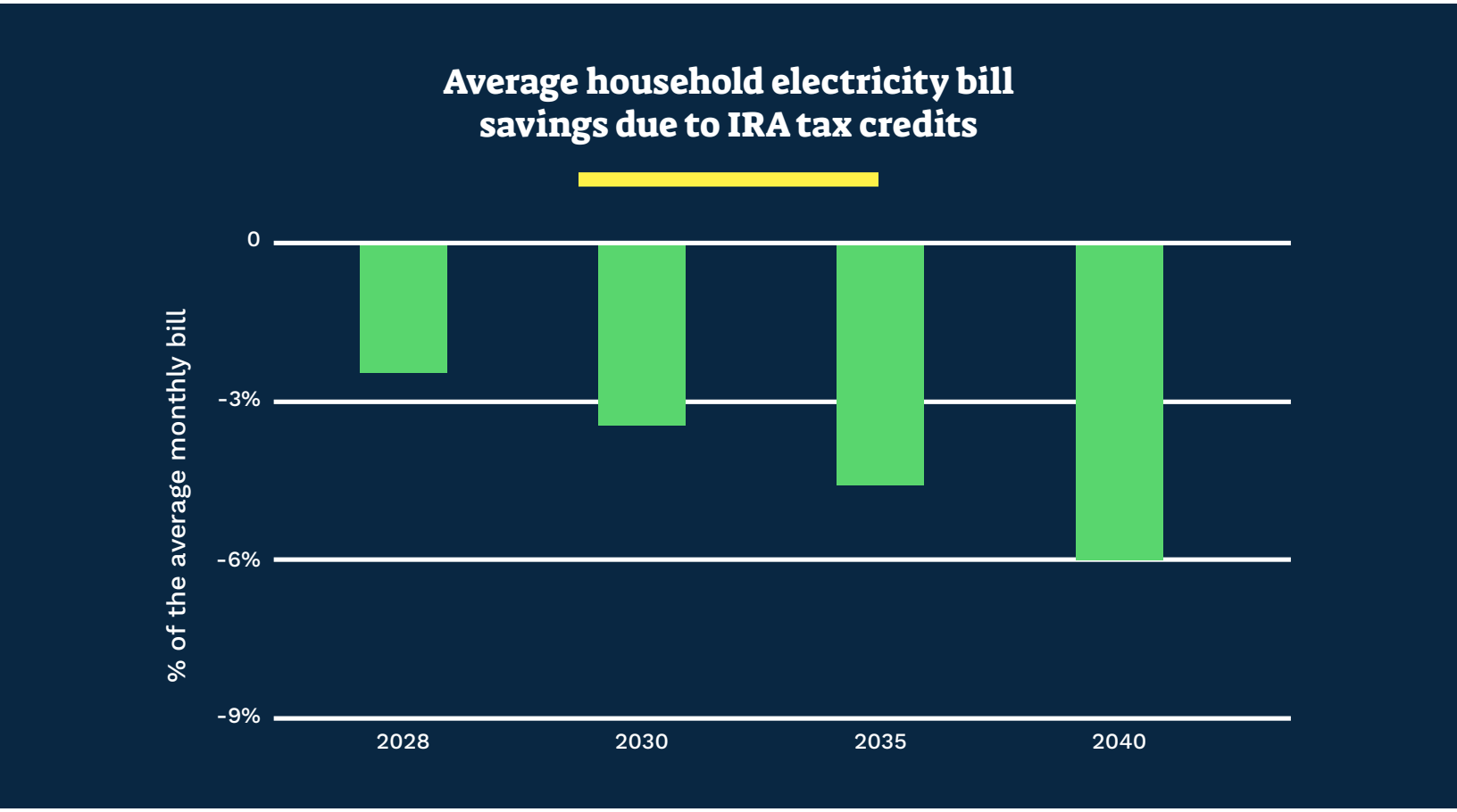


Figure 6: *Average household electricity bill savings due to the IRA clean energy tax credits through 2040, relative to no tax credits.*

2. DOE Loan Guarantee Program

The IRA includes $8.6 billion for DOE loan guarantees, enabling $290 billion in loan guarantee authority. The DOE Loan Guarantee Program, which sits within DOE's Loan Programs Office (LPO), is a powerful tool for leveraging major private sector investment in clean and innovative energy technologies, especially for grid decarbonization. These investments include $5 billion for a new Energy Infrastructure Reinvestment Program, enabling up to $250 billion in loan guarantee authority, to retool, repower, repurpose, or replace retired energy infrastructure (like coal power plants), or build new clean energy infrastructure.

Because of the substantial capital utilities invested in the construction of fossil fuel power plants and unpaid debt on those projects, utilities often want to hold onto their existing fossil facilities. Loans and loan guarantees can help utilities refinance this debt, retire old facilities, and put the savings into new clean energy infrastructure. With large amounts of new loan guarantee authority, DOE must quickly ramp up its operations and staffing to get loans out the door in a timely manner. The $250 billion to retool, repower, repurpose, or replace fossil fuel infrastructure, for example, must be spent by 2026. There is no time to waste.

The IRA also included $3.6 billion for clean energy loan guarantees, which enables another $40 billion in loan guarantee authority. Loan guarantees (and public finance instruments writ large) are powerful tools that can catalyze private investment far beyond the level of funding appropriated by Congress. Not every clean energy investment will turn into the next breakthrough publicly-traded company, but this is by design. If these investments held no risk, companies would not need a loan guarantee in the first place. The Loan Guarantee Program is intended to grow and de-risk new technologies and business models that are unable to obtain sufficient financing from the private sector.

Furthermore, the IIJA and the Energy Act of 2020 also made important reforms to the Loan Guarantee Program to facilitate greater access to this powerful federal finance program. One particularly notable reform in the IIJA clarified that state clean energy financing institutions (like Green Banks) are eligible to receive financial support from the program. Another has allowed the DOE to waive the requirement that an eligible project feature "innovative technology," if it receives such a request from a state government and if the state is also providing said project with financial support. These reforms, plus new funding and financing authority for LPO, will allow DOE to support more states in deploying more clean energy projects. In turn, this will help advance and accelerate states' agendas for 100 percent clean electricity and building out domestic clean energy manufacturing capacity.

3. USDA Rural Utilities Financing

The IRA provides $12.8 billion to help rural communities deploy more clean energy, including $9.7 billion for U.S. Department of Agriculture (USDA) loans to rural electric cooperatives to obtain renewables and other carbon-free energy. These funds could be used to help rural co-ops retire their large coal fleets. Through the USDA Rural Energy for America Program, a further $3 billion is available for rural energy loans and grants for renewable energy, including up to $1 billion for all electric service providers, whether cooperative, municipal, investor-owned, or Tribal.

Rural co-ops still heavily rely on coal power, which is among the most polluting and expensive energy sources available. While investor-owned utilities have increasingly moved to cleaner and cheaper sources of energy, co-ops are often locked into long-term contracts and financial obligations with coal-fired power generation—and many co-ops that want to make the transition lack the financial flexibility to do so. The USDA Rural Utilities Service (RUS) should use its IRA funds to prioritize construction of clean energy projects that permanently replace coal generation on the grid. RUS should also fund planning and support for workforce transition for those displaced by these retirements.

This use of funding—replacing coal generation with clean energy—would have the highest impact in reducing carbon pollution, improving air quality and public health in rural communities, and lowering power costs for co-op owner-members. Any other use of funds, including for investments that prolong fossil generation, would not be in compliance with the IRA's clear statutory mandate to maximize carbon pollution reductions—and would be a missed opportunity for the communities RUS was designed to serve. Since IRA's clean energy tax credits offer direct pay to nonprofits, co-ops have a golden opportunity to retire polluting coal assets and transition to lower-cost clean energy.

4. EPA "Force Multiplier" Programs: Greenhouse Gas Reduction Fund, State Climate Pollution Reduction Grants, Environmental & Climate Justice Block Grants

Greenhouse Gas Reduction Fund

The IRA provides $27 billion towards the Greenhouse Gas Reduction Fund (GHGRF) administered by EPA (Sec. 60103). The EPA Administrator is responsible for the distribution of funds, which will become available no later than Spring of 2023, and must be expended to funding recipients before the end of 2024. Through the GHGRF, EPA has the opportunity to support state and local clean energy leadership, and to build a robust nationwide ecosystem of green and equitable finance—allowing people and communities to leverage public and private sector investments for climate solutions. The GHGRF can and should be a powerful force in building a cleaner, more resilient, affordable, and equitable power sector.

The funding made available within the GHGRF is allocated into two programs:

1. **Zero-Emission Technologies Program:** The zero-emission technologies section allows for $7 billion in grants to be made available to States, municipalities, Tribal governments, and non-profit institutions, to provide grants, loans, and financial assistance to enable low-income and disadvantaged communities to deploy zero-emission technologies, including distributed solar. These funds should be prioritized for state, local, and Tribal programs that demonstrate a plan to deploy these investments equitably and effectively toward program goals.

2. **Clean Energy Accelerator:** The Accelerator provides approximately $20 billion for grants to be made available to non-profit financing authorities to fund projects or efforts that reduce or avoid GHG pollution. This funding could be used to support state and local green banks and related clean energy finance institutions; one or more national green banks or green finance networks; a number of regional clean energy accelerators; and local community development institutions—or some combination of these and other

mission-aligned entities. In addition, the low-income and disadvantaged communities section ensures that at least $8 billion, or 40 percent, supports low-income and disadvantaged communities, consistent with President Biden's Justice40 initiative.

The EPA and the public and non-profit entities eligible to apply for these grant funds will play a significant role in shaping the impacts of this program. EPA has a great deal of responsibility in choosing which projects will receive funding, including the authority to decide what carbon pollution-reducing projects will be deemed "appropriate" for funding. As we have seen with other actions this administration has prioritized, EPA should favor projects with the greatest potential to reduce GHG pollution, those that support high-quality union jobs, and projects that benefit low-income and disadvantaged communities.

In Fall 2022, NRDC, Evergreen, and a number of other advocacy organizations wrote to EPA providing recommendations for implementation of the GHGRF. We urged the program to achieve three main goals:

1. Improve lives, especially for those in low-income and marginalized communities by reducing air pollution and planet-warming GHG emissions that threaten Americans' health, well-being, and livelihoods;

2. Catalyze far more than $27 billion in GHG-reducing investments across the country, which will play a key role in modernizing the U.S. financial system by transforming "green" investments into "mainstream" investments and building a more equitable, clean energy future with significant benefits for underserved communities; and

3. Ensure that the $20 billion green finance program and the $7 billion for state, local, and Tribal governments to deploy zero-emission technologies in environmental justice communities share a common mission: to accelerate the transition to a clean, equitable economy, using distinct but complementary forms of financial and technical assistance.

State Climate Pollution Reduction Grants

The Climate Pollution Reduction Grants program, also called the "State Climate Grants" program, consists of $5 billion for states, air pollution control agencies, municipalities, and Tribal nations to develop and implement plans to reduce GHG pollution. This is an important program that EPA and the Biden Administration can use to support the next generation of state climate leadership—and state leadership on 100 percent clean energy.

This program is largely based on the State Clean Energy Challenge Grants first proposed in President Biden's American Jobs Plan. It consists of three elements: 1) State Climate Planning Grants: $250 million, which must be spread to at least one entity in each state; 2) State Climate Implementation Grants: $4.607-$4.75 billion; and 3) State Climate Administrative Funding: $142.5 million (3 percent of Implementation Grants). EPA grants can cover all sectors of the economy—there are exciting opportunities for states to use these grants to lock in faster policy change towards power sector decarbonization.

In December 2022, Evergreen, NRDC, and 40 organizations wrote to EPA providing recommendations for implementation of the State Climate Grants program, including that EPA should:

- Quickly distribute Planning Grant funding to states and Tribal nations, via formula, and should reserve a significant majority of Implementation Grant funding for a select few applications that demonstrate the most significant, additional climate pollution reductions.
- Prioritize most Implementation Grant funding for applicants that achieve statewide impact, in a single sector of the economy (e.g. towards 100 percent clean electricity), or in an economy-wide or multi-state plan, since states have wide jurisdiction over the major sources of climate pollution and economic development.
- Prioritize Implementation Grant funding for state applications that demonstrate a sort of "policy additionality"—i.e., show how federal funding will fill gaps and unlock greater ambition than its current policy environment may otherwise allow.
- Encourage applicants to show how they will engage partners, support good jobs, and deliver the greatest pollution reductions and economic benefits for disadvantaged communities, consistent with Justice40.
- Move quickly to disburse State Climate Planning Grants in early 2023, ensure the State Climate Implementation Grants are all fully awarded in early 2024, and use administrative funding to expand regional federal capacity, so that state, Tribal, and local governments have on-the-ground federal partners in driving the clean energy transition.

Environmental and Climate Justice Block Grants

The IRA funds $3 billion of Environmental and Climate Justice Block Grants for community-led projects to improve local environmental and public health in frontline and disadvantaged communities and to build community capacity to address disproportionate pollution and climate impacts. Grant projects could cover a range of activities, including pollution monitoring and prevention, climate resilience investments, mitigating health risks from

climate-related events like heat waves and wildfires, increasing community engagement in public processes like rulemakings, and other small projects—including those that advance clean, renewable energy.

These funds are intended to go directly to disadvantaged communities for programs proposed and led by communities themselves, and EPA should prioritize applications accordingly. Funds for technical assistance can help build capacity in disadvantaged communities and assist organizations in applying for other grant opportunities. In Fall 2022, EPA took its first steps in implementation of the program, indicating, in a presentation to the National Environmental Justice Advisory Council (NEJAC) that it was likely to award funding to one entity in each EPA region that would act as a partner in disbursing the grant funds to community-based organizations.

The Environmental and Climate Justice Block Grants program is one of the IRA's most critically-important tools for advancing environmental justice and equitable economic opportunity. It has the potential to support communities in building and realizing their own clean energy future, for themselves. One of the greatest opportunities for many disadvantaged communities could be in using these resources to help shut down polluting power plants and to build locally-developed and owned renewable energy and energy storage projects instead.

5. DOE Transmission Programs

IRA Grants to Facilitate the Siting of Interstate Electricity Transmission Lines

The IRA includes around $3 billion for transmission infrastructure. That includes $2 billion for transmission loans at DOE, $760 million in grants to facilitate transmission siting, and $100 million for interregional and offshore transmission planning. The bill also allocates $375 million to hire personnel at DOE, FERC, and the Department of Interior to process environmental permitting applications, which can help to facilitate transmission development across the U.S.

The $760 million grant program is intended for state, local, or Tribal transmission siting authorities to support accelerated siting of interstate electricity transmission lines. The Secretary of Energy is responsible for distribution of these grants by September 30, 2029, with use no later than two years after receipt. One of the biggest obstacles to deep decarbonization is America's aging grid. To upgrade and expand electric transmission at the necessary pace, states must coordinate at a regional level and build out projects on a tight timeframe. These funds present a critical opportunity to support these efforts through expedited interstate transmission siting. In the absence of a permitting reform bill in Congress, these funds can help speed up the permitting process for transmission projects.

IIJA Transmission Investments and Programs

The IIJA also contains funding for grid upgrades and transmission. DOE has located many of these programs within its new Building a Better Grid Initiative.

Convening Stakeholders

To implement the IIJA, DOE first planned a series of convenings to identify nationally significant transmission lines, validate transmission modeling approaches, and provide technical analysis on transmission. It also held a series of workshops on medium- and long-term offshore wind

transmission challenges, and announced several transmission studies to identify new or upgraded transmission facilities needed to deploy clean energy and integrate offshore wind.

Boosting the Grid

DOE announced that it would begin to deploy the new financing authorities in the IIJA, including $2.5 billion to facilitate the construction of high capacity new, replacement, or upgraded transmission lines, prioritized for projects that improve resilience and reliability of the grid, facilitate interregional transfer of electricity, lower electric sector greenhouse gas emissions, and use advanced technology. DOE will also provide $3 billion to provide matching grants for the deployment of advanced grid technologies and a number of grants for transmission.

Streamlining Permitting

DOE will work with other federal agencies to streamline federal permitting for transmission projects and may enter into public-private partnerships to develop transmission. To implement FERC's backstop transmission siting authority, DOE intends to provide a process for the designation of National Corridors on a route-specific, applicant-driven basis, emphasizing corridors that overlap with or utilize existing highway, rail, utility, and federal land rights-of-way. DOE said that it and FERC intend to work to establish coordinated procedures to implement these authorities. Using this federal siting authority is essential in streamlining transmission siting and planning, especially in light of Congress's inability to pass a permitting reform bill. Finally, DOE announced additional research, development, and demonstration efforts.

Quick Guide to IRA Clean Power Provisions

Tax Components	Description	Timeframe
Renewable Energy Investment Tax Credit (ITC) Extension	Extends deadline to begin construction on projects by a year, and adds energy storage, certain biogas, and microgrid controllers to the list of qualified technologies under the credit **Geothermal projects have until 2035 to begin construction* • Base Credit: 6%	2023-2024*
Renewable Energy Production Tax Credit (PTC) Extension	Restores and extends PTC for solar, wind, and geothermal energy for projects that begin construction by Dec 31, 2024 • Base Credit: 0.3 cents/kilowatt hour	2023-2024
Clean Energy Investment Credit (CEIC)	New production tax credit for any carbon neutral electric generation facility or substantially expanded EGUs **Or when power-sector GHG emissions fall to 25 percent of 2022 levels* • Base Credit: 6%	2025-2032*
Clean Energy Production Credit (CEPC)	New investment tax credit for any carbon neutral electric generation facility or substantially expanded EGUs **Or when power-sector GHG emissions fall to 25 percent of 2022 levels* • Base Credit: 0.3 cents/kilowatt hour	2025-2032*
	Bonus Credits for The Above	
Labor Multiplier	5x multiplier to the base credit for projects that meet prevailing wage and apprenticeship standards	2022 & beyond
Domestically Produced Materials Bonus	10% increase in value of the tax credit for using domestically produced steel, iron, or manufactured product	2023 & beyond
Energy Communities Bonus	10% increase for locating the project in a brownfield site or formerly fossil fuel community	2023 & beyond
Disadvantaged & Low-Income Communities Bonus	For facilities under 5 MW taking an investment tax credit, 10% increase for siting projects in disadvantaged communities & 20% if in a qualified affordable housing project	2023 & beyond
	Additional Tax Code Changes	
Direct Pay	Direct pay is unresticted for the CCS credit, clean hydrogen PTC, advanced manufacturing PTC, and advanced energy project ITC. For all others credits, direct pay is restricted to tax-exempt and government entities	2023 & beyond
Transferability	Taxpayers may complete a one-time transfer of tax credits to an unrelated taxpayer, and payments made to the original credit-holder in exchange for the credit are excluded from their income	2023 & beyond

Grants & Funding Programs	Description
GHG Reduction Fund	$27 billion in funding with $8 billion designated for zero emissions technology for low income and disadvantaged communities
State Climate Pollution Reduction Grants	$5 billion ($4.75 billion for implementation, $0.25 billion for planning) to create and implement plans to reduce GHG pollution **Electricity Sector can be a part of this**
Environmental & Climate Justice Block Grants	$3 billion for environmental and public health projects in disadvantaged and frontline communities
Grants to Facilitate the Siting of Interstate Electricity Transmission	$760 million to state, local or Tribal transmission siting authorities to support accelerated siting of interstate electricity transmission lines
DOE Loan Guarantee Program	$8.6 billion for DOE loan guarantees, enabling $290 billion in loans to deploy clean energy and clean energy infrastructure and to retire fossil infrastructure
USDA Rural Utilities Financing	$12.8 billion in loans and grants to help rural electric cooperatives and other electric providers deploy more clean energy and retire fossil generation

2.4 Other Executive Branch Actions

Federal Utility Leadership

The Tennessee Valley Authority (TVA) is a federally-owned utility providing electricity to about 10 million people across parts of seven southeastern states. It's also one of the largest emitters of air pollution in the country. TVA currently generates only 3 percent of its energy from wind and solar—far below the U.S. average of 13 percent. Worst of all, TVA is heavily invested in building new gas power plants, with 5 GW of new gas plants planned that would likely operate into the 2060s.

In the words of Senator Tom Carper, "TVA can and must do more, and it all starts with leadership." The TVA is governed by a nine-person board of directors nominated by the President and confirmed by the Senate. In December 2022, the U.S. Senate unanimously confirmed six long-waiting Biden nominees to fill out the TVA board, narrowly avoiding a leadership crisis. These confirmations are a huge victory and should kickstart TVA's transformation from climate laggard to climate leader.

A full and functioning TVA board now can and should choose wind and solar over fossil gas, helping keep the U.S. on track to meet its 100 percent clean electricity by 2035 goal. Because the IRA made TVA eligible for direct payment of clean electricity tax credits, the opportunity for low-cost decarbonization is larger than ever. Using the IRA's substantial investments, TVA should become a clean energy powerhouse that leads the nation in clean energy deployment—and in the economic development that this investment can bring. This would be a remarkable turnaround from its current situation, which includes plans to replace only 20 percent of its existing coal and gas generation with clean power.

Leasing of Public Lands and Waters

Key agencies in the Department of the Interior, such as the Bureau of Land Management (BLM) and Bureau of Ocean Energy Management (BOEM), must swiftly and responsibly limit fossil fuel extraction and facilitate deployment of renewables on public lands and waters.

The Biden administration has already taken meaningful action to accelerate offshore and onshore renewable development. Over the last two years, federal agencies jointly announced a goal to deploy 30 GW of offshore wind energy by 2030, approved the first large-scale offshore wind projects, held a record-breaking lease auction in the New York Bight, and partnered with 11 East Coast states to strengthen the domestic offshore wind supply chain. At the end of 2022, BOEM announced $757 million in winning bids for five wind lease areas off the coast of California with the potential to power over 1.5 million homes.

Onshore, BLM raised royalty rates on new oil and gas leases sold for the first time in decades. Using new criteria to assess land for leasing—including Tribal consultation, broad community input, and GHG emissions—BLM also reduced eligible acreage in a recent sale by 80 percent.

These are important steps in the right direction, but to reach net-zero emissions by 2050 the United States needs to devote considerable land area to developing solar and wind projects—anywhere from 61 million to 272 million acres according to researchers at Princeton. We are a long way from that goal, and the fact is that fossil fuel companies still

have the upper hand when it comes to leasing public lands and waters. Over three-quarters of public lands (over 78 million acres) in the Western U.S. with valuable renewable energy resources are currently prioritized for oil and gas leasing—even though those lands often have low potential for fossil development.

Harmful provisions in the IRA will cause real damage to frontline and fenceline communities and complicate renewable deployment. Specifically, the law mandates three offshore lease sales in Alaska and the Gulf of Mexico and makes onshore and offshore renewable development contingent on oil and gas lease sales for the next 10 years. This will worsen air pollution and degrade the environment, disproportionately harming disadvantaged communities. The required lease sales are also inconsistent with President Biden's commitment to zero new oil and gas leasing on public lands and waters. To limit the harm from fossil fuel handouts in the IRA, the Biden administration should minimize new onshore and offshore fossil fuel leasing and limit production from existing leases. Earthjustice has pushed the Department of Interior to set protective lease terms that condition these sales on protections for people, wildlife, and the climate. The administration should do everything in its power to limit the harm from fossil fuel leasing. Communities and advocates also play an important role in fighting back to stop these destructive projects in their tracks.

To flip the scales toward clean energy and move away from a fossil-fueled economy, Biden must implement durable reforms to prioritize renewable development. Agencies like BLM and BOEM should build efficiencies into federal renewable development permitting processes to grant rights-of-way to individual wind, solar, and geothermal projects as soon as possible.

Of course, accelerated deployment must not come at the expense of environmental protections and meaningful cooperation with communities, workers, and project stakeholders. Responsible renewable energy projects must ensure affected communities receive a fair revenue share and minimize impacts to wildlife, ecosystems, and cultural sites. To date, the Biden administration and BOEM have prioritized the creation of good-paying union jobs and the creation of a domestic supply chain for offshore wind by including stipulations in leases that preference bidders who sign community benefit agreements and project labor agreements, or invest in supply chain development and workforce training. This effort is commendable and should be carried forward for future lease sales.

Unlike fossil projects that create toxic, unjust "sacrifice zones" across the country, responsible renewable energy projects on public lands and waters can simultaneously achieve environmental justice, climate, and conservation goals. The Biden administration has already taken steps to prioritize federal renewable development—now it must go further.

The Power of Procurement

The U.S. government is the world's largest procurer of products and services, spending $665 billion on contracts in FY2020. By using clean electricity to power federal buildings, government vehicle fleets, and public housing, and leveraging IRA funding and existing federal programs, the U.S. government could cut GHG pollution by up to 333 million metric tons by 2030, according to analysis by Rewiring America.

In December 2021, President Biden issued executive order 14057, which commits the government to powering federal facilities with 100 percent carbon pollution-free

electricity by 2030, with 50 percent of that electricity available 24/7. Now the White House must continue to leverage its immense demand-side power to negotiate carbon-free contracts with utilities, enter into power purchase agreements, and develop new onsite renewable generation.

Successful federal procurement requires close collaboration with energy policy officials across the country. Key agencies and offices at the fore of clean electricity procurement are the White House Council on Environmental Quality (CEQ), home to the 24/7 carbon-free electricity working group; the Office of Federal Procurement Policy in the Office of Management & Budget; the Department of Defense; and the General Services Administration (GSA), the nation's landlord. These offices must collaborate to advance state, regional, and federal clean power progress, with the aid of $73 billion in the IIJA for the electric grid and power projects.

CEQ should work with GSA to require transparency and disclosure around climate and labor standards from government vendors, including reporting of scope 1, 2, and 3 emissions and net-zero commitments in line with the federal government's targets. GSA should make widespread use of energy savings performance contracts that require bidders to commit to electrification, efficiency, and emissions reductions, and to do so under project labor agreements. As the country's largest landlord and vehicle operator, overseeing more than 300,000 civilian buildings and 600,000 vehicles, GSA should deploy clean energy, distributed solar, and integrated grid technology in federal buildings, and fully electrify its vehicle fleet. The federal government has significant buying power, and the Biden administration shouldn't neglect this crucial demand-pull policy to drive power sector decarbonization, including for fledgling clean firm technologies that are essential to 24/7 carbon-free electricity for both the federal government and the wider grid.

3. State Leadership: An Action Plan for State Lawmakers and Advocates

States have been instrumental in driving early progress toward our 100 percent clean electricity future. With the recent passage of the IRA, states and utilities can transition their energy mix faster—this raises the bar nationwide on climate ambition. State actions will also be crucial in closing the gaps between current policy and our national climate and clean power targets. In this section, we summarize the current state-level clean electricity landscape and provide several leverage points where governors, legislatures, utilities, utility regulators, and advocates can and should push further.

The climate and clean energy provisions in the IRA are modeled to reduce U.S. carbon pollution economy-wide to around 40 percent below 2005 levels by 2030. However, much of the IRA's reductions, including through tax credits, require implementation in the states. For example, if states, utilities, and utility regulators keep their existing, pre-IRA policies, clean energy standards, and utility integrated resource plans (IRPs) on the books, then we will fail to cut carbon pollution at the predicted pace, and many of the IRA's reductions will go unrealized. The IRA can be a paradigm shift toward clean energy—but only if state ambition increases accordingly. A recent report from Energy Innovation highlights the important roles that legislators, governors and state energy offices, and utility regulators each have in ensuring the full benefits of the IRA are realized in the states.

Whether through executive order, public utility commission (PUC) regulation, rules adopted by state environmental regulators, or legislation, states need to advance 100 percent clean electricity standards (CES), and complementary policies, with ambitious timelines and strong interim targets. At the same time, states and utilities should prepare to seize upon new funding programs created by the IRA that will accelerate the transition to the clean energy economy.

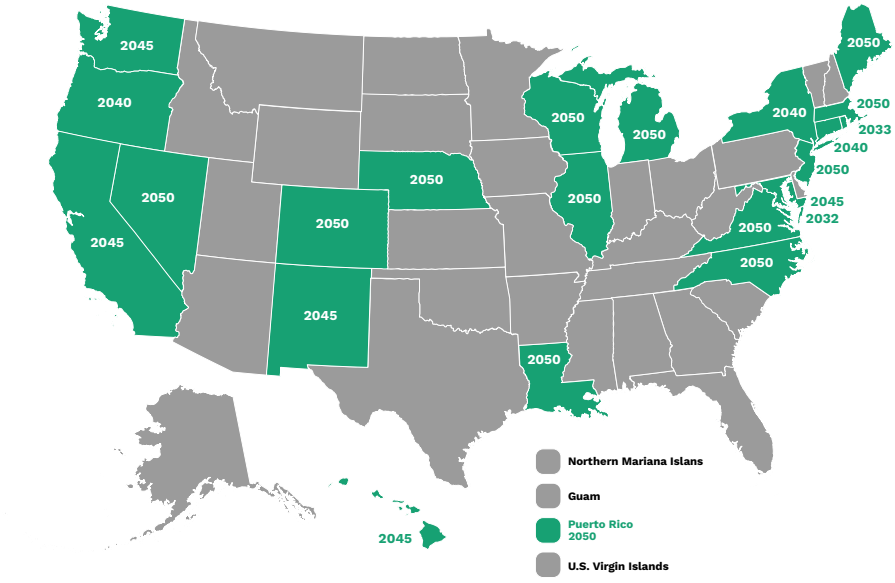


Figure 7: *Map showing states that have set 100 percent clean electricity standards or goals, with the year they have committed to achieving 100 percent clean power.*

3.1 State 100 Percent Clean Electricity Standards

From the Pacific Northwest to the Southeast, from New England to the Midwest, the switch from fossil fuels to renewable, clean, and zero-emission electricity is happening everywhere. States across regions and party lines are rapidly mobilizing towards 100 percent clean energy.

As of September 2022, twenty-two states plus Guam, Puerto Rico, and Washington, D.C., have set a goal to achieve 100 percent renewable or carbon-free electricity (Figure 7). However, not all of those targets are binding requirements for electric utilities under state law. Several aim for "carbon neutrality" as opposed to carbon-free electricity as an ultimate, rather than interim, target. Targets also vary in terms of timeframe and eligible resources, the definitions of which are not always synonymous. States should update their clean electricity goals with legally binding targets for 100 percent carbon-free power by 2035 and set ambitious interim targets for this decade, such as 80 percent clean electricity by 2030.

The strongest 100 percent clean goals are bound in law on tight timeframes and include ambitious interim deadlines, capacity targets for specific renewable technologies, just transition and workforce training plans, public utility commitments, and a commitment to promote environmental justice.

For example, Hawai'i became the first state to pass a 100 percent clean energy standard in 2015. In 2019, New Mexico enacted the Energy Transition Act, requiring 100 percent clean energy by 2045 with strong interim targets that ensure long-term goals will be paired with short-term action. In the same year, the Colorado legislature (SB 236) required the state's largest utility to file a clean energy plan that would achieve at least 80 percent emissions reductions from 2005 levels by 2030, and in 2021, required other utilities to do the same (HB 21-1266). Similarly, in 2021, the Oregon legislature passed the Clean Energy Targets bill, which requires a power-sector GHG reduction of 80 percent by 2030, on the way to 100 percent by 2040. Washington state's Clean Energy Transformation Act, also passed in 2019, requires utilities to achieve 80 percent clean (and 100 percent carbon-neutral) power in 2030, en route to fully 100 percent clean energy. The 2020 Virginia Clean Economy Act (VCEA) mandates a zero emissions power sector by 2050, with an even more aggressive timeline for Dominion Energy, which is currently responsible for the lion's share of power sector emissions in Virginia. The VCEA also includes a number of capacity targets for specific technologies, like solar and offshore wind, to encourage clean energy development at the lowest cost.

Another energy law was enacted in October 2021 in North Carolina, mandating a 70 percent statewide reduction in power sector carbon pollution from 2005 levels by 2030 and carbon neutrality for the sector by 2050. This should prevent any new fossil gas infrastructure from being built in the state, though there is still some uncertainty as to the exact timeline required by the law. Nevertheless, the legislation reflects bipartisan progress in the state.

Where state legislatures block passage of clean energy policy, states can take executive action, and public utilities can set their own targets. Even in more conservative states, where just a few years ago clean power policies might have seemed far fetched, progress is accelerating through these routes. In late 2021, Nebraska became the first

mostly red state to commit to a net-zero power sector by 2050 when its three largest utilities, each publicly owned, adopted clean power targets. Although the goal is nonbinding, the democratically elected utility officials were able to deliver a decarbonization plan when previous efforts were blocked by the state's conservative legislature.

Just in 2022 alone, Rhode Island updated its renewable portfolio standard (RPS) to require 100 percent renewable electricity by 2033; Connecticut codified its carbon-free electricity goal into law with Senate Bill 10; Maryland enacted sweeping climate legislation with a 2045 net-zero goal; and North Carolina announced a 2050 economy-wide net-zero target by executive order. Now, with the passage of the IRA in August 2022, governors and state legislatures have a tremendous opportunity to utilize new funds and tax credits to greenlight major projects that will speed their way to meeting 100 percent clean energy goals.

States can also bolster the transition through carbon programs such as RGGI (the Regional Greenhouse Gas Initiative), a bipartisan market-based, cap-and-invest agreement between 12 Northeast and Mid-Atlantic states to limit emissions of CO_2 from power plants. RGGI funds are invested in energy efficiency, renewables, electrification, GHG abatement, and direct bill assistance, which support customers, lower bills, and create local jobs.

While progress has been steady these last few years, a majority of states still don't have a 100 percent clean electricity goal. Now is the time for states to follow the example of their neighbors and set ambitious targets with robust performance standards and complementary policies. The four states with newly-elected Democratic trifectas (Michigan, Minnesota, Maryland, and Massachusetts) have an excellent opportunity to pass a binding 100 percent CES through

the legislature, or to speed up the timeline of existing CES policies. Where legislative action proves difficult to reach, states can make meaningful progress via requirements and oversight through their public utility commissions and robust implementation of new federal investments.

3.2 The Role of Public Utility Commissions and Utilities

Public utility commissions are the state agencies responsible for regulating monopoly utilities in each state. These entities will play a critical role driving progress towards 100 percent carbon-free power—and transformational new federal investments have totally changed the game for each of them.

Recent research shows that, despite having made public commitments to reduce emissions and address their climate impacts, many utility companies are failing to take necessary actions toward decarbonization. In fact, over multiple decades, some electric utility organizations promoted messaging designed to deny, delay, and cast doubt on the need for climate action. Many electric utilities do not have viable, near-term plans to retire existing coal generation, are planning to construct new gas-powered generation intended to run for decades, and are not adding new clean energy resources at the pace necessary to meet even their own, self-imposed goals.

However, there are signs of progress in the utility sector. Many utilities have made strong advances in reducing carbon emissions, NO_x, SO_x, and other traditional pollutants. And the investor-owned utility trade association (the Edison Electric Institute), the electric cooperative association (the National Rural Electric Cooperative Association), and the municipal utility group (the American Public Power Association) all supported the clean energy tax credits and other climate provisions in the IRA.

To make faster progress toward federal, state, or even their own clean energy goals, all utilities can and should now take full advantage of the IRA's substantial incentives for clean power. Thanks to the IRA, municipal utilities, rural electric cooperatives, and the Tennessee Valley Authority now have access to direct payment of clean energy tax credits to develop their own wind, solar, and storage. As discussed in section 2.3, the IRA also provides DOE and USDA with substantial funding and financing authority to deploy low-cost clean energy loans to refinance and retire fossil fuel plants. In total, there's nearly $15 billion solely dedicated for utilities of various types to retire fossil fuel power plants and invest in renewable energy generation.

Now that finances have changed to bring down the cost of clean energy for the next decade and beyond, PUCs should require their utilities to update all IRPs or other long-term resource plans made before the IRA was enacted. IRPs have been a major driver of utility decarbonization to date, but failure to revisit IRPs based on pre-IRA cost assumptions would cost customers billions in higher electricity bills and potentially lock in new uneconomic gas plants, leading to higher carbon emissions for decades. With long-term tax credits, wind, solar, and storage are even cheaper than before—and they were already the lowest-cost resource in most parts of the country. A recent RMI study found that renewables that take full advantage of IRA tax credits will be cheaper to build than 99 percent of proposed fossil gas plants. Furthermore, expected electrification of transportation and buildings will increase the amount of flexible demand that can better align with the availability of renewable

resources, representing a new opportunity for states and a challenge for IRPs.

> Utilities and PUCs should finalize new IRPs with substantially faster expansion of clean energy, faster coal retirements, inclusion of demand flexibility and energy efficiency, and no new gas plants.

Regarding proposed fossil gas power plants, states should reinforce the "used and useful" ratemaking standard, ensuring that utilities can only recoup costs from ratepayers for new power generation facilities that are found to be prudent and remain economic and operating. Although markets have begun favoring clean energy sources like solar and wind, which keep prices low for end-use consumers, utilities are sometimes incentivized to inflate rates by investing in new uneconomic, polluting fossil gas generation. Unfortunately, the once widely enforced "used and useful" standard has been weakened or eliminated altogether across many states. State regulators must step in to protect consumers and align utility incentives with what the market and clean power targets require.

PUCs can take additional steps to require that utilities clean up their operations, in spite of incentives that might discourage decarbonization. First, PUCs and legislatures should increase (or create) energy efficiency resource standards (EERS) in their states. These standards typically require utilities to meet a certain amount of demand each year through customer, end-use efficiency programs. PUCs could also explore performance-based regulation or performance incentive mechanisms based on utilities meeting carbon targets, clean energy deployment goals, or energy efficiency performance standards. This would ensure that utility incentives are aligned with state decarbonization policies, instead of the other way around.

Even without performance-based rates that change utilities' incentive structures, PUCs should work to enforce and strengthen utility goals and commitments wherever possible, including in their oversight of utility planning and investment decisions. To ensure just and reasonable rates, PUCs must ensure that utilities fairly and comprehensively evaluate clean resources. One option is to require that utilities use all-source competitive procurements. When all resources are forced to compete on a level playing field, clean energy often wins. Post-IRA, the case is even more compelling.

3.3 State-level Efforts to Advance a Just Transition

Prioritizing environmental and economic justice in state policy is critical to realizing a successful, equitable transition. States like Illinois, Washington, and New York have begun to address this, passing legislation that advances environmental justice and supports good union jobs, along with or as a follow-up to setting robust clean energy or GHG requirements. As a whole, states need to do more.

First and foremost, every state should implement policy that prioritizes clean energy investment in disadvantaged communities, directing at least 40 percent of climate and clean energy benefits toward disadvantaged communities similar to President Biden's Justice40 Initiative. This Biden administration initiative was itself inspired by state action—borrowing from New York's Climate Leadership & Community Protection Act

that passed in 2019. Going forward, similar state policymaking processes should ensure that communities of color and low-income communities have power and agency in both the design of Justice40-like policies and in local investment decisions.

Like the federal Justice40 Initiative, state policies should take a wide-angle approach to public spending, including energy efficiency programs, clean energy investments, pollution reduction and electrification programs, household energy assistance, public financing from green banks, and workforce development efforts. States can also create carve outs in CES policies that require utilities to prioritize benefits to disadvantaged communities. States could require that utilities target a certain percent of renewable energy investment into disadvantaged communities (like in Colorado), or require utilities purchase a certain amount of their electricity from community solar projects in disadvantaged communities (as in Massachusetts). Distributed generation and efficiency upgrades are sorely needed in public housing and other disadvantaged communities, where energy costs can average 13.9 percent of household income—sometimes reaching as high as 30 percent.

States' clean energy agendas should also support good-paying union jobs and a just transition for workers and communities that have been historically reliant on fossil fuel industries. Here, too, states have already demonstrated leadership. Washington state's 2019 Clean Energy Transformation Act included clean energy tax incentives tied to project developers meeting certain labor standards, such as paying prevailing wages, utilizing registered apprentices, and entering into Project-Labor or Community Benefits Agreements. Meanwhile, Colorado in 2019 created an Office of Just Transition to assist workers and communities adversely affected by the loss of jobs and revenues related to the coal industry. The IRA's tax credits reflect each of these progress points in state policy—providing larger tax incentives for projects that pay prevailing wages and utilize registered apprentices and further bonus credits for clean energy and manufacturing projects located in traditionally fossil-reliant "energy communities."

New federal funding can also further state, local and community efforts to advance energy justice—making energy systems more affordable, accessible and equitable, in addition to cleaner and less-polluting. New federal tax credits include an expanded incentive for projects under 5 MW that specifically benefit low-income communities and affordable housing residents. Major new grant programs at the EPA, such as the Greenhouse Gas Reduction Fund and the Environmental & Climate Justice Block Grants program, can directly support energy justice through project funding, and should privilege states that focus on environmental justice into their policies and grant applications. State agencies should prioritize applying for IRA funding that will spur a just clean energy transition. Additionally, states should follow the lead of State Reps. Gilda Cobb-Hunter (D-SC) and Larry Lambert (D-DE) in the creation of Justice40 oversight committees (like that which was first created in Delaware), or other environmental justice advisory councils (as in New York), to ensure that federal and state investments are truly benefitting disadvantaged communities and that those communities are represented in decision-making.

3.4 Taking Full Advantage of Federal Support for Clean Electricity

To make the fastest progress toward 100 percent clean electricity, states should seize on new federal clean energy investments.

The IRA provides numerous opportunities for states to accelerate their own plans to reduce GHG pollution and transition to a clean energy economy. However, states must be proactive and utilize the many resources that the IRA provides, including technical assistance, grants, loan programs, and more.

As outlined in section 2.3, the IRA provides myriad important investments into power sector decarbonization. State lawmakers, regulators, and advocates have the opportunity, now, to use those investments to accelerate the transition to 100 percent clean power. Specific IRA (and IIJA) programs that states should look to take advantage of include:

- **Clean Electricity Investment and Production Credits (CEIC and CEPC):** Federal clean energy tax credits that the IRA expanded and made more accessible and equitable over the coming decade should redefine the speed and cost of the clean energy transition for utilities, their regulators, and other state policymakers.
- **DOE Loan Guarantee Program:** Massive new financing authority under this program is coupled with provisions that make it particularly accessible for projects that benefit from state government support and co-investment.
- **USDA Rural Utilities Financing:** States and local government partners can work with their communities and public utilities to transition off of heavily-polluting power plants and instead build job-creating clean energy projects.
- **EPA "Force Multiplier" programs—Greenhouse Gas Reduction Fund, State Climate Grants, Environmental & Climate Justice Block Grants:** These programs provide a combined $35 billion in investments that can be used by state, local, Tribal, and community-based organizations to leverage even greater private and public investment for a just transition towards 100 percent clean energy.
- **DOE Transmission Funding:** New funding, available through both IRA and IIJA, can support state, regional, and utility needs in the build-out of transmission infrastructure.

For a detailed breakdown of each of these state-focused provisions, including when and how much funding will be made available, refer back to section 2.3. States should note that some funding is only available until 2024 or 2026 and prioritize applying for those grants on a compressed timeline.

4. Conclusion

The clean energy transition is at an inflection point. Congress has taken enormous steps to move the needle on climate change by enacting historic investments in clean energy. While vital, these investments alone will not achieve U.S. climate targets. To achieve 100 percent clean power by 2035, the executive branch and states need to move swiftly on executive actions, IRA implementation, and state policy. Beyond climate, achieving President Biden's ambitious clean air, water, and environmental justice goals will also require further action. Armed with new tax credits and federal funding, we are closer to these goals than ever before, but much of the fight is still ahead. EPA, FERC, DOE, utilities, and the states each have important roles in building a thriving, just, and inclusive clean energy economy. It is now up to each of them—and to advocates across the country—to ensure that the grid transforms from 61 percent fossil-fueled, as it is today, to 100 percent clean. This paper has laid out the path ahead. Now we must start running.