

Pathways to Paris: Post-IRA Policy Action to Drive US Decarbonization

Congress took a major step forward in decarbonizing the US economy when it passed the Inflation Reduction Act (IRA) in August 2022, but on its own the IRA is not enough to achieve the US's climate commitment under the Paris Agreement. [Our analysis](#) shows it will likely only drive emissions down to 32-42% below 2005 levels in 2030—well short of the Paris Agreement target of a 50-52% reduction. However, a whole-of-government approach that includes aggressive policy action across Congress, federal agencies and the executive branch, and states and subnational actors, could put the target within reach.

Before the IRA was passed, we assessed a suite of policy options that could achieve the target, including congressional action along the lines of the IRA, in our October 2021 [Pathways to Paris](#) report. In light of passage of the IRA as well as a host of other shifts in the US energy system, we take another look at whether the Paris target is achievable and what policies could help us get there. In this update to Pathways to Paris, we find that ambitious federal and subnational policies can push emissions down to 41-51% below 2005 in 2030. Bold federal action, including stringent standards on power plants and light-duty vehicles, is necessary to achieve these levels, but states and other subnational actors also have a critical role to play. But this outcome isn't guaranteed, clouded by legal risk, non-cost barriers, and politics—making rapid and assertive action all the more important in order to achieve the US's 2030 climate target.

How far down the path are we?

In October 2021, we published [Pathways to Paris: A Policy Assessment of the 2030 US Climate Target](#). In that analysis, we modeled a “joint action” scenario in which Congress, federal regulators, and subnational actors all took ambitious steps to drive down greenhouse gas (GHG) emissions. That scenario resulted in a 45-51% reduction in net GHG emissions below 2005 levels in 2030, illustrating that concerted work across all levels of government could actually lead to the US achieving its Paris climate target, a 50-52% reduction below 2005 levels.

Since our original report, meaningful action has been underway. In particular, in November 2021, Congress passed the Infrastructure Investment and Jobs Act (IIJA), often referred to as the bipartisan infrastructure deal. Then, in August 2022, Congress passed the Inflation Reduction Act (IRA), representing the single largest federal investment in decarbonization in American history.

Taken together, these two bills put in place the lion's share of policies we included in the congressional component of our joint action scenario. With these congressional actions, the US is on track for a [32-42% reduction](#) in GHG emissions below 2005 levels in 2030—bending the US

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emissions curve down toward deeper decarbonization, but still not enough to achieve the Paris Agreement target.

In addition to major congressional action, a number of other factors are different today from 18 months ago, among them:

- The Supreme Court in *West Virginia v. EPA* [constrained](#) the Environmental Protection Agency's regulatory flexibility for CO₂ emissions from power plants.
- The Biden administration has reached its two-year mark in office, and despite some climate regulatory wins, many major climate-relevant federal regulations are still [outstanding](#).
- Russia's war in Ukraine has [resulted](#) in greater near-term volatility and long-term uncertainty in fossil fuel markets.
- Macroeconomic growth projections have trended downward and high inflation persists.
- Time keeps ticking, and we're 18 months closer to the 2030 deadline.

Some of these factors can facilitate faster decarbonization, while others limit emissions reductions. In this note, we reconsider our original joint action scenario, adapt it in light of these new circumstances, and consider whether the US Paris commitment is still in reach.

What does joint climate action look like today?

To model a new joint action scenario, we start with our [Taking Stock 2022](#) (TS2022) GHG projections, which include all relevant federal and state climate policies on the books through June 2022, and add the Inflation Reduction Act. This approach is consistent with our previous [IRA analysis](#). As in TS2022 and past IRA work, we model three emissions pathways: a low-emissions pathway that pairs cheap clean energy technologies with relatively expensive fossil fuels and baseline economic growth; a high-emissions pathway with expensive clean tech, cheap fossil fuels, and more robust GDP growth; and a mid-emissions pathway that splits the difference. Much more detail about these assumptions and the policies already included in our modeling can be found in the [TS2022 technical appendix](#).

We present results for two cases in this note. Our new **joint action scenario** includes an array of actions by US federal agencies and climate-leading states and assumes no new action by Congress. Our **federal action scenario** reflects only the subset of policies in the joint action scenario that involve the federal government, such as appliance standards and Clean Air Act regulations. We present a full list of the policies we model in the appendix to this note. In general, they follow closely the federal executive and subnational [policies](#) included in our original joint action scenario. Notable changes from this list include:

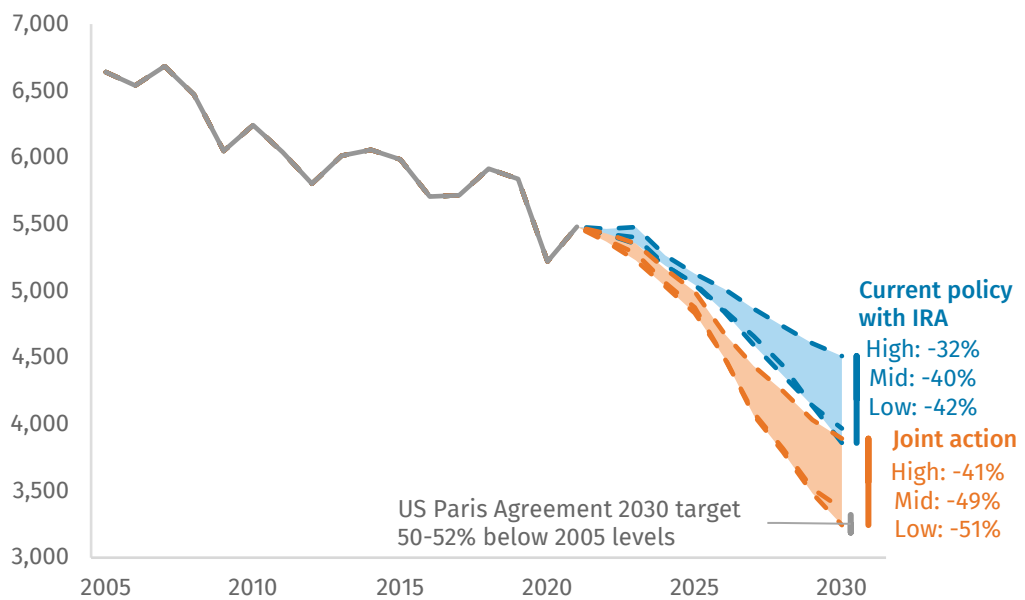
- We developed revised new and existing source performance standards for electric generating units (EGU) based on the Supreme Court's *West Virginia v. EPA* ruling, taking an inside-the-fence approach to establishing the best system of emission reductions.
- We implemented new non-GHG public health regulations for the power sector, including changes to the Cross-State Air Pollution Rule and emission standards for hazardous air pollutants at EGUs.
- We omitted carbon pollution standards for industrial sources since their adoption in the first Biden term is unlikely.

To model these policy scenarios, we use RHG-NEMS, a version of the National Energy Modeling System developed and used by the Energy Information Administration to produce its Annual Energy Outlooks. We modify EIA’s base version of NEMS by incorporating our own cost and performance assumptions for clean energy technologies, and we further modify both algorithms and inputs to reflect recent trends in technology development and deployment. RHG-NEMS also incorporates Rhodium Group’s Industrial Carbon Abatement Platform. Finally, we extend RHG-NEMS to project GHG emissions for all sectors of the US economy across six key GHG categories, following EPA and UNFCCC accounting standards. This allows us to quantify the impacts of policies beyond energy system CO₂ using the same framework as the EPA GHG inventory.

Joint action can still drive the US to its Paris goal

This aggressive set of policies pursued as quickly as possible by federal agencies and climate-leading states can reduce US GHG emissions to 41-51% below 2005 levels in 2030, a 9-10 percentage point reduction beyond what the US is on track for with the IRA alone (Figure 1). In the low-emissions joint action case, this policy portfolio enables the US to achieve its Paris climate commitment, while in the mid-emissions case, the target is within spitting distance. In the high-emissions case, we find higher emissions than in our previous analysis, primarily due to higher total GDP and higher overall clean energy prices in the new high case compared to the last iteration.

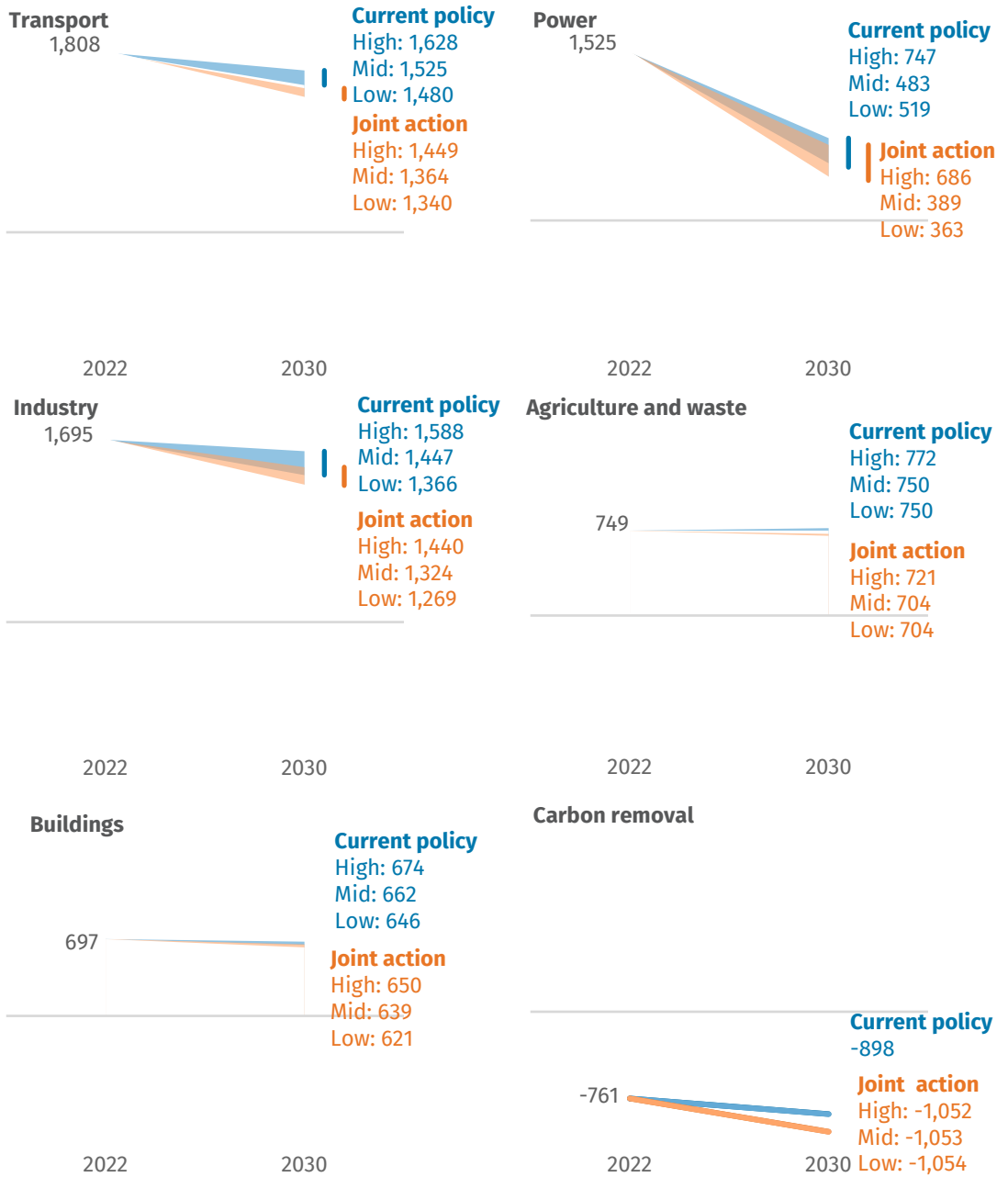
FIGURE 1
US greenhouse gas emissions under a joint action scenario
 Net million metric tons (mmt) of CO₂-e



Source: Rhodium Group. The high, mid, low ranges reflect uncertainty around future fossil fuel prices, economic growth, and clean energy technology costs.

The IRA drives the biggest reductions in the power sector, but the joint action scenario can help drive down emissions across a broader swath of the economy (Figure 2). To be sure, the joint action scenario pushes further on the power sector, yielding an additional 62-157 mmt reduction in GHGs by 2030. The power sector achieves 65-85% clean generation in 2030, up from 60-82% with only the IRA in place.

FIGURE 2
US greenhouse gas emissions by sector
 Net million metric tons (mmt) of CO₂-e



Source: Rhodium Group. The high, mid, low ranges reflect uncertainty around future fossil fuel prices, economic growth, and clean energy technology costs.

The transportation, industry, and carbon removal sectors each experience at least as much reduction as the power sector in the joint action scenario, depending on the emissions pathway. In transport, more aggressive EPA light-duty vehicle (LDV) regulations further accelerate electrification of the LDV fleet, as do accelerated state zero-emitting vehicle targets. Taken together, sales of electric vehicles (EVs) reach 46-61% of all LDVs in 2030, up from 19-57% with only the IRA.

Federal medium- (MDV) and heavy-duty vehicle (HDV) standards and climate-leader state MDV and HDV targets, low-carbon fuel standards, and investments in transit funding also drive down transportation sector emissions.

In industry, the largest portion of GHG reductions comes from EPA finalizing an impactful standard for methane and other harmful pollutant emissions from oil and gas operations. Direct building emissions drop owing to a combination of accelerated federal appliance standards and states upping their energy efficiency resource standards. Agriculture and waste reductions are also driven by climate-leader state targets, while increases in carbon removal result from federal investment in forests and working lands.

FIGURE 3
Change in household energy costs from the joint action scenario, 2030
 2022 US dollars

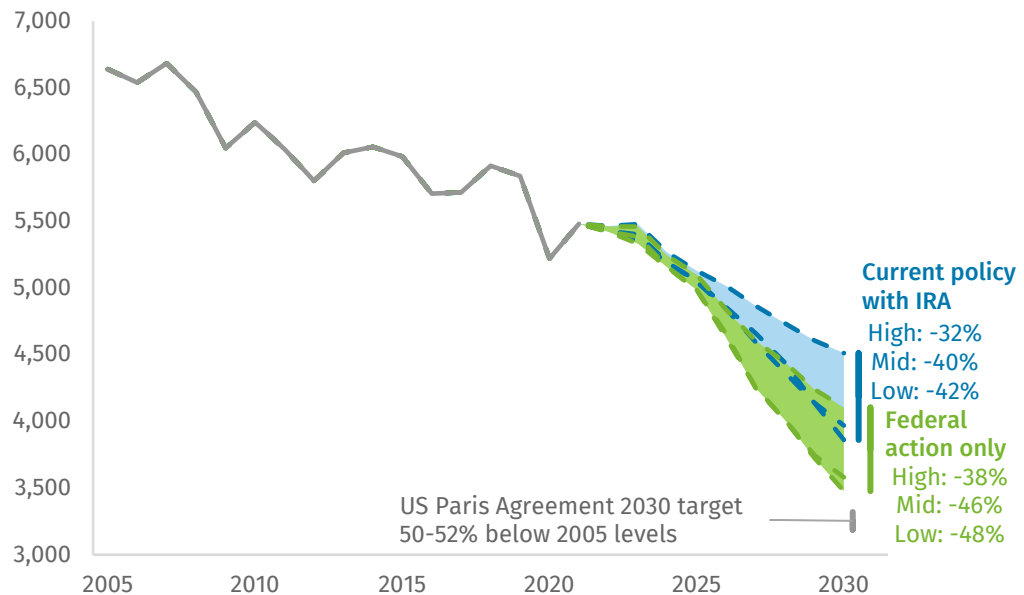


Source: Rhodium Group. The high, mid, low ranges reflect uncertainty around future fossil fuel prices, economic growth, and clean energy technology costs.

All told, the policies in the joint action scenario can reduce average household energy bills by \$287-348 in the year 2030 on top of savings from the IRA alone (Figure 3). Much of this saving comes from reductions in household expenditures on gasoline and diesel for their vehicles, with additional savings from lower electricity bills and less spending on home heating fuels. In our original Pathways to Paris report, we found roughly \$500 in savings accruing to the average household. In our previous analysis of the IRA, we found that the policy would reduce household energy bills by \$27-112 in the year 2030. These savings are already included in our baseline, so they no longer appear as bills savings from the joint action scenario. We also now include material public health regulations in the power sector which, on their own, tend to increase the rates consumers pay for electricity, requiring EGUs to retrofit with pollution control equipment. Despite the application of the additional regulations, consumers see lower energy costs in the future alongside cleaner air. This is in part thanks to IRA incentives that reduce the cost of compliance.

Federal executive action, including new power plant, clean vehicle and methane regulations, is an essential driver of all of the outcomes in our joint action scenario. Federal policy alone can drive emissions down by 6 percentage points in each case, to 38-48% below 2005 levels in 2030 (Figure 4). Failure to promptly adopt the federal executive policies included in the joint action scenario, or neglecting to push for maximum achievable ambition in these policies, or substantial implementation delays after finalization put the US's 2030 climate target very much at risk and will set the US off course on its long-term decarbonization pathway. As we detail below, there is still uncertainty in the impacts of the IRA, and federal action can help reinforce the achievement of these outcomes.

FIGURE 4
US greenhouse gas emissions under a federal action-only scenario
 Net million metric tons (mmt) of CO₂-e



Source: Rhodium Group. The high, mid, low ranges reflect uncertainty around future fossil fuel prices, economic growth, and clean energy technology costs.

This should not minimize the importance of state and subnational actions. Federal action alone is insufficient, and the 2030 target is entirely out of reach if states and other subnational actors neglect to adopt aggressive new policies to advance decarbonization. As in our last analysis, a true, whole-of-government approach is urgently required to achieve the US's Paris Agreement target.

Challenges and risks remain

While this analysis demonstrates that the US 2030 target is still within reach, achieving a 50-52% reduction in GHGs compared to 2005 will hardly be a slam dunk. Even with a boost from IJA and the IRA, a lot needs to happen fast for the US to achieve the pathway we've identified. Just as we noted in our previous report, risks to achieving the target abound, including court challenges to new regulations and the prospect that technology deployment may not be able to scale up at the pace required to meet the target. Headwinds such as permitting and siting bottlenecks, workforce shortages, rapidly shifting supply chains, and other factors may affect the pace of decarbonization. Another clear risk is a lack of consistent prioritization of climate action in leading states and at the federal level over the rest of the decade. If the 2024 election results in White House leadership that doesn't treat climate change as the serious threat that it is, then many of the actions we include in our analysis are at risk of delay or abandonment, putting the target out of reach. The same holds for states. Consistent leadership and prioritization of climate action in state governments will be critical to the fate of US GHG emissions.

Federal, state, and/or subnational actors can also pursue and implement policy actions not considered in our joint action scenario and make meaningful contributions to achieving the 2030 target. We review a wide variety of options, everything from clean product standards to carbon pricing, in our previous report. The joint action scenario does not reflect any additional climate

action in Congress. Just as with the IRA, Congress could surprise on the upside and enact additional decarbonization policies, but again, future elections will greatly impact prospects.

It remains true that even if the US cuts GHG emissions in half in 2030, that's only halfway to the additional target of net-zero emissions by 2050, leaving at maximum 20 years to get the rest of the way. Beyond new regulations and deployment policies, continued investment in innovation and scale-up of emerging clean technologies in this decade is needed to expand the frontier of future emission reduction options. If technologies such as clean hydrogen, clean fuels, a broad suite of carbon removal approaches, and clean dispatchable electric generators are commercially available at scale by the end of this decade, then it will be much easier to maintain decarbonization momentum in the next one.

Onward

With this analysis, we reaffirm that joint action by states and the federal government can put the 2030 target of cutting US emissions in half within reach. Now it's up to government leaders and regulators to act, who can build on the legislative achievements of the last Congress by taking new actions to drive down GHG emissions and cut costs for consumers. Time is of the essence. With so much to do and less than eight years to do it, it's time to hunker down and keep on working towards the implementation of robust, durable decarbonization policy for the US. In the meantime, we'll continue to monitor progress toward these goals and update our projections, including modeling the joint action scenario as part of our upcoming Taking Stock 2023 report.

Disclosure Appendix

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Appendix: Modeled policies

TABLE 1
Executive branch policies in the joint action and federal action scenarios

Policy	Target Sector	Description
GHG pollution standards	Power sector	<ul style="list-style-type: none"> EPA adopts New Source Performance Standards (NSPS) requiring all new coal EGUs and natural gas combined cycle (NGCC) units to meet CO₂ emissions rates equal to 90% carbon capture starting in 2023. EPA adopts Existing Source Performance Standards (ESPS) for CO₂ from coal and other fossil steam EGUs and NGCCs, with binding reduction requirements starting in 2027 and requiring 60% carbon capture at coal EGUs and 50% carbon capture at NGCCs by 2031.
Cross-State Air Pollution Rule (CSAPR)	Electric power	<ul style="list-style-type: none"> EPA tightens the proposed state budgets for the Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standards¹ and expands coverage to several additional states.
Mercury and Air Toxics Standards (MATS)	Electric power	<ul style="list-style-type: none"> EPA tightens MATS in 2027, requiring each coal EGU to achieve a 95% reduction in mercury emissions relative to its uncontrolled mercury emissions.
LDV GHG standards	Transportation	<ul style="list-style-type: none"> EPA adopts mobile source emissions standards that ramp down starting in 2027, achieving a 90 grams of GHG per mile standard for all new light-duty vehicles (LDVs) in 2030.
MDV & HDV GHG standards	Transportation	<ul style="list-style-type: none"> EPA adopts mobile source emissions standards on medium- and heavy-duty vehicles (MDVs, HDVs) that require a 50% faster annual improvement in new vehicle emissions rates than current standards starting in 2028.
ESPS for oil and gas production	Fossil fuel production	<ul style="list-style-type: none"> EPA adopts ESPS on methane emissions from all existing oil and gas production not subject to EPA's NSPS rules (reinstated in 2021) starting in 2026.
Minimum equipment performance standards	Buildings	<ul style="list-style-type: none"> DOE exercises Energy Policy and Conservation Act (as amended) authorities to adopt ambitious minimum efficiency standards for covered equipment that prioritize emissions reductions.
Commodities Credit Corporation funding	Carbon removal	<ul style="list-style-type: none"> USDA leverages discretionary spending under the Commodities Credit Corporation to support implementation of climate-smart agriculture and forestry practices on private lands.

¹ On March 15, 2023, EPA finalized the Good Neighbor Plan. The final rule removes 3 states and meaningfully modifies state emissions budgets for roughly half of remaining covered states.

TABLE 2
Subnational actions in the joint action scenario

Policy	Target Sector	Description
Clean electricity standards (CES)	Electric power	▪ Leadership states set 100% clean electricity standards by 2035.
Utility clean power targets	Electric power	▪ Utilities with 100% clean energy targets accelerate their target deadlines to 2035.
LDV ZEV Mandate	Transportation	▪ Leadership states require 100% zero-emission light-duty vehicle sales by 2035.
MDV/HDV ZEV Mandate	Transportation	▪ Leadership states require 100% zero emission medium- and heavy-duty vehicle sales by 2045.
Low-carbon fuel standards (LCFS)	Transportation	▪ Leadership states adopt a Low Carbon Fuel Standard reducing carbon intensity of fuel by 20% by 2030.
VMT management	Transportation	▪ Leadership states direct new congressional funding to reducing vehicle miles traveled (VMT).
Methane abatement	Agriculture and waste	▪ Leadership states take actions to reduce agricultural and waste methane 40% from 2013 levels by 2030.
N2O abatement	Agriculture and waste	▪ Leadership states reduce N2O via changes to crop management practices.
Energy Efficiency Resource Standards (EERS)	Buildings	▪ Leadership states adopt and revamp EERS to achieve 2.5% electricity savings and 1.25% natural gas savings annually.