



AN “ALL-IN” PATHWAY TO 2030:

The Beyond 50 Scenario

NOVEMBER 2022

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Key Findings



New analysis shows how an all-of-society climate strategy—drawing on the groundswell of bottom-up action from states, cities, and businesses, combined with ongoing federal leadership—can enable the United States to meet its 2030 climate target of 50-52% emissions reductions by 2030 from 2005 levels.



Achieving “Beyond 50” requires coordinated implementation of all current policies at the federal and non-federal levels. Our analysis finds an ambitious, ongoing “All-In” leadership combining additional emissions reductions from states, cities, businesses, and other actors with new federal regulatory actions can achieve reductions of 52% by 2030 from 2005 levels.



To achieve Beyond 50 from today’s levels, the power sector contributes 16% (1,051 MtCO₂e) toward overall emissions reductions; the transport sector contributes 5% (308 MtCO₂e); the methane sector contributes 3% (202 MtCO₂e); and the industry sector contributes 3% (176 MtCO₂e).



Additional policies from the buildings, lands, other CO₂ sectors, and other non-CO₂ gases are also needed to achieve the 2030 target and to set up additional reductions after 2030 to solidify a transition toward a clean, healthy, and prosperous future.



This achievement will be built on the critical building blocks already in place for an all-of-society U.S. climate strategy, including the new Inflation Reduction Act (IRA) and the Infrastructure Investment and Jobs Act (IIJA); regulatory actions from the Executive Branch, including CAFE standards and methane rules; and continued and significant policy progress from states, cities, businesses, and others across all sectors and greenhouse gases. Together, these existing policies at federal and non-federal levels, including the new IRA, can reduce emissions by 39% below 2005 levels by 2030.



Such collaboration can reduce emissions well beyond what the federal government can do alone. Key bottom-up actions include adopting zero-emission vehicle sales targets and mandates, accelerating the retirement of all existing coal plants, and implementing state-of-the-art fugitive methane leak recovery. These measures can be best achieved through a combination of leadership by climate-smart states and ambitious federal standards and policies.

Acknowledgements

The authors gratefully acknowledge helpful comments from Carl Pope, Beyond Carbon, and the broader *America Is All In* organization. This work was made possible with funding from Bloomberg Philanthropies. This paper and analysis were led by the Center for Global Sustainability (CGS) at the University of Maryland, along with support from Rocky Mountain Institute and World Resources Institute. These three organizations represent the analytical team of *America Is All In*. The authors also acknowledge Gokul Iyer, Matthew Binsted, and Yang Ou for guidance on modeling and the University of Maryland supercomputing resources (<http://hpcc.umd.edu>) made available for conducting the research reported in this paper.

Suggested citation: Zhao, A., S. Kennedy, K. O’Keefe, M. Borrero, K. Clark-Sutton, R. Cui, C. Dahl, G. Deye, J. Feldmann, K. Kennedy, H. McJeon, M. Moravec, D. Nilov, S. Rajpurohit, J. Rosas, C. Squire, and N. Hultman (2022). “An All-In Pathway To 2030: The Beyond 50 Scenario.” Center for Global Sustainability, University of Maryland and America Is All In. 16 pp.

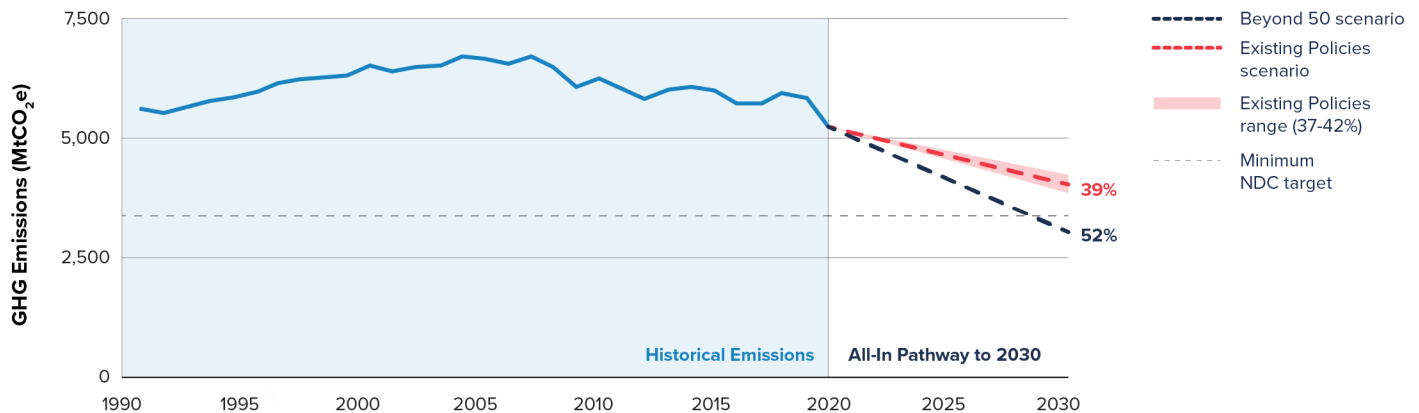


FIGURE 1 The Existing Policies and Beyond 50 scenarios achieve 39% and 52% in greenhouse gas emissions reductions from 2005 levels by 2030, respectively. Closing the gap requires an all-in strategy that emphasizes both actions within states, cities, and other actors, as well as partnership and collaboration with the federal government.

The U.S. Commitment

The United States has set an ambitious goal of reducing its emissions by 50-52% from 2005 levels by 2030. Achieving this goal is possible through a combination of existing policies, including recent comprehensive legislation from the federal government, plus new and accelerated actions from states, cities, businesses, federal regulatory agencies, and civil society across the United States.

Recent actions have placed the United States on a strong pathway toward our ambitious 2030 goal—built from a diverse set of major contributions, including the transformational Inflation Reduction Act of 2022 (IRA), the Infrastructure Investment and Jobs Act of 2021 (IIJA), and other ambitious policies from states, cities, businesses, and the federal government.

This work must continue throughout the 2020s to achieve the U.S. 2030 goal. U.S. states, cities, businesses, and other non-federal actors continue to build on years of innovation to drive a robust, bottom-up approach to support national climate action and to partner with the federal government wherever possible. This new analysis shows how an expanded, economy-wide, all-of-society “Beyond 50” strategy—rooted in expanding and durable state, local, and private sector leadership enabled by federal support—can deliver the remaining emissions reductions needed to meet the U.S. climate targets.

Recent ambitious federal climate actions, enabled by extensive bottom-up climate policies and federal actions implemented over recent years, have delivered a transformational contribution to U.S. climate policy and action. The new IRA and IIJA legislation, passed by Congress, marks the biggest federal investments in climate provisions in history. IRA notably provides new and expanded tax incentives for developing and deploying clean energy technology, reductions in greenhouse gas (GHG) emissions, a fee on methane, and more.

IRA, moreover, creates a new window of possibility for bold climate actions by states, cities, and the private sector. If these funds are spent, and projects are implemented in “climate-smart” ways, the potential for even further and faster reductions are possible. Funding states, cities, and others to transition to renewables, implement electrification and energy efficiency initiatives, build heavy-duty electric vehicles and charging infrastructure, and strengthen climate plans only builds on the momentum of non-federal climate leaders. Importantly, most of the investments in IRA come in the form of tax credits with no dollar or unit caps and are set to remain in place for at least ten years, meaning that the more states, cities, and businesses do to accelerate clean energy deployment now, the more reductions, and societal benefits will be achieved in the long-term.

At the same time, the incentives-based approach of IRA could deliver its full potential only if both federal and local governments implement it effectively. This underscores both the importance of effective implementation and the importance of supporting actions from non-federal actors. For example, high-ambition state policies and programs, such as California’s Zero-Emission Vehicle (ZEV) program, have set a gold standard among “climate-leading” non-federal actors. Other examples include New York City’s All-Electric New Buildings Law, Maryland’s new goal of 60% GHG emissions reduction by 2031,

and Houston’s goal of 40% GHG emissions reductions by 2030. And non-federal leadership in the United States is longstanding, expanding, and broad—climate leaders come from all 50 states and include over 350 tribes, cities, and counties, nearly 3,000 businesses, over 400 universities, and over 800 faith groups. States, cities, and counties committed to climate action represent two-thirds of the U.S. population and economy.⁵

This analysis presents the Beyond 50 scenario demonstrating how an “all-in” pathway can deliver at least 50% reductions by 2030. This scenario builds on the climate-smart application of IRA, IIJA, and other current policies with an all-of-society approach that leverages the critical leadership of states, cities, and businesses across the United States. Critically, this scenario combines actions from non-federal actors, federal regulatory agencies, and partnerships across these actors to enable full and rapid action across all sectors and gases. An additional feature of the Beyond 50 scenario is that it puts in place supply chains and policy ladders for the broader and deeper decarbonization that will be needed from 2030 on. If several states adopted 100% ZEV requirements late in the period, these would not fully deliver reduced emissions by 2030—but they are essential to continue progress through 2050.

This challenging but feasible pathway would enable the United States to achieve a 50-52% reduction below 2005 levels in GHG emissions. Through the remainder of the decade, most reductions through this pathway would occur from the power and transportation sectors, along with critical reductions from the methane sector—a more potent gas requiring rapid action—and the industry sector. Additional policies would also be needed within buildings, lands, other CO₂ sectors, and other non-CO₂ gases to solidify the transition to a clean, healthy, and prosperous future.

An “All-In” Pathway to 2030: The “Beyond 50” Scenario

Since the United States set its national climate target in April 2021, several major Congressional and federal regulatory actions—including IRA and IIJA—and a diverse set of enhanced non-federal policies have been passed or implemented. This analysis assessed how these policies, combined with existing and potential new actions, would affect United States emissions in 2030. Using a well-vetted and transparent modeling tool and framework, it integrates all major climate-related policies across each sector at both federal and non-federal levels, along with existing, currently in-force policies by state and local governments. We present two scenarios representing the impact of existing policies and the additional effects of a suite of potential new policies across all-of-society.

The Existing Policies scenario shows a majority of 2030 emissions reductions coming from the power and transportation sectors. In addition, the combination of policies to accelerate action with the overall market and economic forces continue to drive falling renewable costs and the retirement of uneconomic coal-fired generation. We estimate that the achievement of existing policies, alongside current technological and economic trends, will reduce U.S. emissions by 39% from 2005 levels by 2030. As the implementation of IRA remains unclear, we chose to model the elements that would most critically

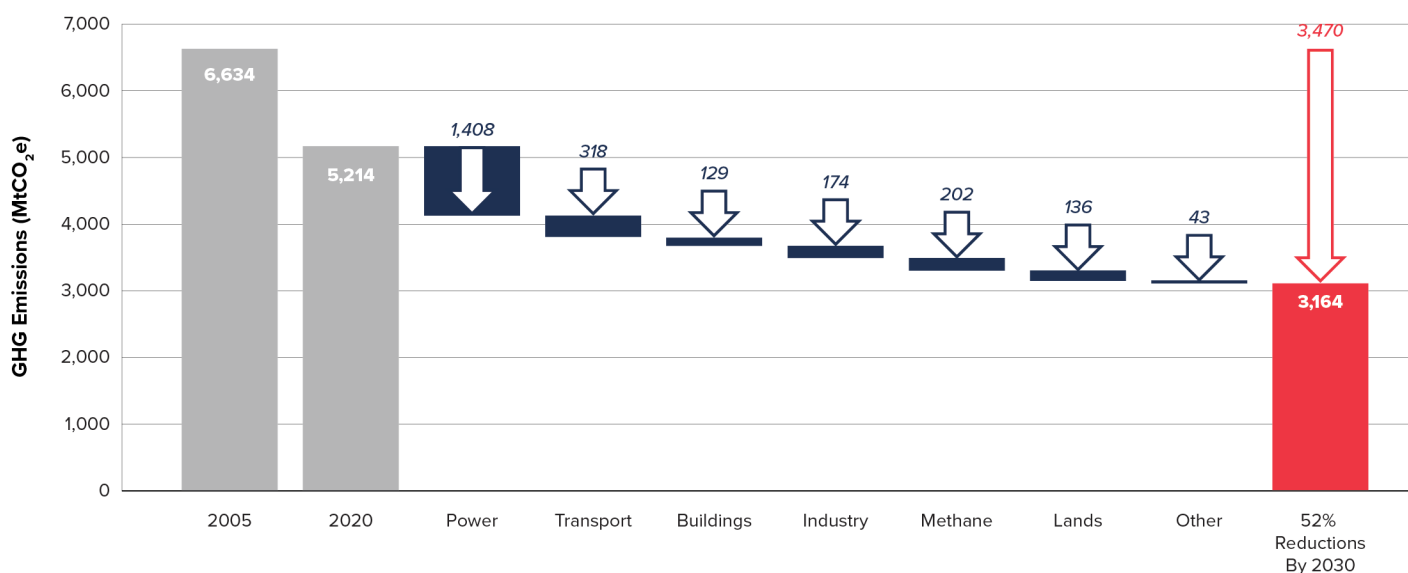


FIGURE 2 Bars show total greenhouse gas (GHG) emissions, with reductions across the power, transport, buildings, industry, methane, lands, and other sectors in the Beyond 50 scenario. Combined federal and non-federal actions in these sectors allow the United States to achieve a 52% reduction by 2030.

impact emissions. Depending on assumptions around the implementation of these provisions, we find that emissions reductions could fall between 37% and 42% (see Technical Appendix for more information).

The Beyond 50 scenario incorporates the climate-smart application of IRA from primarily states, with an all-of-society, accelerated approach to a national climate strategy. Additional policies to achieve at least 50% occur across every sector, and action at the state, city, and business levels are critical to solidifying our transition to a clean, healthy, and prosperous future. By layering ambitious actions from non-federal and federal actors on top of the Existing Policies scenario, this Beyond 50 scenario shows a pathway for the United States to achieve 52% emissions reductions from 2005 levels by 2030. As of today, the United States has achieved 21% reductions, as a result of various existing policies and a rapid reduction in the cost of renewables. To achieve the remaining 29-31% reductions through this decade, major contributions come from the power sector (16%, or 1,051 MtCO₂e), the transport sector (5%, or 308 MtCO₂e), the methane sector (3%, or 202 MtCO₂e), and the industry sector (3%, or 176 MtCO₂e). Buildings, lands, other CO₂ sectors, and other non-CO₂ gases deliver the rest of the needed reductions (Figure 2).

Initial analyses released following the passing of IRA found potential for reductions of 39-42% by 2030.^{6,7,8} At 39%, our Existing Policies scenario is on the low end of this range due to differences in assumptions about how some provisions in IRA will be implemented and might eventually impact emissions. Translating new financial mechanisms or incentive strategies into exact emissions outcomes is particularly challenging, such as the impact of financial provisions on the rate of coal retirements. Importantly, our pathway presented here demonstrates that existing policies, including IRA, IJJA, and other federal and non-federal policies, combined with ambitious and feasible actions for all-of-society, will achieve at least 50% reductions by 2030.

POWER

For the power sector, the major IRA elements that will deliver emissions reductions are the expansion of existing federal tax credits for renewable energy, including the Section 45 production tax credit (PTC) and Section 48 investment tax credit (ITC), which transition into technology-neutral credits in 2025. IRA will also support carbon capture utilization and storage (CCUS) through tax credits from Section 45Q that incentivize capturing and storing carbon underground. Further, the Energy Infrastructure Reinvestment (EIR) program will help accelerate coal retirement through loans and grants for retiring coal plants and replacing them with clean energy. We assume adequate transmission provisions to deploy renewables at their full potential with the IRA tax credits. Without such transmission provisions, the renewable deployment scale would be limited.

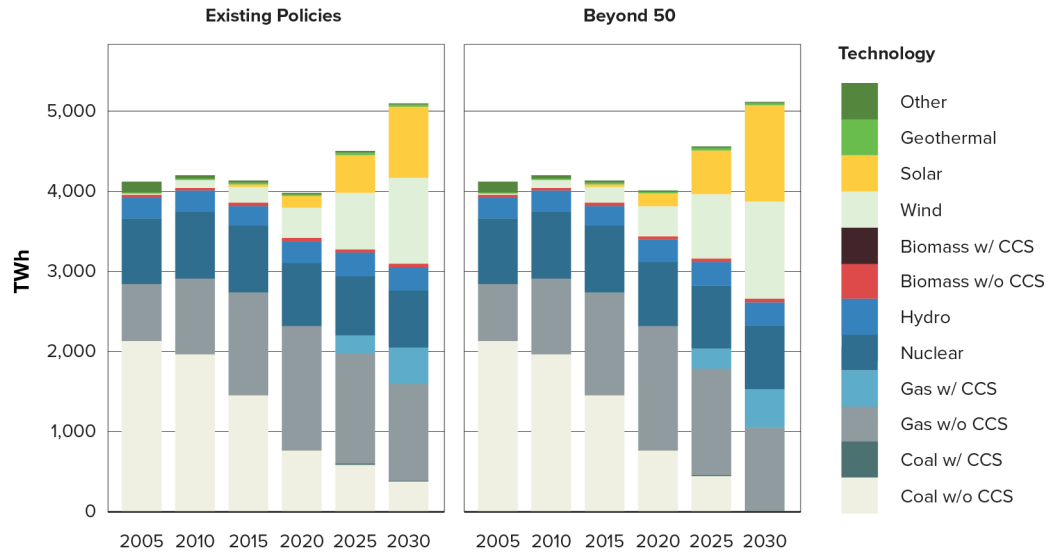
At the non-federal level, state renewable portfolio standards (RPS) and city-level renewable energy targets deliver additional reductions. Some coal and gas plants would be induced to operate at lower capacity factors due to the competition with lower-cost renewable energy as well as the implementation of updated renewable energy targets. We estimate that conventional coal and gas plants will consist of 29% of the total generation by 2030, far down from nearly 70% in 2005.

GETTING TO 52%: KEY POLICIES			
FEDERAL GOVERNMENT	STATES	CITIES & TRIBES	BUSINESSES & NGOS
<ul style="list-style-type: none"> • Existing Policies: Production Tax Credit and Investment Tax Credit for renewables • Beyond 50: EPA regulations on coal and gas plants 	<ul style="list-style-type: none"> • Beyond 50: Accelerated clean energy standards targeting 80% of electricity demand by 2030 • Beyond 50: Coal securitization and just transition policies 	<ul style="list-style-type: none"> • Beyond 50: City-wide clean electricity goals targeting 100% of demand by 2030 	<ul style="list-style-type: none"> • Beyond 50: Utility resource investment and planning to ensure full phaseout of coal generation by 2030

THE BEYOND 50 SCENARIO:

We assume all existing coal plants retire by 2030 through the combination of market forces, state coal-exit policies, and other regulatory compliance costs, driven for example by the Mercury Air Toxics Standards and EPA requirements for the disposal of toxic coal ash. We also assume EPA issues standards requiring new gas plants to install CCS, as the agency has already done for new coal plants, and that no new fossil fuel power plants will be built after 2024. We assume climate-leading states, cities, tribes, and utilities will strengthen and create renewable energy goals. Small businesses can take advantage of the new Greenhouse Gas Reduction Fund, which allocates up to \$27 billion for clean energy technology development to support these goals.⁹ We estimate that by 2030, conventional gas plants consist of 20% of the total generation.

FIGURE 3 Electricity generation reaches 71% clean and 80% clean by 2030 under the Existing Policies and Beyond 50 scenarios, respectively.



TRANSPORTATION

For the transportation sector, major climate-related policies under IIJA and IRA include tax credits for both new and used passenger zero-emissions vehicles (ZEVs), tax credits for freight ZEVs, biofuel subsidies, funding for the electrification of school buses, and investments in charging stations for passenger cars and freight trucks. In addition, investments to decarbonize the power sector influence the indirect emissions from electric vehicles (EVs). While the infrastructure investments could be spent in ways that increase emissions, such as on streets and highways, we assume that state and local governments invest all eligible funding on charging infrastructure to support the widespread adoption of EVs. These Congressional policies are layered on top of current transportation sector measures, including recently updated Corporate Average Fuel Economy (CAFE) standards and continued cost declines in the EV market.

At the non-federal level, state-level ZEV sales targets for passenger vehicles and freight trucks, along with state and local incentives to purchase EVs and build EV charging stations, deliver additional reductions. The combination of these policies drives the 2030 EV market share to 43%, 4%, and 37% for cars and SUVs, freight trucks, and buses, respectively (Table 1). See *America Is All In's* detailed brief on emissions reductions potential within the transportation sector for more information.¹⁰

GETTING TO 52%: KEY POLICIES			
FEDERAL GOVERNMENT	STATES	CITIES & TRIBES	BUSINESSES & NGOS
<ul style="list-style-type: none"> Existing Policies: Clean vehicle tax credits Beyond 50: 100% federal fleet procurement of zero-emission LDVs, light commercial trucks and buses by 2030 	<ul style="list-style-type: none"> Beyond 50: 100% internal combustion engine light-duty vehicle phasedown by 2035 Beyond 50: ZEV mandates for 30-50% new MDV/HDV sales by 2030 	<ul style="list-style-type: none"> Beyond 50: Vehicle miles traveled reductions through planning, low- and zero-emissions zones, decongestion pricing, other mechanisms 	<ul style="list-style-type: none"> Beyond 50: Major auto manufacturers on-track to 100% ZEVs for new LDV sales by 2035

THE BEYOND 50 SCENARIO:

We assume that strengthened federal CAFE standards drive an additional 4-5% increase in fuel economy in diesel-fueled freight trucks. Climate-leading states immediately adopt California's schedule for ZEV sales targets, and other states adopt the targets on a delayed schedule. Climate-leading cities, tribes, and businesses will set or strengthen vehicle miles traveled (VMT) targets, invest in EV charging infrastructure, and help accelerate commercial fleet electrification. These policies drive the 2030 EV market share to 48%, 38%, and 100% for cars and SUVs, freight trucks, and buses, respectively (Table 1).

METHANE

Methane, or CH₄, emissions come from many sources and sectors, with energy and agriculture being the two sectors with the highest reduction potentials. Congressional actions to reduce methane emissions include IRA’s methane fee of \$1,500/tCH₄ or \$60/tCO₂e on oil and gas facilities and IRA’s methane-specific agriculture provisions. EPA and USDA also have initiatives to reduce food waste, with a goal of reducing organic waste by 50% by 2030.

At the non-federal level, states such as Colorado, California, and New Mexico have limited methane from the energy sector through regulations on venting and flaring, requirements for leak detection and repair, and abandoned mine programs. While a few states also have goals for methane reductions from the agriculture and waste sectors, on their own, these goals are insignificant in terms of reducing national methane emissions. See *America Is All In*’s detailed brief on methane emissions reductions potential for more information.¹¹

TABLE 1 Summary of EV sales for cars and SUVs, freight trucks, and buses under Existing Policies and Beyond 50.

EV SALES	EXISTING POLICIES	BEYOND 50
CARS AND SUVS	43%	48%
FREIGHT TRUCKS	4%	38%
BUSES	37%	100%

GETTING TO 52%: KEY POLICIES			
FEDERAL GOVERNMENT	STATES	CITIES & TRIBES	BUSINESSES & NGOS
<ul style="list-style-type: none"> • Beyond 50: Methane fee on all sectors • Beyond 50: More stringent EPA regulations on oil and gas facilities 	<ul style="list-style-type: none"> • Beyond 50: Methane emissions standards on oil and gas sources, with extensive leak detection and repair requirements • Beyond 50: Implementation of manure management projects, anaerobic digesters, and enteric fermentation mitigation 	<ul style="list-style-type: none"> • Beyond 50: Waste reduction goals and infrastructure • Beyond 50: Reduction of methane leakage from distribution infrastructure 	<ul style="list-style-type: none"> • Beyond 50: Methane emissions reduction goals

THE BEYOND 50 SCENARIO:

We assume that the oil and gas methane fee is expanded to cover all sectors, including agriculture and waste. The EPA will strengthen regulations on existing and new oil and gas sources, including banning non-emergency venting and flaring, requiring rigorous monitoring and leak repair, and mandating proper closure of oil and gas wells.

At the non-federal level, climate-leading states adopt standards on existing and new oil and gas sources, implement extensive leak detection and repair requirements, limit venting and flaring, and take actions to reduce methane emissions from active and abandoned coal mines. Cities and businesses help reduce methane leakage from distribution infrastructure and pledge to reduce methane emissions to near zero by 2030. Climate-leading states also set methane emissions standards in the agriculture sector and provide ample funding assistance for the widespread implementation of manure management projects, anaerobic digesters, and enteric fermentation mitigation. Finally, states, cities, tribes, and businesses adopt waste diversion policies similar to California’s SB1383 regulation and San Francisco’s Zero Waste program and implement policies to increase the capture of landfill gas.

There is a wide range of economic potential for methane emissions reductions. To reflect this uncertainty, we consider a range of 38% to 68%, based on EPA’s estimates¹² and International Energy Agency (IEA)’s estimates,¹³ respectively. See box 1 for the range of assessments and the Technical Appendix for more details.

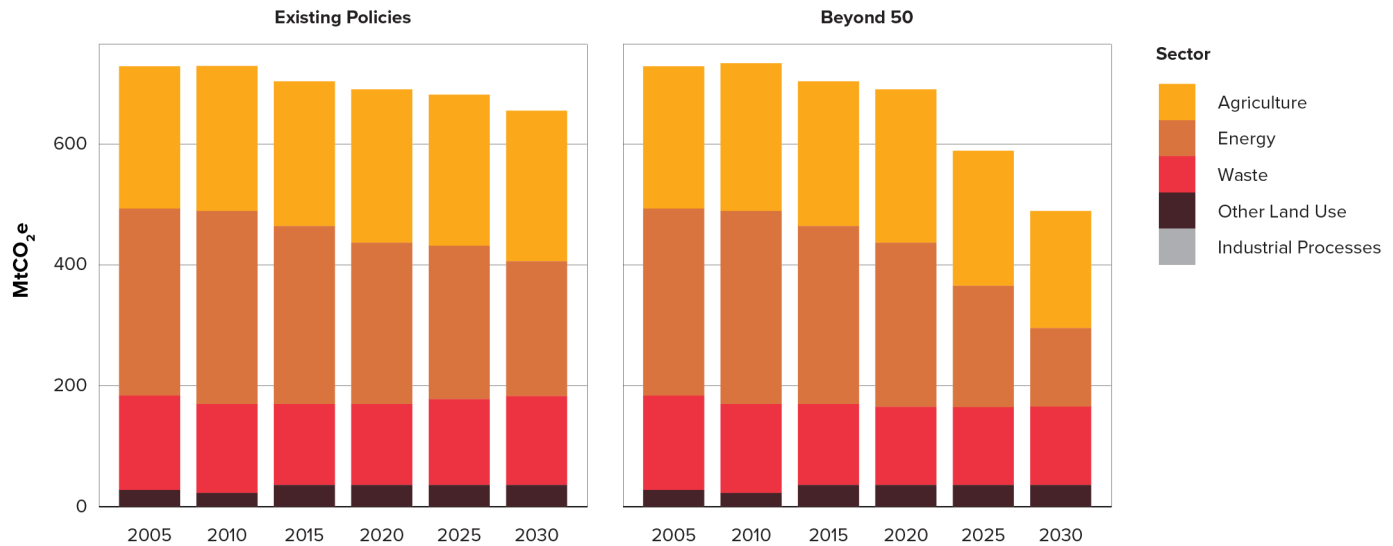


FIGURE 4 Methane emissions decrease by 10% and over 30% below 2020 levels by 2030 under the Existing Policies and Beyond 50 scenarios, respectively. In the Beyond 50 scenario, additional emissions reductions are achieved in the agriculture, energy, and waste sectors due to an economy-wide methane fee and enhanced mitigation from non-federal actors.

BOX 1: FUGITIVE METHANE: CHALLENGES & OPPORTUNITIES

In addition to coal, oil and methane gas purposefully extracted and used as fossil fuels, mining and drilling also release unused “fugitive methane” in large volumes that can accelerate climate change. Assessing the levels and projections for such methane poses many challenges:

1. Methane emissions remain challenging to measure. The most widely used estimates from EPA heavily rely on self-reporting from producers, but other methods of measurement have shown that self-reporting can significantly underestimate emissions. For instance, the International Energy Agency estimates US fugitive emissions at almost double that of EPA inventories.
2. Comparing methane to carbon dioxide is complex because it is over 80 times as damaging to the climate as CO₂ when it is first released into the atmosphere—but while CO₂ lasts hundreds of years, methane decays quickly in the first 12 years—so its contribution to climate change is severe for a decade and then fades rapidly.
3. There are significant differences in the estimates of how much fugitive methane can be reasonably recovered and reused. EPA estimates that 38% of fugitive methane can be avoided under a \$60/tCO₂e methane fee, while on the other hand, IEA estimates that 68% can be avoided at a similar cost.

Combining these three data challenges, and the difference between low and high estimates for recovering fugitive methane from fossil fuel production becomes very large. If, at the lower end, we apply EPA’s 38% abatement potential to the projected fugitive methane emissions in 2030 and average the impact over a full century, oil and gas methane abatement potential is equivalent to 73 MtCO₂e, or 1.1% of the 2005 U.S. GHG emissions. On the higher end, if fossil fuel producers are required to recover 68% of the fugitive emissions estimated by IEA, the 20-year impact of those avoided emissions would be equivalent to 772 MtCO₂e, or about 10% of the 2005 U.S. GHG emissions. This near-term warming—or avoiding it through rapid action—will have a profound impact on the peak warming level. A comprehensive methane reduction strategy aiming for higher fugitive emission recovery would provide major reduction in near-term climate change regardless of the inventory used.

BUILDINGS

In the buildings sector, IRA clean energy credits for residential buildings and energy efficiency credits/rebates for residential and commercial buildings contribute to emission reductions. Additionally, state-level energy efficiency resource standards (EERS) establish long-term targets for energy savings in both residential and commercial buildings.

GETTING TO 52%: KEY POLICIES			
FEDERAL GOVERNMENT	STATES	CITIES & TRIBES	BUSINESSES & NGOS
<ul style="list-style-type: none"> Existing Policies: Rebates and incentives to increase efficiency in residential and commercial buildings Beyond 50: Emissions-based building performance standards for federal buildings 	<ul style="list-style-type: none"> Beyond 50: Heightened adoption of stringent EERS standards Beyond 50: Expanded natural gas bans and electrification targets for new buildings 	<ul style="list-style-type: none"> Beyond 50: City stretch codes to accelerate energy savings and phase out gas appliances Beyond 50: Adoption of emissions-based city building performance standards 	<ul style="list-style-type: none"> Beyond 50: Expanded voluntary target setting, benchmarking and other measures Beyond 50: Participation in voluntary ENERGY STAR program

THE BEYOND 50 SCENARIO:

Federal agencies establish emissions-based building performance standards for federal buildings and adopt stringent efficiency standards for appliances. Climate-leading states further improve energy efficiency through heightened EERS and building codes. These states will also adopt regulations to phase out the sale of gas appliances and require all new houses to be 100% electrified beyond 2025, including heating, cooling, water heating, etc. We assume that other states will follow suit, but their effects may not be realized after 2030 due to slower stock turnover in the buildings sector.



FIGURE 5 States and cities with enacted or proposed building electrification targets (residential, public, and/or private) from 2020-2022.

INDUSTRY

Under IRA, 45Q enhancements further incentivize the incorporation of CCUS and emissions reductions across various industrial sectors, including the cement and paper and pulp sectors. In addition, new hydrogen (H₂) tax credits can be sufficient to shift the market toward green fertilizer, steel, and aluminum production in the United States. The broader deployment of green H₂ is expected to accelerate beyond 2030.

GETTING TO 52%: KEY POLICIES			
FEDERAL GOVERNMENT	STATES	CITIES & TRIBES	BUSINESSES & NGOS
<ul style="list-style-type: none"> • Existing Policies: 45Q tax credit and hydrogen tax credit to increase use of clean fuels and CCS • Beyond 50: “Buy Clean” standards to increase production efficiency, encourage use of clean fuels and CCS 	<ul style="list-style-type: none"> • Beyond 50: Heightened Energy Efficiency Resource Standards and International Organization for Standardization 50001 energy management standards • Beyond 50: “Buy Clean” standards 	<ul style="list-style-type: none"> • Beyond 50: Efficiency targets including industrial facilities/buildings • Beyond 50: “Buy Clean” standards 	<ul style="list-style-type: none"> • Beyond 50: Accelerate deployment of green technologies through investments and pilot projects • Beyond 50: Electrification goals through retrofits and greenfield projects

THE BEYOND 50 SCENARIO:

Additional federal and state action in the form of “Buy Clean” policies to increase production efficiency and the use of clean fuels (i.e. electricity, hydrogen, CCS) will bolster emission reductions. Climate-leading states adopt heightened EERS and International Organization for Standardization 50001 energy management standards to increase energy savings further. We also assume the accelerated deployment of green H₂, with green H₂-based fertilizers reaching half of the market share by 2030. Low-cost renewables and a rapidly growing clean electricity sector result in 21% of industrial energy being electrified, up from 16% in 2005.

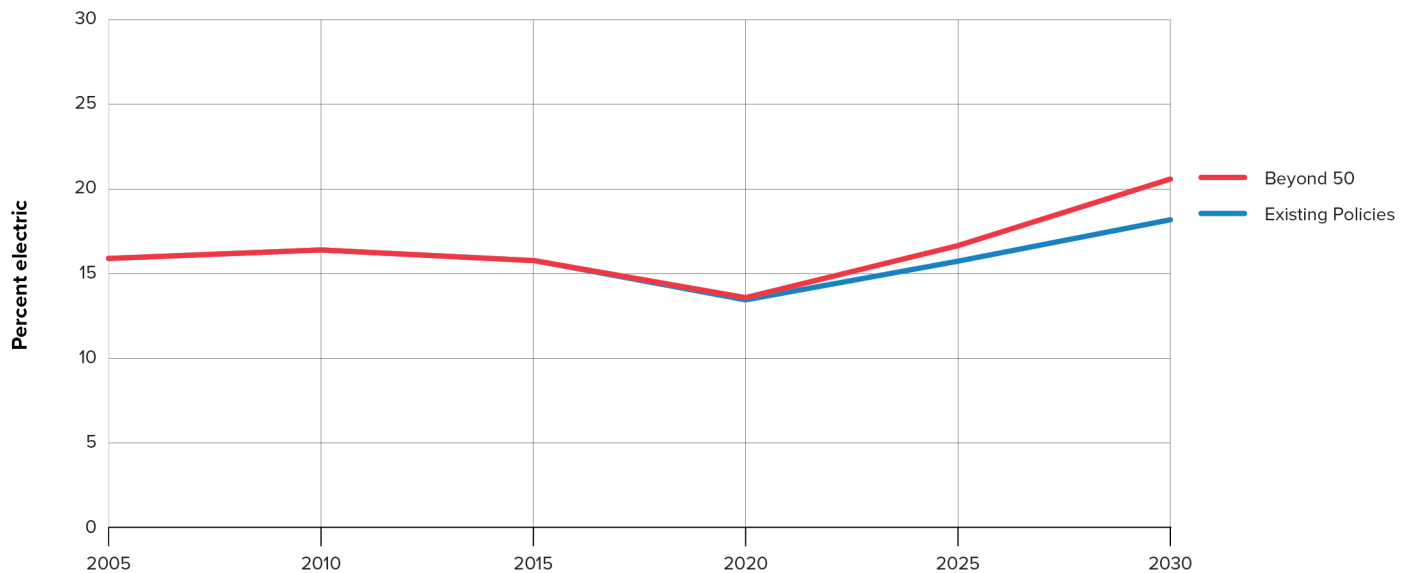


FIGURE 6 Industrial energy reaches 18% and 21% electrification by 2030 under the Existing Policies and Beyond 50 scenarios, respectively. The Beyond 50 scenario achieves additional electrification as a result of “buy clean” policies, regulations on new industrial facilities, industrial electrification goals, and market forces.

LANDS

In the lands sector, IIJA and IRA provide investments and funding for voluntary conservation programs, forest management, and ecosystem restoration—contributing to an increased carbon sink. They also include funding for hazardous fuel load treatments, which increase forest resilience to climate change and wildfires.

GETTING TO 52%: KEY POLICIES			
FEDERAL GOVERNMENT	STATES	CITIES & TRIBES	BUSINESSES & NGOS
<ul style="list-style-type: none"> • Existing Policies: Investments in forest management, land conservation and ecosystem restoration • Beyond 50: Expanded investment in wildfire risk mitigation 	<ul style="list-style-type: none"> • Beyond 50: Targeted programs and investment in reforestation, soil carbon sequestration, climate-friendly agricultural practices, and wildfire mitigation • Beyond 50: Increased investment in GHG quantification and monitoring 	<ul style="list-style-type: none"> • Beyond 50: Expanded urban forestry efforts and fire management practices 	<ul style="list-style-type: none"> • Beyond 50: Increased investments in land-based climate mitigation strategies

THE BEYOND 50 SCENARIO:

The federal government expands investments in GHG quantification and monitoring, wildfire risk mitigation, carbon sequestration in trees and soils, and reforestation. States increase conservation and restoration practices on state and private land and implement targeted programs and investments in reforestation, soil carbon sequestration, climate-friendly agricultural and forestry practices, and wildfire risk mitigation. Cities, tribes, and businesses implement forestry efforts and implement tree canopy targets, and increase investments in land-based climate mitigation strategies investments.

TABLE 2 Summary of key sectoral policies broken down by actor group (continues to next page)

GETTING TO 52%: KEY POLICIES				
	FEDERAL GOVERNMENT	STATES	CITIES & TRIBES	BUSINESSES & NGOS
Power	<ul style="list-style-type: none"> • Existing Policies: Production Tax Credit and Investment Tax Credit for renewables • Beyond 50: EPA regulations on coal and gas plants 	<ul style="list-style-type: none"> • Beyond 50: Accelerated clean energy standards targeting 80% of electricity demand by 2030 • Beyond 50: Coal securitization and just transition policies 	<ul style="list-style-type: none"> • Beyond 50: City-wide clean electricity goals targeting 100% of demand by 2030 	<ul style="list-style-type: none"> • Beyond 50: Utility resource investment and planning to ensure full phaseout of coal generation by 2030
Transportation	<ul style="list-style-type: none"> • Existing Policies: Clean vehicle tax credits • Beyond 50: 100% federal fleet procurement of zero-emission LDVs, light commercial trucks and buses by 2030 	<ul style="list-style-type: none"> • Beyond 50: 100% internal combustion engine light-duty vehicle phasedown by 2035 • Beyond 50: ZEV mandates for 30-50% new MDV/HDV sales by 2030 	<ul style="list-style-type: none"> • Beyond 50: Vehicle miles traveled reductions through planning, low- and zero-emissions zones, decongestion pricing, other mechanisms 	<ul style="list-style-type: none"> • Beyond 50: Major auto manufacturers on-track to 100% ZEVs for new LDV sales by 2035

<p>Methane</p>	<ul style="list-style-type: none"> • Beyond 50: Methane fee on all sectors • Beyond 50: More stringent EPA regulations on oil and gas facilities 	<ul style="list-style-type: none"> • Beyond 50: Methane emissions standards on oil and gas sources, with extensive leak detection and repair requirements • Beyond 50: Implementation of manure management projects, anaerobic digesters, and enteric fermentation mitigation 	<ul style="list-style-type: none"> • Beyond 50: Waste reduction goals and infrastructure • Beyond 50: Reduction of methane leakage from distribution infrastructure 	<ul style="list-style-type: none"> • Beyond 50: Methane emissions reduction goals
<p>Buildings</p>	<ul style="list-style-type: none"> • Existing Policies: Rebates and incentives to increase efficiency in residential and commercial buildings • Beyond 50: Emissions-based building performance standards for federal buildings 	<ul style="list-style-type: none"> • Beyond 50: Heightened adoption of stringent EERS standards • Beyond 50: Expanded natural gas bans and electrification targets for new buildings 	<ul style="list-style-type: none"> • Beyond 50: City stretch codes to accelerate energy savings and phase out gas appliances • Beyond 50: Adoption of emissions-based city building performance standards 	<ul style="list-style-type: none"> • Beyond 50: Expanded voluntary target setting, benchmarking and other measures • Beyond 50: Participation in voluntary ENERGY STAR program
<p>Industry</p>	<ul style="list-style-type: none"> • Existing Policies: 45Q tax credit and hydrogen tax credit to increase use of clean fuels and CCS • Beyond 50: “Buy Clean” standards to increase production efficiency, encourage use of clean fuels and CCS 	<ul style="list-style-type: none"> • Beyond 50: Heightened Energy Efficiency Resource Standards and International Organization for Standardization 50001 energy management standards • Beyond 50: “Buy Clean” standards 	<ul style="list-style-type: none"> • Beyond 50: Efficiency targets including industrial facilities/buildings • Beyond 50: “Buy Clean” 	<ul style="list-style-type: none"> • Beyond 50: Accelerate deployment of green technologies through investments and pilot projects • Beyond 50: Electrification goals through retrofits and greenfield projects
<p>Lands</p>	<ul style="list-style-type: none"> • Existing Policies: Investments in forest management, land conservation and ecosystem restoration • Beyond 50: Expanded investment in wildfire risk mitigation 	<ul style="list-style-type: none"> • Beyond 50: Targeted programs and investment in reforestation, soil carbon sequestration, climate-friendly agricultural practices, and wildfire mitigation • Beyond 50: Increased investment in GHG quantification and monitoring 	<ul style="list-style-type: none"> • Beyond 50: Expanded urban forestry efforts and fire management practices 	<ul style="list-style-type: none"> • Beyond 50: Increased investments in land-based climate mitigation strategies

Benefits of an All-In Climate Strategy

The transformative actions in the Beyond 50 scenario can provide wide-ranging socio-economic benefits, ranging from expanded job opportunities, reduced costs for households and businesses, reduced pollution, improved health, and a more equitable society. Federal, state, local, and private sector policies, investments, and action have primed the pump for strengthening the U.S. economy through a clean energy transition in the years ahead. Continued all-of-society action to speed the clean energy transition and meet the U.S. emissions targets can strengthen communities across the country.

Economic and health benefits of the clean energy transition

The clean energy transition provides a pathway to a stronger, more resilient economy. Scaling up investment in clean energy equipment and infrastructure will result in significant job gains in both manufacturing and installation. This transition will also help reduce energy costs, as many clean energy options are already less expensive on a lifetime basis than their fossil-fueled competitors, and federal investments and tax credits will drive the cost down further.

Recent research has shown that policies aimed at net-zero GHG emissions by 2050 similar to those included in the Beyond 50 scenario can create 2.5 million net additional jobs in the United States by 2035 compared to a reference scenario.¹⁴ These job additions are largely driven by spending on electrification and efficiency.

As jobs shift from sectors focused on the production and use of fossil fuels to clean energy, creating opportunities for fossil-fuel dependent communities and workers will be critical. States have been taking the lead in finding a path forward.¹⁵ The Colorado Just Transition Action Plan makes funds and support available to help communities transition away from coal, while New Mexico has pioneered securitized financing for coal plant retirements that saves money that can be invested in workers and communities. Illinois expanded this approach through the Climate and Equitable Jobs Act, which prioritizes job training for displaced energy workers and residents of disadvantaged communities.

The transition to EVs will also create many opportunities if managed well, particularly if an increasing share of the battery value chain is sourced domestically, as encouraged by IRA. This transition will entail a significant shift in labor from vehicle assembly to battery manufacturing, so it will be important to ensure that job quality (wages, working conditions, opportunities for advancement) in the growing battery sector at least match that in current auto assembly jobs.

New federal tax credits and other incentives will drive down the upfront cost of clean technologies. Making the clean energy economy equitable will require that access to clean and efficient buildings, appliances, and vehicles and improved transportation options are affordable for low-income and minority communities and small and medium-sized businesses.

Addressing climate change through a clean energy transition will also have broader environmental and health benefits. Reducing dependence on fossil fuels will significantly reduce air pollution and improve health outcomes. Recent analysis of IRA shows that reductions in air pollution from implementation of IRA could result in between 2,900 and 4,500 avoided premature deaths in 2030 and between 312,000 and 485,000 avoided lost workdays.¹⁶ In addition to the resulting improvements in outdoor air quality, building electrification and improved ventilation will result in improved indoor air quality.

Improving equity

An equitable shift to a cleaner economy will require foregrounding all types of communities as investments are made in a resilient, clean economy. How policies are implemented and money is spent will determine whether benefits are shared equitably.

Low-income and minority communities have too often been left behind. Focusing energy efficiency, mass transit, renewable energy, and EV charging investments in economically disadvantaged communities can bring jobs, reduce pollution, and reduce energy costs. Directed incentives for low-income households and small and medium businesses in these communities can help deliver affordable access to energy efficiency improvements, efficient electric appliances, EVs, and other clean energy technologies.

Low-income and minority communities also need a voice in the decisions about what types of infrastructure and industry go where and under what conditions. Achieving the goals of the Biden Administration’s Justice40 Initiative—that at least 40 percent of the overall benefits of federal investments go to disadvantaged communities—will require bringing those communities into the decision making process. As discussed above, traditional energy communities will also need directed investments as the economy shifts from fossil fuels.

Rural communities whose economies center on agriculture and natural resources are on the front lines of the changing climate but have not often seen themselves in the solutions pursued by climate champions. These communities can benefit from investments in renewable energy, energy efficiency and energy infrastructure, remediation of abandoned coal mines, capping abandoned oil and gas wells, tree restoration and managing wildfire risks. Recent research has shown that \$15 billion per year invested in the rural economy over five years could support over 250,000 jobs in rural counties, with more than 40 percent in economically disadvantaged counties.¹⁷

Getting benefits to local communities

Federal action has provided a significant jump-start to meeting U.S. climate policy goals. Delivering on the promise of IJA and IRA and taking the additional steps needed to put the United States on the path to meeting its 2030 emission targets and moving to a net-zero economy by 2050 will require an all-of-society approach. Many federal programs are implemented through the states, which in turn often work with local governments and regional planning organizations. Private investment, supported by tax credits and other public incentives, will also play a strong role in speeding the transition.

Federal Regulations & Additional Support for States, Cities, and Businesses

The federal government is a critical driver for success and partner to other actors to deliver on our goals. Beyond recent contributions from Congress and federal regulatory actions, new actions from the federal government will be needed to help achieve over 50% reductions and to support non-federal actors in advancing climate-smart policies, especially in the near term as states, cities, and businesses establish plans to implement their climate targets and policies.

IRA implementation

Several components of IRA have the potential to expand reductions even beyond what is modeled currently, given the uncertainty around implementation at the state level, in particular. For example, solar energy tax credits for low-income communities and the Greenhouse Gas Reduction Fund (GGRF) could not only allow disadvantaged communities to deploy or benefit from zero-emission technologies but also further incentivize the phase-out of fossil fuels in the power sector. Meanwhile, states can implement the funds allocated through GGRF and other congressional action to accelerate building shell retrofits and heat pump installations, which are critical to electrifying the buildings sector. As an example, in Connecticut, these funds can help supplement and extend New Haven’s Livable Cities Initiative’s Efficiency Rehabilitation Assistance Program, which offers financial assistance for energy efficiency retrofits.¹⁸

IRA incentives for green hydrogen can accelerate the decarbonization of aluminum, steel, and fertilizer industries at the state level. In fact, states are already using federal funds to accelerate green hydrogen production: California recently announced the creation of a green hydrogen hub using IJJA funds, for example.¹⁹ The green hydrogen infrastructure developed as a result can unlock even larger potential reductions beyond 2030.

Regulatory actions

As the specific outlines of federal implementation and scope for new regulatory actions come into sharper focus in the coming months and years, there are additional opportunities to help sustain the bottom-up climate leadership. EPA rules for the power sector can usefully focus on mercury/air toxics, coal ash, water toxics, particulate matter, regional haze, good neighbor/cross-state rule, and new gas. The Federal Energy and Regulatory Commission (FERC) could support the coordination of electric grids to increase clean power by “improving the interregional siting process by establishing a cost allocation methodology that better reflects the benefits of transmission solutions.”²⁰ Actions could include greater consideration of externalities and more coordinated regional planning. FERC may need assistance from Congress to fully enable this transition and would benefit from a clearer mandate to expand regional transmission planning and through enforcement of timelines.²¹ Additionally, now that the Department of Energy (DOE) has expanded its loan guarantee program, utilities can use low-interest loans to enable early retirement of their coal and gas plants.²² At the same time, the Bureau of Land Management could streamline the process of leasing renewables while banning or pausing fossil fuel leasing.

EPA rules for other sectors can include regulations for light- and heavy-duty vehicles, gas appliances, and landfill methane. The Department of Housing and Urban Development (HUD) could play a significant role in building decarbonization and electrification; with 4.5 million housing units²³, electrification mandates, energy efficiency retrofits, and appliance standards enacted across the agency would be impactful.

The Future of Non-Federal Action in the U.S.

Policy actions of the past few years, including historically important contributions from Congress in 2021 and 2022, have placed the United States on an accelerated path that keeps our 2030 and 2050 climate goals within reach. But they are not sufficient on their own. It was always expected that reaching the highly ambitious U.S. NDC of 50-52% reductions by 2030 would require extensive, broad, and sustained effort throughout the 2020's to achieve sufficiently rapid reductions. This analysis shows that with coordinated efforts across all of society, the target remains in reach.

Building on recent actions, new and expanded efforts at all levels will be necessary to deliver the requisite scale and pace of reductions. This all-in strategy for the United States combines enhanced regulatory actions from the federal government with new actions from states, cities, businesses, investors, and other government, organization, and community leaders. Key examples of these activities include, but are not limited to:

STATES	CITIES	BUSINESSES
<ul style="list-style-type: none"> • Adoption of coal securitization and just transition policies • Investing in the development of offshore wind • Creating incentives to install rooftop solar • Extending methane leak detection and repairs • Investing in green agriculture • Setting buildings and industry EERS and electrification targets • Creating incentives to accelerate the electrification of cars and freight trucks 	<ul style="list-style-type: none"> • Setting ambitious renewable energy goals that go beyond state guidance or mandates • Implementing emissions reduction goals that go beyond state guidance or mandates • Setting green building incentives along with building electrification programs, including spreading of informational materials and increased inspections • Reducing organic waste and setting waste reduction goals • Investing in EV charging infrastructure 	<ul style="list-style-type: none"> • Setting emissions reduction targets and net-zero goals • Setting oil and gas industry maximum capture of fugitive methane • Implementing HFC reduction targets from commercial refrigeration • Implementing sustainable practices across the entire supply chain to reduce waste

UNIVERSITIES	HEALTHCARE	FAITH GROUPS
<ul style="list-style-type: none"> • Setting voluntary mandates to reduce organizational emissions and to achieve net-zero • Engaging students as future leaders in sustainability education and discussion • Implementing sustainable practices across the entire supply chain to reduce waste 	<ul style="list-style-type: none"> • Setting voluntary mandates to reduce organizational emissions and to achieve net-zero • Publicly accounting for progress on goals and hold all stakeholders accountable • Implementing sustainable practices across the entire supply chain to reduce waste 	<ul style="list-style-type: none"> • Engaging local communities in sustainability education and discussion • Supporting stakeholder engagement efforts by state and local governments to inform and implement climate initiatives

Working together and using new models of partnership across the set of actors engaged in the all-in strategy, the United States can achieve more than 50% reductions by 2030 and in doing so also set the nation on a pathway toward a 2050 net zero emissions goal.

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- 4 Corresponding author
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