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EXECUTIVE SUMMARY OF THE REPORT TO THE PRESIDENT

# Accelerating Effective Reduction of Greenhouse Gas Emissions

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Executive Office of the President  
President's Council of Advisors on  
Science and Technology

February 2024



EXECUTIVE OFFICE OF THE PRESIDENT  
**PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY**  
WASHINGTON, D.C. 20502

President Joseph R. Biden, Jr.  
The White House  
Washington, D.C.

Dear Mr. President,

Your Administration has set ambitious and urgently needed goals for national emissions reduction to achieve a Net Zero emissions economy by 2050, with a sustainable balance between the amount of greenhouse gases produced and the amount eliminated or sequestered. Accelerating emissions reduction will ease climate change impacts upon our Nation while also creating jobs and engendering a healthier environment for all Americans. Your Administration's actions and investments, including the Inflation Reduction Act and the Infrastructure Investment and Jobs Act, have already set the wheels to Net Zero in motion, mobilizing the private sector and stimulating greenhouse gas emissions reduction in many sectors.

Achieving Net Zero is an unprecedented endeavor of grand scale that raises a number of challenges not fully addressed by current national strategies or policy. This effort will require the participation by federal and state and local governments, academia, corporations, industry, and citizens. The recommendations in this report will strategically address these key questions: How can we accelerate emissions reduction by identifying the largest sources of emissions in near real-time so that we can act promptly? How can we provide emissions information that can inform and incentivize both voluntary and enforcement-based emissions reduction efforts? How will we know that we are really reducing emissions, or verify that specific investments have produced the needed national emissions reduction? How will we determine which emissions reduction methods are most impactful and cost-effective while boosting jobs and American competitiveness? What can we learn in the next 10 years to guide our national strategy for the following 30 years?

As we are making strides to reduce all greenhouse gas emissions, addressing methane specifically and immediately will be especially impactful. Reducing large localized methane emissions events, or point-source methane, from the oil and gas sector as well as diffuse emissions from agriculture and landfills, offers an early test bed for the data systems we need, while also addressing a particularly harmful greenhouse gas and providing significant health benefits for Americans living near methane sources.

Vetted, validated, and reliable data is essential to tracking our Nation's progress towards the emissions targets you have set forth. Also needed is a data infrastructure that facilitates decision making and course correction. PCAST applauds the ambitious plans agencies have developed to meet your challenge and endorse your Administration's strategy to create an integrated greenhouse gas measurement, monitoring, and information system.<sup>1</sup> The recommendations that follow build upon your Administration's impressive work thus far. The framework and goals described in this report

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<sup>1</sup> The White House. (2023 November). [\*The Biden-Harris Administration National Strategy to Advance an Integrated U.S. Greenhouse Gas Measurement, Monitoring, and Information System\*](#)

are essential to establish a system that has the scope and rigor needed to support Administration goals, and that facilitates our understanding of *how* to bring U.S. emissions to Net Zero by midcentury and make the most effective use of IRA funds. Implementing the recommendations in this report will also position the U.S. as the leader in international efforts to quantify emissions reduction and serve as a guide to other countries as they develop their own emissions inventories.

Sincerely,

Your President's Council of Advisors on Science and Technology

# Executive Summary

The Biden/Harris Administration has launched an unprecedented revolution in climate and energy policy that will make the Nation healthier, safer, and more prosperous. The Inflation Reduction Act; Innovation, Infrastructure and Jobs Act; CHIPS and Science Act; and the Biden/Harris Administration's suite of climate-related Executive Orders will have set the Nation on a fair and just path toward Net Zero greenhouse gas (GHG) emissions at midcentury, while saving many thousands of people from air pollution deaths, increasing employment in high quality energy-related jobs, revitalizing the Nation's industrial sector, and demonstrating commitment to meeting global climate goals.<sup>2</sup>

The scope and scale of this Administration's revolutionary policies represent exceptional challenges. Achieving Net Zero requires slashing emissions of the suite of climatically important GHGs: carbon dioxide, methane, and nitrous oxide, and others – each with its own diverse set of production sources and sequestration 'sinks.' Currently, the Nation's GHG monitoring capability is distributed across many different agencies, as well as academia, non-governmental organizations, and the private sector. A further challenge is that our national emissions inventory, coordinated by EPA with significant interagency coordination, is compiled from estimates made by individual entities, often with little validation. These estimates are based on targeted emissions measurements that are aggregated and extrapolated across similar emissions sources. There is simply not enough information about all the emissions sources and emissions conditions across the country to evaluate the accuracy of the estimates. With no central system of GHG measuring, monitoring, reporting, and verification (MMRV), our Nation's emissions inventory contains critical gaps, has inconsistent levels of rigor, and sometimes suffers decade-long delays in reporting, as described in more detail in this report. Moreover, the national inventory is not designed to provide sufficiently detailed local data in an understandable format to promote local decision-making around specific emissions.

To track and accelerate our progress towards Net Zero and to maintain public support for these policies, the Nation will need data gathering, analysis, and reporting of GHG emissions that is timely, rigorous, comprehensive, and sustained. Emissions monitoring should be designed to help farmers and entities like cities and corporations that want to voluntarily reduce their emissions. The emissions estimate also needs to be independently verified and validated so that we can trust our understanding of what policies and emissions reduction practices are working best and which need course correction, and so that the public is aware of the benefits.

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<sup>2</sup> Executive Order 13990, 86 FR 7037 "[Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis](#)" (January 25, 2021).

Executive Order 14008, 86 FR 7619 "[Tackling the Climate Crisis at Home and Abroad](#)" (February 1, 2021)

Executive Order 14030, 86 FR 27967 "[Climate Related Financial Risk](#)" (May 25, 2021)

Executive Order 14017, 86 FR 11849 "[America's Supply Chains](#)" (March 1, 2021)

Executive Order 14037, 86 FR 43583 "[Strengthening American Leadership in Clean Cars and Trucks](#)" (August 10, 2021)

Executive Order 14057, 86 FR 70935 "[Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability](#)" (December 13, 2021)

Executive Order 14081, 87 FR 56849 "[Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy](#)" (September 15, 2022)

With decades of investment in basic research, greenhouse gas science has matured, with local activity-based measurements of emissions and emissions rates, process models that allow us to understand the factors that modulate emissions, and airborne and space-borne observations of greenhouse gases from which local or regional emissions can be derived. PCAST has reviewed the Nation's current scientific and technical capabilities and concludes that the U.S. is now ready to move from research to operations and create a system that rigorously assesses the Nation's GHG emissions and guides our transition to Net Zero. In addition to facilitating all of the benefits of the energy transition, such an operational system would provide standards and information to support the Nation's burgeoning ecosystem of private climate service companies and would transform our ability to estimate the emissions of other countries remotely to help them achieve their own emissions goals.

The recently released report by the White House Greenhouse Gas Monitoring and Measurement Interagency Working Group: *National Strategy to Advance an Integrated U.S. GHG Measurement, Monitoring, and Information System* (GHGMMIS) Strategy, reaches these same conclusions.<sup>3</sup> PCAST fully endorses and applauds the recommendations in the National Strategy. Our purpose here is to emphasize the critical attributes of such a system, which PCAST has concluded are essential to deliver on our climate and energy goals.

The Biden/Harris Administration recognizes that quickly reducing methane emissions will slow down warming in the near-term and reduce a health hazard at the same time. While continuing to pursue efforts to reduce all greenhouse gas emissions, PCAST urges immediate and direct work especially on methane, which will provide an excellent test case for an operational system that rigorously assesses overall U.S. emissions.

The agricultural sector is the largest source of methane emissions in the U.S. and its scale and complexity pose unique challenges to comprehensively and accurately monitoring these emissions.<sup>4</sup> Uncertainties in agricultural emissions estimates translate directly into uncertainties in the national methane emissions inventory and less effective mitigation efforts. Currently, emissions estimates from the agriculture and forestry sectors are mostly out-of-date and unverified, as they are estimated from sparse measurements or from decadal surveys and emissions factors that may not capture current conditions in the working fields or advances in agricultural best practice.

Urgent action is needed to accelerate and sustain an integrated GHG MMRV system that achieves the Nation's climate goals.

## Recommendations

**Recommendation 1. Establish a unified common operating picture for the Nation of emissions measurements, monitoring, reporting, and verification to enable accurate, granular, validated, and timely GHG information at multiple geographic and temporal scales.**

Given the urgency of reducing our Nation's GHG emissions, PCAST recommends that the President immediately establish a National GHG Monitoring and Information Office that would further the

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<sup>3</sup> The White House. (2023 November). [The Biden-Harris Administration National Strategy to Advance an Integrated U.S. Greenhouse Gas Measurement, Monitoring, and Information System](#)

<sup>4</sup> Environmental Protection Agency. (2023). [Overview of Greenhouse Gases](#)

development and provide oversight of the U.S. GHGMMIS Strategy to 2050 and beyond, as well as host all federal and non-governmental data on GHG concentrations and emissions in the U.S., ensuring a common operating picture and providing actionable information to facilitate emissions reduction.

**Recommendation 2. Increase the Nation’s capacity to track and accelerate progress toward Net Zero in 2050 and beyond by strengthening research and infrastructure to innovate MMRV of GHG emissions.**

To sustain GHG MMRV to 2050 and beyond, we recommend the development of a multi-decadal strategy for satellite observations for GHG MMRV that is coordinated among the agencies, academia, and the private sector. This would maintain U.S. leadership in satellite observations. We also recommend that the National GHG Monitoring and Information Office coordinate interagency research programs to innovate, expand, and sustain GHG MMRV. This would involve, among other things, the innovation of affordable sensors and their calibration, as well as automation of data collection and reporting.

**2.1 Develop a multi-decadal strategy for satellite observations for greenhouse gas MMRV.**

**2.2 Coordinate interagency research programs to accelerate innovation of affordable sensors and their calibration, to develop systems that could automate GHG data collection and reporting, and to expand the GHG monitoring efforts across the country.**

**Recommendation 3. Expand comprehensive and up-to-date monitoring and reporting of methane emissions from all sectors and incorporate verification using atmospheric approaches.**

To quickly advance our Nation’s climate and equity goals we recommend expanding and sustaining monitoring and timely reporting of data on methane emissions from the entire supply chain of oil and gas industries and the entire life cycle of methane. We further recommend expanding atmospheric monitoring programs nationwide, to include neighborhoods in the vicinity of large methane sources and other urban areas. Frequent and routine synthesis of atmospheric-based and activity-based emissions estimations is critical to producing coherent and consistent regional and global scale methane emissions estimates. The synthesis would also point to and prioritize next steps for emissions reduction. Although methane is not our only GHG challenge, addressing methane first can provide rapid improvements to help minimize the already dire impacts of climate change as well as improve community health.

**3.1 Accelerate and expand the monitoring and timely reporting of data on methane emissions from the entire supply chain of oil and gas industries and the entire life-cycle of fossil methane.**

**3.2 Expand atmospheric methane monitoring coverage to include neighborhoods in the vicinity of large methane sources, and in urban areas across the country.**

**3.3. Accelerate the transition from research to operations in order to integrate atmospheric-based and activity-based emissions estimations to produce consistent regional, national, and global scale methane emissions estimates.**

**Recommendation 4. Accelerate, expand, modernize, and sustain the measuring, monitoring, reporting and verifying of GHG emissions from the agricultural and forestry sectors, focusing first on methane, in order to assess and enhance the effectiveness and implementation of climate-smart agriculture and forestry practices.**

The strategy should establish protocols and metrics for direct measurement of methane emissions from systems that are significant but poorly quantified sources, especially methane emissions from rice cultivation, enteric fermentation, waste management systems, and managed and working wetlands. We also recommend accelerating the collection, reporting, and dissemination of data on agricultural practices such as tillage, fertilizer amendments, and animal feed, as well as on the associated methane emissions coefficients. Data latency should be no more than two years.

The recommendations in this report are aimed at supporting and accelerating the U.S. GHGMMIS Strategy and agency efforts towards Net Zero. They would also maintain the U.S. as the international leader in GHG quantification and can serve as a guide to other nations as they develop their own emissions inventories. The actions recommended here can be taken immediately to advance the climate and equity goals of the Biden/Harris Administration.

**4.1 Establish protocols and metrics for direct measurement of GHG emissions from sources that are significant but poorly quantified, especially methane emissions from rice cultivation, enteric fermentation, waste management systems, and managed and working wetlands.**

**4.2 Accelerate the collection, reporting, and dissemination of data on agricultural practices and associated emissions factors relevant for assessing our Nation's annual GHG emissions from agriculture. Data latency should be no more than two years.**

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