

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

March 2013

Dear Mr. President:

When you met with your Council of Advisors on Science and Technology (PCAST) at the end of November, you noted that your Administration was in the process of developing a strategy for addressing climate change during your second term and you asked for our input.

In this letter, we suggest six key components for consideration that we deem central to your climate change strategy and policy:

- (1) focus on national preparedness for climate change;**
- (2) continue efforts to decarbonize the economy, with emphasis on the electricity sector;**
- (3) level the playing field for clean-energy and energy-efficiency technologies by removing regulatory obstacles, addressing market failures, adjusting tax policies, and providing time-limited subsidies for clean energy when appropriate;**
- (4) sustain research on next-generation clean-energy technologies and remove obstacles for their eventual deployment;**
- (5) take additional steps to establish U.S. leadership on climate change internationally; and**
- (6) conduct an initial Quadrennial Energy Review (QER).**

The first component aims to reduce the damage resulting from changes in climate (“adaptation”), while the last five aim to reduce the pace and magnitude of these changes (“mitigation”). Both approaches are essential parts of an integrated strategy for dealing with climate change. Mitigation is needed to avoid a degree of climate change that would be unmanageable despite efforts to adapt. Adaptation is needed because the climate is already changing and some further change is inevitable regardless of what is done to reduce its pace and magnitude. Below, we discuss each of these six components in greater detail.

(1) Focus on national preparedness for climate change.

A primary goal of a national climate strategy should be to help the Nation prepare for impacts from climate change in ways that decrease the damage from extreme weather and other climate-related phenomena (i.e., increase robustness) and ways that speed recovery from damage that nonetheless occurs (i.e., increase resilience). Recent disasters involving extreme weather events (including Hurricane Sandy, extreme drought, and rampant wildfires) have underscored the Nation’s vulnerability and the urgent need for preparedness.

Preparedness against major threats is a critical responsibility of the Federal Government, working with the States. An ongoing focus on preparedness, moreover, will help Americans understand that climate change is a clear and present threat, whose effects are already visible, expensive, and worsening (rather than a distant issue with impacts many decades hence). A preparedness strategy that engages state and local officials, as it must given the geographic variation in climate-change effects and vulnerabilities and the need for state and local actions to address them, will also strengthen the national constituency for the comprehensive approach to climate change — mitigation as well as adaptation — that is needed.

A national climate preparedness strategy should include:

(A) mechanisms to create, regularly update, and communicate national climate preparedness plans, including regional assessments and sharing of best practices;

(B) mechanisms to create, regularly update, and communicate to citizens indices of extreme events that capture these leading indicators of climate change on a global, national, and regional basis;

(C) maintenance and improvement of the Nation's capabilities in weather forecasting and climate-change prediction to help those in harm's way take actions to protect themselves in both the short- and long-term;

(D) plans for infrastructure modernization that incorporate the impact of future climate change, and also serve to support the development of advanced infrastructure for the 21st century economy; and

(E) changes to Federal policies on disaster relief and insurance to ensure that economic incentives are aligned with long-term safety and security, and that financial capital, when invested following a disaster, is used not just to rebuild, but to rebuild better.

To accomplish these goals, you could:

- **Create a National Commission on Climate Preparedness charged with recommending an overall framework and blueprint for ongoing data collection, planning, and action.** The Commission's work would address the five elements above, in particular recommending changes to existing insurance and disaster relief policies to ensure that they are aligned with long-term climate preparedness goals. Its work would complement the ongoing Federal adaptation efforts coordinated by the Council on Environmental Quality, the Office of Science and Technology Policy (OSTP), and National Oceanic and Atmospheric Administration (NOAA), and would include representatives from industry, universities, and state and local governments.
- **Designate Departments to serve as leads to oversee the annual creation of climate preparedness plans at home and abroad.** A logical choice for domestic preparedness would be the Department of Homeland Security, with the Department of Defense playing the lead role for climate preparedness plans involving events overseas that affect our national security (as they already have responsibility for this). These Departments would oversee the creation

of national and regional preparedness plans based on input of scientific and management agencies. In addition, you could designate the Office of Management and Budget (OMB) or the Council of Economic Advisors to oversee economic analysis and policy measures to improve climate preparedness, including reform of Federal flood and crop insurance and disaster relief.

• **Develop an infrastructure renewal plan that integrates climate preparedness and other benefits to the Nation’s economy.** Much of U.S. infrastructure – from transportation to energy and water delivery – needs renewal to meet modern demands. At the same time, robustness and resilience to climate change and other disruptions (both natural and manmade) have not been built in (for example, recovery of the electrical grid from major storms). The Administration, in close cooperation with the proposed National Commission on Climate Preparedness described above, should prepare a plan, ideally within six months, that lays out infrastructure investment opportunities that synergistically address climate risks and economic productivity. Infrastructure planning efforts should also consider investments in environmental capital from which ecosystem services flow that can ameliorate damages from climate change (such as coastal wetlands that reduce the impacts of storm surge).¹

• **Improve coordination and support for research efforts on climate change preparedness.** There has been a series of activities to build a Federal research effort on climate change adaptation, but after the nationwide drought of 2012 and Hurricane Sandy an acceleration of effort across the Federal agencies is appropriate. PCAST suggests that the Director of OSTP chair a workshop with representatives from each of the relevant funding agencies to coordinate and prioritize Federal funding for research on climate change adaptation.²

(2) Continue efforts to “decarbonize” the economy, with an initial focus on the electricity sector.

Over the past four years, emissions reductions have come primarily from declining oil consumption and a switch from coal to natural gas in the electricity sector (the first resulting from a combination of efficiency improvements and recession, and the second from the low price of natural gas). Further reductions in U.S. carbon dioxide (CO₂) emissions over the next decade will result from a continued shift from coal to natural gas and renewables in the electricity sector (with the help of the Renewable Portfolio Standards that have been passed by many states) and through the growing leverage of the Administration’s CAFE (Corporate Average Fuel Economy) standards in the transportation sector. Additional emissions reductions in the residential, commercial, and industrial sectors will come from improvements in energy efficiency. We believe that a primary aim of new policy efforts should be to reinforce these pathways to lower CO₂ emissions. Economy-wide, market-based solutions,

¹ Environmental capital was the focus of the PCAST report, “Sustaining Environmental Capital: Protecting Society and the Economy,” released in July, 2011.

² In May, 2010, at the request of the OSTP Director, the University Corporation for Atmospheric Research (UCAR) convened a National Adaptation Summit that identified seven priorities for near-term action. Two-and-a-half years later, in the aftermath of a series of devastating weather-related disasters, it seems appropriate to revisit those recommendations. The new workshop suggested here would build on them and would feed into the U.S. Global Change Research Program’s Adaptation Working Group, leading to specific plans by Federal agencies including NOAA, National Science Foundation (NSF), U.S. Department of Agriculture (USDA), and the Department of Energy (DOE) to augment programs focused on climate adaptation research.

such as a carbon tax or a cap-and-trade system, are excellent ways to incorporate the costs of externalities and encourage technological innovation. But given the political resistance to such approaches, there are other policy measures that can also encourage energy transformation and decarbonization.

The focus on “decarbonizing” electricity generation has been misconstrued by some as “an attack on coal.” In reality, the decreased market share of coal in U.S. electricity production has been driven by market forces and by consideration of health externalities as required by the Clean Air Act and amendments. The Administration has undertaken efforts to increase coal’s usability through development of carbon capture and storage (CCS) technologies that would drastically reduce sulfur dioxide (SO₂), nitrogen oxides (NO_x), particulate, and mercury emissions from coal combustion, as well as CO₂ emissions.

To reinforce the key decarbonization pathways, the Administration could:

- **Support continuing expansion of shale-gas production, ensuring that environmental impacts of production and transport do not curtail the potential of this approach.** Continuing substitution of gas for coal (and in some instances for oil) will remain an effective short- and middle-term decarbonization measure and an economic boon only insofar as methane leakage from production and transport is held to low levels and drinking water is not adversely impacted. The Federal Government has an important role to play in both of these respects, through collecting and distributing reliable data and through strengthened regulation where the data indicate this is required.
- **Continue implementation of Clean Air Act requirements on criteria pollutants (such as SO₂ and NO_x) and hazardous air pollutants (such as mercury)** to include creating new performance standards for CO₂ emissions from existing stationary sources, which would follow the performance standards for new plants released in March 2012.
- **Accelerate efforts to reduce the regulatory obstacles to deployment of CCS, and continue political support for the large CCS projects currently underway.** Successful demonstration of CCS will provide a role for coal in a carbon-constrained future. CCS will eventually be necessary for other large, stationary sources of CO₂, including natural gas power plants and biofuel refineries. In February 2010, you created the Interagency Task Force on Carbon Capture and Storage, charging it with proposing “a plan to overcome the barriers to the widespread, cost-effective deployment of carbon capture and storage within 10 years, with a goal of bringing 5 to 10 commercial demonstration projects online by 2016.”³ The Task Force issued a report in August 2010, recommending reforms including better Federal coordination and several possible approaches to managing long-term liability. We recommend that these findings be the basis for a directive to the relevant officials. There are several commercial CCS projects underway in the United States that have received grants from the Department of Energy (DOE). Continued support for these projects is important not only for the purpose of establishing the technical and regulatory basis for CCS in the United

³ Presidential Memorandum (2010). *A Comprehensive Federal Strategy on Carbon Capture and Storage*. www.whitehouse.gov/the-press-office/presidential-memorandum-a-comprehensive-federal-strategy-carbon-capture-and-storage.

States, but also because U.S. support for and success with this technology will likely be influential in moving other countries such as China and India toward CCS use.

(3) Level the playing field for clean energy and energy efficiency technologies by removing regulatory obstacles, addressing market failures, adjusting tax policies, and providing time-limited subsidies for clean energy when appropriate.

The cost of electricity from renewable sources has been dropping, but still exceeds the cost of electricity from coal or gas, particularly with low natural gas prices. We believe that the Federal Government has an opportunity to remove regulatory barriers and correct market failures to accelerate investment and development of renewable technologies, even aside from any specific tax subsidy and/or a price on CO₂ emissions. There are also opportunities to correct market failures that prevent investments in energy efficiency, which can also reduce greenhouse gas emissions.

Some opportunities worthy of consideration are:

- **Level the playing field on access to capital through special tax benefits.** Conventional energy projects have better access to low-cost capital than renewable energy projects. As with many energy projects, the cost of financing for renewable energy projects makes up a significant portion of their overall cost, and lower financing costs in the marketplace could help encourage the development of renewables. Preferred tax status through investment vehicles such as Master Limited Partnerships (MLPs) and Real Estate Investment Trusts (REITs) have benefitted conventional energy projects but are not currently available to renewable projects. Rulings by the Department of the Treasury may suffice to confer such status in some cases, but Congressional action will be required in others. We suggest that the Administration reexamine the options to make it easier to finance renewable energy projects.

- **Broaden the tax credit for wind to include all forms of renewable energy, replacing the annual renewal with a longer time horizon of 5 to 10 years.** It is likely that the current wind tax credit would have been much more effective had it been guaranteed for a longer period of time. The two-year extension of the existing credit in the recent “fiscal cliff” agreement will clearly have an important impact on the wind industry going forward. We suggest that in future years the tax credit be broadened to include all renewable energy systems, or at least both wind and solar. These credits should be given a longer time horizon, but then be phased out when either market forces or other regulation makes them no longer essential. (We acknowledge that, from the standpoint of economic efficiency, it would be preferable to level the playing field by eliminating the subsidies for fossil fuels rather than by expanding subsidies for renewables. In practical terms, however, the former approach appears to be a longer-term project, even though the Administration has already embraced it in principle.)

- **Eliminate market failures that prevent the adoption of technologies for energy efficiency.** Over the past four years, the Environmental Protection Agency (EPA) and Department of Transportation have agreed on revolutionary new requirements for the efficiency of motor vehicles, and DOE and the Department of Housing and Urban Development (HUD) have greatly expanded programs promoting energy efficiency in buildings and industry. There are still market failures that prevent sound investments in

energy-efficient buildings, appliances, and heating and cooling systems. A major problem is that energy efficiency and associated reductions in home operating costs are not properly valued during real estate transactions, thus limiting the opportunity to make these investments during renovations. One idea is to ask the Secretary of Energy and Secretary of HUD to work with Fannie Mae and Freddie Mac to create novel programs that would guarantee that the housing market values energy efficiency investments as part of the mortgage transaction.

(4) Sustain research on next-generation clean-energy technologies, and remove obstacles for their eventual deployment.

Some technologies are far from being economically competitive today, but are very likely to be important contributors to a low-carbon energy system several decades from now. Examples include electric cars, geothermal heat pumps, and advanced biofuels. As the Nation works to lower greenhouse gas emissions in the next decade, it is critical that investments in “game-changing” research and development on advanced energy technologies continue in order to ensure that at least some of them become competitive in the years ahead.

Climate-modeling studies have demonstrated that the climate system responds above all to cumulative emissions of the longest-lived major greenhouse gas, CO₂, which means that reducing total CO₂ emissions to near zero as quickly as possible should be the primary aim. Short-term emissions goals, as emphasized in section 2 above, are important for encouraging the growth of low-carbon technologies and increasing energy efficiency. But the development of critical technologies needed to achieve deeper reductions in the long run – such as next-generation nuclear power, CCS, and electric and fuel-cell cars – is crucial and should not be neglected. A balance is needed between investments that will lower emissions in the near-term and investments, such as “game-changing” research on advanced energy technology that may have only a small effect on emissions over the next few years but will be critical to achieving success in the long run.

• **We recommend that you sustain and, if possible, augment the investment in research and development in energy innovation, focusing on the critical technologies that have the potential to dramatically lower our greenhouse gas emissions in the long run.** In the last four years, the DOE has pioneered several new efforts including the Advanced Research Projects Agency – Energy (ARPA-E), energy innovation hubs, and energy frontier research centers. (Examples of important areas include energy storage, fast-charging batteries, advanced biofuels, and new nuclear reactor designs.) We suggest that you continue to support such efforts and augment them where possible. And we suggest that new emphasis be placed on creative management and reform of applied research programs in nuclear, fossil fuels, renewables, and energy efficiency, taking lessons from the success of ARPA-E.

• **Nuclear power requires special attention, as the Federal Government’s role is different than for all other technologies.** Nuclear power currently supplies 19 percent of U.S. electricity. Achieving low-carbon goals without a substantial contribution from nuclear power is possible, but extremely difficult. Nuclear power involves large capital investments recovered over long time periods. Even if current market conditions driven primarily by low natural gas prices persist for a decade or more, it is important to eliminate obstacles now that would impede renewed commitments to nuclear energy as energy economics shift over time. Today, a critical issue is progress in nuclear-waste management, and we recommend

implementation of the recommendations put forward by the Blue Ribbon Commission (BRC) on America's Nuclear Future.⁴ Indeed, nuclear waste disposal needs to be addressed independent of whether nuclear power deployment continues. The recent DOE strategy document generally endorses the BRC and proposes a timeline for some key steps towards a functioning waste management system. Implementation is key.

We also support adequate research funding for new and potentially cheaper nuclear technologies.

(5) Take additional steps to establish U.S. leadership on climate change internationally.

Climate change is a global problem that requires global action. There is an opportunity for the Administration to continue to shape the international discussion around climate change as efforts to reduce greenhouse gas emissions and enhance climate preparedness proceed at home. To complement ongoing efforts by the State Department, some opportunities worthy of consideration are:

- **Explore the possibility of a new North American climate agreement.** In 1995, prior to the Kyoto Protocol, the EPA Administrator signed a North American Free Trade Agreement (NAFTA) on climate change along with environment ministers from Canada and Mexico. Since then, energy and environmental issues have played a major role in discussions between the United States and its two largest trading partners. In February 2009, the United States announced the commencement of a Clean Energy Dialogue with Canada focused on the “development of clean energy technologies to reduce greenhouse gases and combat climate change.”⁵ A similar bilateral agreement with Mexico announced later that year, the Framework on Clean Energy and Climate Change, focused on training and infrastructure to promote clean energy technologies. In 2010, the Cross-Border Electricity Task Force was established by the United States and Mexico to promote regional renewable energy markets. A new North American climate agreement could incorporate much of the effort invested in these bilateral agreements, with some additional areas of focus such as CCS, the environmentally safe development of unconventional natural gas and oil resources, and border policies for dealing with energy or energy-intensive imports consistent with proceeding with EPA regulation of greenhouse gases under the Clean Air Act. This would create an important regional effort on climate change, demonstrating the seriousness of our commitment to the rest of the international community.

- **Continue work towards increased cooperation with China on the climate challenge.** This would include continued and expanded scientific exchanges, bilateral workshops on climate change adaptation and agricultural preparedness, and increased bilateral interactions of policy leaders to explore the possibilities for the United States and China to jointly lead the

⁴ Blue Ribbon Commission on America's Nuclear Future. (2012). “Report to the Secretary of Energy.” www.cybercemetery.unt.edu/archive/brc/20120620220235/http://brc.gov/sites/default/files/documents/brc_final_report_jan2012.pdf.

⁵ The White House, Office of the Press Secretary. (2009). [Press Availability]. www.whitehouse.gov/the_press_office/Press-Availability-by-President-Obama-and-Prime-Minister-Harper-of-Canada-2/19/09/

world toward an adequate program of action on both the mitigation and adaptation fronts. If China and the United States, as the two largest CO₂ emitters, can find more ways to agree on paths forward, much of the world will follow, whether by formal agreement or otherwise. CCS is particularly ripe for increased collaboration.

(6) Conduct an initial Quadrennial Energy Review (QER).

In 2011, the DOE published a Quadrennial Technology Review (QTR) as the first step toward a full QER that would cut across all Federal departments and agencies, as recommended in the November 2010 PCAST *Report to the President on Accelerating the Pace of Change in Energy Technologies Through an Integrated Federal Energy Policy*. The full review should be initiated officially now, building on the QTR and other preparatory work that has been underway at the Domestic Policy Council and OSTP, so that early work can help shape decisions over the next six months and to have a fully integrated plan by January 2015 for the start of the 114th Congress. The QER will provide an analytical underpinning for policy tradeoffs, such as those between hydrocarbon production, climate change mitigation, and expanded manufacturing. This in turn may help with a more productive bipartisan dialogue on clean energy innovation and the economic, environmental, and security threads of energy policy. Establishing the multiagency process may provide a lasting contribution to enhanced government effectiveness.

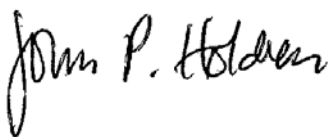
Concluding Comment

We hope you and your other advisors in this domain find the ideas your PCAST has set out here to be useful. We would be pleased to expand upon any of them on which you and/or they would like more detail. We know that your Domestic Policy Council, Council on Environmental Quality, National Economic Council, Council of Economic Advisors, National Security Staff, and relevant Federal departments and agencies are all also working on various parts of this terrain, and going forward we hope that PCAST will be working in close coordination with all of them to help you identify and develop the full range of constructive options for tackling the immensely important challenges that climate change poses.

Sincerely,

Co-Chairs

John P. Holdren



Eric Lander

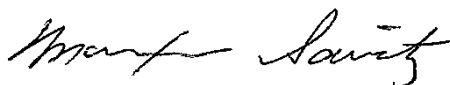


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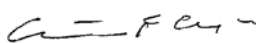
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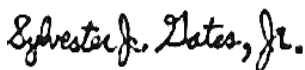
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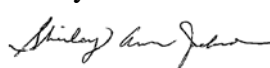
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