



**Statement before the
Senate Energy and Natural Resources Committee**

***“Examining Opportunities for Energy
Innovation and Other Potential Solutions to
Help Address Global Climate Change”***

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April 11, 2019

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Chairman Murkowski, Ranking Member Manchin and Members of the Senate Committee on Energy and Natural Resources, thank you for the opportunity to appear before you today to discuss opportunities for energy innovation and other potential solutions to help address global climate change.

I would like to thank the Committee for its commitment to fostering a constructive dialogue on the urgent need to address global climate change. For far too long this discussion has been about avoiding near-term costs and not about maximizing the potential long-term benefits. As I will lay out in my testimony, the United States is one of the most energy-advantaged nations on the planet. Not only do we have every conceivable tool at our disposal to chart a viable pathway to a net zero-emissions, resilient energy system at home, but we also have the unparalleled ability to provide global leadership in the strategies and technologies that can bring sustainable and affordable energy supplies to the growing and developing populations of the world. We just have to decide to do it.

This Committee has already covered the importance of energy innovation and climate change in several other hearings this Congress. The testimony and discussions in those hearings has been robust and useful. My testimony seeks to reinforce some of the key messages from those hearings and add a few additional recommendations and insights to the record.

[Harness energy as a source of economic opportunity](#)

For the last three years, the CSIS Energy and National Security Program has devoted itself to studying the way in which the energy landscape in the United States is changing and how the public and private sectors are responding to a host of new energy realities. Last week we published the first of two major studies examining how energy's role in the U.S. economy is shifting and next month we will release a second study on the ways in which energy is used as a tool of economic development and social mobility in states and regions around the country. Both studies have recommendations for policymakers that this Committee may find useful as you continue to address these important issues.¹ This section of my testimony (drawn from the above-mentioned report) outlines the changes in both the U.S. energy landscape and the U.S. economy and describes some of the most pertinent findings of this work.

The shifting energy landscape

Driven by shifts at home and abroad, U.S. production, trade, and consumption of energy has changed dramatically over the past two decades. In 2000, the United States was the world's largest energy consumer and its largest emitter of greenhouse gases—positions that it has since ceded to China in 2009² and 2005³ respectively. To the great consternation of many policymakers at the time, the country seemed all but certain to increase its reliance on foreign energy supplies, with the Energy Information Administration (EIA) forecasting in 2000 that the

¹ Sarah Ladislaw and Jesse Barnett. "The Changing Role of Energy in the U.S. Economy." CSIS, March 2019. https://csis-prod.s3.amazonaws.com/s3fs-public/publication/190329_LadislawandBarnettWorkshop_WEB_v4.pdf.

² Energy Information Administration, "International Energy Statistics," Raw Data, <https://www.eia.gov/beta/international/data/browser/>.

³ BP, Statistical Review of World Energy, Raw Data (London: BP Plc, 2017), <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

American economy would, on a net basis, import nearly 16.9 million barrels of petroleum per day by 2020⁴—an estimate that, as of 2018, has been revised down to just less than 1.0 million barrels per day.⁵ At the time, this pessimism reflected the relatively limited menu of U.S. energy options. Two decades ago, domestic oil and natural gas production was stagnating, solar and wind constituted less than one percent of the total energy mix,⁶ and the electric power sector was dependent on coal for 55 percent of generation⁷ compared to 30 percent today.⁸

Yet even with these seismic shifts, other elements remain essentially unchanged: despite rapid growth in renewables, the United States still relies on fossil fuels for the vast majority of its energy; most electricity continues to come from centralized sources; and the transportation sector still is dominated by liquid transportation fuels, with electric vehicles playing a small but growing role in the overall fleet.

Energy in the broader economic context

It is important to reflect upon the ways in which U.S. energy trends and policy priorities are often related to the broader economic context in which they exist. For the first decade of this millennia, the global economy largely was driven by the growth of China and other emerging markets, with nearly a quarter of world GDP growth between 2000 and 2017 directly attributed to the former.⁹ High commodity prices and concern over potential resource scarcity colored the U.S. perspective on its growing import dependence for energy resources like oil and natural gas. Resource scarcity also bolstered the rationale for the development of alternative energy resources such as nuclear power, biofuels, hydrogen, solar, and wind.

In 2008, the global financial crisis, the Great Recession, and a decline in commodity prices created new imperatives to stimulate economic growth and reform those sectors—namely, the financial and housing markets—that posed a systemic threat to the global economy. The pre-crisis period of high prices and incentives for alternative energy, followed by several years of fiscal and economic stimulus, created an environment where renewable energy costs dropped, not only for relatively proven technologies such as wind turbines and solar photovoltaic panels, but also for their more nascent peers, including algae fuels, cellulosic ethanol, solar heat pumps, offshore wind, tidal power, and enhanced geothermal. U.S. unconventional oil and natural gas production, responsible for the largest increments of oil and gas production growth in history for several years in a row, also grew out of this period.

⁴ Energy Information Administration, “Annual Energy Outlook,” Raw Data (2000), <https://www.hsdl.org/?view&did=15936>.

⁵ Energy Information Administration, Annual Energy Outlook with projections to 2050 (Washington, DC: EIA, 2018), <https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf>.

⁶ Energy Information Administration, “Supplement Tables to the Annual Energy Outlook 2002, Table 88 Renewable Energy Capacity, Generation, and Consumption,” Raw Data (2002), <https://www.eia.gov/outlooks/archive/aeo02/supplement/index.html>.

⁷ Ibid.

⁸ Energy Information Administration, “Electricity Data Browser, Net Generation,” Raw Data, <https://www.eia.gov/electricity/data/browser/>.

⁹ Exclusive of Hong Kong SAR and Macao SAR. Source: World Bank, DataBank, Raw Data, <https://databank.worldbank.org/data/reports.aspx?source=2&series=NY.GDP.MKTP.CD&country=>

Together, these energy and economic trends have fundamentally altered the American energy outlook from scarcity to abundance—energy is no longer assumed to be destined to be ever-more expensive and increasingly difficult to deliver but instead more readily available and from a diversified portfolio of sources. Today, the United States and the global economic context have grown more complex. Although the world has grown more prosperous and has seen record numbers of people lifted out of abject poverty, the rise of economic inequality within developed countries has challenged political agendas around the world. In the United States, this concern typically manifests in debates over jobs and wage stagnation. Even with rates of unemployment and GDP growth that are the envy of much of the developed world, economic malaise continues to pervade much of the public discourse, with discouraging long-term growth prospects for unskilled workers and a likely global economic slowdown proving particularly worrying.

Energy, however, has been a source of largely good news for the U.S. economy, with cheap energy prices, an increasingly diverse pool of sources and suppliers, and—until recently—lower greenhouse gas emissions all providing a welcome exception to an otherwise bleak economic outlook. But the overriding atmosphere of economic anxiety has also altered public expectations of the role that energy should play in both the U.S. economy and society writ large. Whether as an input, an end product, or a source of externalities, energy increasingly is expected to serve as a creator of jobs and an enabler of local economic opportunity—a reality that, fair or not, is relevant for public policymakers and energy companies alike.

Energy and economic development

This rings especially true in states and local communities around the country that seek to harness energy resources to create economic opportunity for their respective communities. The role of energy differs throughout the country, however, with a handful of states accounting for the vast majority of each major type of energy production. Six states account for 85 percent of U.S. onshore oil production. Nine states provide 87 percent of onshore natural gas production. Eight states produce 84 percent the nation's coal. Ten states produce 83 percent of the corn and 85 percent of U.S. ethanol. Ten states generate 81 percent of U.S. conventional hydro, and ten states account for 76 percent of wind generation (five of which are geographically co-located).¹⁰ For each of these states, energy represents an important source of investment and job creation, even if it does not account for an overwhelmingly large portion of the state economy or job-base.

Even states without significant basic energy resources seek to create economic opportunity through efforts to create innovation clusters, whose activities can extend far beyond energy. To date many states have created innovation clusters with the goal of attracting investment and creating an innovation ecosystem that will pay technological and economic returns. The literature on these efforts is not encouraging – noting that many innovation clusters fail to deliver the desired outcomes. As Joseph Parilla and Mark Muro of the Brookings Institute note in a forthcoming paper there is a, “gap between the recognition that clusters play an important role in and economy that demands concentration and specialization and the practical ability to develop

¹⁰ Kevin Book. “America’s State-Level Energy Haves and Have Nots,” CSIS, January 2019. https://csis-prod.s3.amazonaws.com/s3fs-public/190128_Book_HavesHaveNots_0.pdf

initiatives that help firms within cluster become more competitive and spur growth.”¹¹ The pair attribute this to hopes being set too high, erroneous targeting of goals, superficial execution or lack of follow through. There are a number of lessons learned from existing innovation cluster strategies that can help inform cluster initiatives going forward. The relative success or failure of various innovation cluster initiatives should serve as a useful guide to federal, state and local policymakers who want to learn from mistakes of the past.

It is also worth noting that regional innovation clusters are not only attractive for economic development reasons but also an important part of the U.S. innovation ecosystem. According to the recent report, *Advancing the Landscape of Clean Energy Innovation*, regional innovation clusters are a big part of why America’s innovation system has been so successful to date. The national laboratories, university systems, and connections to state and local government as well as private industry all serve an important and reinforcing role in fostering a cycle of innovation.

The first takeaway for this Committee is that energy is playing an increasingly important role in how states and regions think about regional economic opportunity. This state-level interest can be an important catalyst for innovation and climate solutions as well as creating the economic opportunity sought by states. Policymakers should pay close attention to how energy development, innovation clusters, worker retraining programs, and energy policies and incentives in general, fulfill or fall short of delivering on expected economic outcomes.

Use global challenges as a guide

In previous hearings, this Committee has heard a true and familiar refrain – innovation is a critical component of the global energy system. Innovation defines the art of the possible when it comes to meeting society’s basic energy needs, and it is at the heart of U.S. economic competitiveness against that backdrop. But innovation is the means to a solution and not a solution in and of itself. Innovation in this context must be harnessed to achieve certain societal goals, and it is in setting those goals that the biggest disagreements often exist.

Countries around the world face a similar challenge – provide affordable and reliable energy services to enable economic growth and societal development, while maintaining a healthy environment. Throughout much of modern history, countries have struggled to achieve this trifecta, often falling short on environmental measures, especially during periods of industrialization, or reliability measures, often due to a variety of economic or security issues. Along the way, innovation and sound public policy have greatly improved countries’ ability to meet these challenges in new and more effective ways.

Currently, the global community is organized around three shared challenges that the United States should continue to prioritize. The first and most daunting, is to decarbonize the world’s energy system as part of a comprehensive strategy to address global climate change. According to the latest assessments conducted by the Intergovernmental Panel on Climate Change (IPCC) and the U.S. government’s own National Climate Assessment (NCA), the impacts of a changing climate are more and more pronounced with each passing day and the world is not on track to

¹¹(forthcoming paper) Joseph Parilla and Mark Muro, “Revisiting Cluster Strategies,” paper prepared for CSIS Workshop on Energy as a Source of Economic Growth and Social Mobility, January 2019.

reduce emissions commensurate with globally stated goals or provide sufficient resources and strategies to adapt to the anticipated changes.¹² There are many potential pathways available to achieve atmospheric stabilization but the world is not currently tracking with any of them.

The second goal is to end energy poverty by providing universal access to modern and sustainable energy services.¹³ Here too the world has seen encouraging progress but is not on track to achieve universal access by 2030. According to the International Energy Agency, the number of people without access to electricity has declined to below 1 billion people for the first time in 2017. The number of people without access to clean cooking facilities has also been declining but still accounts for 2.7 billion people. The challenge is particularly pressing in sub-Saharan Africa where 600 million people (57 percent of the population) have no access to electricity.¹⁴

The third goal is to ensure a resilient and secure energy system. Energy security has long been thought of as freedom from the importation of oil or the provision of energy resources during times of acute scarcity. Modern day energy security is about a great deal more – from assuring reliability of energy supply in energy systems in transition, to providing enhanced resilience to cyber-attacks, to planning for anticipated sea level-rise, severe storms, or forest fires.

The second important takeaway for this Committee is to use agreed upon global goals to drive the relevant conversations around climate change both within your jurisdiction and across committees with whom you work. Too often these three challenges are pitted against one another to suggest that achieving one means neglecting or working against another. While trade-offs do exist, the solutions are not mutually exclusive. Innovation and climate policy should work toward solutions that contribute to achieving all three goals simultaneously and reject the notion that one goal is more important than another.

Innovation and competitiveness

Concern over the decline in U.S. competitiveness in the field of innovation is not a new theme. In 2007, the National Academies of Science, in response to a request from Congress, published “Rising Above the Gathering Storm,” which captures the consensus recommendations from a committee of experts about how the United States should seek to maintain its expertise in field of innovation. Report authors wrote: “Although many people assume that the United States will always be a world leader in science and technology, this may not continue to be the case inasmuch as great minds and ideas exist throughout the world. We fear the abruptness with which a lead in science and technology can be lost-and the difficulty of recovering a lead once lost, if indeed it can be regained at all.”¹⁵

¹² Intergovernmental Panel on Climate Change, “Special Report on Global Warming of 1.5 degrees”, <https://www.ipcc.ch/sr15/> and U.S. Global Change Research Program, Fourth National Climate Assessment

¹³ SDG7

¹⁴ Laura Cozzi and Aaron Koh, “Population without access to electricity falls below 1 billion,” International Energy Agency, October 30, 2018. <https://www.iea.org/newsroom/news/2018/october/population-without-access-to-electricity-falls-below-1-billion.html>

¹⁵ National Academies of Science, Committee on Prospering in the Global Economy of the 21st Century. “Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future.” 2007. Page 3. <https://www.nap.edu/read/11463/chapter/2>

In the intervening decade, maintaining the competitiveness of the U.S. economy, particularly in the area of innovation has been a near constant pre-occupation of policymakers. And yet, it is not clear that the United States is making the kind of unambiguous progress towards maintaining its competitive edge relative to international competitors. Several panelists in earlier hearings correctly attributed this to several factors. The first is the sheer amount of technological changes and rapid pace of innovation both in and outside the energy sector – in areas such as the next phase of the digital revolution, advancements in biotechnology, nano-technology and autonomous systems.¹⁶ Anticipating the ways in which these kind of society transforming technologies will impacting energy-use is exceedingly complicated in no small part because they include major unanswered questions about the human/technology interface and the role of policy and society in shaping the extent of the role they can and should play. For example, smart cities can be greatly enabled by the deployment of sensors, the ability to apply machine learning to manage systems, and the ability to derive valuable systems information from the data collected. This all depends on the willingness of policymakers and people to allow for this level of observation and intervention in their daily lives. It also requires a good deal of trial and error to understand what types of intervention elicit different human responses.

Second, is the growth of innovation as a strategic economic priority for many countries around the world, most pressingly China, and their growing capability to deliver outcomes at higher levels of innovation chain (rather than simply replicating and manufacturing technology). According to a recent report from the Council on Competitiveness, “China’s investment in R&D has more than doubled since 2010, reaching \$451 billion in 2016, second only to the U.S. investment, and set to outpace the United States by the end of this decade. China has overtaken the United States in science and engineering publications. China has an 18.6 percent world share, while the United States has a 17.8 percent share. China has posted double-digit growth rates in international patent filings in every year since 2003, and now lags only the United States in patents filed.”¹⁷

Third, and finally, experts note ongoing shortcomings in the U.S. innovation system that can and should be addressed as another reason for concern over the U.S. competitiveness. According to the Council on Competitiveness, “There are many factors that affect a country’s ability to innovate and compete. This includes levels of investment in R&D, the availability of capital including venture capital to fuel start-ups and innovation at critical stages, the availability of talent, the environment for entrepreneurship, and the general business environment including taxes and the level of business regulation. These elements are different in countries around the world, and can play a significant role in a country’s competitiveness and capacity for innovation.”¹⁸ It should be noted, however, that consistent support at much higher funding levels from Congress and across disparate administrations has been noted as a desirable goal by the

¹⁶ For more fulsome discussion see earlier testimony from Deborah Wince-Smith, President and CEO of the Council on Competitiveness. https://www.energy.senate.gov/public/index/cfm/files/serve?File_id=4DDAD4C6-A45D-4300-B926-C74FF0C6FB49

¹⁷ “2018 Clarion Call, The launch of the National Commission on Innovation and Competitiveness Frontiers,” Council on Competitiveness, <https://www.compete.org/storage/reports/2018%20clarion%20call%20final.pdf> p. 34

¹⁸ Ibid, 30.

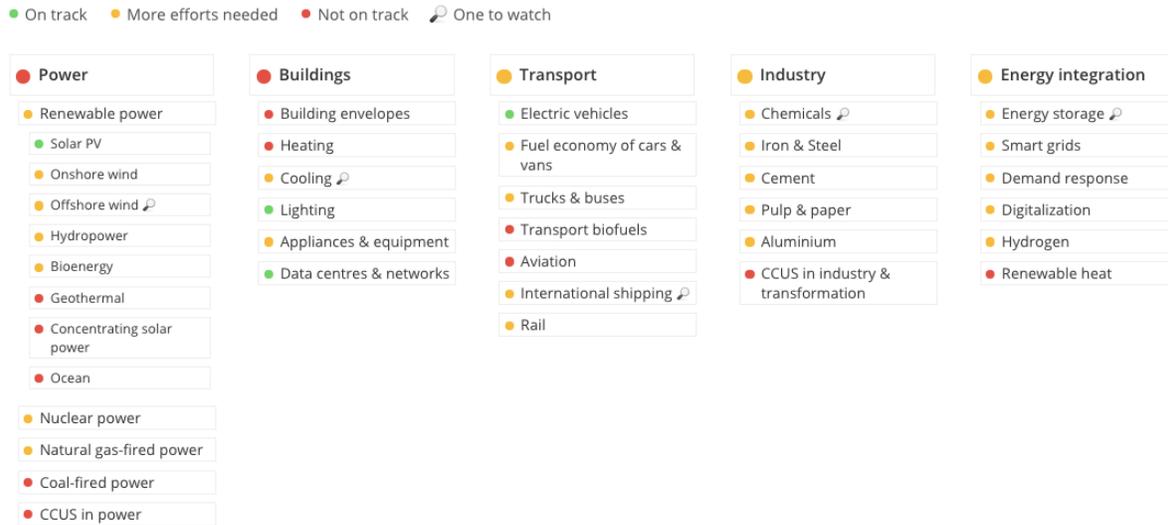
American Energy Innovation Council and, indeed, was that state goal and U.S. commitment as part of Mission Innovation. The recently released study *Advancing the Landscape of Clean Energy Innovation* has a number of ideas about how to organize and better integrate the nation's energy innovation system.

Picking winners

Beyond the concern over spending levels and the innovation process there is a general concern about government “picking winners.” This aversion, echoed in earlier testimony by Secretary Moniz, asserts that the government cannot possibly divine or prescribe innovation outcomes and should therefore avoid backing any one technology over others. This is a sound principle as far as it goes but it also completely divorced from the reality and history of U.S. energy and innovation policy. Through policies and investments, the United States has historically and continues to presently, signal preference for certain fuels and technologies over others. So long as the backing of a particular technology or fuel is done as part of a portfolio of options there is nothing inherently wrong with this approach. This extends all the way from research and development to the deployment phase of various technologies. In a recent report from Senator Rubio on the U.S. response to the Made in China 2025 strategy, he writes, “Nations desire high-value, high-labor content production, and compete for industries and innovations that drive it. In a world of state competition for valuable industries, a domestic policy of neutrality is itself a selection of priority. ‘Not choosing’ is a choice, however it is made. The critical policy consideration, then, is not whether states should organize their economies, but how they should be organized.”¹⁹ This perspective suggests that rather than not choose winners, the U.S. should think much more deliberately about technologies and industries where it wants to be competitive (Senator Rubio suggests high-value and high labor content industries as the priority) and try to create outcomes along those lines. While this seems like a dramatic departure from the laissez-faire attitude typically ascribed to U.S. economic and innovation policy, it is, in reality, a call for a more concerted focus on the structure of the U.S. economy, the priorities we should have for our own growth and competitiveness, and a more deliberate conversation about how we propose to achieve those outcomes.

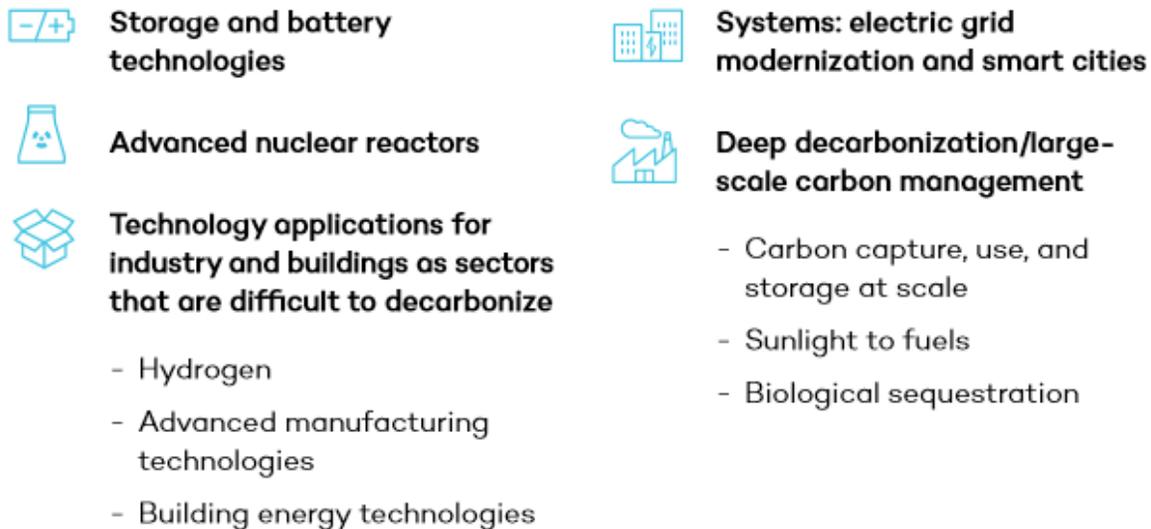
In the energy sector, deciding on a portfolio of priority technologies is actually not terribly hard to do as there is widespread agreement among experts about the suite of technologies that are necessary for decarbonizing the energy system. What exact mix of fuels and technologies will ultimately be deployed is not as certain, nor should it be entirely preordained. The International Energy Agency offers a useful assessment of “where technologies are today and where they need to be according to the IEA’s Sustainable Development Scenario.” According to this analysis, of the 38 technologies required to meet this scenario (i.e. to “meet the Paris climate goal of well below 2 degrees C, deliver universal energy access and significantly lower air pollution”) the world is currently on track to make the required progress on four of them – solar PVs, LEDs, data centers and networks, and EVs. The world is not on track to meet eleven of the technology goals and is making progress but in need of more effort on the remaining twenty-three (see below).

¹⁹ “Made in China 2025 and the Future of American Industry,” U.S. Senate Committee on Small Business and Entrepreneurship, February 12, 2019. <https://www.rubio.senate.gov/public/cache/files/0acec42a-d4a8-43bd-8608-a3482371f494/262B39A37119D9DCFE023B907F54BF03.02.12.19-final-sbc-project-mic-2025-report.pdf>



Source: <https://www.iea.org/tcep/>

This suite of technologies is not vastly different from the “technologies with breakthrough potential” put forth in the *Advancing the Landscape for Clean Energy Innovation* report. The IEA technology tracker list combines existing energy technologies and resources as well as efforts to improve the cost and performance of next generation or more advanced versions of existing technologies. The “technologies with breakthrough potential” list below prioritizes technologies across a range of criteria that make them ripe for a breakthrough meaning technological advancement that could lead to widespread deployment.



Source: *Advancing the Landscape for Clean Energy Innovation*

The disagreements arise when it comes to determining the relative merit of each technology as a solution. In practice, policymakers, investors, scientists, and private companies all have a complex array of incentives that lead them to prefer one technological solution over another.

These preferences are not, in and of themselves, a problem and can lead to a healthy competitive environment for technological advancements and added incentives to ensure deployment. It is a problem, however, when preference for one fuel or technology leads to support for only that fuel or technology on a widespread basis or to the detriment of other technologies or solutions. One way of mitigating this outcome within the federal R&D portfolio is to ensure that technological progress is based on performance metrics.

The third important takeaway for the Committee is that an all of the above energy strategy has become a cliché for muddling along without making decisions. We need an “all-in” on all of the above strategy where we commit to devise strategies to make every resource compatible with the needs of a 21st century energy environment – low carbon, cost-competitive, and secure. This can also include more deliberately creating an industrial strategy around certain technologies where we want to compete for a host of climate, competitiveness, security or economic reasons.

Moderate climate policy need not be mediocre

Recent reports on climate change present a stark reality. The impacts of a warming climate are becoming more frequent and severe, as the science suggested they would. Moreover, as a society, we are not preparing to address those present-day challenges much less stave off the worst impacts projected on the horizon.

Some argue such alarming news requires a drastic response; anything less simply will not rise to the level of the challenge. Others argue that a dramatic approach is impractical and implausible given the cost and lack of political will. Still others are so skeptical of the cost of action, the severity of the problem, or society’s ability to collectively solve the problem, that they see all but a few climate-related policies or investment as throwing good money after bad.

Proposed climate strategies ranging from “do nothing” to “change everything” reveal how polarized the federal government is on this issue. The American public is not nearly as polarized. Though disagreements do exist across party lines and relative to various solutions, there is widespread agreement that climate change is occurring and that it is a problem.²⁰ There is also increasing recognition that there are real and tangible benefits to addressing it. The disagreements are, as you well know, about the right policies and approaches. Investing in technological innovation alone is not likely to deliver enough emissions reduction on time to make a meaningful contribution to the solution. The policy environment plays an important role in shaping and expediting the transition to a net-zero emissions future.

A moderate approach to addressing climate change should seek to make progress where progress can be made and build support for additional policies as confidence grows in our ability to navigate towards a net-zero carbon world. To do this, moderate climate policy should pick from policies that a) have a proven track record of working and b) have the best chance of finding broad-based support. A moderate path forward should include both efforts to reduce emissions

²⁰ Abel Gustafson, Parrish Bergquist, Anthony Lesierowitz, and Edward Malabach, “A Growing Majority of Americans Think Global Warming is Happening and are Worried,” Yale Program on Climate Change Communications, February 21, 2019, <http://climatecommunication.yale.edu/publications/a-growing-majority-of-americans-think-global-warming-is-happening-and-are-worried/>.

and build resilience and the ability to adapt to a changing climate. Here existing federal policy and state examples can serve as a guide for reform of existing policies or new policy implementation.

Clean Energy Standard

For example, 29 states, the District of Columbia and 3 territories have mandatory renewable portfolio standards. In addition, eight states and one territory have voluntary renewable portfolio standards. The scope and scale of the various RPS programs differ from state to state and several of these states have updated or are in the process of updating them.²¹ According to one study, nearly half of the renewable power generation capacity built in the United States since 2000 is associated with a renewable portfolio standard. And while the impact of renewable portfolio standards on market outcomes has diminished in recent years, they still play an important role in certain regional markets where they support between 70-90 percent of the new capacity additions.²² In addition, at least four states have adopted zero emissions credit programs to support existing nuclear generation.²³ One idea to build on this state-level momentum is to introduce some sort of national clean energy standard (CES). According to one recent study conducted by Resources for the Future, a clean energy standard, “typically refers to a technology-neutral portfolio standard that requires that a certain percentage of utility sales be met through ‘clean’ zero – or low-carbon resources such as renewables, nuclear energy, coal or natural gas fitted with carbon capture, and other technologies.”²⁴ Increasing the number of technologies in competition to reduce emissions can lower costs. The RFF analysis finds that, “a technology neutral CES coupled with a more stringent target could therefore result in both higher emissions reduction and lower costs relative to a traditional RPS.”

The idea of a Clean Energy Standard is not new for this committee. In 2012, Senator Jeff Bingaman introduced the *Clean Energy Standard Act of 2012*. Two years before him, Senator Lindsey Graham sponsored the *Clean Energy Standard Act of 2010*. As states continue to consider the next round of RPS and think about the broader decarbonization challenges for their respective, and shared, electric power sectors, discussion of a national clean energy standard could make sense.

Enhanced Energy Efficiency

Energy efficiency improvements have played an important role in reducing U.S. energy consumption and emissions and increasing energy productivity. Going forward, energy efficiency is estimated to account for well over a third of the cost-efficiency emissions reduction strategies that cut across all aspects of the energy sector. This Committee has worked hard to make sure the often-overlooked focus on energy efficiency is an ongoing priority of the federal government. It goes without saying that efforts to roll back efficiency measures, particularly in the area of vehicle efficiency, threaten to do long-term damage to the competitiveness of U.S. industry. Countries around the world are demanding ever more efficient technologies to help

²¹ National Conference of State Legislatures, “2018 Energy Trends Across State Legislatures,” March 2019. http://www.ncsl.org/Portals/1/Documents/energy/2018_energy_trends_33331.pdf

²² Galen Barbose. “U.S. Renewables Portfolio Standards 2017 Annual Status Report,” Lawrence Berkeley National Laboratory. <http://eta-publications.lbl.gov/sites/default/files/2017-annual-rps-summary-report.pdf>

²³ National Conference of State Legislatures, “State Action in Support of Nuclear Generation,” January 26, 2017.

²⁴ Kathryn Cleary, Karen Palmer, and Kevin Rennert, “Clean Energy Standards,” Issue Brief 19-01, Resources for the Future, January 2019. <https://www.rff.org/publications/issue-briefs/clean-energy-standards/>

curb energy consumption, local pollution concerns, and greenhouse gas emissions. In addition to supporting robust energy efficiency standards in the regulatory process, Congress can continue to fund the energy efficiency research and development priorities at the Department of Energy, supporting regular updates of existing standards, and supporting pilot and demonstration projects for new energy efficiency solutions. In the area of tax policy, tax incentives for energy efficiency measures such as retrofitting existing home and commercial buildings, homeowner purchases of high-efficiency equipment or electric vehicles are all areas to explore. Also, to the extent that this Congress pursues infrastructure related investments, there is an enormous opportunity to embed energy efficient codes and standards, life-cycle cost accounting for projects, and investment in smart energy infrastructure that can increase energy efficiency across a range of sectors.

The fourth and final takeaway for this Committee is that moderate climate policy does not have to be mediocre. These are just two examples of places where moderate federal climate policy could make a difference. The key is to use policy and regulatory mechanisms that people recognize, trust and use, but be ambitious about their targets and implementation. There will be ongoing efforts to build support for economy-wide strategies, which will be necessary to reach deep decarbonization, but these policy pathways, along with others, can play a critical role in making notable progress right now.

Embrace the Green New Deal for what it offers

Finally, a great deal of air time has been given to the House and Senate resolution calling for a Green New Deal (GND). Regardless of one's opinion of that particular approach, the concept provides a number of important elements. First, it is appropriately scaled to the challenge at hand. Second, it strikes the right tone in terms of urgency. Third, it seeks to engage a group of people who feel particularly vulnerable to the changes in our economy and the impacts of climate change. What the plan lacks is a strategy for broad based engagement. As you proceed with your efforts to find bipartisan consensus on a viable and adequate path forward to address climate change, there are many ways to productively work with the sentiments put forth in that resolution. In a previous publication I suggested three:

Make it a rallying cry, not a purity test

Very soon after the GND started attracting attention, a group of environmental organizations submitted a letter outlining the types of energy that would be acceptable under the context of a GND, notably leaving out nuclear and carbon capture and sequestration.²⁵ They also noted that a carbon tax or cap and trade program should not have a role in the GND policy framework. All of this is unnecessary and counterproductive. For starters, it puts the oil, natural gas, and coal producing communities on the opposing side of this deal from the outset, and if a just transition for those communities is really a priority, they will need to be on board. Moreover, even if supporters of a GND are one hundred percent certain that wind, solar, and hydro are superior low carbon sources of energy, they could be wrong about whether scaling them to 100 percent of the energy system is possible or desirable from a public policy standpoint. Creating this kind of purity text benchmarks on technology or policy solutions will unnecessarily limit the scope of participation and support for the concept. A GND should set outcome related benchmarks about

²⁵ https://www.eenews.net/assets/2019/01/10/document_daily_02.pdf

greenhouse gas emissions and other factors but avoid being overly prescriptive about the type of solutions that can get us there. The resolution introduced by Senator Markey (D-MA) and Representative Ocasio-Cortez (D-NY) leaves room for debate on these issues, and that will be important.²⁶

Expand the base of support and grow potential avenues of execution

The GND resolution is short on details relative to its scope, and that's a good thing because a lot of discussion should still take place. Much of that discussion need not take place only in Washington. Many of the most important policies and regulation affecting the energy sector today happen at the state level. Local and regional discussions about this concept may show areas of agreement or policy approaches that go against the "conventional wisdom" in Washington.

The GND is also, by and large, a platform that speaks in progressive terms. This is fine in principle, but in order to win over non-progressive constituencies, it would be good to articulate its ultimate goals in terms that other political and ideological persuasions can engage. Several pillars of the GND, oftentimes expressed in different terms, can take on centrist and even conservative forms. It is worth noting several recent polls indicate that certain policies designed to address income inequality, such as higher marginal taxes on the wealthy or wage assistance programs, have more support among the general public than previously appreciated. Recognition of the present-day impacts of climate change is also increasing and is likely to only continue to rise in the coming years, and, as a Brookings Institution analysis of Climate Impact Lab data recently pointed out, many of the places hardest hit in the United States are traditionally conservative states.²⁷ Finally, infrastructure investment is overwhelmingly popular around the country and a huge part of the GND framework.²⁸ So, while there may be disagreements on the policy mechanisms, many of the plan's pillars already share widespread support. There are many pathways to achieving these goals, and it's worth exploring them in earnest.

Make it a global deal

Many of the issues raised in the GND look like the sustainable and inclusive growth agenda that has emerged in recent years from the International Monetary Fund (IMF). As outlined in a new book by several IMF staff, inclusive growth can occur not at the expense of overall growth, but in support of a more durable kind of economic growth.²⁹ Many countries around the world could benefit from policies designed to make economies more durable and would pay a negligible or no price for doing so under the right policy design. The GND framework could also spark a much-needed discussion about how to accomplish the goals of decarbonization without harming those who can least afford or would be most impacted by this transition.

Many of the United States' traditional allies and even our strategic competitors, might appreciate U.S. leadership along these lines. Rather than simply looking out for U.S. interests, a global green new deal can be a way for governments to refresh the international system that has brought

²⁶ <https://assets.documentcloud.org/documents/5729033/Green-New-Deal-FINAL.pdf>

²⁷ <https://www.brookings.edu/research/how-the-geography-of-climate-damage-could-make-the-politics-less-polarizing/>

²⁸ <https://news.gallup.com/poll/226961/news-public-backs-infrastructure-spending.aspx>

²⁹ <https://cup.columbia.edu/book/confronting-inequality/9780231174695>

benefits to so many but needs to remedy some of the issues that have gone unaddressed and are at the core of the governance difficulties being faced by many countries. It also provides a new lens through which to discuss the tensions over global competitiveness among countries that have arisen during this period of rapid economic, technological, and geopolitical change.

The most appropriate policy outcomes may differ by country (just as they may differ in the United States by state), but the idea of preparing for and making the transition as part of a new and more durable growth path is a decent starting point for discussion that broadly supports but also potentially reanimates the global discussion regarding sustainable development goals. Which raises the point, why would the GND, if it is just a platform for discussion of ideas, be any more effective than previous discussions on this topic? The answer is, it might not. But, as the world enters the post-post-great recession recovery period and thinks about how to prepare for the inevitable economic challenges of the future, address the populist unrest brought about by economic and social anxiety, and take a more ambitious posture vis-à-vis the global climate crisis, it provides the component pieces of a path forward.