COMMITTEE ON
ENERGY & COMMERCE
CHAIRMAN FRANK PALLONE, JR.

MEMORANDUM

February 1, 2019

To: Subcommittee on Environment and Climate Change Members and Staff

Fr: Committee on Energy and Commerce Staff

Re: Hearing on "Time for Action: Addressing the Environmental & Economic Effects of Climate Change"

On **Wednesday, February 6, 2019, at 10:00 a.m. in room 2123 of the Rayburn House Office Building**, the Subcommittee on Environment and Climate Change will hold a hearing entitled, "Time for Action: Addressing the Environmental & Economic Effects of Climate Change."

I. BACKGROUND

On November 23, 2018, the U.S. Global Change Research Program released its Fourth National Climate Assessment (NCA) detailing the widespread impacts of climate change across all parts of the United States. The NCA warned that, in the absence of climate action, average global temperatures could rise by at least three degrees Celsius (°C) by 2100, prompting sea levels to rise by as much as four feet by that year. According to the assessment, Americans are already experiencing increased frequency and intensity of extreme weather, heat waves, wildfires, and flooding due to climate change. The NCA also shows that inaction will lead to significant economic and other damages. By 2090, lost wages will reach $155 billion, mortality from extreme temperatures will surpass $140 billion, and coastal property damage will approach $120 billion. All told, the U.S. economy could lose more than ten percent of its GDP under the worst-case scenario.[1]

The NCA stated, in no uncertain terms, that greenhouse gas (GHG) "emissions from human activities are the only factors that can account for the observed warming over the last century; there are no credible alternative human or natural explanations supported by the observational evidence."[2] That conclusion came on the heels of the Intergovernmental Panel on Climate Change's (IPCC) *Special Report on Global Warming of 1.5°C*, released in October 2018, which highlighted the difference between limiting warming to 1.5°C versus 2°C (the target range set under the Paris Agreement), including substantial extreme heat increases, habitat loss,

[1] U.S. Global Change Research Program, *Fourth National Climate Assessment* (Nov. 2018).

[2] *Id.* at 39-40.

permafrost thawing, and fisheries decline.[3] The IPCC report warned that there are just 12 years to act to avoid passing the 1.5-degree threshold, during which countries will have to make "rapid, far-reaching and unprecedented changes in all aspects of society."[4]

Meanwhile, nine of the top ten hottest years on record have occurred since 2005, and 2018 is on track to rank fourth on that list.[5] As a result, glaciers, which provide drinking water for millions of people, are melting at alarming rates and approaching a "tipping point."[6] Similarly, oceans – which absorb 93 percent of GHG emissions and provide a key buffer against climate change – are warming as much as 40 percent faster than previously thought. Warming oceans drive increased rainfall, sea level rise, coral reef bleaching, and melting of ice sheets, caps, and glaciers.[7]

Against this dire backdrop, emissions continue to rise in the U.S. and in other nations. In 2018, global emissions increased 2.7 percent over the previous year – a rate scientists described as a "speeding freight train."[8] In the United States, carbon dioxide (CO_2) emissions rose by 3.4 percent in 2018, marking the largest increase in eight years.[9] This latest increase contrasts sharply with the goal of reducing U.S. emissions by 1.2 percent annually through 2020, as described in the U.S. Nationally Determined Contribution submitted under the Paris Agreement.[10] The U.S. Energy Information Administration (EIA) projects that energy-related

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[3] Intergovernmental Panel on Climate Change, *Special Report on Global Warming of 1.5°C* (Oct. 2018).

[4] Intergovernmental Panel on Climate Change, Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments (www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments) (Oct. 8, 2018).

[5] National Oceanic and Atmospheric Administration, Global Climate Report – November 2018 Global Annual Temperature Rankings Outlook (www.ncdc.noaa.gov/sotc/global/201811/supplemental/page-2) (Dec. 2019).

[6] *Greenland's Melting Ice Nears a 'Tipping Point,' Scientists Say*, The New York Times (Jan. 21, 2019). Michael Bevis et al., *Accelerating changes in ice mass within Greenland, and the ice sheet's sensitivity to atmospheric forcing*, Proceedings of the National Academies of Science (Jan. 22, 2019).

[7] B. Menounos et al., *Heterogeneous Changes in Western North American Glaciers Linked to Decadal Variability in Zonal Wind Strength*, Geophysical Research Letters (Dec. 13, 2018).

[8] Corinne Le Quéré et al., *Global Carbon Budget 2018*, Earth System Science Data (Dec. 5, 2018). *Greenhouse Gas Emissions Accelerate Like a 'Speeding Freight Train' in 2018*, The New York Times (Dec. 5, 2018).

[9] Rhodium Group, *Preliminary US Emissions Estimates for 2018* (Jan. 8, 2019).

[10] The White House Archives, FACT SHEET: U.S. Reports its 2025 Emissions Target to the UNFCCC (obamawhitehouse.archives.gov/the-press-office/2015/03/31/fact-sheet-us-reports-its-2025-emissions-target-unfccc) (Mar. 31, 2015).

CO_2 emissions will decrease just 16.2 percent below 2005 levels by 2050.[11] This falls far short of the 80 percent emissions cut below 2005 levels by 2050, as outlined in the Obama Administration's Mid-Century Strategy for Deep Decarbonization.[12]

II. MITIGATION

The United States can take a broad spectrum of actions to reduce GHG pollution that is driving climate change. Mitigation measures can be applied on an economy-wide basis, sector-specific basis, or in combination.

Two of the most common economy-wide mitigation methods are market mechanisms designed to reduce emissions by setting a price on carbon, either by establishing a cap-and-trade system or instituting a carbon tax.

Cap-and-trade is a market mechanism that has been used successfully to reduce pollutant emissions from power plants in the United States and abroad. Cap-and-trade systems create financial incentives for heavy polluters to reduce emissions by setting an overall emissions cap from covered facilities and making available a fixed number of allowances that covered facilities then buy and sell. Facilities with emissions below the cap may sell allowances to ones that exceed the limit. In the United States, nine states participate in the Regional Greenhouse Gas Initiative (RGGI) cap-and-trade system in the Northeast (two others, Virginia and New Jersey, have announced plans to enter or reenter). To date, RGGI has reduced regional CO_2 emissions by 6.4 million short tons and saved consumers $1.7 billion in lifetime energy costs.[13] Public health benefits may be even higher, with one estimate suggesting that RGGI has provided at least $5.7 billion in health savings and related benefits.[14] Likewise, California has operated its own cap-and-trade system since 2012. Beginning in 2014, California linked its program with Quebec's cap-and-trade system to create an international emissions trading network.

In its most common form, a carbon tax (or fee) imposes a gradually escalating price on each ton of carbon. Policy design determines whether the tax is assessed upstream on the producer or downstream on the end-user. Revenues from a carbon tax could be used in a variety of ways, such as funding investments in clean energy, efficiency, carbon sequestration, or returned as "dividends" to consumers. Various tax proposals have been proposed in the United States, but none have been adopted at the state or federal level. Several countries and regions have experimented with carbon taxes, including Switzerland and British Columbia.

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[11] U.S. Energy Information Administration, *Annual Energy Outlook 2019* (Jan. 24, 2019).

[12] The White House Archives, *United States Mid-Century Strategy for Deep Decarbonization* (Nov. 16, 2016) (obamawhitehouse.archives.gov/sites/default/files/docs/mid_century_strategy_report-final.pdf).

[13] Regional Greenhouse Gas Initiative (RGGI), Investment of Proceeds (www.rggi.org/investments/proceeds-investments) (accessed Jan. 27, 2019).

[14] Abt Associates, *Analysis of the Public Health Impacts of the Regional Greenhouse Gas Initiative* (Jan. 11, 2017).

There are also policy options to reduce emissions from specific sectors of the economy. The Environmental Protection Agency tracks U.S. GHG emissions for five economic sectors: transportation; electricity; industry; commercial and residential; and agriculture.

The transportation sector is now the largest source of U.S. GHG emissions, and is expected to drive emissions increases in the coming years. Examples of emissions reduction measures for this sector include strengthening vehicle fuel economy standards; incentivizing low- or zero-emissions vehicles; switching to alternative fuels (e.g. biofuels or hydrogen); or reducing vehicle miles traveled through expanded use of public transit and inter-city transit (e.g. high-speed rail).

The electricity sector is the second largest source of U.S. GHG emissions. Mitigation measures in this sector include improving existing power plant efficiency; grid modernization; fuel-switching from coal and natural gas to carbon-free sources of energy; and deployment of carbon capture, utilization, and storage at coal- and gas-fired power plants. In addition, thirty-seven states (plus the District of Columbia) have introduced renewable portfolio standards or renewable portfolio goals, which mandate a minimum share of electricity generation come from renewables. Hawaii, California, and the District of Columbia have adopted targets for 100 percent renewable energy.[15]

Heavy industry and manufacturing account for roughly one-fifth of domestic GHG emissions. Mitigation opportunities include energy efficiency improvements for industrial equipment; switching to low- or zero-carbon fuels for onsite power generation; and use of process heat or onsite combined heat and power (in which heat generated from power generation is used to produce additional electricity) to improve overall fuel efficiency.

Similarly, building design and end-use appliance efficiency improvements can reduce emissions from residential and commercial properties. Efficiency measures and advanced materials can reduce the overall amount of energy needed for heating, cooling, lighting, refrigeration and other end-uses.

Land can either release GHGs or sequester them, depending upon usage. Agricultural practices related to livestock and crop production result in emissions. Forested lands in the United States remove more CO_2 from the atmosphere than they emit. Some land management practices can enhance sequestration. Such practices include reducing land-clearing and deforestation, expanding afforestation (creating a forest where one previously did not exist), and reforestation. Additionally, measures to improve livestock, crop, and soil management play an important part in climate mitigation.

[15] Database of State Incentives for Renewables & Efficiency, *Renewable Portfolio Standard Policies* (ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2018/10/Renewable-Portfolio-Standards-2018.pdf) (Oct. 2018).

III. ADAPTATION AND RESILIENCY

While mitigation is key to avoiding some of the worse effects of climate change, the United States must also take steps to adapt to current and anticipated effects. GHGs remain in the atmosphere for decades or centuries, creating a time lag between when they are emitted and when their consequences are felt. Adaptation enables people to respond to hazards stemming from increased temperatures, sea level rise, extreme weather, drought, and food insecurity.[16]

Different regions will experience climate change in different ways. Adaptation measures must be tailored to the specific, localized needs of communities, regions, and nations. Resiliency is central to climate adaptation, and the design and development of resilient infrastructure can be a major driver of job growth. Communities must not only reduce their vulnerability to climate change effects, but they must bolster their capacity to respond to them.[17] Coastal and other flood-prone regions, for instance, are finding ways to protect residents and infrastructure from increased flooding.[18]

Rising temperatures will also place new stress on drier parts of the country, including those prone to heat waves and drought. Adaptive measures to protect water supplies are central to safeguarding human health and well-being, as well as agricultural productivity. Likewise, changes to the management of forests, fisheries, and ecosystems can insulate people, infrastructure, and habitats from the worst impacts of climate change.

Despite growing recognition that adaption is critical to climate action, the NCA warned that "the scale of adaptation implementation for some effects and locations seems incommensurate with the projected scale of climate threats."[19] Furthermore, adaptation efforts have mostly focused on near-term impacts – even though the financial benefits of adaptation exceed the costs in both the short- and long-term. Greater emphasis on long-term adaptation planning will require coordinated action at the local, national, and international levels since climate change poses substantial cross-border risks (including impacts on food security, ecosystems, and marine biodiversity).[20]

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[16] NASA, Responding to Climate Change (climate.nasa.gov/solutions/adaptation-mitigation) (Dec. 13, 2018).

[17] *See* note 1 at Chapter 28.

[18] *See, e.g.*, New York City Mayor's Office of Recovery and Resilience, *Climate Resiliency Design Guidelines* (Apr. 2018) (www1.nyc.gov/assets/orr/pdf/NYC_Climate_Resiliency_Design_Guidelines_v2-0.pdf) (These guidelines, developed in response to Superstorm Sandy, offer sweeping guidance to enhance resiliency and adapt new and existing buildings and infrastructure to a changing climate).

[19] *See* note 1 at Chapter 28.

[20] Intergovernmental Panel on Climate Change, *Climate Change 2014: Impacts, Adaptation, and Vulnerability – Summary for Policymakers* (Mar. 2014).

IV. CLIMATE AND ENVIRONMENTAL JUSTICE

The U.S. Climate and Health Assessment, released in 2016, found that all Americans are vulnerable to health-related impacts of climate change. Yet, certain groups are disproportionately at risk, including people of color, low-income communities, indigenous people, people whose first language is not English, older adults, individuals with disabilities, and immigrants. People in those groups face increased risk factors that limit their ability to prepare for or respond to climate change, including having limited access to healthcare services, reduced capacity to relocate or rebuild after disaster, and living in areas especially vulnerable to climate change.[21] A changing climate may, therefore, exacerbate health concerns within vulnerable populations.

[21] U.S. Environmental Protection Agency, *Climate Change, Health, and Environmental Justice* (May 2016) (19january2017snapshot.epa.gov/sites/production/files/2016-06/documents/ej-health-climate-change.pdf). U.S. Global Change Research Program, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (Apr. 2016) (health2016.globalchange.gov).