United States: GHG Policies, Directions, and Opportunities

Where Are We?

The United States of America\(^1\) is a party to the Paris Agreement of 2015. As part of this agreement, the United States (U.S.) established a nationally determined contribution (NDC) to reduce economy-wide greenhouse gas (GHG) emissions by 26 to 28 percent relative to 2005 emissions by the year 2025. Between 2005 and 2016, U.S. GHG emissions declined by 12 percent from 6,589 MtCO\(_2\)-e to 5,794 MtCO\(_2\)-e in 2016. Increases in population and economic growth have been more than offset by improvements in GHG emissions intensity.

However, on June 1, 2017, the President of the United States announced that the United States would withdraw from the Paris Agreement. Article 28 of the Paris Agreement governs withdrawals by Parties. It prescribes a 4-year withdrawal period. The United States would therefore be withdrawn from the Paris Agreement on November 4, 2020. In the period after June 1, 2017 climate measures that had been put in place at the federal government level, such as the Clean Power Plan and fuel economy standards, have been or are in the process of being weakened. On the other hand, the Bipartisan Budget Act of 2018 contains a provision that amends the federal tax code called, 45Q. The new 45Q regulation provides for a $35/ton CO\(_2\) for CO\(_2\) employed of CO\(_2\) captured by large point-source emitting facilities for enhanced oil recovery (EOR) and $50/ton CO\(_2\) for capture and saline storage. All large point-source emitters are eligible to participate.

The recently released report, *Fulfilling America’s Pledge: How States, Cities and Businesses Are Leading the United States to a Low-Carbon Future* (Bloomberg Philanthropies, 2018) describes continuing actions occurring at state and local scales in the United States and within the private sector. Examples of such climate actions include: the California Clean Energy Bill of 2018 (expected to pass), California Assembly Bill 32 (AB32)—California Cap and Trade System, California Advanced Clean Cars Program (e.g. the Zero Emissions Vehicle program), California Global Warming Solutions Act of 2006 (SB32), multiple state renewable portfolio standards, state land-use programs to enhance soil and other terrestrial system carbon, Northeast Regional Greenhouse Gas Initiative (REGGI), and state motor fuels taxes. The report found that while current policies and measures at the states, cities, and the private sector will reduce U.S. GHG emissions from 2015 levels, current policy measures would need to be augmented to achieve the U.S. NDC as originally registered (Figure 1).

![Figure 1. Contributions of various state, city, and business actions toward the U.S. NDC. Source: Bloomberg Philanthropies, 2018.](https://themasites.pbl.nl/commit/)

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Where do we want to go?
The present United States official federal government position is that it has no long-term goal for emissions mitigation and favours policies that would increase the use of coal and other fossil fuels. However, the Bipartisan Budget Act of 2018 contains a provision that amends the federal tax code called, 45Q, so as to encourage deployment of CO₂ capture and storage (CCS) technology. Prior to 2017, the United States developed a mid-century strategy (MCS) to achieve 80 percent reduction in economy-wide GHG emissions relative to 2005 by 2050 (The White House, 2016). This results in cumulative CO₂ emissions of about 120 GtCO₂ during the period from 2010 to 2050. This budget is consistent with the range projected by a number of global models for cost-optimal scenarios assuming a global carbon budget of 1000 GtCO₂ considered equivalent to likely below 2°C increase in global mean temperature. We consider this as the benchmark low-carbon scenario for our analysis in this factsheet (Figure 2).

![Bar graphs showing energy system transformation towards decarbonisation](image)

Figure 2: Energy system transformation towards decarbonisation (key transition indicators). Numbers in graph indicate change between 2015 and 2050 (intensity indicators: %, share indicators: percentage points, pp).
Source: GCAM model, low-carbon scenario.

How do we get there?
The mid-century low-carbon strategy articulated by the previous U.S. government engaged all sectors of the economy in the process of deep decarbonisation. That strategy envisioned a wide range of technology development pathways towards the target of 80% reduction in economy-wide GHG emissions.

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Figure 3. Greenhouse gas emissions in 2015 and by 2050 in the reference scenario (NDC), emission reductions between the reference and low-carbon scenarios by sector (energy supply, industry, residential and commercial buildings, transport, non-energy CO₂), and 2050 emissions in the low-carbon scenario (consistent with 2 °C). Non-energy CO₂ includes emissions from AFOLU and industrial processes. Source: GCAM model.

All pathways employed a six-part strategy:

1. **Employ energy efficiency as much as economical**: Energy efficiency improvements in all energy demand sectors provide a means of continuing to deliver the energy services for a high quality of life, while reducing the need for energy. That in turn means that emissions-producing capital investments that might otherwise have been needed to provide energy services are never built, saving both near-term and long-term emissions.

2. **Decarbonise power generation**: The power sector has multiple options to serve the demand for electricity using low- or zero-carbon technologies including fossil fuel with CCS, renewable power, nuclear power, bioenergy, and bioenergy with CCS (BECCS). Emissions reductions in power generation can change rapidly at the margins, that is, in new investment decisions. However, existing fossil fuel plants and equipment can continue to operate as long as they can continue to cover their operating costs. BECCS is a particularly important technology option as it provides a pathway to generate net negative emissions, offsetting hard to reduce residual emissions by using renewable bioenergy and storing the carbon in permanent repositories. BECCS can allow the power sector to produce net negative carbon emissions. As the power sector decarbonises, the electricity use in end-use sectors (heating, cooking, mobility, industries) becomes an increasingly powerful means to reduce overall emissions.

3. **Electrify Buildings and Industry as much as economically feasible**: Electrification has been a long-standing trend in buildings and industry. This is particularly true in developed economies. Appliances, lighting, refrigeration, air conditioning and other services are already provided primarily by electricity. Heating and cooking remain sectors into which electricity has not become dominant. Electricity continues to make its way into industrial applications. Motors and direct electric services such as in aluminium manufacture have already electrified. Other major energy uses such as raising steam and direct process heat remain dominated by fossil fuels. They offer potential new electricity markets, but would benefit from technology innovation that favoured electric power. The refining sector can play an important role in an economy that uses significant bioenergy resources for energy. Since end-use bioenergy typically needs a higher carbon-energy ratio than exists in the bioenergy feedstock, the capture of the residual carbon and sequestering it in a permanent repository offers the industrial sector an important pathway to produce negative emissions through BECCS.
4. **Decarbonise transport as much as economically feasible**: The transport sector is one of the most difficult sectors to decarbonise. The fossil fuel based internal combustion engine has proved a highly cost-effective method for delivering mobility services. Carbon taxes have only a modest impact on the cost of delivering mobility due to the high capital intensity of the sector. Three potential pathways for decarbonising transport are use of electric passenger and freight vehicles, substitution of bio-derived fuels for fossil fuels, and the use of hydrogen derived from non-emitting sources (especially in transport segments that cannot be easily electrified). Any or some combination of these three fuels could be used to decarbonise the transport sector.

5. **Halt deforestation, employ strategies that will reduce the need to deforest**: Land-use change emissions are frequently overlooked in discussions of deep decarbonisation. Yet, as the energy sector decarbonises, land-use becomes increasingly important and can come to dominate residual emissions by 2050. Land-use policies can limit and even reverse emissions. Afforestation is an important negative emission pathway. Other opportunities include more efficient application of fertilisers, enhancing soil carbon, and increasing crop yields, which reduce the demand for land and the need to deforest.

6. **Reduce non-CO₂ GHG emissions**: There are abundant opportunities to reduce non-CO₂ GHG emissions. For example, methane emissions from pipeline losses can be reduced by better monitoring, land-fill emissions can be harvested, nitrous oxide emissions can be reduced using targeted fertiliser application and lower GWP gases can be substituted for high GWP gases.

Net negative emissions were an important component of most low-carbon pathways, though some pathways used afforestation primarily, while others used CO₂ removal technologies such as BECCS. The availability of CO₂ removal technologies was an important determinant of the pace of decarbonisation needed by the energy sector.

The role of state-level climate policies and success stories towards decarbonisation

The United States is a complex economy. Its energy system and land use are governed by federal, state and local governments. While the federal government has expressed its intention to leave the Paris Agreement by 2020, many state and local governments have implemented policies and measures designed to improve energy efficiency, encourage renewable energy supply, and reduce greenhouse gas (GHG) emissions.

California has one of the most aggressive GHG emissions limitation programs in the United States. The California Clean Energy Bill of 2018 sets the goal of 100 percent clean energy by 2045. This is the latest in a series of California laws that include the California Assembly Bill 32 (AB32) (which establishes the California Cap and Trade System), the California Advanced Clean Cars Program (e.g. the zero-emissions vehicle program), and the California Global Warming Solutions Act of 2006 (SB32).

Furthermore, the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont in the northeast of the United States created the Regional Greenhouse Gas Initiative (REGGI), which is a mandatory GHG emissions trading market designed to cap and reduce emissions from power generation. The emissions cap declines from 2005 levels at 2.5 percent per year. Buttressed by renewable portfolio standards in individual states and improved energy efficiency, power sector emissions have declined by 40% between 2005 and 2015.

In addition to assessing potential emission limitations fostered by the combined efforts of states, localities, and cities, *Fulfilling America's Pledge: How States, Cities and Businesses Are Leading the United States to a Low-Carbon Future* (Bloomberg Philanthropies, 2018) provides examples of success stories in moving toward low-carbon emissions. Here we highlight “Case Study 03: Energy Efficiency Resource Standards in Arkansas”:
Arkansas is the only state in the Southeast with an energy efficiency resource standards (EERS), which was first established in 2007, requiring electric and natural gas utilities to propose and administer energy efficiency programs. Arkansas’s energy savings targets started out low, initially requiring utilities to reduce annual electricity use by 0.25 percent with respect to sales, ramping up to 0.75 percent in 2013. Natural gas reduction targets were set at 0.2 percent in 2011, increasing to 0.4 percent in 2013. The Arkansas Public Service Commission has strengthened these goals with 1.0 percent reductions to take effect in 2019.

The gradual and deliberate approach to evolving utility programs has allowed Arkansas to achieve and build upon early successes to garner increasing support for energy efficiency. For example, in 2008 the home energy efficiency services market in the state did not yet exist. Utilities worked to improve their understanding of the scope of recruiting and training resources needed and focused on building partnerships with contractors. A significant factor in the success of many of the programs has been the ongoing classroom and field training for contractors undertaken in coordination with trade allies and regional technical colleges. Through careful monitoring of program results with the help of a third-party evaluator, utilities have been able to make a variety of adjustments over time to improve the program effectiveness. These have included the gradual addition of new measure offerings, such as incentives for heat pump water heaters, behavioural benchmarking through home energy reports, and measures targeting multifamily properties. Other refinements have included making programs easier for customers to access, studying new energy efficient technologies, and making more concerted efforts to reach certain customer segments that might have more difficulty accessing utility efficiency programs.

Taken together, Arkansas electric utilities have increased energy savings more than fivefold over the past decade through these programs, raising savings from 60,000 megawatt-hours (MWh) in 2009 to more than 300,000 MWh in 2016, or enough to power more than 28,000 homes for a year. Through these efforts, Arkansas has emerged as a Southeast energy efficiency leader, and an example to its neighbours of the diverse benefits achievable when a state and its utilities come together to value and pursue efficiency as an energy resource on the same level as other fuel sources.

According to the American Council for an Energy-Efficient Economy (ACEEE), if states were to continue to meet savings targets and legislators and regulators were to extend expiring targets in the years leading up to 2020, the combined annual electricity savings from the 26 states with EERS policies would be equivalent to 6.2 percent of overall electricity sales in the United States in 2020. Existing policies and pledges are expected to reduce annual electricity demand by as much as 200 TWh by 2025.