



## News &amp; Highlights

## Climate Agreement

Lance A. Davis

Senior Advisor, US National Academy of Engineering

On Saturday September 3, 2016, on the eve of the G20 Summit in Hangzhou, China, the US, following earlier negotiations with China, agreed to join the Paris Agreement on climate change reached in December 2015 [1,2], joining the prior commitment made by China. In order to go into force, the agreement required ratification by 55 countries representing 55% of global emissions. With the agreement on the part of China and the US, representing together 38% of global emissions, obstacles on the path to ratification were markedly reduced. Indeed, on November 4 the required ratifications were reached in order to put the agreement in force [3].

The details of the agreement between China and the US on their respective goals to jointly combat global warming under the Paris Agreement were reported by the whitehouse.gov fact sheet [4], as follows: “The United States highlighted actions including the extension of the production and investment tax credits for wind and solar, which will deploy roughly 100 gigawatts of renewable energy over the next five years, new fuel efficiency standards for heavy-duty vehicles, and efforts to finalize 20 additional efficiency standards for appliances and equipment by the end of the year. Likewise, China highlighted plans to reduce carbon dioxide (CO<sub>2</sub>) and energy intensity by 18 percent and 15 percent, respectively, as well as to increase the share of non-fossil fuels in primary energy consumption to 15 percent by 2020. China also noted its commitment to start its national cap-and-trade program in 2017 and to promote green power dispatch to accelerate the use of renewable energy.” Prior commitments to reduce aviation emissions and to amend the Montreal Protocol to reduce hydrofluorocarbon emissions were also noted in the statement. Other sources report China’s pledge on non-fossil fuels somewhat differently, i.e., to increase the non-fossil fuels in its energy mix to 20% by 2030 [5]. For the US, the agreement reflects the goals of the US Environmental Protection Agency (EPA)’s proposed Clean Power Plan to cut emissions 26% to 28% below 2005 levels by 2025. According to Carbon Tracker [6], the EPA believes these emission cuts will be achieved because the plan’s regulations will result in retirement of an estimated 180 GW of coal fired electricity capacity by 2020, although the US Energy Information Administration estimates it could be closer to 60 GW of retired capacity. But, some coal fired capacity that remains will be relegated to cycling or intermittent duty, which will contribute to reduced emissions. The level of emissions reduction is, thus, a matter of debate, but a strong shift away from coal is envisioned.

According to one analysis, the trend line for global emissions in-

dicates a level of about 80 gigatonnes per year of CO<sub>2</sub> in 2050. This would have to be reduced to 20–25 gigatonnes per year [7], on the order of half the 2010 level, to reach the goal laid out by the Intergovernmental Panel on Climate Change (IPCC) to contain the rise in global temperature to 2 °C relative to preindustrial levels in 2100. Measured against these estimates, the commitments by the US, China, and the European Union (EU) are substantive, but no country is on the trajectory necessary to meet the 2 °C target. Allowing for the substantive commitments of the US, China, and the EU, but assuming that other countries will continue to let emissions grow, the probability of staying within the 2 °C goal is less than 1% [8], based on a model of Chris Hope of the University of Cambridge. CO<sub>2</sub> accounts for 9% to 24% of the greenhouse gas effect [7] and meeting the goal is exacerbated by the fact that, according to the IPCC, about half the CO<sub>2</sub> allowable in the atmosphere to remain below the 2 °C limit is already there.

The fate of the US commitment to the Paris Agreement will depend on the actions of a new US Republican administration which will be ushered in on January 20, 2017. The outcome of the November 2016 US election was a surprise for many if not most Americans, as the northeastern US press confidently predicted a victory for the Democratic candidate. Much as for the case of the UK Brexit vote, where Londoners voted against exit from the EU and less affluent citizens outside London, who felt the EU did not favor them economically, voted for exit, Democratic voters were concentrated in the most prosperous locales in the US, the northeast and west coast corridors. In the heartland of American, buffeted by economic stress, middle-class citizens and citizens who had fallen out of the middle-class, mostly older and white, voted for the change and recovery promised by the Republicans.

This political development throws the US commitment to combat global warming into uncertain territory. It goes without saying, of course, that all the present solutions to reduce greenhouse emissions are engineering solutions and the path to even more economical and effective solutions will be through engineering as well. However, engineering solutions are necessary but not sufficient in the absence of the political will and/or an economic driving force to use them. The Republican party in general has been very vocal in its skepticism of global warming, it has decried what is viewed as excessive environmental regulation and has expressed great sympathy for the plight of states in the US that are falling into decline because of the collapse of the coal industry [9]. That collapse was initially driven by utilities

responding to present and expected future environmental regulations to mitigate global warming that disadvantage coal, but it has been dominated primarily by availability of cheap natural gas from fracking. Of course, the US political campaigns are notorious for statements of wild excess which are forgotten by the candidates within a few heartbeats of election, though not necessarily by those who elected them.

The way the US addresses global warming is important to the global community both numerically and psychologically. And, thus, the question of how the new US administration will pursue global warming goals and commitments put in place by the prior administration looms large. It has been suggested that the US will “cancel” the Paris Agreement [9], although the US ratification of the treaty is binding under international law [1]. However, federal action to meet the commitments under the treaty may simply not take place. It has also been suggested that the EPA will be dismantled, which is not likely, but the Republican Congress could severely restrict its budget. The EPA can set regulations for environmental pollutants under the 1970 Clean Air Act and has done so to create the Clean Power Plan, which is the centerpiece of the US commitment under the Paris accord. However, the Plan is currently under litigation by 28 states and over 100 companies and could go before the Supreme Court next year [9]. A vacancy on the Court also needs to be filled, which could tip the Court in opposition to the Clean Power Plan, and the administration could refuse to defend the plan when it goes to the court. And, lastly, the EPA could be directed to rewrite the rules to favor industry. The latter would be subject to lawsuits by environmental groups, but adoption of the Clean Power Plan or something like it would continue to be delayed indefinitely.

This piece ends with a note of sadness to acknowledge the passing of a colleague, Ralph Cicerone, at age 73 on November 5, 2016 [10]. Ralph was a tireless, but patient and civil proponent of the need to address the issues of global warming and climate change. He was educated as an engineer at Massachusetts Institute of Technology (MIT), but his most noteworthy research was done as an atmospheric chemist, where he and two colleagues from the University of Michigan were among the first to warn that the atmosphere's ozone layer was being dissipated by chlorine gases. He had a distinguished career, serving as chancellor of the University of California at Irvine from 1998 to 2005 and as president of the US National Academy of Sciences from 2005 to June 2016. In the latter capacity, he was a

staunch advocate of the national academies' efforts to conduct impartial, evidence-based studies of the causes and consequences of global warming and climate change. Those studies are available free of charge on the web [11].

## References

- [1] Breakthrough as US and China agree to ratify Paris climate deal [Internet]. London: Guardian News and Media Limited; c2016 [updated 2016 Sep 3; cited 2016 Nov 14]. Available from: <https://www.theguardian.com/environment/2016/sep/03/breakthrough-us-china-agree-ratify-paris-climate-change-deal>.
- [2] Stanway D. U.S., China ratify Paris climate agreement [Internet]. London: Reuters; c2016 [updated 2016 Sep 3; cited 2016 Nov 14]. Available from: <http://www.reuters.com/article/us-china-climatechange-idUSKCN11901W>.
- [3] Paris Agreement—status of ratification [Internet]. Bonn: United Nations Framework Convention on Climate Change; c2014 [cited 2016 Nov 14]. Available from: [http://unfccc.int/paris\\_agreement/items/9444.php](http://unfccc.int/paris_agreement/items/9444.php).
- [4] Office of the Press Secretary, The White House. Fact sheet: U.S.–China cooperation on climate change [Internet]. Washington, DC: The United States Government; [updated 2016 Sep 3; cited 2016 Nov 14]. Available from: <https://www.whitehouse.gov/the-press-office/2016/09/03/fact-sheet-us-china-cooperation-climate-change-0>.
- [5] Parlapiano A. Climate goals pledged by China and the U.S. [Internet]. New York: The New York Times Company; c2016 [updated 2015 Oct 2; cited 2016 Nov 14]. Available from: <http://www.nytimes.com/interactive/2014/11/12/world/asia/climate-goals-pledged-by-us-and-china-2.html>.
- [6] What does the US-China climate change agreement mean in practice? Analytical insights [Internet]. London: Carbon Tracker Initiative; c2014 [cited 2016 Nov 14]. Available from: <http://www.carbontracker.org/what-does-the-us-china-climate-change-agreement-mean-in-practice-analytical-insights/>.
- [7] Global warming [Internet]. San Francisco: Wikimedia Foundation, Inc. [cited 2016 Nov 14]. Available from: [https://en.wikipedia.org/wiki/Global\\_warming](https://en.wikipedia.org/wiki/Global_warming).
- [8] Biello D. Everything you need to know about the U.S.–China climate change agreement: a turning point has been reached in the world's bid to curb global warming [Internet]. New York: Scientific American; c2016 [updated 2014 Nov 12; cited 2016 Nov 14]. Available from: <https://www.scientificamerican.com/article/everything-you-need-to-know-about-the-u-s-china-climate-change-agreement/>.
- [9] Davenport C. Donald Trump could put climate change on course for “danger zone” [Internet]. New York: The New York Times Company; c2016 [updated 2016 Nov 10; cited 2016 Nov 14]. Available from: [http://www.nytimes.com/2016/11/11/us/politics/donald-trump-climate-change.html?emc=edit\\_th\\_20161111&nl=todaysheadlines&nlid=35255817](http://www.nytimes.com/2016/11/11/us/politics/donald-trump-climate-change.html?emc=edit_th_20161111&nl=todaysheadlines&nlid=35255817).
- [10] Roberts S. Ralph Cicerone, scientist who sounded climate change alarm, dies at 73 [Internet]. New York: The New York Times Company; c2016 [updated 2016 Nov 7; cited 2016 Nov 14]. Available from: [http://www.nytimes.com/2016/11/08/science/ralph-cicerone-scientist-who-sounded-climate-change-alarm-dies-at-73.html?emc=edit\\_th\\_20161108&nl=todaysheadlines&nlid=35255817&r=0](http://www.nytimes.com/2016/11/08/science/ralph-cicerone-scientist-who-sounded-climate-change-alarm-dies-at-73.html?emc=edit_th_20161108&nl=todaysheadlines&nlid=35255817&r=0).
- [11] Nap.edu [Internet]. Washington, DC: National Academy of Sciences; c2016 [cited 2016 Nov 14]. Available from: <https://www.nap.edu/>.