Climate Change 2: Mitigation (2021-2030)

In order to stop the steady rise in global temperatures, I t is necessary to eliminate emissions of CO2 and other greenhouse gases (GHG) from fossil fuels, bringing the net rate of GHG emissions to zero. There are 3 major efforts that are an essential first step, and must be well underway by the end of this decade. These are:

a) building new wind and solar power facilities at a much faster rate, with storage systems as needed,
b) expanding the U.S. electrical energy grid by building high-voltage transmission lines which can efficiently transport energy over long distances (~2000 miles), and
c) electrifying ground transportation – cars, buses, and trucks.

At present, the major sources[1] of U.S. power are natural gas (NG), which supplies about 40% of total U.S. electric power, with coal, nuclear, and renewable sources each supplying about 20%. Wind and solar make up about half the renewable sources, with hydropower accounting for most of the rest. The original Biden infrastructure plan[2] has the goal of reducing GHG emissions in 2030 by 50% below the 2005 levels. This would mean expanding wind and solar by a factor of 3 – 4, much higher than the rate over the last decade. This will require constructing massive new storage facilities in many regions, depending on the type of renewable energy and the existing power sources available. At this writing, negotiations in Congress are still underway, and it remains to be seen what the final infrastructure plan will cover. The Illinois Clean Energy and Jobs Act (CEJA), recently passed by both houses and signed by Pritzker, is an important step toward accomplishing these goals in Illinois. It will be described in a separate note.

The U.S. has more extensive sources of renewable energy than most countries, but they are not at all uniformly distributed[3]. Solar power is more available and efficient in the South, Southwest, and California; wind power is strong in the Midwest, but many regions have poor prospects for either of these. In order to make renewables most efficient, we need to construct long-distance high-voltage transmission lines that can carry large amounts of power across thousands of miles. This can be done with existing technology, and should be led by the Federal Energy Regulatory Commission[4]. The resulting national grid should not only bring power to every region, but also reduce the cost of electricity (since markets will be vastly expanded) and make the energy production more stable (since wind is always blowing somewhere). These expansions and improvements are also addressed in the Biden plan.

While these changes are underway, it is just as important to replace gasoline-powered vehicles with electric ones, which produce better performance, less maintenance, and no emissions. The Biden infrastructure plan has the goal[5] that 50% of new car sales in the U.S. will be electric by 2030. Other countries such as the U.K. have even loftier goals, such as 100% of new cars being electric by 2030 or 2035, and many auto manufacturers have already committed to these goals.

Each of these three programs is essential. Electric vehicles are important because the transportation sector accounts for 35% of CO2 emissions. The production of electricity is just slightly less at 31%, but this sector is even more important because electricity will allow us to replace carbon-emitting processes in other areas, such as transportation, industry, construction, and heating.

All of these can make major improvements in reducing carbon emissions in this decade, but alone they are not enough to get us to net zero CO2 production by 2050. Other steps, and the R&D that is now going into them, are described in the following paper (Climate Change 3).

Regardless of whatever actions we take, CO2 levels and temperatures will continue to rise over the next two decades; we can only hope to reduce the rate of increase. We also need to take actions to deal with

the effects of climate change in vulnerable areas, by building sea walls, modifying construction codes for new buildings, improving disaster preparedness, conserving water, etc. These efforts are also included in the Biden infrastructure plans.

1. Sources of U.S. Power: https://www.eia.gov/energyexplained/electricity/electricity-in-the-us.php
2. Build Back Better Act: https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/Fact%20Sheet%20on%20E%26C%20Build%20Back%20Better%20Key%20Provisions%20.pdf
3. "Decarbonizing the U.S. Economy with a National Grid", by Steve Cicala, page 78-87 of "U.S. Energy & Climate Roadmap", by the Energy Policy Institute at the University of Chicago. https://epic.uchicago.edu/area-of-focus/decarbonizing-the-us-economy-with-a-national-grid/
4. Ibid., pp. 84-87.
5. https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/05/fact-sheet-president-biden-announces-steps-to-drive-american-leadership-forward-on-clean-cars-and-trucks/