Analyzing America’s Race to Zero Carbon

**Problem Statement:**

According to a 2018 report by the United Nations’ Intergovernmental Panel on Climate Change (IPCC), Earth will reach the crucial threshold of 1.5 degrees Celsius (the “tipping point”) by as early as 2030.[[1]](#footnote-1) To mitigate this crisis, many countries like the United States have adopted new greenhouse gas reduction plans. Under President Biden’s plan, one of the goals is to establish a carbon emissions-free power sector by 2035. Our project **scrutinizes this plan by determining where the power sector stands in this current decarbonization race and the paths it must take to reach zero carbon by 2035.**

**Introduction:**

Based on the U.S. Environmental Protection Agency (EPA) annual reporting, the “electric power” sector accounted for 25 percent of all greenhouse gas emissions in 2019. Carbon dioxide (C02) makes up majority of the greenhouse gases emissions from the sector. This gas is released during the combustion of fossil fuels, such as coal, oil, and natural gas, to produce electricity. Power plants using fossil fuels accounted for 61.5 percent of electricity generated in the United States in 2019, with the rest generated from nuclear and renewable sources.[[2]](#footnote-2)

On April 22, 2021, President Biden announced a new target for the U.S. to achieve a “50 percent reduction from 2005 levels in greenhouse gas pollution in 2030.”[[3]](#footnote-3) However, the focus of our project is the plan’s complete elimination of the power sector’s dependence on fossil fuels by 2035. This plan thus informs the basis of our methodology.

**Methodology:**

The project involves three different analyses:

1. ***Business-as-usual*:** Look at historical trends in carbon emissions data, then apply a forecasting model to predict progression by 2035 without any additional commitments to reduce emissions. The main question being, if efforts to decarbonize are not taken seriously and do not materialize, then what will our future carbon levels look like?
2. ***Declared Initiatives:***Examine initiatives by U.S. utility companies in their pledge to wean themselves off fossil fuels. Measure forecast data using the metric that they have publicly committed to reaching by 2035. Importantly, with this model, we will conclude if their proposals will reach zero carbon.
3. ***Whatever-it-takes:***Regardless of any new regulations or industry initiatives, in this model, we measure the minimum amount of carbon reduction required each year to achieve zero carbon by 2035.

**Detailed Process:**

1. Collect the historical emissions data from all power plants
2. Calculate baseline emissions for each plant based on the Biden administration’s 2035 goal
3. Compile emissions data by parent companies as emissions are reported independently by subsidiary companies
4. Shortlist the top 10 parent companies by CO2 Emissions
5. Collect decentralized initiatives by the shortlisted companies, calculate the estimated reduction in emissions as a result of the initiatives.
6. Predict the emissions trends in two different scenarios
   1. Business-as-usual
   2. Proposed and materialized initiatives by the shortlisted companies
7. Visualize both the scenarios in comparison to the base requirements as per the 2035 plan
8. Visualize the effects of emissions spatially by state (to show emissions density)
9. Rank the companies by progress

**Input Sources:**

1. Energy companies and their yearly carbon emissions
   1. <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>
   2. <https://peri.umass.edu/greenhouse-100-polluters-index-current>
   3. <https://www.eia.gov/todayinenergy/detail.php?id=48856>
2. Geo-spatial data about each company
   1. <https://www.eia.gov/maps/layer_info-m.php>
3. Company Initiatives to reduce carbon emissions
   1. <https://www.greentechmedia.com/articles/read/the-5-biggest-u.s-utilities-committing-to-zero-carbon-emissions-by-mid-century>
4. Biden administration’s emission reduction plan for power industry
   1. <https://www.theguardian.com/us-news/2021/mar/15/race-to-zero-america-emissions-climate-crisis>

**Challenges/ Limitations:**

1. Analysis based only on current initiatives and future plans can change the course of individual companies
2. Quantifying different initiatives by each company would need substantial research
3. Ambiguous emission reduction plans and data from each firm

**Additional Scope:**

1. Strict Government initiatives and enforcements and their impact on the emission reduction trend
2. Impact of new technologies like Fusion, H2 batteries, Carbon Capture, and other clean energy techniques

1. IPCC. “Global Warming of 1.5°C.” [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, (eds.)]. *World Meteorological Organization*, 2018. 32pp. https://www.ipcc.ch/sr15/ [↑](#footnote-ref-1)
2. U.S. EPA. “Inventory of U.S. Greenhouse Gas Emissions and Sinks.” *EPA 430-R-21-005, Apr. 2021.* [↑](#footnote-ref-2)
3. United States, Office of the Press Secretary. “President Biden Sets 2030 Target [Fact sheet].” *The White House,* Apr. 2021. [↑](#footnote-ref-3)