**Tom Hudson Capstone Proposal**

**Executive Summary**

It is my intention to define the current state of clean energy as it applies to U.S. transportation, both personal and public. I will use data from various sources to determine:

* The availability of clean energy as a percentage of the total electricity supply,
* The locations of electrical charging stations, as well as future ones identified within the new legislation on infrastructure,
* Identify other types of infrastructure that are, or need to be, in place (i.e. battery disposal/recycling)
* Identify an historical model of the mix of electricity generation methods and a rough, straight-line prediction of the near future.
  + Broad categories of electrical sources are Fossil Fuels, Nuclear, and Clean or Renewable, will underpin this entire project.

*A stretch goal will be to section the US into sensible regions and determine each region’s current state of the source of current.*

**Motivation**

The thought of an EV is an attractive one to me with two, personal exceptions. The first is one of range. I believe the absolute minimum an EV should be able to travel would exceed 500 miles. I don’t feel it is reasonable to have one vehicle for commuting, etc. in the area and have a second vehicle, which has range, for trips. A 500-mile range, to me, is reasonable and a comfortable drive. This exception has been attenuated to some degree by the expanding network of charging stations, but remains an expectation for me.

The second exception is the source of the electricity. Driving an EV doesn’t automatically mean you don’t have a carbon footprint. Is it any better to drive an EV when the electricity you use is created by power plants burning coal, fuel oil, or natural gas? Are you really being green? Is the benefit garnered from electric vehicles enough to offset the negatives such as disposal/recycling of batteries and components to the environmental damage in sourcing the raw materials this technology requires?

This second exception generates excitement for me simply because I want to know when this “tipping point” will occur. I readily accept that I will not see 100% clean energy in my life-time, much like I contend that the global economy will always need crude oil. For me, the question is when will the electricity used in the average EV be “clean enough.” I admit that this is a qualitative point, but I look forward to getting the quantitative data in place to make a prediction of the milestones mentioned in the Executive Summary.

**Data Question**

Data are plentiful via U.S. government sites regarding the current state of power generation. The Build Better Back legislation will also address my project in areas of electrical grid, electrical charging stations, EV tax support schemes, and electrical mass transit. Most can be accessed via downloading .csv’s. The Build Better Back legislation is quite new and might only be accessible via webscraping. I also want to investigate California’s current state as that state tends to lead efforts related to green energy and low carbon footprints.

My operating theory needs to account for some simple predictions. According to the Department of Energy’s Short Term Energy Outlook (STEO), approximately 21% of electricity consumed in 2020 came from either hydro power or non-hydro renewables (wind & solar). President Biden’s New Energy for America plans on investing $150 billion over the next decade to build a clean energy future. Assuming this plan passes Congress, how will that affect the U.S. energy generation? When will clean energy hit 50%, etc.?

**Minimum Viable Product**

The aim of this project is to identify the current state of electricity generation, the current state of electrical vehicle penetration in both the public and private sector, and the risk/reward equation related to advancing the EV technology. The MVP of this project is to identify this current state and deliver tools to visualize and understand this current state.

**Schedule**

1. Get the data by November 24
2. Clean & explore the data by November 30
3. Create presentation of the analysis by December 13
4. Internal demos: 12/17/2021
5. Demo day: 01/07/2022

**Data Sources**

British Petroleum – dataset bp-stats-review-2021-all-data; from this site: [Statistical Review of World Energy | Energy economics | Home (bp.com)](https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html)

World Resources Institute – dataset zip file global\_power\_plant\_database\_v\_1\_3; from this site: [Welcome - Data | World Resources Institute (wri.org)](https://datasets.wri.org/)

U.S. Energy Information Administration (iea) – datasets listed below:

* annual\_consumption\_state
* cost\_of\_fossil\_fuel
* emission\_annual
* net\_generation\_all\_sources
* net\_generation\_renewables
* revenue\_expense\_investor\_owned\_utilities
* from this site: [Homepage - U.S. Energy Information Administration (EIA)](https://www.eia.gov/)

Organisation for Economic Co-operation and Development (OECD) – dataset csv file ‘oecd.csv’; from this site: [OECD Data](https://data.oecd.org/)

Our World in Data – dataset csv file ‘renewable-share-energy.csv’; from this site: [Our World in Data](https://ourworldindata.org/)

FRED Economic Data – dataset from csv file ‘TOTANLSA.csv; from this site: [Total Vehicle Sales (TOTALSA) | FRED | St. Louis Fed (stlouisfed.org)](https://fred.stlouisfed.org/series/TOTALSA)

Caltech.edu dataset on adaptive charging networks with multiple interfaces - [ACN-Data -- A Public EV Charging Dataset (caltech.edu)](https://ev.caltech.edu/dataset)

US DOE datasets centering on EV’s - [Alternative Fuels Data Center: Maps and Data - Electric Vehicle Registrations by State (energy.gov)](https://afdc.energy.gov/data/)

Department of Transportation – focus on interstate commerce -[Bureau of Transportation Statistics (bts.gov)](https://www.bts.gov/)

**Known Issues and Challenges**

The first known issue and challenge is the overabundance of data available. My challenge is to continue my focus on the purpose of this project. In my effort to gather data on the current state, I have forgotten the Electrical Vehicle (EV) component of this activity. I need to continue my focus on this document going forward.