**Design Process**

Loading multiple data files

Starting with the sample file, I strived to design the various features and components this website must support by analyzing how data was being loaded for one csv file. In order to simplify my understanding and test out the ability to load multiple data sets, I created a new function called parse1 which held some of the parse capabilities once the data was loaded. Here's a sample of how the loading works in my project.

```javascript
function load() {

    var listOfLocalities = [];
    var localities = {};

    Papa.parse('data/total_primary_energy_production.csv', {    //Total Primary Energy Production

        download: true,
        header: true,
        dynamicTyping: true,
        complete: function(results)
        {
            parse1 (results,localities,listOfLocalities)

            Papa.parse('data/total_primary_energy_consumption.csv', {   //Total Primary Energy Consumption

                        download: true,
                        header: true,
                        dynamicTyping: true,
                        complete: function(results)
                        {
                            var localitiesPEC = {};
                            parse1 (results,localitiesPEC,listOfLocalities)
```

By adding the parse1 function and returning the parsed variable I was able to quickly debug and understand the many issues with loading multiple csv files. Using one parse1 function also helped me scale the code instead of having to write the same parser repeatedly in each csv file. Once I was able to load all 13 files I proceeded to design the front end of the website.

Designing the website

I started out by sketching all the required components that the website must support such as the ability to switch between a bar and a line, load multiple countries and then the aforementioned 13 variables. Initially I did not consider the user experience aspect of the design and created low fidelity sketches of the website's look based on core functionality.
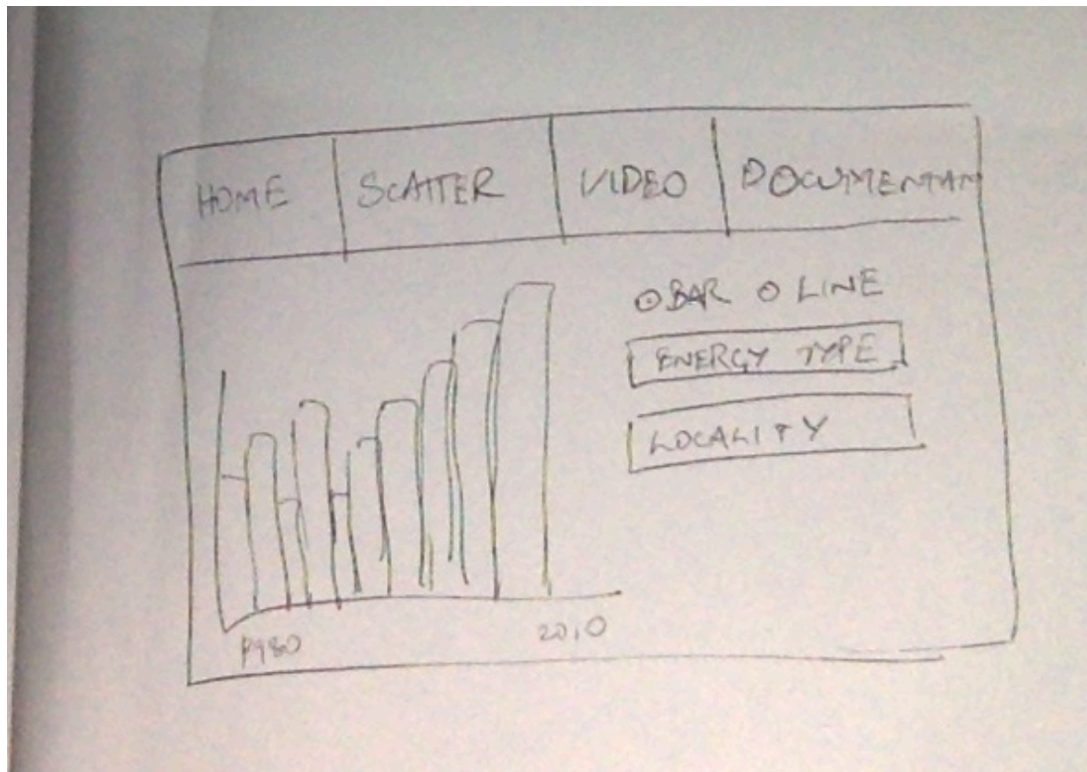
Using Bootstrap, I was able to create a simple layout with menus that allowed me to test my code and also navigate the website. Here is a sample of the original index page.
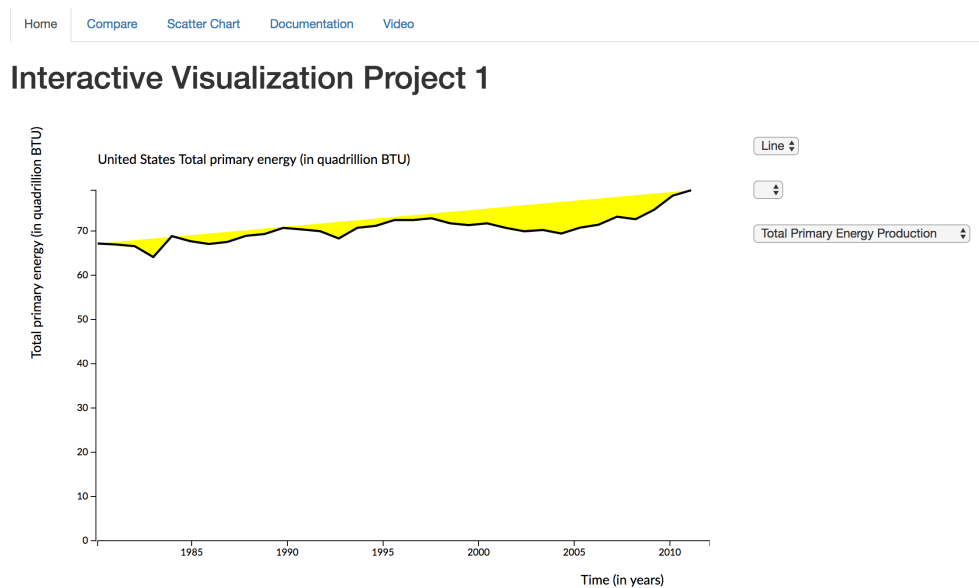
Once I was able to view the working code, now I felt like I could design with the user in mind. To improve the user's experience when they initially came to the site I added a textual description of the website and some initial tips to navigate the site.

Interactive Visualization Project 1

This project is used the represent Energy Production and Consumption data from around the world. Please use the below controls in a sequential manner to view the energy production and consumption values . To start off, please select type of chart you wish to see along with the region. You may also choose to look at one of the 13 variables of Energy Production/Consumption from the third dropdown.

Then I created specific headers and optional fields that would help the user move through the site and feel like they are in control of the interactions.

Rationale – Nielsen's heuristics says that User Control and Freedom is essential in designing a good user experience. (http://www.designprinciplesftw.com/collections/10-usability-heuristics-for-user-interface-design)

Another reason I had to include textual descriptions was due to my code parsing method. To give you an example, due to on change functions and sequential code, the user must first select the type of chart and then proceed to select the region. Since the user Is unaware of this, he/she must be informed prior to interacting with the website the most suitable method to ensure a satisfactory user experience. In order to solve this issue, I resolved the add the following explanations.

Chart Type
Please select a value ▲▼

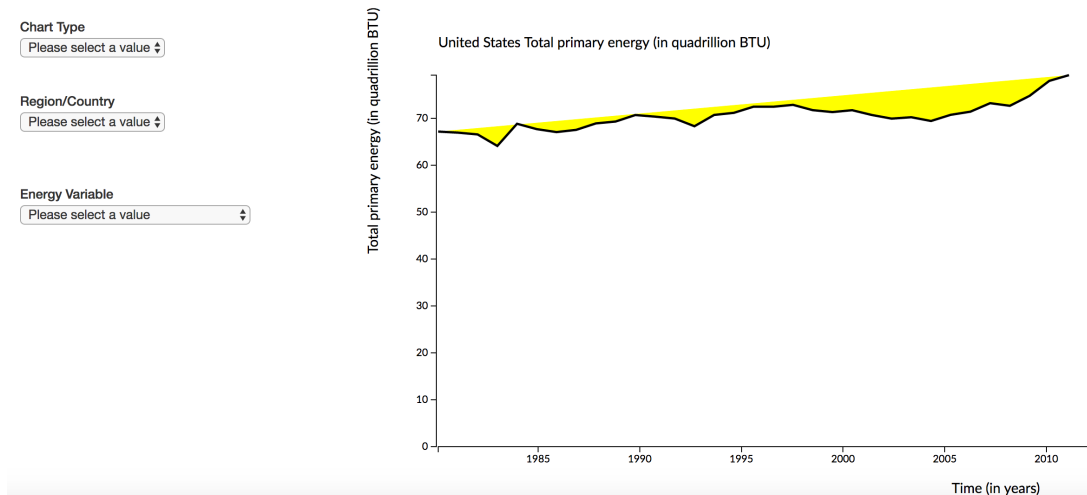**Region/Country**
Please select a value ▲▼

Energy Variable
Please select a value ▲▼

By requesting the user to make a choice and placing the items in a cascading fashion I feel like I have informed the user on how to interact with the site. I moved these components from the right hand side of the page to the left hand side of the page since I wanted the user to make these decisions first and then look at the chart area for the graph.

Rationale : Studies have shown that user move through a website in "Z" pattern starting from the top left and ending at the bottom right. So placing text at the top left would help the user easily discover the different ways to navigate the site.
(http://www.creativeblog.com/ux/how-human-eye-reads-website-111413463)

Chart Type
Please select a value ⇕

Region/Country
Please select a value ⇕

Energy Variable
Please select a value ⇕

Color Scheme:

Colors were chosen from ColorBrewer2.org. I chose to use colorblind safe, print friendly colors to ensure that any individual would be able to effectively see the various charts bring plotted. I chose a white background for the website and dark simple colors for components of the charts. All axis values and labels were in black so they could be clearly read on a white background. Color choices were required for the following features.

Line Chart- I chose the basic dark red for the Line represented in the chart. The stroke was set to 2.5 so it would clearly visible rather than a flimsy line which represented the variation in values.
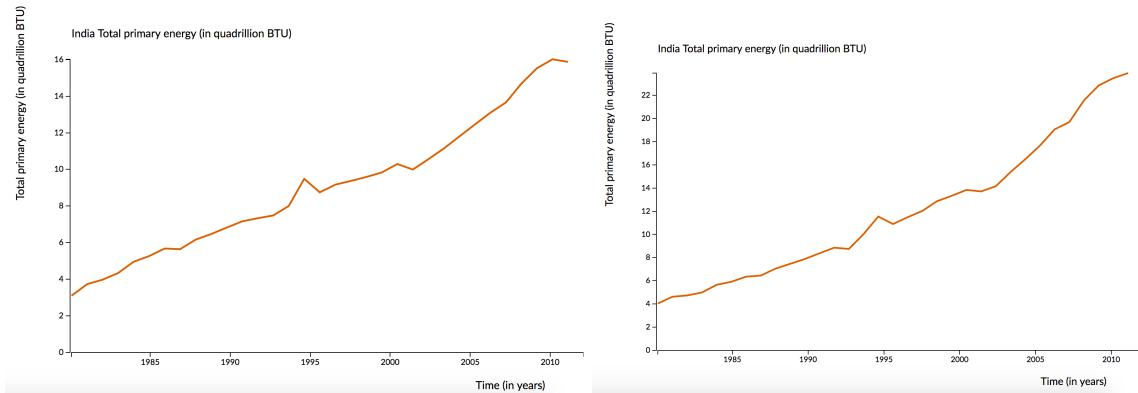
Bar Chart- The bars were chosen to be Simple Green which I felt was a good contrast to the white and black on the webpage and also colorblind safe.

Insights:
Being an Indian student I wanted to observe some of the trends set across India for the energy consumption behaviors. One interesting observation about India is that the consumption needs are always a fraction behind production for most variables provided here.

For example:

In the below graphs the one on the left is production and one on the right is consumption.

India Total primary energy (in quadrillion BTU)
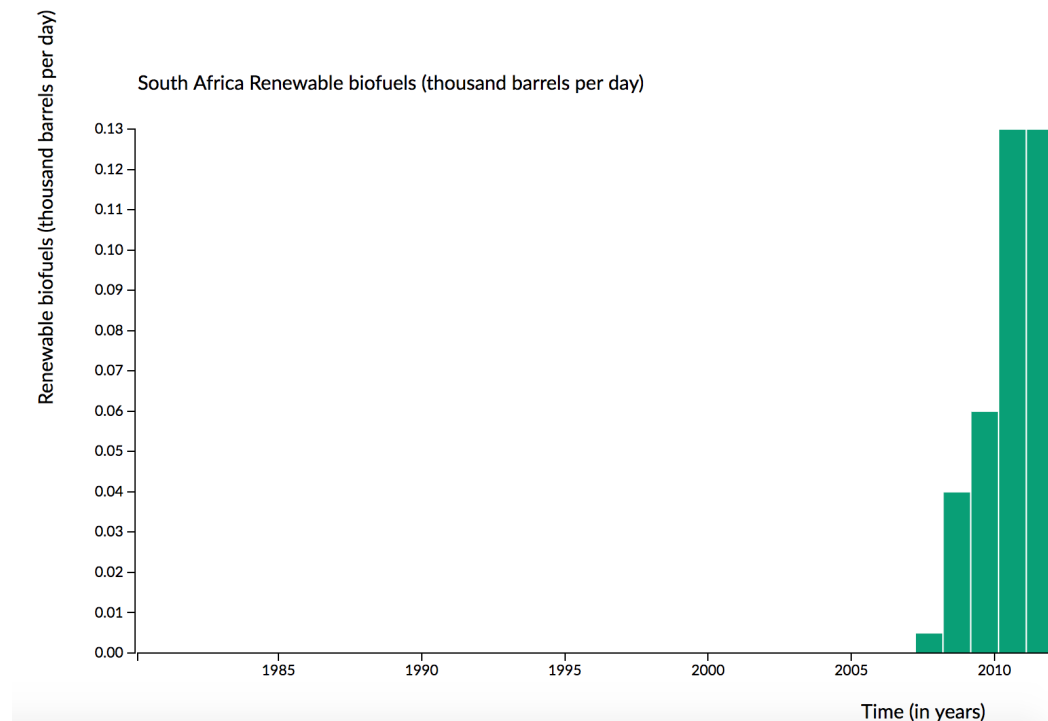

India Total primary energy (in quadrillion BTU)

This breakneck graphs show that India's production can barely sustain the consumption and this might be very troublesome with its forecasted population growth and urban development projects.
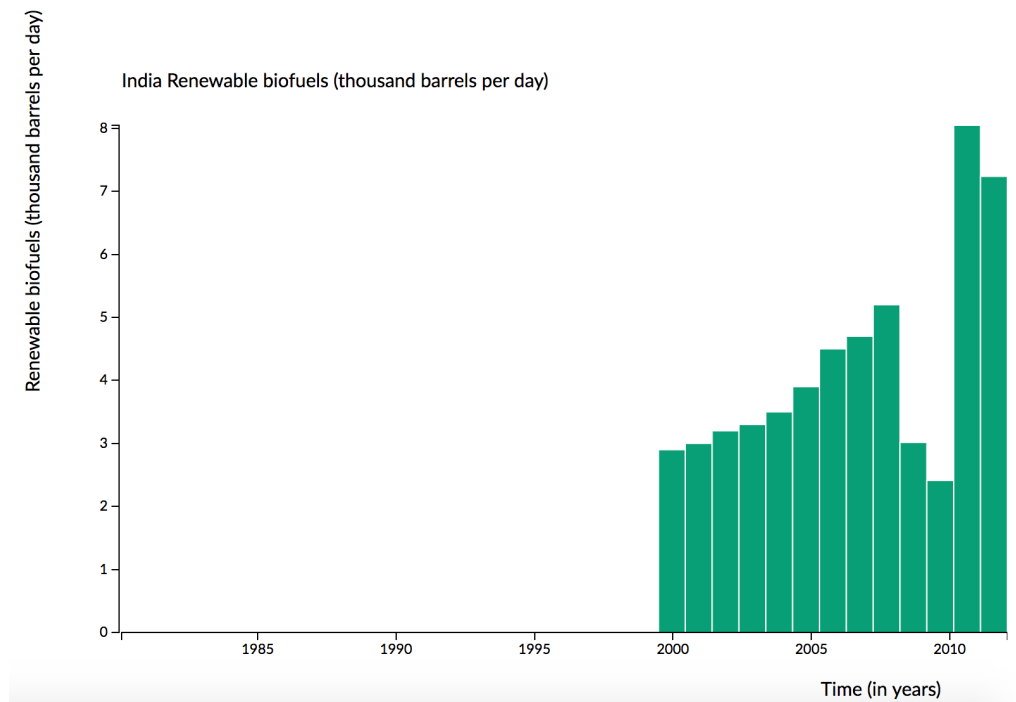
Renewable Biofuel
Another interesting insight I discovered in the datasets was the the production and consumption of Biofuel based energy has taken off only recently.
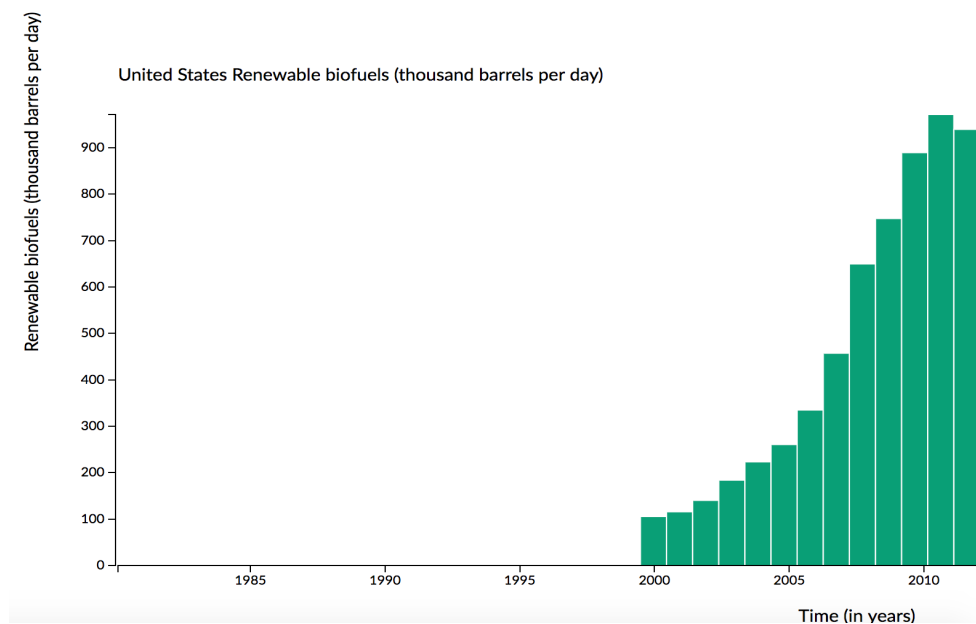
Here are 3 countries namely South Africa, India and the US all of which have started producing Biofuel based energy as recently as the early 2000s.

South Africa Renewable biofuels (thousand barrels per day)

South Africa

India Renewable biofuels (thousand barrels per day)

India

United States Renewable biofuels (thousand barrels per day)

United States

One reason might be the inadvertent energy crises of the 2000s that might have forced huge nations to explore and invest in alternate sources of energy. Therefore, I ask the following questions to dig deeper into this issue.

1. How did the energy crises of the 2000s affect the energy consumption of the the following countries, India and the United States ?

United States
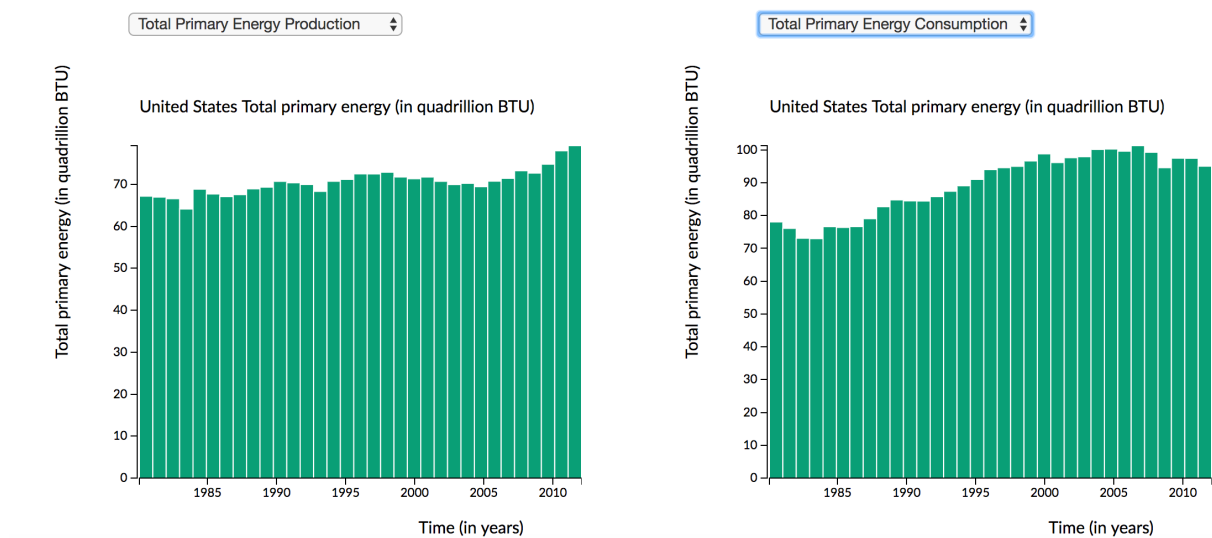
Though the production decrease due to high oil prices and weakening of the US dollar we can see that the consumption continued in a forward trajectory until dipping dangerously low in late 2008. This dip may also be caused by the financial crises and other tribulations affecting the world at that point.

India
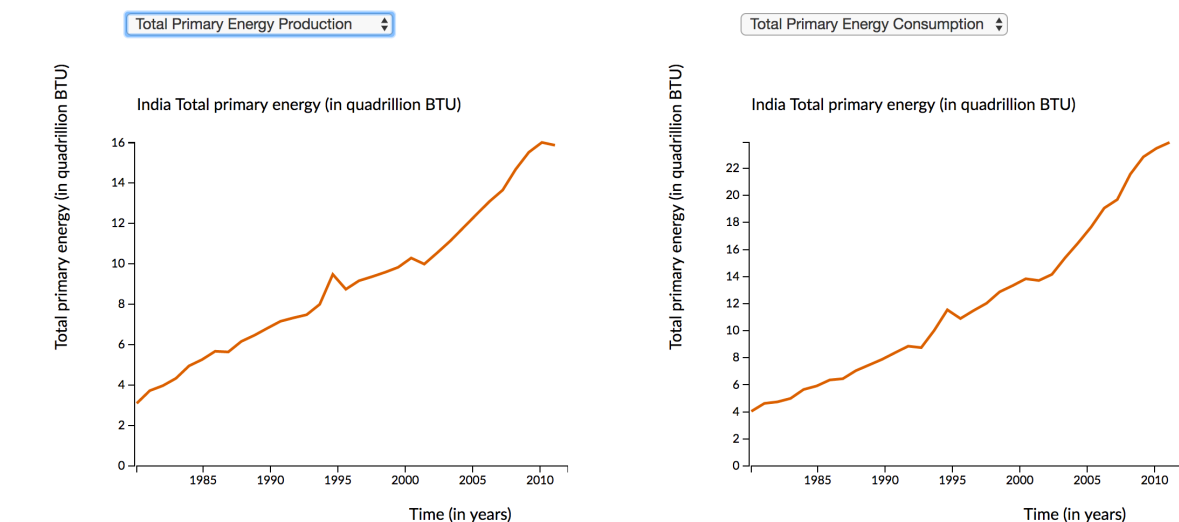
India shows a significant dip in both production and consumption. India has limited amount of coal and petroleum reserves, and its dependency on Iran and Russia for its oil needs might explain why the consumption was reduced along with production as production is a direct influencer especially during the oil crises.