***Background***

**The Problem**: Public utility groups implement demand response (DR) programs to encourage consumers to shift or reduce energy usage during periods of high demand. The primary goal of DR programs is to maintain resource adequacy and reduce costs. However, the impact of these programs on greenhouse gas emissions is not well understood. Knowledge of the emissions impacts of DR programs has the potential to inform state targets and motivate consumer participation.

**Our Solution**: Create a dashboard that shows how DR programs impact CO2 emissions.

***Data Sources***

| Description | Source | Type | Structure |
| --- | --- | --- | --- |
| Emissions Rates Avoided by DR Programs | John Ollis, Northwest Power and Conservation Council | Excel |  |
| DR Potential and Hours | Tina Jayaweera, Northwest Power and Conservation Council | Excel |  |

***User Profiles***

**User 1**: Policymakers want to know how DR programs in the Northwest United States impact greenhouse gas emissions. Lacking formal training in data science, policymakers want a simple, easy-to-use interface to visualize the emissions impacts. They want a dashboard, including both figures and brief interpretations, that makes it clear how emissions rates may change under different DR scenarios. They want to use this information when considering DR targets for public utility groups.

**User 2**: Environmentally conscious members of the general public want to reduce their carbon footprints. They have heard that participating in DR programs might help reduce emissions. These consumers are not necessarily familiar with data science, so they want a simple, user-friendly dashboard that clearly shows how consumer participation in DR programs impacts emissions. They want to use this information to help them decide whether they want to participate in DR programs. For time-of-use programs, they want to know what times they could shift their electricity usage in order to maximize emissions reductions.

**User 3**: Journalists want to tell their audiences how DR programs impact greenhouse gas emissions. They are familiar with DR policies and the utilities groups that implement them. In addition to a simple dashboard, they want information on how the data is collected and analyzed. They want access to the data so that they can be sure the information they communicate to the public is accurate.

**User 4**: The researchers involved in gathering the data and designing the dashboard want to update the information as new data is collected. They want clear code and documentation that make it easy to update the data and make changes to the dashboard. They also want to easily output images for inclusion in a white-paper to policymakers.

***Use Cases***

**Use Case 1**: The user wants to view a dashboard that shows the emissions impacts of DR programs.

Expected Interactions:

* + - * User: Load dashboard webpage (the emissions calculator has already processed the data and created files for the dashboard webpage in a GitHub repository)
      * System: Show dashboard with a few default plots and interpretation; option to learn more
      * User: Check out default plots; choose option to learn more
      * System: Display new plots like emissions factors, dropdown option for different policy scenarios
      * User: Choose alternate policy scenario for the emissions factor plot
      * System: Show emissions factor plot for the alternate policy scenario
      * User: Download plot

**Use Case 2**: The user wants to run the emissions calculator using updated datasets.

Expected Interactions:

* + - * User: Clone, fork, or pull Main and Web GitHub repositories
      * System: Provide code for analyzing data and deploying the dashboard
      * User: Upload new input data to Main/input\_data folder and edit and run umbrella\_emissions\_calculator.py
      * System: Output analyzed data to Main/processed\_data folder
      * User: Update dashboard scripts home.py and more\_info.py in Web/pages folder and deploy using Heroku
      * System: Display updated dashboard