Student Project Activity #1: Temporal Demand Diversity

Overview:

The purpose of this activity is to learn the basic commands used in an URBANopt project while introducing the students to the concept and benefits of load diversity in terms of building energy modeling. The students will simulate two provided example districts that have the same total annual energy usage, but different operational schedules. Both districts consist of the same buildings including malls, hotels, offices, residences, restaurants, and schools.

Tasks:

1. (5 mins) Utilize the Create Project Command to create your class project directories:
   uo create -p <path/to/ PROJECT_DIRECTORY_NAME> <FLAG_TO_CREATE_SPECIFIC_EXAMPLE_PROJECT>
   Tutorial: https://urbanopt-tutorial.s3.amazonaws.com/videos/05_CreateProject.mp4

   Create two project directories in a folder in your root directory:

   1) Create a new folder in your root directory and name (e.g. C:/class_project):

   2) In your command prompt got to this folder and utilize to uo "create" to create two project directories. Name one 'coincident' and name the other 'diverse':

      a. uo create -p coincident -C

      b. uo create -p diverse -D

   Note: The next steps should be performed to both project directories to run simulations for both the diverse and coincident projects and compare the results.

2. (5 mins) Create Scenarios Command: Create scenario files using the instructions to "Create a Scenario CSV File for each mapper":
   Tutorial: https://urbanopt-tutorial.s3.amazonaws.com/videos/06_CreateRunScenario.mp4

```
uo create -s <path/to/FEATUREFILE.json>
```

   Take a screenshot of your project file directory after creating the scenario files.

3. (120 mins) Run Command: Run each feature file using the baseline_scenario.csv scenario file. (It is recommended to give each scenario file a unique name to distinguish between coincident and diverse feature files)

```
uo run -f <path/to/FEATUREFILE.json> -s <path/to/SCENARIOFILE.csv>
```

Note: This task will take some time and significant processing power as your computer performs the energy simulations. The processes can run in the background but may take up to an hour to complete. To save computational time, you can run more than 2 building simulations in parallel by editing the runner.conf file to set the "num_parallel" value to the number of cores you would like to use. Refer to https://urbanopt-tutorial.s3.amazonaws.com/videos/06_CreateRunScenario.mp4 .

   a. This command will also generate a run folder located in your project folder that contains all the project results.

Note: Troubleshooting errors: If errors occur during the run command, they will be stored in a log file called "in.osw.log" in the run folder for a given scenario. Refer to https://urbanopt-tutorial.s3.amazonaws.com/videos/06_CreateRunScenario.mp4 .

4. (10 mins) Process Command: Post-process general results for each feature file.
   Tutorial: https://urbanopt-tutorial.s3.amazonaws.com/videos/07a_PostProcess.mp4

```
uo process -d -f <path/to/FEATUREFILE.json> -s <path/to/SCENARIOFILE.csv>
```

5. (5 min) Visualize Command: visualize the results of each project scenario.
   Tutorial: https://urbanopt-tutorial.s3.amazonaws.com/videos/07b_VisualizeValidate.mp4

```
uo visualize -f <path/to/FEATUREFILE.json>
```

   a. This command will create an html file with standard plots of the results of your run
6. (180mins) Write a 2-page Report:
   a. Using the results located at ProjectFolder/run/scenario/default_scenario_report.csv file, create figures for both the diverse and coincident projects showing:
      i. The electrical energy used over a 3-day period of your choosing.
      ii. The total annual energy use
      iii. The monthly peak electricity demand

   Note: Feel free to use any tool to generate these plots (for example you can use excel or python to draw the plot)
   b. Using the results located at ProjectFolder/run/scenario_comparison.html file, extract the following figures:
      i. Monthly Fuel Use, Monthly Net Energy, and Annual End Uses
   c. Discuss the impact of load diversity on district energy use by comparing the energy use between the two projects. Refer to the figures you created in 6a & 6b.

Deliverables: (Week 2-3)

- Screenshot of the project directory after creating the scenario files.
- Screenshot of scenario_comparison.html file charts.
- Graphical comparison between the coincident and diverse load profiles.
- A 2-page report as stated in Task #6.