Student Project Activity #2: Energy Efficiency Measures

Overview:

In this activity, students propose and evaluate their own combination of energy efficiency measures for the class project community. The addition of energy efficiency measures should help the community achieve its energy goals.

Tasks:

1. (10 mins) Select an energy-related objective for your district, based on the results from Activity #1.
2. (20 mins) Choose Measures: Browse the measures in the list below and select 3 that you believe will help achieve your energy objective.
   - Add Window Overhangs
   - Enable Demand Controlled Ventilation
   - Enable Economizer Control
   - Improve Fan Belt Efficiency
   - Improve Motor Efficiency
   - Increase Insulation for Walls
   - Increase Insulation for Roofs
   - Reduce Electrical Equipment Loads
   - Reduce Lighting Loads
   - Reduce Space Infiltration

   Further detail on each of these measures is available here: https://github.com/NREL/openstudio-ee-gem/tree/develop/lib/measures
3. (30 mins) Research the approximate cost to implement your selected measures. This information will be needed for your final report.
4. (60 mins) Write a Proposal: Write a 1-page proposal describing your objective and the selected measures you will examine, with a brief justification of why you selected them. Clearly state the evaluation criteria upon which you will base your analysis in the subsequent portions of the project.
5. (30 mins) Add Measures: Add these measures to your project model:
   Link: https://docs.urbanopt.net/resources/customization/adding_own_measure.html
   a. Locate and open the ClassMeasures.rb mapper file (ProjectFolder/mappers/ClassMeasures.rb)
   b. To enable a measure:
      i. Change the "SKIP" value of your chosen measures from "true" to "false"

```
OpenStudio::Extension.set_measure_argument(osw, 'MeasureName', '__SKIP__', false)
```

   c. To edit a measure argument (change a parameter of a measure):
      i. Change the argument value as shown below

```
OpenStudio::Extension.set_measure_argument(osw, 'MeasureName', 'MeasureArgument', <set argument value here>)
```

d. Save and close this mapper file

6. Create a scenario CSV file that maps the modified mapper to the buildings in the CSV file (refer to : https://urbanopt-tutorial.s3.amazonaws.com/videos/06_CreateRunScenario.mp4).
   a. In the project directory make a copy of the baseline_scenario.csv file and rename to a name of your choice(eg.classproject_scenario.csv)
   b. Open the csv file and substitute all the string inputs under the header "Mapper Class" to URBANopt::Scenario::ClassProjectMapper
7. (60 mins) Run Command: Run this project model with your new measures added by using the path for your new scenario CSV file (eg.classproject_scenario.csv):

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

8. (5 mins) Process Command: Post-process general results for each project scenario.

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

9. (60 mins) Assess your Measures: Analyze the effectiveness of your added measures for the coincident and diverse projects by examining the results located in the Project "run" folder:
10. (120 mins) Modify and Iterate: If your chosen measures were not very effective in achieving your energy goals, choose other measures (or modify existing measure arguments) that you think may have a better chance of success.
    a. Present a comparison of the cumulative annual electricity consumption and a chosen 3-day period between the baseline scenario and class measures scenario results to display the benefits of your added measures.
11. (60 mins) Write a Report: Summarize your methodology and the effects of the measures chosen for the coincident and diverse projects (including net annual energy and daily power profile). Make final recommendations on which energy flexibility or efficiency measures to implement for the district based on your modeling and optimization results. Your analysis must include energy and upgrades cost comparisons, regardless of your specific evaluation criteria. Use of an executive summary is recommended.

Deliverables: (Week 4-5)

- Your final ClassMeasures.rb mapper files used in this project
- A 1-page proposal as stated in Task #4
- A report as stated in Task #10