



# Student Project Activity #0: Installation and Basic Concepts

## Overview

The purpose of this first activity is to install and test the URBANopt software while also learning about the concepts of Urban Building Energy Modeling (UBEM). The student will also create an environment variable for their API key which will allow the use of the REopt tool later in the project.

## Tasks

1. (30 mins) Install URBANopt: Follow the link below to the URBANopt Installation page. Select your platform and familiarize yourself with the page. Follow the directions for “install with the URBANopt installer”:  
<https://docs.urbanopt.net/installation/installation.html>
2. (1 min) Test URBANopt installation: Run the URBANopt CLI “help” command in Git Bash (Windows) or Terminal (macOS):

```
$ uo -h

>>> URBANopt CLI version: 0.9.1
>>> Usage:
>>> uo [options] [<command> [suboptions]]
>>>
>>> Options:
>>> -v, --version      Print version and exit
>>> -h, --help        Show this help message

...
```

This will output a help menu with a list of commands available in URBANopt and the version number. Take a screenshot and save it to your report document.



**Tip:** When installing URBANopt, make sure to run the `setup_env.sh` file found in the directory where URBANopt was installed. This will create the `“.env_uo.sh”` file in the user’s home directory. Also, source the `~/ .env_uo.sh` command before running the `uo -h` command. This will have to be done every time a new Git Bash or Terminal is opened. These instructions can also be found in the installation steps on the URBANopt website (<https://docs.urbanopt.net/installation/installation.html>)

3. (5 mins) Request and save a Developer API Key to access web-based resources such as Reopt: <https://developer.nrel.gov/signup/> .



**Warning** - Do not wait until the last minute to request an API key, as it may take some time to receive it.

- a. Request an API key using the link above
- b. In the box labeled: “How will you use the APIs” enter:

```
URBANopt class project
```

The API key will be displayed on the screen (and also emailed to the address provided)

- c. Configure your environment:

**On Windows:**

- i. In the windows search bar search and go to: “edit environment variables for your account”
- ii. Select “new”
- iii. Variable Name: GEM\_DEVELOPER\_KEY
- iv. Variable Value: <insert your API key from step 3c above>

**On macOS:**

- i. Go to the user directory:

```
cd ~
```

- ii. Find the .zshrc file, open it, and add this line at the very end:

```
export GEM_DEVELOPER_KEY=<YOUR_API_KEY>
```

- iii. (optional) To have the URBANopt environment configured automatically upon every Terminal launch add the following line at the end.

```
source ~/.env_uo.sh
```

- iv. Save the file and reload the terminal, resource the .env\_uo.sh file if not using step iii above.
- v. Type `env` in the terminal to verify that the variable is set

- d. Verify that `uo -h` runs successfully, one last time.

4. (60 mins) Write a Report: Review online documentation and scientific papers to prepare a 1-page written response to the following UBEM questions:
- a. What is Urban Building Energy Modeling (UBEM) and how is it different from individual building energy modeling? What are its capabilities and limitations?

- b. What is Grid-interactive Efficient Buildings (GEB)?
- c. For which GEB objectives might UBEM provide insights beyond individual building energy modeling?
- d. What is URBANopt (provide a brief description)? Briefly describe the objects that URBANopt defines: What is a Feature, FeatureFile, Scenario, Scenario File?

Selected References:

- [Modeling Urban Building Energy Use: A Review of Modeling Approaches and Procedures](#)
- [Grid-interactive efficient Buildings Technical Report Series: Overview of Research Challenges and Gaps](#)
- [URBANopt: An Open-Source Software Development Kit for Community and Urban District Energy Modeling](#)
- <https://docs.urbanopt.net/>
- <https://docs.urbanopt.net/resources/definitions.html>

## Deliverables (Week 1)

- Screenshot of the terminal after running
- Screenshot showing the value of your API key
- A 1-page report as stated in Task #4