

QuEST Performance Tutorial



QuEST Performance Tutorial

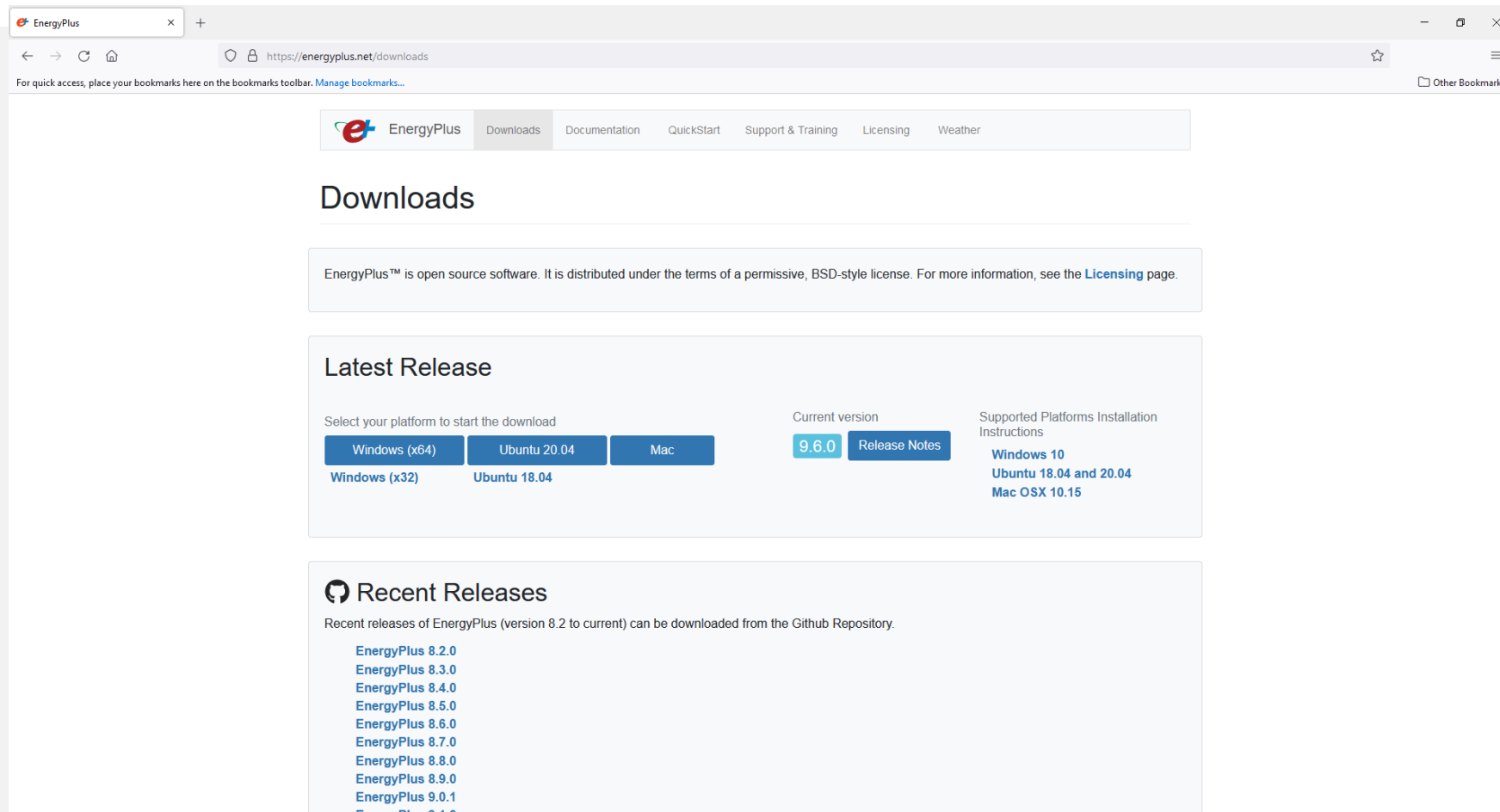
In this tutorial, a basic example will be introduced to enable the user to use the QuEST Performance Tool

The tutorial will cover the following:

- How to download EnergyPlus
- How to download the weather data using QuEST Data Manager
- How to run a QuEST Performance simulation after a QuEST valuation run

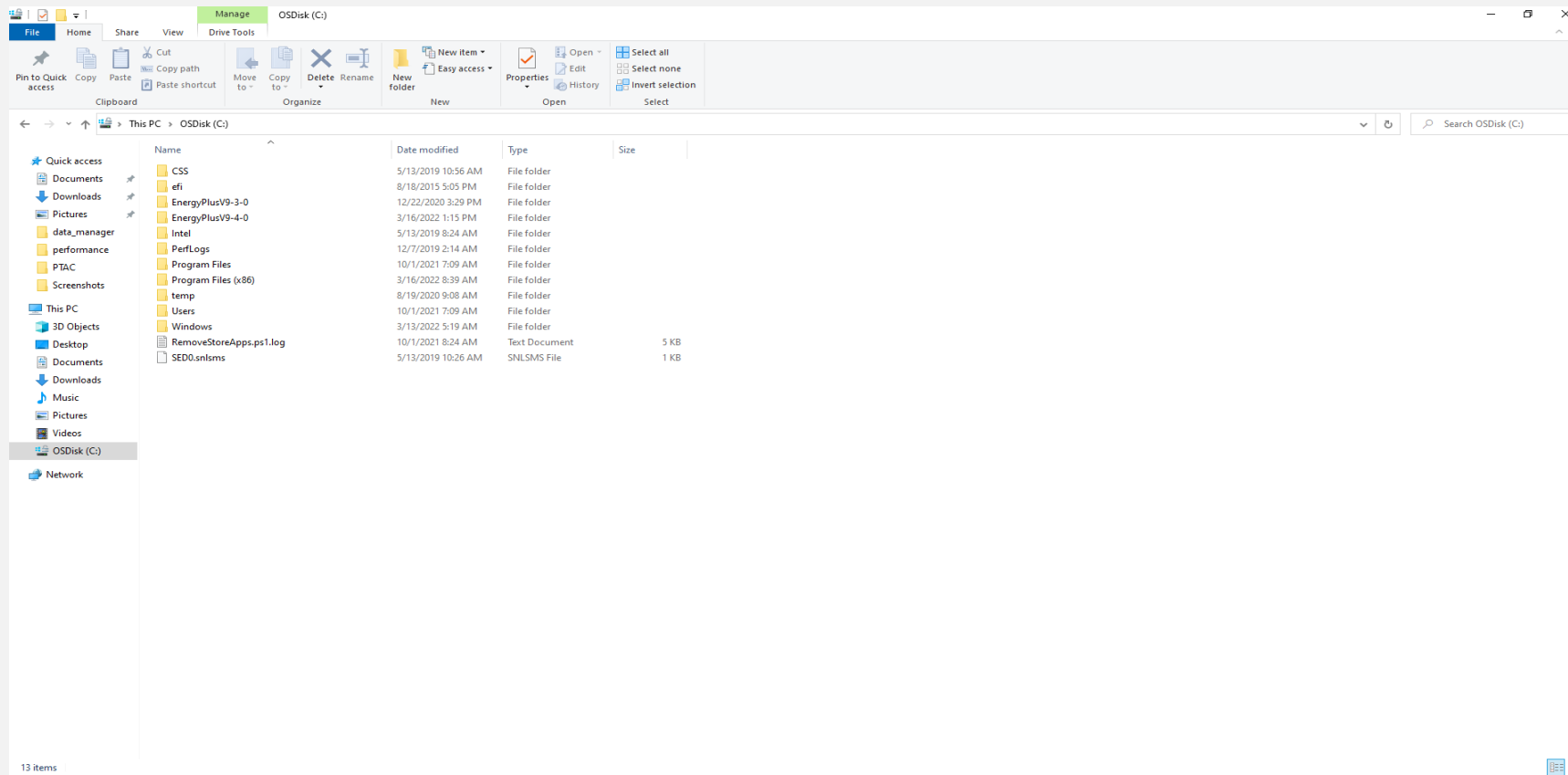
For this example, our location will be New York City.

Download EnergyPlus



Open a web browser and navigate to <https://energyplus.net/downloads>

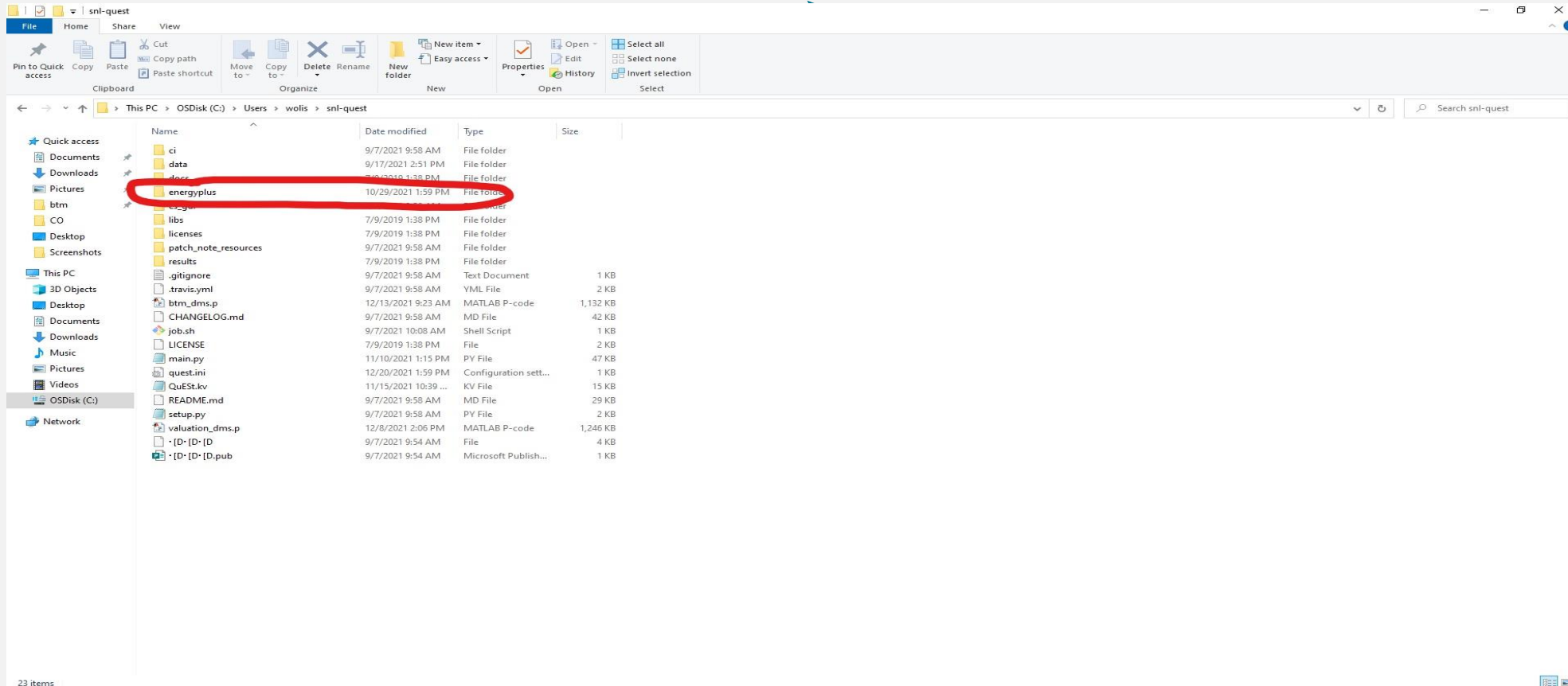
Download EnergyPlus



Download the latest version

Find the EnergyPlusVx-y-z on your drive (x, y, and z represent the version number)

Download EnergyPlus



Copy and paste this file into the Quest directory (folder). Rename to “energyplus”

Download Weather Data

The screenshot shows the QuEST web application interface. At the top, there is a navigation bar with the QuEST logo on the left and links for 'home', 'about', and 'settings' on the right. Below the navigation bar, the main content area is divided into two columns. The left column features a vertical stack of four buttons: 'QuEST Data Manager' (highlighted in blue), 'QuEST Valuation', 'QuEST BTM', and 'Technology Selection'. The right column contains a 'New or returning user?' section with a 'Take a quick tour' button, followed by the 'QuEST Data Manager' section which describes its function and lists data sources. At the bottom of the right column is a 'Get started' button. The footer includes copyright information and logos for the U.S. Department of Energy and NASA.

QuEST

home about settings

QuEST

New or returning user?

Take a quick tour

QuEST Data Manager

Manages the acquisition of data from ISO/RTOs, databases, and other sources for use in QuEST applications, including:

- *ISO/RTO historical market data
- *U.S. utility rate structures/tariffs
- *Commercial and residential building load profiles
- *Photovoltaic power system profiles
- *Weather data

Get started

QuEST Data Manager

QuEST Valuation

QuEST BTM

QuEST Performance

Technology Selection

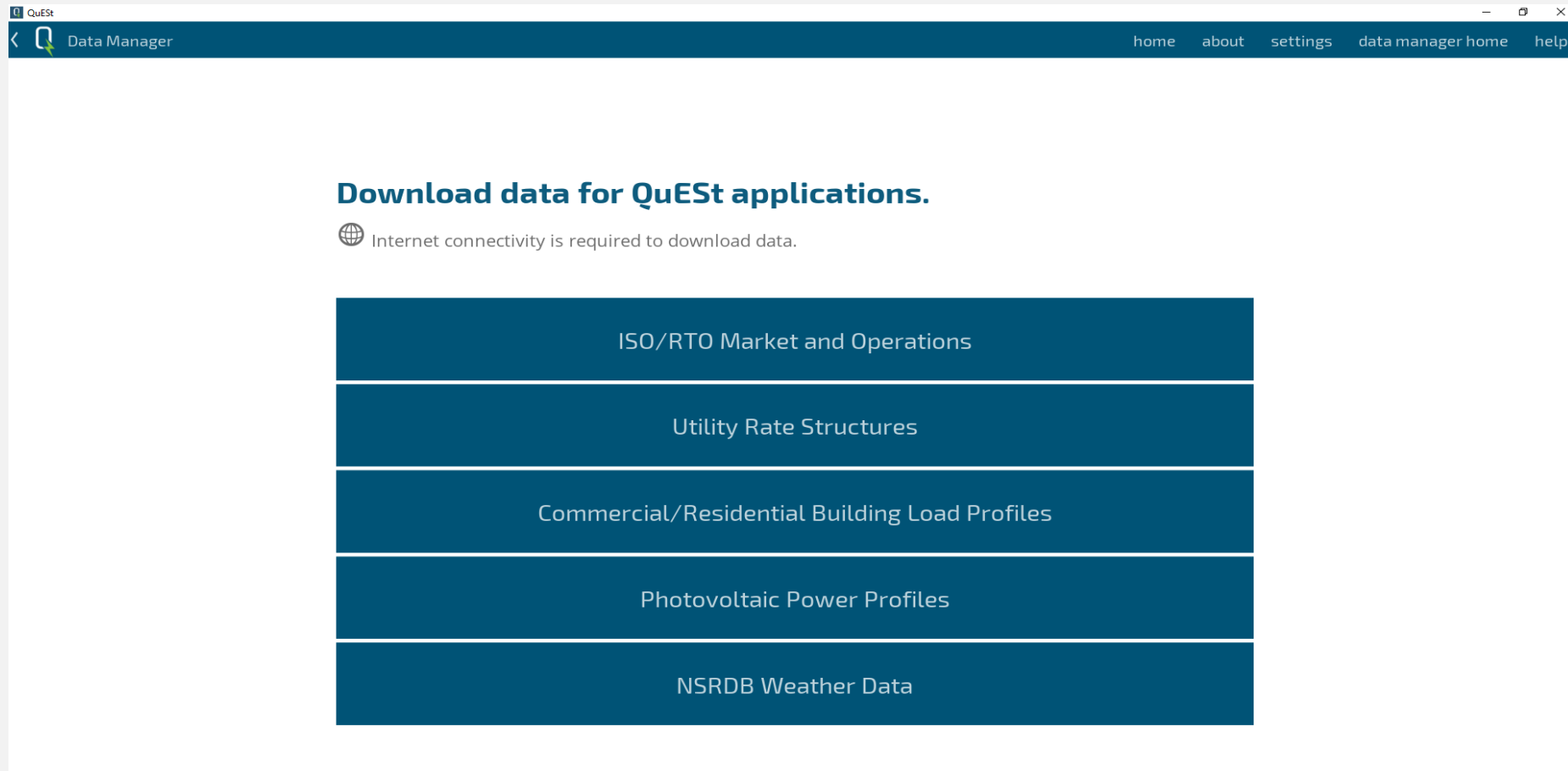
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Open QuEST, head to the Data Manager Tool.

Download Weather Data



Open NSRDB Weather Data tab.

Download Weather Data

The screenshot shows a web browser window titled 'Data Manager: NSRDB'. The page has a dark blue header with navigation links: 'home', 'about', 'settings', 'data manager home', and 'help'. Below the header, the main heading is 'Search for a weather file.'.

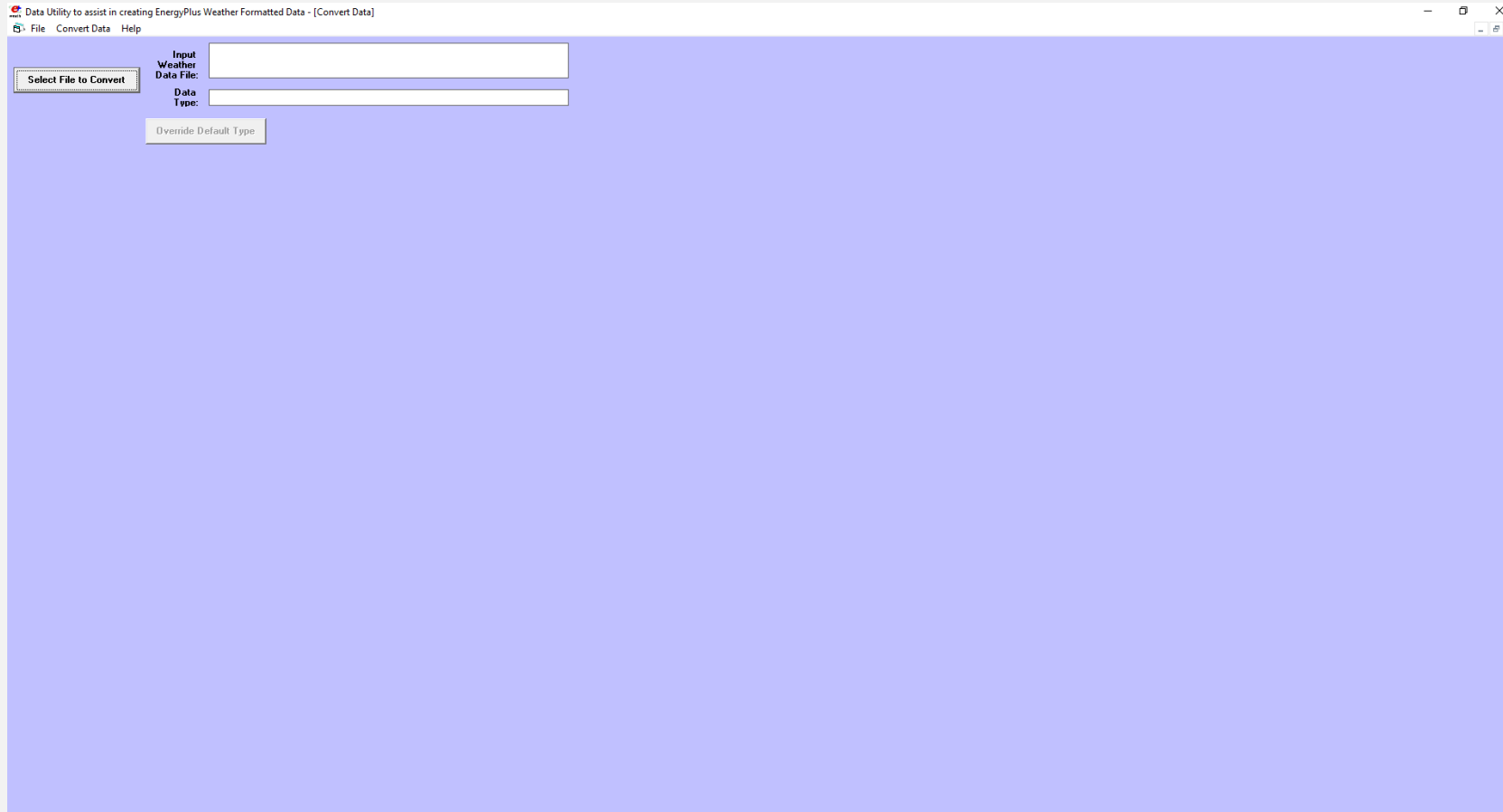
The form contains the following fields and labels:

- Data.gov API key**: A text input field with the placeholder 'API key'.
- location**: A text input field with the value 'NY'. Description: 'Location for directory purposes.'
- latitude**: A text input field with the value '40.73061'. Description: 'The latitude of the site in the range (-90, 90).'
- longitude**: A text input field with the value '-73.935242'. Description: 'The longitude of the site in the range (-180, 180).'
- year**: A text input field with the value '2020'. Description: 'Year of requested data'
- leap year**: A text input field with the value 'true'. Description: 'The leap year parameter. If true will return leap day data if present.'
- utc**: A text input field with the value 'false'. Description: 'Universal time code. True will use UTC, false will use local time zone of data.'
- email**: A text input field with the value 'nail@email.co'. Description: 'Your email'
- mailing list**: A text input field with the value 'false'. Description: 'Do you want to sign up for their mailing list?'

At the bottom of the form, there is a text input field containing 'nyc_2020' and a dark blue 'Save' button.

Enter your data.gov API key along with the information requested for the download. All fields are required. Once ready click save.

Download Weather Data



After clicking the save button, the EnergyPlus weather converter will open.

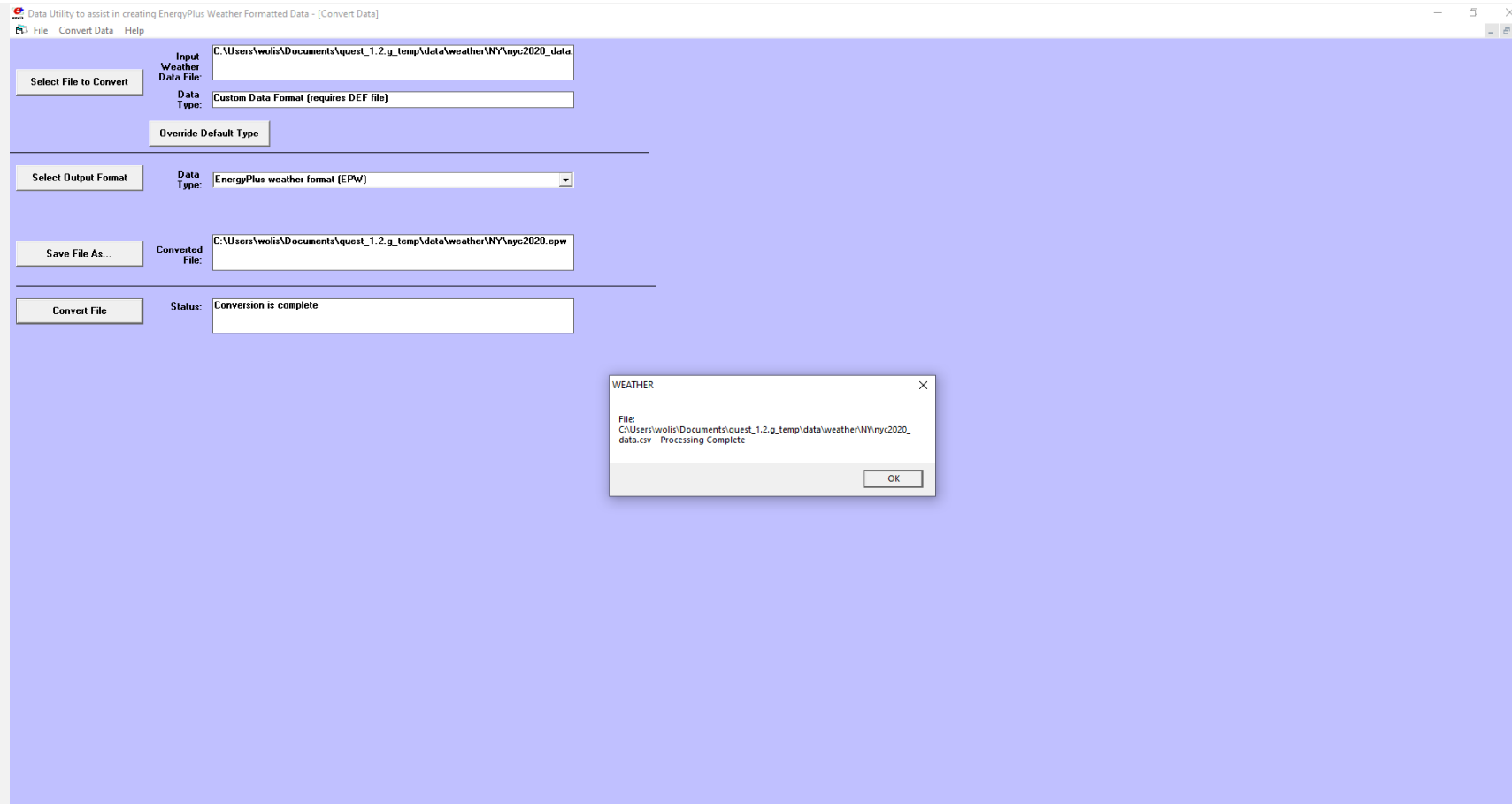
Download Weather Data



To convert the weather data, click “Select File to Convert” and navigate to QuEST/data/weather/NY/. Select the “nyc_2020_data.csv”.

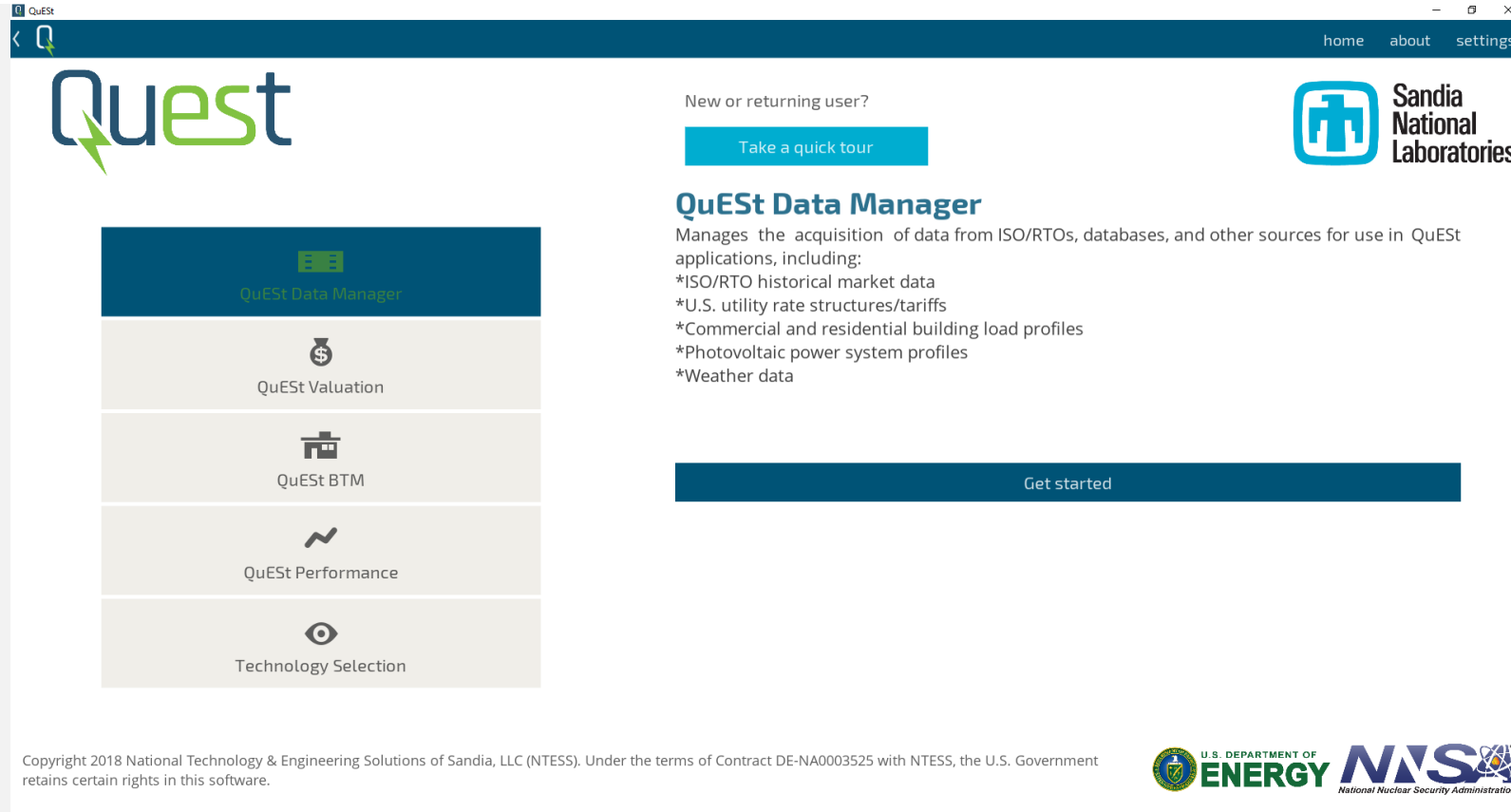
Click select output format which will default to EnergyPlus weather format (EPW). Click save file as and enter your desired file name.

Download Weather Data



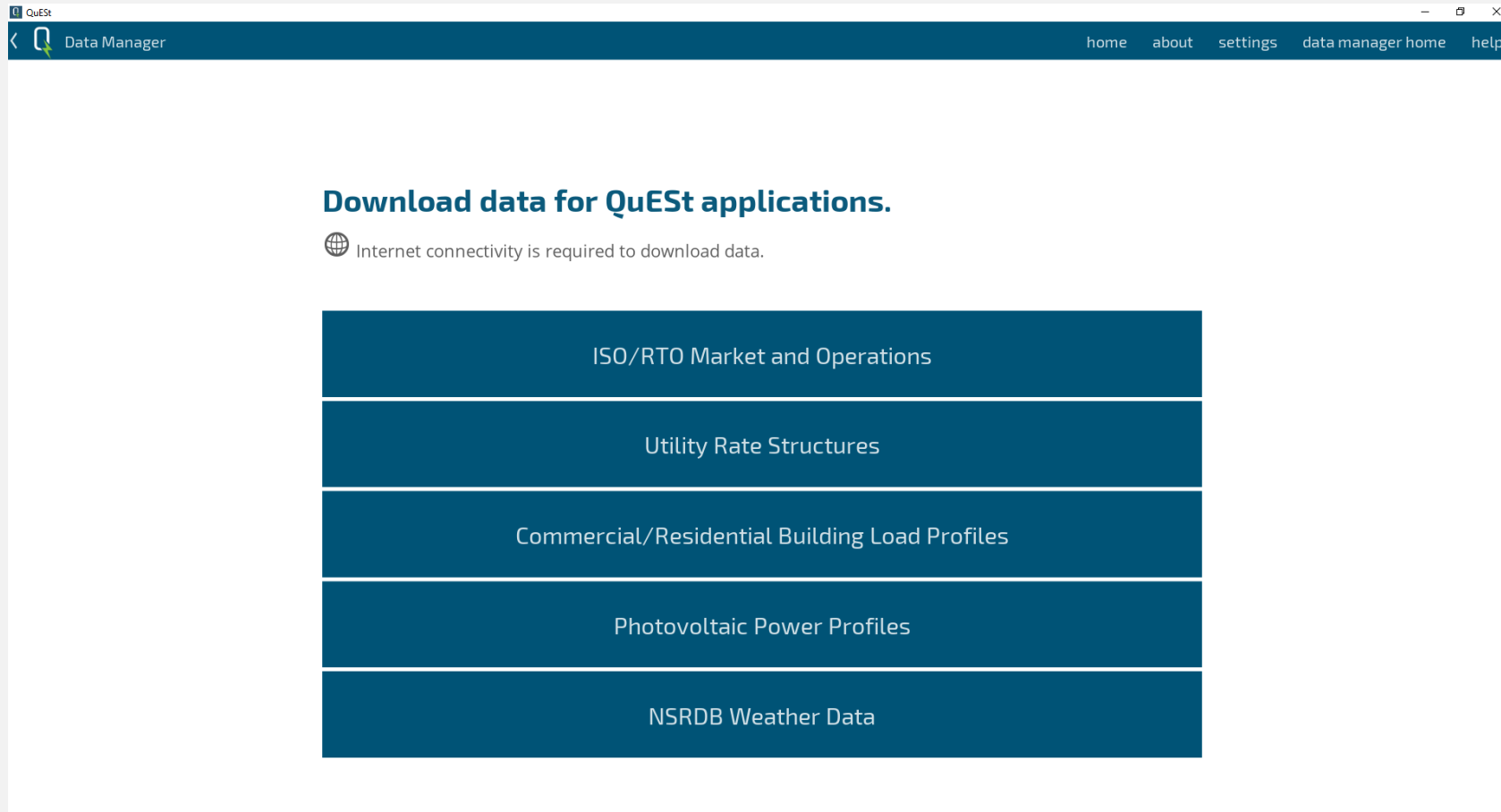
Click convert file. When finished click ok and close out the weather converter. Done!

Run QuEST Valuation



- First we need to download NYISO data. If you are familiar with this, feel free to skip ahead.
- Open QuEST, head to the Data Manager Tool.

Run QuEST Valuation



- Select ISO/RTO Market and Operations from the options.

Run QuEST Valuation

The screenshot shows the QuEST Data Manager interface. At the top, there's a navigation bar with links: home, about, settings, data manager home, and help. Below this, the main heading is "Download ISO/RTO market and operations data." Underneath, there are tabs for different ISOs: SPP, PJM, NYISO (selected), MISO, ISO-NE, ERCOT, and CAISO. The NYISO section is active, showing a "Range of months" section with "Start:" set to January 2020 and "End:" set to January 2021. There's also a "Types of nodes" section with "Zonal" checked and "Generators" unchecked. At the bottom right of the form, there are "Download" and "Cancel" buttons. A "Settings" button is located at the bottom right of the entire interface.

QuEST

Data Manager: ISO/RTO Market and Operations Data

home about settings data manager home help

Download ISO/RTO market and operations data.

SPP PJM **NYISO** MISO ISO-NE ERCOT CAISO

NYISO

Range of months

Start: January 2020

End: January 2021

Types of nodes

☒ Zonal ☐ Generators

Download

Cancel

Settings

- Select the NYISO tab. Set the range of months from January 2020 to December 2020. Check the Zonal nodes box. Make sure your settings are correctly configured, click download.

Run QuEST Valuation

The screenshot shows the QuEST web application interface. At the top, there is a dark blue header with the QuEST logo on the left and navigation links (home, about, settings) on the right. Below the header, the main content area is divided into two columns. The left column features a vertical menu with five options: QuEST Data Manager, QuEST Valuation (highlighted in dark blue), QuEST BTM, QuEST Performance, and Technology Selection. The right column contains a section for new or returning users with a 'Take a quick tour' button. Below this is the 'QuEST Valuation' section, which includes a descriptive paragraph about the tool's function: 'Estimates value for an energy storage system providing ISO/RTO services. Uses historical data to determine the maximum amount of revenue that the energy storage system could have generated by stacking multiple services/value streams (e.g., ancillary services, energy arbitrage). This retrospective analysis estimates value from future cash flows.' A 'Get started' button is located below the description. At the bottom of the page, there is a copyright notice and logos for the U.S. Department of Energy and NASA.

QuEST

home about settings

QuEST

New or returning user?

Take a quick tour

QuEST Valuation

Estimates value for an energy storage system providing ISO/RTO services. Uses historical data to determine the maximum amount of revenue that the energy storage system could have generated by stacking multiple services/value streams (e.g., ancillary services, energy arbitrage). This retrospective analysis estimates value from future cash flows.

Get started

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- Navigate to the QuEST Valuation tool.

Run QuEST Valuation

The screenshot shows the QuEST Batch Runs interface. At the top, there's a navigation bar with links: home, about, settings, view results, and batch runs. Below the navigation bar, the main heading is "Run multiple valuations with one click." The interface is divided into two main sections: "Select a pricing node." and "Select months to evaluate." The "Select a pricing node." section has a filter by name input and a list of nodes: CAPITL, CENTRL, DUNWOD, GENESE, HUD VL, LONGIL, MHK VL, MILLWD, N.Y.C. (highlighted), NORTH, and WEST. The "Select months to evaluate." section has a list of months from January 2020 to December 2020, with the first six months (January to June 2020) highlighted in blue. At the bottom, there are three buttons: "Data", "Parameters", and "Go!".

QuEST Batch Runs

home about settings view results batch runs

Run multiple valuations with one click.

NYISO

Arbitrage and regulation

Select a pricing node.

Filter by name

CAPITL
CENTRL
DUNWOD
GENESE
HUD VL
LONGIL
MHK VL
MILLWD
N.Y.C.
NORTH
WEST

Select months to evaluate.

January 2020
February 2020
March 2020
April 2020
May 2020
June 2020
July 2020
August 2020
September 2020
October 2020
November 2020
December 2020

Data Parameters Go!

- Click on the Batch Runs Button -> select NYISO from the pull down options -> select N.Y.C. from the node options -> select arbitrage and regulation from the pull down options -> select the first six months of the year.

Run QuEST Valuation

The screenshot shows the 'Batch Runs' interface of the QuEST application. The header bar includes a back arrow, the QuEST logo, and the text 'Batch Runs'. On the right side of the header are navigation links: 'home', 'about', 'settings', 'view results', and 'batch runs'. Below the header, a blue banner reads 'Run multiple valuations with one click.' The main area contains a grid of input fields for various parameters. The parameters and their current values are: self-discharge efficiency (%/h) at 100, round trip efficiency (%) at 85, energy capacity (MWh) at 1, power rating (MW) at 1, initial state of charge (%) at 50, minimum state of charge (%) at 5, maximum state of charge (%) at 95, % of reg. bid reserved for discharging at 0, % of reg. bid reserved for charging at 0, frac. of reg. up capacity deployed at 0.25, frac. of reg. down capacity deployed at 0.25, and performance score at 0.95. Below this grid, there is a red heading 'Optional: parameter sweep' followed by a dark blue button labeled 'Select a parameter to sweep'. Under this button are three input fields labeled 'min', 'max', and '# of steps'. At the bottom of the interface are three buttons: 'Data' (dark blue), 'Parameters' (grey), and 'Go!' (green). The 'Parameters' tab is currently selected.

Parameter	Value
self-discharge efficiency (%/h)	100
round trip efficiency (%)	85
energy capacity (MWh)	1
power rating (MW)	1
initial state of charge (%)	50
minimum state of charge (%)	5
maximum state of charge (%)	95
% of reg. bid reserved for discharging	0
% of reg. bid reserved for charging	0
frac. of reg. up capacity deployed	0.25
frac. of reg. down capacity deployed	0.25
performance score	0.95

Optional: parameter sweep

Select a parameter to sweep

min max # of steps

Data Parameters **Go!**

- Click the Parameters tab. Change the energy capacity to 1 MWh and the power rating to 1 MW. Change the minimum state of charge to 5% and the maximum state of charge to 95%.
- Once everything looks correct, click Go! Once the simulations are finished, navigate back to the home page.

Run QuEST Performance

The screenshot shows the QuEST web application interface. At the top is a dark blue header with a navigation bar containing 'home', 'about', and 'settings' links. Below the header is the QuEST logo, which features a green lightning bolt. To the right of the logo, there is a section for new or returning users with a 'Take a quick tour' button. The main content area is divided into two columns. The left column contains a vertical menu with five items: 'QuEST Data Manager' (with a database icon), 'QuEST Valuation' (with a dollar sign icon), 'QuEST BTM' (with a house icon), 'QuEST Performance' (with a green line graph icon and highlighted in dark blue), and 'Technology Selection' (with an eye icon). The right column features the 'QuEST Performance' title, a brief description: 'Estimates the effect heating and cooling loads have on battery energy storage performance.', and a large 'Get started' button. At the bottom of the page, there is a copyright notice and logos for the U.S. Department of Energy and NASA.

QuEST

home about settings

New or returning user?

Take a quick tour

QuEST Performance

Estimates the effect heating and cooling loads have on battery energy storage performance.

Get started

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- Navigate to the QuEST Performance tool.



Run QuEST Performance

The screenshot shows the QuEST Performance Simulations web interface. At the top, there is a navigation bar with a back arrow, the QuEST logo, and the text "Performance Simulations". On the right side of the navigation bar are links for "home", "about", "settings", and "help". Below the navigation bar, the main heading reads "Run performance simulations.".

The interface is divided into three main columns for configuration:

- PTAC:** A dropdown menu showing "PTAC".
- NY:** A dropdown menu showing "NY".
- Valuation:** A dropdown menu showing "Valuation Mar 16, 2022 10:07:21".

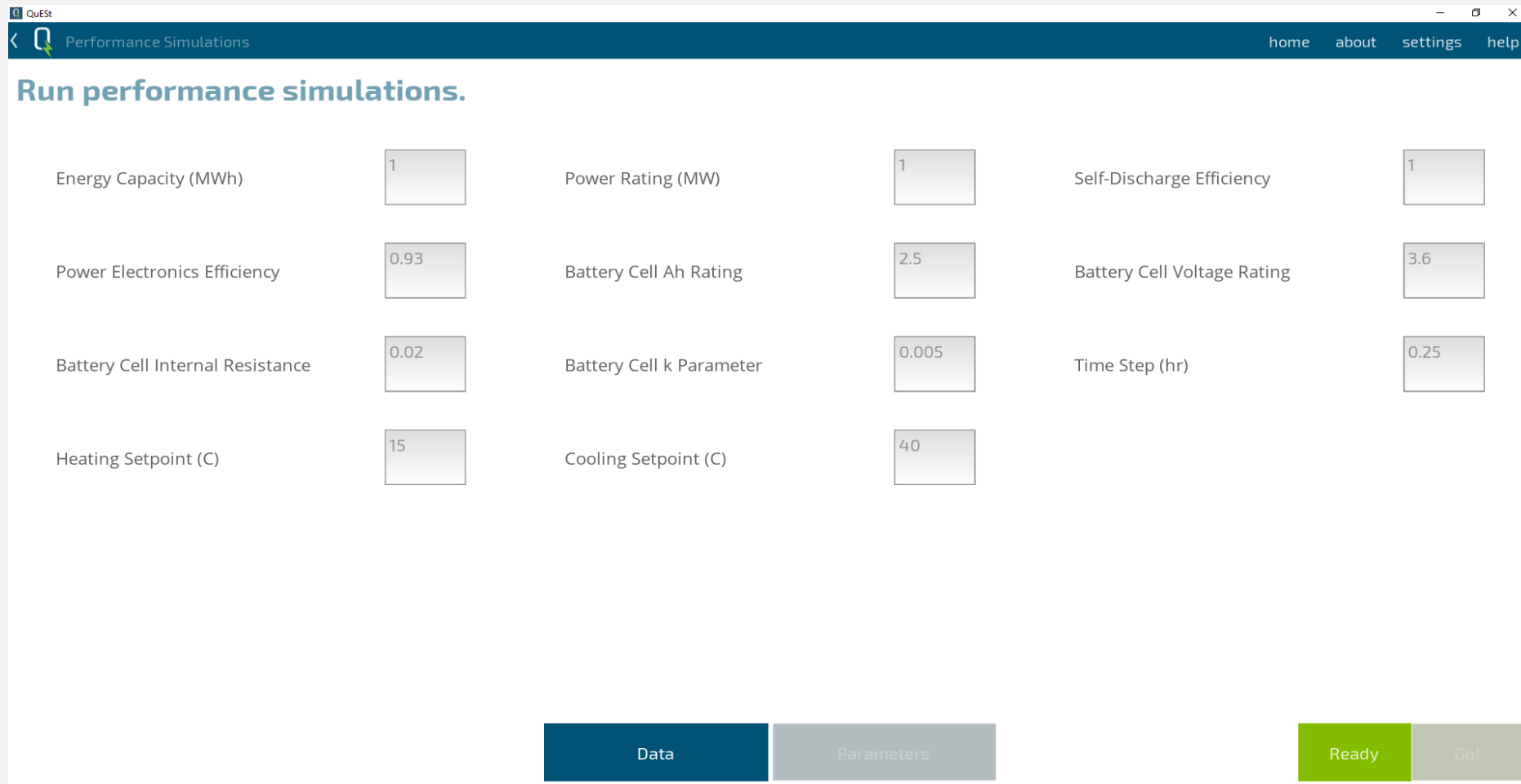
Below these columns are three sections for file selection:

- Select an input file:** A dropdown menu showing "container_wESS_ptac.idf".
- Select weather file:** A dropdown menu showing "nyc2020.epw".
- Select battery profile:** A dropdown menu showing a list of months: "June", "May", "March", "April", "February", and "January".

At the bottom of the interface, there are two buttons: "Data" (disabled, grey) and "Parameters" (active, dark blue). To the right of these buttons are two more buttons: "Ready" (active, green) and "Go!" (disabled, grey).

- Enter the Performance Simulations option. Select PTAC from the HVAC options. Select the provided input file describing a BESS in a shipping container. Select NY from the location dropdown. Select the weather file downloaded previously. Select the Valuation run from the Profile dropdown. Select the six months available.

Run QuEST Performance



The screenshot shows the QuEST Performance Simulations web interface. At the top, there is a navigation bar with a back arrow, a QuEST logo, and the text "Performance Simulations". To the right of the navigation bar are links for "home", "about", "settings", and "help". Below the navigation bar, the main heading reads "Run performance simulations.".

The interface contains a grid of input fields for various parameters:

Parameter	Value
Energy Capacity (MWh)	1
Power Rating (MW)	1
Self-Discharge Efficiency	1
Power Electronics Efficiency	0.93
Battery Cell Ah Rating	2.5
Battery Cell Voltage Rating	3.6
Battery Cell Internal Resistance	0.02
Battery Cell k Parameter	0.005
Time Step (hr)	0.25
Heating Setpoint (C)	15
Cooling Setpoint (C)	40

At the bottom of the interface, there are four buttons: "Data" (dark blue), "Parameters" (grey), "Ready" (green), and "Go!" (grey).

- Click the Parameters tab. Leave the default parameters as is, click the Ready Button.

Run QuEST Performance

The screenshot shows the QuEST Performance Simulations web interface. The header includes the QuEST logo and navigation links: home, about, settings, help. The main heading is "Run performance simulations." Below this, there are three sections for configuration: HVAC, Location, and Profile. The HVAC section shows "PTAC" and "container_wESS_ptac.idf". The Location section shows "NY" and "nyc2020.epw". The Profile section shows a valuation date of "Mar 16, 2022 14:35:50" and a list of months from June to January. To the right of these sections is a "System Parameters" list with values for Cooling Setpoint, Heating Setpoint, Time Step, Battery Cell k Parameter, Battery Cell Internal Resistance, Battery Cell Voltage Rating, Battery Cell Ah Rating, Power Electronics Efficiency, Self-Discharge Efficiency, Power Rating, and Energy Capacity. At the bottom, there are four buttons: "Data", "Parameters", "Ready", and "Go!".

QuEST Performance Simulations

home about settings help

Run performance simulations.

HVAC:
PTAC
container_wESS_ptac.idf

Location:
NY
nyc2020.epw

Profile:
Valuation Mar 16, 2022 14:35:50
June
May
April
March
February
January

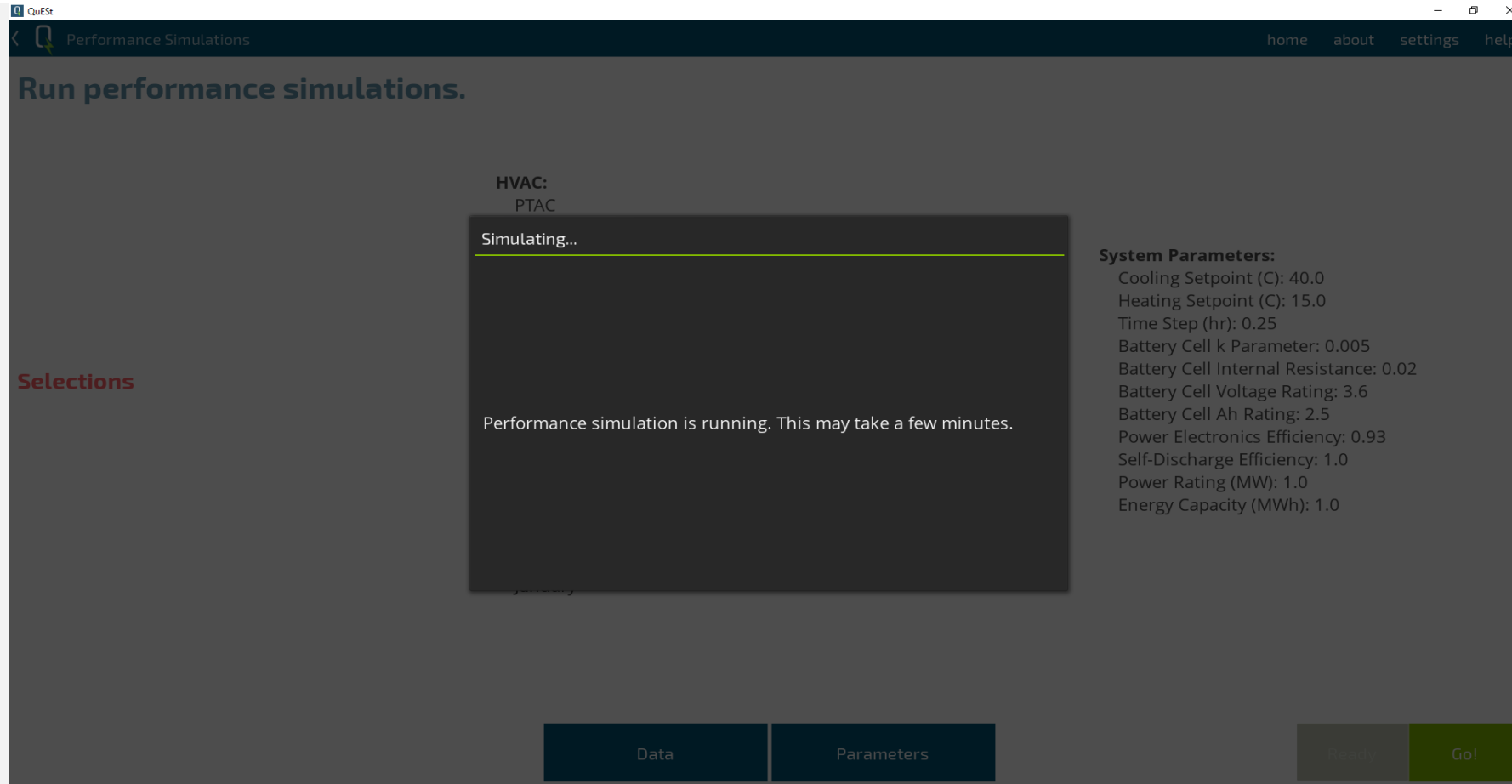
System Parameters:
Cooling Setpoint (C): 40.0
Heating Setpoint (C): 15.0
Time Step (hr): 0.25
Battery Cell k Parameter: 0.005
Battery Cell Internal Resistance: 0.02
Battery Cell Voltage Rating: 3.6
Battery Cell Ah Rating: 2.5
Power Electronics Efficiency: 0.93
Self-Discharge Efficiency: 1.0
Power Rating (MW): 1.0
Energy Capacity (MWh): 1.0

Selections

Data Parameters Ready Go!

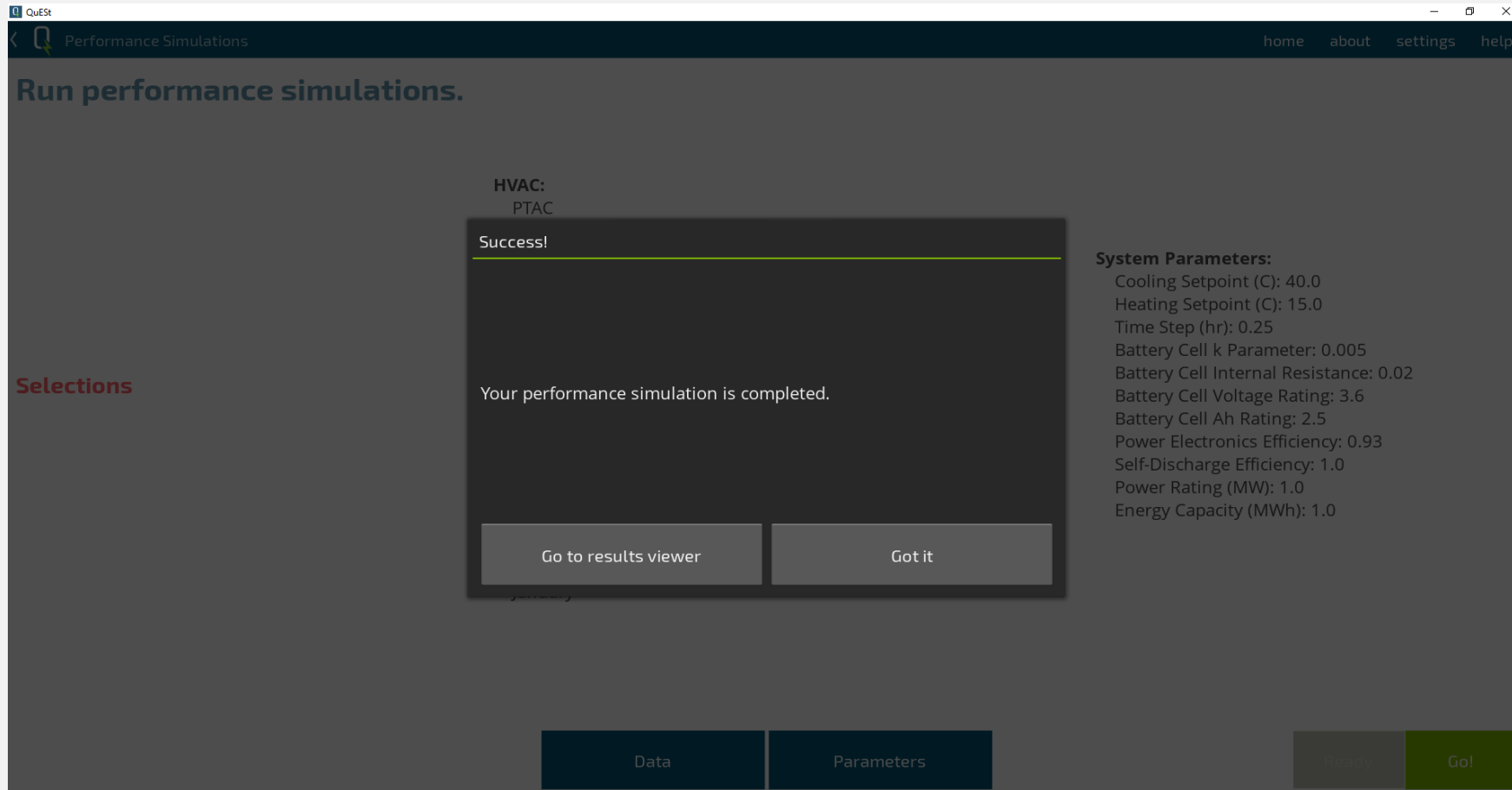
- The selections made will be displayed. If everything looks correct, press Go!

Run QuEST Performance



- A popup will appear reassuring that the performance simulation is running, which may take a few minutes.

Run QuEST Performance

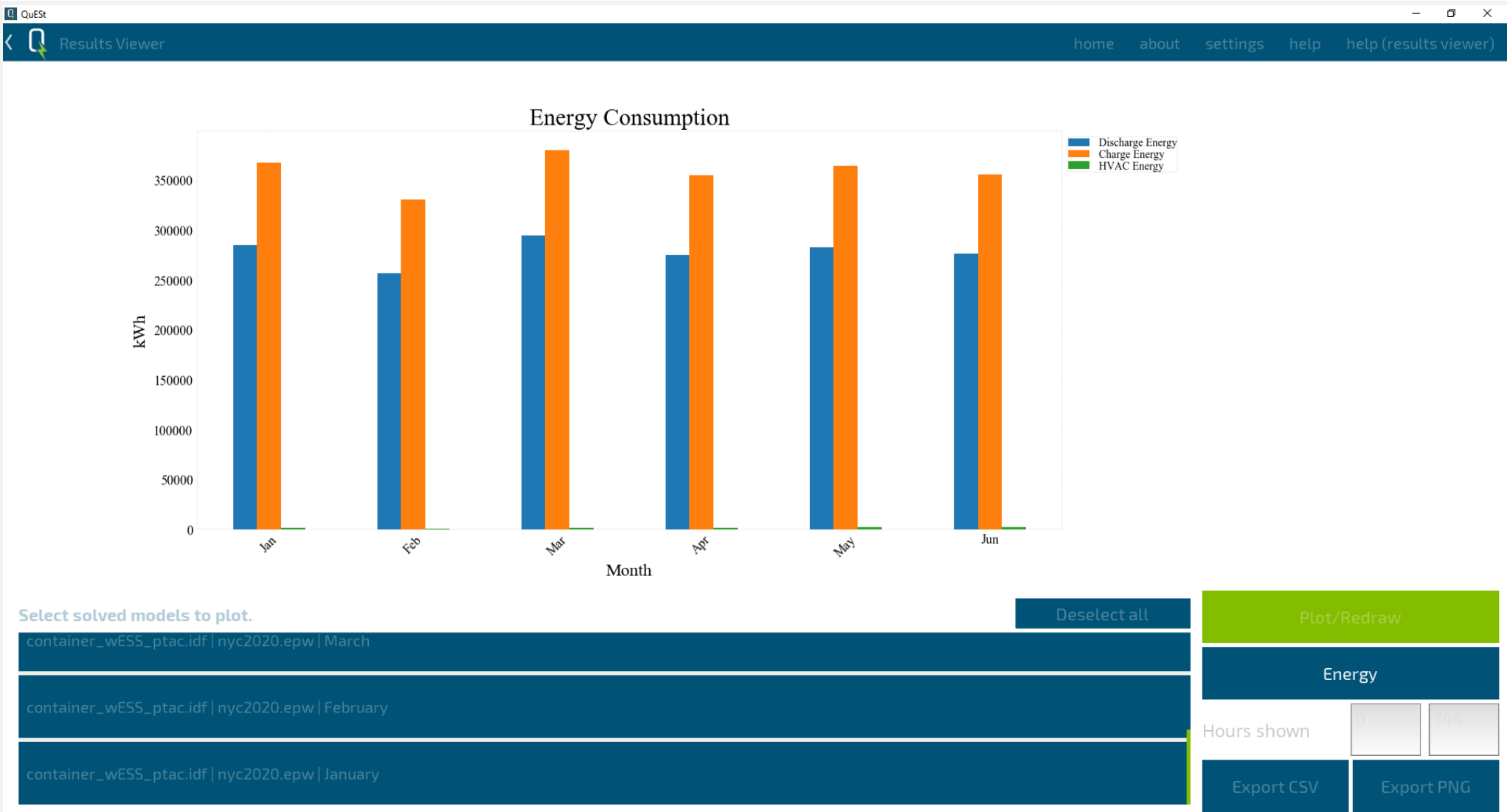


- Once the simulation is completed, a new popup will appear saying the simulation is completed. Click “Go to results viewer”.

Run QuEST Performance

- Select as many runs as you want, the pictures displayed here show all six.
- Options to plot are the monthly energy consumption of battery and HVAC, Hourly HVAC or Battery power throughout each month, and the month efficiency of the battery.

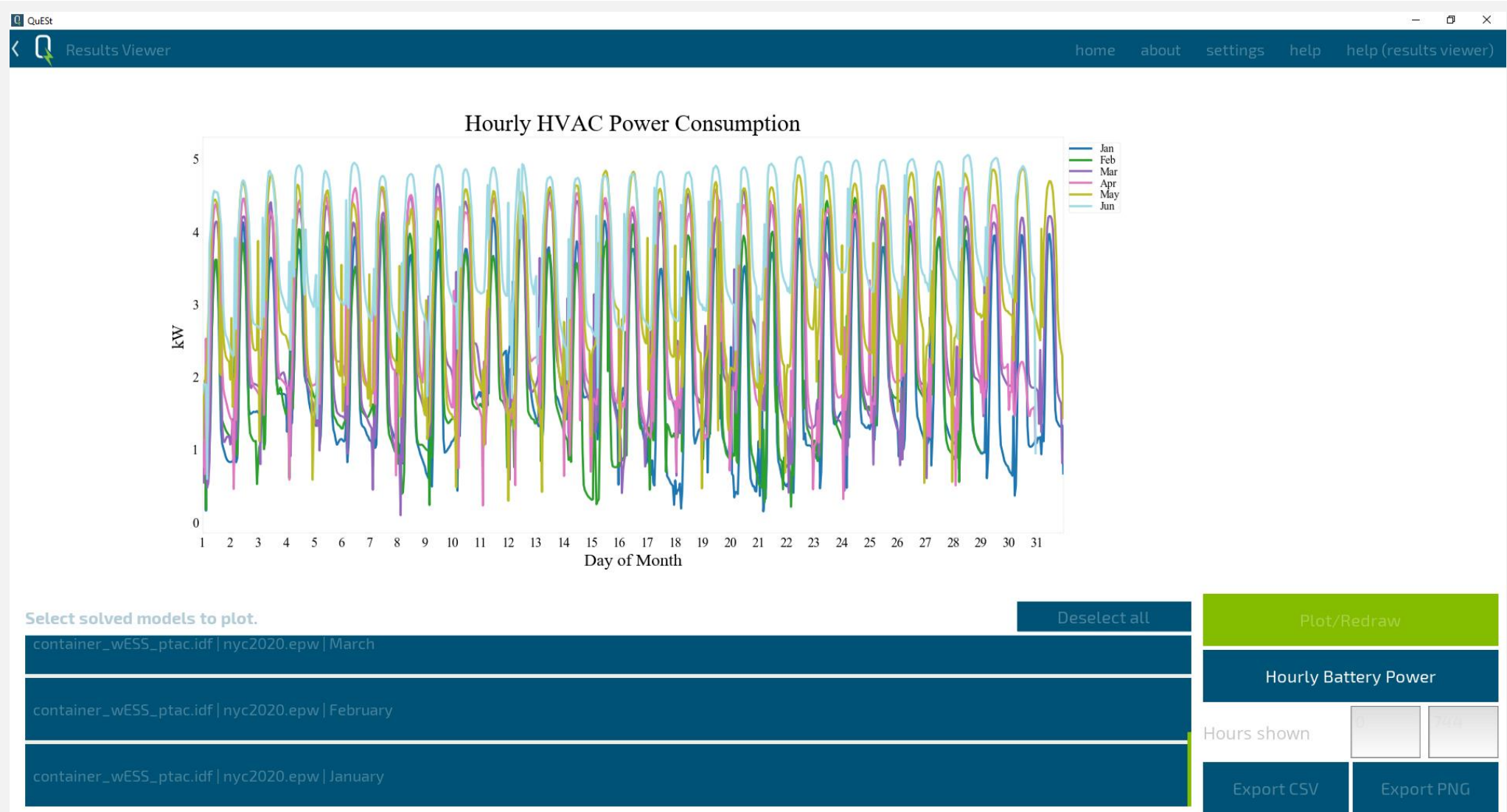
Run QuEST Performance



Run QuEST Performance



Run QuEST Performance



Run QuEST Performance

