Solar Tri-Generation

enersion

SDSU | San Diego State University

Project Description

Enersion is a clean energy start-up with a system called tri-generation where they provide cooling, heating, and electricity to a customer.

To assist their analysis, we created a GUI that displays input data such as solar availability, electrical and hot water usage, cooling load, and compares it with the projected energy capabilities of various sizes of Enersion's system.

Ultimately, a cost of energy upkeep and carbon footprint analysis is output to help a customer realize the benefits of installing Enersion's system.

Fig. 1

Tri-Generation

As shown in Figure 1, the input to Enersion's system is solar radiation in the form of specialized photo voltaic panels that generates both electricity and hot water. They then leverage the hot water to power their chiller, therefore producing cooling. The outputs of their system are hot water, electricity, and cooling.
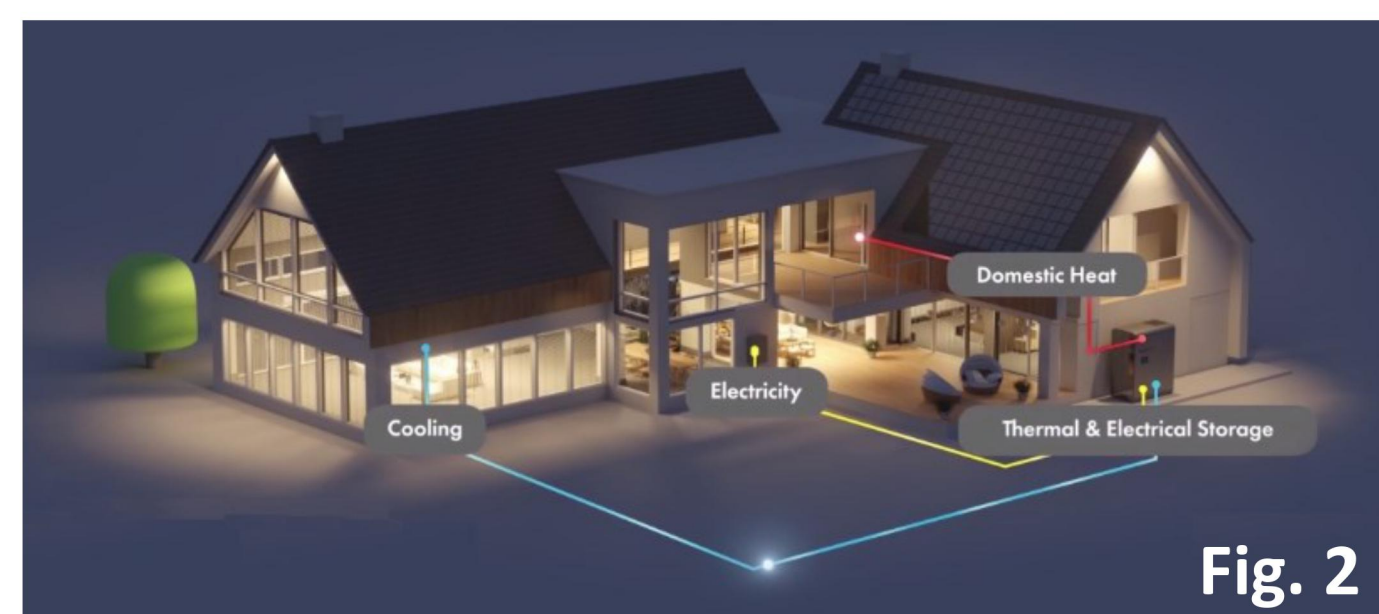

Fig. 2

In Figure 2, the storage capabilities of Enersion's system are displayed. The system can store hot water and electricity produced in the daytime to later be used at night when no energy is produced.

Figures 1 and 2 from www.enersion.com

Graphical User Interface (GUI)

Allows a user to input yearly energy demand of a building in hourly intervals, select location, sizing, electrical and gas rates, and displays it for the user in a date-selectable graph with variable running averages.
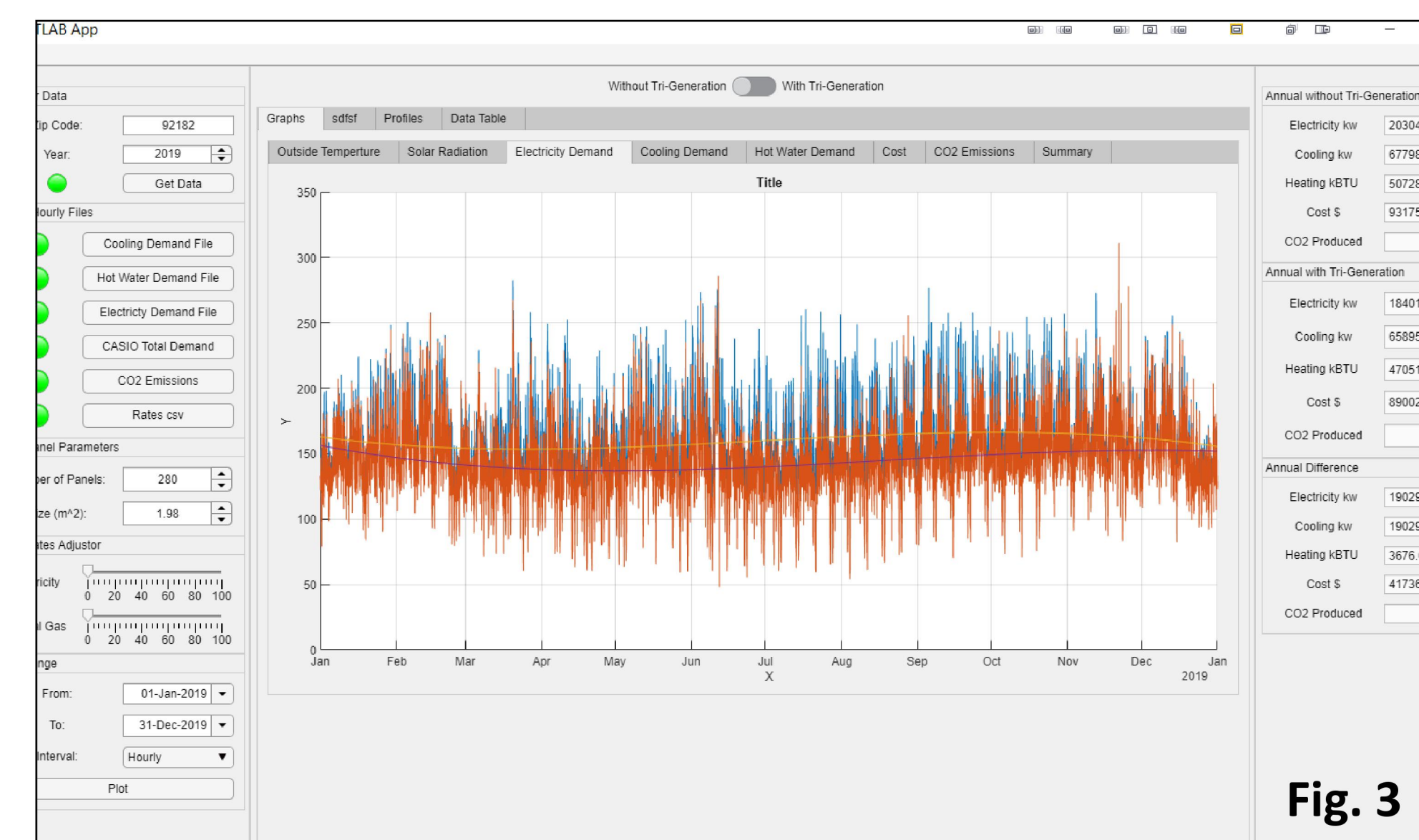

Fig. 3

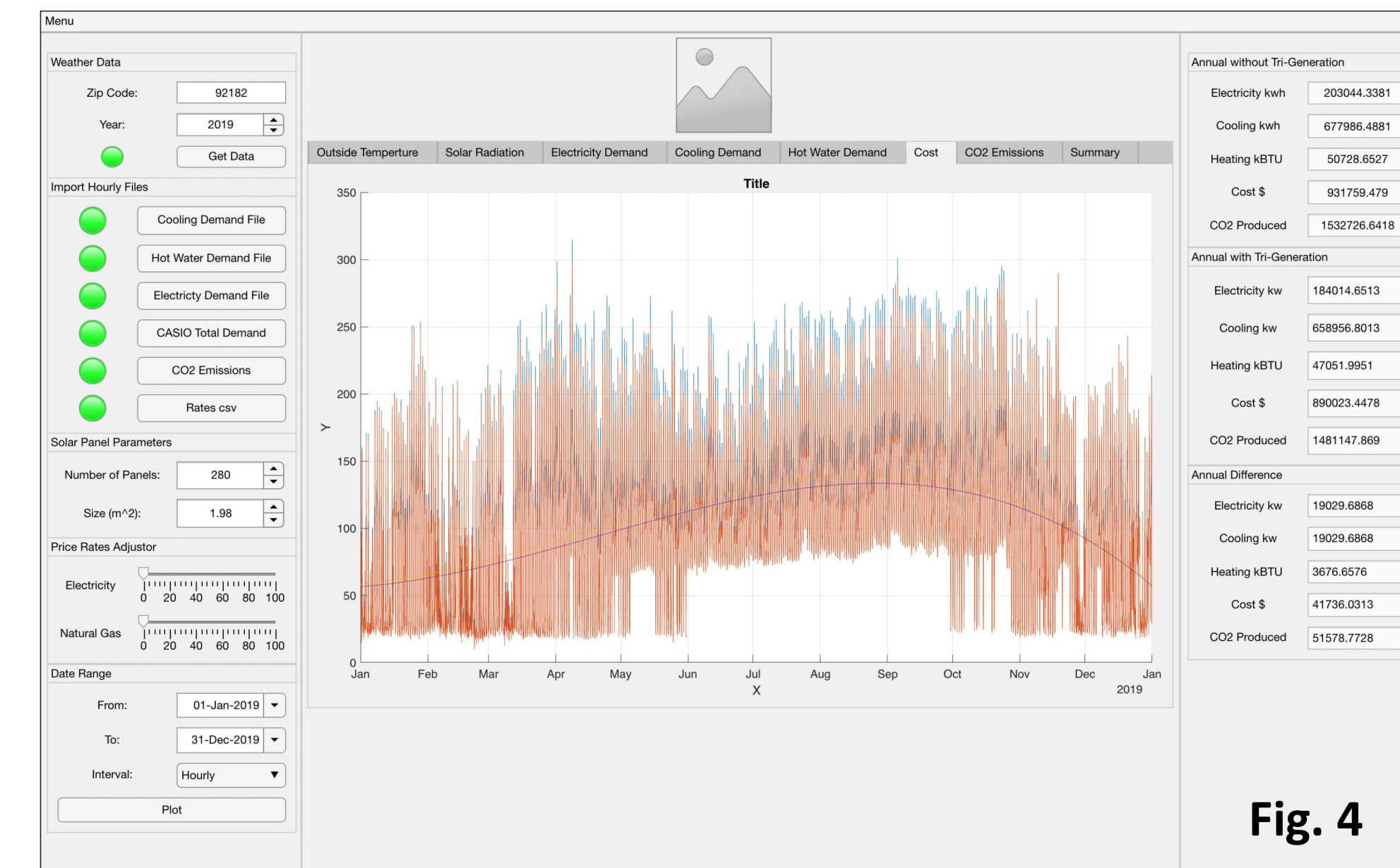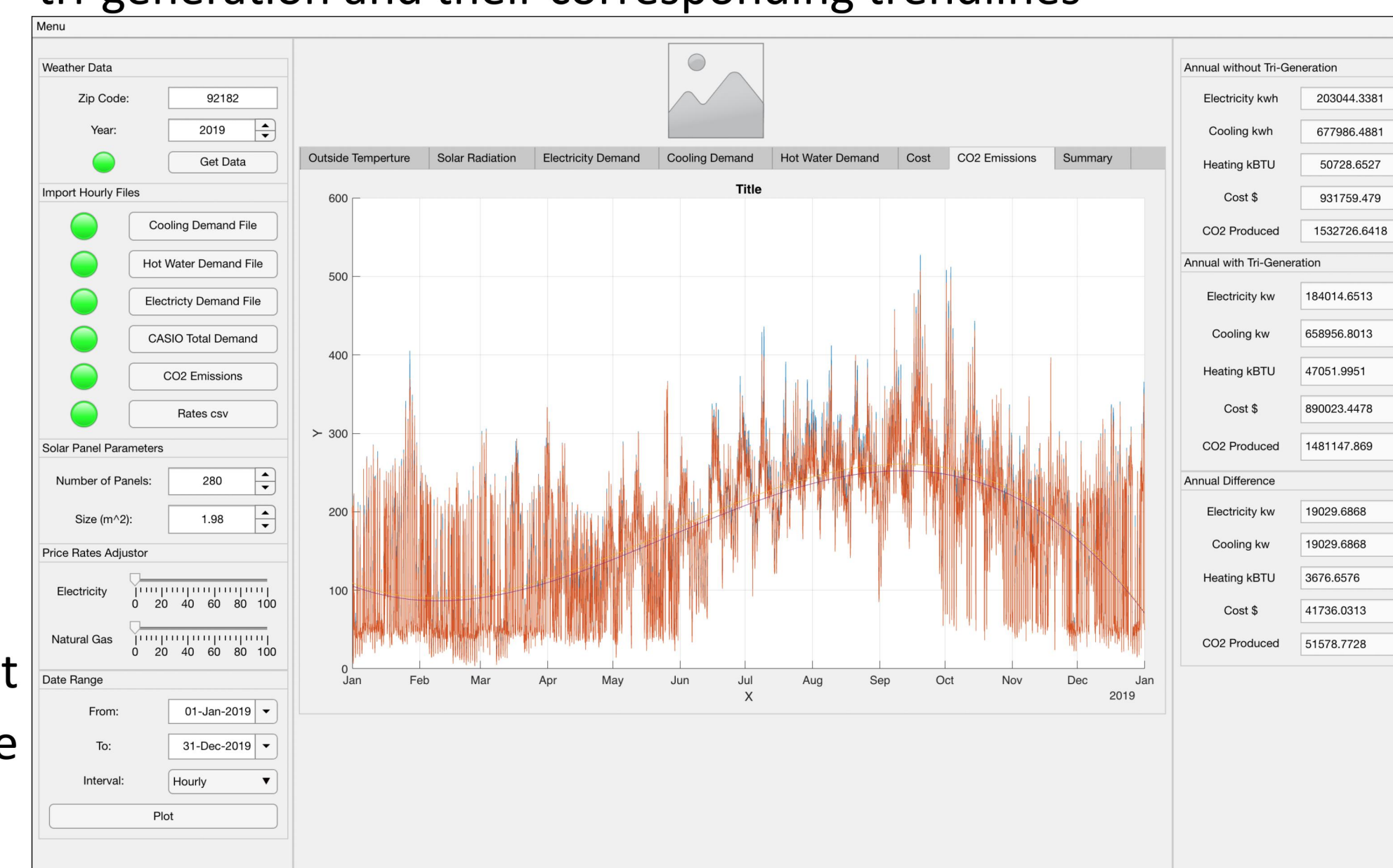**Figure 3:** Electrical energy demand with and without tri-generation and their corresponding trendlines

Fig. 4

Figure 4: Cost of energy upkeep with and without tri-generation and their corresponding trendlines

Figure 5: CO_2 production of the building without tri-generation and its corresponding trendline

Data Flowchart

The following block diagrams visually show what happens to the raw input data. The light yellow blocks highlight the unit conversions, the blue blocks show data comparisons, the green blocks show the total project cost, and the orange blocks show the CO_2 production.
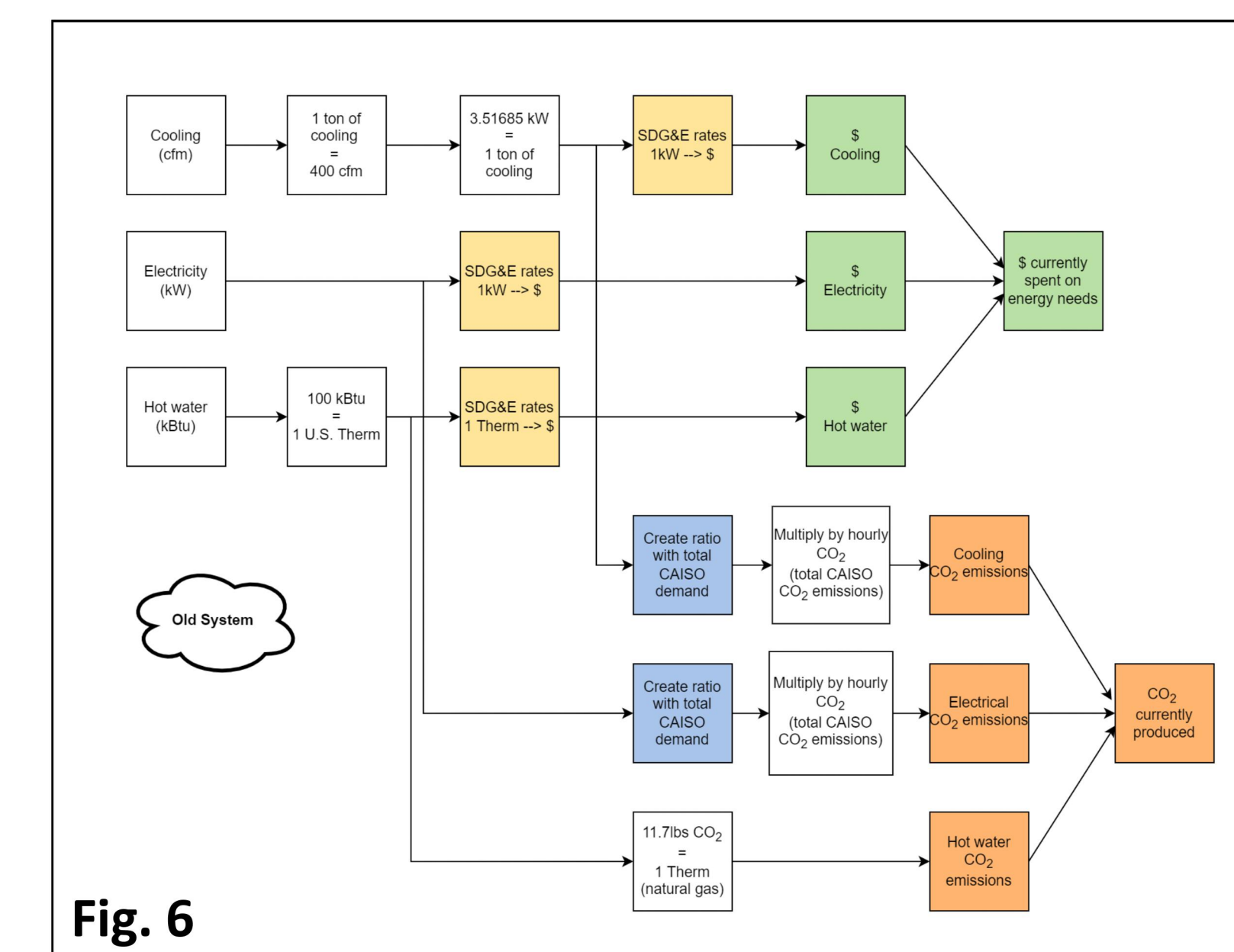

Fig. 6

Figure 6: Block Diagram depicting the calculations to analyze a building's current energy upkeep cost and CO_2 production.

Figure 7: Block diagram showing the calculations with the implementation of a size-variable tri-generation system on the building. Ultimately, Enersion's system will decrease the energy usage of a building from the grid reducing cost and CO_2 emissions.
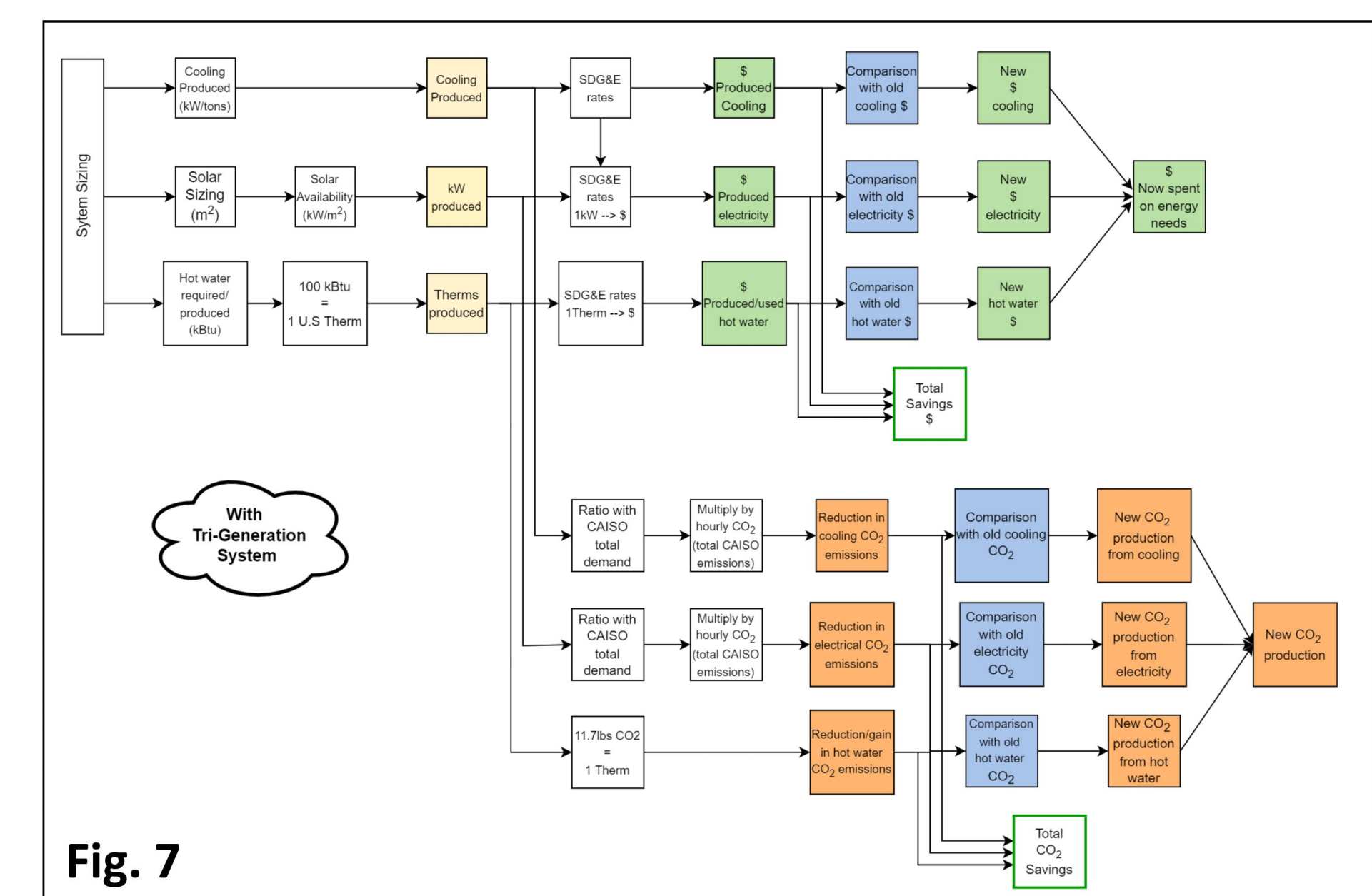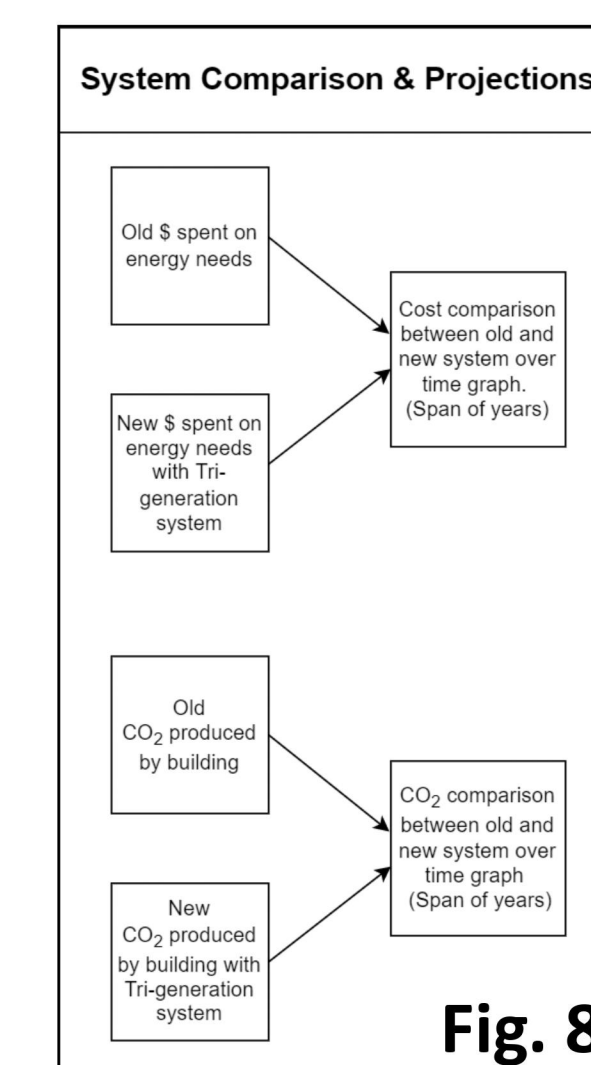

Fig. 7

Fig. 8

Figure 8: Block diagram illustrating the combination of the data from the prior 2 block diagram resulting in cost and CO_2 comparisons.

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