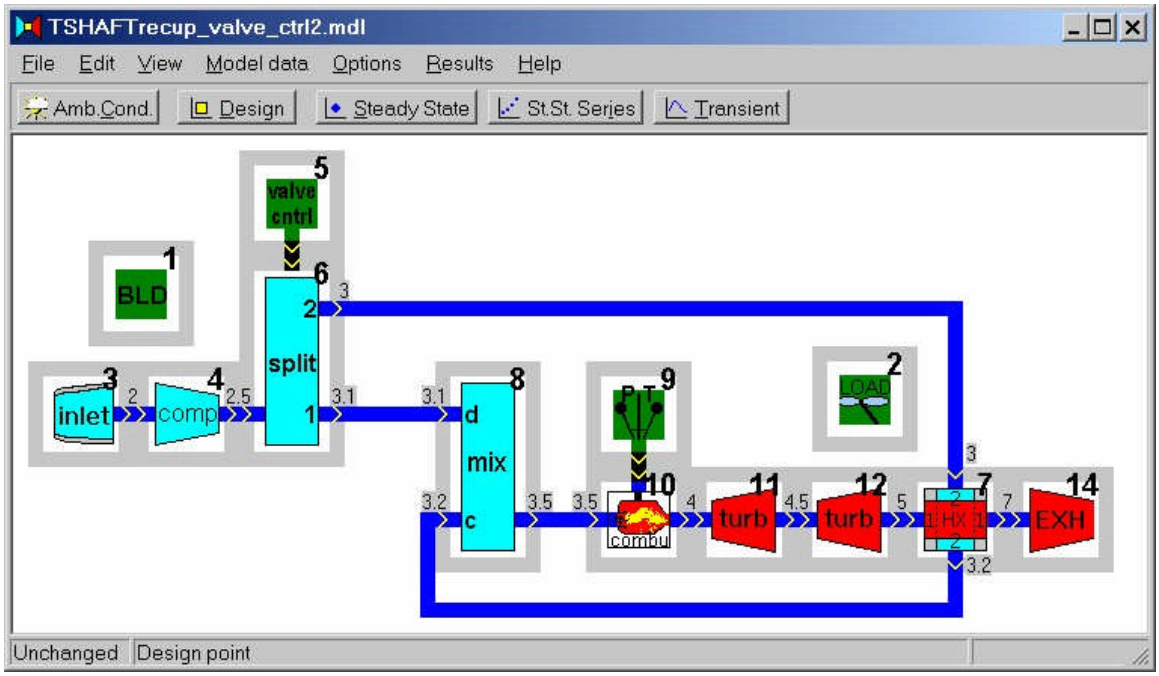
Modeling a CHP System
Using a Gas Turbine Simulation Program (GSP)

After collecting data from chosen universities, the next step is to begin exploring different CHP system configurations. Physical experimentation is beyond our team's resources, so thermodynamic modeling software will provide a reliable means of simulating potential CHP systems. We will be using a program called GSP to build models of CHP system configurations and perform thermodynamic analysis on them.

The final result of the modeling process will be:

- A generalized CHP system design with optimal carbon emissions reduction and thermodynamic efficiency (Chapter 1).
- A system design specific to the needs and demands of the University of Maryland, College Park campus (Chapter 2).

Below is a screenshot of what a final system configuration (this example is a recuperate turboshaft) would look like in GSP. The parameters of individual components (compressor, turbine, exhaust, etc.) can be easily modified by double-clicking on the component.



Simulation of a recuperated turboshaft in GSP
Image taken from the official GSP website

Q: On what parameters will your modeling be based?

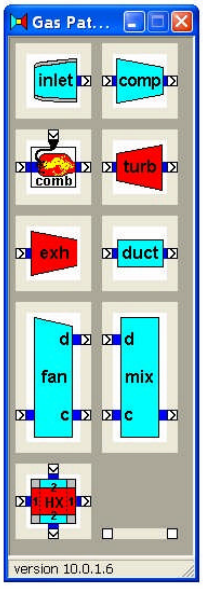
A: By defining parameters such as fuel energy density, demand, duty cycle, climate, and other elements affecting turbine performance, a method will be outlined to determine the optimal type and configuration of a gas or steam turbine in a CHP system.

Q: Why did you specifically choose GSP your modeling software?

A: The primary reason for choosing GSP is the flexibility with which gas path components can be defined.

Many other modeling programs that we considered restricted the user to choosing their components from a library of existing GE products. Because our project is based upon creating a novel system design, independent of the limitations imposed by the turbines that are on the current market, we needed a program that allowed us to define our own component parameters. In addition, GSP is free and easily downloaded.

Below you can see the library of components that are available in GSP:



Screenshot of gas path component library

Inlet, compressor, combustion chamber, turbine, exhaust, duct burner, fan, mixing point

Q: How will you ensure that your model is realistic?

A: We will use GSP to model the individual CHP systems of the universities we have contacted and generate thermodynamic analysis. We will then compare the generated data to the real data that we gathered in order to ensure that our model is valid.