NAU Solar Thermal Capstone

Individual Analysis topics

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Drake Cleveland

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For the NAU Solar Capstone project, the team has been working diligently to develop the necessary calculations to create a solar thermal heating system to be installed for use in the Engineering building of NAU's campus. The following memo identifies each team member's individual analysis topics based upon their work within the capstone project.

Cole Jennings has been working mainly towards finding a correct configuration of solar panels that will be effective and efficient for the heating system. The preliminary calculations for the panel system were based upon a model of solar panels that were used in a previous project at NAU. The main mathematical calculations for this portion of the project involve ensuring that the panel system can provide the necessary outputs of flow rate and temperature of the water-glycol solution. In the individual analysis report, calculations will be provided to demonstrate the panel system will properly produce the flow rate and temperatures necessary for the engineering building's demands.

Drew Bandhauer's main focus for this project has been dealing with the piping, pumps, and mechanical drawings of the system already in place as well as the system being designed. He has been analyzing potential flow rates through the pipes and panels as well as head loss through the entire system. Similarly, he has been working closely with Cole to ensure the panels picked will fit the desired pipe flow, and will accommodate the head losses and efficiencies of the pump in place. If the pump in place does not work for the system to be put in place, it is likely that a new one will have to be picked to match the specifications of the system in terms of flow rates, head losses, and efficiency. These calculations have been created and discussed by analyzing other sources dealing with the same components, and applying those methodologies to the design in question.

Drake Cleveland's primary objective thus far has been researching and determining an approximate amount of radiation from the sun that the team can expect at the engineering building in a typical meteorological year. The entire system is based around heating water using the sun's radiation, so determining the expected amount of radiation is crucial to the success of the system's design. This has included researching Solar Thermal systems as a whole, collecting solar irradiance data for a typical meteorological year over many years, taking advantage of the System Advisor Model, and extrapolating these results to what the team can expect at the engineering building. Hourly radiation data is crucial to the success of the team's design, and using the tools discussed, the team now has accurate enough approximations to design around.