

EXECUTIVE SUMMARY

The following report contains four in-depth analyses that focus on some of, if not all of, the following core areas of investigation: Critical Industry Issues, Value Engineering, Constructability Review, and Schedule Reduction/Acceleration. Additionally, a mechanical redesign breadth and a structural breadth were performed in an attempt to validate changing the current fully geothermal system to a hybrid system.

Analysis #1: Mechanical System

The results of this analysis and subsequent breadth validated changing the current geothermal mechanical system into a hybrid system. The results showed that with a minor structural redesign the roof of the mechanical room would be able to support a 352 ton cooling tower. Due to the cooling and heating load characteristics of the building it was found that a fully geothermal system was not the most efficient system. By using a cooling tower to supplement the peak load conditions the upfront cost of installation would be cheaper by \$1,347,349.40 and it would take over 200 years for the fully geothermal system to prove more cost efficient.

Analysis #2: Solar Energy Conversion System (SECS)

The owner's goal for this project was to create a state-of-the-art educational facility, particularly in the field of science and technology. If a photovoltaic array were incorporated into the building it could possibly serve an educational function while saving money on utility bills. For this analysis a PV array was designed with an upfront cost of roughly \$660,000 with a payback period just under five years. Additionally if this system were chosen to be implemented it could be installed in a timely manner and have little to no impact on the project schedule.

Analysis #3: Alternate Delivery Method

Due to several delays on the project, poor communication, and problems associated with the construction drawings the construction management agency was put under a lot of pressure. The current CM @ Risk delivery method did not provide them with much leverage when it came to dealing with subcontractors and they suffered from that as a result. This analysis compares the current delivery method against a design-build delivery system. The findings showed that a design-build approach would increase construction and delivery speeds, reduce cost and schedule growth, foster more collaboration between parties, and reduce owner risk. However it would reduce owner input as well.

Analysis #4: Façade Prefabrication

In an attempt to reduce the project schedule a prefabricated façade system was investigated. It was found that this approach added an additional 8% to the current price of the façade. With this considered, it is still suggested that a precast façade be implemented because it reduces the schedule by 6 weeks, would create a cleaner site, allow for higher quality control, and be safer among other things.