

Executive Summary

This report is the culmination of a comprehensive analysis of the Research and Graduate Education building and Comparative Medical Unit expansion project. The goal of this analysis was to evaluate the merits and goals of the existing project and its systems, and then execute a proposal of alternatives intended to provide tangible benefits to the operators and occupants.

As a high-technology, medical research project the RGE and CMU proved to be a very interesting and technically challenging project to analyze. A high degree of system complexity resulted from the wide range of services needed and strict environmental requirements. The existing system showed itself to be well-designed with regard to programming requirements and in many ways the most appropriate solutions to the design challenges at hand. The goal of the project was very clear: provide the highest quality research and education facility possible to foster the growth and development of health care education within the university and the surrounding community.

Keeping in mind the project goals of quality, availability, independence, and flexibility, a modification to the existing building utilities was proposed in the form of a cogeneration plant to go alongside the existing plant in the RGE basement. Adding on-site generation capability would make the project completely independent of outside utility structures, and the myriad of thermal loads for both space conditioning and lab processes were potential uses for excess generation heat. A configuration was chosen that provided the ability to handle the full campus electrical load, with reasonable turndown for part load operation due to its modular nature. Excess heat was taken advantage of to cover both the low-pressure and high-pressure steam loads present throughout the year. Due to the low cost of electricity at the project location, electric on-site generation did not prove as big of a savings generator as is usually expected from cogeneration projects. However, the cogeneration plant still had a reasonable payback of roughly a decade due to very low gas prices and high equipment efficiencies. A number of the non-quantifiable benefits of cogeneration are directly applicable to this facility, including power reliability, conduciveness to facility expansion, and off-hour operation. In addition, the plant will decrease the campus energy use and environmental impact.

In conjunction with the proposed cogeneration or CHP plant, an interconnection scheme was devised so that the plant could operate in parallel with the electric grid safely and effectively. The ability to start up from a dead state without outside assistance, known as black start capability, was also designed into the cogeneration plant.

Another auxiliary component of the proposal was the implementation of a Design-Build project delivery method in place of the then-mandatory Multiple-Prime contract structure. Based on outside research findings and documented project management challenges, it is quite plausible that an alternative delivery method could have made project administration significantly smoother and quite possibly have saved schedule time and change order money.