Executive Summary

This report includes an overview of the existing design of the New Science Center and a proposed design and evaluation of a solar thermal system on the Georgetown University New Science Center.

The New Science Complex is a five story, 154,000 SF research facility being built on the Georgetown University campus in Washington, DC. The building consists primarily of labs, classrooms, offices, and conference rooms that will support the university's Physics, Biology, and Chemistry departments. Through sustainable design and construction, the building is intended to achieve LEED Silver Certification upon completion.

The existing mechanical design utilizes state-of-the-art, highly efficient technologies. The Dedicated Outdoor Air System is comprised of (4) 50,000 cfm built-up AHU's with enthalpy wheel exhaust heat recovery. Supply and exhaust airflow is adjusted based upon occupancy sensors and schedules using Variable Air Volume control devices. A total of 97 fume hoods support the laboratory spaces throughout the building. Air is supplied to most of the spaces via induction chilled beam diffusers.

Active chilled beams are used in the majority of spaces, providing a large portion of the sensible thermal demand of the building. The heating and cooling equipment is supplied by a Georgetown University's district steam and chilled water plant. A water-side heat pump recovery unit reduces district plant load to the chilled beams and air reheat coils.

The proposed solar thermal system design utilizes the flat roof on the west side of the penthouse floor level for 77 evacuated tube solar collectors. The system will offset the steam consumption of the four hot water heaters of the existing sanitary and lab domestic hot water system. The 2424 sf of collectors will result in a useful solar gain of 496.6 MBtu/year. The system will save approximately 4966 therms of district steam demand annually. The system will pay for itself after only 2 years of operation and provide an10 year revenue of $534,000 in present value.

A structural analysis of typical roof bay found that the existing structure will sufficiently support the additional weight of the solar collectors and the slab and steel members will not require resizing.

A constructability study was performed on the proposed solar thermal system. Using a custom Silverback Solar collector mounting system, the collectors will be capable of tying into the slab-on-deck roofing system, while maintaining a watertight seal and having minimal effect on roof insulation. A trade coordination study found that with efficient planning and coordination, the installation of the system can be achieved by adding an additional solar subcontract with minimal effect on the existing construction schedule.