



American Solar Delivers HHS Headquarters Building Heat Recovery Design

Annandale, VA, August 17, 2016—American Solar, Inc. Completes Design For Heat Recovery Systems For Health and Human Services Headquarters Building.

American Solar Inc. designed a novel cost-effective heat-recovery system to capture waste heat from exhaust air and deliver it to the building heating system.

Annual steam use at the HHS headquarters costs around \$1 million per year. Due to the very high unit cost of steam heat, HHS explored several options to cut heating costs. American Solar, Inc. proposed to replicate a similar project recently installed at the Army Research Lab, in Adelphi, Md.

The approach used simple packaged air-to-water heat pumps to recover heat from the return air (a lower cost source of heat) and generate high temperature (>130F) hot water for the hydronic heating loops and cool dry air (<60F) for the return air. HHS contracted with American Solar to provide a preliminary design and then proceed to a full design ready for contract solicitation and award.

The headquarters building of the Department of Health and Human Services is located next to the US Capitol complex, along the Mall in Washington, DC. The building operates 24/7/365. For heating, the building uses steam-heat from the central plant, which supplies steam to several buildings along the Mall. The cost of the steam is \$38 per million BTU.

The air conditioning system provides chilled air through the ventilation system. The steam in the penthouse tempers the chilled air in a reheat process, which operates all year at about 120F. A separate two-pipe 'perimeter' system sends hot water to fan coil units in the heating season. The system switches over to cooling with chilled water on warmer days.

The building locates most of the supply and return fans in the penthouse mechanical room. Capacities vary from 15,000 to 64,000 cfm to serve different zones. Return air mixing with outside air provides most of the tempering to deliver 55 F air to the supply fans during the heating season. Cooling coils further reduce the mixed air temperature to achieve a 55F supply temperature.

An economic analysis indicated that the heat pump heat recovery systems could serve at least 10 of the large supply air handlers. An estimated installed cost of around \$860,000 resulted in total life cycle savings of \$3.6 million to the building, with a savings to investment ratio of 4 and simple payback of 4 years. Life cycle CO2 savings exceed 13,000 metric tons.

American Solar completed the detailed design in 2015. Contractors completed the installation in August 2016. Initial operations demonstrated hot water delivery temperatures of 130F and cool air exhaust temperatures of ~55F (compared to the 90+ F outside air during the hot

Washington summer.) Each heat pump uses around 5 kw of electric power to generate 16 kw of hot water and simultaneously deliver 11 kw of cool air.

Each of the (2) 5 ton heat pumps installed at each air handler delivers around 3.7 gallons per minute of hot water, a total of around 67 gpm for 18 installed units on 9 air handlers. The maximum reheat loop flow is 130 gpm. Therefore, the total reheat from the heat pumps is about 50% of the maximum required.

The perimeter heating system capacity is much larger, about 950 gpm. Therefore, the heat pump hot water capacity is only 7% of the perimeter system maximum flow. From an airflow perspective, the system is small, relative to the air handlers, (2,500 cfm vs. 15,000 – 64,000 cfm). The cool exhaust-air in the summer contributes cooling savings by reducing the chiller load, without overcooling the return air during the winter heating operations.

The sizing of the heat pumps ensures that they are delivering to the base load and not trying to service a seasonal peak load. In serving the base load for heating and cooling, they operate every day, saving money every day, to quickly repay the initial investment.

About American Solar, Inc.

American Solar provides project development, consulting services and technical advice for solar-thermal projects in the agricultural, commercial, industrial, and government markets. The company develops projects for its patent-protected solar air-heating technologies. ASI also conducts research and testing of solar air-heating and low temperature air-heat-recovery systems.

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