

ASSOCIATION OF ENERGY ENGINEERS (AEE) 2017 INNOVATIVE ENERGY PROJECT OF THE YEAR AWARD



ENSER - MORRIS HYBRID PHOTOVOLTAIC/SOLAR THERMAL HEAT PUMP (PV/T/ HP) SYSTEM

This hybrid PV/T HP project, designed and built by **Capital Sun Group**, maximizes roof-mounted solar energy collection utilizing a sandwiched dual collector system. The array combines high-performance **SunPower®** photovoltaic panels for generating electricity with **SunDrum® Solar** thermal panels mounted on their PV's rear surfaces to collect heat. The thermal component is a closed glycol loop acting as the source for a heat pump that amplifies the collected energy to heat the home, domestic hot water and pool/storage water. Summer cooling rejects waste heat to the night sky via the solar array. A closed loop circulates propylene glycol to the source side of a water-to-water heat pump whose load side heats the home via a water-to-air coil mounted above the legacy 92% efficient gas furnace retained as backup. Using three-way diverting valves, this load loop also delivers heat to the swimming pool, which is insulated in the winter months to store solar heat for nighttime use. Solar thermal energy collection is recorded on revenue grade Btu meters, allowing the client to participate in the Washington, DC Thermal SREC market. Further, solar power harvested is recorded on a revenue grade WattNode® meter for electricity SREC accounting. Cooling the home while heating the pool and domestic hot water, the system achieves a high TOTAL COP. Water heating gas consumption is minimal in the heating and cooling seasons. The fully instrumented monitoring system by **Net Zero Meter** provides real-time and historical summaries viewable online.

Since the system's commissioning in January 2016 to September 2017, the **Enser Morris Hybrid PV/T HP System** has provided 84.3% of the domestic water heating load, 86.1% of the space heating load, over 95% of the space cooling load, 100% of the pool heating load, and approximately 75.3% of the total electrical power consumed by the project. The clients are continuing to strive for a "**Net Zero Home**" by implementing further energy conservation measures (ECMs) to minimize their carbon footprint.

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System Component Details:

- **46 SunPower photovoltaic panels – model SPR-X21-250-BLK (250Wp)**
- **Tigo Optimizers for panels level monitoring and rapid shutdown capability**
- **2 SunPower - SMA-America Sunny Boy SB500TL-US String Inverters**
- **42 SunDrum® Solar thermal panels - Model SDM100-30 (480Wp)**
- **SunDrum® Solar HarvestHP™ (WaterFurnace) Envision Model: NSW-040**
 - **4-ton Reversible with Desuperheater and Intelistart**
- **Grundfos Magna3 Smart Pump on Solar Glycol Loop**
- **Grundfos Stainless Steel Alpha Pump on Desuperheating Loop**
- **Grundfos Cast Iron Alpha Pumps on Load and Direct Solar DHW Preheat Loops**
- **Pentair IntelliFlo Variable Speed Pool Pump with Digital Time Clock | 3HP Max**
- **Belimo Three-way Motorized Diverting Valves**
- **Goldline- Jandy Three-way Pool Water Diverting Valve**
- **80 Gallon Dual Heat Exchanger Kingspan Stainless Steel Solar Storage Tank**
- **K3N Spirec Stainless Steel Heat Exchanger (Pool Water/Glycol Loop)**
- **Magic Aire 4-ton Water-to-Air Coil**
- **EcoBee3 Smart Thermostat with Remote Sensor**
- **Temco Big Brother (BB) Direct Digital Control (DDC) System**
- **1 Resol DeltSOL MX Solar Controller with 2 Expansion Modules (EM) & Data Logger (DL3)**
- **Solar-Cell Sunblanket™ (Double Layer in Winter) with Winter Cover Over Top**
- **Net Energy Meter Data Acquisition System**
 - **3 WattNode Revenue Grade Watt Meters**
 - **4 Istec Revenue Grade Btu Meters**
 - **1 Temco 1” Flow Meter**
 - **1 Davis Weather Station**