Icarus RT - Technical Assistance Request

The development and advancement of the solar energy industry is heavily constrained by fundamental limitations of photovoltaic (PV) technology, despite the growing demand for clean, renewable energy. Commercial panel efficiency remains low at about 21% and peak solar production time does not match peak demand time. Icarus' technology aims to overcome these limitations by increasing PV power generation and providing energy storage. Icarus technology extracts heat and cools PV panels, stores the heat, and effectively converts PV arrays into hybrid PV/Thermal storage and generation systems.

Figure TA.1 – Alpha prototype

Icarus has already built and is testing a full-scale alpha prototype at the Englekirk Structural Engineering Facility of Jacobs School of Engineering at University of California, San Diego. We have confirmed the feasibility and usefulness of this heat extraction and cooling technology through this proof of concept (see Figure TA.1). We are now developing the storage system.

The prototype includes a robust monitoring system with a weather station (Figure TA.2) that measures and reports parameters such as panel temperature and fluid temperature and pressure which we designed and built with the help of engineering seniors completing capstone projects.

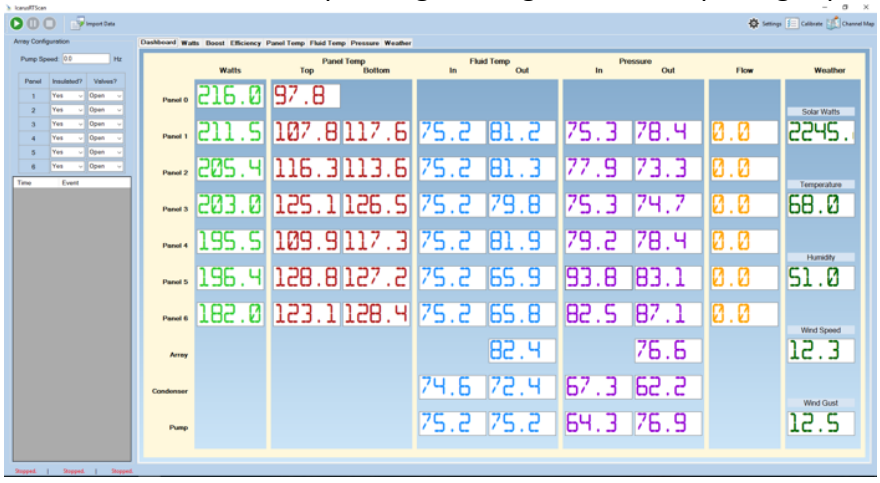

Figure TA.2 – Prototype control system

Technical assistance from national labs, private facilities, or the American-Made Network is requested to: 1) Provide technical guidance for the final design of the Thermal Storage Tank, the Solar Panel Heat Exchanger, and the flow control system (described below). We will also seek to complete testing and validation activities required prior to UL certification and commercial launch.

We are currently working with Jacobs School of Engineering at University of California, San Diego (UCSD), and the Combustion and Solar Lab at the College of Engineering at San Diego State University (SDSU) to optimize designs and manufacturing for the condenser storage tank (Figure TA.3) and for the snap-on heat exchanger (Figure TA.4). We have modeled these components in

SolidWorks and will analyze the components using multi-physics computational fluid dynamics finite element analysis software like COMSOL but lack the expertise.

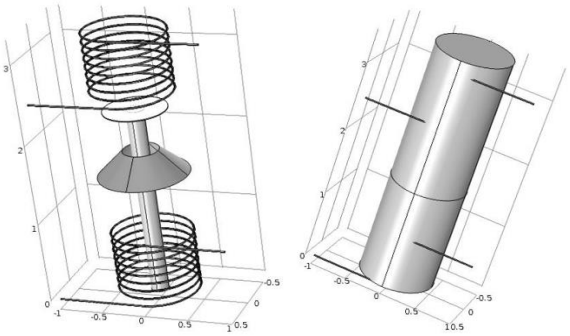

Figure TA.3 – Thermal storage tank design

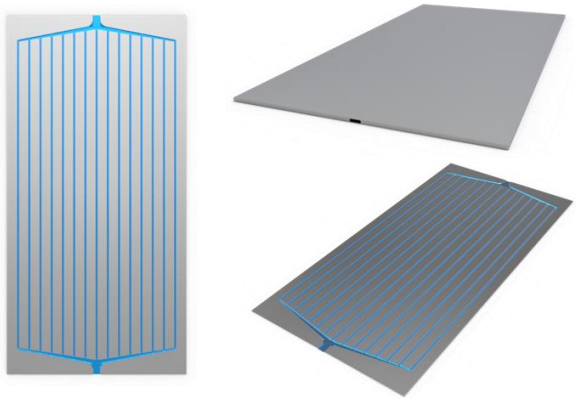

Figure TA.4 – Solar panel heat exchanger design

Finally, precisely controlling flow of refrigerant, or controlling the location in the heat exchanger where phase change occurs, has been challenging. This is important because once gasified, the fluid loses substantial ability of the liquid to collect heat. The current control system effectively monitors the system's state but lacks ability to adequately control the fluid flow (See Figure TA.5). The ability to adjust the location at which the refrigerant boils (changes phase) is critical to optimize the heat transfer rate. We are currently working to optimize fluid flow and pressure and seek technical guidance to maximize performance.

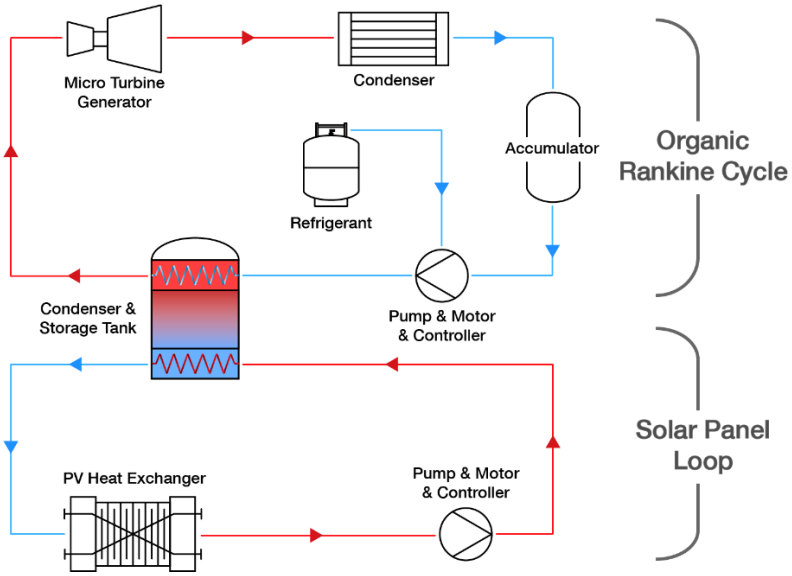

Figure TA.5 Simplified schematic plan of the system.

The above areas of interest for technical assistance, if received, will be designed, fabricated, installed and tested first by Icarus at UCSD and SDSU. Icarus will compile the results into a preliminary case study with the support from The Chemours Company. We are seeking: 1) Design guidance, testing and validation from a national lab, and fabrication and prototyping assistance from a fabrication lab for the manufacturing ready components. Technical assistance in the areas above would allow full development of Icarus' technology.