TECHINCAL ASSISTANCE REQUEST (two pages, including images, to be made public)

Provide a two-page description of the unique challenges that a National Lab, private facility, and/or member of the American-Made Network might help you resolve if you advance to the Design contest. The prize administrator will make this request broadly available so members of the American-Made Network can understand your needs and assist you through the voucher program or otherwise.

Response:

To whom it may concern,

When advancing to the Design contest, SolMem LLC would benefit a lot if helps can be provided in resolving the following two challenges.

The first challenge is to optimize the performance of our solar near zero liquid discharge (NZLD) system with respect to the constantly changing ambient environment, such as temperature, feed solution salinity, solar irradiance, and so on. This requires building an accurate heat and mass transfer model for the Multi-Effect Nanophotonic-Enabled Solar Membrane Distillation (ME-NESMD) process. As shown in **Figure 1**, the heat and mass transfer processes in the ME-NESMD process are highly complex as they are nonlinear and strongly coupled. Plus, due to the constantly changing ambient energy input to our system (e.g., solar irradiance), the ME-NESMD may never reach a steady state, which further complicates the modeling process. With the modeling expertise as well as the supercomputers in National Labs, solving such a challenge can be significantly easier.

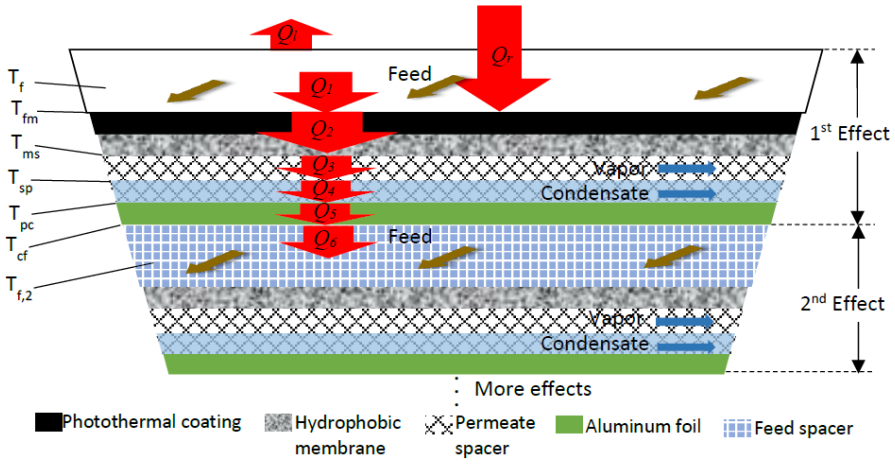

Figure 1. Schematic of heat and mass transfer process in a two effects NESMD system.

The second challenge is to lower the cost in manufacturing the special parts of the core reactor of our solar NZLD system. **Figure 2** below shows the schematic of our core reactor, which consists of two plastic outer caps, two plastic inner caps, and one quartz tube. The quartz tube can be directly purchased from our vendor, while the plastic parts (i.e., inner cap and outer cap) need to be customize-made. For a relatively small system (i.e., 100 m^3/day treatment capacity), 3D printing can be a good method to tailor the plastic parts. Although SolMem LLC has its own 3D printer, it is not designed to manufacture parts in a quick and cheap manner. Therefore, a 3D printer that enables the cheap and facile fabrication of the plastic parts would greatly help SolMem LLC in the Design contest.

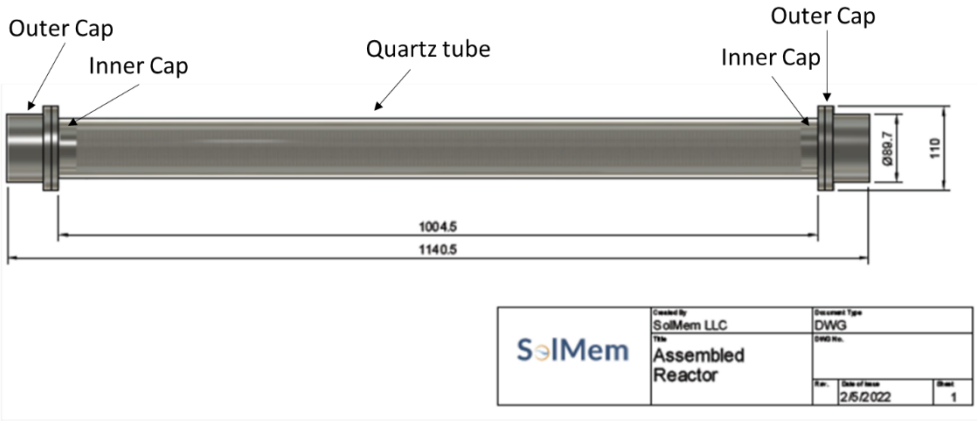

Figure 2. Schematic of SolMem LLC's core reactor in a Sola NZLD system.

Thank you and best regards,

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Solar desal competition round 2 Team Captain

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