

# **Cool Buildings with Less Cooling: Novel Liquid Desiccant-membrane Dehumidification and Integrated Radiant Cooling**

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## **Abstract**

We are researching and developing a novel system to increase the efficiency of building cooling through a new high-performance integrated membrane liquid-desiccant dehumidification system. Buildings are the largest single sector of primary energy demand in the U.S., with 40 percent of total demand going to commercial and residential buildings. Cooling has grown to about 6 percent of residential demand and about 10 percent of commercial building demand. Although less than half of the heating energy demand, cooling plays a much more critical role in the energy sector as it is the source of the summer peaks for which utilities must install peaking facilities. Those peaks, particularly in regions like New Jersey, are largely influenced by humidity. The dehumidification required in building cooling system creates the latent demand that is more than half of the overall cooling demand. Our research and development, combining a new non-corrosive liquid desiccant material from Dow with a unique nonporous hydrophilic membrane from Arkema, will allow the latent load to be met with waste heat streams easily found during cooling season or generated from renewable solar inputs. A small prototype has been built, tested, and promising initial results published in conferences and journals. We have also had fruitful meetings and discussions with Dow and Arkema about new system pathways that leverage 3D printing and unique geometries. We plan to build a room-scale prototype in the coming year.