KILOWATCH

Forward Looking Technology to Keep an Eye On – Radiative Sky Cooling!

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Radiative Sky Cooling has the potential to be one of the next evolutions in building cooling/refrigeration efficiency. If you're not otherwise familiar, now is the time to check it out – see discussion/links below!

Apparently, ancient people made ice in desert climates long before electricity was available. They were able to freeze water at night, at above freezing temperatures (i.e., ~42F), then store within insulated structures during the day. This was possible by a principle a "Night Sky Effect Cooling", or radiative cooling. Which is when water loses heat by loss of light, and related release of thermal radiation into space, via infrared light. This could only occur at night since the sun would counteract this cooling effect, by increasing temperatures, during the day.

While this principle has been understood for a long time, its cooling properties during evening times have left limited practical application. More recently scientists, using this principle, have designed a multilayer optical material that acts as both a mirror, reflecting sunlight/heat, and emitter of infrared light that moves this heat into space more efficiently. In short, this optical material gets ~9F colder when it is taken out of the shade and placed out into the sun, demonstrating cooling potential that can allow for more practical applications.

Scientists believe this type of technology material/application can allow for significant efficiency boost to ac and refrigeration systems by integrate e material into solar cooling panels, which then tie into ac/refrigeration system condensers. A related pilot project at UC Davis has initially demonstrated a system efficiency improvement of ~12%. More recently, the US DOE has awarded ~$3.5M to support the scale up of this technology.

The near-long term goal is to integrate solar cooling panels into high efficiency building systems and reduce building cooling demands by 2/3. The upper technology potential is to reduce cooling temps by 42C below air temp, with no electricity. This could be a big deal for global energy use related to cooling systems collectively make up ~17% of use and ~8% GHG emissions; and has the potential to grow 8X by 2050, particularly due to a potentially vicious feedback loop associated with a warming planet and the growth of third world economies in warm climates.

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