

# NREL Demonstrates Game-Changing Air Conditioner Technology

Highlights in  
Research & Development

## Testing of DEVAP prototype validates modeled predictions of 40% to 85% energy savings.

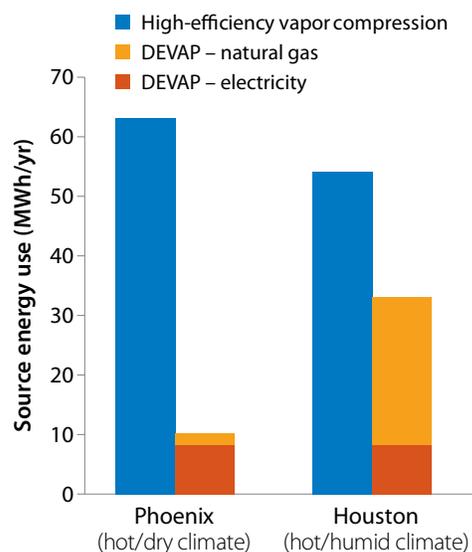
Researchers in the NREL Buildings group are moving the award-winning desiccant enhanced evaporative (DEVAP) air conditioning technology further toward commercialization by demonstrating that its energy-saving performance matches closely with thermodynamic model predictions. Industry partners Synapse Product Development and AIL Research built two prototypes of DEVAP based on NREL's design and modeling, which were tested in NREL's Advanced HVAC Systems Laboratory. Experiments added confidence to the predicted energy savings of 40% in humid climates and 85% in dry climates, empowering the model as a tool for developing marketable designs, and illustrating the potential of DEVAP to transform existing air conditioning technology.

Given that air conditioning accounts for 15% of U.S. building energy use, widespread use of the highly efficient DEVAP technology could save billions of dollars in operating and utility costs. In addition to energy savings, DEVAP operates with a concentrated salt water solution instead of using refrigerants such as environmentally harmful hydrofluorocarbons. Furthermore, compared to vapor compression air conditioners, DEVAP's novel design improves air quality by independently controlling temperature and humidity and increasing ventilation. Based on initial cost evaluations, researchers estimate a simple payback of three years in Houston and two years in Phoenix.

The future looks bright for a market launch of DEVAP, which won a 2012 R&D 100 Award. The technology has been licensed by 7AC Technologies, Inc., which is developing prototype products. Partnerships with other air conditioning developers are being pursued. NREL researchers are in the process of developing a prototype for field testing, which is expected to lead to a commercially available product in three to five years.



A DEVAP prototype undergoing testing at the Advanced HVAC Systems Laboratory. Photo by Dennis Schroeder, NREL 20200



DEVAP source energy use estimate for a 10,000-square-foot office building in Phoenix and in Houston, compared to a SEER-16 vapor compression air conditioner. DEVAP uses natural gas to reconcentrate the liquid desiccant and electricity for fans and pumps.

## Key Research Results

### Achievement

NREL researchers demonstrated the cooling performance of DEVAP prototypes, which validated modeled energy savings of 40% to 85%.

### Key Result

Experimentally measured performance matched closely with modeled predictions, adding confidence to the theoretical model and illustrating DEVAP's potential as a transformational technology.

### Potential Impact

Air conditioners account for approximately 15% of building energy use in the United States. The highly efficient DEVAP technology will save energy and money, reduce peak electrical consumption, and offset environmental impacts.

**Technical Contact:** Jason Woods, [jason.woods@nrel.gov](mailto:jason.woods@nrel.gov)

**References:** Kozubal, E.; Woods, J.; Judkoff, R. (2012). *Development and Analysis of Desiccant Enhanced Evaporative Air Conditioner Prototype*. NREL/TP-5500-54755. <http://www.nrel.gov/docs/fy12osti/54755.pdf>.

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15013 Denver West Parkway  
Golden, CO 80401  
303-275-3000 | [www.nrel.gov](http://www.nrel.gov)

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