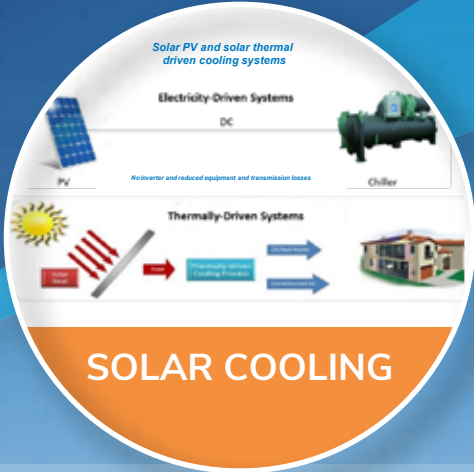


## Technology Overview

# SOLAR COOLING AND COLD THERMAL STORAGE

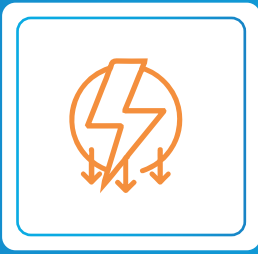
Solar cooling and cold storage can potentially reduce cooling-related electricity requirement, especially during peak periods in KSA.



Cooling with renewables, in particular with solar energy, provides a means to utilize the solar irradiance to mitigate electrical loads associated with peak cooling demand and at other times. Solar cooling systems consist of several components, and typically either solar thermal collectors or PV modules are required.

Cold storage is a form of energy storage that can store ice or chilled water through the use of mature and reliable conventional refrigeration systems. Cold storage is ideally suited for Saudi Arabia and other countries in the Middle East region where most of the electricity demand is for cooling purposes.

### THE BENEFITS



Reduce electricity consumption during peak demand periods



Improved load management

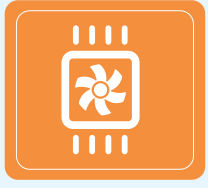


Investment deferral for costly peaking power stations



Absorption cooling offers higher COP and is more effective in cooling large spaces

### WHAT IS DRIVING ADOPTION?



Growing cooling demand



Focus on energy efficiency and management measures to reduce electricity demand and consumption



Need for cooling in off-grid locations



Climate change mitigation and sustainability

### PATENT AND INNOVATION TRENDS – KEY AREAS OF RESEARCH



Air-conditioning systems using solar heat in household units



Solar heat collectors for combined heating and refrigeration systems



Absorption-based systems for HVAC applications



Heat exchange systems

### PROMINENT COUNTRIES/ TECHNOLOGY PROVIDERS



### KEY APPLICATION AREAS



Residential end users



Commercial establishments



Government building and offices



Centralised cooling facilities



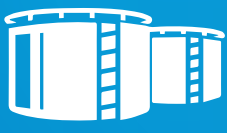
District Cooling

### OPPORTUNITIES FOR KSA LOCALIZATION

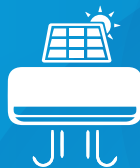
Manufacturing of the following technology components:



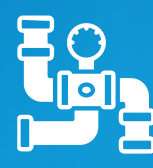
Heat Exchangers



Storage Tanks



Solar PV air conditioning systems



Piping, valves and flanges



Pumps and pumping Systems

### CHALLENGES TO SCALING IN KSA

1

Subsidized electricity tariffs affect financial viability of solar cooling and cold thermal storage systems

2

High CAPEX – 2 to 2.5 times conventional air conditioners

3

Absence of financial incentives and subsidies to improve payback periods and ROI

4

Limited end user awareness about technology and benefits