# Sustainable Snowflake

# Frosty Technology INC.

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**Functional Requirements** 

**Swamp Coolers & Air Conditioners** 

**Currently Enabling Technologies** 

**Future Technologies** 

# Source of Home Cooling

## Requirements

- Cost Effective Minimal Maintenance
- Security from Power Grid Failure

<u>Constraints</u> SW – Dry Heat SE – Humid Heat

Societal Challenges
Increasing Probability
of High Temperature
[5] and Drought [2]
- Financial Burden of

**Cooling Cost [4]** 

#### Swamp Coolers [3]

#### Pros - Higher Energy Efficiency

#### Cons

- Low Water Efficiency
- Not Appicable in Humid Environments
  - Increased Maintenace

### Air Conditioners [3]

#### <u>Pros</u>

- Higher Levels of Cooling
- Usable in Most Environments

## Cons

- Low Energy Efficiency

#### Heat Pump [6]

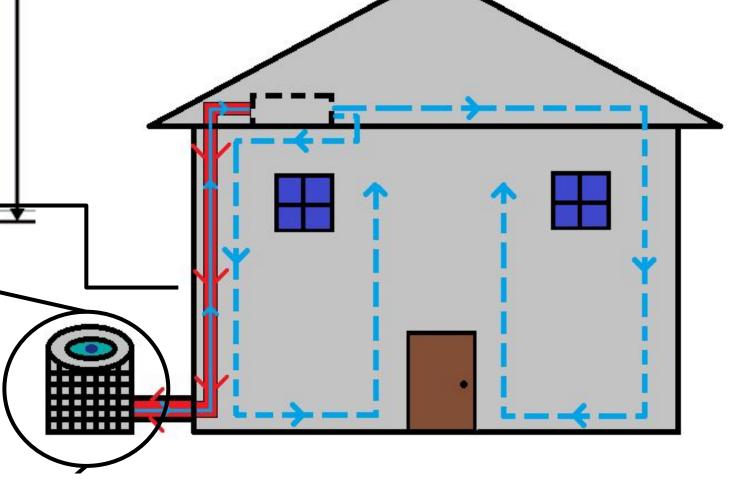
- Utilizing the process of transferal heat energy to cool the inside of a house, a Heat Pump takes in warm air.
- It proceeds to runs this air over coils containing refrigerant which absorbs the heat energy from the air.
- After which the now cool air is recirculated throughout the house.

#### Solar Thermal

- Alternative power source for heat pump and rotors
- A 'reverse heat pump' transfer heat into kinetic energy [1]

#### Magnetocaloric Refrigerator [7]

- The coolant, now saturated with heat energy circulates outside to an apparatus performing a Magnetocaloric process.
- Using the alternating magnetic fields around a special alloy, causes the alloy to change temperature states from hot to cool.
- While in contact with the alloy the coolant then returns to a cooling temperature, and is recirculated into the Heat Pump.



**Home Heating & Cooling Industry** 

Southwest Region Home Residents

Southeast Region Home Residents

> Energy Suppliers

Value Created: Our solution provides cool air at low costs while reducing dependency on the power grid and nonrenewable resources.

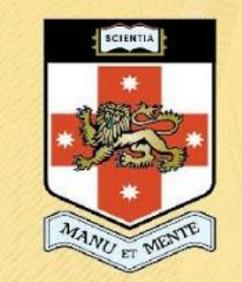
## Societal Impacts:

- Reduces dependency on power grid
- Promotes the conservation of energy/ sustainable lifestyle
- Higher quality of life by providing cool air

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# Grand Challenge Scholars Program







References: [1] Pehlan, P., et al, 2013. Trends and Opportunities in Direct-Absorption Solar Thermal Collectors. J. Thermal Sci. Eng. Appl 5(2), 021003.

[3]"Portable Air Conditioners vs. Swamp Coolers - Which is Right for You?". http://www.air-n-water.com/portable-ac-swampcooler.htm. N.p., 2017. Web. 9 Apr. 2017.

[6]"Heat Pump Systems | Department Of Energy". Energy.gov. N.p., 2017. Web. 3 Apr. 2017.

[7]"Using Magnets To Keep Cool: Breakthrough Technology Boosts Energy Efficiency Of Refrigerators". Energy.gov. N.p., 2017. Web. 3 Apr. 2017.



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