Solar Thermal Energy (For Building Applications)

**Types of Collectors**
- Low temperature collectors: < 110 degrees F
  - Used to heat pools and for space heating
- Medium temperature collectors: 140-180 degrees F
- High temperature collectors: >180 degrees F
  - Generate electricity (concentrated Solar)

**Liquid heaters**
- Heat water to be used directly or heat a transmission fluid for heating.

- Flat plate collectors:
  - Copper tubes covered by a flat plate. Water passes through small copper tubes and absorbs heat.
  - Less effective in lower temperatures

- Evacuated tube collectors:
  - Vacuum tubes contain a transmitting fluid. The hot fluid moves upward toward a hot water reservoir. The spent cold fluid flows back down to the bottom of the tube. The tube is self insulated and works in cold temperatures, unlike the flat panel

**Solar air heat collector:**
- A plate covering a chamber of air. The air is heated then pumped throughout a building.

**Thermal energy storage:**
- Stores collected heat energy in a heat collection medium such as salt for later use.
- Used when electricity is more expensive or when heat cannot be collected as easily

**Other Technologies**
- Integral Collector Storage (ICS):
  - Collects energy directly into an energy storage unit
- Thermosiphon: Moves hot water naturally without using a pump

Heaters only supply 80% of heat
- Use a Photovoltaic panel to drive a liquid or air pump. Or supplies last 20% of heat/AC

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**How much can this technology reduce CO2 emissions**

This is how much energy the average household uses each year!
- 65.4% of this could be replaced by using solar thermal panels! (Water heating, AC, Space Heating)

**CO2 Not emitted by using switching to solar thermal**

Powerplants produce this much CO2 each year supplying electricity to homes for heating and cooling.

**Where It’s used and where it should be used**

This map shows Solar potential Solar energy in Kilowatt hours per day per square meter. This does not directly correspond to Solar Thermal energy but shows which locations get the most heat (red)

**Policy:**
- 30% of the cost of the System is tax deductible.

**Solar thermal Cooling:**
- Any of the techniques used to heat a transmission fluid can be used to evaporate a cooling agent that can be used to cool the room. This requires another power source to drive the AC unit. Possibly Photovoltaic.