Solar Energy for Buildings and Habitats

Presented By:

Dr. Sameer Maithel

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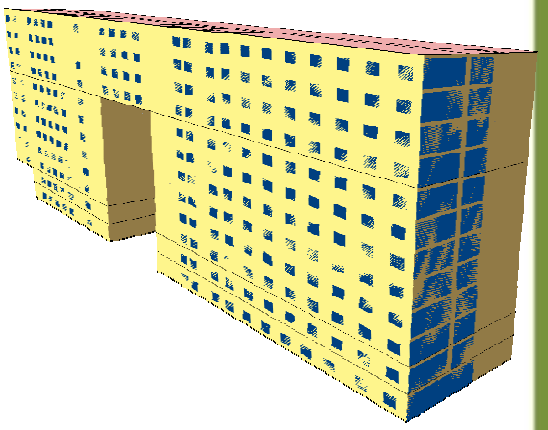
Greentech Knowledge Solutions – Relevant Services

Energy simulation for energy-efficient building design



Feasibility studies and design support for Solar Energy Integration in Buildings

SDC Project on Building Energy Efficiency

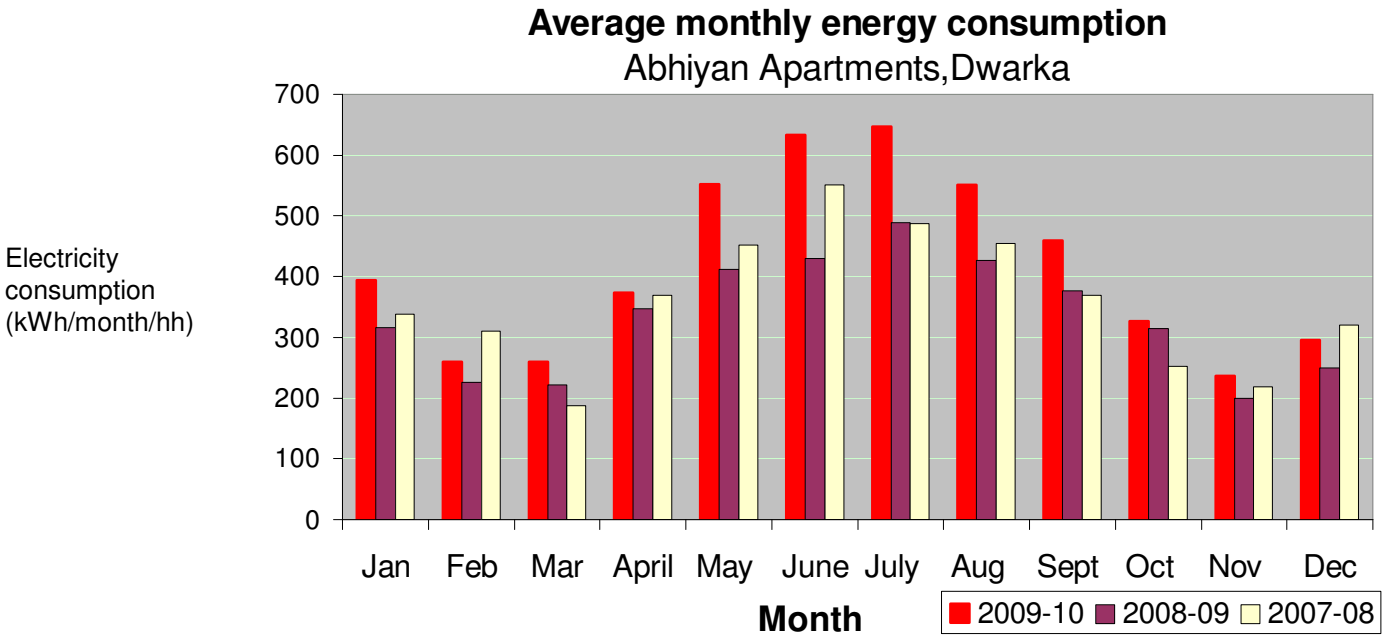
- Greentech Knowledge Solutions is the Indian Project Management Unit of the project supported by the Swiss Agency for Development and Cooperation (SDC)
- The project is involved in
  - Technical support through design charrettes (workshops) organized by a team of Swiss engineers and architects, aimed at integrating energy efficiency concepts at an early design stage in large building projects in India (around 20 projects in India would get technical support).
  - Development of comprehensive design guidelines for energy-efficient new housing in India.

Outline

- Solar Energy
  - Water Heating
  - Cooling
  - Steam generation

Water Heating

- **Residential Buildings**: Around 5 TWh of electricity is used for heating water in the residential buildings.
  - 5 TWh is equivalent to meet basic electricity requirement of 14 million rural households.
  - The demand for hot water for bathing ranges from 5 to12 months in a year.
  - The demand for hot water is increasing rapidly in urban households.



Water Heating

- Commercial buildings (hotels, hospitals, guest houses, etc.): Large quantities of electricity, liquid fuels, PNG is used for water heating.

- A significant part (25-90%) of the water heating requirements can be met through solar energy in residential and commercial buildings

Solar Water Heating

- Solar water heaters are growing @ 15-20 % for last 15 years in India.
- SWH applications can be found in hotels almost throughout the country. In recent years, good growth in hostels and hospitals.
- SWH applications in housing
  - Bangalore (10% penetration); Pune (5%); Rajkot (4%) ; Nagpur ; Thane ; Nashik; Coimbatore; Hyderabad; Mysore; ….
  - SWH being made mandatory for certain types of residential buildings in some cities.
- Solar Mission (JNNSM) aims at increasing the area of SWH by around 5 times in next 10 years
  - Almost 80% of this would come from the residential sector.
  - Revival of central subsidy on SWH.
  - UNDP-GEF-MNRE Solar Water Heater Project for promotion of SWH in the country.

MULTI STOREY BUILDING– Bangalore

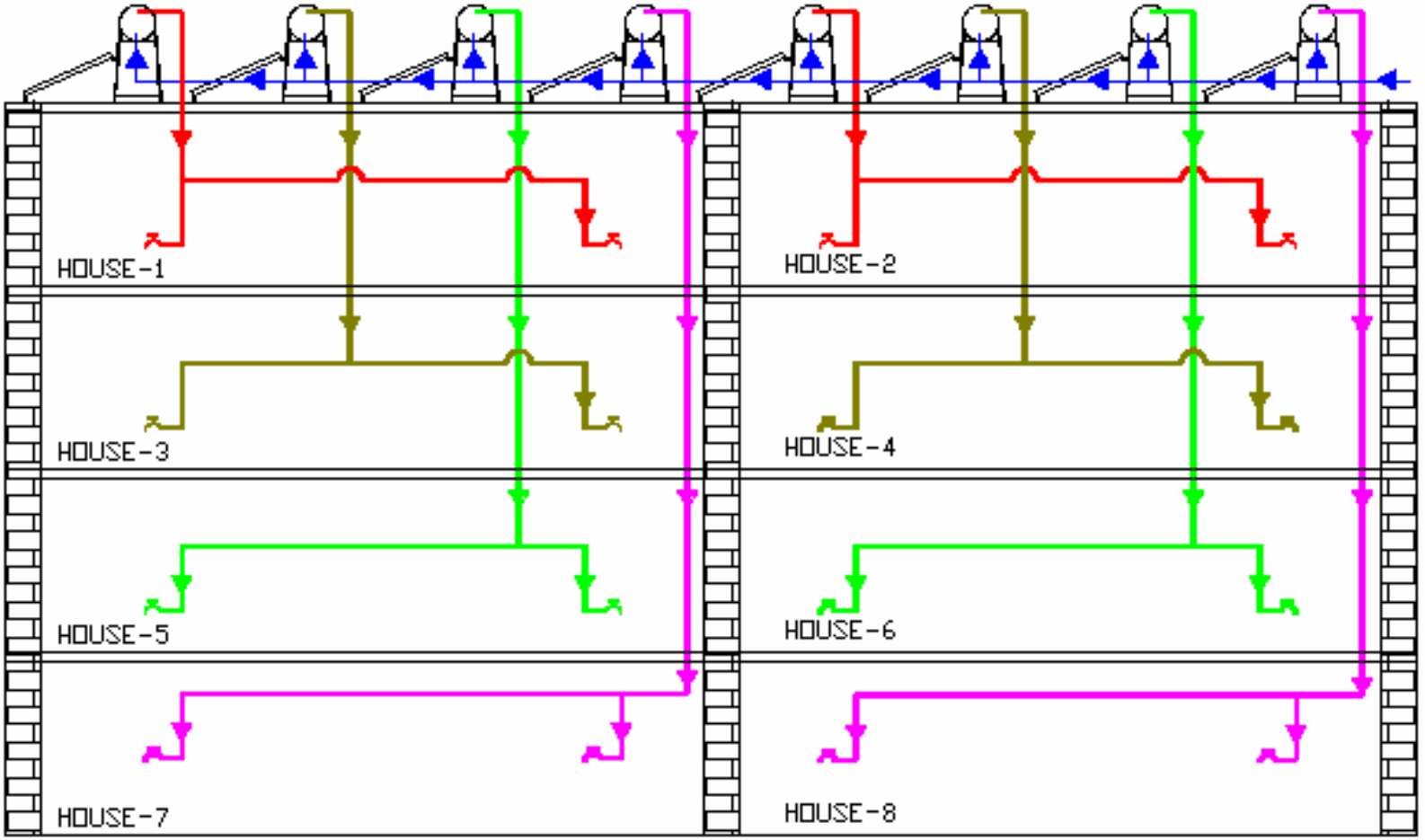
Source: Emvee Solar

MULTI STOREY BUILDING– GURGAON

Source: Synergysolar

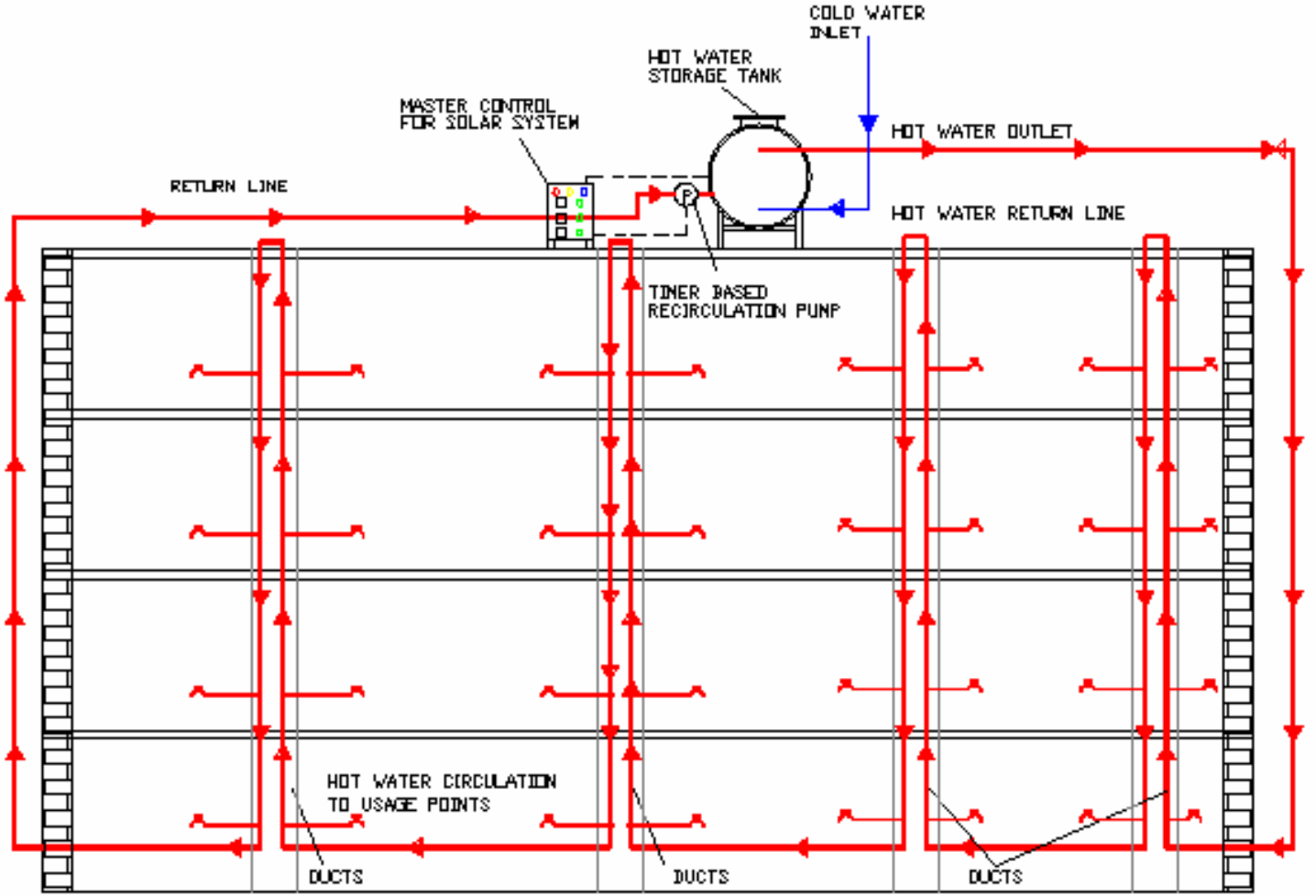
Row Housing - Rajkot

Installation of Multiple Small systems in multistoried buildings – Option 1



Source: Synergysolar

ILLUSTRATION ABOUT PLUMBING AND DISTRUBUTION OF HOT WATER – Option 2



Source: Synergysolar

Solar Hot Water Management System

Source: Akson's Solar

SOLAR WATER HEATING PANELS

MAIN DISPERSING TANK

INDIVIDUAL FLAT TANK

DUCT VIEW

WATER HEATING SYSTEM

Project: Orange County, Pune

Source: Akson's Solar, Pune

Solar Water Heating

- Large scope for increasing the penetration of solar water heaters in new buildings.
  - Installation of SWH in new buildings.
  - Making new buildings SWH integration ready i.e. provision of hot water distribution line during the construction.

- Emphasis required on optimization of design, reliability and good performance:
  - Solar radiation
  - Hot water load profile
  - Types of collectors
  - Auxiliary heating options
  - Hot water storage
  - Hot water distribution
  - Instrumentation & Control
  - Hot water management

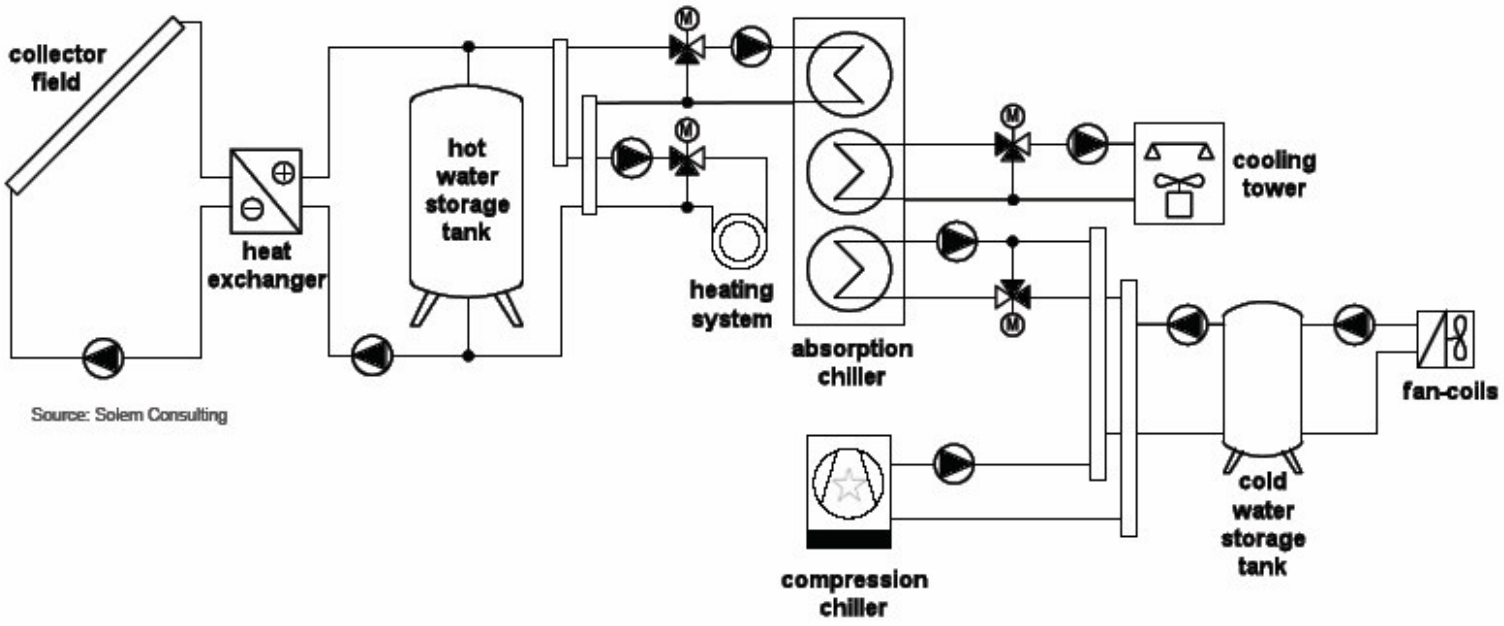
- Useful web resources
  - User's handbook and solar water heater calculator available at http://www.mnre.gov.in/ .

Solar Cooling

- Vapor Absorption Machine (VAM) provides cooling similar to centralized AC's and requires heat instead of electricity as input.
- Solar thermal energy can be used to run VAM by using Solar collectors.
- Over 400 solar cooling installations worldwide. In India a few examples exists.
- Solar concentrators and Evacuated Tube Collectors are normally applied.

General Scheme

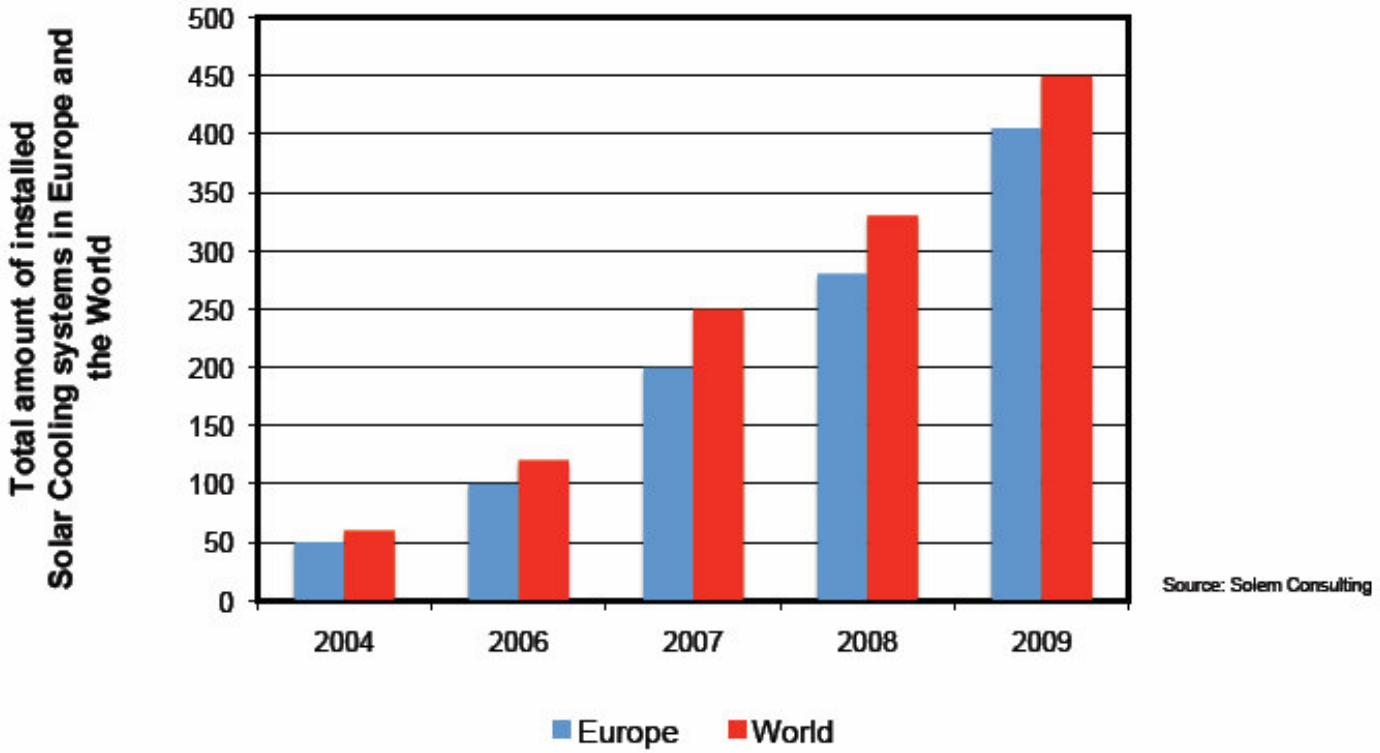
General scheme of solar cooling system



Source: Solem Consulting

Solar Cooling - Internationally

Market development solar cooling

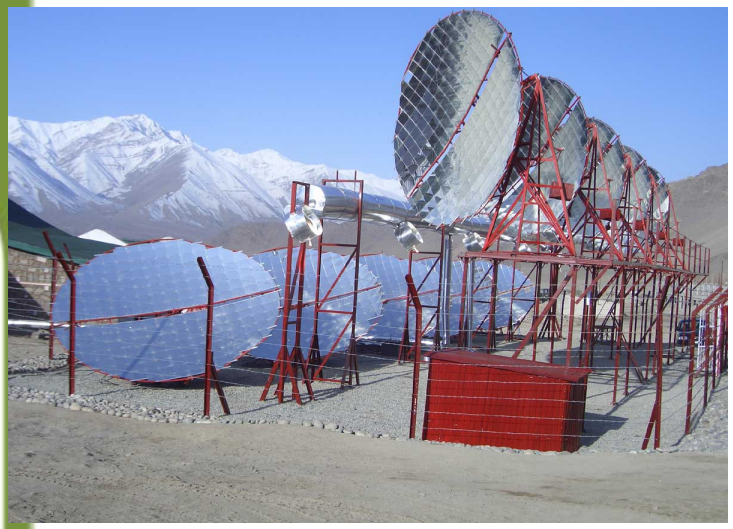


Source: Solem Consulting

Solar Cooling in Turbo Energy Ltd, Chennai

Source: Thermax

Solar Concentrator Technologies

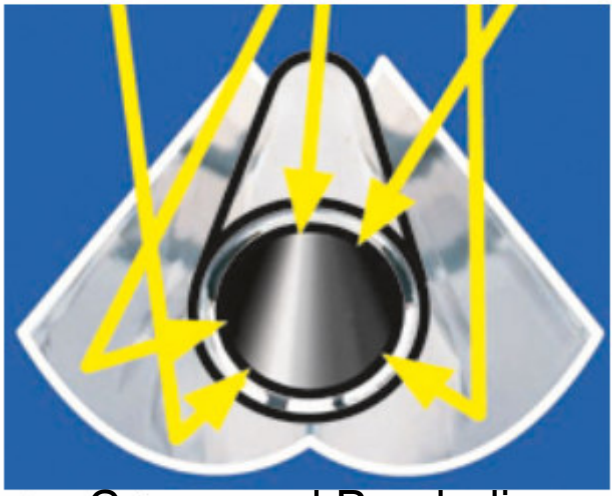


Scheffler

Parabolic Dish (ARUN)

Linear Fresnel (LFR)

Parabolic Trough (PTC)



Compound Parabolic Concentrator (CPC)

Solar Steam Generation

Applications in buildings

- Cooking in institutions
  - More than 50 installations in India
- Hotels (laundry, kitchen, hot water)
- Hospitals (laundry, kitchen, hot water)

Solar Concentrators at ITC Maurya, New Delhi

Source: Clique Developments Pvt Ltd

Source: MNRE

Conclusions

- A large scope exists for integrating solar energy in buildings.
- Solar water heaters are technically and commercially viable. Rapid advances in technology and cost reduction is expected in solar cooling and steam generation in coming years.
- For getting maximum benefits of solar energy in buildings
  - Solar options needs to be explored and integrated during the early-design phase of a project.
  - Should be designed taking into consideration demand profile, solar resource, technology characteristics, controls and operation and management aspects
  - Should be integrated with energy-efficiency options.

Thank You !

sameer@greentechsolution.co.in

www.greentechsolution.co.in