

## Cooling Towers as Solar Towers in Thermal Power Plants - A Conceptual Approach

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**Abstract:** Large size cooling towers are used in the Thermal and Nuclear power plants to lower the temperature of hot water received from condensers. These field erected Cooling towers are usually much larger in size either hyperboloid structures that can be up to 200 meters (660 ft) tall and 100 meters (330 ft) in diameter, or rectangular structures that can be over 40 meters (130 ft) tall and 80 meters (260 ft) long. The large exterior surface of these tower's body can be used to install the number of solar PV panels to capture the maximum amount of solar energy to generate the electricity. Thus, power plants can generate the much more electricity by cogenerating the conventional and non-conventional energy sources. With this understanding, the concept looks into potentially optimizing the way the electricity is generated in power plants. A feasibility study of this concept would be of great interest, because such a study could point to the optimal way of capturing solar energy with the use of exterior surface area of cooling towers for the installation of solar panels by saving land area.

**Keywords:** Cooling Tower, Solar Energy, Solar Panels, Solar Towers.

### 1. Introduction

Solar power in India is a fast-developing industry. Solar energy has emerged as the most viable and environment-friendly option for India to cater to the energy requirements of one and all including the 50% of its rural inhabitants who still live without electricity. A typical solar system is very easy to set up and just entails installing solar panels correctly in order for it to work. With about 300 clear and sunny days in a year, the calculated solar energy incidence on India's land area is about 5000 trillion kilowatt-hours (kWh) per year (or 5 EWh/yr) [1]. The solar energy available in a single year

exceeds the possible energy output of all of the fossil fuel energy reserves in India. The daily average solar-power-plant generation capacity in India is 0.30 kWh per m<sup>2</sup> of used land area, equivalent to 1400–1800 peak (rated) capacity operating hours in a year with available, commercially proven technology [2]. As shown in Figure 1, the large size cooling towers varies 2 to 3 in numbers depending on the capacity of thermal and nuclear power plants are used. The large exterior surface of a tower's body can be used to harness the maximum amount of solar energy by installing the large number of solar PV panels. These solar PV panels

can be installed around the circumference of cooling towers as shown in [Figure 2](#).



**Figure 1: Cooling Towers**

with tracking system and amount of energy generated using sun-tracking solar panels than fixed solar panels. There is some consensus that “sun-tracking” solar PV panels capture 30% to 40% or more solar energy than. Since the solar panels are not at an optimal angle when attached to the wall surface of the tower, the sun-tracking panels’ efficiency is much greater.

The field erected Cooling towers is usually much larger in size mostly of hyperboloid structures that can be up to 200 meters (660 ft) tall and 100 meters (330 ft) in diameter.

Available Exterior surface area of cooling towers,

$$\begin{aligned} \text{Surface Area} &= (\pi \times D \times L) \quad \text{m}^2 \\ &= (\pi \times 100 \times 200) \text{ m}^2 \\ &= 62,831 \text{ m}^2 \end{aligned}$$

The solar panels attached to the tower’s exterior wall may be fixed panels at an optimal angle or Sun-tracking solar panels depending on the cost associated



**Figure 2: Installation of Solar Panels around the periphery cooling towers**

With this surface area available for the installation of solar PV panels, large number of solar panels can be installed depending on the size and shape of panels. Thus, much more electricity can be generated by properly arranging the solar panels around the circumference of these cooling towers.

With installation of solar PV panels, the cooling tower gains the view of Cosmo-bio-logical looking skin. Thus, cooling tower as a solar tower produces new and intensified way of utilizing the surface area to produce electricity creating awareness.

## 2. Conclusion

The concept of use of cooling Towers as Solar Towers provides new approach to the power plants which can generate the much more electricity by cogenerating the conventional and non-conventional energy sources. The study

can be helpful to develop and install the Solar Panels which can harness the maximum amount renewable energy providing the optimal usage of space and energy storage by saving the land area required for the installation of Solar Panels.

### References

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