Giant fresnel lens solar concentrators

Physicists at the Indian Institute of Science are considering using arrays of giant fresnel lens solar collectors to harness solar energy for purifying water and producing electricity in villages. Huge fresnel lens with fine grooves can be fabricated locally and temperatures up to 400ºC achieved during daytime, when there is maximum sunlight.

Fresnel lens is a representation of a “planoconvex” lens in a refracting substance that helps focus solar radiation on a common point. The use of acrylic material as the refracting material lowers production costs and is easy to maintain in rural conditions. The solar concentrator is similar to a giant powerful burning glass and the surface is broken into a number of zones that are so small that straight lines represent the curved surface and help in bending light rays to a common focus.

The combination of fresnel lens and a “solar tracker” developed at the Institute helps boost the output of the collected solar energy. Both the fresnel lens and solar tracker involve simple production techniques that can be duplicated in rural areas with ordinary cutting tools. Adjustments to the solar tracker involves three operations – adjusting the time period of the clock, balancing the cages on which the solar devices are mounted and alignment of the axis of rotation. The time period of the clock is suitably changed by adjusting the top and bottom masses of the compound pendulum along its length and by adjusting the setting of a pair of pellets that control the escapement wheel rotation.