

Engineering Design

The land art project involves the combination of passive techniques for the use of solar energy and active energy generation systems:

- 1. Mud brick walls – Insolation and thermal mass
- 2. Solar updraft tower- Energy production system
- 3. Photovoltaic cells- Energy production system

Passive system

•Mud brick walls

Due to the climatic conditions of the city, it is necessary to create ventilation and cooling passive systems that control the heat generated by solar radiation and then help reduce the temperature of public space.. The mud bick wall, which begins at a ground level and reaches 20 meters, captures the thermal energy of direct sunlight, allowing passive cooling of the area and in addition, stores the heat of this energy to be released in the cold nights of the desert. This type of system known as thermal mass causes a design between the contributions of heat and the increase in temperature.

The alleys formed by the mud brick wall refer to the interaction of wind in the sand of the dunes, in technical form, these intersections help to increase the speed of the wind that must arrive to the turbines under the chimney. These walls are characterized by their low cost production and maintenance so, wich optimizes the performance and economic benefit of the project. Furthermore, they do not emit greenhouse gases during their operation.

Active system

Every hour, the sun throws more energy on Earth in the form of light and heat, enough to meet the global needs of a full year. It is estimated that in a year of absorption of solar energy on Earth is equivalent to 20 times the total reserves of fossil fuels.

"In the span of six hours the deserts receive more energy from the sun than anything humanity consumes in a year." Gerhard Knies. In this way, the project encourages the use of this technology, recognizing the potential of both photovoltaic and solar thermal energy in the city, which is located within the region known as "Sunbelt"

•Solar updraft tower

A solar tower is a construction that tries to take advantage of solar energy by convecting air. The tower consists of a 80m chimney painted black at inside that absorbs the solar energy and hot air that is inside it. A membrane composed of ETFE (Ethylene Tetrafluoroethylene), plastic resistant to high corrosion and high temperatures it is located in the lower part of the tower is by which the solar energy that heats the air below it is collected, leaving a difference in temperatures with the outside air. As a result of this convection, the hot air goes up the tower creating an air flow that moves the air turbines under the tower to produce energy.

•Photovoltaic cells

Thanks to the photovoltaic effect the cells will generate electricity that will then be stored in transformers that are, for the safety of the visitors, in the adobe walls. The proposal for the introduction of this type of technology is based on the use of thin film solar cells that are found on the surface of the walls and roofs in a total area of 8,500 m

Amount of Energy produced:

Solar updraft tower

Each tower: 96,000kWh/day. =35,040Mwh/year 4 towers: 140,160 Mwh/year

Photovoltaic cells

8,500m2 with a 5,168 kWh/day= 1,886.32 Mwh/year

