**FOREST OF LIGHT**

Forest of Light proposes a lighthouse on the city of Masdar.

Forest of Light supports the vision of Masdar City to become one of the leading sustainable cities in the world.

Forest of Light envisions space where art, technology, culture, people and the city coexist with each other.

Forest of Light expects to generate 9,504,000kWh energy from the energy network it constructs with the city.

**DESIGN**

The design of Forest of Light begins with the question ‘how could energy-generating land art engage even more deeply with the city in terms of its physical and technological attributes?

Thus, our first approach on the design was to apply a distinctive and representative figure found around the region to the art. The pointed arch is one of the most symbolic forms adopted to gateways, mosques, houses in the UAE. This form signifies the cultural context of the region and could be further adopted and manipulated to maximize its aesthetic value.

On the site, a pointed arch revolves on the street axis crosses the given site boundary. The rotation constructs a semi-circle elevation facing to north-east and south-west. At the same time, two mirrored pointed arches create the spatial plan, and the pointed arch follows along the longitudinal axis of the site.

In terms of the technology, as Masdar city is the leading sustainable city and a pioneer in its field, the vision of the land art also should not be just bounded by a small portion of the city. We believe that the city needs a broader network of energy generating systems and that the artwork could be at the center of this infrastructure.

Thus, we decided to exploit the potential involved in the form generated by the manipulation of pointed arch. The overall shape draws a huge possibility of adopting the ‘Concentrated Solar Power System.’

The principle of this system is utilizing focused sunlight that uses thousands of heliostats as concentrators to heat molten salt which is then used to generate steam from water. The steam is then used to generate energy from steam turbines. Masdar Institute discovered the potentiality of this technology from an early stage and has been managing the project called ‘Beam Down”. CSP technology can convert sunlight into electricity in a more efficient and lower-cost way than other technologies.

When thousands of heliostats are installed onto the urban fabric in different heights such as roofs of buildings, canopies, urban plazas, public parks, et cetera and Forest of Light would become a central receiver of that focused light. Forest of Light hence is not an independent artwork away from the city but a central node of a wide range of network composed of Concentrated Solar Power technology.

In this process, the proposed form conducts an essential role in the system. The height of 75 meters with semi-circular form is necessary in order to receive reflected sunlight from various altitude and latitude around the city.

Forest of Light is composed six interweaving layers. The layers get thinner towards the outer shell and this provides variation in layering and opacity. The innermost layer consists of steel pipes and acts as the main structure of the artwork. The next three layers are where the molten salt passes through and receives the thermal energy of the concentrated sunlight. The outermost two layers are meshes that add to the variation of the structure. The differing patterns, density and thickness of these layers create a ‘forest canopy’ where the light is filtered through to create infinite variation in brightness and shadow.

One leg of the pointed arch lets the molten salt rise within and after heat is gathered from the heliostats, the other leg of the pointed arch sends the molten salt down to the turbines below ground level. This process is analogous to the way that trees in a forest receive water from the ground and this combines that water with sunlight to create the nutrients it needs for its sustenance.

**ENERGY PRODUCTION**

The heliostats dispersed throughout the city concentrate sunlight towards the receivers in the pipes. These heliostats rotate according to the position of the sun. The receivers in the pipes then transfer the heat to molten salt flowing within the pipes. These pipes lead underground where the salt is stored in tanks. This capability of storage is another important strength of this technology. When needed, the heated salt is sent to the steam generator where it is used to turn water into steam. The explosive energy generated from the steam generator is sent to the turbines and the fans turn to generate electricity which is sent to the power grid. The water within the artwork is used to condense the steam back into water for later use.

One of the most successful precedents of the Concentrated Solar Power system is Ivanpha Solar Power Facility in Mojave Desert. It deploys 173,500 heliostats, each with two mirrors focusing solar energy on boilers located on three centralized solar power towers. The system covers up about 3,500 acre of public land and generates gross capacity of 392 Megawatts with 173,500 heliostats which would serve more than 140,000 homes in California.

When calculated, it would produce 0.28 Megawatts per hectare, and one heliostat produces 2.26 kilowatts. Also, heliostats cost around $0.17, with efficiency 25% percent.

If this system is adopted to urban fabrics (building roofs, canopies, parks, plazas, et cetera) throughout the city, net area would be around 376,800 sqm, or about 37.68 hectares.

Since CSP can generate 0.28 Megawatts per hectare, this would create 37.68 x 0.28 = 10.55 Megawatts.

The efficiency is 25% and MWh is MW x 3600, annual MWh would be 9,495.36Mwh, which is 9,495,360 kWh.

**ENVIRONMENTAL IMPACT SUMMARY**

The new art-infrastructure aggregates, connects and reacts to different urban fabrics through the technology of CSP. Acting as an interwoven network, Forest of Light is the centerpiece of the CSP network. Infrastructural systems merges with an aesthetic touch that was driven from the cultural background of the region around Masdar City. When overlaid, natural lights and gathered light could be diffused through the lattice generated by each compartment of the system. The space inside will be filled with kaleidoscopic light.

Further, the semi-circular form of 148m x 40m x 75m would react to the scattered heliostats in various locations, increasing the efficiency of the technology.

The space inside provides different spatial qualities in reaction to its users and the weather. People can listen to the sound of water drops while watching the kaleidoscopic light through the superimposed branches of layers while contemplating the fact that this beautiful art piece is generating clean and efficient energy with no negative impact on the environment.