**Wave City**

Masdar City is a greenprint of the future sustainable cities around the world. It’s a rapidly growing sustainable urban community with futuristic architecture that relies on renewable source of energy. The concept of Wave City is to amalgamate these two prominent aspects of Masdar City. The aim is to design a visually futuristic and free flowing art installation that incorporate highly efficient yet flexible renewable sources of energy that are easy to install into different structural forms. The concept of wave as a design form resonates with free flowing energy that surrounds us as well as emerges to be futuristic in visuals. Multipurpose spaces are created underneath the wave structures that can be used for various purposes such as art exhibition, social gathering on events etc.

**Technology**

Wavecity generates electricity by harnessing solar power and incorporating kinetic pavement in the design. Masdar City has good exposure to sunlight throughout the year therefore using solar power to generate electricity is more beneficial than using other types of renewable technology.

The solar panels are **Sphelar®** BIPV (Building Integrated PhotoVoltaics). This type of solar cells consists of arrays of 1-2mm dia micro spherical solar cell on a transparent flexible membrane. Having a capacity to capture rays from all direction, Sphelar Cell is less dependent on the angle of incoming light thus giving a higher efficiency as compared to other conventional solar panels. The transparent membrane also helps to illuminate the insides of the structure to a certain extent.

Efficiency (E) = 20%

Average Solar Radiation (R )=264 w/m2

Average Exposure in one day (D) = 6 hrs

Total Area of Solar Panels (A1)= 12,320 m2

Energy Output of 1 solar panel in one day (E1) = R x D X E

 = 264 x 6 x 0.2

 = 316.8 w hr/m2

= 0.317 kw hr/m2

Peak Capacity of the installation (P1) = R x E x A1

 = 264 x 0.2 X 12320

 = 650 kw

Power generated annually (T1) = P1 X 365

 = 3905 X 365

 = 1,425,325 kw hr

 = 1,425 Mw hr

Kinetic Pavement is provided by **Pavegen**. It is a triangular composite tile with electro-magnetic generators incorporated below it. As pedestrian walk across the Pavegen flooring system, the weight from their footsteps compresses electromagnetic generators below, producing 8 watts of off-grid electrical energy per step. Pavegen system also continuously monitors footfall, providing the ability to predict peak timings and prime locations.

Energy generated (EF) = 8 watt/ footfall

Average footfall (Fa) = 5000

Average Exposure in one day (D) = 6 hrs

Peak Footfall (Fp) = 20,000

Total Area of installation (A2) = 5000 m2

Peak Capacity of the installation (P2) = Fp x Ef

 = 20000 x 8

 = 160,000

 = 160 kw

Power generated annually (T2) = Fa x Ef x D X 365

 = 5000 x 8 x 6 X 365

 = 87,600 Kw hr

 = 87.6 Mw hr

Total Power generated on site annually = T1 + T2

 = 1425 + 87.6

 = 1513 Mw hr

 Total power generated on site annually is 1513 Mw hr

Energy from each panel and floor tile is channelled through an underground grid line to an onsite substation (15m x 15m x 7.5m). The substation includes a battery to store the power generated, an invertor to convert DC current into AC current and a step up transformer to increase the voltage and reduce the current in the distribution feeder so that the heat losses and cost of feeder are minimised. The energy can further be distributed in the city via distribution feeder (grid lines).

**ENVIRONMENTAL IMPACT**

 An art installation that inspires both an artist and a scientist, Wave City plans to be the cultural hub of the Masdar city where large crowd can gather on occasional social events or where people can go for leisure in the evening. It serves as both a visually appealing as well as environmentally friendly pavilion that upholds the very spirit of Masdar City and focuses to fulfil the aim of a smart city ideology on which Masdar city was designed. A close proximity to universities and industries provide university students and industrial workers with evening leisure walks after work. Being connected to main roads on multiple sides gives an advantage of having more exposure and becoming a landmark in the vicinity. 1513Mw hr energy that is produced annually is distributed in the city to provide electricity to hundreds of households. It also raises awareness on how renewable energy can be beautiful.