

In approaching the LandArt Generator design, our team strived to create an interactive user experience rather than a static object that can be observed at a distance. We wanted the public to become engaged with whatever we designed, and to create both purpose and meaning to the design that allowed it to function not only as an art piece that generates electricity, but as a multi-functional space / object that serves a number of purposes simultaneously. We wanted our design to provide an element of entertainment and excitement that drew visitors in, even those visitors who were not interested in supporting artwork that generates energy and even if the topic of renewable energy would not interest them in the first place. We feel that by creating a design that targets a segment audience outside of the interested circles, that we would allow the message of energy conservation and generation to reach a wider audience, and get others to learn about one of the most pressing issues that we as a global community face today; and perhaps hopefully the audience could be inspired to come up with their own ideas and solutions to the energy crisis.

This allowed our team to think strategically on how we approach our design and tackle the design loop at both a micro and macro end simultaneously. By looking at the current technologies, and how we can utilize them to bolster entertainment value, we saw a possible missed opportunity within wind energy utilization. When it comes to wind turbines, the energy input and output (in this case, the wind) is of similar (if not the same) value, yet the output energy (wind after passing through the turbine) is considered leftover. We investigated creating a series of tubes (Mirco Wind Turbines) that could harness that output wind energy into something else, and perhaps create a series of wind based musical instruments, like large scale trumpets. To make this idea work, we embedded a wind turbine into a brass tube, where the turbine is situated at the receiving end to generate the energy needed, but as the wind passes through the other side, the tube diameter decreases until it escapes from a smaller hole, which can be automatically and mechanically altered to be tuned to a specific musical note, allowing the turbine tube to be both an energy generating force as well as a musical instrument at the same time.

Our next question in the design loop was the placement on the site, which allowed us to ponder the size of these tubes and how they would be structurally carried to ensure that they are on the receiving end of the prevalent wind direction. The next design decision was thus to create a series of undulating and curving planes that would act as a structural carpet to carry these turbine tubes at the proper heights (allowing them to act as wind catchers and chimneys). The curvature of these planes were designed to capture the prevalent Northwest wind and gust, which coincidentally aligned with the orientation of the site, and the series of openings allowed for the free flow of the wind to circulate into all the spaces that were created by these undulating planes, and move from space to space freely to create continuous cross ventilation and air circulation.

The designed structural system contained large concrete curving pillars that support the lighter structural elements and canopies that carry the wind turbine tubes. The spaces were then carved out from the ground floor to create several stages and platforms underneath the canopies, where the performer becomes the series of tubes that are being carried all throughout the site. The design decision was the size of these turbines and the quantity. We reduced the size of each tube to allow the turbine engine to span a radius of 1.25m – which allowed us to create 196 of such tubes throughout the entire design site. Our calculations at 30 km/h gust or wind speed we could reach 71 kilowatts per hour during peak times, and 22 Megawatts per year on average (taking an average of 15 Km/h gust/wind speed). Each of these tubes would have a mechanically contracting brass tube (which we call tuning tubes) that would tighten the exit hole of the tube to be tuned to a specific musical note. These interior tuning tubes can be automatically programmed to allow the resultant music come of as musical chords (which each set of turbine tubes be tuned to a specific tonal interval for the chords), or a experimental performance artist can manually manipulate them to create a new and unique musical experience for the visitors. This means that the stages or platforms underneath these tubes can be used as a regular shaded public space (used for hangouts or picnics...etc), or as experimental concert venues. The tuning tube can also be left completely open to allow the air to escape freely without manipulating the resultant sound.

The canopies that shade and shelter the stages are also placed to face Southeast (With the canopy twisting in shape in certain areas to face both South and Southwest directions as well), allowing maximum solar exposure throughout the day. By applying a layer of transparent "Thin-Film Multi-Junction Solar Cells" (our calculations are based on the First Solar Series 6 TM Thin Film Photovoltaics), we effectively allow the back facades of our canopies to capture the solar energy. The surfaces on which we have applied the solar cell films amount to 7,160m<sup>2</sup>, which would amount to 6.45 MW per day, and 2354 MW per year on average.

Another way in which we have discussed utilizing the structure in order to generate energy is through all the heavy traffic parts of our design, which includes all the stages/platforms as well as on the steps and bridge over the street connecting both our project sites together. We have used Kinetic Energy Harvesting Systems (Pavegen TM or similar) to capture the foot traffic during peak hours and activities. This would generate on average 5 additional watts per footstep on these surfaces, or 5 KW per person on an event day (area can take up to 3000 people during peak times).

There are a total of 4 canopy structures, two of which with overall dimensions of 137.5x20m with a height of 24 m; the other canopy structure is 130x20m with a height of 28 m; the largest structure (which houses the bridge) is 260x20m with a height of 35 m. All these structures house a stage platform, which starts on the ground level and goes as deep as 6m below grade. The canopies consist of concrete arches (1.25m thick) with light weight steel secondary structure for the canopies, with a mixture of thin steel louvers and glazed surfaces for photovoltaics. We expected a construction budget of 35-40 million Dollars.

