

The Seaflute

In the afternoon the families gathered on the beautiful green hill on St. Kilda Triangle. As the fresh sea breeze blew through the trees and the children played through the park, soft, playful melodies of the Seaflutes chimed into their laughters. Spending time at the park after a beautiful day at the beach or a visit to the Palais theatre had now become a ritual for the locals. Many parents with their kids, and tourists alike, always gathered around the Seaflutes to see it with their own eyes. How could such a funny and playful sculpture that played music with the sea breeze be supplying the city with its electricity?

Context

We are living on a planet on which an unfathomable amount of energy has always passed before our eyes. The sun, sea, wind, gravity, have always surrounded us. There have been key points in our brief existence, where we have asked: "what if I could capture that energy?" and off we have gone, from making sailboats and water mills, to solar panels and turbines. We have utilized these energies in such a way, that it would have been considered magic only decades before.

Technology : Seaflute As a Clean Generator

Our process started some years back when we were surveying wind turbines for electricity generation. The idea behind the wind turbine was set with the right intentions, however its effectivity had suffered from its design. To put it in very basic terms, the wind turbine featured numerous moving parts (propeller, gearbox, generator, etc.) in order to make the power generation possible. The reality was that the presence of each moving part in the generator, translated into lesser energy being produced. Meanwhile, that lost energy would turn into heat, friction, noise and wear. This made the wind turbine relatively inefficient, expensive and maintenance-heavy.

The question we asked was, what if we could cut out all of the lossy parts? What if, we could break down each level of energy transformation from wind to electricity, such that there would be a direct conversion of wind's kinetic energy into electricity.

The technology behind the Seaflute, which in principal is a Direct Wind to Electricity Generator (D-WEG), brings together Three different fields of science: Aerodynamics, Electrostatics Electromagnetics. The science used in this device is not based on theory, but rather real, practical science which we have used for decades. It is in the arrangement and integration of these disciplines, however, that this module can do what seems so counterintuitive. This mechanism will be briefly explained in order for the full concept to be understood in whole.

The key feature of Seaflute is its shape. To put it simply, it resembles a cap-less and bottomless hollow champagne bottle. Taking inspiration from airplane wings, its intricate curves are shaped in such a way that the oncoming wind is directed to the back of the bottle shaped Seaflute at high speeds. As the wind rushes off at the end, a vacuum is formed at the back opening. This vacuum naturally draws and empties the air from the hollow interior. This forces a continuous air suction from the narrow front opening of the module, as the air rushes in to

refill the hollow space. This continuous flow of air abides by the same physics that enable airplane wings to lift off (See: Bernoulli's Effect).

Now that we have a constant and forceful flow of wind inside of the Seaflute we can engage the rules of Electrostatics and Finally Electromagnetism .

Surrounding the narrow passageway of air at the tip of the module is where we can find the Electrostatic Ion Generator as well as the Ferro-magnetic core. This unit's function is vital. As the jet of air passes by the ionizer within the narrow neck of the module, a continuous stream of charged electrons are generated (electron cloud). This long electron cloud traveling through the narrow tube can be likened to an invisible wire, carrying an electrical current. As the long electron cloud continues through the Ferromagnetic core, the core in turn replicates the passage of charge through it in a process called induction. This generates an ongoing electrical current, which is in turn captured, regulated and sent directly as a DC current to lithium batteries. This process, can create an ongoing current as long as the wind blows. There are no moving parts involved, no wearing down of equipment and no emissions/byproducts. The exhaust of this generator releases the same air that had entered it milliseconds before, in the same form as it was before.

Technology: Seaflute as a musical instrument

The Seaflute's capability as a power generator allow its presence to remain clean, accessible and friendly for the human scale. But what has been especially designed for the Seaflute at St. Kilda is its interactive features.

While the passing wind provides an unlimited flow of air for electricity production, the same air passing through the Seaflutes can create music. Through a careful study of pan flute structure and dimensions, each of the Seaflutes has been customized in length to create a specific note. The 14 Seaflutes represent 2 octaves of the music scale. Various times during the day, and per request, the flutes can be controlled via a centralized computer which opens and closes the air columns inside each Seaflute, playing melodies according to the musical notations given to it.

Social Impact Summary

The social presence and interactivity of the Seaflute are key, in order for it to become a real solution for our world. By bringing this invention to the waterfront and situated to live among us, we want to showcase what the possibilities are only if we have the right perspective. The idea of an immense power plant perched on a hillside or by a lake, releasing clouds of smoke and a river of polluted water simply becomes invalid and unnecessary, when we can have power generators that can not only be beautiful sculptures but also instruments of awe and education for our society and its visitors. On St. Kilda, the urban regeneration of what once was a grey parking lot into a green hill by the water dotted by Seaflutes, is a further testament to our time and the change in how we see our resourceful planet.

Environmental Impact Summary

As mentioned above, when compared to traditional methods of power generation and the negative environmental impacts imposed on our planet, the mere idea behind the Seaflute and its positive impact on the environment has required a complete paradigm shift.

The Seaflute produces zero waste. Thanks to its fellow solutions such as the solar panel, it is now not such a bold statement to say that power generation can be done without waste. Moreover, as the Seaflute has no direct moving parts, it does not require maintenance or part replacement like the old wind turbine. , the amount of constructed landscape cut down to a fraction of any other form of power plant, and emissions and runoff cut down to zero.

The power generated from the Seaflute can be directly stored in batteries as preferred by the city towards their goal of 40 MW of battery storage.

The Build

Specs:

L: 20m W: 4m H: 30m

Weight: 2T

Material: Can be manufactured in various types of Resin based polymers depending on the cost

Energy Specs:

14 Generator Units

Capable to align to wind direction up to 228°

Estimated clean energy produced: 1.2 GWh per year.

Noteworthy points regarding energy production:

Assuming a very mild wind of 10km/hr the 14 units produce 168kWh (12KWh/unit) of clean energy. The unique capability of these units is that with increased speeds in wind, their production increases exponentially. For example, a 20km/hr wind can produce 48kWh, while a 40km/hr wind produces up to 192 kWh. With higher wind speeds the production potential per year can go up to 19.2 GWh per year.

Investment: \$1.3 Million

The perceived return on capital investment:

Assuming a production of 20 Gigawatt/year, and the the price of \$0.07/kw, \$1.4 Mil worth of energy is produced which covers the cost of production by the end of the first year.

Conclusion

Through science and innovation, we can make our way back to an abundant and healthy planet, while also answering the ever-growing needs of the human population on energy. For this to become a reality, we need to carefully reconsider how and what we perceive our natural resources to be. The story here is simple; Each time we look closer into the most subtle of our planet's elements, the more we realize that there is indeed much more than meets the eye. Once, the humans looked at the air as a way to create music. What resulted were lasting songs for centuries, all due to a shift in perspective. That same ingenuity and creativity can once again be utilized to see beyond the capabilities of our elements; to create energy that is unlimited, clean and accessible out of thin air. Indeed there is magic in the air.