CLOUD

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a revelation of transient states through steam

A once stirring site for grand shipping machines defines the heart of Refshaleøen Holding. Deep carvings in the earth pronounced the birthplace of vessels, as they arose from the earth to travel the billowing seas. Within the depths of Refshaleøen Holding exists another flux however: geothermal energy. Craving to rise and weave with the water and the sky, the intertwining of these elements is the foundation from which CLOUD arises. The project seeks to bring the elemental earth and water together to establish a ritual of cleansing environment and body as one, connecting people and nature in a dynamic system of ever changing currents and flows.

CLOUD evokes the culture of Copenhagen. A series of three steaming sculptures in the landscape of Refshaleøen Holding give rise to a cleansing ritual of body and environment. The landscape is altered to create a shallow pool on the north end in which three sculptures are anchored. Careful consideration was taken to ensure that no earth was removed from the site, but instead earth dug out for the shallow pool would be used to create a raised area that would contain changing chambers below.

A deeper understanding of the forces and processes are formulated as people progress through the site. Trails of steam rising from each concrete sculpture envelopes visitors as they arrive on site. Once visitors emerge from changing rooms located underneath the mass of raised earth, they surface into the shallow pool with whirling steam above, producing a sensual understanding of the forces to be harnessed. Within the shallow pool are slightly deeper channels that lead people into the sculptures. The material quality of the sculptures offers a concrete inner core providing for contextual permanence and monumentality and a metal paneled wind shell alluding to the shipyard history of the site. The sequence through CLOUD embraces traditional bathing customs as visitors immerse themselves in the cool water before entering the steam room. In winter the sculptures, like a bow of the ship, cut through ice and mist with the wind shell designed to redirect wind flows on the site. Oscillating steam turbines then become visible as people slip into the steam rooms within the sculptures. The contemplative space inside allows for an intimate experience between people and technology.

CLOUD is a purifier of body and environment. As people use the sculpture to cleanse their body, the sculpture cleanses the surrounding water of impurities which becomes valuable for the environment and ecosystems of Refshaleøen Holding. The purification process is also the generator of the power, since it is the same steam that powers the turbines for energy. The result is a compelling relationship between people and technology, and people and environment.

To operate, the three sculptures make use of a well drilled into the ground that brings hot water to the surface. The water is then mixed with surrounding water from the shallow pool and carbon nanoparticles. The nanoparticles nature allows them to absorb heat more efficiently than water particles, creating at a molecular scale, pockets of boiling water creating steam. Once the steam is harnessed through the turbine, residual steam passes into both an interior concrete steam room and exits outward to create visualizations of the existing forces on the site. Wind patterns and the movement of people simultaneously affect the flow of steam through the site creating a variety of patterns that turn immaterialized flows into visual and sensual experiences for people.

CLOUD, the evocative formation of steam that ebbs and flows over the landscape of Refshaleøen Holding, thus establishes itself as a new landmark in Copenhagen. The steam generated by the sculptures envelops the site and reaches out to surrounding buildings, creating a fluctuating landscape in an otherwise flat terrain. The cloud of steam, visible to people located at surrounding landmarks will intrigue the public and initiate a discussion among the public. The discussion will not only be about the benefits of green energy, but also of how the process can become an intrinsic part of the existing culture in Copenhagen.

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environmental impact

CLOUD capitalizes on geothermal reservoirs known to be underneath the surface of Copenhagen. To date, these reservoirs are not used to generate energy since temperatures are not hot enough. However, research being conducted by Rice University in Houston, Texas has discovered a new way of boiling water at a lower temperature by using carbon nanoparticle technology. The technology is currently in its infancy, but remains very promising for future use and for use by CLOUD.

With this system in place, CLOUD can harness the natural geothermal energy that exists on site and convert it into electricity by using a simple steam turbine. Geothermal energy is a known source for cost effect, reliable, and clean energy. It is a constantly available, site specific power source with a 90% or higher reliability. The amount of energy capable of being generated is 7-10 Megawatts per turbine with a combined maximum total of 30 Megawatts produced per year, enough to power about 15,000 homes. The systems reliability and potential compensate for the initial high embodied energy. Not to mention that the system is simultaneously cleaning the surrounding water. In a seemingly impossible task, as long as the sculptures stand, water will be purified bit by bit. The binary cycle geothermal sculptures do not create greenhouse gas emission and instead positively affects its surrounding. Foreseeing future issues, all turbines and tanks have been made accessible in the case of any future issues and the shallow six inch pool on site can be closed off to drain if necessary.