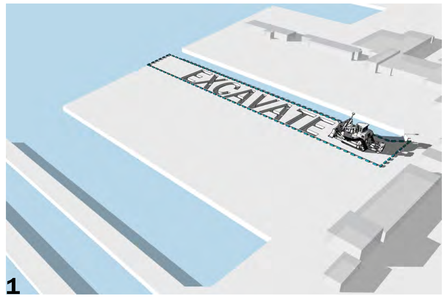
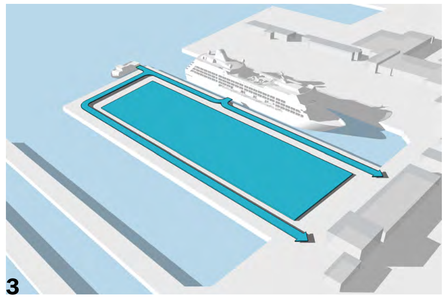
THE BORROWED NET

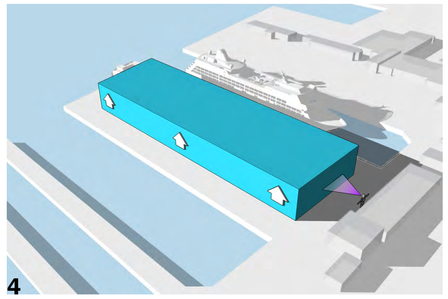
Microbial fuel cells (MFC) are the star child of waste water energy conversion. Using common bacteria, MFCs convert chemical energy from waste streams into electrical energy through catalytic reactions in an anaerobic environment. The system works in three simple steps. Firstly, a bacteria-coated anode is submerged into a carbon source (waste water) that is placed under anaerobic conditions. The bacteria consume the carbon in the waste water, generating hydrogen, carbon dioxide, and an electrical current. This electrical current is captured as it passes along a membrane to a cathode, and the hydrogen combines with oxygen to form water. The process produces three products—electricity, carbon dioxide, and water.

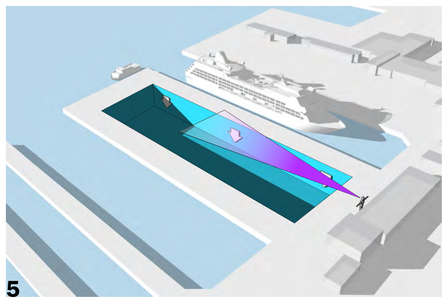
Our Borrowed Net takes the process a step further. By combining the energy-generating potential of MFCs with the carbon sequestration and biofiltration provided by living plant matter, we are able to create a system that produces three products—electricity, water, and a cultural, economic, and beautiful landscape.

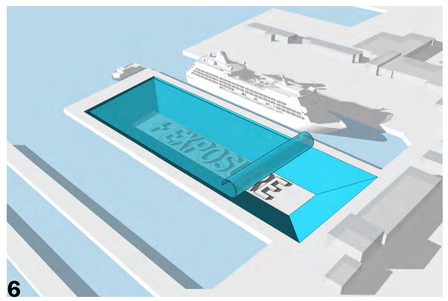
[1] A northern portion of the site is excavated to allow cruise ships clearance to the area. [2] The surface area required for MFC energy production is determined. [3] Site circulation, pedestrian, and ship access influence useable footprint. [4] Footprint is extruded to allow for greenhouse vegetation (views blocked in process). [5] Volume is depressed to reestablish views [6] Taper volume to increase solar exposure for vegetation and add plane to allow for circulation across site. [7] Squeeze plane to decrease volume while maintaining surface area. [8] Grade south and west site edges to provide access to new amenities–the Beach and the Promenade.

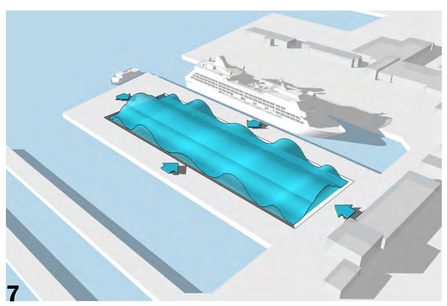


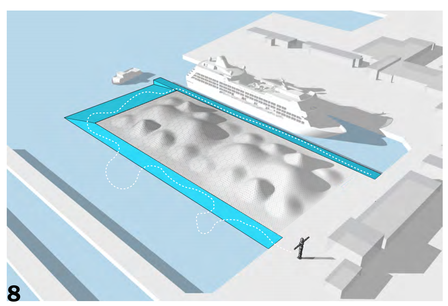












[1] The Greenhouses are positioned over five large holding tanks where the microbial process is taking place. Two of these tanks are the accepting points for waste, gray, and bilge water from cruise ships docked at the northern edge of Refshaleøen. [2] These tanks contain spherical anode arrays coated in the bacteria *Aermonas hydrophilia*. The spherical shape of the anode allows for maximized surface area between the bacteria and wastewater, resulting in overall increased energy generation. [3] Electrons created by the *Aermonas hydrophilia* travel along a membrane towards the cathode array, which is integrated into the tessellated domes of the Greenhouse. [4] Besides housing the cathode arrays, the Greenhouses contain a vast diversity of flora that serve three important functions—converting CO2 (created as a byproduct of MCFs) to O2, filtering graywater during the final stages of the MFC, and acting as a conservatory for endangered ecosystems in Denmark. [5] Clean water from the living machine can be used in two ways: repurposed on the cruise ships for various tasks, and piped into Refshaleøen to be used in homes, businesses, and industries.