

land art generator initiative

RENEWABLE ENERGY CAN BE BEAUTIFUL

Public Art of the Sustainable City (2010)

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INTRODUCTION

Imagine yourself walking in a large park at the edge of the city. In the distance, an object appears to rise organically from the landscape. Its armatures and folds relate to the composition of the setting. Looking closer, the large object makes you think of the complexity of patterns that exist in the natural world while at the same time it inspires an awe of human invention and ingenuity. The geometries of the sculptural elements seem to respond to the sun and the wind.

When you reach the observation platform the vision comes into perfect form, like a painting in a frame. As you watch the way that it reacts to the forces of nature, you think about the interconnectedness of human activity with the earth and the delicacy of our shared ecosystem. You are surprised to learn that the beautiful object that has so captured your attention is also a power plant harnessing the energy of nature in the creation of carbon-free megawatt-hours that are at that very moment providing electricity to thousands of nearby homes. You stay for a while listening to the energy conservation discussion that is going on there that day, stealing glances toward the artwork as it moves to follow the sun.

Is it possible that in the future, all human endeavors could be fuelled by clean renewable energy? And that the systems which generate the energy could be designed to be beautifully and seamlessly integrated into the fabric of our biotic and cultural ecosystems?

THE STATUS QUO

When most people think about renewable energy a few things come at first to mind. We might picture dark blue solar panel arrays or large wind turbines in the ocean and lining mountain ridges. The form of these objects is derived almost entirely from the engineering processes that have made them function more efficiently through each generation of technological advancement. Consideration of efficiency and cost per kilowatt capacity has driven the appearance of renewable energy technologies for two reasons. First, the cost of energy is relatively low in a global market that subsidizes non-renewable fossil fuels and writes off externalities¹, and renewable alternatives must strive to compete on those terms. And second, large-scale energy generation facilities (i.e. coal-fired power plants) have historically been located far enough away from the city and public spaces that aesthetics were not of utmost importance.

Functional and mechanical considerations should always remain an important priority of good technology design, and it is imperative that we implement strategies that will ensure universal access to affordable energy. At the same time, we may be wise to question the ability of advances in renewable energy technologies to reach their greatest potential if their physical forms continue to exist entirely outside of aesthetic and cultural considerations. This question is reinforced by the fact that the process of harnessing renewable resources such as the sun and the wind often requires that energy generation facilities be located in more visible locations.

The science of renewable energy may soon find the way to cost parity with conventional fuel resources, and by some measures, they already have. But the popular adoption of new sustainable technologies will require that they have the ability to appeal to people on an emotional level. It will require a popular appreciation of the value inherent within a shift in energy resources and not just of the dangers inherent in not shifting.

Meanwhile, the dangers are quite real and time is critically short. With climate, environmental, and health effects of extraction and combustion on the one hand, and the finite nature of fossil fuels and uranium on the other hand, it is imperative that the next few decades see a rapid transition to renewable alternatives. One of the leading obstacles to greater adoption is the indifference or lack of understanding of policy makers, stakeholders, and community leaders. Either the gravity of the situation is not apparent, or they mistakenly are under the impression that the renewable energy technology is not advanced enough to provide for large-scale base load systems. Given the poor state of common understanding, we must look to all means with which to educate and influence popular opinion.

The incredible bounty of the Earth, if managed sustainably, can potentially lead to a heroic triumph over poverty, over suffering, and to a transcendence of the petty vestigial inheritances of our hierarchical memes and our fear-triggered instincts. We have the conscious ability to ask ethical questions when we are confronted with the opportunity to flex our technical muscles².

Instead, our ability to tamper with the balance of nature and to squander the precious resources available to us has been a tragedy of epic proportions. A short-list of the damage done includes all of the polluting effects of mining and extraction industries, the “resource curse” stifling freedom and progress in post-colonial nations, effects of airborne and waterborne toxins on human health, habitat destruction and species extinctions, wars waged over resources, increased risks to coastal populations, loss of freshwater resources, agricultural instability, increased desertification and deforestation, ocean acidification, and global economic instability.

This list of 20th century tragedies is in great part due to the historically brief anomaly of easy access to conventional crude oil (~1860–2060). But it also has to do with the corresponding cultural memes that proliferated with and as a consequence of the technological and scientific expansion that was fueled by oil economies.

MEMES OF CONSUMPTION

All along the way art has had a pivotal role to play although it may be often overlooked. In 1909, the Futurist Manifesto³, along with other contemporaneous movements, gave added momentum to the sentiment of the triumph of man over nature. Europe was gripped by a collective progress-euphoria, as it reveled in the excesses of its scientific and industrial triumphs. It was that same year that humans reached the North Pole, and six years previously the first successful flight had heralded victory over the sky. The world had been mapped and catalogued and ideas about time and space were being challenged. This euphoria of progress is an addiction from which 100 years later we are still recovering, the abuses of which have taken their toll on our history, on our sanity and on the delicate vessel of our collective habitation. The manifesto was a seduction to the thrilling and fleeting ecstasies that come from narcissistic cultural self-evaluation, environmental destruction, squandering of resources and the waging of war. Above all, its lesson is the ability of art to contribute to change in the world.

While declaring the greatness of speed and progress, Futurism also equally declared the greatness of humanity. But what it did not bring into the fold of its political message was a concern for the well being of the planet or notions of “humanity” as being defined by a sense of empathy or compassion.

The intellectual profundity of the idea of “Greatness-In-Newness” that was born of those first decades of the 20th century played a critical role in art and design theory that was to follow.

On the positive side of the bargain, this grand movement that has seen various iterations and reinterpretations over the last century has consistently questioned the nature of art. The application of its higher ideals has given us the ability to invent spectacular otherworldly creations by fusing together disparate existences into wonderful or shocking manifestations.

On the negative side of the bargain, artistic glorification of mankind's triumph over nature has arguably contributed, if not to the neglect of our obligation to nature, at least to a distraction from it. In the meantime, we have arrived in the 21st century at a somewhat desperate place in which an updated vision of our future may have no place for human life at all on a planet that has been heated up by our combustion and raked clean by our endless mining for metals and fuels in our insatiable and un-moderated quest for speed and convenience.

A countermeasure of serious import to the Futurist ideas of "Progress for the Sake of Progress" and the "Greatness In Newness" has been the dawning awareness, since the middle of the 20th century⁴, of the serious situation that our addiction to unabashed industry and the fast life of unbridled consumption has placed us—and the planet. Artists have been pivotal in expanding this awareness to the critical mass required for action.

This use of art for ethical and didactic purposes continues with the expanding reach of genres such as eco-art, environmental art, and art as social practice. Artists are using the tools at their disposal to educate the viewers and readers of their work about the ethical considerations that are so relevant to popular human behaviors. Art and design have indeed been able to enlighten people about a broad range of social and environmental issues and instill awareness about the products we buy, the foods we eat, and the energy we consume.

In no small part this has been done through art that employs technology, (e.g. visualizations of climate data or air pollution⁵). Technology is being glorified and used in art with a new purpose and with awareness of the potential harming effects of human behavior on the delicate balance of the natural biosphere.

The relationship between art and technology is an ancient symbiosis. From the earliest tool-making that manifested aesthetics beyond pure utility, all the way through to the electronic media art revolution, both sides of the coin have gained riches from the company of the other.

A reductive binary view on the relationship between art and technology could be seen as: on one side, a glorification of technology over nature and, on the other side, a reaction and dissociation of art from technology. An obvious middle approach that has been developing is to see technology and scientific progress as tools to bring human existence into harmony with the planet, as a steering wheel that can alter our trajectory towards destruction. This approach uses science and research as grist for the artistic process as well as the actual medium for its creation. Art is becoming more and more a partner with technology and science to spread the message of positive change.

And yet it always seems that there is more to be done. The tipping point of change as it applies to energy production and consumption has yet to be sufficiently reached to affect consequential political action. To bring about the required momentum there must be a resounding voice, articulated in a manner that surpasses the limitations of language. Moreover, it must speak to more than the insular communities of artists and critics.

It must also overcome the limitations of didacticism. It is good to teach, but the best methods of teaching have always been demonstrative. How can art 'do' as well as 'be'? Whatever the answer, the 'do'ing certainly implies a partnership with technology.

Renewable energy technologies have the ability to rise to the occasion that is provided by these two conditions of the contemporary art world: social practice and technological integration. The Land Art Generator Initiative (LAGI) was born from a consideration of art in this context.

RENEWABLE ENERGY INFRASTRUCTURE AND SUSTAINABLE URBAN PLANNING

We are also aware of the issues surrounding the cultural acceptance of medium size renewable energy installations as they find greater implementation in communities. It is apparent following the news that renewable energy installations are often hindered by negative opinions of the visual effects that wind turbines and solar panels may have on neighborhood image.

It is important that we recognize the inherent differences that exist between the old and the new means of energy production and the change to built manifestations that consequently follow from this shift. As the days of the gas or coal fired power plant at the farthest outskirts of the city come to a close, we will find more and more integration of energy production within the fabric of our communities. Because the renewable forms of energy generation such as solar and wind do not pollute in their daily operations, they are more likely to find their way into proximity with residential and commercial neighborhoods. The need for large scale exurban generation will always be there, but this will be augmented more and more by urban micro-generation as well.

As this has already started happening, there has been some push back from local communities in terms of aesthetics, for example with neighborhoods rejecting wind turbines that they can see from their backyards (the so-called NIMBY effect)⁶. For while such installations do not billow smoke, the argument can be made that visual pollution is no less an impediment to the proliferation of clean energy inasmuch as detractors can point to “not in my backyard” examples of installations that have negative impacts on real estate values and community cohesion.

We live in a world that cross-culturally puts a high emphasis on design. As energy generation necessarily comes in closer proximity with the real estate that it powers, issues of aesthetics that drive acceptance are becoming more and more debated.

Macro energy installations in the landscape should integrate with their surroundings both visually and environmentally. Micro installations should integrate with the fabric of the urban community. Just as buildings and public art exist as interventions in the fabric of the environment, so must power generation constructions from our green fields to our suburbs to our downtowns react responsibly to their role as permanent additions to our shared experience.

Cities around the world are exploring contained energy self-sufficiency in preparation for the end of conventional oil. Some are starting from scratch and others are aspiring to retrofit themselves to carbon neutrality.

We have on the one hand an ever-increasing drive toward buildings and cities that are being designed to run on greater amounts of renewable energy as written into municipal/city initiatives⁷. And on the other hand we have technologies proliferating that are still rather utilitarian in their form. What is needed in order to bridge the gap (between the larger desire for a renewable future and the community level negative reactions to the application of the systems required for it) is an artistic movement that can set a course towards aesthetic considerations in sustainable infrastructure. Because, after all, sustainability in communities is not only about resources, but it is also about harmony.

SOLUTION-BASED SOCIAL PRACTICE AND ENERGY ART:

THE 2010 DESIGN COMPETITION FOR THE UNITED ARAB EMIRATES

When we arrived in the United Arab Emirates in 2008 the dramatic beauty of the Arabian landscape inspired us to conceptualize a project that took advantage of the unique qualities of the region: expansive landscapes, a thriving new art scene, avant-garde architecture, a receptivity to cultural innovation, and an overabundance of renewable natural resources (solar, wind, and wave) set so intriguingly against a petroleum-export economy with the second highest per-capita carbon footprint.

Our process was influenced by the “not in my backyard” response to renewable energy technologies globally, by our personal interests in art, design, architecture, and activism, and by a desire to truly affect public opinion that could in turn influence public policy. From this came the idea to provide an opportunity for collaborative and interdisciplinary teams to establish new ways of thinking about what renewable energy generation can look like, and in doing so widen the audience that may become interested in energy-related issues. We imagined the LAGI project setting a path for creative individuals to engage in pragmatic and aesthetic solutions to the problems that face us (global warming, resource management, environmental pollution).

It was clear to us that there must be a symbiotic relationship between creative individuals and scientific minds in order for the best results to occur. By recommending interdisciplinary teams that included artists working with scientists and engineers in the call to action, we hoped to create a system where the monumental task of shifting our approach to energy generation and consumption is shared. We believe that the ideas born from such lateral interactions may even have the potential to push the envelope of energy science by expanding definitions and questioning established, discipline-specific guidelines and assumptions.

LAGI thus becomes an opportunity for a new constructivism in public art—a questioning of its purpose and a reevaluation of its potential multifaceted value—but it equally aims to stimulate new models of planning and implementation of renewable energy infrastructure.

Whereas art in the public realm has been and will always be an integral part of the constructed environment, and serves to strengthen community cohesion and raise the value of property, it is a natural progression that a fusion should occur between the necessary cultural function that art objects fulfill and their potential to serve as functional commodities. By providing aesthetic examples of how humans can work in harmony with nature to acquire the energy that is needed to power modern life, the LAGI project aims to inspire a greater public awareness of renewable energy and a greater public acceptance of the integration of renewable energy generation infrastructure into the fabric of our cities.

The goal of the Land Art Generator Initiative is the design and construction of large-scale public art installations that have the added benefit of clean energy generation. Each sculpture will supply renewable megawatt-hours of electricity into the electrical grid with each public art installation having the potential to provide power to thousands of homes.

As we prepared in the spring of 2009 to organize an international competition around the LAGI idea, we first conceptualized some of what we referred to as provisional concepts. These were art installations that fulfilled the criteria and potential of what we imagined as a “land art generator”. Perhaps the most interesting of these provisional concepts was the Ibn Al Haytham Pavilion.

The first camera obscura was built by Arab scientist Abu Ali Al-Hasan Ibn Al Haytham, born in Basra (965-1039 CE), who also discovered that light travels through time and space and that it always travels in a straight line.

The pavilion is a tribute to his work. Using a standard concentrated photovoltaic (CPV) system that is modified to create beams of vertical light with the power of 800 suns by concentrating sunlight through Fresnel lenses at the roof. These beams are then re-concentrated at the raised floor level by a second Fresnel lens field and onto the CPV cells which are arrayed in a naturally cooled plenum space at ground level.

The beams are set against an interior of mirrored walls to increase the effect of the visual field. The relative darkness of the room that houses the beam field insures that the beams are clearly visible inside it. The beams themselves, while always vertical, change position as the heliostatic dual-axis hinges of the Fresnel lenses follow the exact location of the sun. This ever-changing abstracted composition of solar energy is visible in two locations: the horizontal viewing aperture at the North elevation, and from within the camera obscura room on the South side of the pavilion.

We created these and other example installations to serve as inspiration to the design teams.

By the autumn of 2009, we had outlined the schedule for the first competition and began to draft the design guidelines, which gave artists the choice between three sites: one in Dubai and two in Abu Dhabi. The sites were theoretical but they were chosen because they all fit the following three criteria: 1. they are not slated for development in either of the city’s long-term urban plans, 2. they combine the perfect mix of adjacency to natural beauty and proximity to urban areas, and 3. they have ample access to renewable energy resources. We chose sites

that would inspire the minds of the design teams, as well as the residents, local stakeholders, and decision-makers of both cities. And we assembled a list of 14 jurors both local and international who represented top professionals across many disciplines.

The prize and award ceremony for the winning design of Land Art Generator Initiative's first international design competition were sponsored by Masdar. We couldn't have asked for a more perfect partner. The architectural design of Masdar City has consistently set a standard of visual creativity in the methods of integration of both passive sustainable design and active renewable energy systems. Masdar's support for the integration of renewable energy systems with public art shows their continued support for the cultural aspects of the renewable energy future—a great compliment to the scientific research that Masdar is conducting which is so necessary to achieve that future.

The outcome of the 2010 LAGI design competition exemplifies how interdisciplinary teams can come together to solve one of the largest problems of our times. Hundreds of submissions came in from over 40 countries around the world. The design teams that submitted concepts included many top firms and artists, both locally and internationally.

Based on the success and global interest in the project, LAGI will be holding similar competitions biennially along with community outreach and educational programs as we continue to pursue the actualization of the concept designs toward the construction of the first-in-the-world grid power producing public artwork.

The eventual constructed artworks will provide a great value to the city in which they are built. Not only will they be a cultural amenity (and one that is educational as well), but they will be a contributor to the renewable power infrastructure and a catalyst towards its greater proliferation. The sites will be designed with the public visitor in mind. They will have programmatic spaces dedicated to educational activities and awareness events to help spread knowledge about ecology and sustainable systems of survival.

And while it is not the primary concern in the creation of art, it should be noted that the constructed works will have a great financial return to the city or private investor. They will pay for themselves over time by generating real megawatt-hours of energy and by bringing visitors from around the world to experience their beauty. The revenue streams (in addition to the sale of megawatt-hours) that will accrue from increased tourism and events at the sites will make the construction of the projects a viable investment for private and/or public capital. Opportunities might exist (as was suggested in some of the 2010 entries) for citizens to buy into cooperative arrangements as collective owners of the artworks—able to benefit from the energy that they generate and proud to know that their homes are being powered by art.

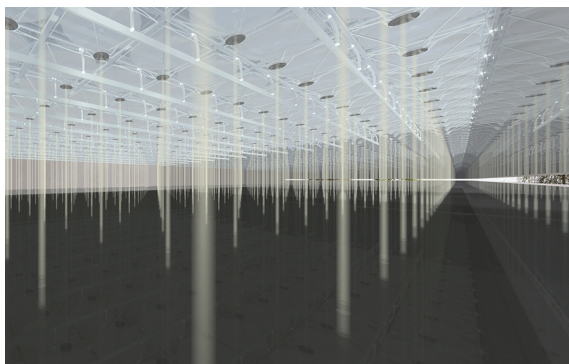
We can envision a day when renewable energy generating artworks will add cultural and economic value to public spaces around the world, while giving us cause to feel good about our creative stewardship of the environment. This book is a catalogue of the first steps along that path.

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Ibn Al Haytham Pavilion for Mushrif Park: 150KW
Designed by Robert Ferry & Elizabeth Monoian



The first camera obscura was built by Arab scientist Abu Ali Al-Hasan Ibn Al-Haytham, born in Basra (965-1039 CE), who carried out practical experiments on optics in his “Book of Optics”. In his experiments, Ibn Al-Haytham used the term Al-Bayt al-Muthlim, translated in English as dark room. In the experiment he undertook in order to establish that light travels in time and with speed, he wrote: “If the hole was covered with a curtain and the curtain was taken off, the light traveling from the hole to the opposite wall will consume time.” He reiterated the same experience when he established that light travels in straight lines. A revealing experiment introduced the camera obscura in studies of the half-moon shape of the sun’s image during eclipses which he observed on the wall opposite a small hole made in the window shutters. Concentrated photovoltaic (CPV or HPVC) technology concentrates sunlight through a lens onto a high performance solar cell, thus increasing the electricity generated over conventional PV panels. Typical photovoltaic panels only convert about 10 to 15 percent of incoming light into energy. CPV cells utilize multijunction photovoltaics which can reach efficiencies of 40 percent.

Typically the CPV solar cell lies directly beneath the fresnel lens or parabolic mirror concentrator. In the Ibn Al-Haytham Pavilion, this type of system is modified to create beams of vertical light with the power of 800 suns by concentrating sunlight through fresnel lenses at the roof. These beams are then re-concentrated at the raised floor level by a second fresnel lens field and onto the CPV cells which are arrayed in a naturally cooled plenum space at ground level.

¹ Externalities include costs of environmental pollution, loss of habitat and species, increased human health risks, and the geopolitical costs of establishing security of access. The Environmental Law Institute has published an excellent study on energy subsidies: *Estimating U.S. Government Subsidies to Energy Sources: 2002–2008* (http://www.eli.org/Program_Areas/innovation_governance_energy.cfm)

² For theory about technology and ethics, see Murray Bookchin, *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy* (Black Rose Books, Revised Edition September 1, 2001); and for information about resource and climatic boundaries, see the Stockholm Resilience Centre at Stockholm University.

³ F.T. Marinetti, *The Founding and Manifesto of Futurism* (Paris, Le Figaro, February 20, 1909):

...9. We will glorify war—the world’s only hygiene—militarism, patriotism, the destructive gesture of freedom-bringers, beautiful ideas worth dying for, and scorn for woman.

10. We will destroy the museums, libraries, academies of every kind, will fight moralism, feminism, every opportunistic or utilitarian cowardice.

...Art, in fact, can be nothing but violence, cruelty, and injustice.

⁴ Books such as those listed below made some of the earliest impacts on popular culture:

- Jacques Ellul, *La technique ou l'enjeu du siècle* (Armand Colin, 1954)
- Murray Bookchin, *Our Synthetic Environment* (Alfred A. Knopf, 1962)
- Rachel Carson, *Silent Spring* (Houghton Mifflin, 1962)

⁵ See: Andrea Polli, *Particle Falling*, (San Jose, 2010) and *Hello Weather*, (New York City, 2008); Sabrina Raaf, *Grower* (2004–2006); Katherine Moriwaki, *Inside/Outside* (2003); The Leonardo Lovely Weather project (2007–ongoing).

⁶ See: Patrick Devine-Wright, *Renewable Energy and the Public: From NIMBY to Participation* (Earthscan Ltd, 2010);

⁷ See: Masdar City, Abu Dhabi, United Arab Emirates (example of new city plan); *Eco-Metropole 2015 Plan*, Copenhagen, Denmark (example of existing city adaptation plans).