INTRODUCTION

New Energies

Robert Ferry and Elizabeth Monoian

In 2012, the Land Art Generator Initiative design site at Freshkills Park brought forth hundreds of ideas about how we can creatively adapt our reclaimed landfills for renewable energy infrastructures, seamlessly integrated into a regenerated natural environment—beautiful public energy parks to power hundreds of homes while providing safe places for people to recreate and learn. The juxtaposition of reclaimed landfill and energy infrastructure design provided a fertile conceptual terrain onto which artist teams imagined their work.

In 2014, LAGI has explored new territory with new conceptual frameworks. The 2014 site at Refshaleøen is an industrial brownfield site. Its history is unique (as you will read in the essay by Annette Skov on page 16), but every city has a site similar to this. These are places where residential development is not yet possible due to high levels of environmental pollutants deposited year after year during a long industrial past. In places such as these, there is a great opportunity to conceive of iconic public art installations that can stand watch over history until the ground and air are clean enough to be sustainably developed into the fold of the growing city. In the meantime, these sentinels can serve to reduce our dependence on fossil fuels by generating clean, renewable electricity for the city.

The entries to this year's competition have once again pointed the way to a future in which our sustainable energy systems can exist in complete harmony with the living city around us.

Will humanity transition to 100% carbon-free energy? Yes, we will because we must, and the solutions already exist.[1] Fossil fuels are a finite resource and their unrestrained extraction/combustion is damaging to human health and the environment.[2] The question is: how difficult will the change be, and how long can we put off the inevitable before the effects of climate change bring suffering to millions and ruin to the global economy?

If we are to make a fairly seamless transition, then we must possess an appreciation for history and acknowledge that individuals and corporations acting without adequate government coordination and leadership will not be able to find solutions quickly enough.

Consumer movements, activism, and corporate responsibility have brought us to a point in time where a clear majority of people are in favor of public investment in renewable energy. If we are to continue to rely mostly on the marketplace to dictate the terms of the transition, all progress will be threaded through the financing needle of net present value determinations using time horizons that are too short-sighted for our long-term collective interest.[3]

Instead, we desperately need a coordinated effort organized by governments, and policies that can override the short-term economic models. According to the International Energy Agency, in order to meet the global carbon reduction challenge, the world will need to invest $6 trillion over the next 25 years.[4]

When we are facing a collective challenge such as this, we would be wise to transcend narrow commercial interests and recognize the value of economy-wide returns like those associated with renewable energy investment. We have done this before during times of critical mass determination, in order to address social injustices or to expand the boundaries of scientific progress.[5]

[1] Mark Z. Jacobson, Guillaume Bazouin, Zack Bauer, et al., "100% Wind, Water, Sunlight (WWS) All-Sector Energy Plans for the 50 United States," (Atmosphere/Energy Program, Dept. of Civil and Environmental Engineering, Stanford University, July 17, 2014). **http://web.stanford.edu/group/efmh/jacobson/Articles/I/USStatesWWS.pdf** (**http://thesolutionsproject.org**)

[2] If we are to avert the most devastating effects of global climate change by staying at or below 2° Celsius of warming, we must abandon (leave in the ground and not use) 80% of the proven reserves of fossil fuels that the industry is now claiming on their balance sheets as assets. For more information, refer to the Carbon Tracker Initiative's report, "Unburnable Carbon" at **http://carbontracker.org**

[3] A rate of return of 12–15% (IRR) and investment horizons of 7–10 years are a barrier to some renewable energy investments, which may require more than a decade to achieve strong returns on investment. Technological innovation to reduce the EROI (energy return on energy invested) of renewable energy systems (to make them more competitive with fossil fuels in the marketplace) requires expensive research and development that is not easily borne by the private sector. Feed-in-tariffs, portfolio standards for utilities, and tax incentives can make renewable projects more commercially attractive to private investors, but the fact that global GHG emissions continue to increase year-on-year shows that these mechanisms alone are not sufficient.

It is time to come together again in the name of renewable energy investment, and the way forward is to look to the best models that are already in place.

The success of wind power in Denmark is an example of what can happen when people come together as a collective and consider energy and climate change from the point of view of the common good.[6]

In our recent conversation with Natalie Mossin (February 2014), the head of the Danish Architects' Association (Arkitektforeningen), she noted:

> The overall objective of a sustainable society is, in the end, a collective objective. Taking over ownership of energy production is not an end in itself. It is the taking ownership of the collective solution that is interesting. The initiatives of individuals should be a part of that. The Andelsbevægelsen, or cooperative movement, in Denmark is a really strong part of our culture and it shows beautifully how each individual can take ownership in the collective solution. Each person has a role and influence, but all are acting for the common good.

This strong history of the economic cooperative has always influenced Denmark's energy sector[7] and has played a pivotal role in defining the strategy for the implementation of wind power in Denmark in the later decades of the 20th century. During that time, most wind farm developments were financed collectively by cooperatives of 20 to 40 households with some government assistance and the requirement that all those living within three kilometers of a turbine were invited to invest in its installation. A strong feed-in tariff[8] helped to ensure these installations were profitable with the earnings shared among the cooperative stakeholders.[9]

In the early years of the 21st century, changes were made to these cooperative-friendly policies. The three-kilometer rule was dropped and feed-in-tariffs were removed in favor of market incentives. The result was that investment in wind power declined rapidly between 2004 and 2006, and instances of public resistance to new installations increased. In 2008, some of the incentives were brought back, but many fear that resistance to new installations will clash with Denmark's ambitious renewable energy goals.

In order to meet the goal of 50% electricity from wind by 2020, Denmark will need to install an additional 500 MW of wind power onshore and 1,500 MW offshore.[10] Given decreasing land resources, these installations will inevitably need to come into closer proximity with residential neighborhoods and populated shorelines. Recent popular resistance to new wind turbine installations has led to research efforts to study the causes, such as the Danish Strategic Research Council's 23.6 million DKK (4.5 million USD) grant to study the dynamics of local acceptance.[11]

Denmark is setting the highest standard for the public embrace of renewable energy infrastructure, but as we have seen, even in this relatively idyllic political environment there are still a great many challenges to overcome.

4 Brendan Pierpont, Uday Varadarajan, David Nelson, and Anne Schopp, "Renewable Energy Financing and Climate Policy Effectiveness CPI Analysis Framework (Working Paper)," (The Climate Policy Initiative, July, 2011). **http://climatepolicyinitiative.org**

5 A dedicated investment on a par with that provided to the Apollo program ($160 billion in 2014 dollars) could be exactly what is needed to lay the infrastructural foundation for a shift to 100% renewable energy.

6 Denmark has set a realistic goal of a complete transition to 100% renewable energy by 2050. A great overview of the strategy and history can be found in the 2012 Danish Energy Agency publication, "Energy Policy in Denmark." (Danish Energy Agency, 2012). **http://www.ens.dk/sites/ens.dk/files/dokumenter/publikationer/downloads/energy_policy_in_denmark_-_web.pdf**

7 Denmark's first district heating plant (waste-to-energy) was running in 1903 in Frederiksberg municipality (just outside of Copenhagen). **http://dbdh.dk/district-heating-history**

8 A statutorily guaranteed buy-back rate from the utility company for kilowatt-hours produced in excess of those consumed at a given site, such as a residence with solar panels on the rooftop.

9 Information from Professor Frede Hvelplund of Aalborg University, featured in a 2012 article by Aedan Kernan. **http://www.leonardo-energy.org/danish-community-and-wind-power-feature**

10 Ibid.

The Land Art Generator Initiative sees these challenges as a welcome opportunity. In this book, you will read about how we can make energy visible by recognizing the inherent mystery of electrical power generation (p. 26). You will learn about the ways in which ecological art movements can model how to intervene in our environments and public spaces (p. 46), and how interdisciplinary collaborations between artists and scientists are opening up new avenues of design exploration (p. 42). You'll be asked to think about how science education can be advanced through the imagining of potential futures (p. 50).

You will learn about how research in Denmark is casting a light on the way that humans adjust to sustainability-centered cultural shifts (p. 28) and how actor-network theory can be applied to the complex history of the emergence of wind power as a dominant force in Danish energy production (p. 30). We find a particular relevance in Peter Karnøe's essay—a story of city-integrated and design-oriented renewable energy infrastructure, which is also a story of interacting actor networks and an evolution from establishment to emerging social systems.

Our sincere thanks are due to all those who participated in LAGI 2014 Copenhagen: as artists and designers, as project partners, as jurors and committee members, and as messengers of the information that is contained within this volume.

We hope that these ideas will stimulate conversations within Denmark and around the world, so that we can recognize that the road ahead is not paved with zero-sum, either/or questions, but rather with expansive futures where we can grow a healthy natural and social environment while maintaining a high standard of living and economic prosperity.

[11] "Wind2050 – Multidisciplinary study on local acceptance and development of wind power projects" (2014–2017) led by Kristian Borch with the Technical University of Denmark in Lyngby. From the abstract:

> The overall analytical perspective considers wind power facilities as socio-technical systems, which allows the work packages to use different scientific perspectives and methods in order to understand why and how different institutions, regulations, actors and perceptions induce or block deployment of wind power. The analyses are finally integrated in strategic scenarios, which provide recommendations and decision support for future deployment of wind power and other renewable energy sources.

***Balance / Imbalance* by Hideaki Nishimura**

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LAGI 2014
DESIGN GUIDELINES

The LAGI 2014 design guidelines were developed closely with Refshaleøen Holding and the City of Copenhagen.

The guidelines constituted the rubric for determining qualified entries to the LAGI 2014 competition.

PROJECTS MUST:

Consist of a three-dimensional sculptural form that has the ability to stimulate and challenge the mind of visitors to the site. The work should aim to solicit contemplation from viewers on such broad ideas as ecological systems, human habitation and development, energy and resource generation and consumption, and/or other concepts at the discretion of the design team;

Capture energy from nature, convert it into electricity, and have the ability to store, and/or transform and transmit the electrical power to a grid connection point to be designed by others. Consideration should be given to the artful housing of the required transformer and electrical equipment within the project boundary and restricting access to those areas for the safety of visitors to the site;

Not create greenhouse gas emissions and not pollute their surroundings. The work must not impact the natural surroundings negatively. Each entry must provide a brief (approx. 300 words) environmental impact assessment as a part of the written description, in order to determine the effects of the project on the natural ecosystem and give reference to a mitigation strategy addressing any foreseeable issues;

Be pragmatic and constructible, and employ technology that can be scalable and tested. There is no limit on the type of technology or the proprietary nature of the technology that is specified. It is recommended that the design team make an effort to engage the owners of proprietary technology in preliminary dialogue, as a part of their own research and development of the design entry. The more pragmatic the proposals are, the greater the likelihood will be that one of them may get built;

Be well informed by a thorough understanding of the history, geography, details of the design site, and the broader contexts of Refshaleøen, Copenhagen, and Denmark;

Be safe to people who would view it. Consideration must be made for viewing platform areas and boundaries between public and restricted areas;

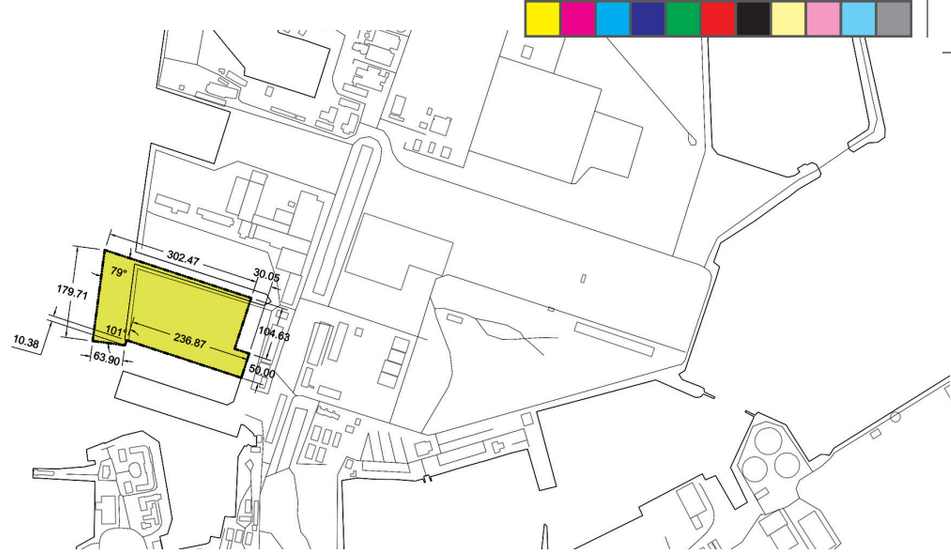
Be designed specifically to the constraints of the design site at Refshaleøen as shown in the Location Plan;

Designs must not exceed 125 meters in height.

LAGI 2014 JUDGING CRITERIA

The LAGI 2014 jury made their decisions based on the following criteria:

- Adherence to the Design Brief;
- The integration of the work into the surrounding environment and landscape;
- The sensitivity of the work to the environment, and to local and regional ecosystems;
- The estimated amount of clean energy that can be produced by the work;
- The way in which the work addresses the public;
- The embodied energy required to construct the work;
- The perceived return on capital investment of the work, judged by the complexity of the design in relation to the energy it produces each year;
- And the originality and social relevance of the concept.



LAGI 2014 Design Competition Site

The jury and voting process took place through an online format over the month of July 2014.

OFFICIAL LAGI 2014 JURORS

Connie Hedegaard
European Commissioner for Climate Action

***Martin Lidegaard**
Danish Minister for Climate, Energy, and Building

Tina Saaby
City Architect of Copenhagen

Lars Aagaard
Director, Danish Energy Association

Jason F. McLennan
CEO, International Living Future Institute

Nille Juul-Sørensen
CEO, Danish Design Centre

Kent Martinussen
CEO, Danish Architecture Centre

Christian Herskind
CEO, Refshaleøen Holding A/S

Steen Christiansen
Mayor, Albertslund Municipality

Maria Hørmann
Change Maker—Design & Innovation; Blog Editor, Hello Materials Blog, Danish Design Centre

Else Marie Bukdahl, Dr. Phil.
Danish Art Historian, Ålborg University

Agnete Fog
Chairman of Green Cities 2014–2015

Sharon Chang
CEO and Founder, Yoxi; NYU Trustee

Chris Fremantle
Producer, ecoartscotland

Matthew Rosenberg
Founding Partner, M-Rad; 2nd Place Winner LAGI 2012

Michael Singer
Principal, Artist and Designer, Michael Singer Studio

Stig L. Andersson
Founding Partner, SLA; Creative Director, Professor

*Unable to participate due to change in position.