



BACKGROUND

HISTORY

The first known name of the City of Copenhagen was 'Havn' -meaning 'harbour', and it is obvious that the harbour, the naval and merchant fleet, the transportation by the seas has been a central reason and position for the growing capital of Denmark.

The actual site is a part of the former naval areas founded in the 17th century. It was situated inside the fortification of Copehagen, as a large inner harbour area, where the Royal Danish Navy could keep the fleet protected and establish ship-yards to build new ships.

In 19th century, Burmeister & Wain established a civil shipyard which grewed to a national industry icon. On its top it employed around 8.000 people, constructed during the years around 1000 ships etc. Some up to almost 250 m long, 30 m wide and more than 80.000 ton deadweight. The last ship build on the shipyard was delivered in 1996.

The history of the site shows, that it is completely man-made according to the needs of the time. This is for us a key to the understanding of the future design of the site.

PRESENT

The last 20 years a lot of different activities has found place on Refshaleøen. Small creative businesses and entrepreneurs are hosted by the former industry buildings. Latest the 2014 Eurovision Song Contest show, where the raw character of the giant former B&W construction hall made the scenography a big succes.

FUTURE

The development of Refshaleøen will slowly begin in the next 10 years. This is to allow the challenges of former industial contamination to be solved, and to establish a connection to the public infrastructure of Copenhagen etc.

The property owners wishes that the future development of the growing new parts of Copenhagen will be based of the values:

sustainability - creativity - authenticity - diversity

in a way that the temporarily use can establish social relations and use that could be a part of the future development.

The city of Copenhagen has in its municipal development plan 'Kommuneplan 2011' formulated three founding values of the planning:

a good everyday life - knowledge and business - green growth

The City of Copenhagen has made important analyzes of how the future citizens of Copenhagen will live, which dreams they have for their city, and how the city could activate visions to meet these dreams (both from 2004):

The future Copenhagen and Copenhageners
'Fremtidens København og københavnere'

The lifestyles of Copenhagen citizens
'Københavnrelivsformer'

With great importance for this LAGI competition, is the formulated ambition for the City of Copenhagen to be the first capital in the world to be CO2 neutral by 2025, as expressed in:

Copenhagen Climate Adaption Plan
Copenhagen Carbon Neutral by 2025 (from 2011)

It is an ambitious goal which requires focused actions from the City on a variety of key areas, dealing lifestyle, transport, resource consumption and consumption patterns in a broader view, design of buildings and infrastructure etc.

As a group working in the field of future sustainability of human activities and our society in general, we are aware of the many aspects of daily life and planning this complex question addresses.

To give answers, it is necessary with a broad knowledge of sustainable planning and status in our global society, and to reach more specifk goals of our cities, important tools are knowledge of technological possibilities, human behaviour as near future development of sustainable solutions.

DESIGN

SUSTAINABLE CITY HARBOURSCAPE

Our design should be seen as a broad and open framework that gives the City of Copenhagen the possibility to create a site in the new urban area that could develop to a central place of experiencing sustainability, a meetingpoint for both the new neighborhood of Refshaleøen as for all of Copenhagen.

The very central location of the site makes it a perfect venue to visit, and a great landmark that could be a perfect frame for the events taking place in 2025, where Copenhagen will show the world, how it succeeded beeing the first sustainable CO2 neutral capital!

DESIGN CONCEPT

The design is a poetic translation of the history of Copenhagen, its harbour and the specific site, regarding that the naval and merchant fleet always has been a central part of the site and city.

As ships in the naval and merchant fleet always has been build to carry a load, the energy ship of the future will be able to store the produced energy and unload it when needed.

As the site will in the future transform into a sustainable city harbourscape, where the overall design concept expresses the harbor history: it will be a future work-hop, a shipyard, where the energy ship of the future will lead the way to new understandings, producing and storing energy from sunsails, wavegenerators and windturbines.

ENERGY: COPENHAGEN IS WATER, WIND AND SUN

Therefore the production of electrical energy is based on these elements, which all can be established by wellknown technologies incorporated in an new overall design:

SUN SOLAR PANELS of photovoltaic type
5.400 m2 of panels
850.000 kWp installed effect
generating app. 760.000 kWh pr. year

WIND WIND TURBINES urban type with vertical axis
18 units each 4 kW = 72 kW
each unit produces app. 6.000 kWh pr. year
18 x 6.000 kWh total app. 100.000 kWh pr. year

WATER WAVE generators integrated in bulwark and harbour
micro wave generators

STORAGE

The challenge with renewable energi: to store it between periods with high production to periods with high consumption, has been a major design element, with a focus on energy storage for later consumption. Over the year the site will have a surplus of energy production, that can be sent to the grid.

STORAGE 'THE SHIP' (surplus: sunpanels and windturbines)
30x30x200 m = 180.000 m3 of water pumped with surplus energy
30.000 m3/h = in 6 hours by 100 pumps of 300 m3/h
each pump 2.2 kW, total 220 kW

SECONDARY PRODUCTION 'THE SHIP'
axial water generator 100 kW at 1 m3/sec, av. 15 m waterheight
1 m3/sec = 3.600 m3/h
180.000 m3 with 3.600 m3/h = 50 hours production of 100 kW
app. 2 night/days continuous prod. or 10 days with 5 hours prod.

' THE SHIP' store energy for
water experiences / larger consumption units / events

STORAGE 'SITE TUBES' (surplus: wave generators)
tube diameter 1,5 m, volume 100 m = 177 m3
each tube filled in 6 hours: 30 m3/h, pump 2 kW
by 100 tubes+pumps: pump effect 200 kW

SECONDARY PRODUCTION 'SITE TUBES'
mini water turbine for low stream in tubes
0,01 m3/sec = 36 m3/h and 1 m waterheight = 0,1 kW
running 4 hours a day, pr year app. 1500 h =
year prod. pr tube 150 kWh
by 100 tubes / mini generators = 15.000 kWh

' SITE TUBES' store energy for the LED lights of the site area.

