



## Solar Heat in District Heating Systems: Experiences of Western Harbour/Bo01, Malmö

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## 100% Locally Renewable Energy



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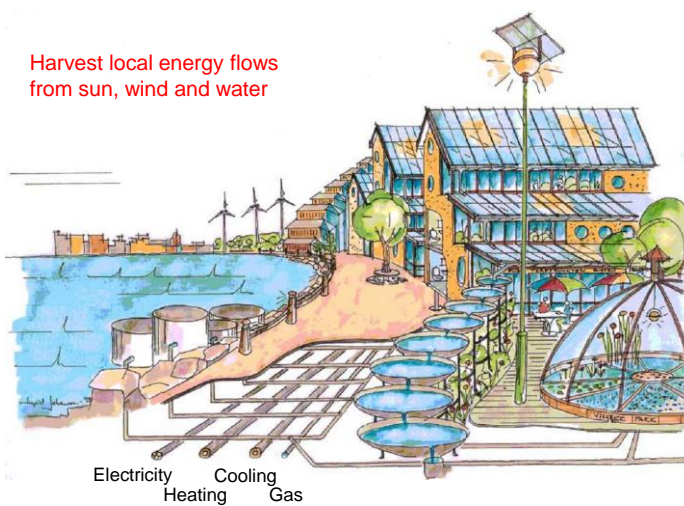
Western Harbour,  
Malmö



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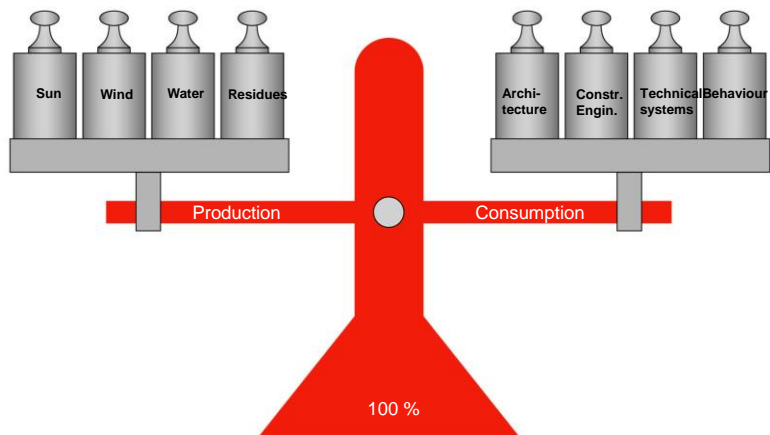
## 100% Locally Renewable Energy

Harvest local energy flows  
from sun, wind and water



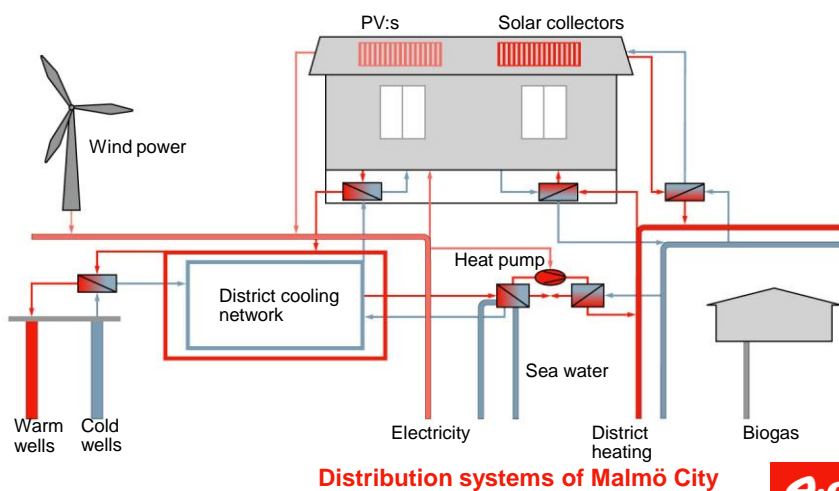
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**Distribution systems of Malmö City**

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### Generation and Storage

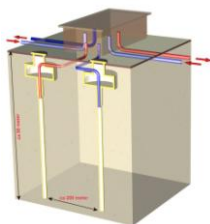
#### Electricity

- Windmill
- Solar cells



#### Heat

- Heat pump
- Solar collectors



#### Cooling

- Heat pump
- Sea water



#### Seasonal storage of heat & cooling

- Natural Aquifer

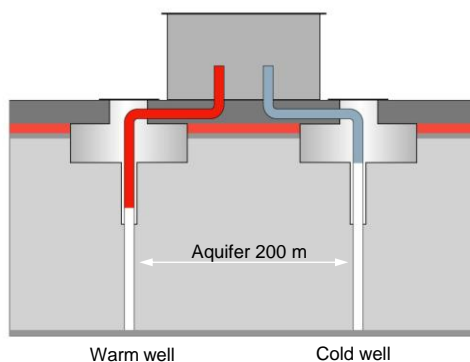
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### Aquifer

- Seasonal storage for heating and cooling
- 5 pairs of wells
- 90 meters deep



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### Solar collectors

- 1 400 m<sup>2</sup> on 10 buildings
- Two types – vacuum and plane
- Connected to district heating
- Partnership with architects and developer
- Expected output, 15 % of annual heat demand







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### Wind power

- 2,0 MW
- Well proven technology, developed from standard machine
- Placed 3 km from the area to avoid disturbances but close enough to "belong" to the area
- Connected to the electrical grid in Malmö
- Sufficient for all the electrical needs at Bo01



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### Solar cells

- 120 m<sup>2</sup>
- Connected to the electrical grid
- Integrated on one building
- Partnership with architects and developer



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### Learnings – Generation and Storage:

There have been problems with local energy production systems

- Seasonal storage/Aquifers      OK
- Heat pump      Need of total exchange after 4 years
- Solar Collectors connected to the district heating grid
  - Plane collectors -      OK
  - Vacuum collectors –      Need of total exchange after 5 years
- Solar Cells      OK – connection to the electricity grid was problematic
- Windmill      OK – after about 10 years of operation in need of large maintenance or exchange

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Total vacuum collector failure



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### Learnings – Consumption:

Energy consumption in many buildings are higher than the goal figure of 105 kWh/m<sup>2</sup>,year  
(35 kWh electricity/m<sup>2</sup>,year and 70 kWh heat/m<sup>2</sup>,year)

- Household electricity consumption was almost as estimated (25 kWh/m<sup>2</sup> year) in the beginning, today about twice as high as estimated
- Heat consumption was much higher than estimated in the beginning (up to 300 kWh/m<sup>2</sup>, year) , after a few years of trimming heat consumption target levels have nearly been met today

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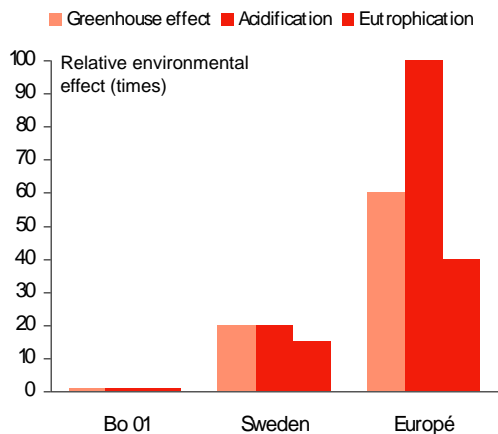
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### Apartment 85 m<sup>2</sup>

35 kWh electricity/m<sup>2</sup>, year

70 kWh heat/m<sup>2</sup>, year



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## 100% Locally Renewable Energy European and national support

- Campaign for Take off  
Malmö – the first nominated city
- EC-5th Framework Programme  
City of Tomorrow-Cleaner Energy Systems  
Partnership with four other countries  
Investment contribution
- Ministry of the Environment  
Investment contribution



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Bo01/Western Harbour – The City of the Future?



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