The story of a veteran

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My career in solar

1977: Hired at a Norwegian research institute (SINTEF) to design Norway's first solar house

1982 (?): Served as chairman of the Norwegian Solar Energy Association (four terms)
Attended my first ISES Board meetings (as observer, representing the Norwegian association)

1985: Awarded a full professorship in architecture at the Norwegian University of Science and Technology (specialization – energy use in buildings)

1998-2000: President of ISES Europe

2001-2003: President of ISES

2011: Received the Farrington Daniels Award (for "contribution to the advancement and knowledge of energy conservation and solar energy in the built environment")

Other relevant activities:

Chairman of the conference North Sun'92
International chairman of Eurosun 2000
Scientific chairman of Eurosun 2002
Associate and guest editor of Solar Energy (1996-2006)
Project leader (Operating Agent) for IEA's Solar Heating and Cooling Programme's Task 13 and Task 23 (1988-2002)

My professional story –

in line with the story of solar in Norway

- from systems based on air to systems based on water to photovoltaics
- from passive solar to active solar to hybrid systems to solar buildings
- from single technologies to whole building design
- from solar buildings to solar architecture
- from passive solar to zero emission buildings and neighborhoods

and Solar Cities?

At the start:

Sunspaces and atria

Amenity value more important than energy savings

My own sunspace, 35 years old and still a delight.
(At 63ºN - Trondheim)

Dwelling at 63ºN - Malvik
IEA SHC Task 8 case study)

University campus at 63ºN - NTNU
(IEA SHC Task 11 case study)

The trends I see:

- Continuing reductions in energy use per m^2 (as a result of stricter building codes and ..)
- Higher ambient temperatures (as a result of climate change?)

Several consequences:

- Less need for space heating (and concentrated to the relatively darker winter months)
- More need for space cooling
- Relatively greater need for heating of DHW
- Much more focus on electricity

I.e.:

- Passive solar heating systems partly out
  except windows/direct gain
- Passive solar cooling systems in
  primarily ventilation
- Active solar heating of DHW most important
- PV always useful

= **Solar buildings**

At the same time:

Towards building integration

Better potential for cost effectiveness
Both for solar thermal systems and for PV systems

Solar thermal:

PV:

Building integration/architectural integration

an issue for architects

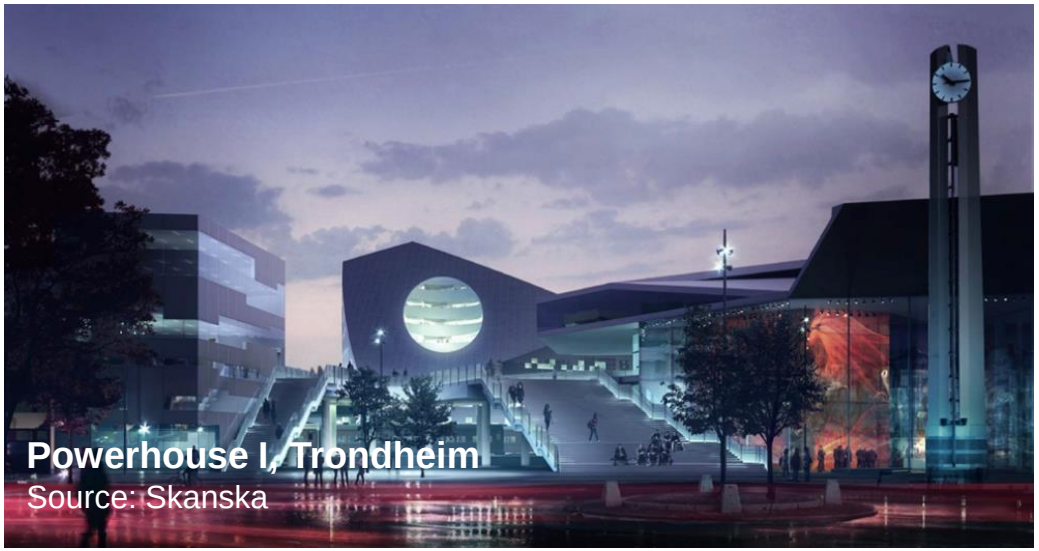
Brynseng school, Oslo

Retrofit, Bergen

Cultural Center, Os

The focus now is on environmental issues rather than on solar as such. Therefore:

Zero emission buildings



Powerhouse I, Trondheim
Source: Skanska

a challenge also for architects

«Form follows energy» ?

Refuge du Arpont, France

Refuge du Gouter, France

Monte Rosa Hütte, Switzerland
Source: V.Wittwer

Zero emission - Architectural consequences

”Zero Energy Buildings are designed to perform well, be comfortable, require only standard maintenance, and look no different than ordinary buildings”.

Quote: NREL/U.S.DOE

Nonsense!

Zero emission buildings will have many different architectural expressions and provide many architectural possibilities!

Architect: Coop Himmelblau
Source: Klaudia Farkas, NTNU

A Norwegian example:

Powerhouse Brattørkaia

Office building planned as “plus energy house”

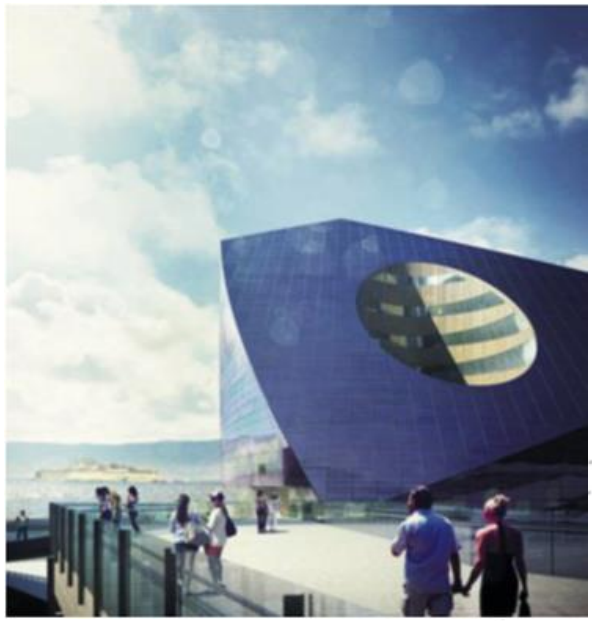
- Alliance: Entra, Skanska, Snøhetta, Hydro, ZERO
- Location: Trondheim
- Size: 7 stories, ~ 7000 m² TFA

Illustrates two trends:

- The trendsetting architects now like to use solar systems (especially PV).
- The design of such buildings require so-called integrated design processes – where all the actors cooperate from the start.

“The integrated design process has been crucial in the development of this project.”

Quote: T.Hegli, Snøhetta



Source illustrations: Skanska

And women in solar?

Continually increasing number of female students!

Women especially interested in environmental issues.

The future looks bright!!

Students at a seminar in our international MSc- program on Zero Emission Buildings