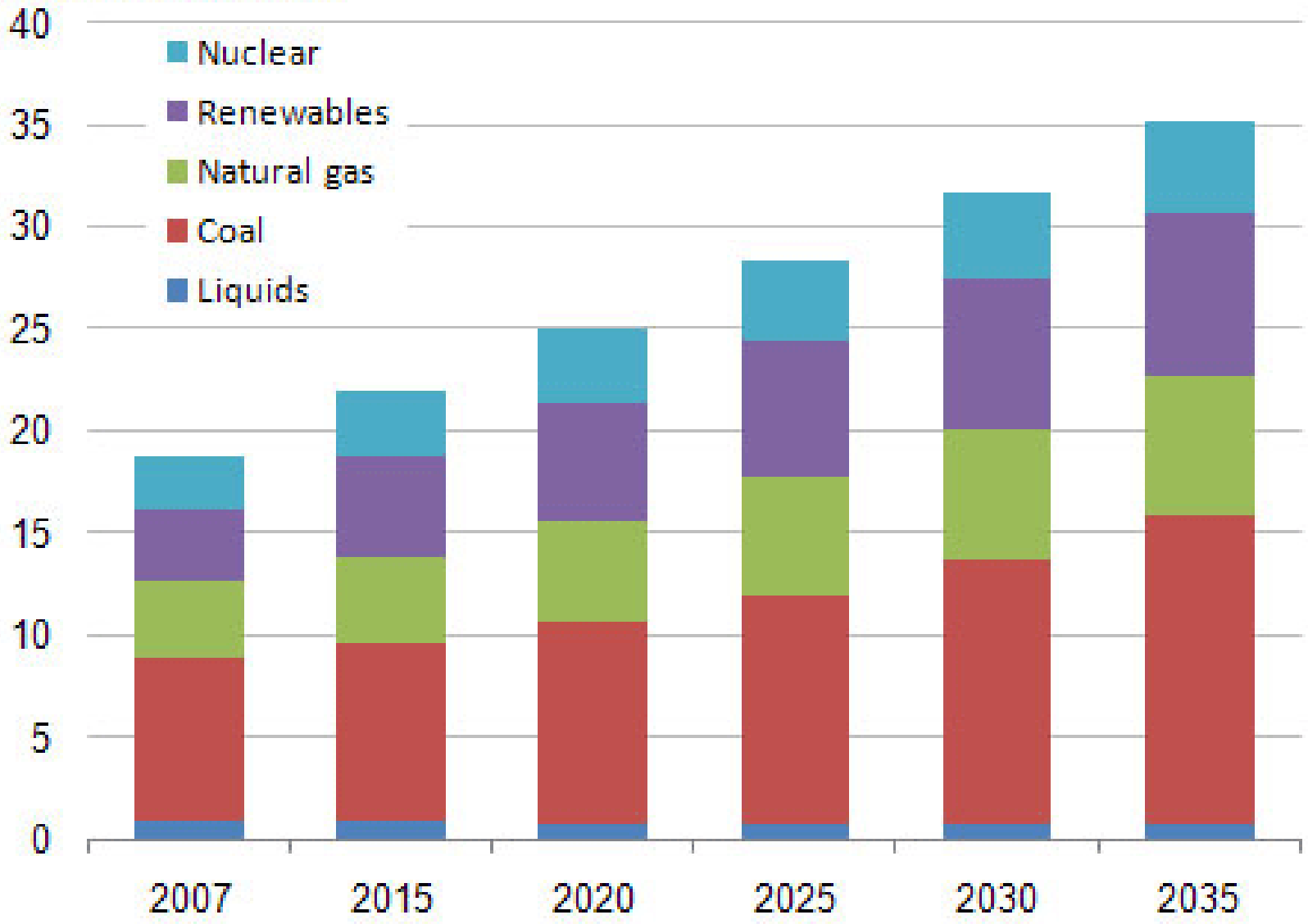
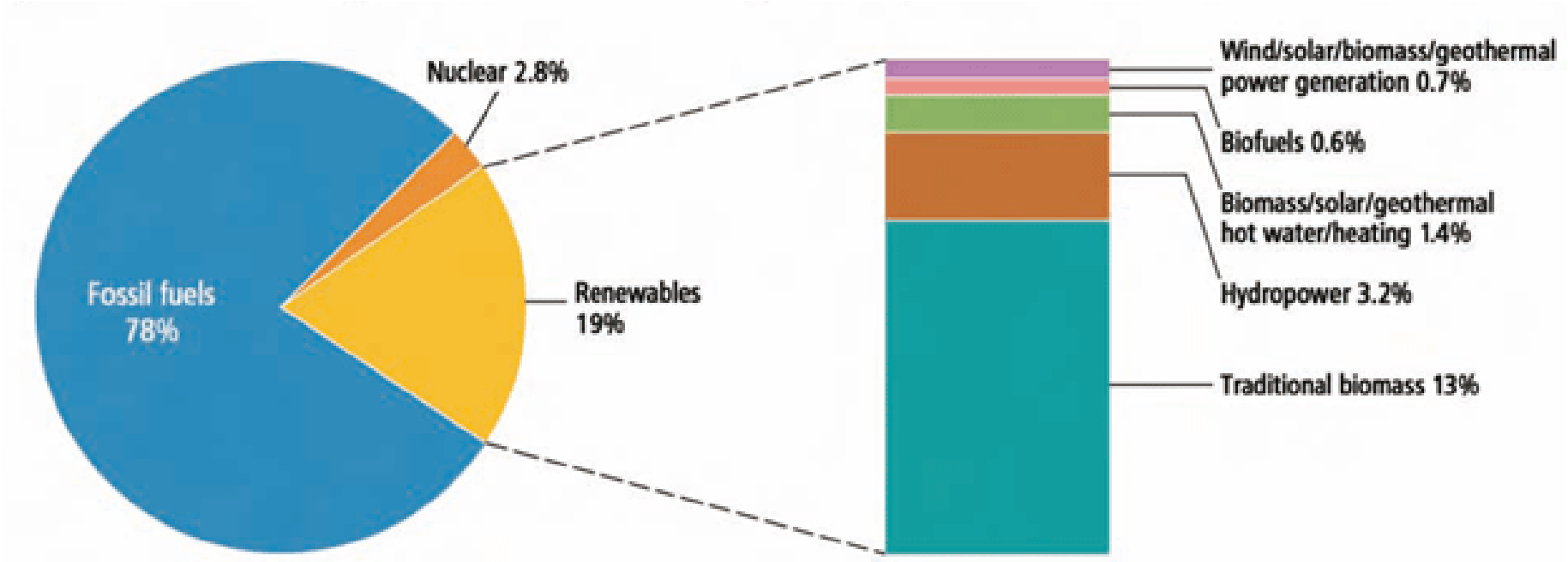
BUILDING INTEGRATION OF RENEWABLE ENERGY SYSTEMS

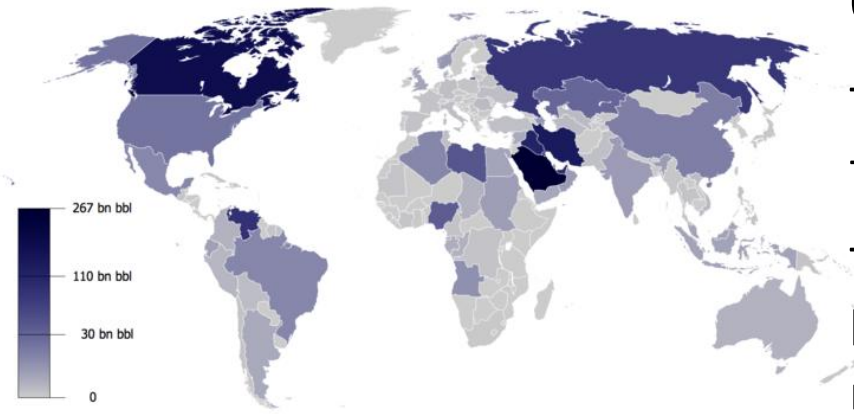
towards EU target for nearly zero energy buildings from 2020


40
35
30
25
20
15
10
5
0
Nuclear
Renewables
Natural gas
Coal
Liquids
2007
2015
2020
2025
2030
2035

Renewable Energy Share of Global Final Energy Consumption 2008



Global Energy Problem



Oil:

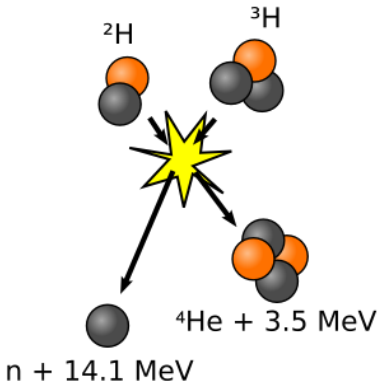
The price for a barrel of oil is 4 times higher to the price before the crisis of 70's

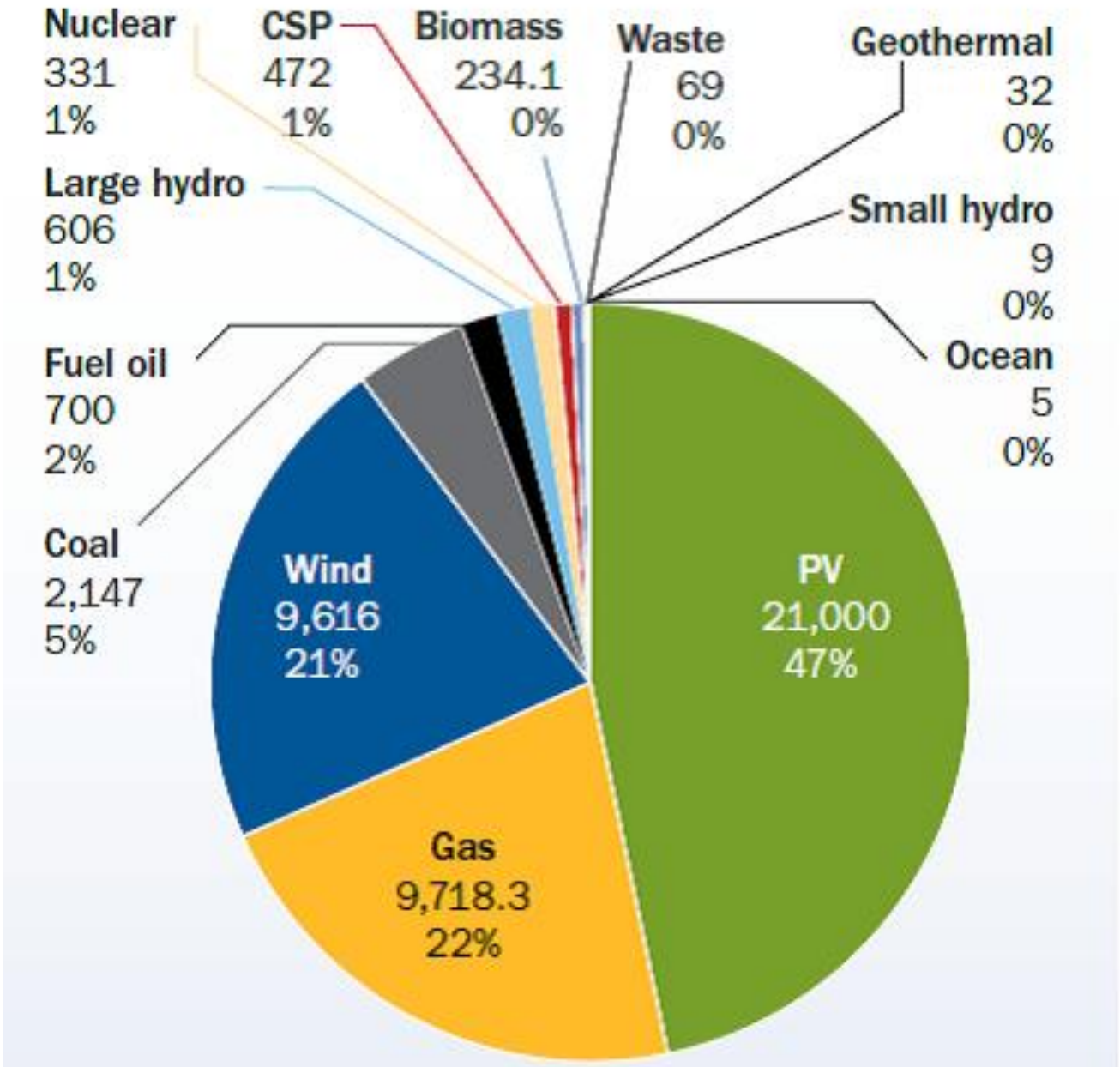
The discovering rate of new oil sources is lower than the oil consumption rate. This results to global energy and economical problems

Nuclear Energy

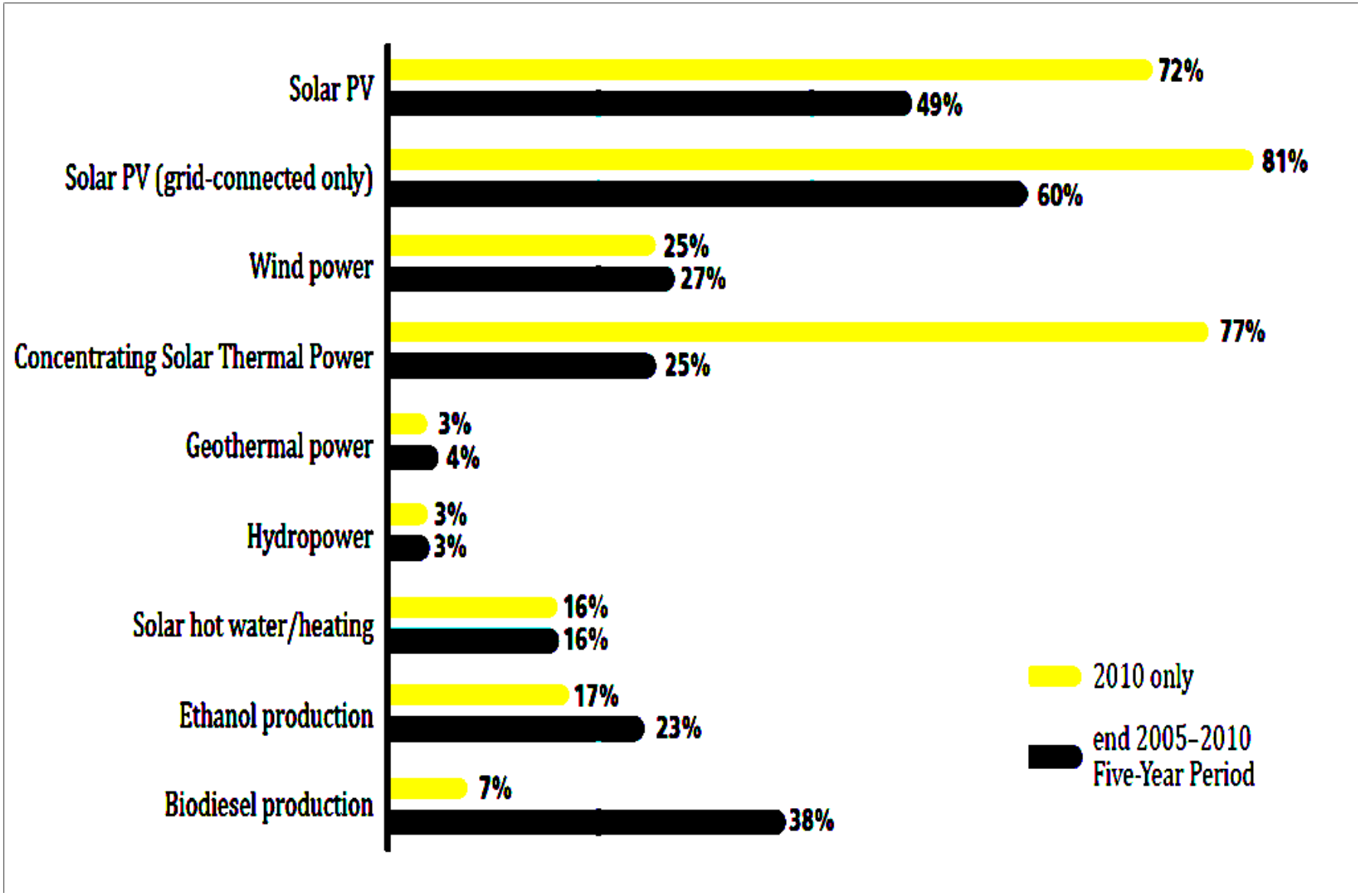
Nuclear fission reactors have problems with safety and disposal of radioactive waste

Nuclear fission is not yet controlled. It is expected to be controlled after 30 years.

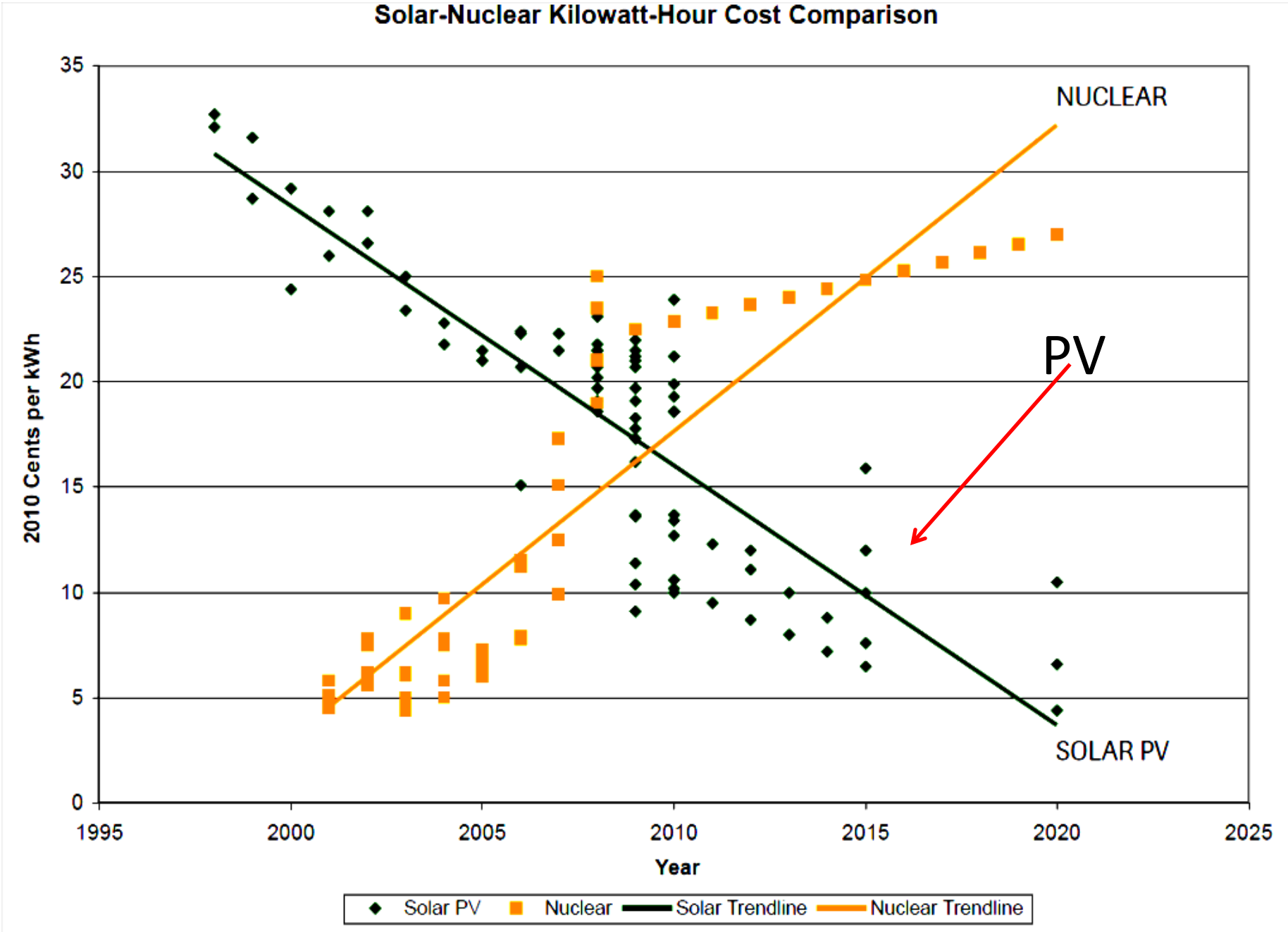




New Power Installation in 2011



Mean installation rate of Renewable Energy Sources
PV and concentrating solar thermal, present the highest rate

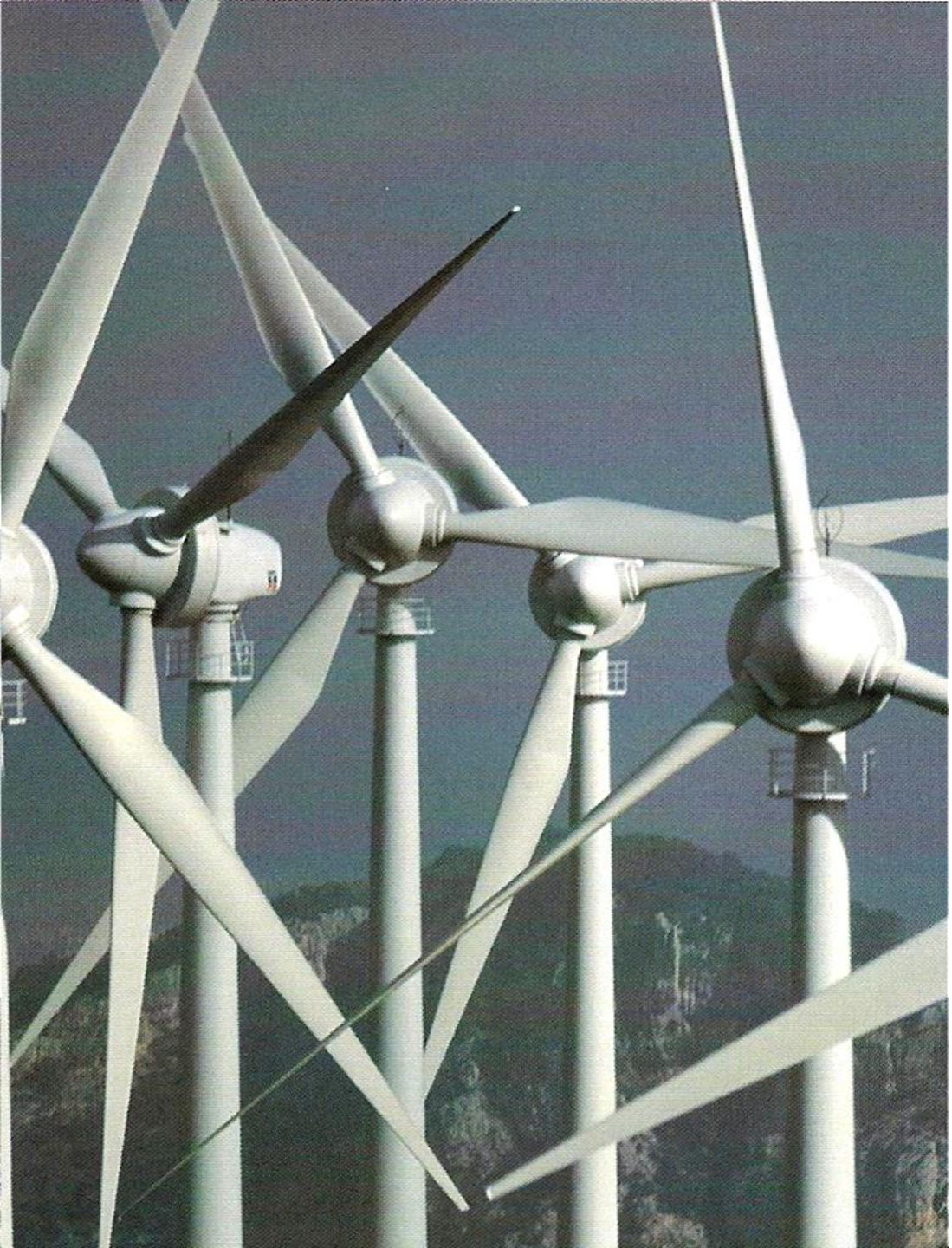

Solar-Nuclear Kilowatt-Hour Cost Comparison
NUCLEAR
PV
SOLAR PV
2010 Cents per kWh
Year
0
5
10
15
20
25
30
35
1995
2000
2005
2010
2015
2020
2025
Solar PV
Nuclear
Solar Trendline
Nuclear Trendline

European Targets for 2020

- 20% energy by Renewable Energy Sources
- 20% reduction of CO2 emission relative to 1990
- 20% energy saving to all sectors
- use of biofuels by 10% to transportation

- From 2020 all new buildings should be:

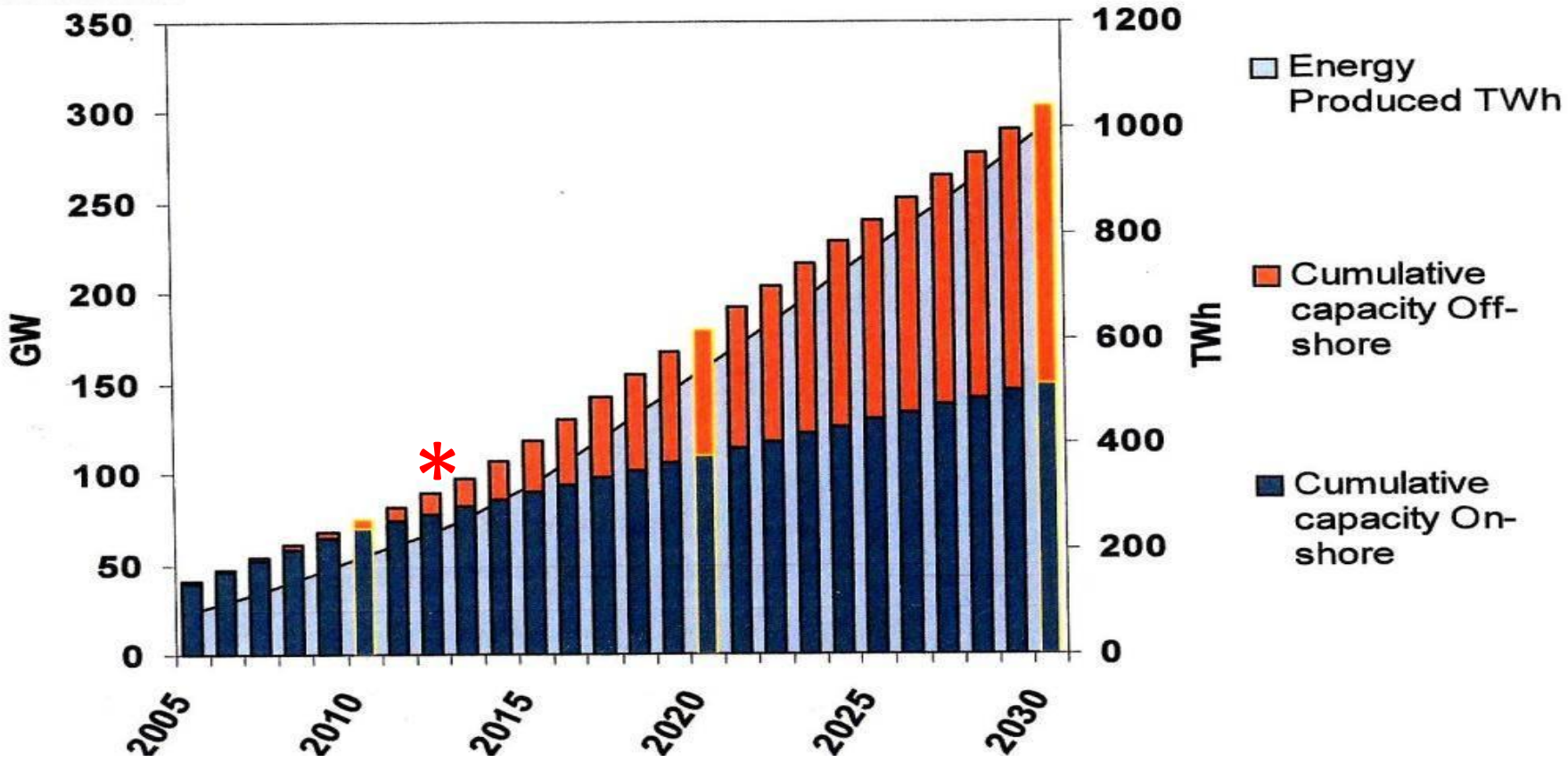
nZEB (nearly Zero Energy Buildings)



Wind Energy

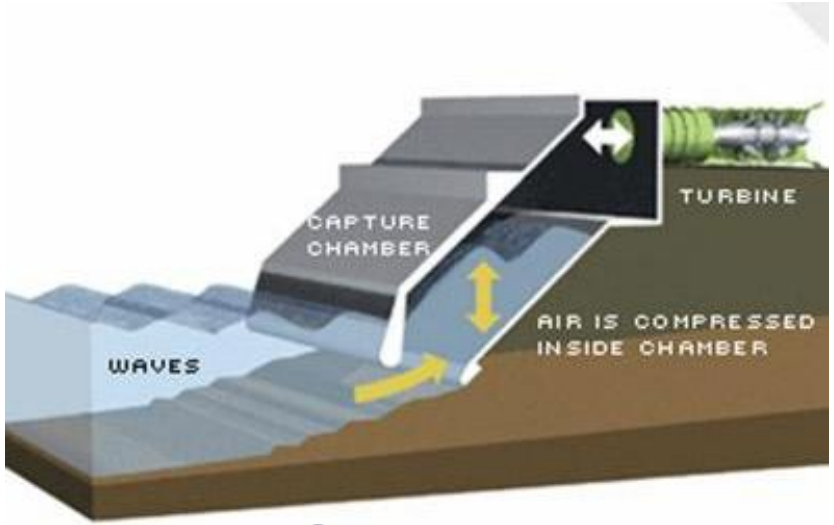
Wind Turbines

Greece: 2.000 MW, Europe: 94.000 MW

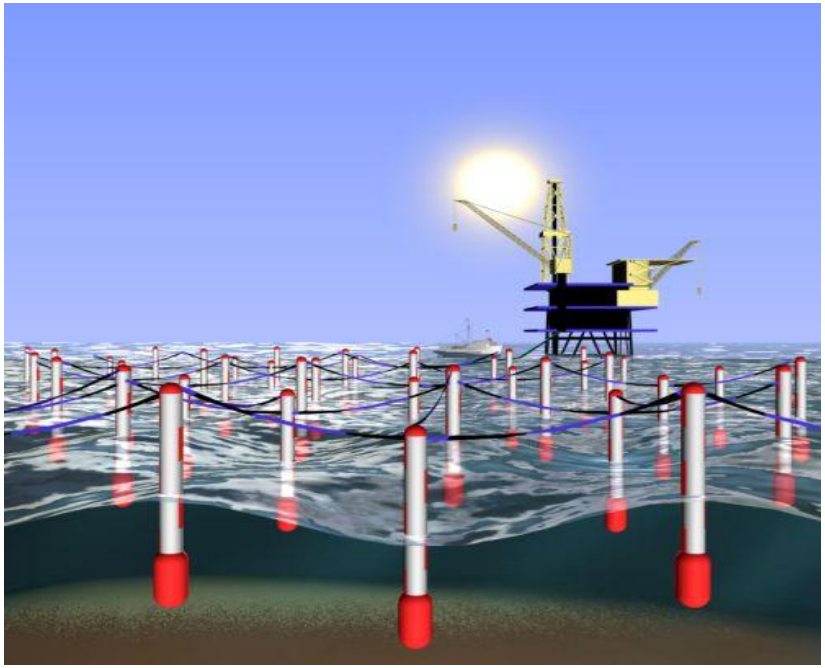


Wind Park on Panahaikon mountain, Patras

HYDRO ENERGY

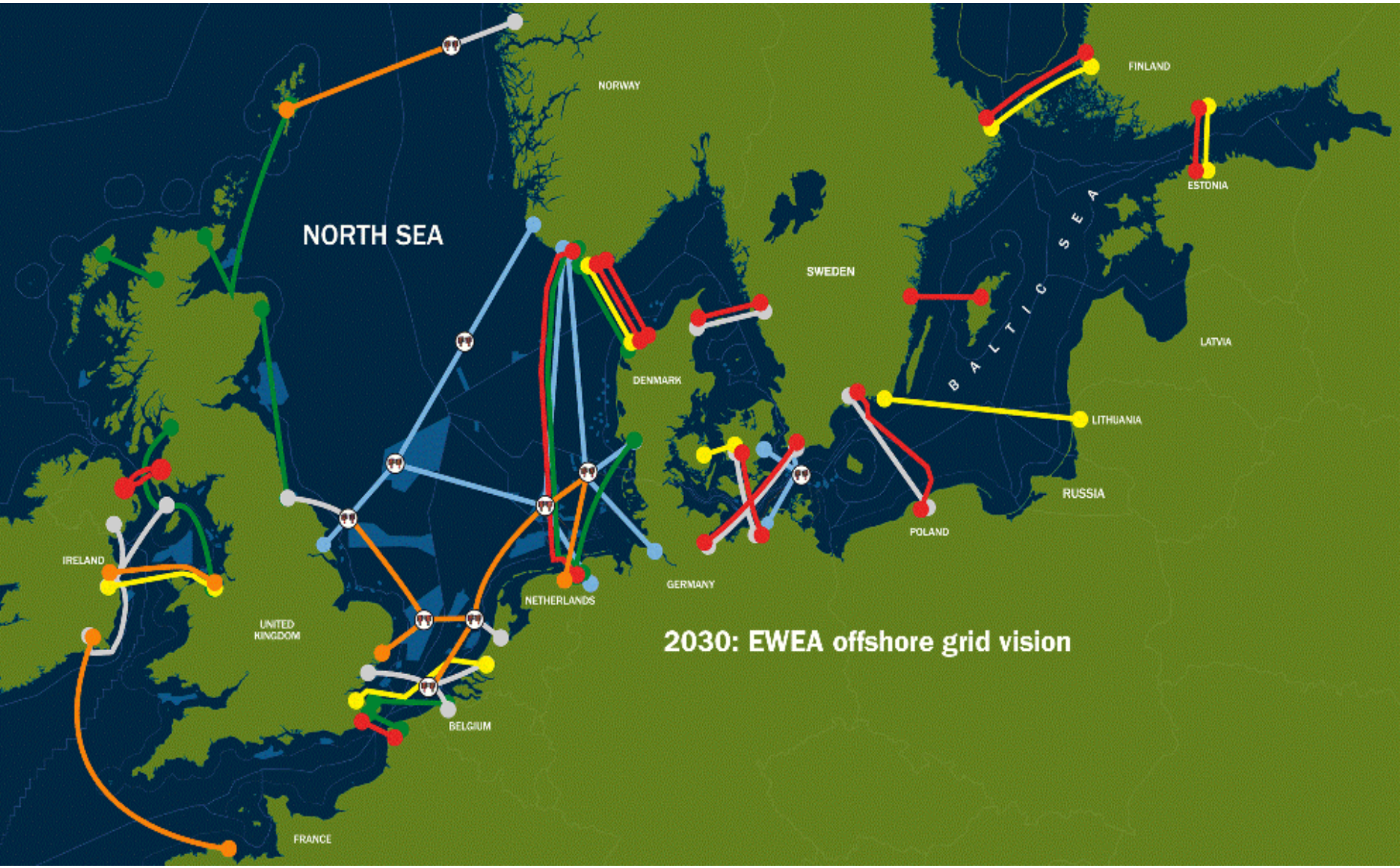


Wave Energy

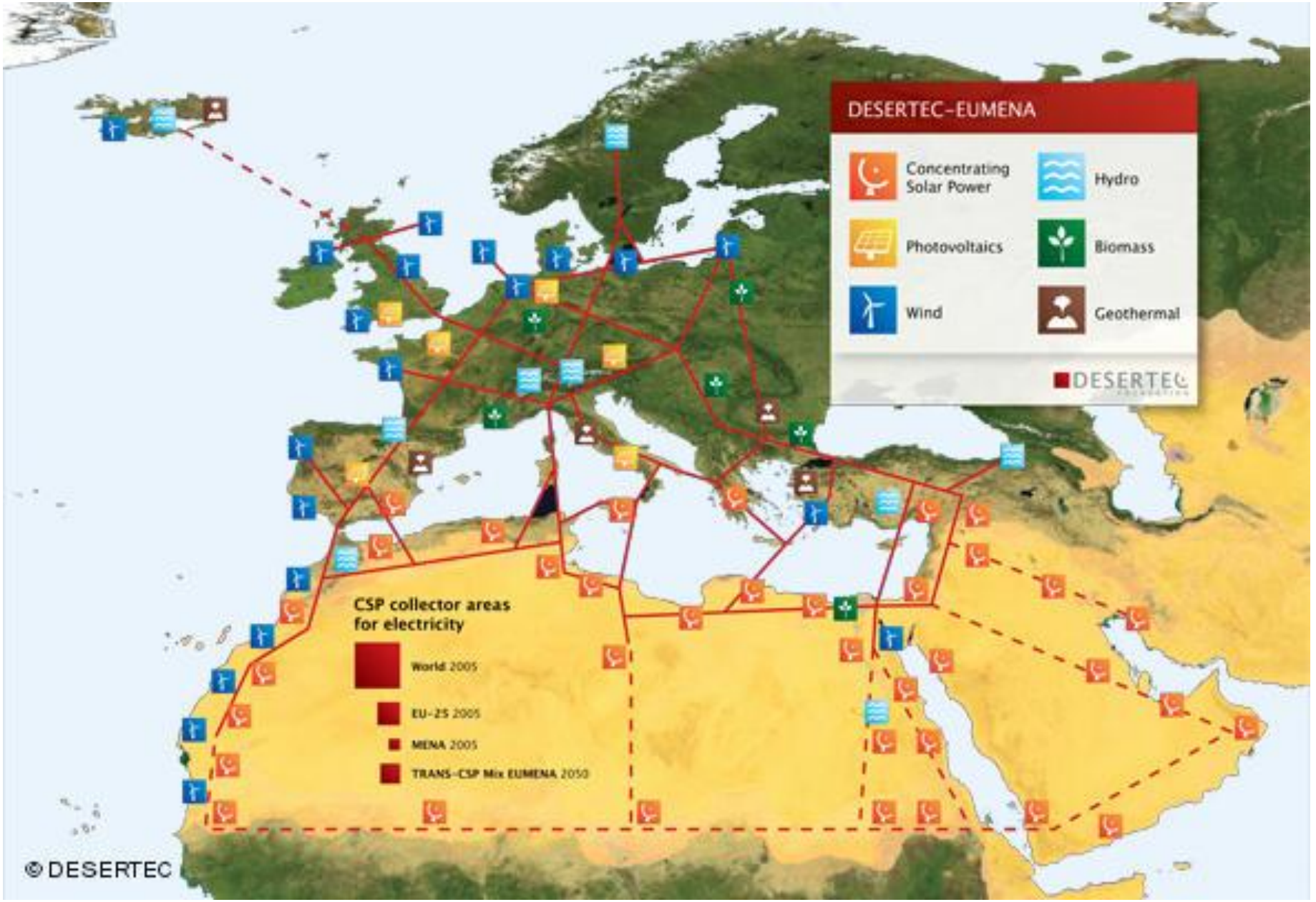



Tidal Energy

NORTH EUROPE RES NET



SOUTH EUROPE RES NET

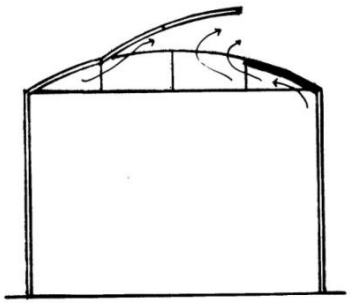


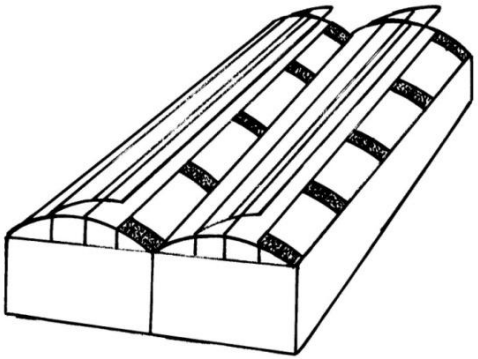
Energy share per sector

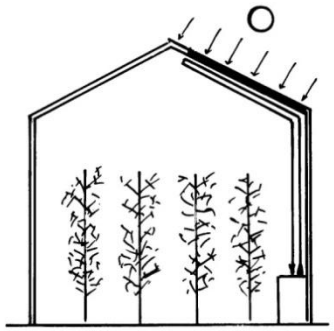
Built sector	40%
Industry/agriculture	30%
Transportation	30%

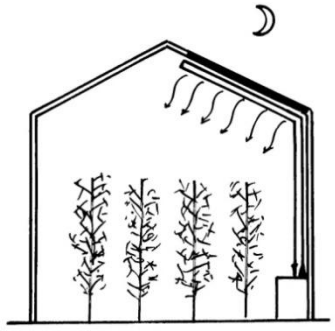
Application of solar thermal to industry/agriculture

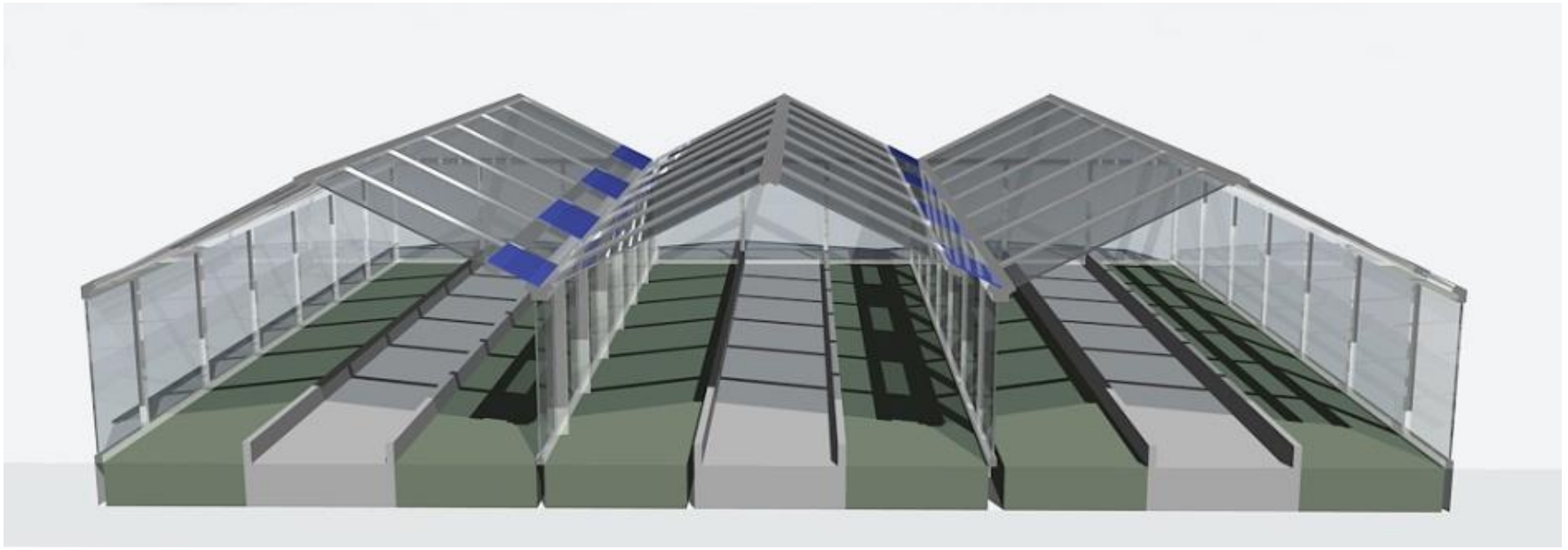
Application of solar energy systems to greenhouses

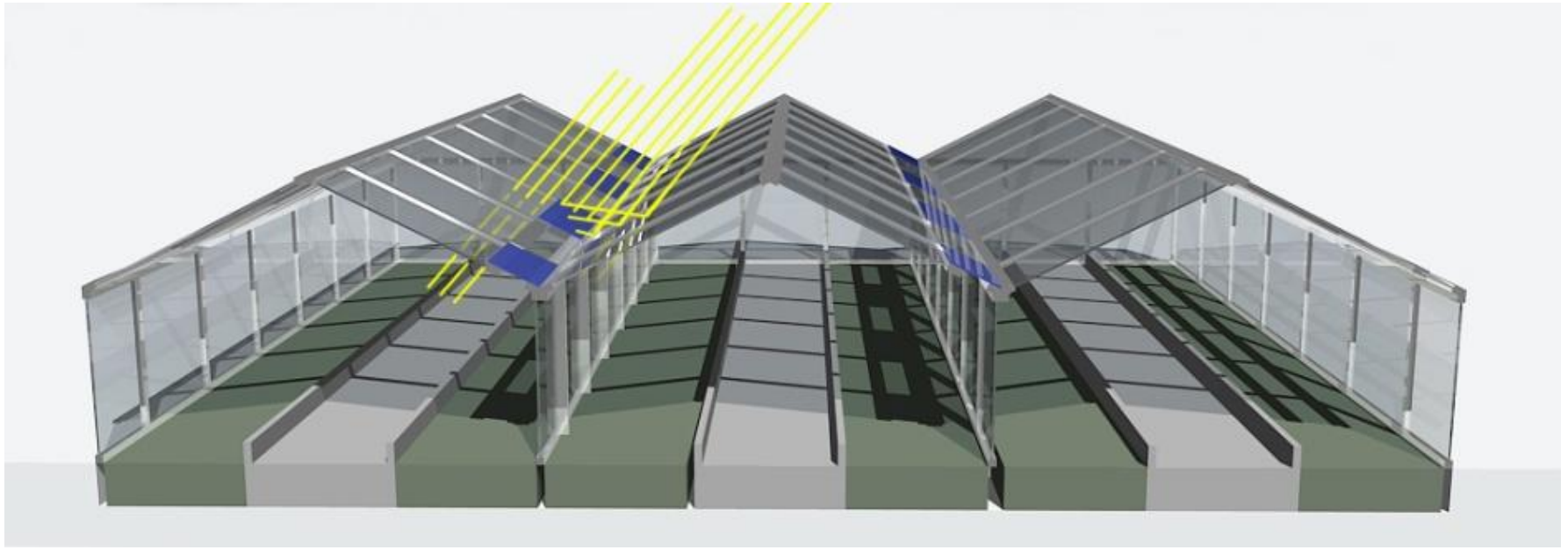










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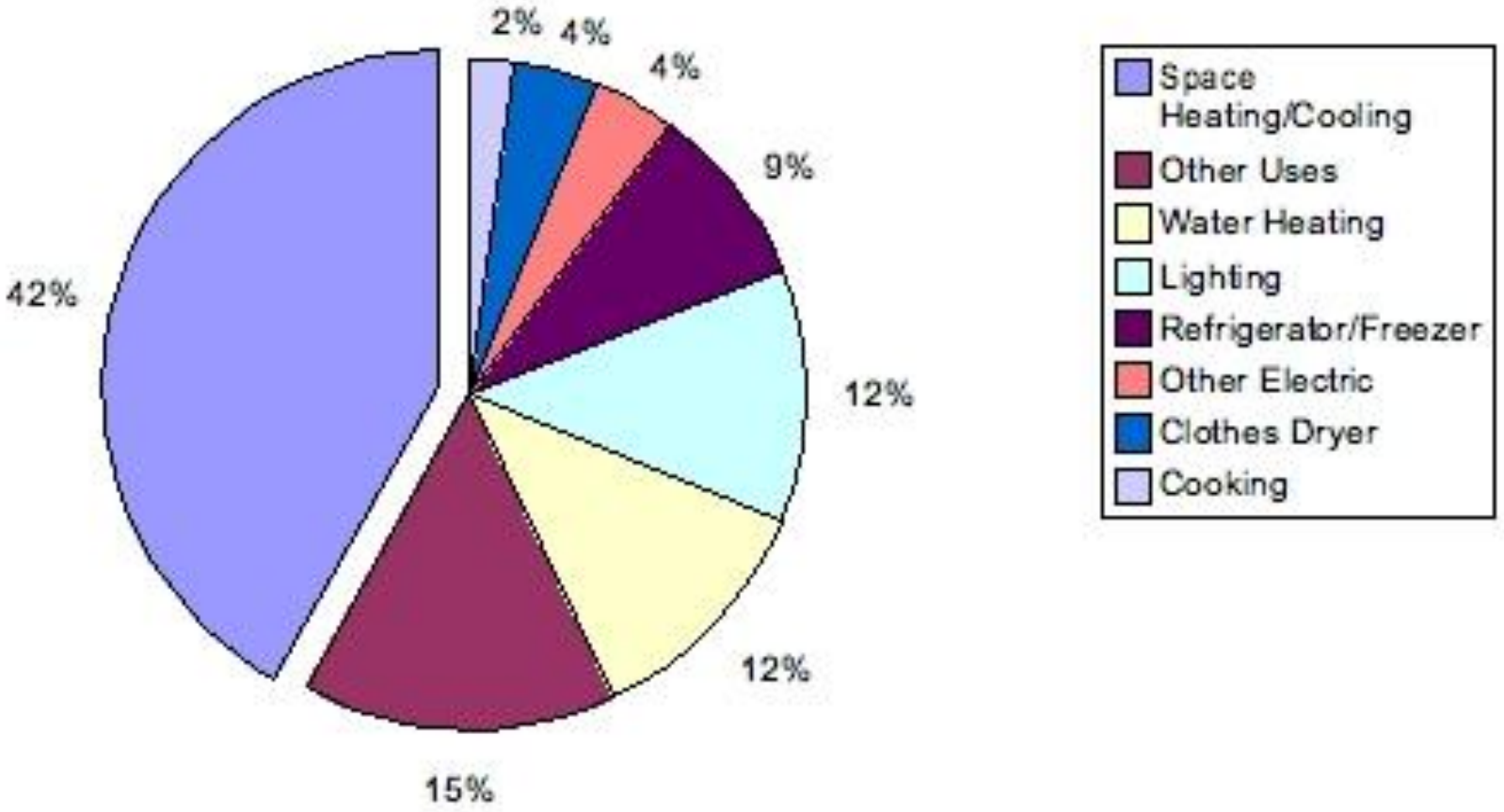
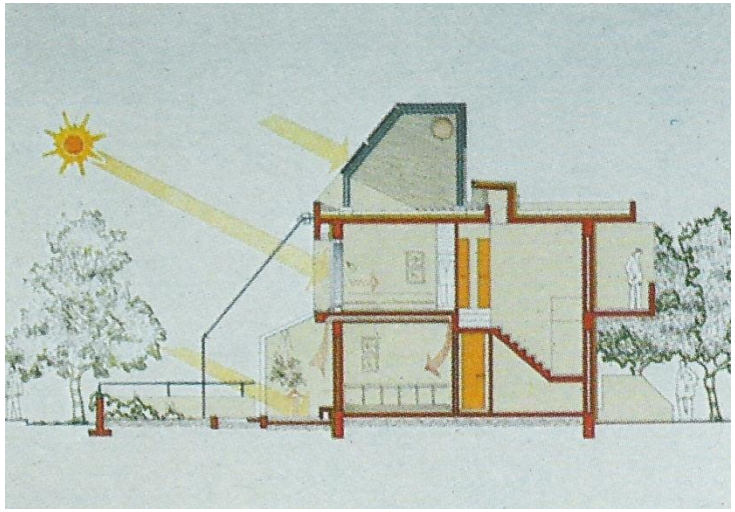
11 . 11 . 2009

Distribution of energy demand in buildings

Energy Information Administration, Annual Energy Outlook 2004



Bioclimatic Architecture



- Natural lighting and ventilation
- Solar gain and shading
- Passive heating and cooling

Target for 2020: 20% energy saving in buildings

Use of Renewable Energy Sources

Green facades, roofs and balconies

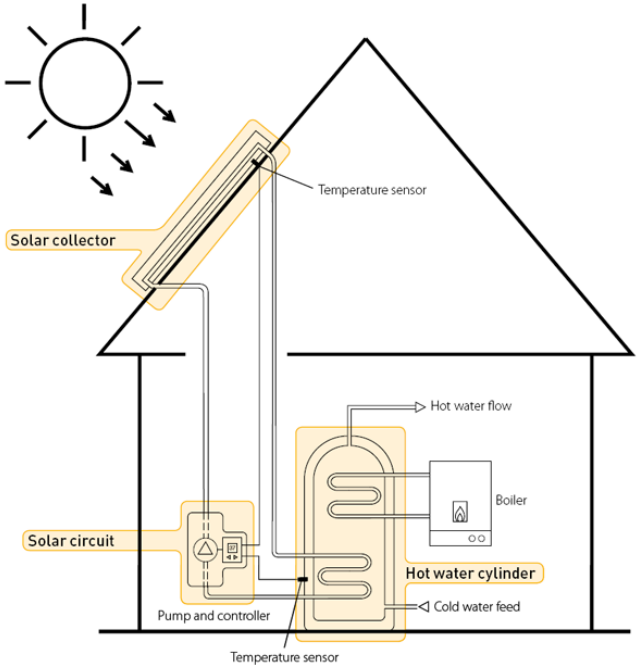
Solar Energy systems for domestic use

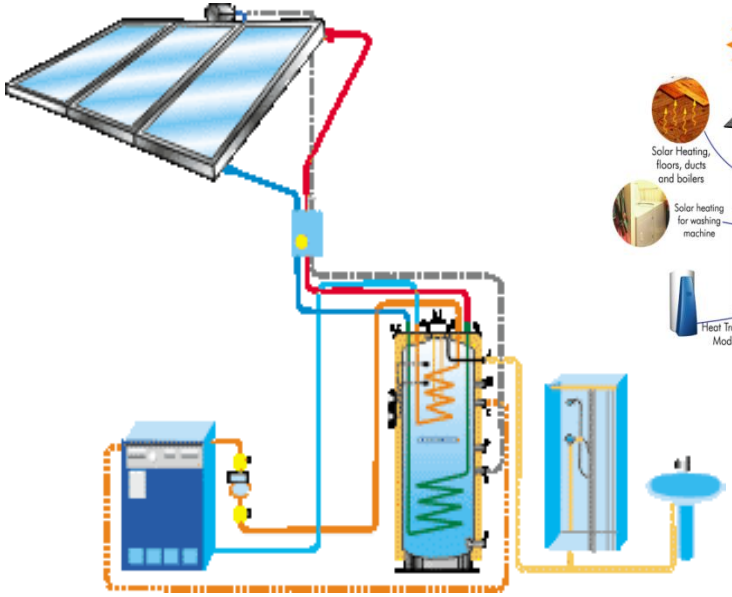
Solar thermosiphonic systems,
Integrated Collector Storage systems,
Central Solar Thermal systems

Solar Thermal Collectors for domestic hot water and space heating

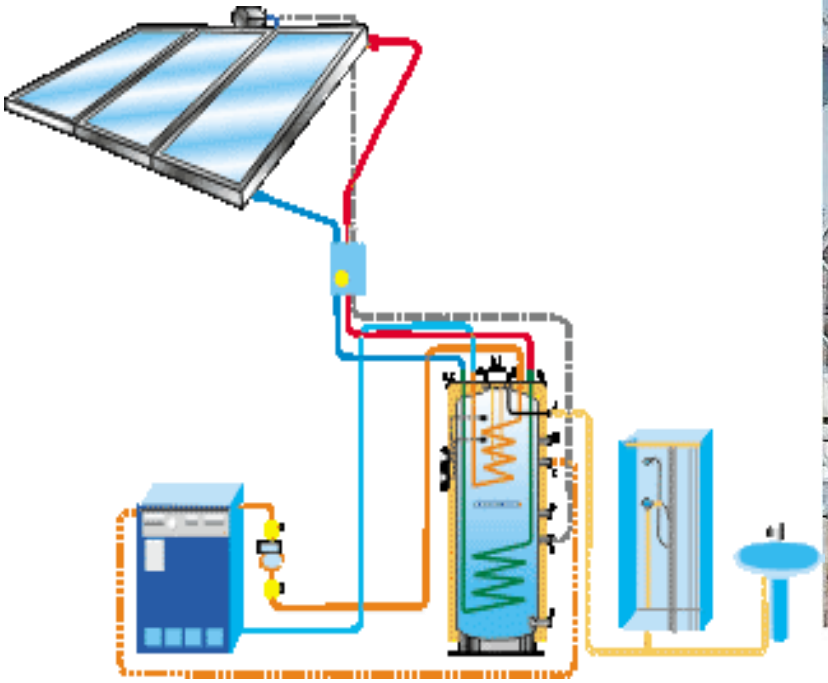
Systems of 4-6 m2 and 200-300 liters water storage for DHW.

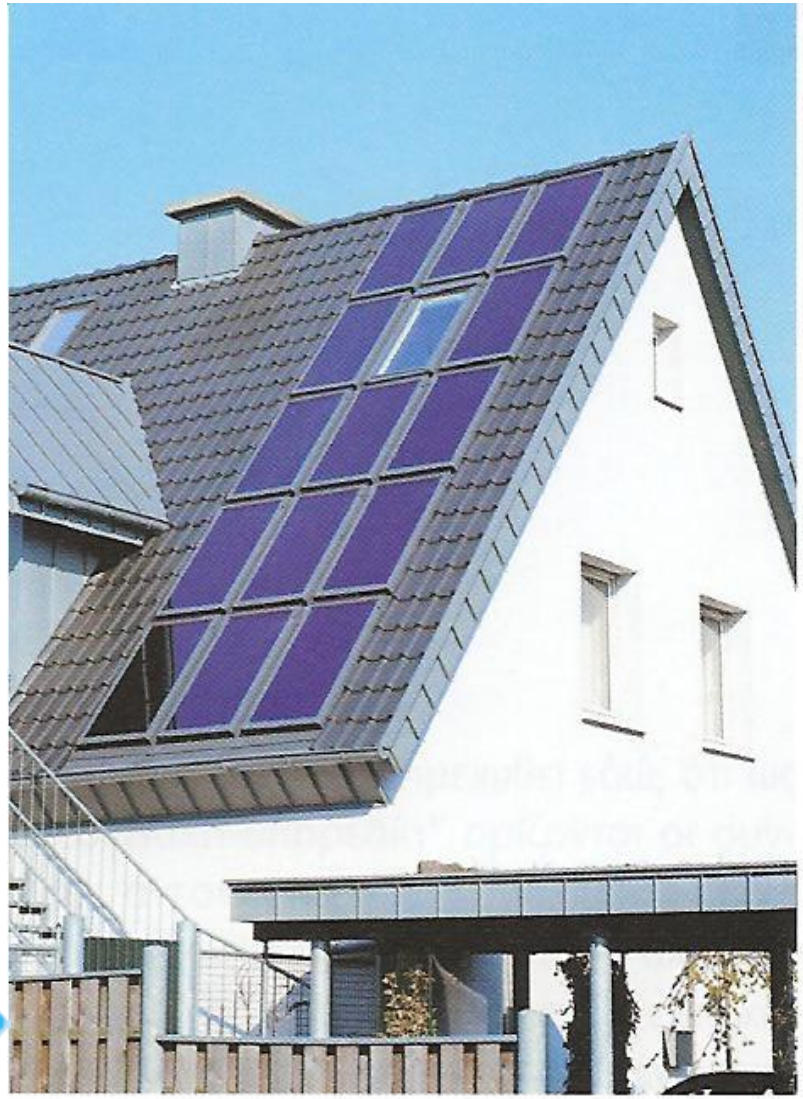
Systems of 10-20 m2 and 500-1000 liters water storage for DHW and contribution to space heating





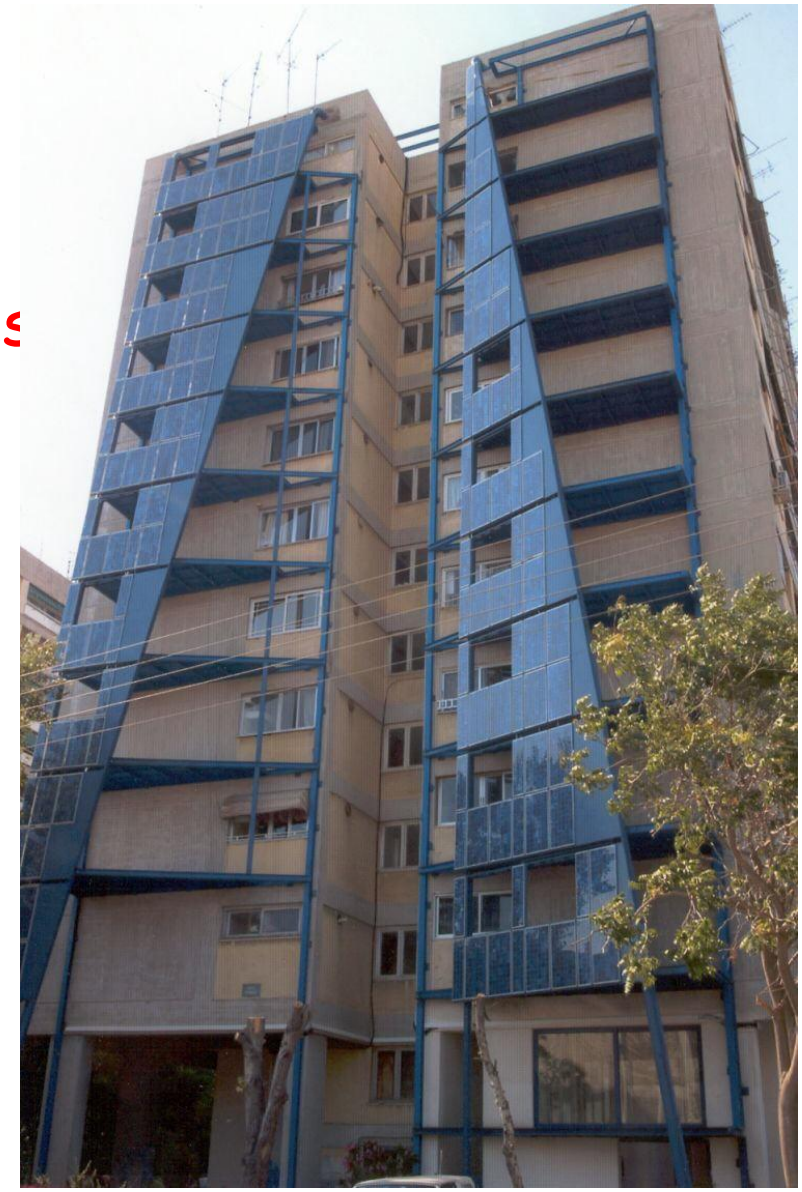
Solar Thermal collector Systems

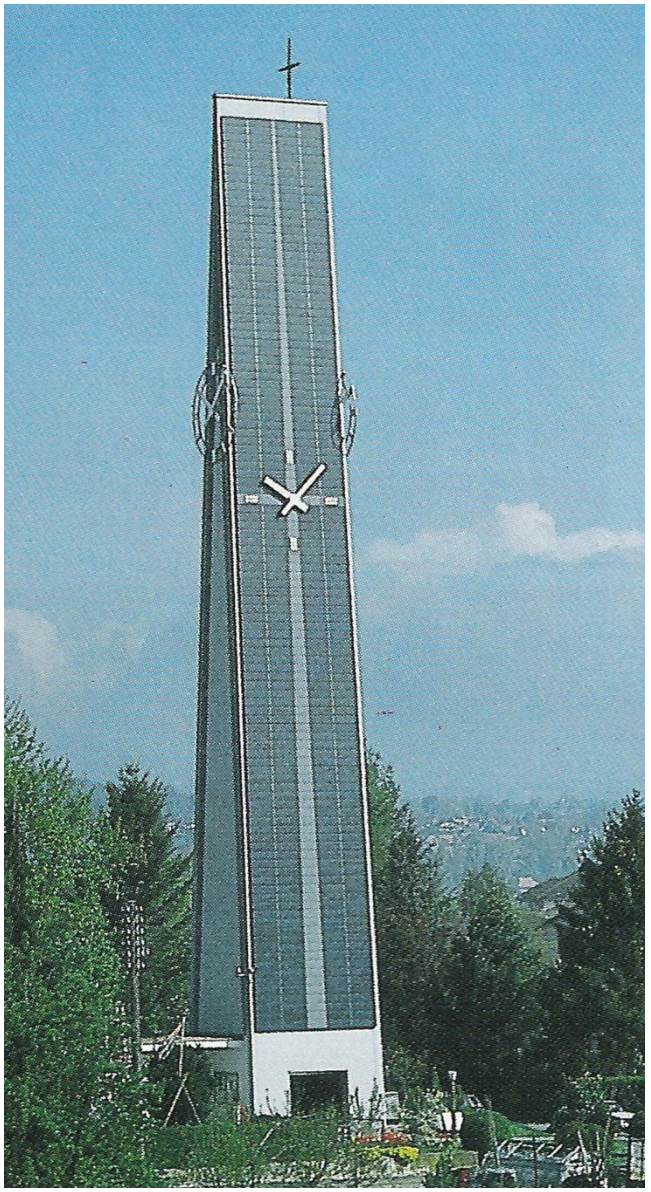




Solar Thermal collector Systems

Photovoltaics on buildings

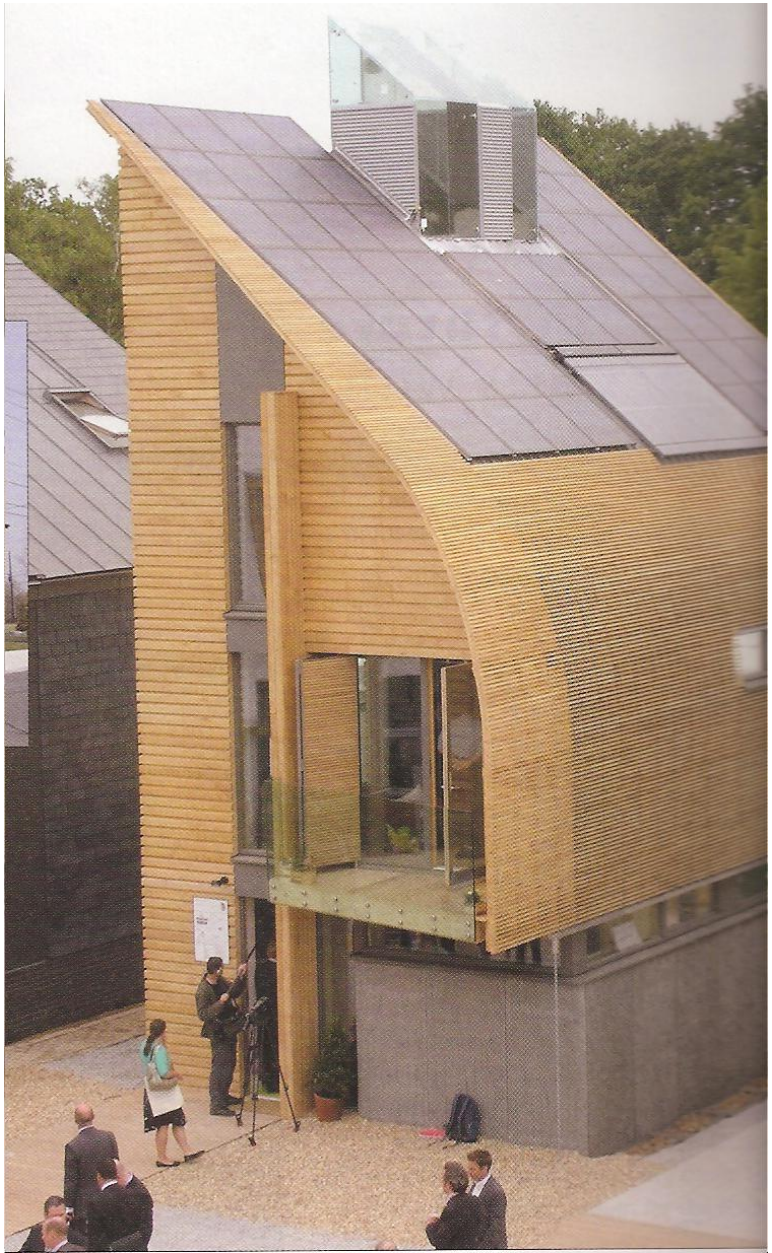


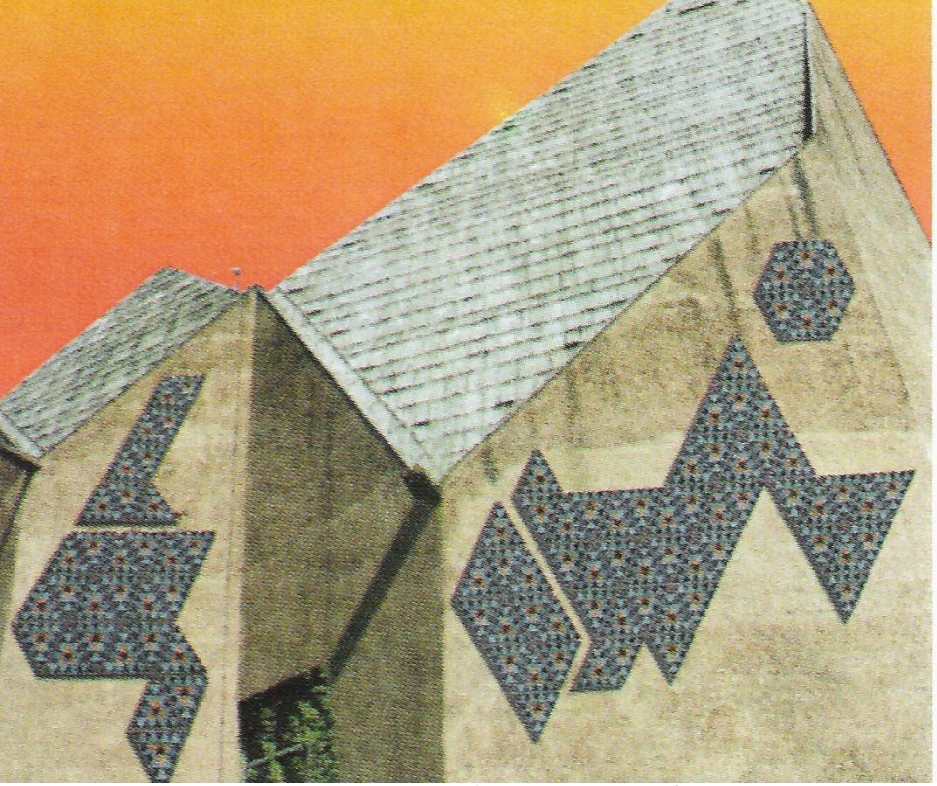


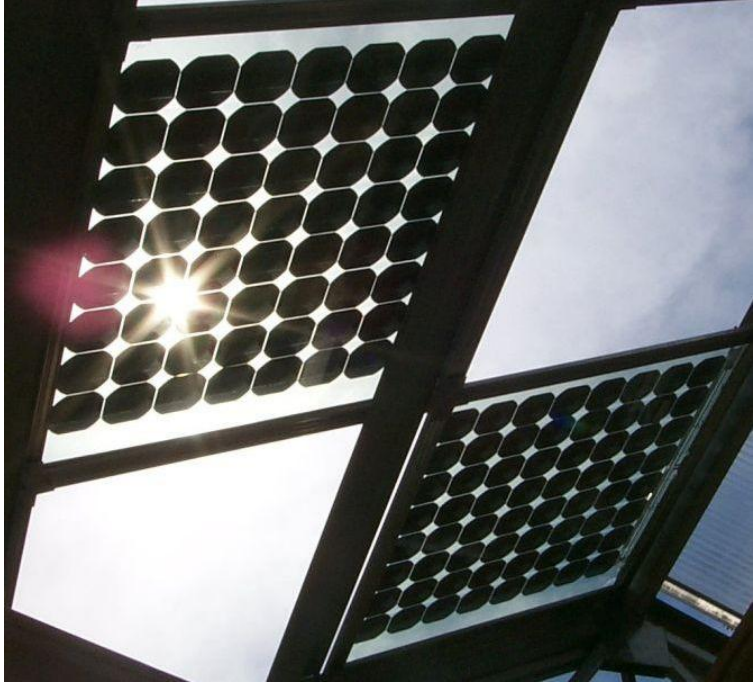
Photovoltaics

Photovoltaics

Photovoltaics on buildings

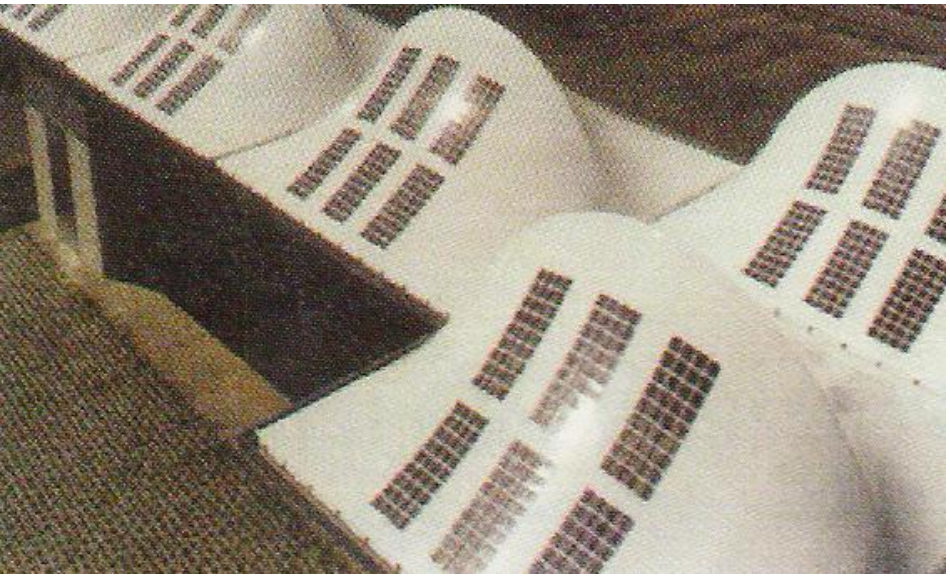






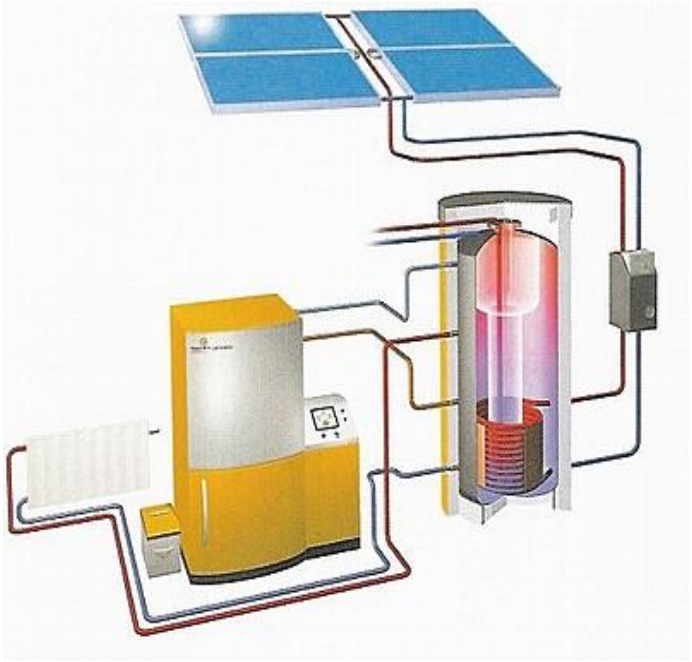
Photovoltaics

Interesting integration of curved photovoltaics



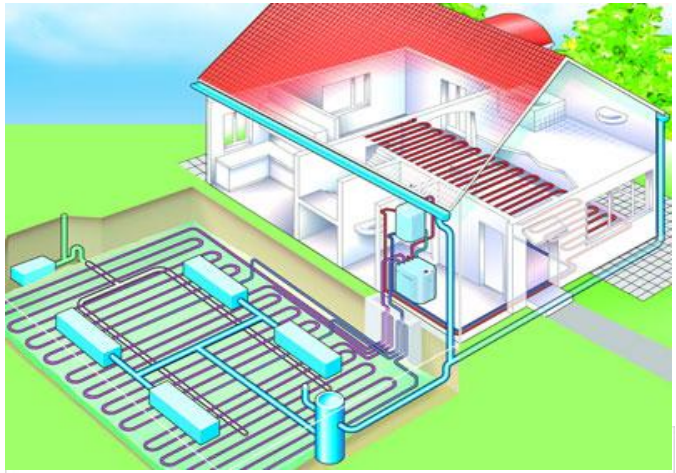
Biomass and Geothermal energy

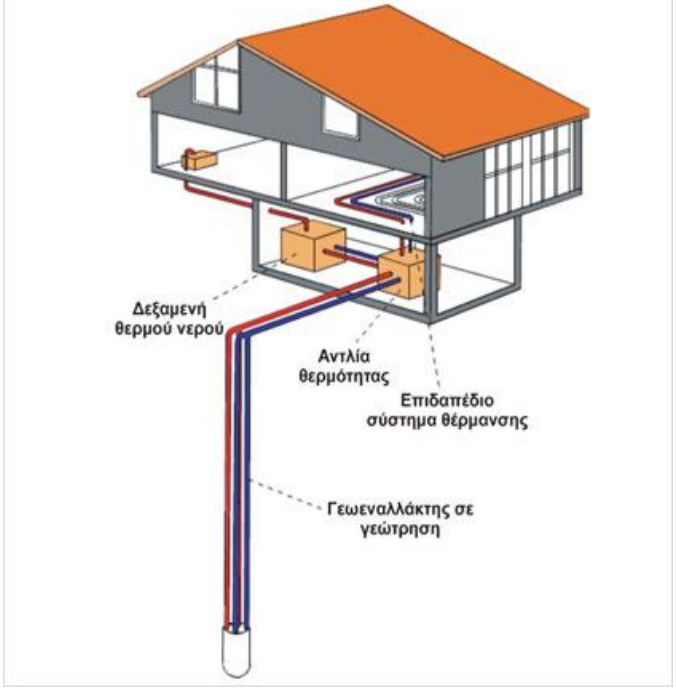
Biomass (wood, pellets, biofuels) and Geothermal Energy (geothermal heat pumps, plants) are alternative technologies that will be applied more next years



In addition, small wind turbines can be also used if a satisfactory wind potential exists

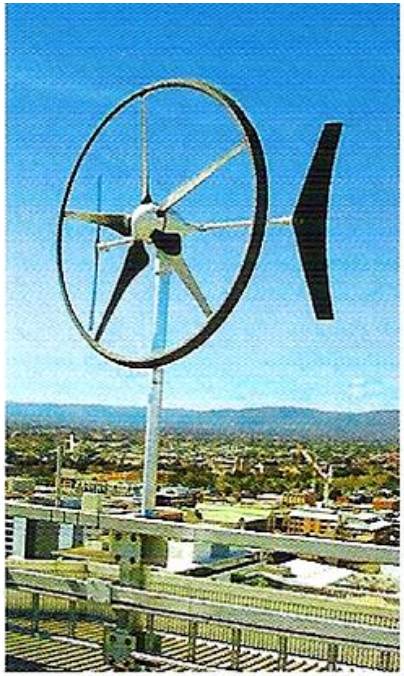
Geothermal Heat Pumps

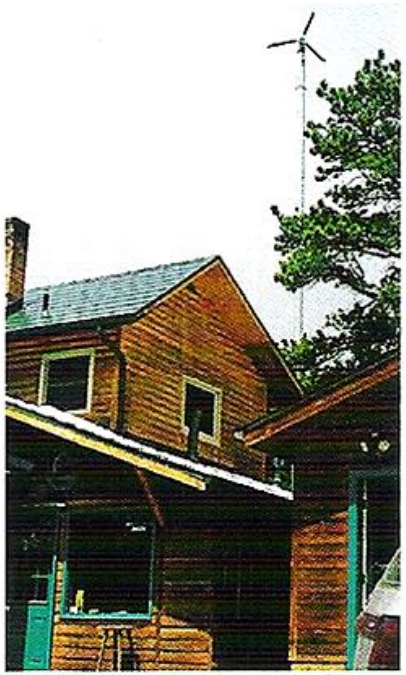




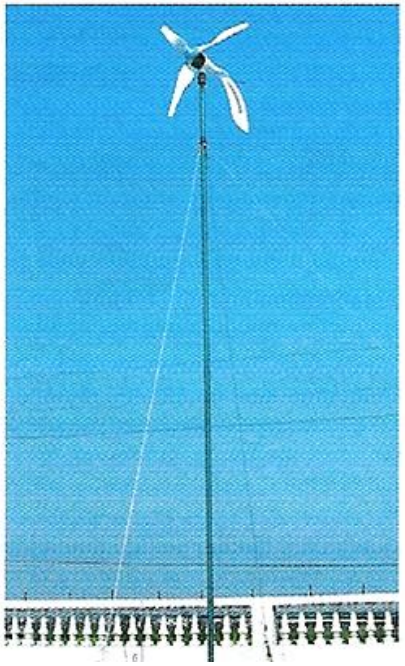
Building integration of wind turbines

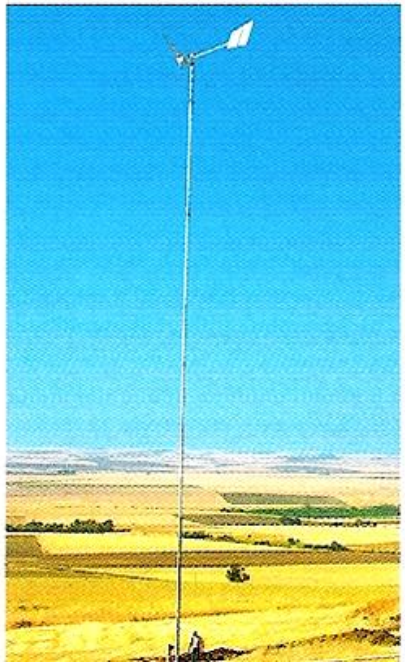

Building integration of
wind turbines

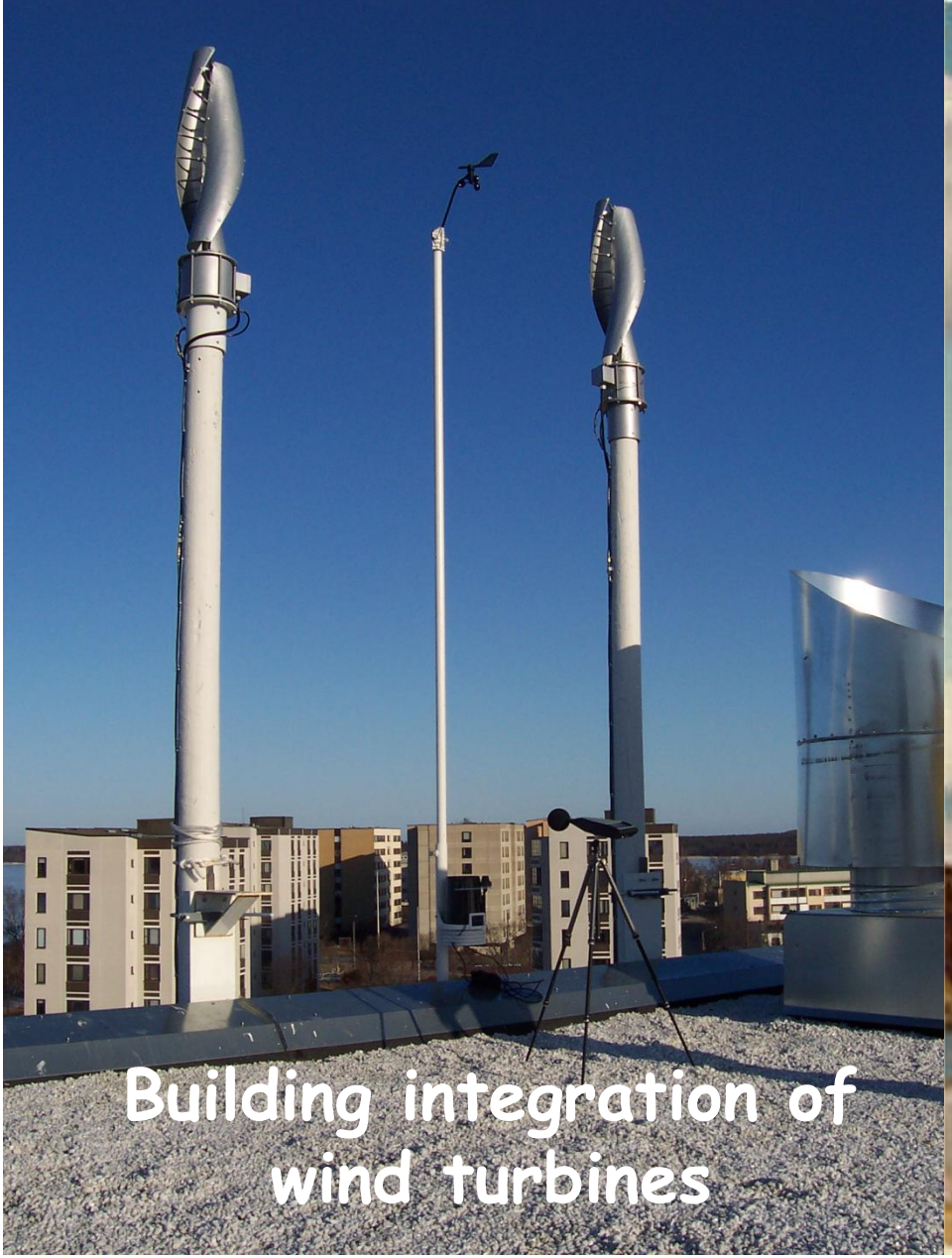




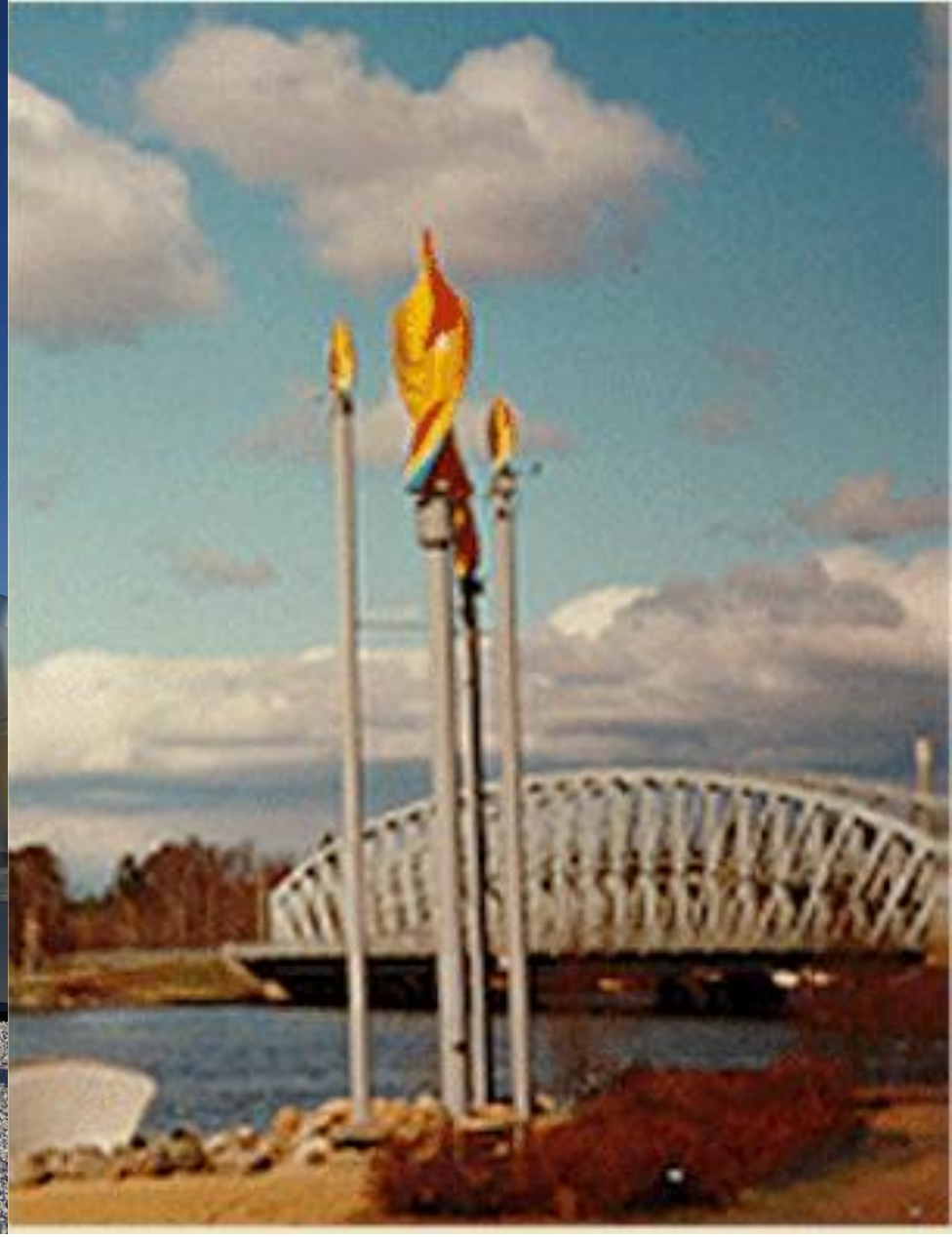
Building integration of wind turbines





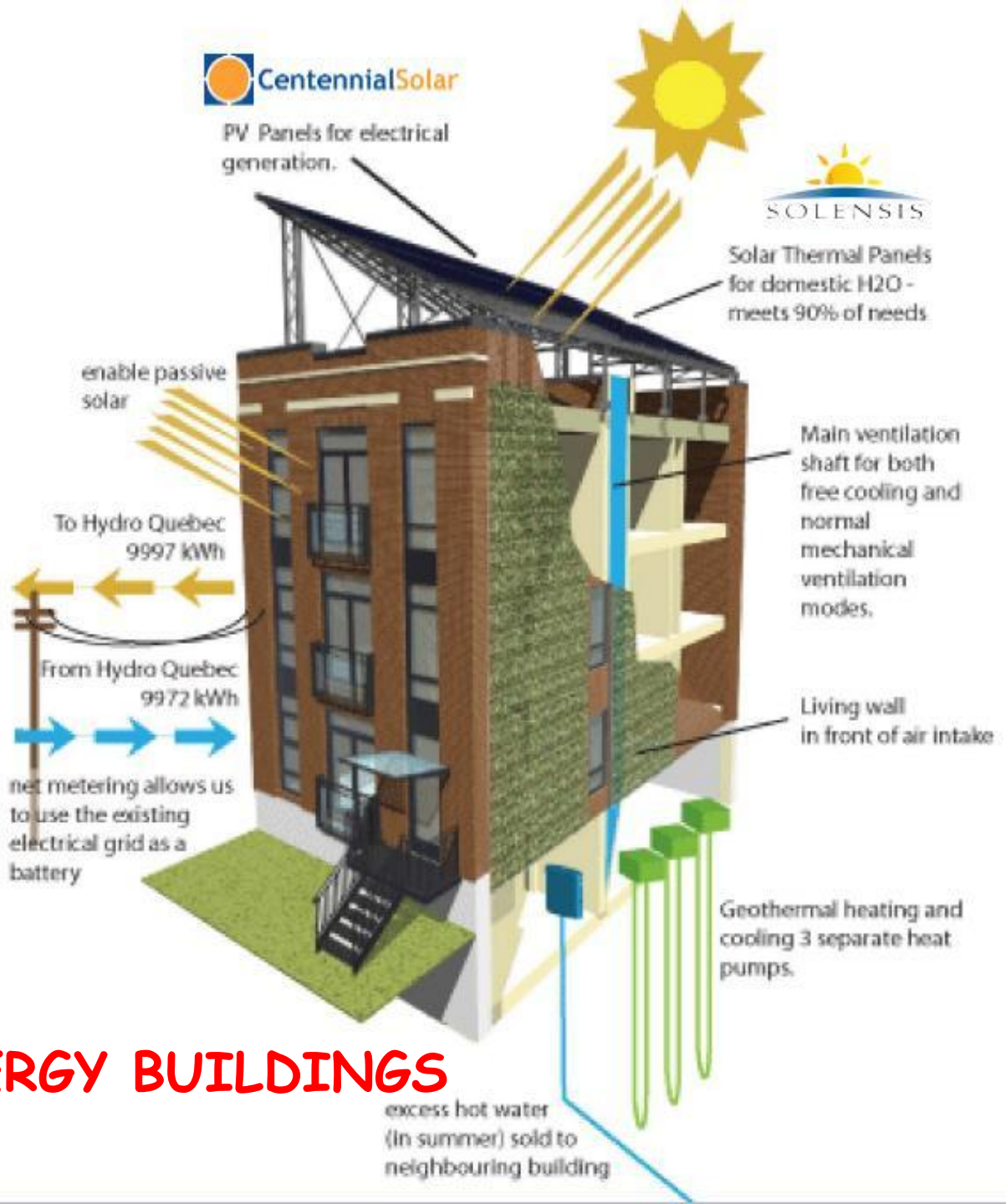


Building integration of wind turbines



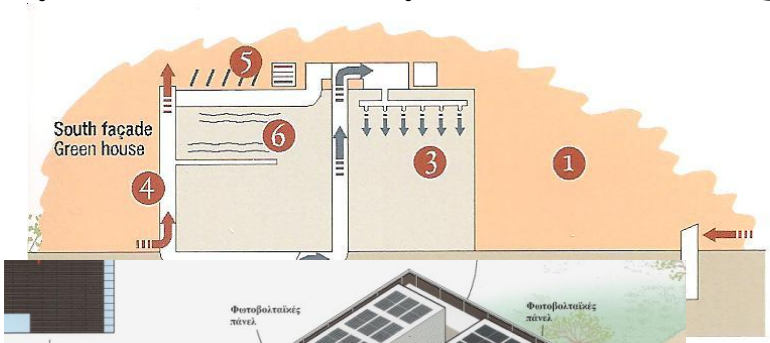
Le Soleil,

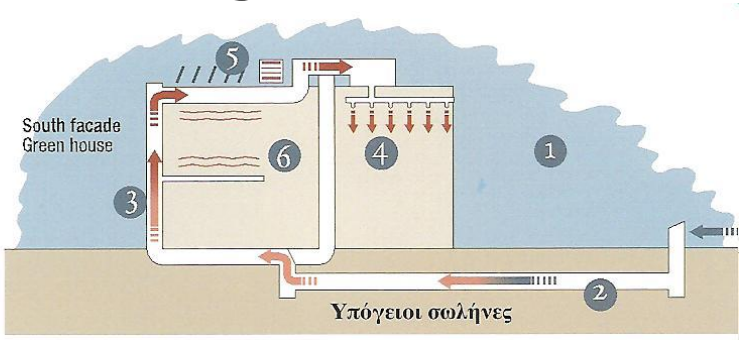
The net zero energy triplex, Montreal



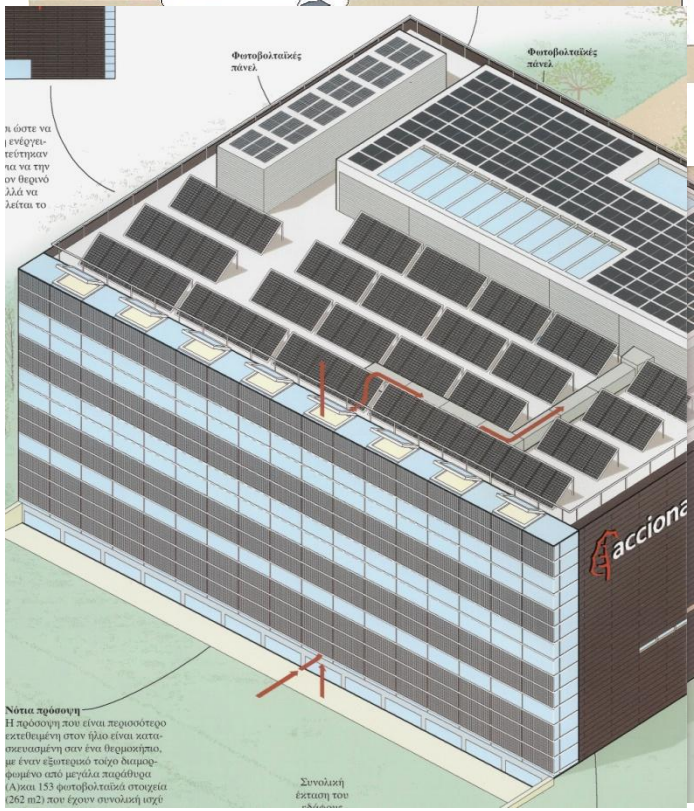
Nearly ZERO ENERGY BUILDINGS

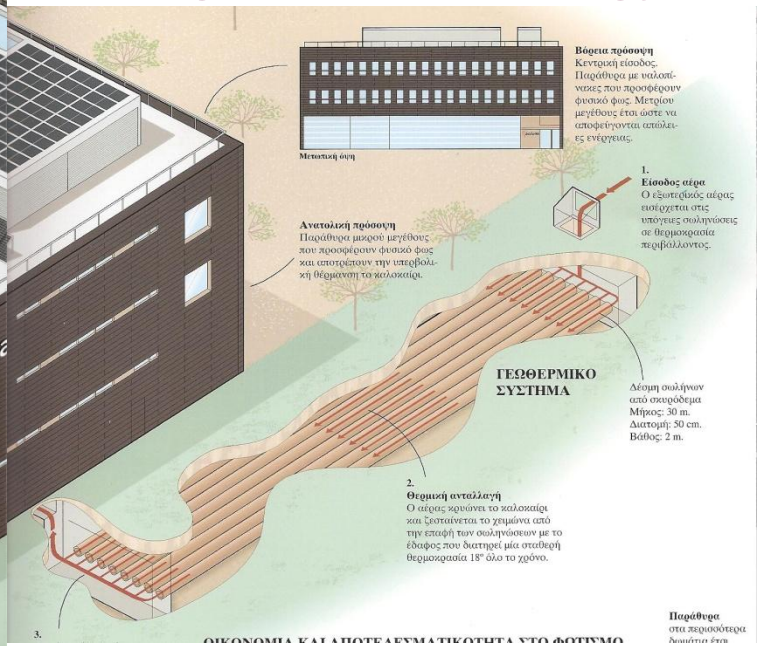
Example of nearly zero energy building "Acciona Building"

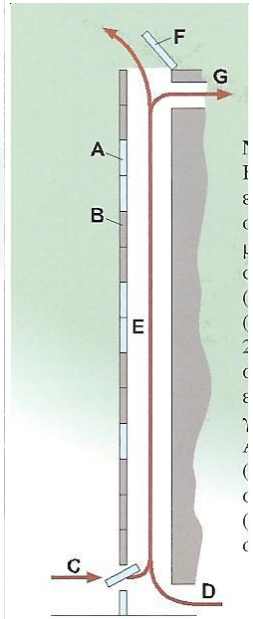




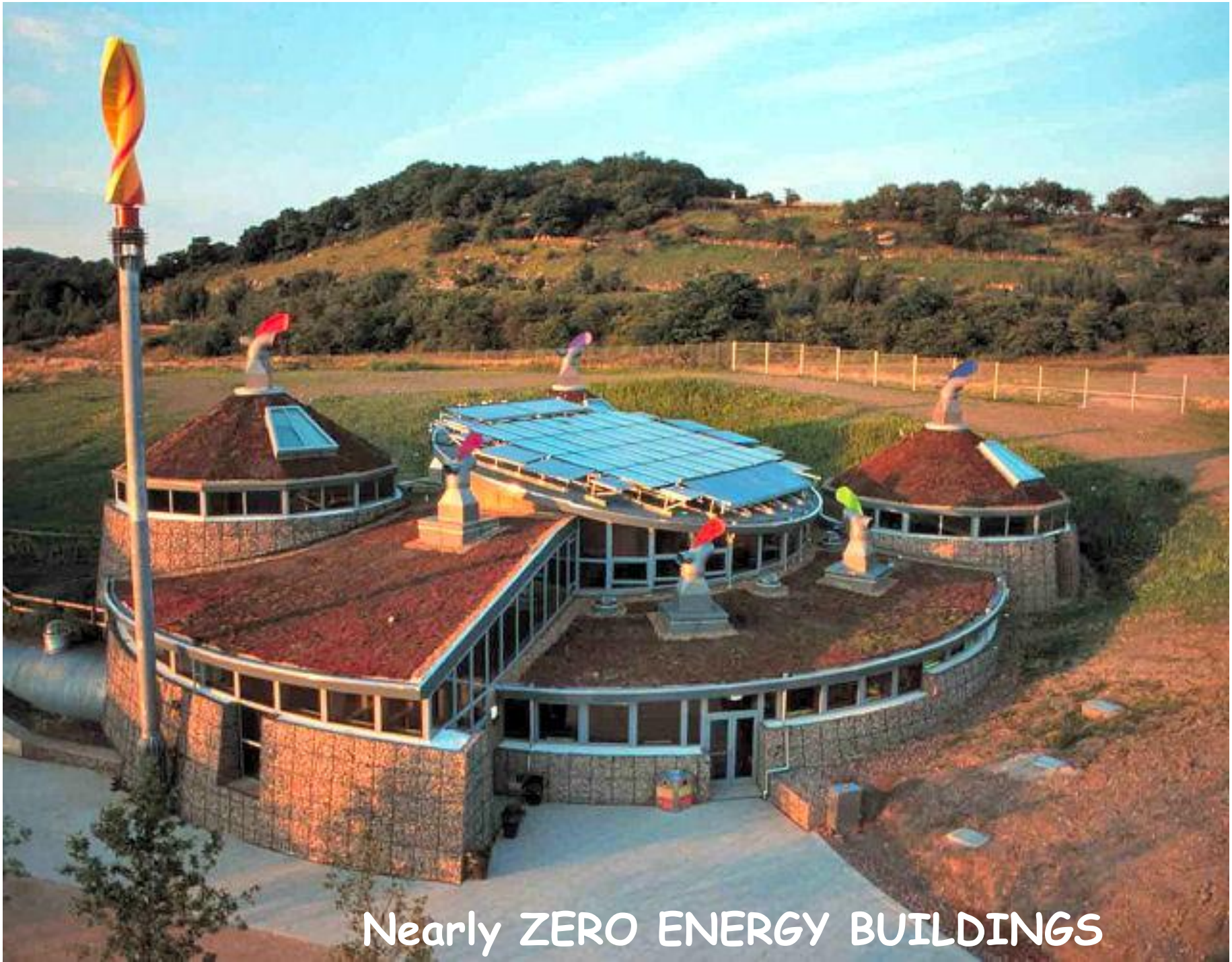
Building with holistic energy saving design







Bioclimatic energy saving (52%), Photovoltaics (21.4 kW), Solar thermal collectors (156 m^2), Biofuel (5000 l/y), Geothermal heat pumps (30 m length, 2 m depth)


Nearly ZERO ENERGY BUILDINGS

Nano-vent skin as a zero emission material

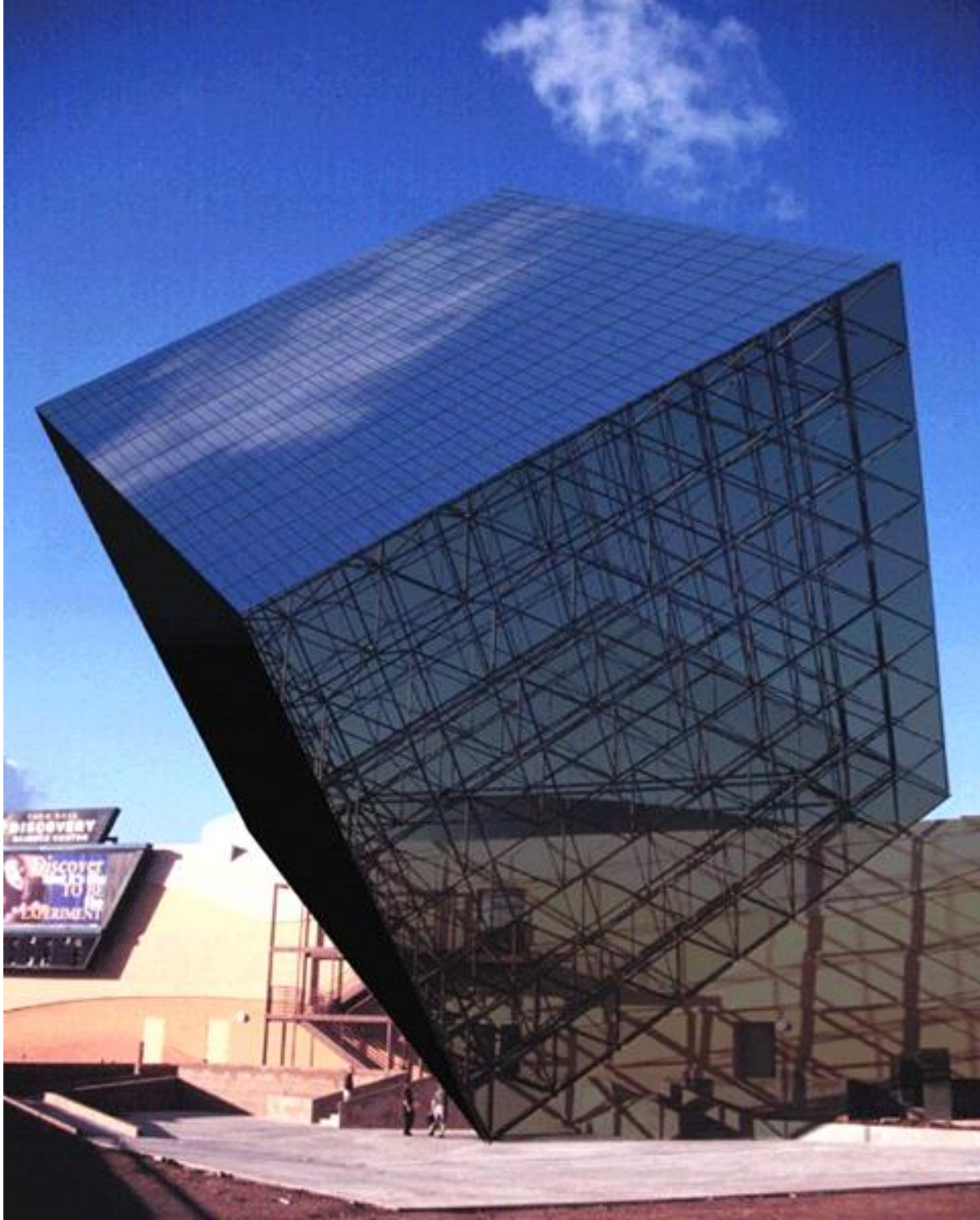
nZero Building by Zaha Hadid

Bahrein


Computer generated image of the proposed world trade centre in Bahrain, one of a number of concept designs for building integrated wind turbines MIMARBAOI STUDIOS / KHALID AL-MIMARBAOI

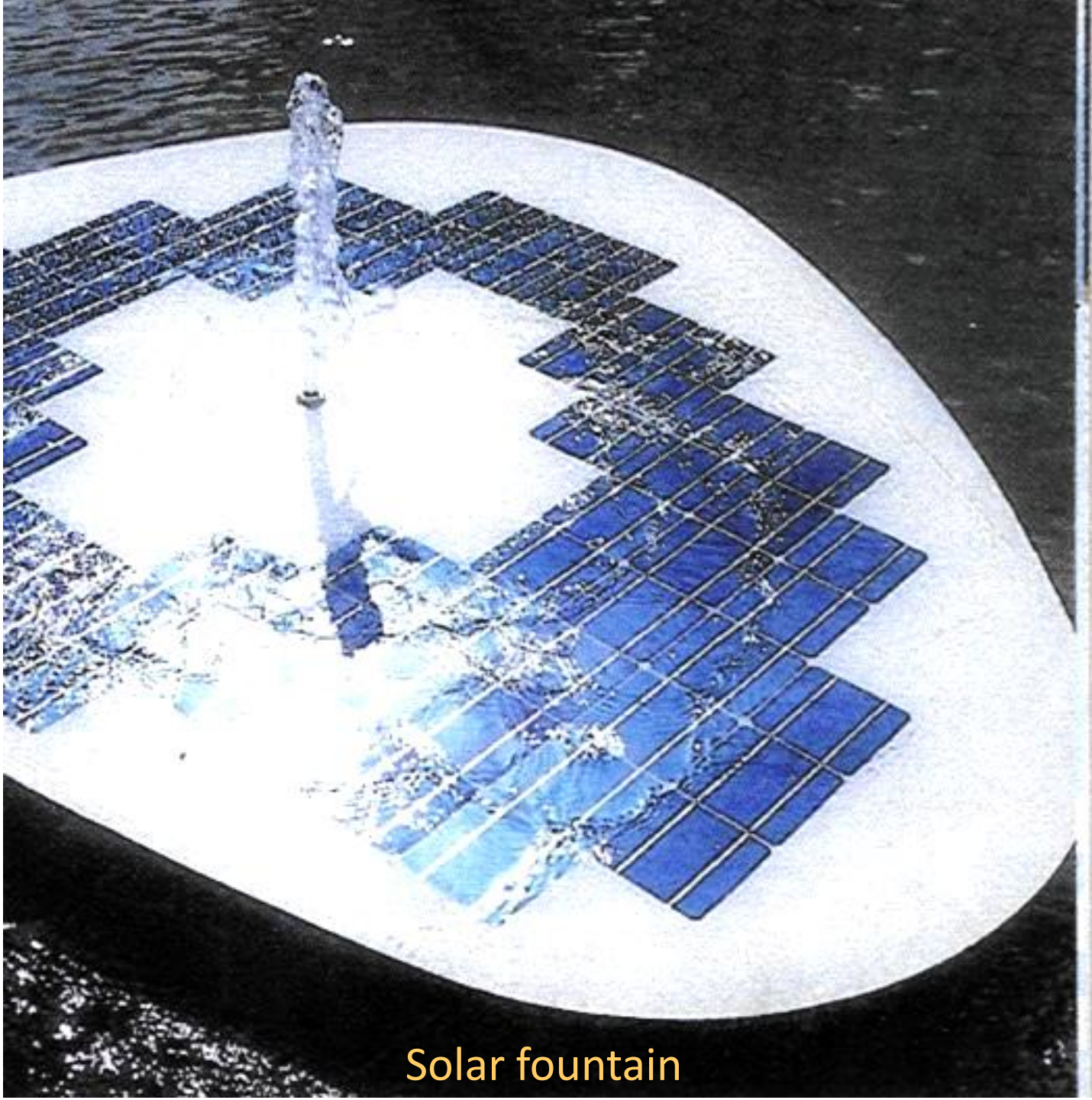
Solar sail

Solar cube

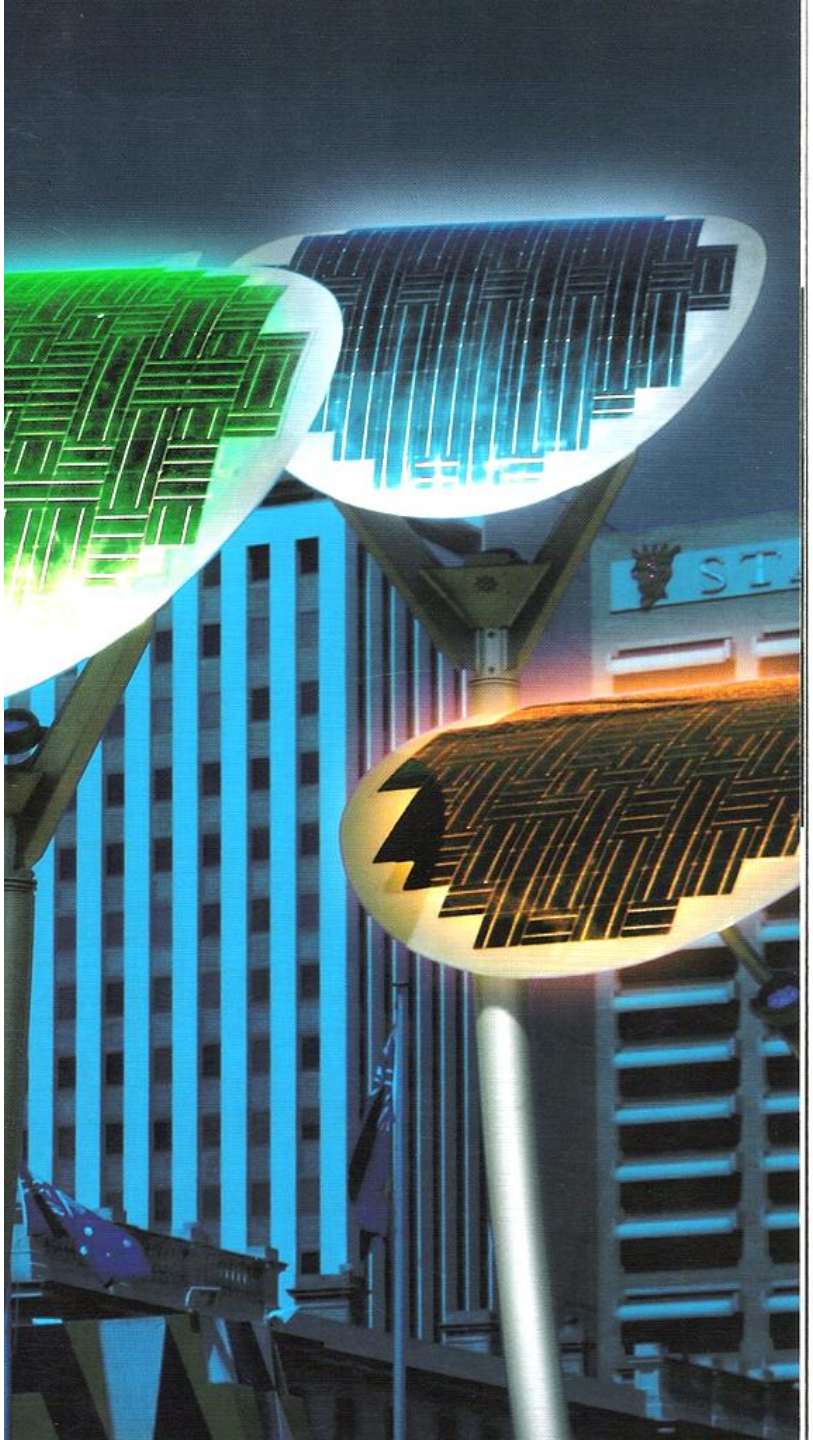


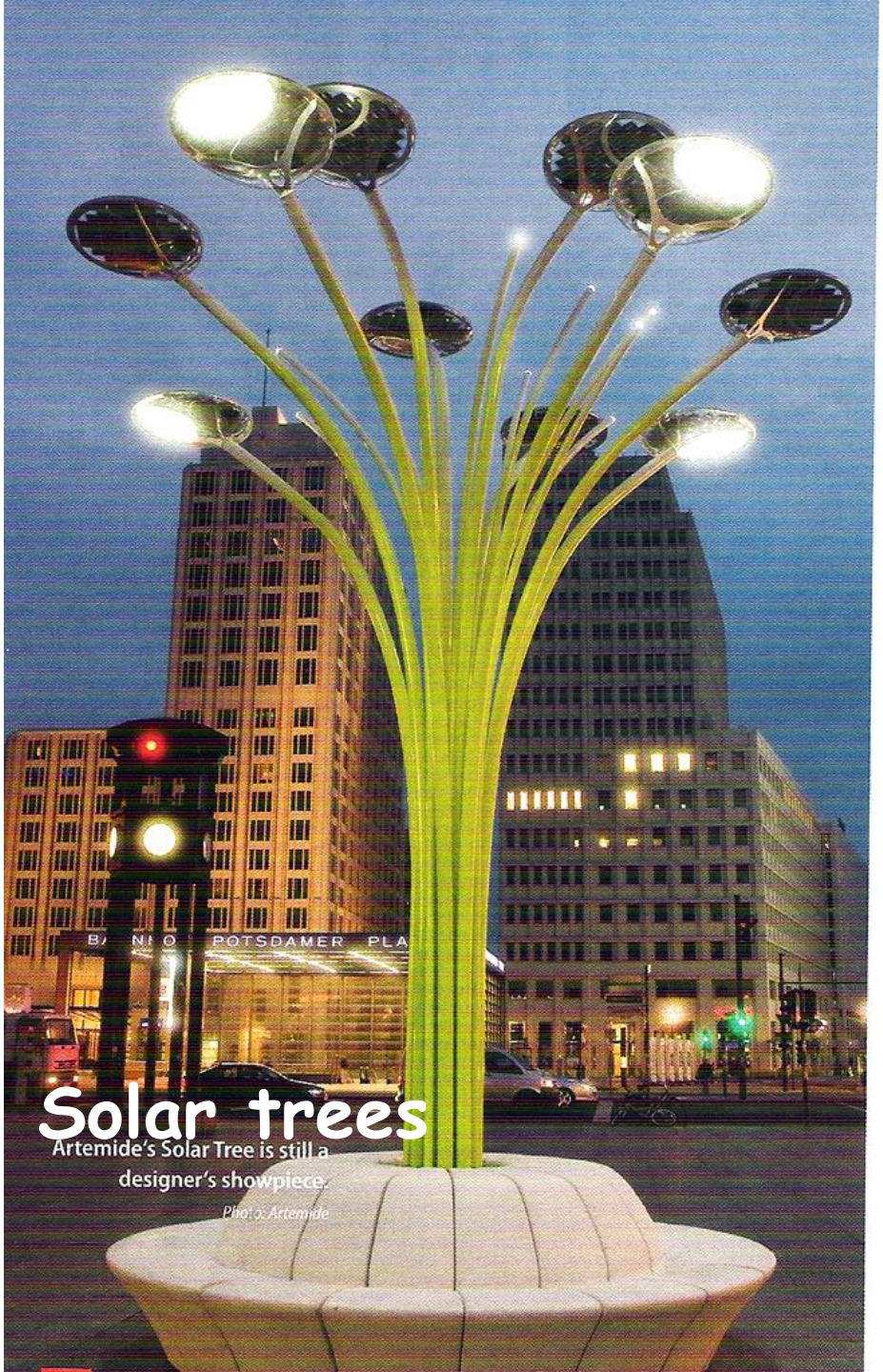
Solar flowers

Solar brain



Solar fountain



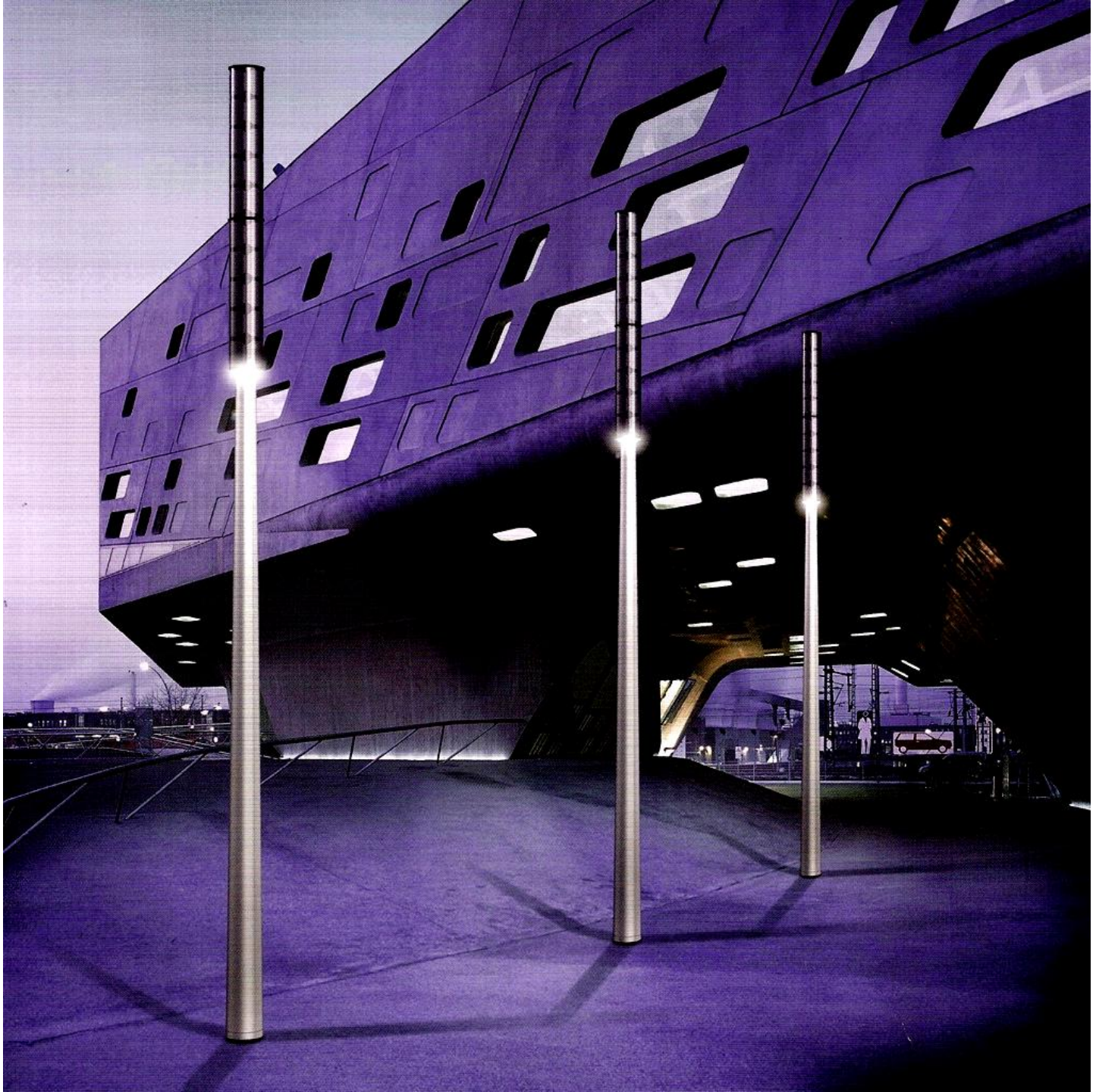


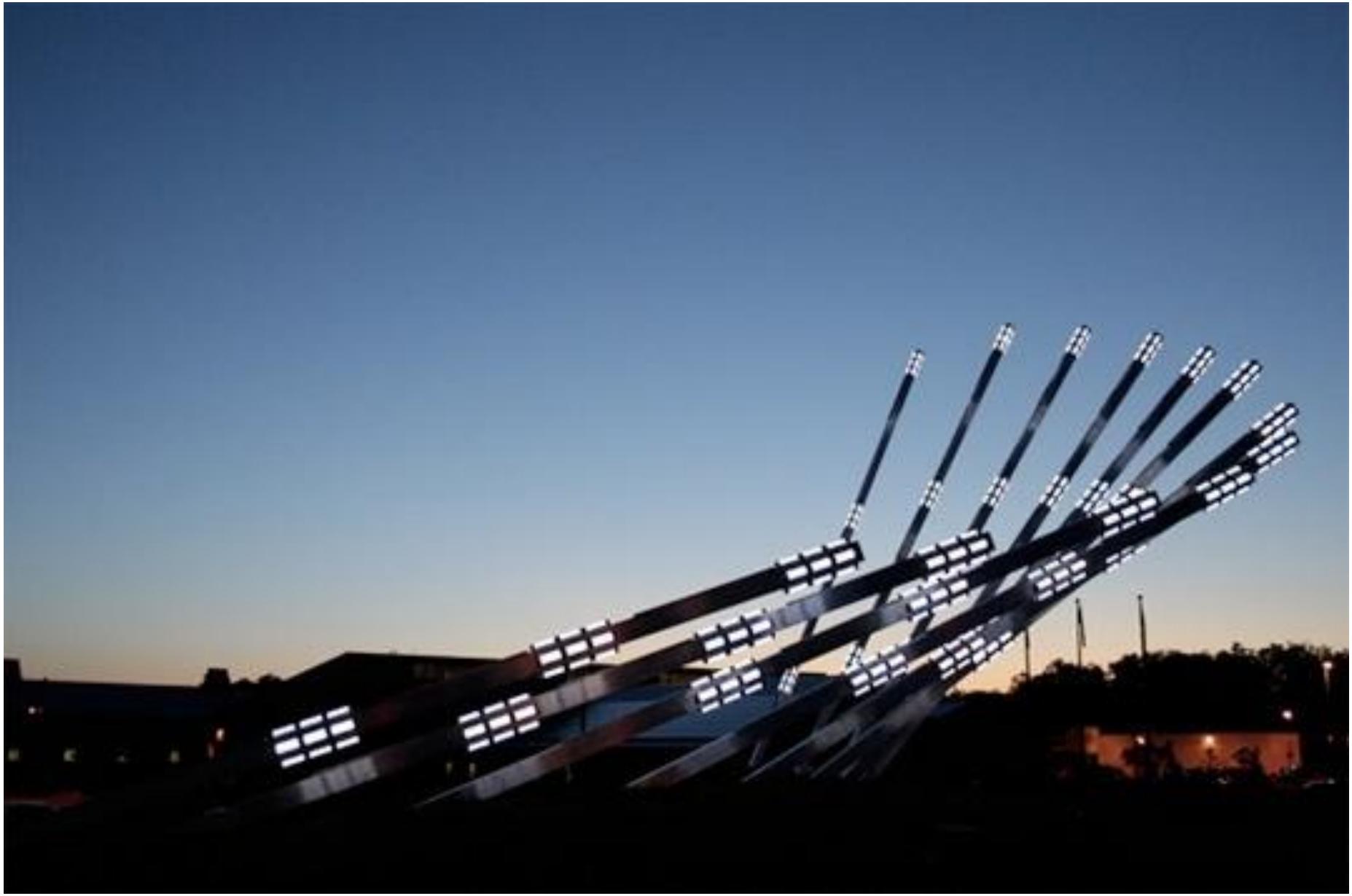
Solar trees

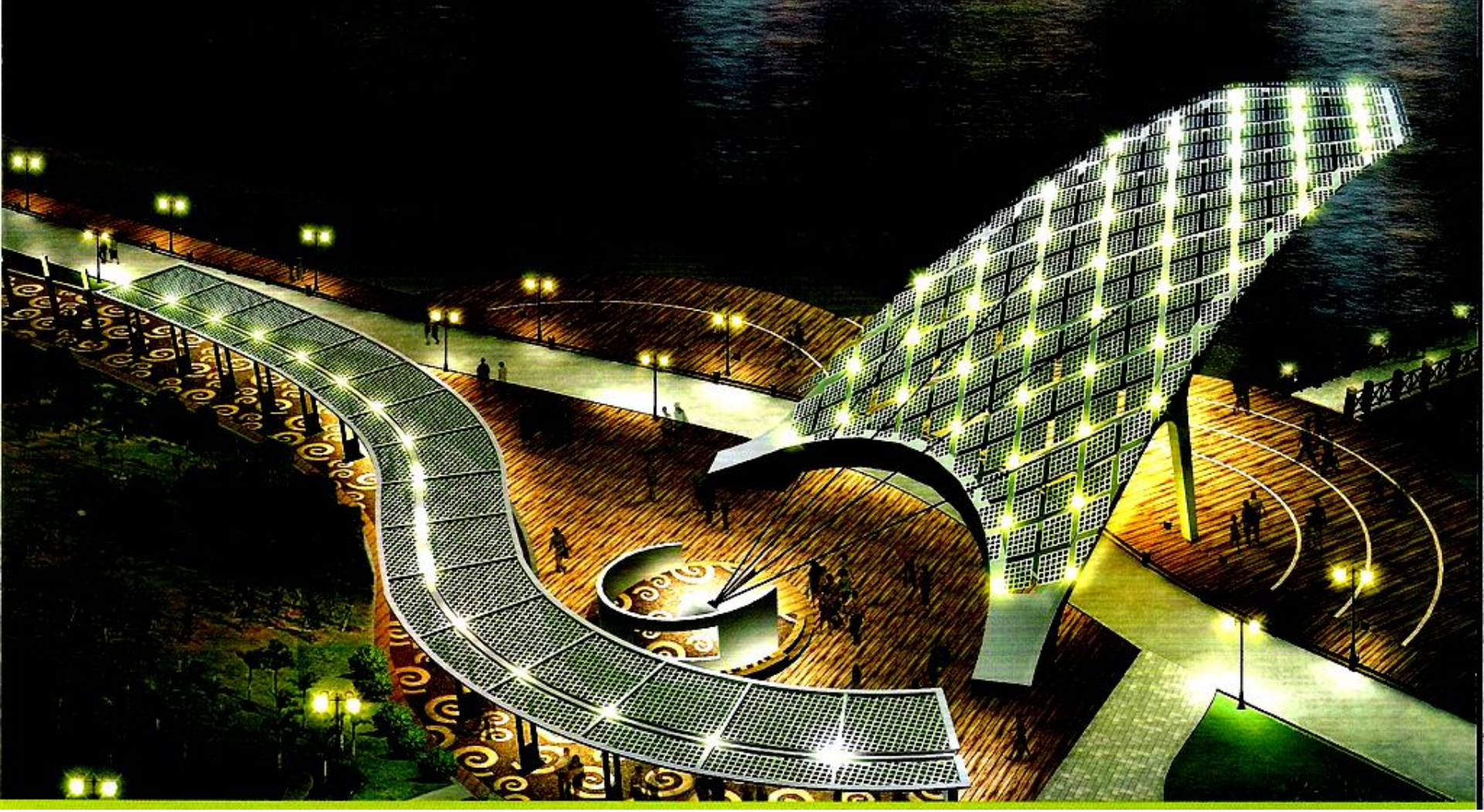
Artemide's Solar Tree is still a designer's showpiece.

Photo: Artemide

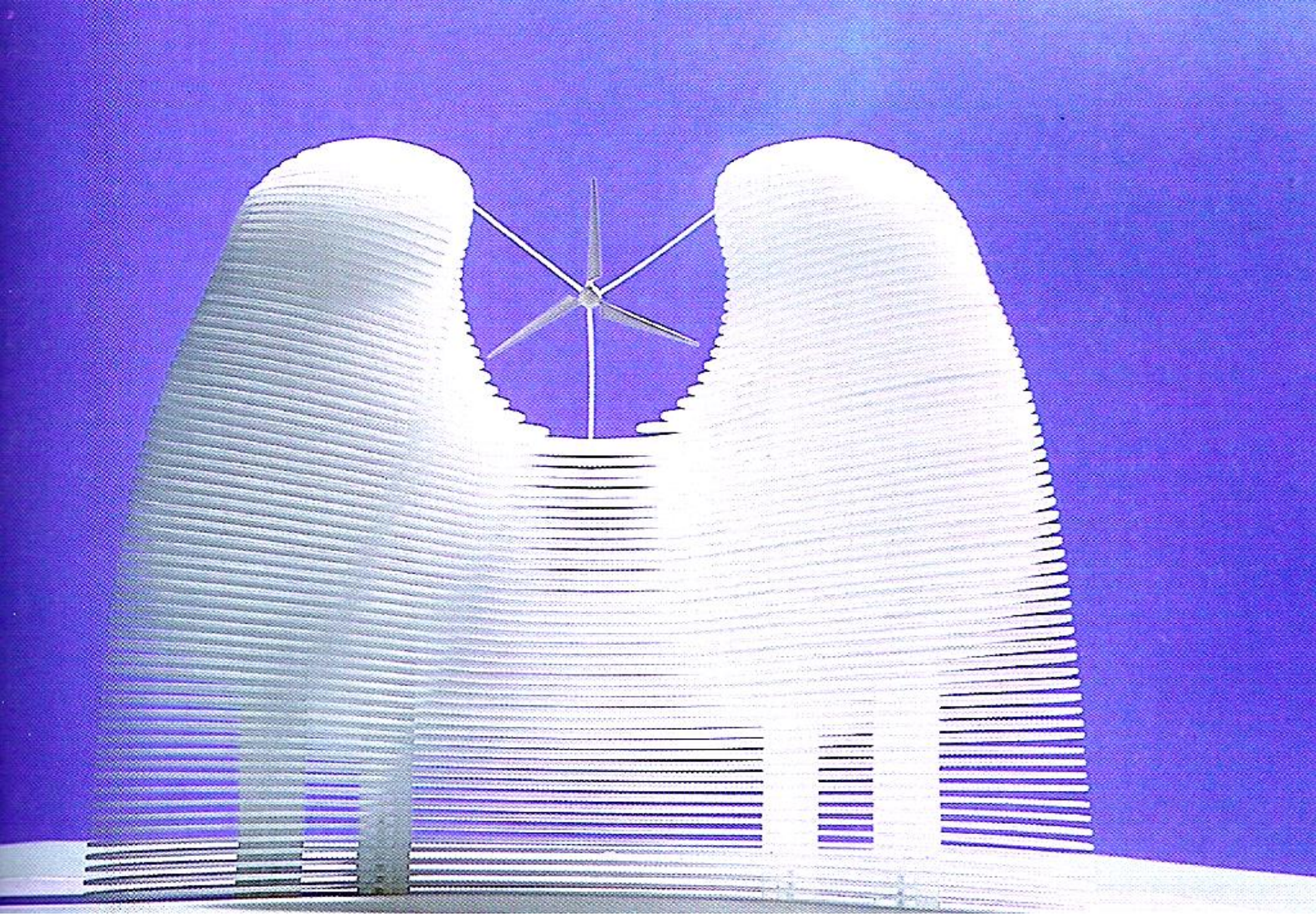

TAOS







Solar pergola



Interesting architectural design

UPatras architectural design for cycladic island houses

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Thank you for your attention

Ευχαριστώ για την προσοχή σας