Utilisation of solar energy in the building sector in Austria
From Research and Development to Market Deployment

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Practical research in and demonstration of low-energy buildings as well as new technologies for the heating of buildings have resulted in a number of economical and marketable solutions in the building sector; Figure 1. The following technical possibilities offer the reduction of energy consumption in buildings:

(1) Reduction of heat need for space heating through energy saving building constructions: *low-energy building*.
(2) (1) and the application of elements and systems for the “passive” use of solar energy in buildings: *solar building*.
(3) (1), (2) and the application of energy-efficient heating systems: *low energy building in combination with energy-efficient heating systems.*
(4) (3) and the use of solar energy via "active" (solar collectors) and "passive" (solar architecture) ways as well as via "indirect" use of solar energy through ambient heat (thermal stored solar energy in the environment):
low-energy building in combination with solar and heat pump systems.
(5) Reduction of fuels for *hot water preparation* through solar and heat pump systems.
(6) reduction of electricity for lighting via *day-lighting systems* especially in commercial and institutional buildings.

The market development of solar systems in Austria illustrates both the multiple possibilities for the use of solar energy and solar energy utilisation even in areas with a moderate climate and larger seasonal differences in solar radiation. Solar systems for hot water preparation both in new buildings and building renovation are today standard in Austria. Especially ineffective heating systems for hot water preparation outside the heating season have been replaced by solar hot water preparation; Figure 2 and Figure 3. Thus, pollutant emissions through heating (wood, coal, oil boilers) could be reduced, and, at the same time, a high comfort in hot water preparation could be reached. In solar systems for hot water preparation in residential and commercial buildings, flat plate collectors of different designs (non-evacuated and evacuated collectors with and without selective coating) are used.

Combined solar-biomass heating systems, individual as well as in combination with district heating, are attractive applications for renewable energy heating technologies in Austria. The solar system covers about 80% of the hot water demand outside the heating season; Figure 4.

The use of solar energy for space heating in buildings can be justified in the case of low energy buildings (new buildings or renovated buildings) with a maximum design temperature of the heating distribution system of 40°C. Quite satisfactory technologies and approaches exist for heating systems; Figure 5 to Figure 7. The solar share for heat demand in buildings (space heat and hot water) is covered up to 60% on annual basis. Combined solar heating systems increased in the last five years: about 20% of the installed solar thermal systems are connected to the heating system. Popular solar combined heating systems are both solar-assisted biomass and solar-combined ground-coupled heat pump systems.

A new approach for solar thermal systems are solar-supported district heating of housing estates; Figure 8 and Figure 9.

Fig. 1: Utilisation of solar energy in the building sector in Austria

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Solar share: 8% - 15%
for hot water + space heating

Collector: 6 - 8 m²
Storage: 300 - 500 litre

Fig. 2: Solar hot water system for single-family housing

Solar share: 5% - 8%
for hot water + space heating

Collector: 3 - 4 m²/flat
Storage: 150 - 200 litre/flat

Fig. 3: Solar hot water system for multi-family housing

Solar share: 9% - 13%
for hot water + space heating

Fig. 4: Solar hot water system for biomass district heating

Solar share: 35% - 50%
for hot water + space heating

Collector: 16 m² - 25 m²
Storage: 800 - 2000 litre

Low-energy buildings
and
Low-temperature heat distribution

Fig. 5: Solar supported heating system for single-family housing

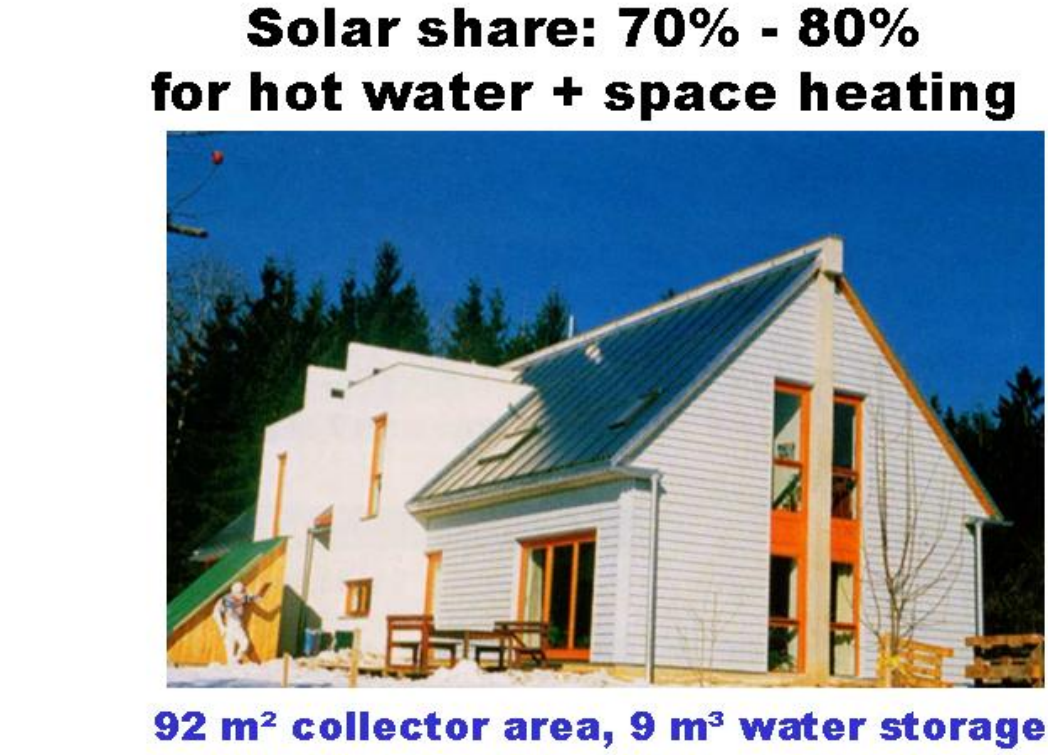

Fig. 6: Solar supported heating system for single-family housing

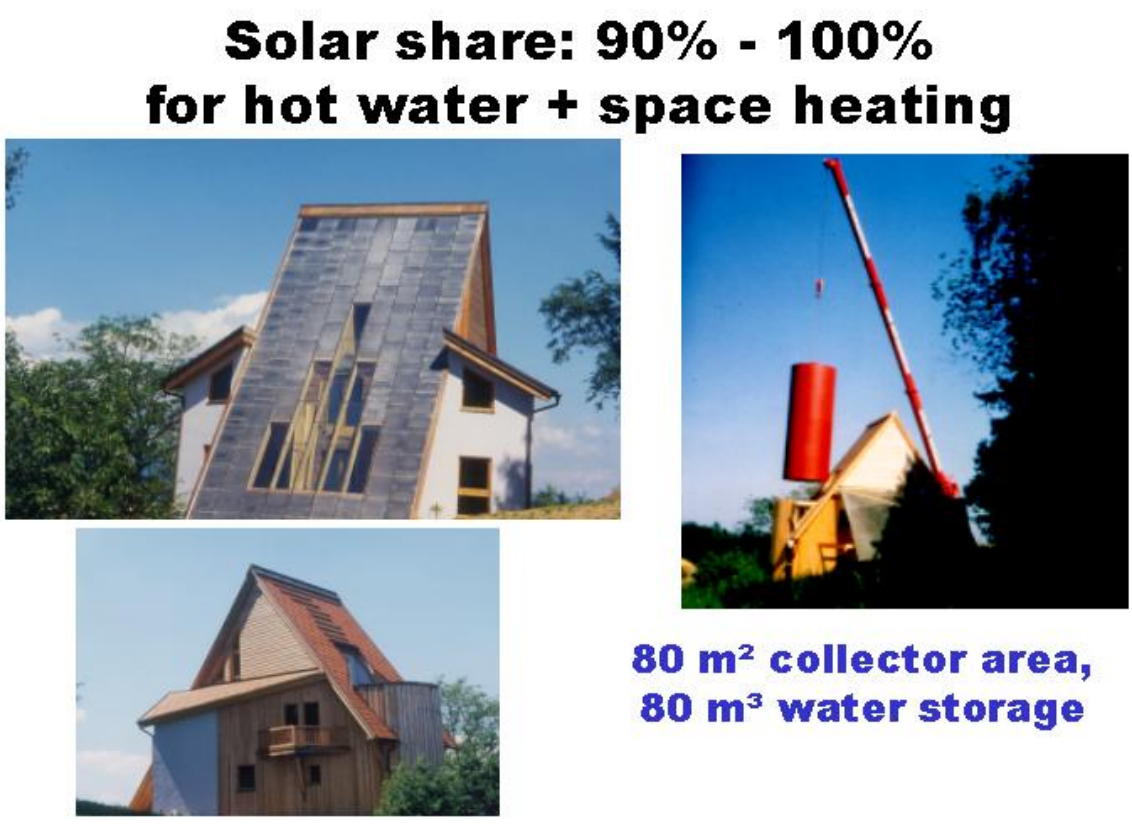

Fig. 7: Solar supported heating system for single-family housing

Fig. 8: Solar supported heating system for housing estate

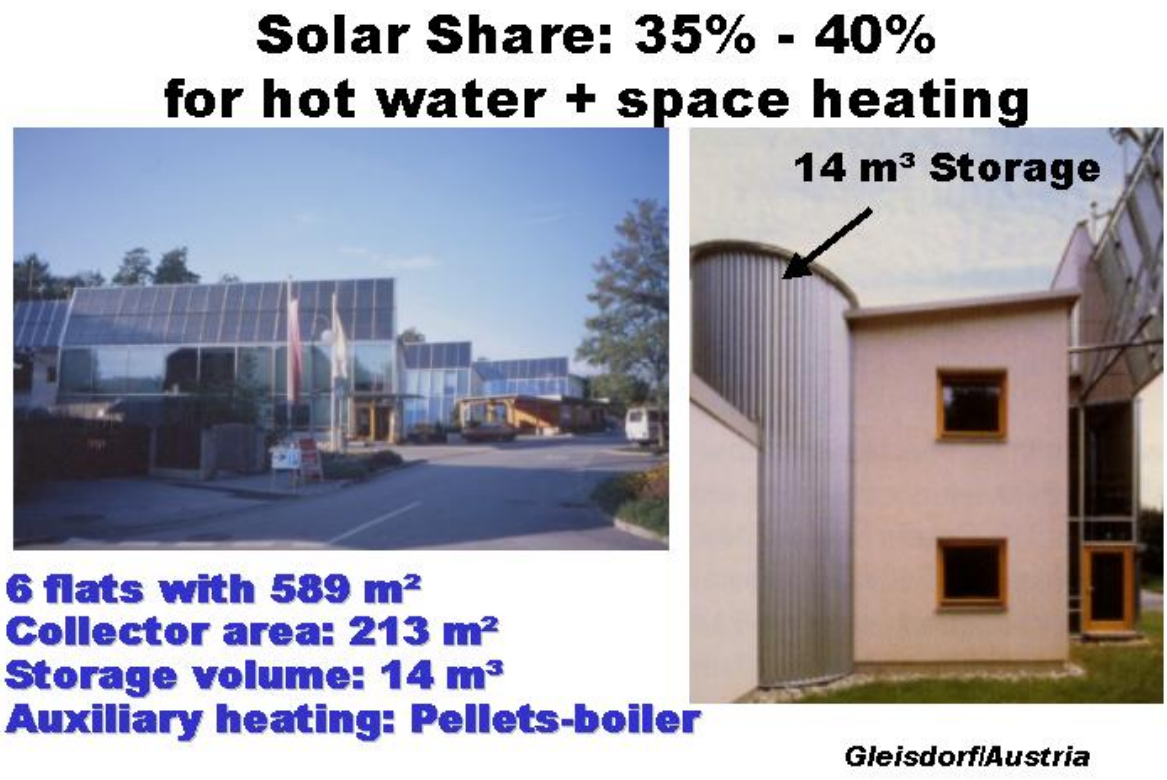

Fig. 9: Solar supported heating system for housing estate