DRAFT

Solar PV heating and cooling

Jean-Christophe Hadorn

Generic systems

- Important: try to find generic systems

Start with main Components and organize them consistently

- PV
- T
- Electrical storage
- Cold store
- Hot store
- Inverters
- Control
- Heat pump
- Air / water / ground source device
- Cooling machine
- Recooler
- …to be completed

System 1: All DC

- PV modules: 1 to 5 kW ?
- Batteries
- Cooling with a DC machine
- With heating capability
- No grid connection or grid back up
- Cold / warm storage or not

System 2: PV to grid

- PV modules: 1 to 100 kW

- Inverters

- No electrical storage

- Grid connection and all in grid

- Cooling or/and heating machine

- Cold / warm storage

-

System 3: PV net metering

- PV modules: 1 to 100 kW

- Inverters

- No storage

- Grid connection and only net metering (surplus to grid)

- Cooling or/and heating machine

- Cold / warm storage or not

-

System 3: PV/T

- PV/T modules: 1 to 100 kW

- Inverters

- No electrical storage

- Grid connection and all to grid

- Cooling and heating machine on the T modules

- Cold / warm storage

-

System 4: PV + T

- Usual T heating combi + PV
- Usual T cooling system with PV

System 5: PV future local storage

- PV

- Indirect electricity storage:
    - Car batteries
    - Hydrogen
    - Methanol
    - Supercaps
    - Etc…

Follow up

- This document is a preliminary think tank…

- Enhancements
    - Sketch all possible systems in a matrix of components
    - Draw square views like for Task 44 see next slide

JC Hadorn ing.-conseil 2013

Source	Sink	Solar Collectors SC	Air Heat Exchanger AH	HP	Hot Backups HB	Secondary Storage SS	Heat Distribution HD	DHW Distribution WD	Solar Pump PS	Air Pump PA	Heat Distr.Pump PD	DHW Distr.Pump PW	Fans FN
Electricity	El			El.HP	El.HB				El.PS	El.PA	El.PD	El.PW	El.FN
Energy Carrier	EC			EC.HP									
Sun	Su	Su.SC											
Air	Ar		Ar.AH										
Solar Collectors	SC			SC.HP		SC.SS							
Air Heat Exchanger	AH			AH.HP									
HP	HP				HP.HB								
Hot Backups	HB					HB.SS	HB.HD						
Secondary Storage	SS						SS.HD	SS.WD					

JC Hadorn ing.-conseil 2013

Energy Flow Chart: DHW & Heating - *Copyright IEA SHC-Task 44 / HPP-Annex38*

Sun | Ground | Air | Water | Waste Heat

Solar Collectors | Ground Probes | Air HX | Water HX | Waste HX

Electricity

Primary Storage

Rejection Storage

Energy Carrier

Cold Backups

HP

Hot Backups

Secondary Storage

Cold Distrib.

Heat Distrib.

DHW Distrib.

Solar Compleet - Heating + DWH mode
Sonnenkraft GMBH

By:
EURAC
SPF
AIT
Fraunhofer ISE