SWITCH TO A RENEWABLE FUTURE

Renewable energy for residential buildings

Dietmar Bässler, energy craftsman

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Château-Gontier · Murrhardt · Frome · Rabka-Zdrój

Renewable energy sources (RES) for residential buildings

content

- Energy demand in residential buildings
- RES-technology and systems for energy supply of buildings
- Efficacy and efficiency
- system integration
- System combination
- summery

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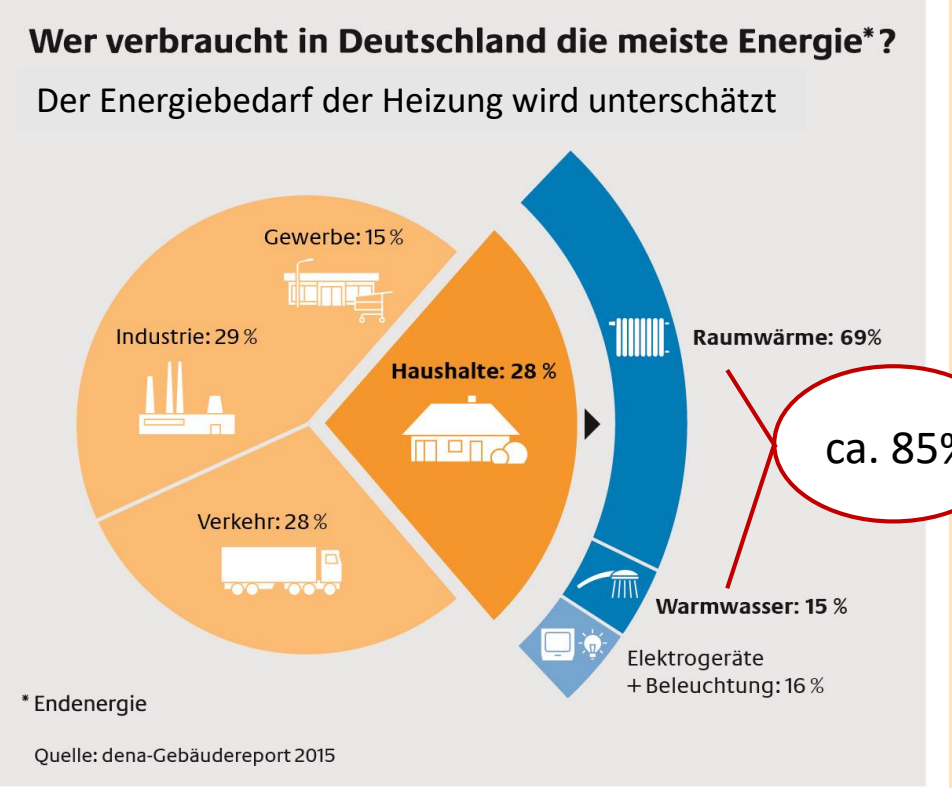
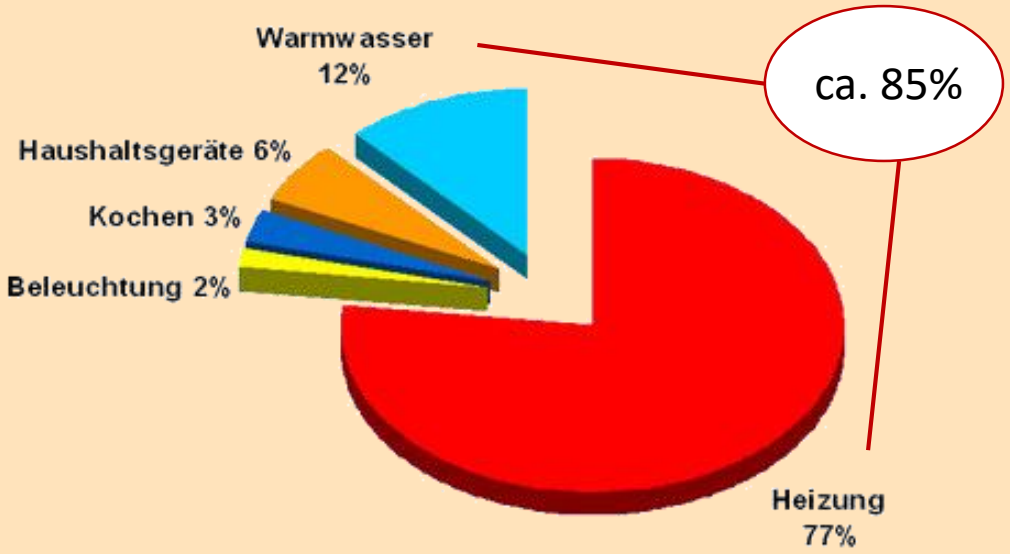
What and where?

Energy demand in residential buildings





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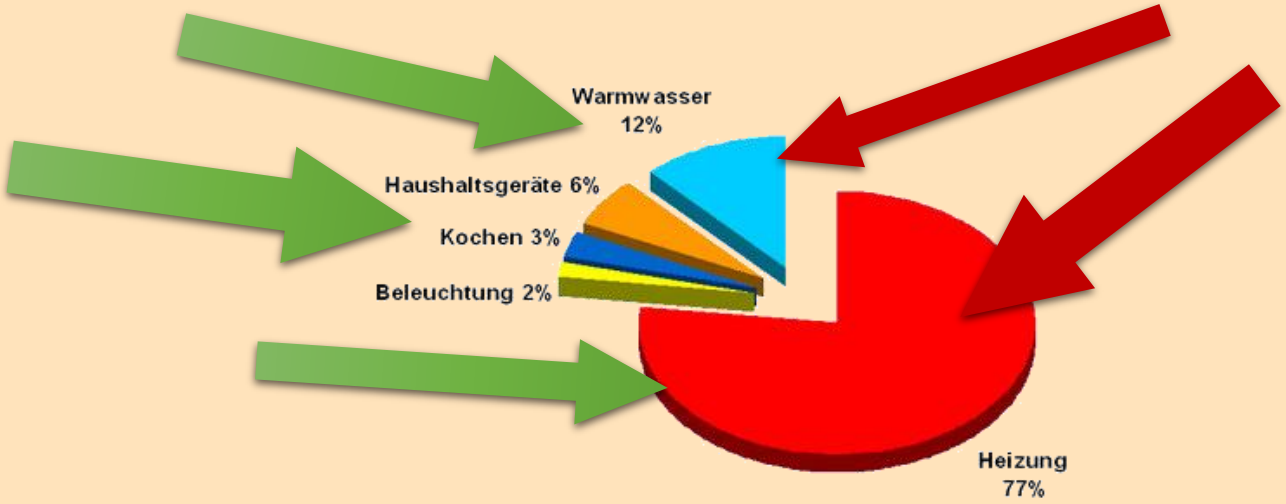
Diversity of systems

RE technology for building energy supply

- Electricity from photovoltaic (PV)
- Electricity and heat from CHP
- Electricity from small wind turbines

- Heat from solar thermal
- Heat from biomass
  (Wood, pellets, wood chip heating systems)
- Heat from heat pumps



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conditions

RES systems for building energy supply

Criteria on site:

- ✓Structural situation
  - Roof, roof orientation, utility room, boiler room, heat distribution
- ✓Living conditions of the inhabitants and users
  - Automatic-manual mode (firewood, ash, etc.)
- ✓Wishes and financial possibilities of the customer
  - possibly divided into several stages of the project

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You have the choice

RES systems for building energy supply

Criteria for system selection:

- ✓ Energy sources with no or the lowest energy cost
  - Sun (solar energy + solar thermal), pellets, wood, wood chips, etc.
- ✓ Devices with high efficiency and more efficient use of energy
  - High efficiency in partial load operation
- ✓ Integration into the overall system
  - Are future enhancements and supplements possible?
- ✓ Combination of equipment and systems
  - Smart combinations with the aim RES = 100%, energy costs = 0,- €

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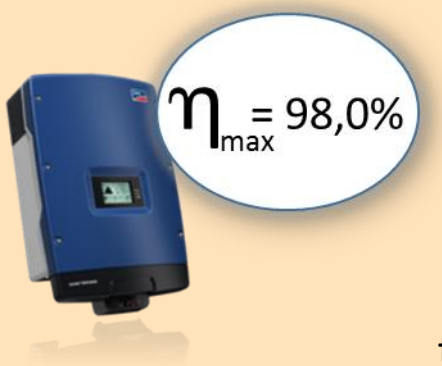
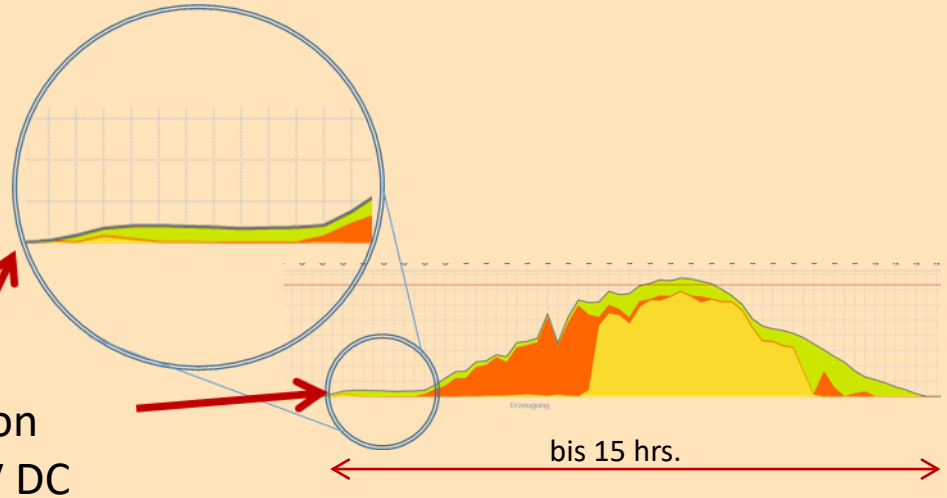
Efficiency and utilization counts

High efficiency at part load

Ex. solar power - Inverter

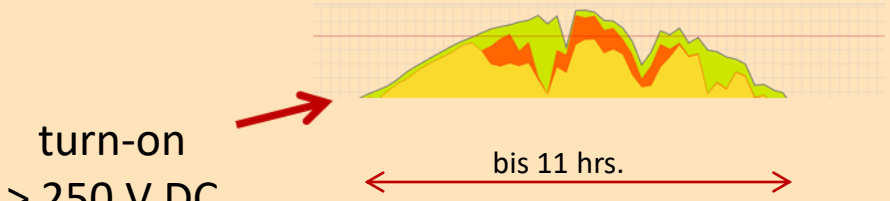
WR 1





- time in use is increased by up to 4 hrs. per day
- energy output increases by 5 - 10%

WR 2



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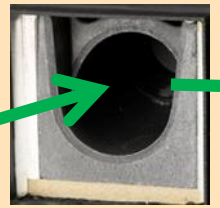
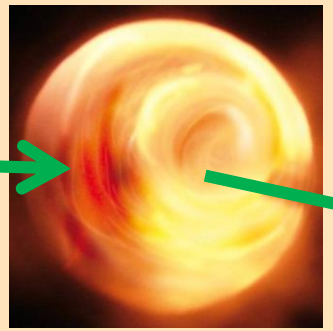
Efficiency and utilization counts

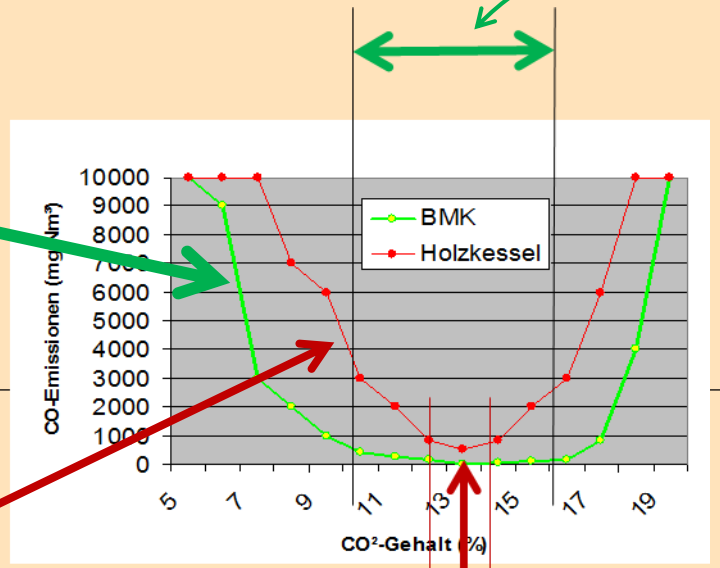
High efficiency at part load

Ex. Wood Gasification Boiler

with swirl combustion chamber

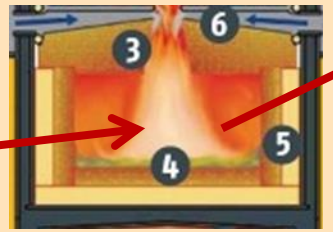






- Large operating range with high efficiency
- Very low emissions

Standard combustor



- operating range good at only one point
- long heating period

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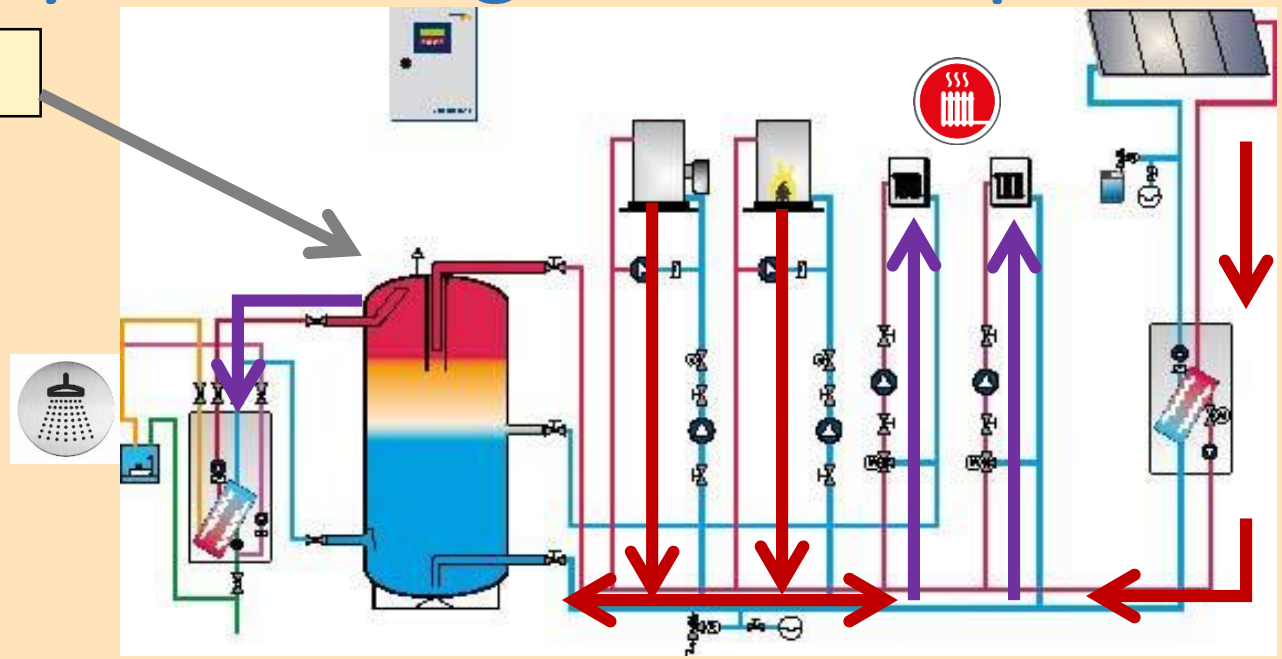
Efficiency and utilization counts

System integration is important

Ex. Central buffer



heat sources

heat consumers

Direct distribution of heat

Characteristics:

- Direct distribution of heat
- Central storage of heat
- Fresh hot water
- Heat sources operate independently of each other

Advantages:

- Fast heat supply to consumers
- Low Standby – losses
- Very good combination possibilities
- Anytime, easily extendable

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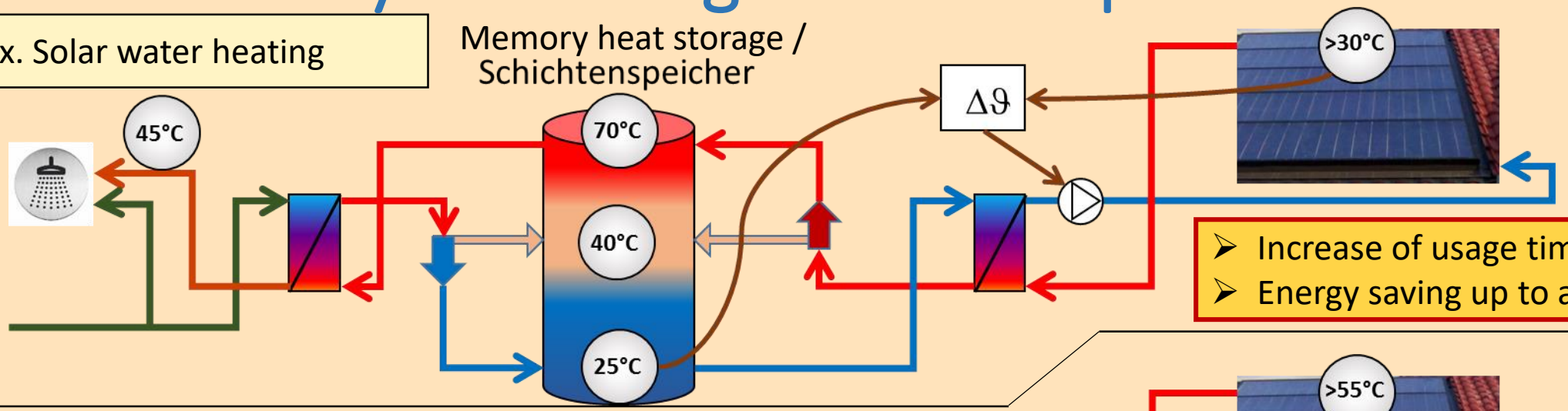
Efficiency and utilization counts

System integration is important

Ex. Solar water heating

Var. 1

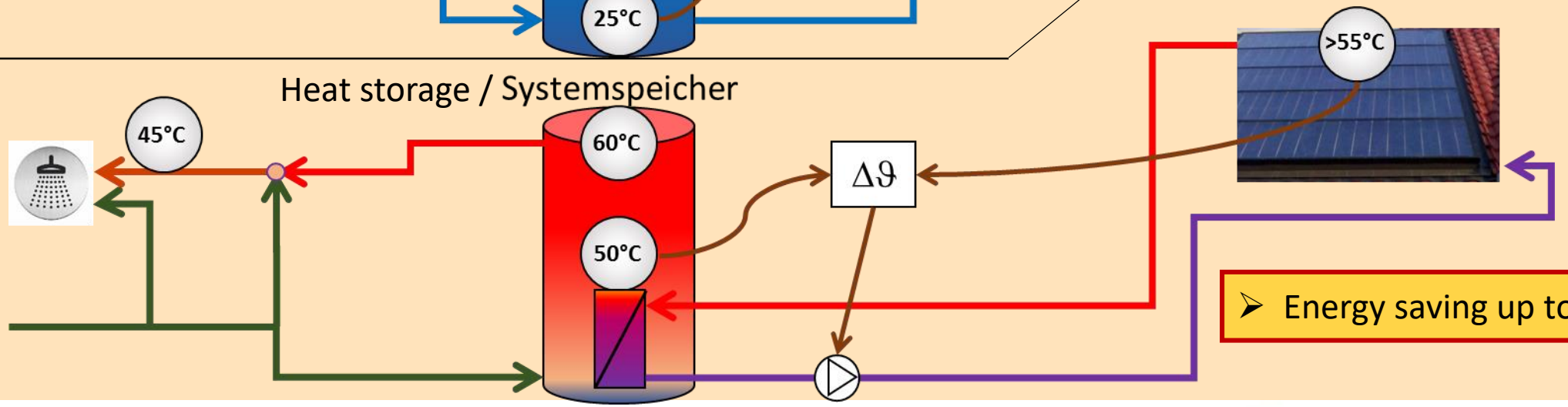
Memory heat storage / Schichtenspeicher



- Increase of usage time
- Energy saving up to about 50%

Var. 2

Heat storage / Systemspeicher



- Energy saving up to 20%

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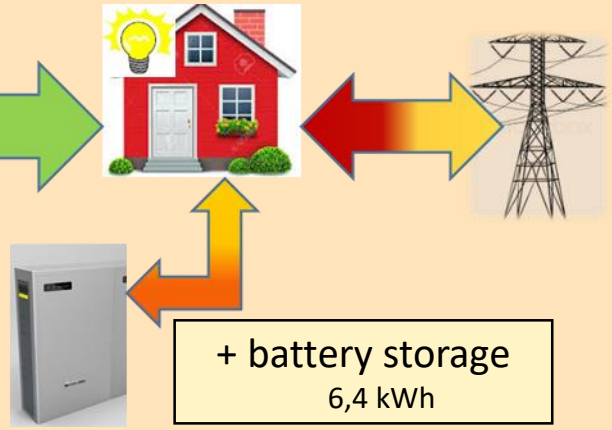
Efficiency and utilization counts

System integration is important

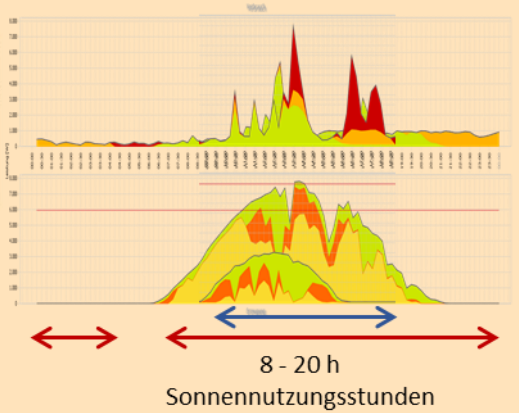
Ex. PV system / solar power usage (overfeeding)

Var. 1

9,9 kWp
alignment:
East 10° + south 13° + west 10°



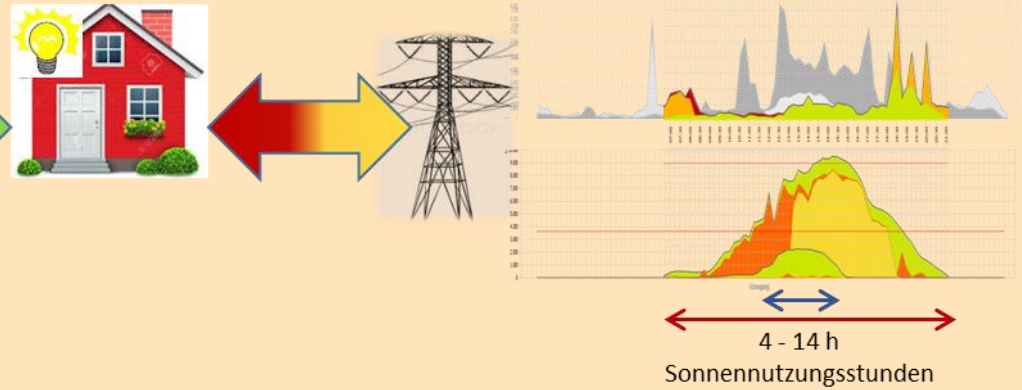
+ battery storage
6,4 kWh



Own efficiency about 50%
Energy saving about 60%
Electricity costs reduction
with electricity sales 95%

Var. 2

5,2 kWp
alignment: south-west 32°



Own efficiency about 30%
Energy saving about 20%
Electricity costs reduction
with electricity sales 45%

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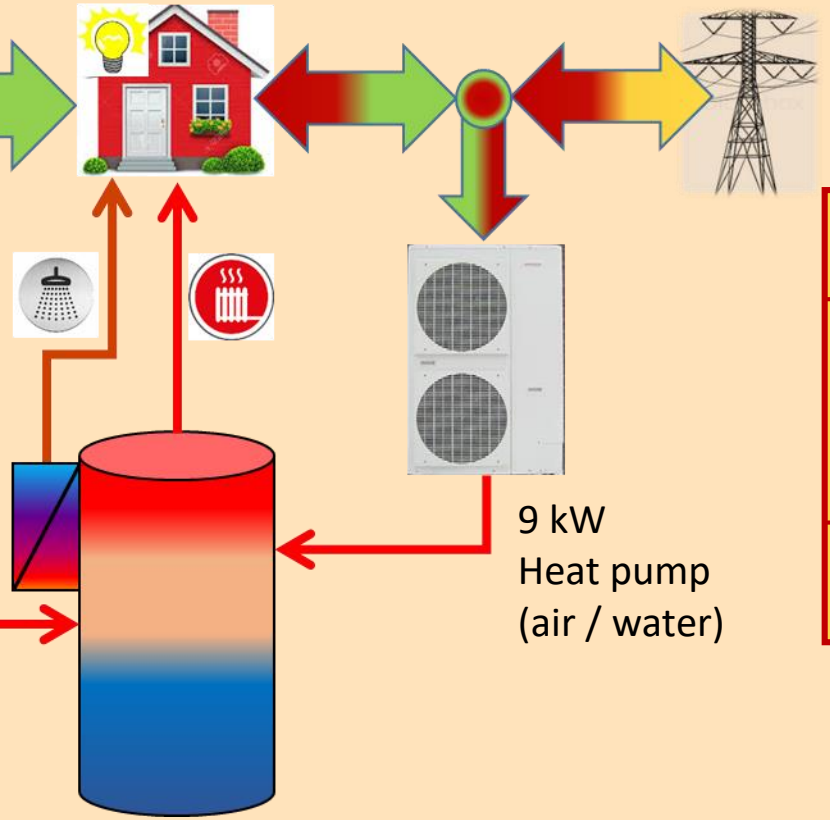
Efficiency and utilization counts

Combination of systems

Ex. PV-conditioning / heat pump / solar thermal system

10 m² solar thermal

8,2 kWp PV
alignment: south 34°



9 kW
Heat pump
(air / water)

Self-efficiency PV 12%
Percentage of e-energy and thus Energy saving about 80% (For PV power, ST-heat, WP-heat)
Energy costs per annum 680, - € (For House-power, WP-electricity, heat)
With electricity sales approximately -550, - €

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Efficiency and utilization counts

Combination of systems

Ex. PV system / Electric storage heaters / electric storage for hot water

9,9 kWp
alignment:
East – West 30°

electric storage
for hot water2-6 kW

Home-Manager

electrical
storage heaters 8 kW

electrical
underfloor heating 0,6 kW

www.

Self-efficiency PV 40%

Percentage of e-energy and thus
Energy saving about 50%
(For PV power, PV-thermal, PV WW)

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summary

- **consider local situation**
  - → objective: use the variety of possibilities
- **using Renewable Fuels**
  - →objetive: Goal: no costs for energy
- **Devices with high efficiency**
  - →objective: high efficiency at partial load
- **integrate systems efficiently**
  - →objective: high efficiency!
- **combine systems smart**
  - →objective: low energy / operating costs!

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Think cross!

Ask dogmas in question!

And have fun!

Thank you for your attention

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