iDM Energiesysteme

Intelligent heat pump systems in connection with photovoltaic systems
Agenda

Introduction to iDM Energiesysteme
Photovoltaic systems and heat pumps
The potential of overheating buffer & building
Navigator 2.0
Outlook: cost – variable tariffs
Agenda

Introduction to iDM Energiesysteme

Photovoltaic systems and heat pumps

The potential of overheating buffer & building

Navigator 2.0

Outlook: cost – variable tariffs
WE TAKE CARE OF YOUR WELL-BEING

Heat pump systems from 2 – 1500 kW

• Development, production and distribution of efficient, regenerative thermal energy systems
• Provider of intelligent energy management in connection with PV systems
AIR / WATER HEAT PUMPS

monobloc outside

AERO ALM
2-8 / 4-12
6-15 / 10-24

iPump ALM
2-8 / 4-12

AL Twin / AL Max
32 / 60

monobloc inside

AERO ILM
4-13

AERO SLM
3-11 / 6-17

split systems

iPump A
2-7 / 3-11
BRINE & GW / WATER HEAT PUMPS

R410A

TERRA SWM
3-13 / 6-17

TERRA SW TWIN
20 / 26 / 35 / 42

TERRA SW MAX (DUO)
55 / 85 / 110 / 140
(170) / (220) / (280)

R134A with higher outlet temperature

TERRA SW TWIN H
13 / 22

TERRA SW MAX H (DUO)
35 / 50 / 70 / 90
(140) / (180)
We will see more of that later ...
CONNECTIVITY of HEAT PUMPS
Why even connecting the heat pump with the PV system?

- Revenues for feeding in decreases steadily
- The price for electricity from the grid is rising
- Use this gap for a cost advantage

→ FOCUS: SELF CONSUMPTION of PRODUCED ENERGY & USE OF ENERGY ACCORDING TO AVAILABILITY
COMMUNICATION between PV and HP

- No communication
- Restricted communication
- Direct communication

Transmission of PV yield & energy surplus (power meter)
Maximizing self consumption: Keeping the energy surplus near to 0

→ NEED OF INTELLIGENT, MODULATING HEAT PUMPS
MODULATING HEAT PUMP

Solar eclipse: 20\textsuperscript{th} of March 2015

PV power

Power consumption of the heat pump
WHERE TO STORE THE THERMAL ENERGY?

Using the surplus of energy (PV yield):

• To overheat the domestic hot water storage
• To overheat the heat buffer
• To overheat the building
• To overheat the rooms
Agenda

1. Introduction to iDM Energiesysteme
2. Photovoltaic systems and heat pumps
3. The potential of overheating buffer & building
4. Navigator 2.0
5. Outlook: cost – variable tariffs
• Less feed in
• Less energy consumption from the grid
Optimizing PV self consumption:

• Connecting the PV to a modulating air-source heat pump
• Using the storage (buffer) as a thermal energy storage
• Using the building as a thermal energy storage
DESCRIPTION

• Single Family House with a 140 sqm
• Buffer for heating and a freshwater station for DHW
• PV with 5,2kWp

• Heating demand 6726 kWh / a
• DHW demand 2980 kWh / a
FOR AN EASY UNDERSTANDING WE WILL COMPARE:

1. Using a 2000 Liter buffer without overheating
2. Using a 2000 Liter buffer with intelligent overheating

WHAT IS OUR BENEFIT?
TIME TO TAKE A GUESS:

• Can we decrease the grid consumption?
• Can we increase our self consumption of PV yield?
LESS GRID CONSUMPTION (HEAT PUMP)

Using a 2000 liter buffer with overheating, halves the grid consumption of the heat pump.

Heat pump grid and PV consumption

- 800 Liter Buffer: 2676 (grid) + 493 (PV) = 3169
- 2000 Liter Buffer: 2798 (grid) + 462 (PV) = 3260
- Overheating 800 Liter Buffer: 1805 (grid) + 1561 (PV) = 3366
- Overheating 2000 Liter Buffer: 1329 (grid) + 2175 (PV) = 3504
- Overheating 800 Liter Buffer & Building 3K (IT): 1357 (grid) + 2058 (PV) = 3415
- Overheating 2000 Liter Buffer & Building 3K (IT): 1329 (grid) + 2175 (PV) = 3504
Using a 2000 liter buffer for overheating, multiplies the PV consumption of the heat pump by nearly 5 – which decreases the PV FeedIn as well.
Overheating the building doesn’t really mean that the room temperature is rising. But even when, the rooms will be controlled by a single room regulation.
1. Using a 2000 Liter buffer without overheating
2. Using a 2000 Liter buffer with intelligent overheating

WHAT IS OUR BENEFIT?

• Can we decrease the grid consumption? Yes, by a half.
• Can we increase our self consumption of PV yield? Yes, multiplied by 5.
Agenda

Introduction to iDM Energiesysteme

Photovoltaic systems and heat pumps

The potential of overheating buffer & building

Navigator 2.0

Outlook: cost – variable tariffs
CONNECTIVITY
LIVE ENERGY DISTRIBUTION

System

HKA

- Raum
  - Soll 22.6 °C ← Ist 22.8 °C
  - Vorlauftemperatur
  - Soll 29.3 °C ← Ist 29.6 °C

Photovoltaik

- 3.2 kW
- 9.2 W → 296 W
- 2.9 kW
STATISTICS OF ENERGY DISTRIBUTION

Statistik | Stromfluss

<table>
<thead>
<tr>
<th>Tag</th>
<th>Monat</th>
<th>Jahr</th>
<th>Gesamt</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.09</td>
<td>3</td>
<td>4</td>
<td>7.1 kWh</td>
</tr>
<tr>
<td>19.09</td>
<td>20</td>
<td>9</td>
<td>30.6 kWh</td>
</tr>
<tr>
<td>18.09</td>
<td>15</td>
<td>13</td>
<td>34.0 kWh</td>
</tr>
</tbody>
</table>

Eigenverbrauchsquote: 94.1 %, Autarkiegrad: 43.7 %

Eigenverbrauchsquote: 50.8 %, Autarkiegrad: 51.9 %

Eigenverbrauchsquote: 62.8 %, Autarkiegrad: 34.4 %
FUTURE OF ENERGY MANAGEMENT

• Decreasing load peaks
• Individual control of each component
• Optimized use of energy and efficiency
  - Cost variable tariffs
  - Weather forecasts
  - Optimized PV consumption
• Increased self consumption or even energy autarky
A gap up to 40 c / kWh - on a normal day (exactly one week ago)
Big potential for the heat pump: a lot of consumption (in HH), whilst being dynamic
USE OF ENERGY ACCORDING TO AVAILABILITY
& USE OF ENERGY ACCORDING TO THE PRICE
iDM already implemented cost variable tariffs – to decrease the price for energy
We can see the starts of the heat pump in the local minima of the energy price
CONCLUSION

• PV systems need a direct communication to the heat pumps for optimized self consumption
• Heat pumps are intelligent and can use the energy surplus to overheat buffer & building
• An intelligent communication to the grid is needed for decreasing peak loads & gaining advantage in terms of prices for energy
There is no Planet B

Intelligent heat pump systems in connection with photovoltaic systems