

WÄRMEPUMPEN IN MEHRFAMILIENHÄUSER

Lösungsvorschläge international



Dr.-Ing. Marek Miara

Mehrfamilienhäuser und Wohnkomplexe mit großen Wärmepumpen (Webinar III)

17.06.2020

Die Themen

1

IEA HPT,
Annex50

2

Charakteristik der
Länder, Barrieren

3

„Matrix tool“

4

Lösungsgruppen

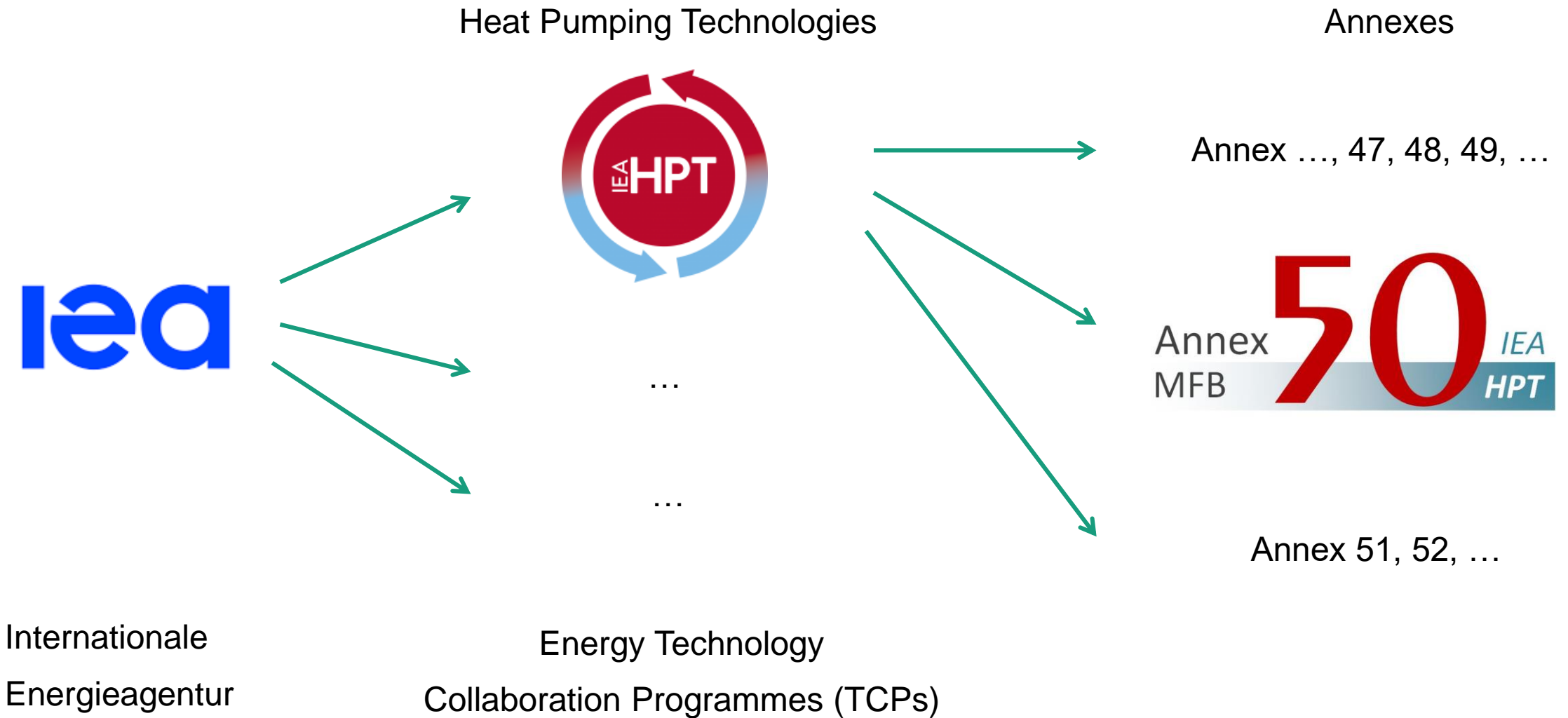
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Beispiele aus der
Praxis

6

Vision – online
tool “solution
finder”

IEA Network



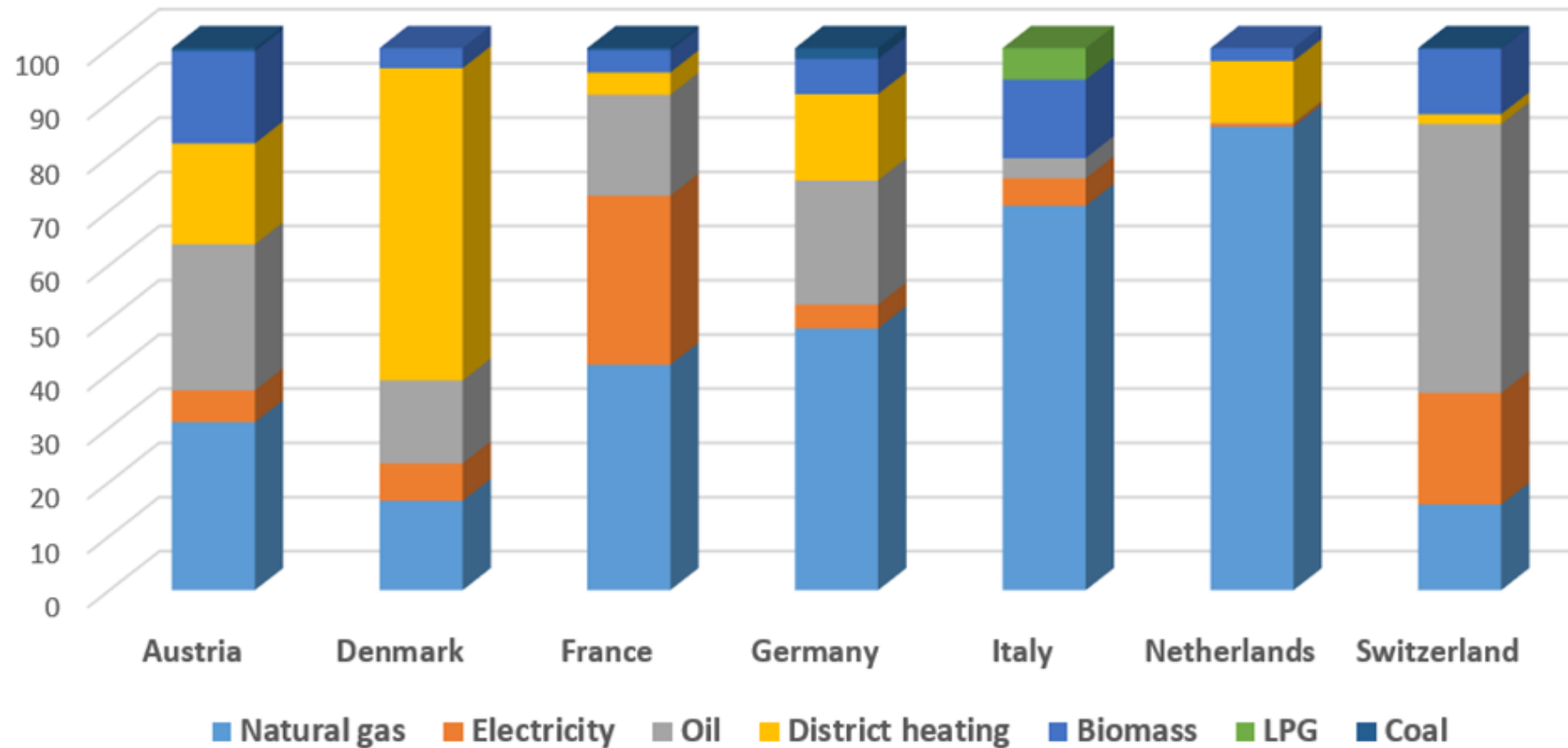
Annex 50

Key facts

- Dauer: Annex 50 endet am 31.12.2020
- Teilnehmer:
 - Deutschland (Operating Agent)
 - Österreich
 - Die Schweiz
 - Niederlande
 - Frankreich
 - Italien
 - Dänemark
- Website: www.heatpumpingtechnologies.org/annex50

Vergleich der Länder (Country reports)

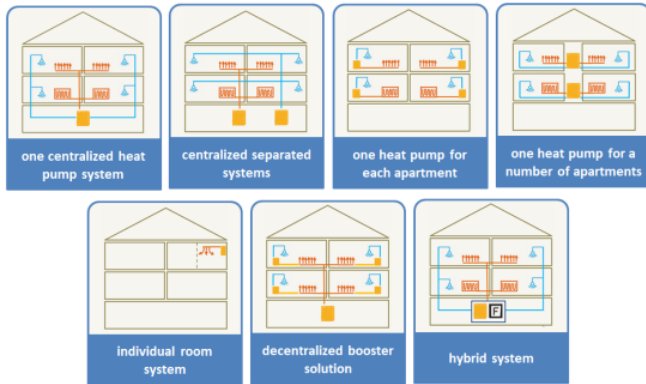
Beispielhafte Auswertung



Die Energieträger für die Beheizung von Mehrfamilienhäusern in unterschiedlichen Ländern

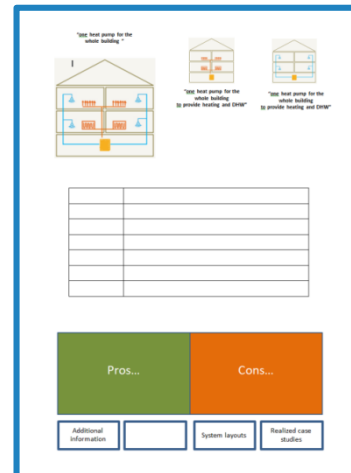
Klassifizierung der Lösungen „Matrix tool“

1



Übersicht
„Lösungsgruppen“

2



Beschreibung der
Konzepte

3

Best Practice Examples
Heat Pumps in Multi Family Buildings

Hot Ice Weis, Austria

The project is focused on the use of latent heat with two ice storages and heat pumps in combination with unglazed solar collectors and a PV system. It is designed as a pilot project for local heat supply.

Key facts

Building	Weis, Austria
Location	2025
Construction	2025
Heat distribution	under-floor heating
Heated area	857 m ² /floor
Level of insulation	very good
Heat pump and source	
Number of	2
installed power	4 kW + 100W
Operation mode	monoenergetic
Heat source	ice storage + solar
Heating system	
heat demand	
Heating temperature	35 °C
Domestic hot water	
Type of system	central
Min. temperature	60 °C
Circulation system	yes
Other information	
Electric energy	10000 kWh
consumption 2016	10000 kWh
Investments costs	unknown
PV installation	yes

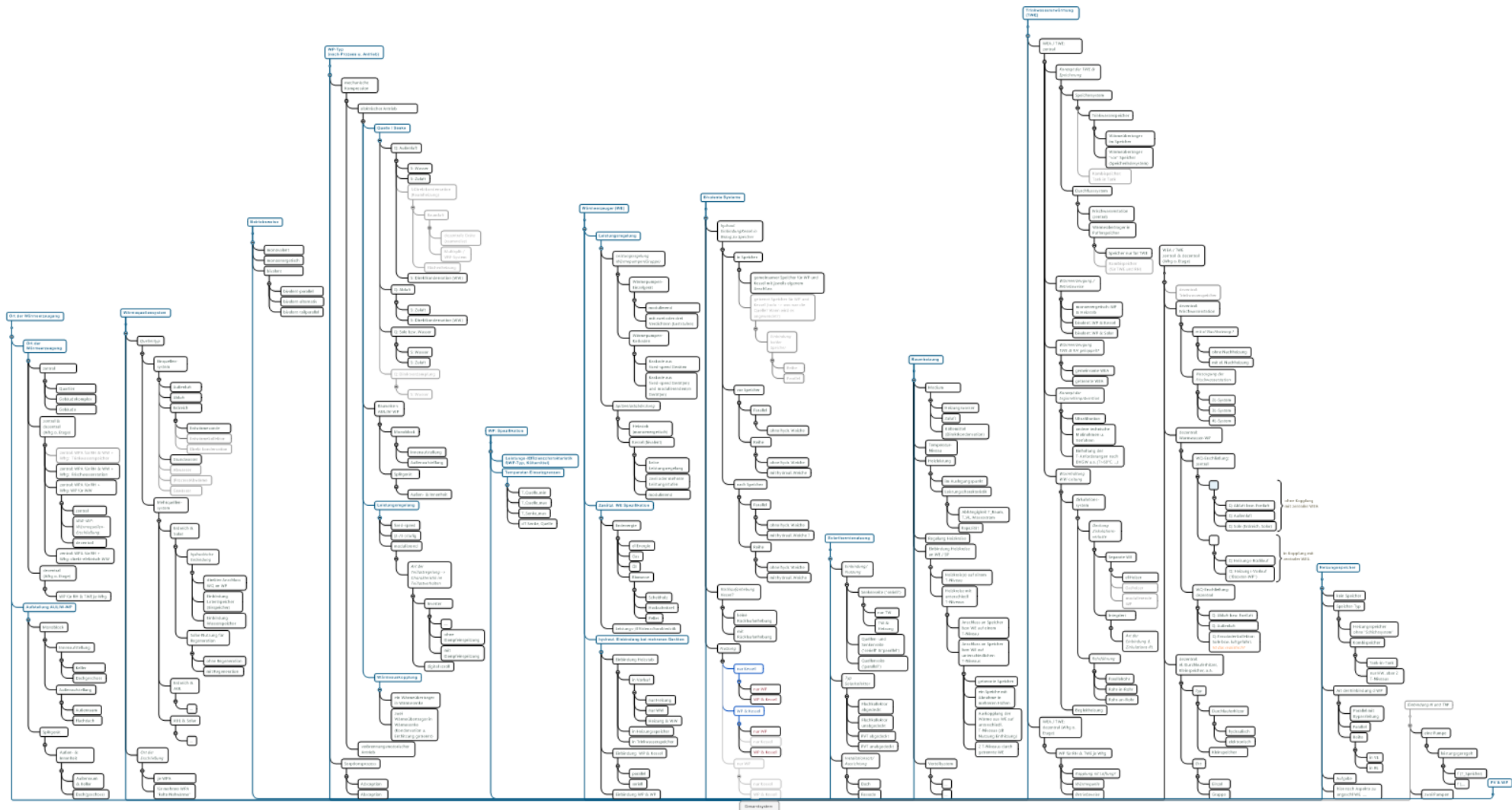
Lessons learned

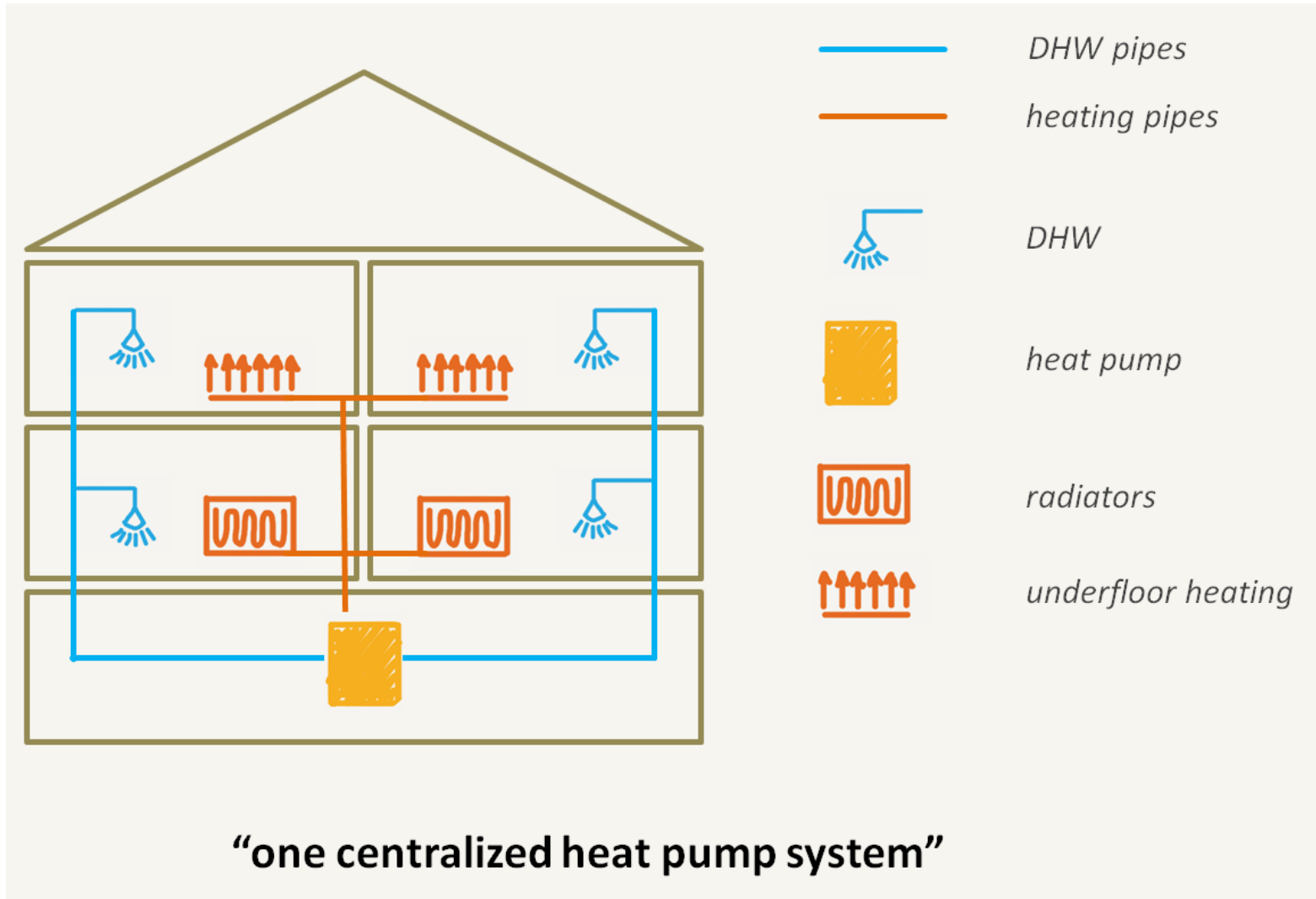
- Use of innovative heat source - ice storage connected with solar thermal storages works very well for multi family buildings with very low energy demand (passive house standard).
- Comprehensive concept including PV modules lets increase the energetic independent of the buildings.

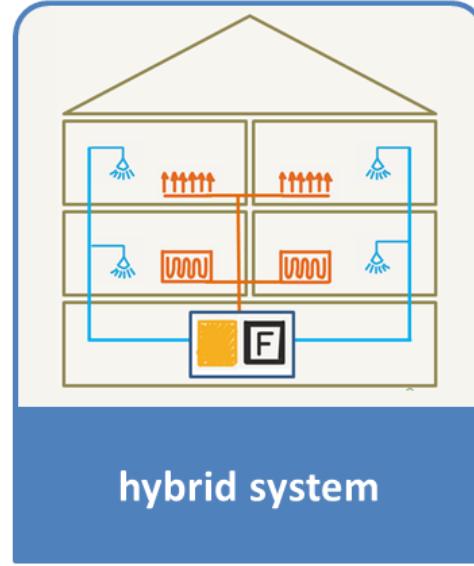
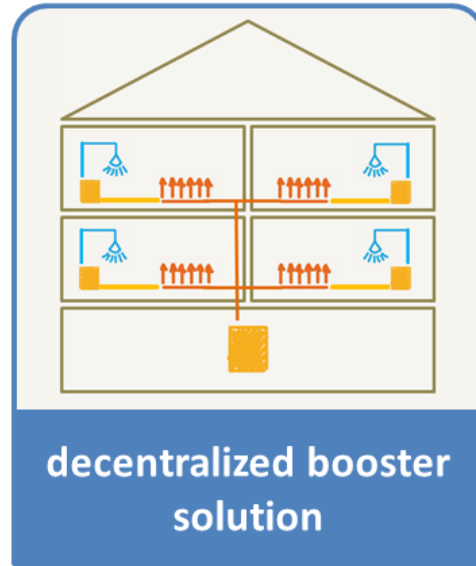
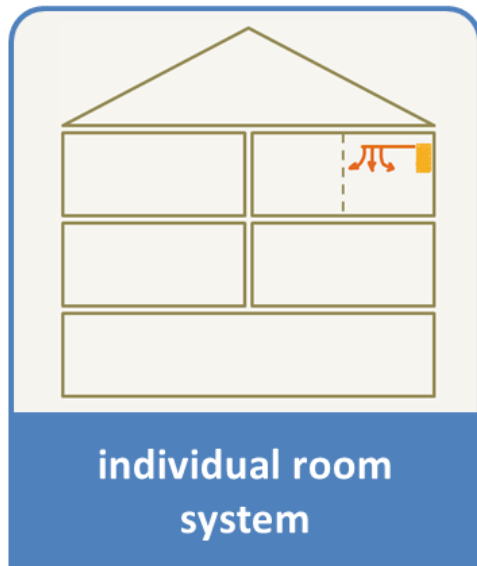
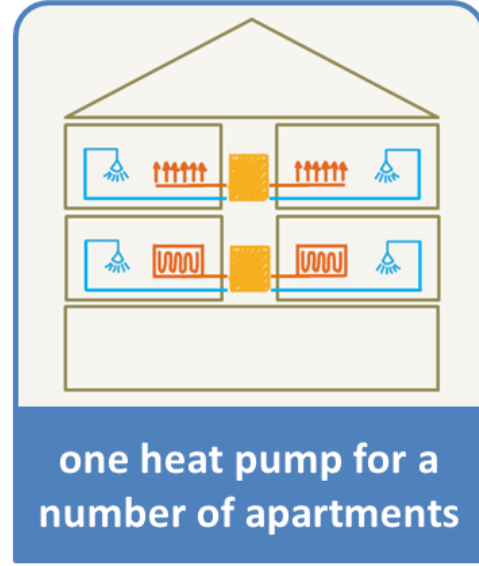
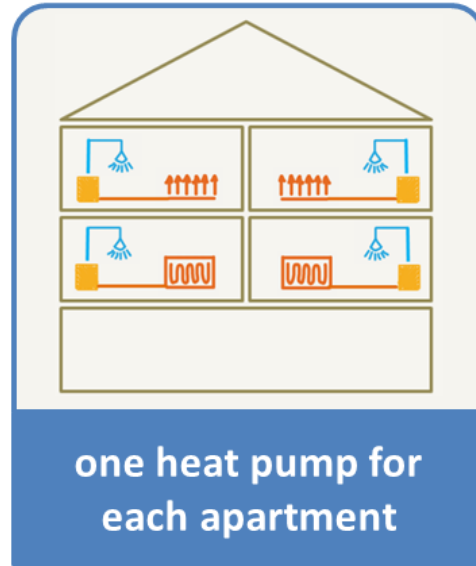
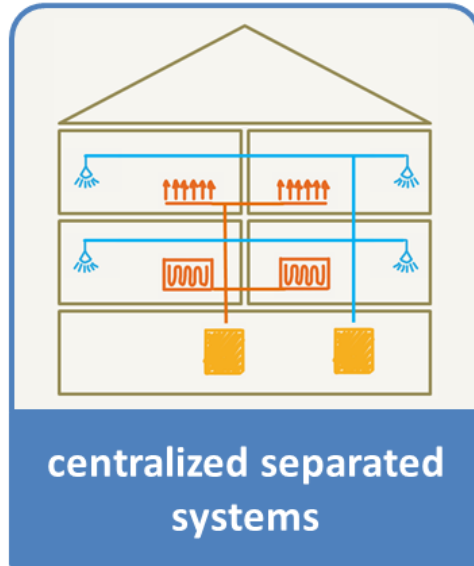
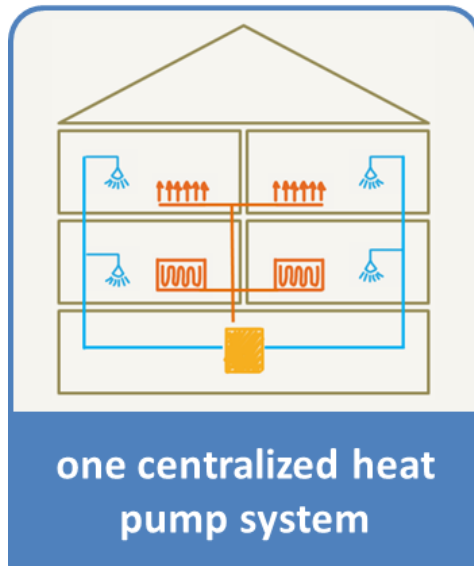
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konkrete
Praxisbeispiele

Klassifizierung der Lösungen – Anspruch auf Vollständigkeit...

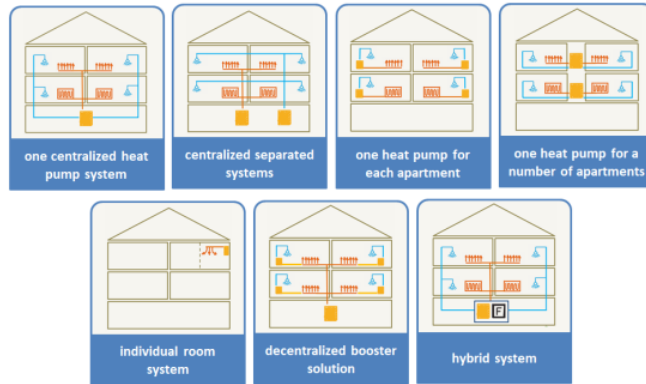






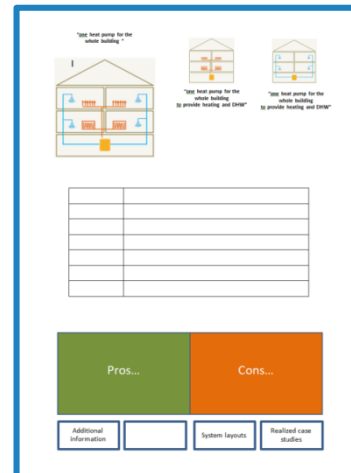
Klassifizierung der Lösungen „Matrix tool“

1



Übersicht
„Lösungsgruppe“

2



Beschreibung der
Konzepte

3

Best Practice Examples
Heat Pumps in Multi Family Buildings

Hot Ice Weis, Austria

The project is focused on the use of latent heat with two ice storages and heat pumps in combination with unglazed solar collectors and a PV system. It is designed as a pilot project for local heat supply.

Key facts

Building	Weis, Austria
Location	2025
Construction	2025
Heat distribution	under-floor heating
Heated area	857 m ² /floor
Level of insulation	very good

Heat pump and source

Number of installed power	2
Operation mode	monoenergetic
Heat source	ice storage + solar

Heating system

heat demand	35 °C
Heating temperature	35 °C

Domestic hot water

Type of system	central
Min. temperature	60 °C
Circulation system	yes

Other information

Electric energy consumption 2016	16650 kWh
Investments costs	unknown
PV installation	yes

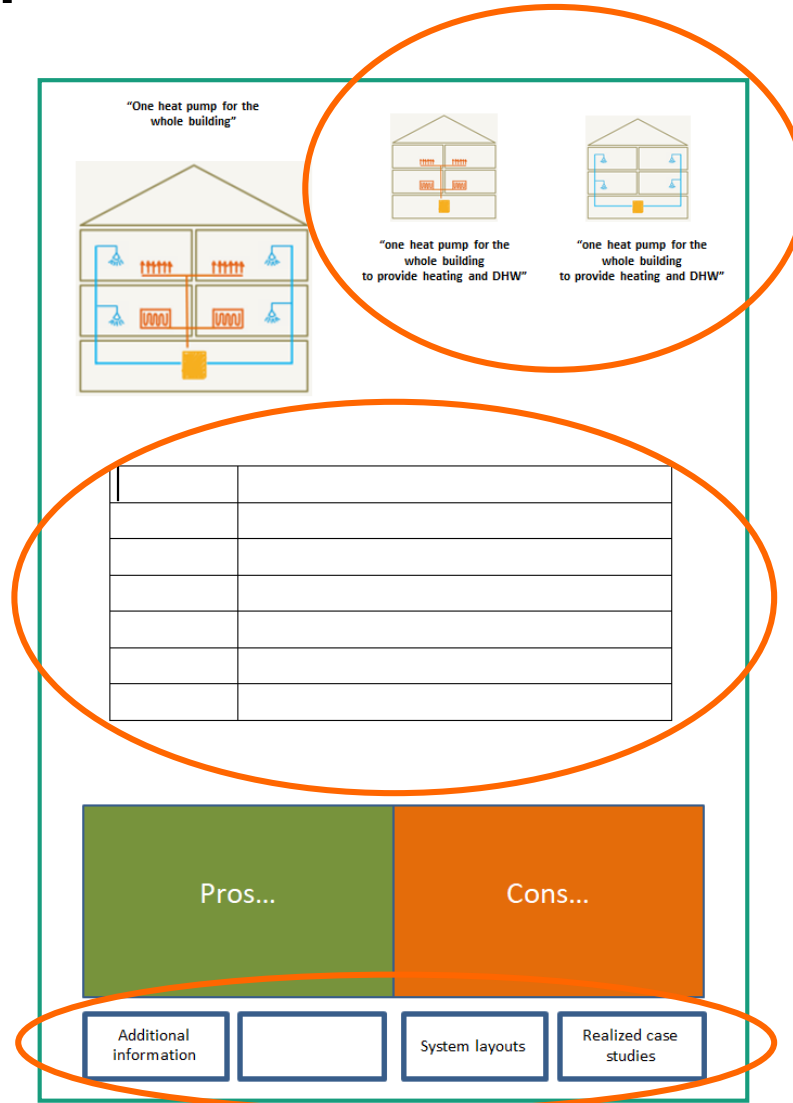
Lessons learned

- Use of innovative heat source - ice storage connected with solar thermal absorbers works very well for multi-family buildings with very low energy demand (passive house standard).
- Comprehensive concept including PV modules lets increase the energetic independent of the buildings.

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konkrete
Praxisbeispiele

Beschreibung der Konzepte



„family members“

description and “assessment”
of the system

additional information
and links

Case studies

<https://heatpumpingtechnologies.org/annex50/case-studies/>

CASE STUDIES

itere Informationen zum Erstellen eigener Karten.

Vereinigtes Königreich

Isle of Man

Dänemark

Polen

Deutschland

Frankreich

Italien

Hot Ice Weiz

Name
Hot Ice Weiz

Beschreibung
The project is focused on the use of latent heat with two ice storages and heat pumps in combination with unglazed solar collectors and a PV system. It is designed as a pilot project for local heat supply.
<https://heatpumpingtechnologies.org/annex50/hot-ice-weiz/>

Best Practice Examples
Heat Pumps in Multi Family Buildings

Annex 50

Hot Ice Weiz, Austria

The project focuses on the use of latent heat with two ice storages and heat pumps in combination with unglazed solar collectors and a PV system. It is designed as a pilot project for local heat supply.

Key facts

Building
Location Weiz, Austria
Construction 2015
Heat distribution underfloor heating
Heated area 957 m² living
Level of insulation very good

Heat pump and source
Number of 2
Installed power 6 kW + 30 kW
Operation mode monoenergetic
Heat source ice storage + solar

Heating system
Heat demand 2016/17 29390 kWh/a
Heating temperature 35 °C

Domestic hot water
Type of system central
Heat demand 2016/17 26200 kWh/a
Max. temperature 60 °C
Circulation system yes

Other information
Electric energy consumption 2016/17 16850 kWh
Investments costs unknown
PV installation yes

Lessons learned

- Use of innovative heat source - ice storage connected with solar thermal absorbers works very well for multi-family buildings with very low energy demand (passive house standard).
- Comprehensive concept including PV modules lets increase the energetic independence of the buildings.
- Quality of the system's control is crucial.
- Compared to design data increased heat demand due to increased room temperature & DHW consumption.

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Best Practice Examples
Heat Pumps in Multi Family Buildings

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Hot Ice Weiz, Austria, Technical details

Description of the technical concept

The heat provided from the solar collector can either be delivered to the ice storage via a heat exchanger or to the heat pumps. The heat pumps lift the heat to the desired temperature level. (Remark: Up to now, it is not possible to use heat from the solar collector directly to heat the DHW or the SH storages.)

Depending on the current heating requirement, one or two heat pumps are in operation. They always work in one mode (DHW or SH), with priority on DHW and ensure that the temperature in the storages remains within the desired range. If both heat sources (solar collector & ice storage) are not sufficient, it is possible to heat the two storages with auxiliary heaters (electrical heating rods).

During summer, this system can also be used for cooling. For this purpose, the ice storage is used directly as heat sink ("cold source") for "passive cooling", so that no chiller (reversible heat pump) is needed.

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Case studies

<https://heatpumpingtechnologies.org/annex50/case-studies/>

CASE STUDIES

Project in Geneva 2

Name
Project in Geneva 2

Beschreibung
The project in St. Julien, Geneva concerns the replacement of an existing oil heating system by a HP only solution in a multifamily building. With the goal of having the total heat production from HP origin, two air/water heat pumps were implemented on the rooftop. One of the previous fuel oil boilers was kept for back up.

Best Practice Examples
Heat Pumps in Multi Family Buildings

Annex 50

St-Julien, Geneva, Switzerland

This project concerns the replacement of an existing oil heating system by a HP only solution in a multifamily building. With the goal of having the total heat production from HP origin, two air/water heat pumps were implemented on the rooftop. One of the previous fuel oil boilers was kept for back up.

Key facts

Building	Geneva, Switzerland
Location	1972
Heated area	4'049 m ² living
Level of insulation	low (1972 standard)
Heat pump	ambient air
Number of HPs	2
Installed power	2 x 125 kW (A-7465)
Heating system	HP only
Operation mode	300 kW (back-up)
Existing oil boiler	
Heat demand	ongoing monitoring
Heating temperature	65 °C @ 70 °C ext
Heat distribution	radiators
Type of system	centralized
Max. temperature	60 °C
Circulation system	yes
Other information	
Consumption	ongoing monitoring
Investments costs	unknown
PV installation	no

Lessons learned

Ongoing monitoring, but so far:

- Major air HP constraints encountered: noise emissions, vibrations, safety, ... These implied important costs and planning work.
- Building's electrical connection had to be reinforced due to HPs massive absorbed power.
- Adjustment of rooftop infrastructure, including insulation, in order to withstand the compression forces of larger HP chassis.

This existing MFH (multi-family building), built in 1972 in Geneva, contains 53 apartments over eight floors. It suffered no major envelope retrofits before this project and the total oil consumption amounted to 700 MWh/yr (for space heating and domestic hot water of its 4'049m² of heated area). (Photo credit SIG, CSD Ingénieurs SA)

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Best Practice Examples
Heat Pumps in Multi Family Buildings

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St-Julien, Geneva, Switzerland, Technical Details

Hydraulic scheme of the system

Description of the technical concept

This project, part of a Geneva pilot program to replace fossil fuel boilers by heat pumps (HP) in MFH, concerns the replacement of a oil heating system by HP only heating system. For this purpose two 125 kW air/water heat pumps were implemented on the rooftop. As a back up, 300 kW oil boiler was maintained.

It should be mentioned that:

- The building rooftop was retrofitted before the HPs were installed. No other retrofit action was undertaken.
- The heat and DHW distribution system was not modified.

The two HPs work in turns, except when both are needed simultaneously. They provide the total heat for both space heating and domestic hot water.

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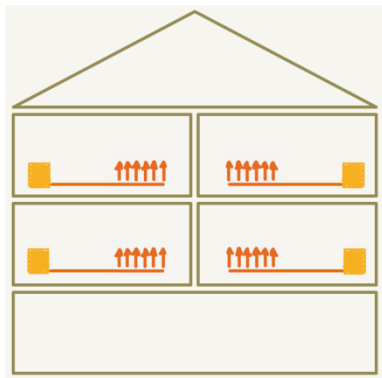
Vision – online tool “solution finder”

Building envelope	new	old	renovated
Type of system	central	decentralised	mix
mode	heating	DHW	Heating + DHW
medium	water	air	

Vision – online tool “solution finder”

Building envelope	new	old	renovated
Type of system	central	decentralised	mix
mode	heating	DHW	Heating + DHW
medium	water	air	

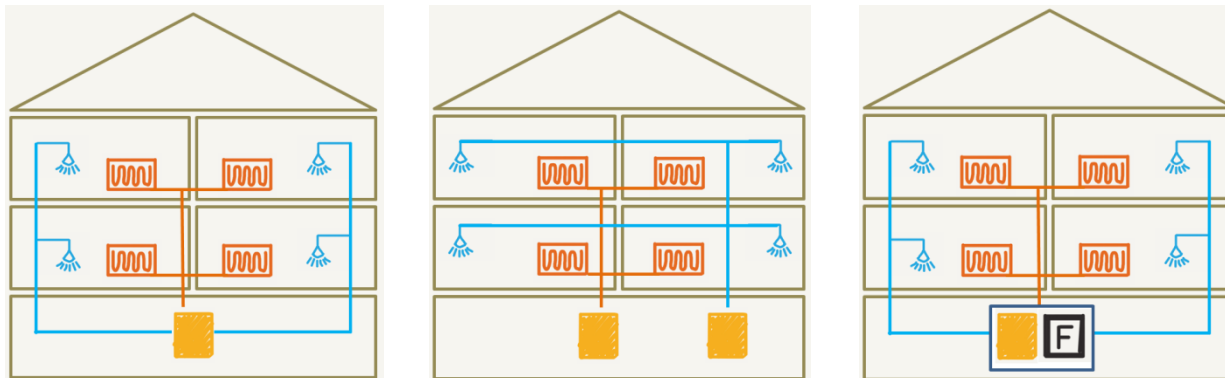
Suggested solutions:



Vision – online tool “solution finder”

Building envelope	new	old	renovated
Type of system	central	decentralised	mix
mode	heating	DHW	Heating + DHW
medium	water	air	

Suggested solutions:



Vielen Dank!

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