

Energetic optimisation of a terraced house in Ennetbaden

Initial situation

The property currently has a pellet-boiler heating system and a solar thermal system. The pellet-boiler heating system frequently cycles on and off, and the efficiency of the system is being questioned. Additionally, the solar thermal system requires extensive maintenance and can only operate during the summer months.

Current Energy Consumption

- Electrical Energy: 14'340 kWh/a
- Room Heating: 20'020 kWh/a
- Hot Water: 6'720 kWh/a

Aim of the project

In the upcoming years, a comprehensive renewal of the building technology is planned. As part of this, the pellet heating system is intended to be replaced by a new system, and a photovoltaic system will be installed on the building. The purchase of a second electric vehicle is also planned. Its impact will be investigated as well.

The project aims to investigate the energy supply and the correct dimensioning of the components and thus provide a basis for the implementation of the refurbishment of the building technology.

Six concepts were developed according to the best design for the building technology and recommendations were made for the following components:

- Photovoltaic system
- Heat source
- Hot water production
- Energy storage

Definition of six concepts

Six possible concepts for the future energy supply of the property were developed and subsequently evaluated.

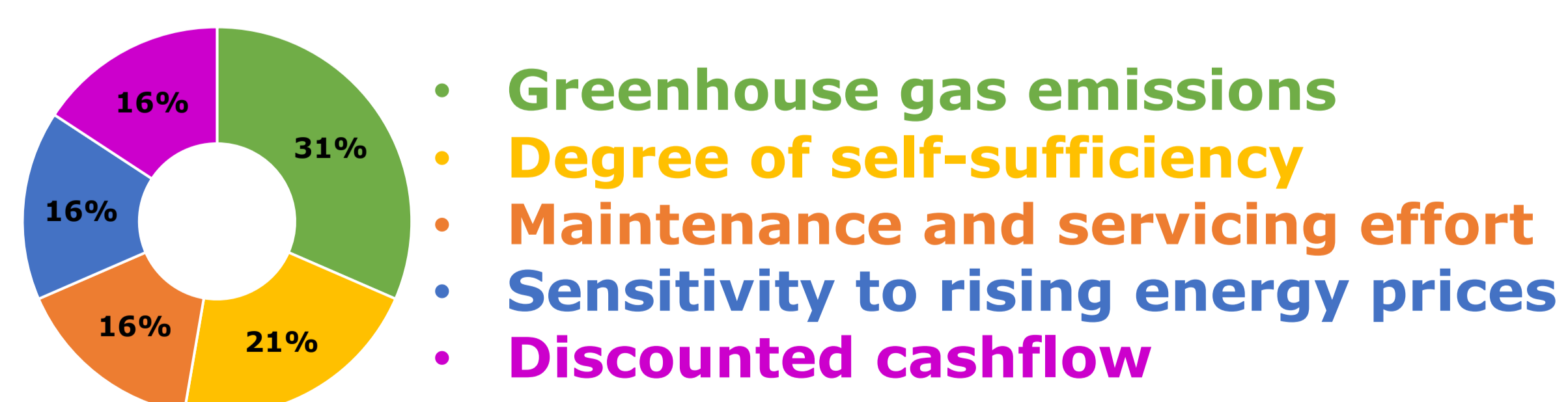
The concepts differ as follows:

Concept number	1	2	3	4	5	6
PV Power [kWp]	40.1	30.8	40.1	22.7	27.9	27.9
Heat source	HP	HP	HP	HP	HP	PB
Battery storage	Yes	Yes	No	Yes	No	No

Heat-Pump = HP, Pellet-Boiler = PB

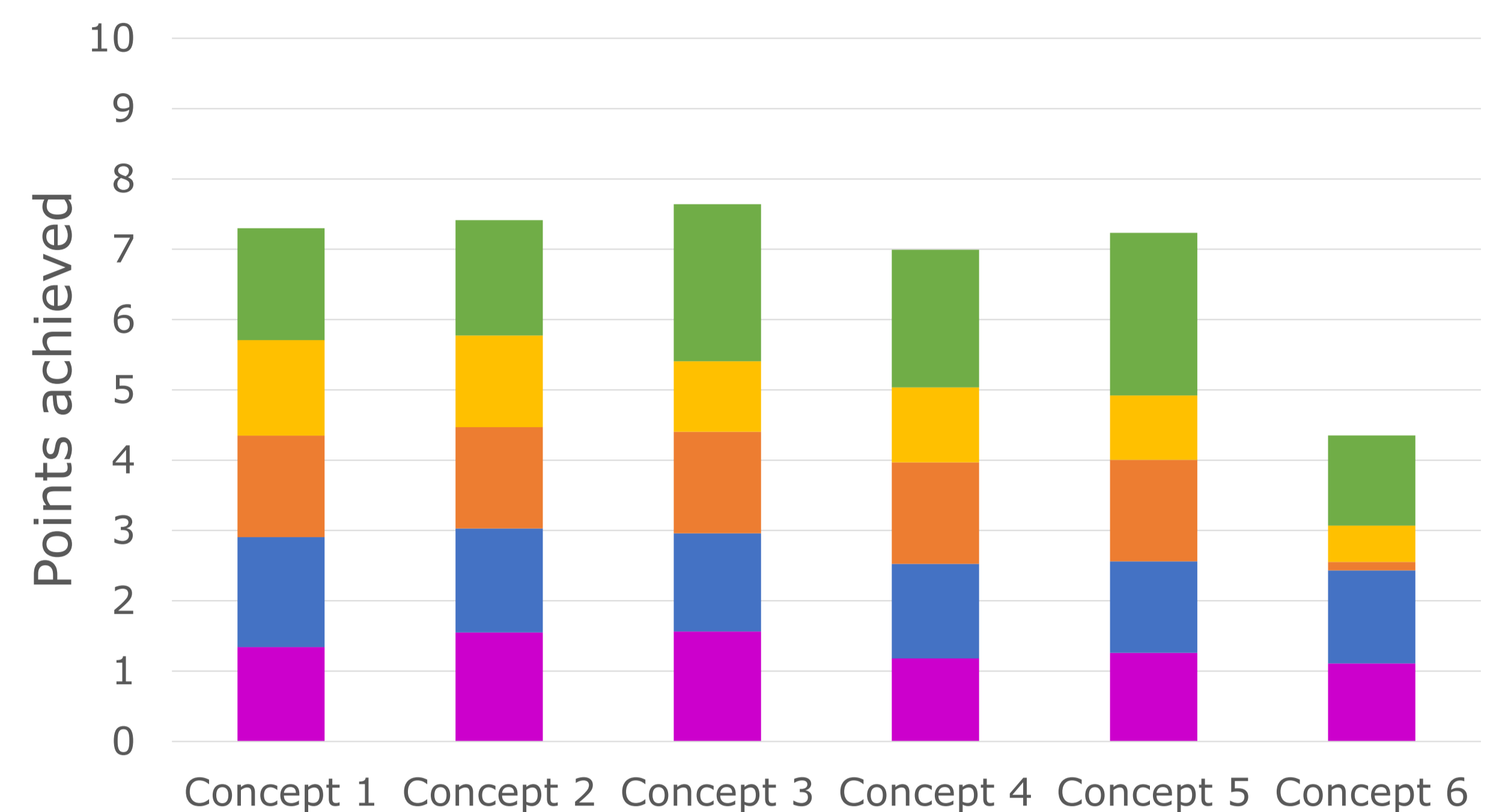
Criteria for the evaluation

Together with the client, the following criteria and their weighting in percent were defined for the utility analysis:



Result of the utility analysis

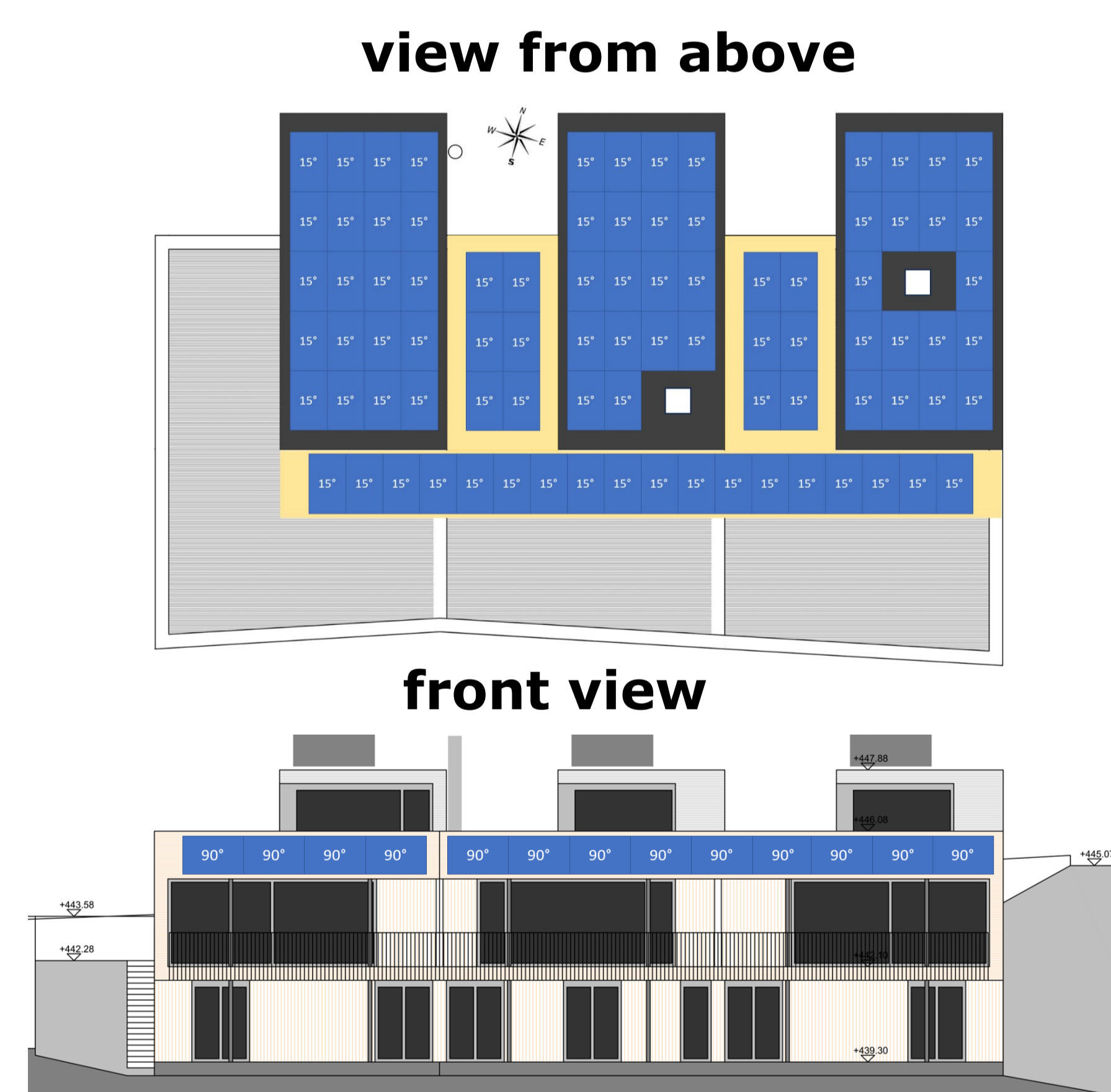
A maximum of 10 points can be achieved in the utility analysis. The defined concepts achieved the following scores in the analysis:



Recommendation

Despite the rather low degree of self-sufficiency, the evaluation shows that concept 3 is the most suitable for the client. Therefore, this concept is recommended for the renovation of the property. It consists of the following components:

- **Photovoltaic system with 40.1 kWp**
Roof panels (east) - 43 pcs.
Roof panels (west) - 43 pcs.
Facade panels (south) - 13 pcs.
- **Heat pump with 10 kW heating power**
- **Thermal energy storage with 3'000 litres**



Future energy situation

- Consumed from Photovoltaic: 11'617 kWh/a
- Feed to grid: 24'112 kWh/a
- Grid consumption: 13'752 kWh/a
- Greenhouse gas emissions: 1'009 kg CO₂-eq./a
- Discounted cashflow: CHF 178'277
- Degree of self-sufficiency: 45.8%
- Autonomy electric vehicle: 78.4%

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