Economic system analysis of anergy networks using the example of the Smart Anergy Quarter in Baden

Abstract of the technical final report of the research project SANBA[1] covering economic aspects

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Motivation and key issues

Anergy networks – are in the broad sense heating and cooling networks with operating temperatures close to the surrounding temperature – are seen as a possibility to benefit from the low temperature heat loss of trade and industry. Although several appropriate pilot and demonstration plants have been constructed in Europe over the last decade methodical approaches for a profitable evaluation of such systems have hardly been documented.

In the research project SANBA an interdisciplinary planning and analysis of an anergy network for the specific example case of the Martinek barracks in Baden close to Vienna and the neighbouring dairy NÖM AG, see *figure 1* is made. The Martinek barracks which are not used by the Austrian military anymore and which are under monumental protection are developed in SANBA into three different scenarios whereby the research work focusses on a system for the heat supply and refrigeration supply on the basis of an anergy network. The scenario MINI involves an exclusive renovation and further benefit of the monumentally protected existing building. The scenarios MIDI and MAXI further lead to a redensification of the quarters through newly constructed buildings. The profitability system analysis is here an integral part of the planning process.

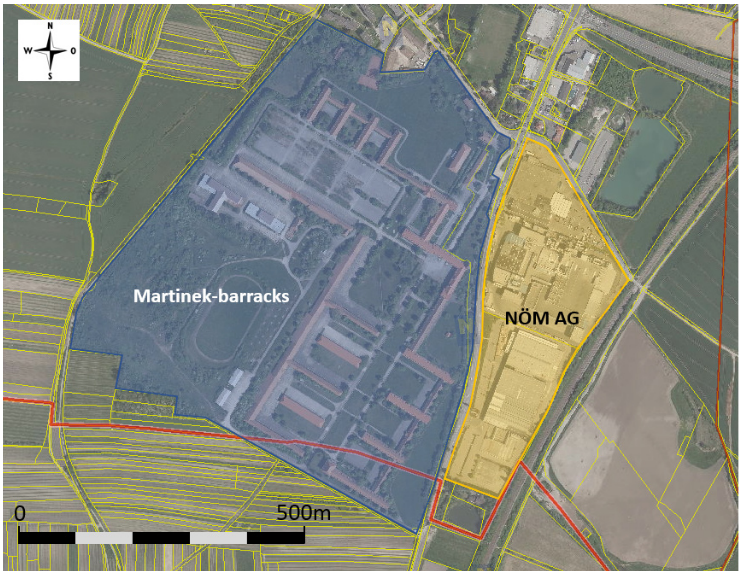

Figure 1: The investigated area consisting of the Martinek barracks in Baden close to Vienna as well as the company grounds of the NÖM AG: Source orthophoto: NÖ Webgisatlas, atlas.noe.gv.at.

Methodical approach

For the profitability analysis a top-down approach on the basis of network figures and a microdata-based bottom-up approach on the basis of the capital value method are compared whereby the analyses are always made for three defined scenarios. Technical and economic learning effects as well as scale

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effects are investigated in the bottom-up approach and the robustness of the system in regard to short-term and long-term failures of the anergy supply by the industry plant is addressed.

Results and conclusions

The achieved findings show a good convergence of the different methodical approaches and a great number of influencing factors on the profitability of the heat and cooling supply via anergy network. The network figures summarized in *table 1* from the top-down analysis correspond regarding their statement to the results from the dynamic profitability analysis of the bottom-up approach, *see figure 2*. In both cases the MINI scenario turns out to be economically not profitable whereas the scenarios MIDI and MAXI are economically promising.

Here the success factors are a sufficient density of thermal energy of the anergy network, a win-win-situation between anergy source and sink, the possibility of a seasonal compensation via geothermal probe fields, the benefit of scale effects in regard to system design and absolute network size, structural framework conditions for the network construction, appropriate tariff models for heating and cooling and many more.

Table 1: Network-figures for the three SANBA-scenarios

Figures in the SANBA-scenarios	MINI	MIDI	MAXI
Density of thermal energy [$MWh_{th}/(a*m_{route})$]	1,6	4,9	5,4
Density of thermal power [kW_{th}/m_{route}]	0,8	1,7	2,1

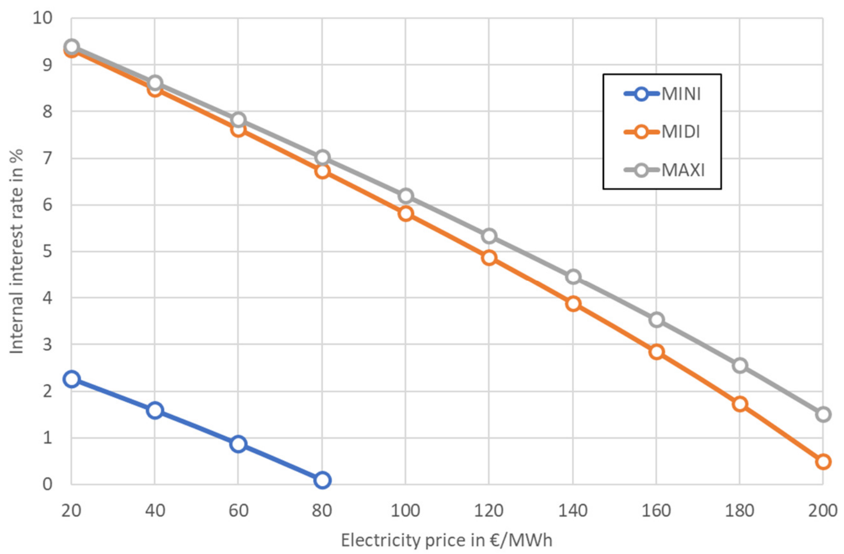

Figure 2: Internal interest rate depending on the electricity price. Source: ENFOS.

Apart from the savings of greenhouse gas emissions through a climate neutral heating and cooling supply the investigated system also stands out due to a high resilience which is hardly reflected in the profitability calculation. A short-term failure of the anergy source (days to weeks) can be compensated even with unfavourable weather conditions through an existing geothermal probe storage. For longer or permanent failures, a network interface for a temporary mobile provisional feed-in and a permanent upgrading with a central large heat pump are provided.