CASE STUDY

sympheny

Optimized energy concept for Insel-Holligen

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Year: 2023

Illustrations: Shutterstock

Introduction

EnergieWasser Bern (ewb) and Eicher+Pauli employed Sympheny software to develop an energy concept for the Insel-Holligen area in Bern, Switzerland, aiming to identify the most suitable technologies and renewable energy sources to meet future energy needs. Sympheny's algorithms helped identify a range of optimal energy supply solutions for the site, offering a trade-off between cost minimization and CO_2 emissions reduction.

Key facts

- Site: Insel-Holligen, Bern
- Total energy (heating & cooling) demand: 90'000 MWh, modelled as 6 energy hubs
- System highlights:

  District heating
  Heat pumps
  River water and Groundwater

What was achieved

- Optimal energy supply solutions
- Balance of economic and environmental performance
- Optimal sizing and locations of conversion

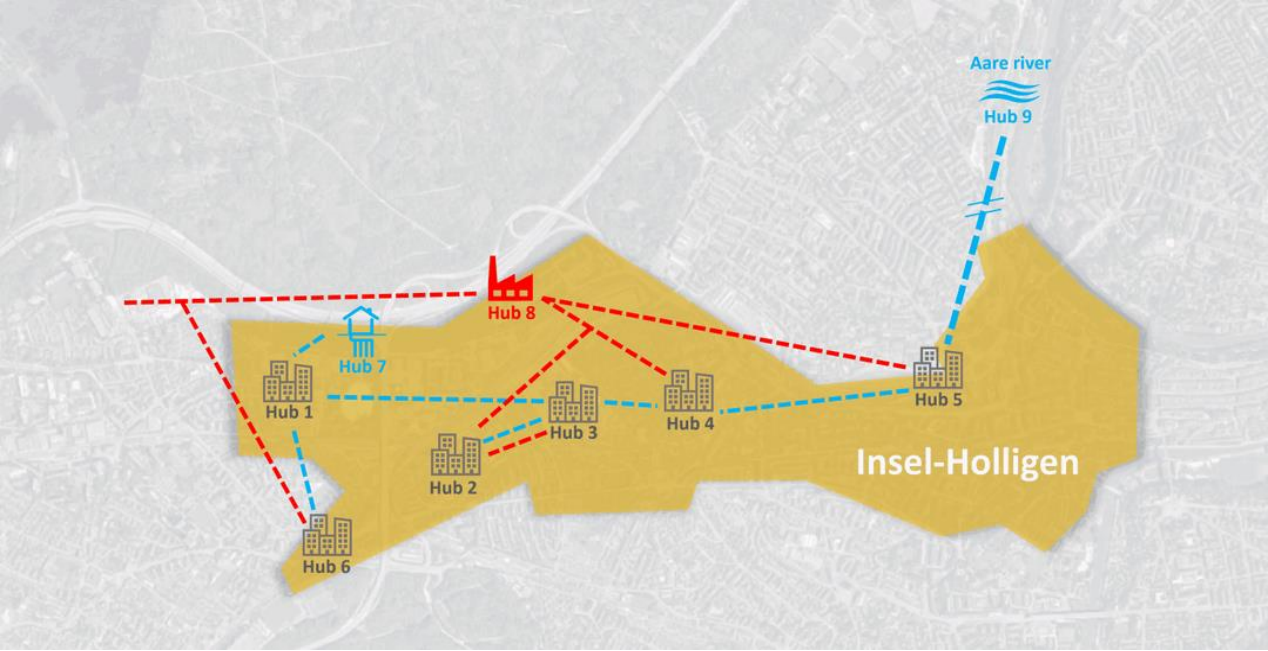
Framing the Opportunity

In mid-2020, Energie Wasser Bern and Eicher+Pauli used the Sympheny software to support the development of a new energy concept for the Insel-Holligen area of Bern, Switzerland. The goal was to determine which technologies and which renewable energy sources would be best suited to provide for the future energy demands of the site. Through the site's proximity to the river Aare, the suitability of a low-temperature thermal network supplied by groundwater and/or river water was of central interest. The seasonal constraints on groundwater and river water use - to ensure a sustainable use of these resources - needed to be accounted for. The complexity of such an analysis combined with the ambition of having an optimal and reliable solution led the customer to Sympheny. Rather than using a more time-intensive spreadsheet approach, they wanted to take advantage of the much faster digitalization and optimization opportunities offered by Sympheny.

The story of ewb and Eicher+Pauli

Energie Wasser Bern was created in 2002 through the merger of the city of Bern's electricity company and the city's gas, water and district heating supply.

Eicher+Pauli were founded in 1986 and are a full-service provider in the areas of energy and sustainability.
Their projects benefit from the possibilities of using digital methods and devices in construction planning.



Site map with hubs and river highlighted.

Features of Sympheny's analysis

For the creation of the energy model, the site of Insel-Holligen was divided into 6 areas. Each of these areas was modelled as a separate energy hub (or energy subsystem). In the model, they were linked to each other via the existing and candidate infrastructure (in this case the low temperature network) as depicted in Figure 1. The demand, possible energy sources and energy technologies were provided by the energy planners through a set of inputs. These included for each hub: the heating and cooling energy demand profiles at different temperature levels and a set of candidate energy supply technologies (see Figure 2).

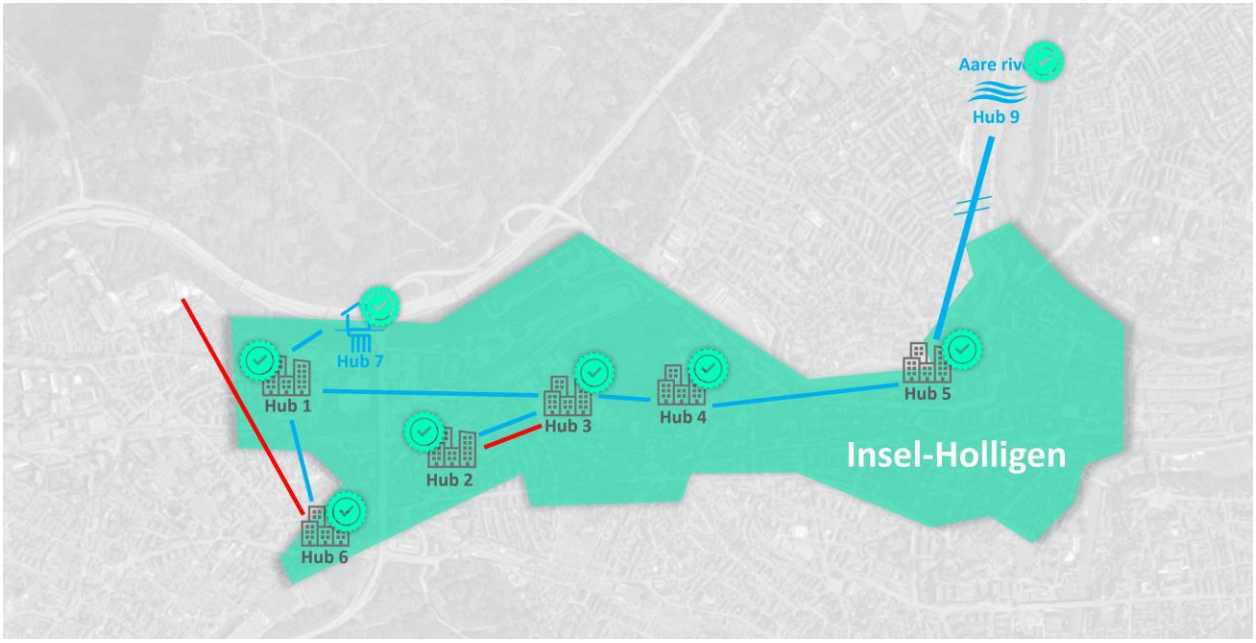


Figure 1

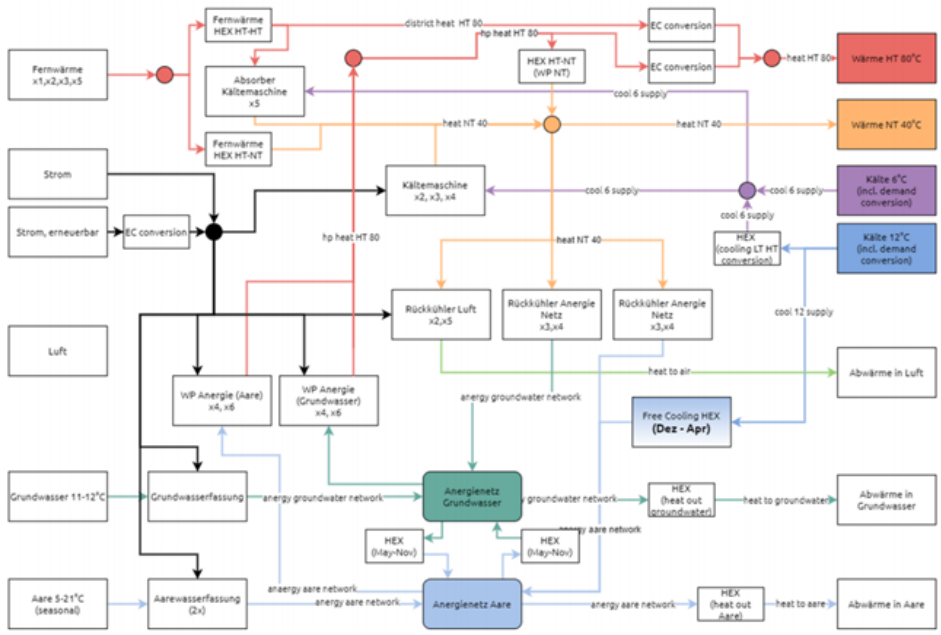


Figure 2

sympheny

The Result

Using Sympheny's algorithms, a menu of optimal energy supply solutions for the site was identified, ranging from a cost-minimizing solution to a CO_2-emissions minimizing solution. These solutions are combinations of supply technology candidates and thermal network connections offering the best balance of economic and environmental performance (solutions on the pareto front). Besides finding the optimal energy systems' set, Sympheny provided the planners with optimal sizing and locations of conversion and thermal network components to be installed, through the algorithm's hourly energy balance resolution.

Additionally, a sensitivity analysis was carried out to assess the effects of more than 30 different future energy prices and energy demand scenarios on the economic performance of the optimal system. The insights from Sympheny's software enabled ewb and Eicher+Pauli to quickly and confidently develop an optimized energy supply concept for Insel-Holligen.

"Sympheny supports our strategic energy planning in an ideal way. The flexibility is extremely convincing and the sensitivity analysis provides security in finding solutions."

Andreas Wirz
CEO, EicherPauli

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