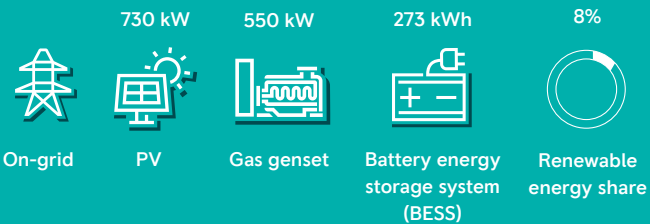




## Microgrid use case | Germany Shopping center

### Configuration for lowest energy costs



### Benefits: microgrid vs. conventional

#### CAPEX (in € millions)



#### OPEX (in € thousands/p.a.)



Cost of electricity (CoE) (€/kWh)

5 Years  
Break even compared to initial costs (2021)

# REDUCING ENERGY COSTS AND EMISSIONS AT A GERMAN SHOPPING CENTER

A microgrid solution can reduce the costs of power and heating by 57%

#### Executive summary

Shopping centers have high electricity and heating demands. As a result, energy consumption makes up a large part of their operating expenses. However, as the following case study illustrates, a microgrid solution that integrates the combined heat and power (CHP) of a gas generator set with a photovoltaic (PV) and a battery energy storage system (BESS) can help shopping center owners reduce their overall energy costs by 57%.

**Who:** Shopping mall owner

**Where:** Germany

**Why:** For businesses dependent on high on-grid electricity and heating costs, a microgrid solution that utilizes combined heat and power (CHP) provided by a gas genset together with solar panels and a battery energy storage system (BESS) offers excellent opportunities for substantial savings.

**Main benefits:**

- Energy cost optimization
- Resilience through grid independence

# OPTIMIZING ENERGY COSTS WITH MICROGRIDS

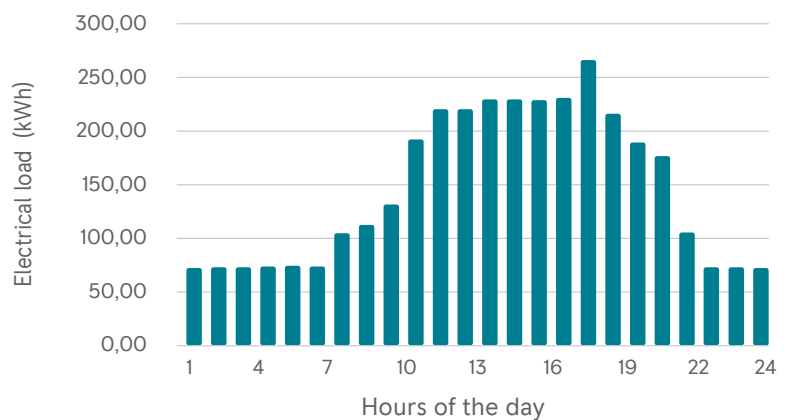
To illustrate the savings potential of a microgrid solution for shopping centers, we created a business case calculation for a facility in Germany using HOMER GRID™ simulation software.

## Microgrid solutions are ideally suited for facilities with high power and heating demands

Low electricity costs are crucial for shopping center profitability. Power supply reliability is also essential for smooth daily business operations. Power outages can lead to an immediate revenue loss, often with other negative consequences such as spoiled refrigerated goods. This microgrid solution is ideally suited for reducing energy costs and improving the carbon footprint by efficiently combining cooling, heat and power from a gas genset with rooftop photovoltaic (PV) panels.

Typical daily load profile

Annual electricity demand: 1.4 GWh  
Annual heat demand: 2.9 GWh



## Initial situation

A medium-sized shopping center powered by the local grid and heated with a gas-fired boiler.

Grid power: 100%



— electricity connection  
— thermal connection

### Levelized cost of energy\*

€ 0,245 per kWh

### Costs per year:

€ 406k per year

## Reduced energy costs with microgrids

**-42%**  
OPEX

The cogeneration of heat and electricity from a gas-powered genset in combination with solar panels enables shopping centers to operate 100% autonomously and reduce operating expenses by 57%. Integrating a battery energy storage system (BESS) stabilizes the load. The grid connection is only used for backup.

Grid power: 0%  
CHP: 550 kW

BESS: 270 kWh / 135 kW  
PV: 730 kWp



### Levelized cost of energy\*

€ 0,138 per kWh

### Costs per year:

€ 173k

### Savings per year:

€ 233k

\* LCOE (Levelized Cost of Energy) - the average, discounted cost of electricity (including CAPEX, OPEX, inflation, discounted at 8%) over 20 years

# RESULTS OF THE USE CASE

As the use case illustrated, a microgrid solution with a gas-powered genset offers several benefits for shopping centers still relying on conventional power from the grid and heat from a gas-fired boiler.

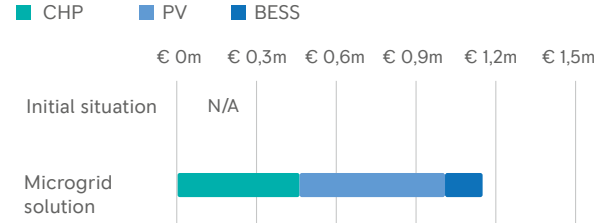
## Investing in a microgrid solution

### Microgrid setup

A microgrid solution combines solar panels covering most of the rooftop surface of a building with the cogeneration of heat and electricity supplied by a gas generator set. Additionally, a small battery energy storage system is used to stabilize the load and ensure smooth operations.

Total investment: € 1,15m

### CAPEX (in m€/p.a.)



## Initial situation

### Saving on grid consumption charges

In the initial situation, the shopping center draws electricity from the local utility company at a cost of € 0.22 per kWh. Additionally, there is a demand charge of € 120 per kW per year. It also purchases gas-generated heat for € 0.28 per m<sup>3</sup>.

Total operating costs: € 406k per year

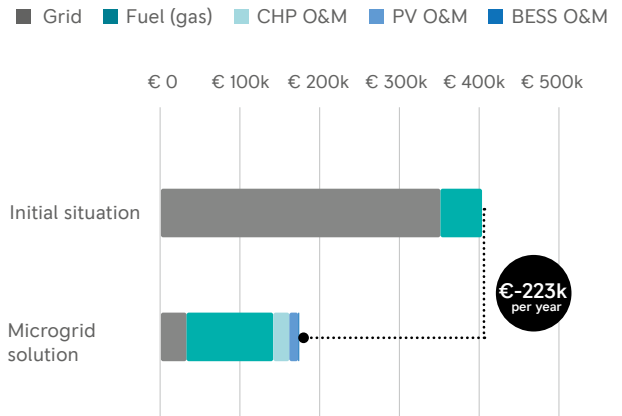
### Microgrid case

With the microgrid case, the shopping center is self-sufficient. The only on-grid costs are fees for the backup grid connection, amounting to € 66 per kW of contracted backup power. Other than that, there are only maintenance costs for the genset, rooftop solar panels and the battery energy storage system (BESS) as well as gas consumption costs. These are nearly double with the conventional case.

Total operating costs: € 173k per year

Total savings: € 233k per year

### OPEX (in k€/p.a.)

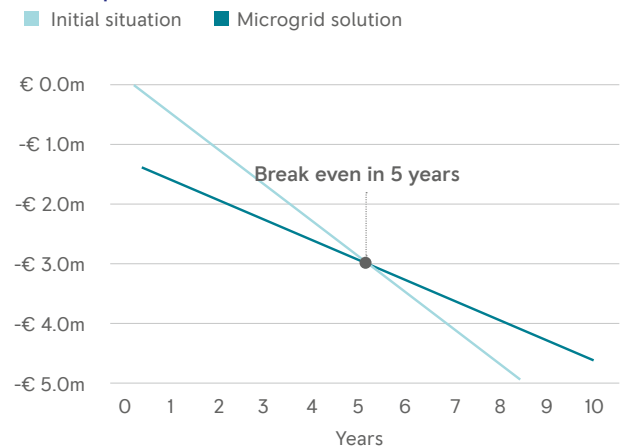


## Payback period

Although a microgrid solution is a significant investment, the savings make up for it within 5 years. With the life expectancy for the components estimated at around 20 years, a microgrid offers significant savings over the entire lifetime.

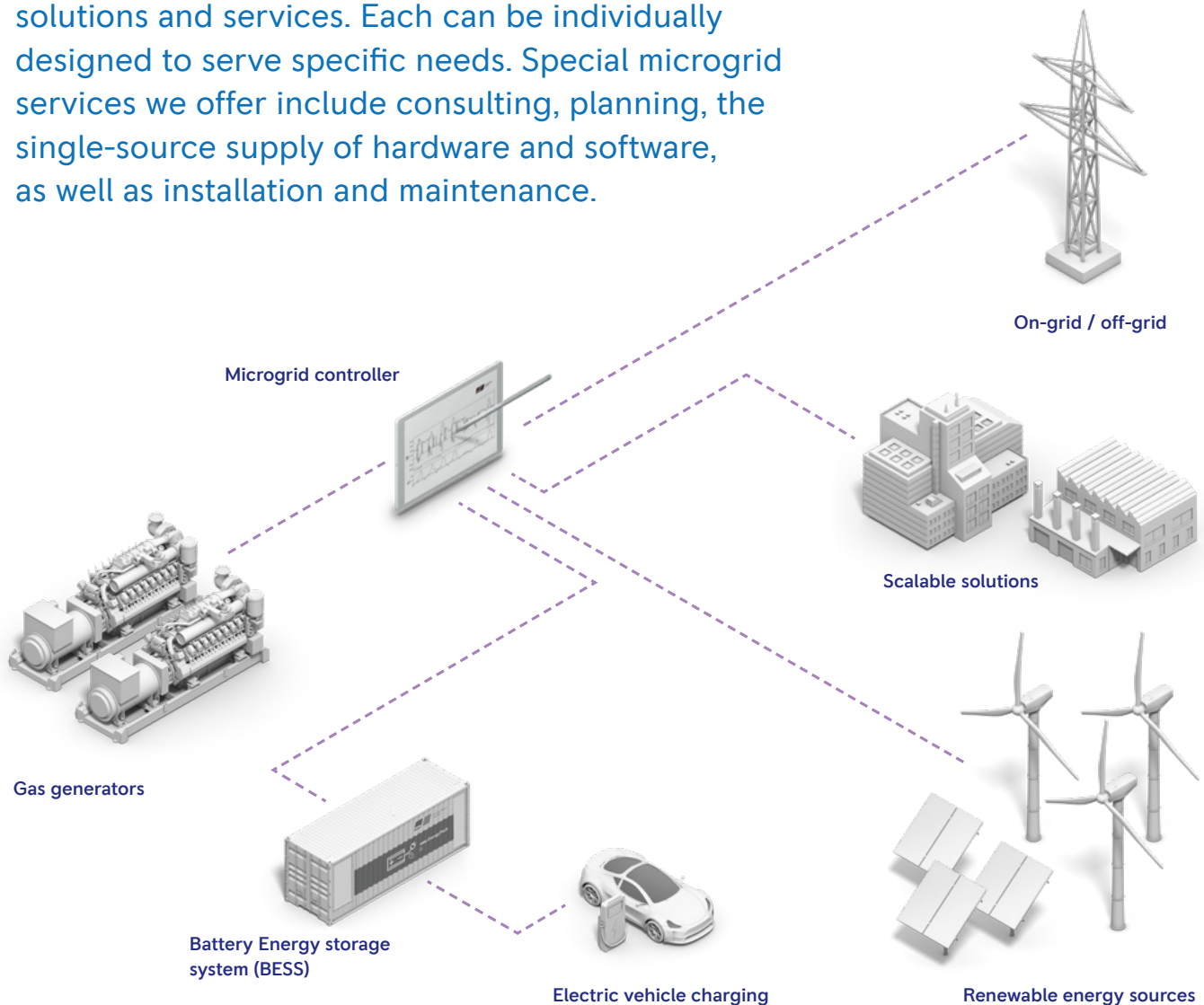
The payback period is 5 years.

### Cost comparison



# MICROGRID SERVICES, SYSTEM INTEGRATION AND SMART CONTROL

Our microgrid systems offer a wide variety of solutions and services. Each can be individually designed to serve specific needs. Special microgrid services we offer include consulting, planning, the single-source supply of hardware and software, as well as installation and maintenance.



## Start saving costs with microgrids

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