Summary of rooftop solar analysis

Location: Frankfurt, Germany **Date of analysis**: Dec/2023

***Recommendation**: Install 22 solar panels (43.96 m^2), for a net present value of EUR 3562, with a payback period of 15.9 years.*

Main economic results

Financing	NPV (EUR)	Payback (years)	IRR (%/year)	LCOE (EUR/kWh)
Gov. subsidies and 75% bank debt	3562	15.9	6.08	0.103
Gov. subsidies and 100% equity	3743	14.0	5.08	0.102
No gov. subsidies and 75% bank debt	(2158)	22.5	1.42	0.108
No gov. subsidies and 100% equity	(965)	19.1	2.52	0.102

(The data above refers to a PV system consisting of 22 panels)

Additional results

A PV system of 22 panels, together with a battery of 9.6 kWh, requires an initial investment of EUR 19866, but provides an NPV of EUR 9972, with a payback period of 13 years. The NPV amounts to EUR 14044 if the household has a heat pump installed, as the annual electricity consumption is significantly higher. The most favorable scenario is the combination of heat pump and battery with an NPV of EUR 20778 and payback period of 10 years. However, the model remains highly sensitive to critical input variables such as initial gross investment, electricity buy price, lifetime of the PV system and annual electricity consumption.

Main inputs and assumptions

Household and Economics

Electricity Consumption	4500	kWh/year	Inflation	1.93%	p.a.
Electricity price – buy	0.38	EUR/kWh	Bank loan interest rate	3.35%	p.a.
Electricity price – sell	0.082	EUR/kWh	Bank loan maturity	10	years
			Equity cost of capital	3.05%	p.a.

PV panels

Peak power	425	W/panel	System losses	13.5%	of output
Panel area	2	m^2/panel	Degradation with age	0.5%	p.a.
Useful life	25	Years	Maintenance costs	2%	p.a.
			Total cost of optimal installation size	15477	EUR

Government subsidies

Under the German Renewable Energies Sources Act (German: Erneuerbare-Energien-Gesetz), a fixed feed-in tariff of 0.082 EUR/kWh is guaranteed during the first 20 years. For a maturity of 10 years, a local interest rate subsidy of 1.00% p.a. is granted from funds of the state of Hesse, resulting in an effective interest rate of 3.35%.

Some PV panel suppliers

- https://www.zolar.de/
- https://www.calosol.de/
- https://klarsolar.de/

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