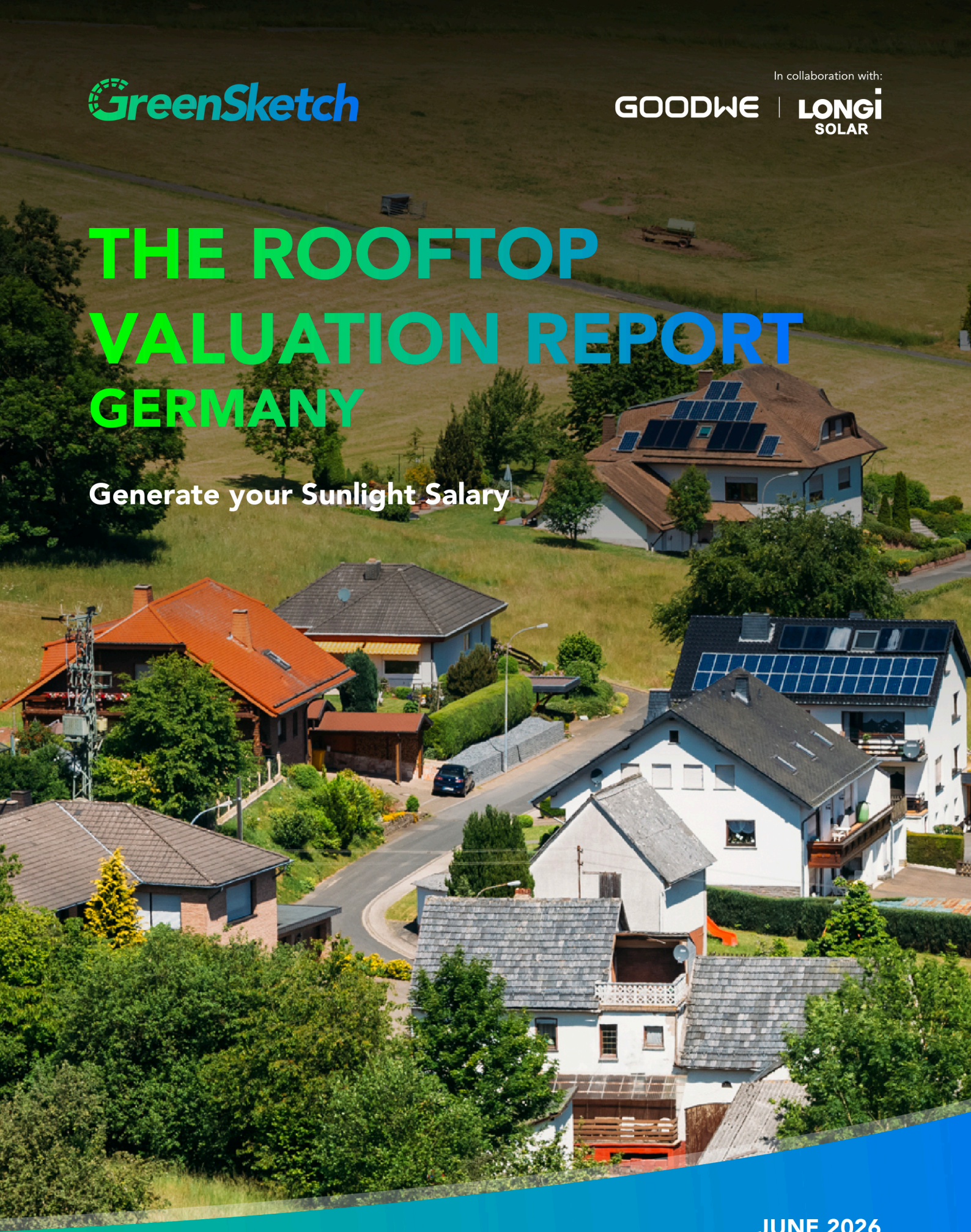
GreenSketch

In collaboration with:

GOODWE | LONGi SOLAR

THE ROOFTOP VALUATION REPORT GERMANY

Generate your Sunlight Salary



JUNE 2026

FROM DISTRIBUTED INFRASTRUCTURE TO NATIONAL SAVINGS

Discover the value of your rooftop and see how sunlight can turn into real household income.



GreenSketch

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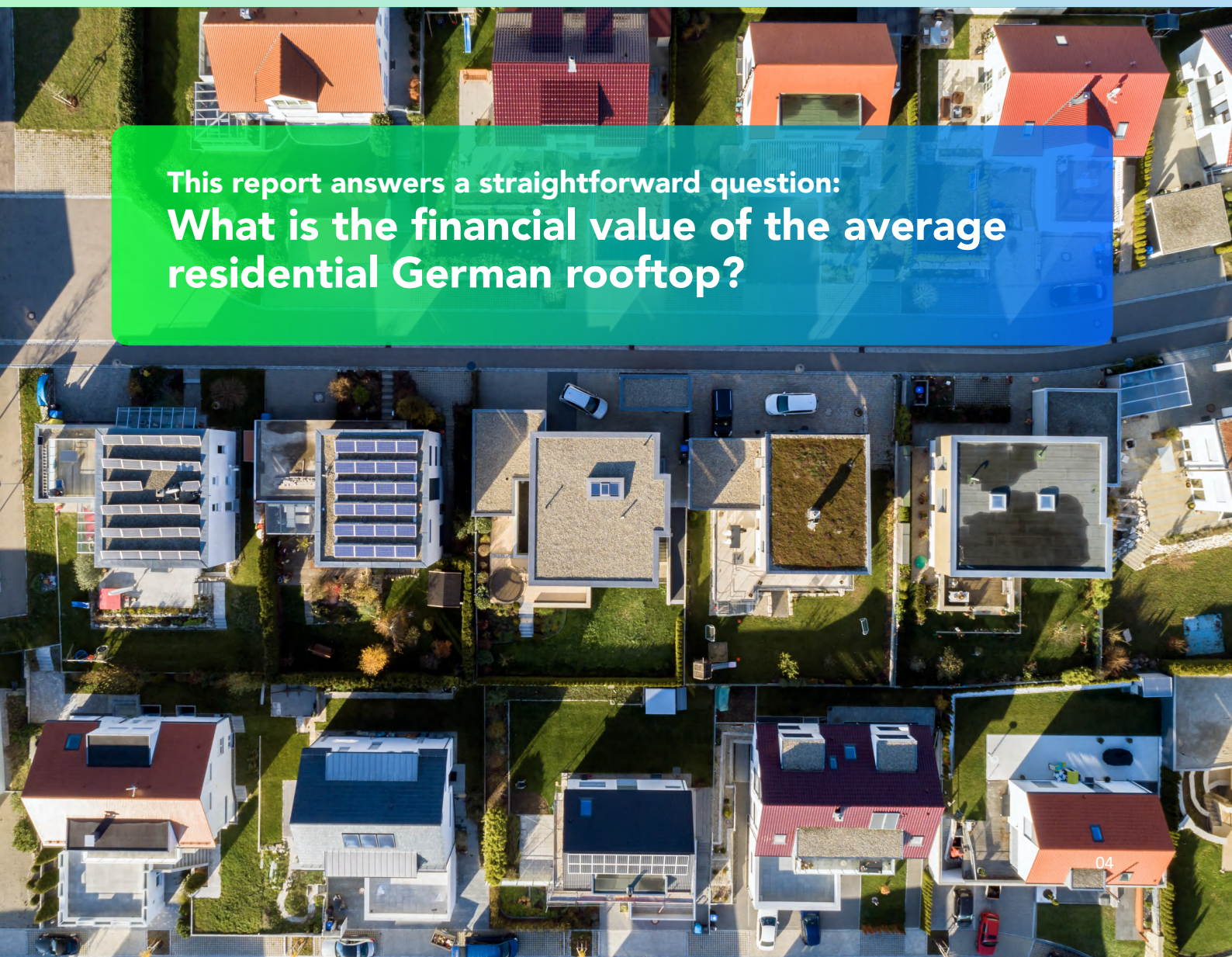
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EXECUTIVE SUMMARY

Germany has long set the benchmark for solar energy ambition globally. With industry maturing in a phase of downturn and a planned revamp of its energy system ("*Energiewende*") underway, the next chapter of its solar story is being written. Germany's rooftops have the potential to move from the background to lead player. With only 4.1 million homes having a rooftop solar system installed[1] as of 2025, much of the distributed energy and household savings afforded by generating and consuming their own energy remains untapped.



This report answers a straightforward question:

What is the financial value of the average residential German rooftop?

Germany's Sunlight Salary

Using Emily, GreenSketch's AI agent, we assessed over 28 million homes across 401 districts and independent cities, modelling the solar potential and projected returns on an optimised rooftop solar and battery system at each address individually. We found an estimated:

€45.43 billion
total annual value of German rooftops in electricity savings.

€1,620
average annual savings for a German home.

€3,744
average returns after 10 years.

€19,030
average returns after 20 years.

8.44 years
average payback period.

11.5%
average Internal Rate of Return (IRR).

Geography is the single most important determinant of rooftop value. South Germany, led by Bavaria and Baden Württemberg, outperforms every other geographical region across all five key metrics (average annual savings, payback period, IRR, returns after 10 and 20 years) based on modelled data. Bavaria's average payback period is approximately 8.00 years, almost half a year faster than the national average, while its estimated 20-year returns of €20,504 exceed the lowest performing northern state Hamburg (€15,291) by more than €5,000.

City states and dense urban areas also consistently perform lower, with Berlin ranking last across every metric. All top performing districts are located in South Germany, while majority of the lowest-performing districts are in North Germany.

A distributed, decentralised energy infrastructure

Even as fixed feed-in tariffs look set to be abolished, the financial case for rooftop solar has never been clearer. Every kilowatt-hour generated and consumed on-site is rising in value. Combined with storage, heat pumps, an electrical vehicle and home energy management systems, households can raise their self-consumption rates dramatically and accelerate payback while improving energy security. The result goes beyond utility bill reductions: it represents a step-change in how households interact with and benefit from Germany's energy system.

Germany's rooftops are already seen as a key part of its energy transition. This report makes the case for positioning it as distributed, decentralised energy infrastructure and a measurable financial asset class, by providing the data and coherence needed to bring the opportunity to light. This source of clean energy falling above our heads deserves to be properly valued and invested in by homeowners and policymakers alike. Supported by market-sensitive platforms like GreenSketch and empowered by data on the potential total value of the nation's roofs, Germany's renewable energy future could once again chart the course for the rest of the world.

This report makes it clear: the opportunity is already there.



INTRODUCTION

Germany's Rooftops as Distributed Energy Infrastructure

Germany's solar story is one of early promise and for many other countries, ripe with lessons on planning and managing the energy transition. From 2004–2014, it led the world in total installed solar energy capacity,[2] and in 2009, was hailed as the "world's first major renewable energy economy".[3] With a right combination of strategic investments, leading technology and strong government support,[4] Germany is now widely considered as a world leader in solar energy.

Germany's early leads in global adoption have since grown into a phase of maturation and downturn, particularly in the residential sector.[5] Its first-mover position also comes with challenges and drawbacks: from higher risks, greater exposure to unknown variables, to limited insights to learn (and avoid) from other jurisdictions, as observers and academics have begun elucidating.[6,7] For instance, policy and infrastructure have not moved in lock-step: while Germany has accelerated transition, boasting a market with a high generation capacity where negative electricity costs are not unusual,[8] the flipside to its oversupply is that grid expansion and transmission has not kept at pace with generation. In September 2025, Minister for Economic Affairs and Energy Katherina Reiche presented a "reality check" report on the energy transition,[9] which signalled slower demand growth to focus on overall grid and system costs. As of May 2026, plans to end subsidies for rooftop solar installations,[10] or systems with an installed capacity of up to 25 kilowatts, are reportedly underway.

Germany has one of the largest residential rooftop markets in Europe. At the end of 2025, there were approximately 4.1 million rooftop solar systems installed across the country,[11] accounting for around 38% of the 104GW of installed solar capacity[12] in Germany. Studies also suggest that rooftop solar could account for up to 28% of the added capacity needed[13] to meet Germany's 2030 climate targets. However, in-line with policy shifts and declining demand, 2025 saw a 25% decline in new private rooftop installations.[14]

With industry stagnating and policy support being less favourable for new entrants, what impetus do homeowners have to install rooftop solar and batteries? What role can homeowners and household rooftop solar and battery systems play in the energy transition?

Against this backdrop, our report makes the case for **reframing rooftops as a distributed, decentralised energy infrastructure and financial asset class.**

We explore:

1. ***The financial value and potential of rooftops across Germany if all suitable homes adopted solar and storage solutions;***
2. ***The measurable returns of solar generation paired with a battery for each household; and***
3. ***The outlook beyond private homes.***

Key Takeaways

1. Rooftop solar returns are widely achievable

Our data modelling indicates that the majority of German homes still have the potential to generate meaningful income and savings from solar generation. As a nation, the 28 million rooftops analysed are collectively worth an estimated **€45.43** billion annually in electricity savings, assuming an optimised solar and battery system and even without subsidies factored in. Households may save an estimated average **€1,620** a year depending on location, and up to **€1,759** in the highest performing district (see page 10 for a more detailed explanation of how we calculated these figures).

2. The value of a rooftop solar and battery system compounds over time

Installing rooftop solar and a home battery is just the first step toward a secure energy and financial future. The returns for German homeowners may significantly increase over time, with estimated national totals of **€105 billion** over 10 years and increasing more than seven-fold by 20 years at an estimated **€533.7 billion**. For the average home, this represents an estimated **€3,744** after 10 years and **€19,030** after 20 years, after factoring upfront investment costs. As Germany moves away from fixed feed-in subsidies toward a more market-oriented energy system, the value of self-generated solar electricity—especially when stored and used on-site—is likely to keep growing.

3. Location, location, location

There is a clear reason why the cliché rings true: a pronounced north-south performance divide defines Germany's rooftop solar landscape. South Germany (Bavaria in particular) leads across all five key metrics (annual bill savings; payback period; Internal Rate of Return (IRR); 10- and 20-year returns), with its estimated average 20-year returns approximately €6,000 higher than Berlin's and a payback period that is around two years shorter. At the district level, the top performers are concentrated in the Allgäu and Upper Bavaria regions, and lowest-performing districts being northern coastal regions and city-states such as Berlin and Hamburg. However, regardless of performance, all districts and states still have the potential to generate meaningful long-term returns, demonstrating the investment value of solar across Germany.

RETURNS ON RESIDENTIAL ROOFTOPS IN GERMANY

The roofs above our heads represent more than shelter. They are a national, distributed and decentralised energy infrastructure asset that is increasingly seen as a critical resource and deserve to be properly valued.

For many, the decision to adopt solar is not purely out of environmental considerations; particularly with energy crises affecting Europe since 2022 driven by a combination of geopolitical disruption and market factors, it is an economic and security-led imperative. The value of self-generated electricity is increasing, especially with high prices, feed-in tariffs reduced in 2025,[15] talks of potentially abolishing support,[16] rising concerns around energy security, and greater adoption of electric vehicles (EVs) and heat pumps. A recent study[17] also found that financial considerations, including investment costs, were the most important factor influencing German homeowners' decision to adopt solar. **This report therefore sets out to establish the full financial potential of the German domestic rooftop solar market** (if an optimal solar and battery system was installed on all homes) and the **financial returns German homeowners may achieve.**

Our Methodology

GreenSketch, a full-stack, AI-driven solar industry ecosystem platform, is the world's first free, end-to-end solar and battery design platform. At the heart of our technology is **Emily**, an AI agent designed to deliver near-instant rooftop solar and financial assessments, enabling solar and battery design and rooftop valuation—thus quantifying the value of a roof based on its solar potential in real time.

Emily generates solar and energy storage configurations at each eligible address, using AI-based roof recognition, GIS services, and a series of core computational logics. We applied Eurostat's Nomenclature of Territorial Units for Statistics (NUTS) system for our data generation, aggregating data on over **28 million rooftops across 401 districts and independent cities** in Germany individually, and applied basic economic calculations to derive national-, state- and district-level results.

Instead of using sampling or simulated data, what makes Emily's modelling and process distinct is that it **calculates the solar potential of the majority of rooftops in Germany individually**. We leverage leading-edge models to increase the accuracy of 3D building reconstruction, which in turn leads to more precise data. Our calculations include the average system, battery size, annual generation capacity and self-consumption rates. The findings in this report are thus anchored to **what can actually be installed on a real rooftop** under current technical and regulatory constraints.



A more detailed explanation of the process and core modules applied is as follows:

1. Basic data acquisition and potential assessment

This step involved identifying the physical limits of each roof using GIS and 3D modelling, obtaining information on the roof's slope orientation (angle and direction the roof faces) and number of installable panels. We employed industry-leading AI models to perform visual reconstruction from satellite imagery. This process digitally recreates approximately 87% of buildings from 2D images to 3D models with high fidelity, aiming to ensure that the data models their true-to-life physical forms.

2. Electricity demand derivation

We applied existing preset data on electricity consumption in each state, calculating each home's average daily, daytime, evening peak, and overnight electricity consumption. This allowed us to align system sizing with rooftop potential and realistic household demand patterns.

3. System capacity and hardware selection

Emily calculates the number of PV panels and inverter specifications, and matches standard battery capacities by combining surplus PV energy with overnight electricity demand. For all new systems, our calculations include PV and battery combined as the default.

Emily then provides three different proposals based on different solar system set-ups and financial considerations. Emily also supports two different types of configurations: new systems (PV + battery), or system expansion (additional PV + battery, or battery-only).

Proposal	Considerations	System configuration
Budget	Designed to secure the best ROI, focusing on the lowest investment cost and fastest payback.	***7.05 kWp PV + 5 kWh Battery***
Smart	Offering the best overall value, with the best balance of savings, quality and future-readiness.	***10.34 kWp PV + 9.6 kWh Battery***
Premium	Focusing on maximum self-consumption, back-up capabilities and future expansion for the greatest energy independence.	***11.75 kWp PV + 16 kWh Battery***

For the purposes of this report, we applied the **Smart** proposal configuration across all our data and analysis. Our calculations here are based on **entirely new** full systems (PV + inverter + battery).

4. Generation and energy flow simulation

To determine the average self-consumption rate, we utilised PV-GIS data to calculate hourly power generation, simulated energy flows for self-consumption, charging/discharging and grid feed-in.

5. Financial and return analysis

To arrive at the final value for each address, we calculated the average total system cost (including hardware, balance of system components, additional fees). On this basis and energy generation performance (determined by the amount of sunlight in a given region) and assumed household electricity consumption rates, we projected the annual bill savings, payback period, Internal Rate of Return (IRR), and 10- and 20-year returns.

With national plans to end subsidies for small systems in-discussion at time of writing, our calculations do not factor in subsidies, and we have calculated the average upfront investment (without tax) across all 401 districts and independent cities analysed to be approximately **€12,167** based on the Smart Proposal system size (10.34 kWp PV + 9.6 kWh Battery), using the following formula:

Investment Cost = PV system size × €550/kWp + inverter capacity × €330/kW + battery capacity × €400/kWh

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This report was developed in collaboration with our partners GoodWe and LONGi Solar, and anonymous expert reviewers. As industry leaders and experts, their insights and experience were critical in ensuring that our findings are reflective of market conditions and expectations, and that the methodology behind Emily is appropriate for application at a national level.

Our Nationwide Findings

We generated data on **28 million homes** across **401 districts and independent cities** in Germany. Based on this and assuming that all of them have the **Smart Proposal configuration** (10.34 kWp PV + 9.6 kWh Battery) installed, we found:

Germany's Sunlight Salary (Nation-Wide)				
Roofs analysed	**Total value (annal savings)**	**Average returns (annual savings)**	**Average upfront investment**	**Average payback period**
28,042,960	€45.43 billion	€1,620	€12,167	8.44 years
IRR	**Total returns (10 years)**	**Average returns (10 years)**	**Total returns (20 years)**	**Average returns (20 years)**
11.5%	€105 billion	€3,744	€533.7 billion	€19,030

Table 1: Summary of Rooftop Value across Germany.

Total value of German rooftops

The total value of rooftops across the 28 million homes analysed is estimated to be **€45.43 billion** in annual electricity bill savings. Across Germany, this represents a potential **€1,620** in annual savings on electricity for the average rooftop solar system.

Financial returns

The total financial returns in Germany for rooftop solar over 10 years are estimated to be **€105 billion**. Over 20 years, the returns grow by more than seven-fold and come up to around **€533.7 billion**. For the average German home, this translates to financial returns of an estimated **€3,744** after 10 years, and **€19,030** after 20 years, with upfront investment costs factored.

Payback period

The average German household can expect to see payback on their solar investment after **8.44 years**.

Investment return

The average estimated Internal Rate of Return (IRR) is **11.5%**.

GERMANY'S ROOFTOP VALUE MAP

How effective a solar system is depends on the right combination of factors. For homeowners, the performance potential of rooftops varies across regions and is mainly influenced by the **availability of sunlight, roof conditions**, and **electricity prices**.

We break down how this contributes to the highest returns across Germany using five key metrics:

(i) annual bill savings (ii) payback period (iii) Internal Rate of Return

(iv) 10-year returns and (v) 20-year returns

All metrics (except for roofs analysed) in Tables 2-7 present averages for that geographic region/ state/ district, and decimals have been rounded.

Germany's Sunlight Salary Map (By Geographic Region)

Legend: Best performing | Lowest performing

Geographic region*	Roofs analysed	Avg. annual bill savings	Avg. payback period (years)	Avg. IRR	Avg. 10-year returns	Avg. 20-year returns
North Germany	5,318,644	€1,572	8.72 years	11.05%	€3,270	€18,101
Central Germany	14,238,044	€1,596	8.57 years	11.29%	€3,514	€18,578
South Germany	8,486,272	€1,690	8.05 years	12.20%	€4,428	€20,372

Table 2: Summary of Rooftop Value across Germany by Geographic Region. 8486272

* For the purposes of this report, the states are categorised by region as:

North Germany: Bremen, Hamburg, Lower Saxony, Mecklenburg-Vorpommern, Schleswig-Holstein

Central Germany: Brandenburg, Berlin, Hessen, North Rhine-Westphalia, Rhineland-Palatinate, Saarland, Saxony, Saxony-Anhalt, Thuringia

South Germany: Baden-Württemberg, Bavaria

Germany's Sunlight Salary Map (By State)



State	Roofs analysed	Avg. annual bill savings	Avg. payback period	Avg. IRR	Avg. 10-year returns	Avg. 20-year returns
Bremen	154,514	€1,480	9.34 years	10.14%	€2,372	€16,339
Hamburg	269,897	€1,426	9.72 years	9.58%	€1,837	€15,291
Lower Saxony	3,199,295	€1,613	8.46 years	11.46%	€3,677	€18,898
Mecklenburg-Vorpommern	639,382	€1,480	9.35 years	10.13%	€2,370	€16,335
Schleswig-Holstein	1,055,556	€1,553	8.79 years	10.86%	€3,083	€17,734
Berlin	358,730	€1,388	10.10 years	9.19%	€1,462	€14,555
Brandenburg	1,203,592	€1,551	8.81 years	10.85%	€3,067	€17,703
Hessen	1,987,798	€1,646	8.28 years	11.78%	€4,000	€19,531
North Rhine-Westphalia	5,406,132	€1,606	8.50 years	11.39%	€3,606	€18,759
Rhineland-Palatinate	1,679,691	€1,660	8.20 years	11.92%	€4,142	€19,810
Saarland	403,225	€1,667	8.16 years	11.99%	€4,207	€19,937
Saxony	1,321,198	€1,522	9.05 years	10.56%	€2,784	€17,148
Saxony-Anhalt	977,937	€1,579	8.65 years	11.12%	€3,339	€18,237
Thuringia	899,741	€1,552	8.81 years	10.86%	€3,079	€17,727
Baden-Württemberg	3,537,077	€1,680	8.11 years	12.11%	€4,334	€20,187
Bavaria	4,949,195	€1,696	8.00 years	12.27%	€4,496	€20,504

Table 3: Summary of Rooftop Value across Germany by State.

Ranking the States

To determine the states' final rankings, we assigned a score of 1-16 for each of the 5 metrics, then ranked each state based on finalist aggregate score (out of a possible lowest 5 and highest 80, i.e. 16x5).

Rank/ Score	Avg. annual bill savings	Avg. payback period	Avg. IRR	Avg. 10-year returns	Avg. 20-year returns	Final Ranking (score)
1	Bavaria (€1,696)	Bavaria (8.00 years)	Bavaria (12.27%)	Bavaria (€4,496)	Bavaria (€20,504)	#1 Bavaria (5)
2	Baden-Württemberg (€1,680)	Baden-Württemberg (8.11 years)	Baden-Württemberg (12.11%)	Baden-Württemberg (€4,334)	Baden-Württemberg (€20,187)	#2 Baden-Württemberg (10)
3	Saarland (€1,667)	Saarland (8.16 years)	Saarland (11.99%)	Saarland (€4,207)	Saarland (€19,937)	#3 Saarland (15)
4	Rhineland-Palatinate (€1,660)	Rhineland-Palatinate (8.20 years)	Rhineland-Palatinate (11.92%)	Rhineland-Palatinate (€4,142)	Rhineland-Palatinate (€19,810)	#4 Rhineland-Palatinate (20)
5	Hessen (€1,646)	Hessen (8.28 years)	Hessen (11.78%)	Hessen (€4,000)	Hessen (€19,531))	#5 Hessen (25)
6	Lower Saxony (€1,613)	Lower Saxony (8.46 years)	Lower Saxony (11.46%)	Lower Saxony (€3,677)	Lower Saxony (€18,898)	#6 Lower Saxony (30)
7	North Rhine-Westphalia (€1,606)	North Rhine-Westphalia (8.5 years)	North Rhine-Westphalia (11.39%)	North Rhine-Westphalia (€3,606)	North Rhine-Westphalia (€18,759)	#7 North Rhine-Westphalia (35)
8	Saxony-Anhalt (€1,579)	Saxony-Anhalt (8.65 years)	Saxony-Anhalt (11.12%)	Saxony-Anhalt (€3,339)	Saxony-Anhalt (€18,237)	#8 Saxony-Anhalt (40)
9	Schleswig-Holstein (€1,553)	Schleswig-Holstein (8.79 years)	Schleswig-Holstein (10.86%)	Schleswig-Holstein (€3,083)	Schleswig-Holstein (€17,734)	#9 Schleswig-Holstein (45)
10	Thuringia (€1,552)	Thuringia (8.81 years)	Thuringia (10.86%)	Thuringia (€3,079)	Thuringia (€17,727)	#10 Thuringia (50)
11	Brandenburg (€1,551)	Brandenburg (8.81 years)	Brandenburg (10.85%)	Brandenburg (€3,067)	Brandenburg (€17,703)	#11 Brandenburg (55)
12	Saxony (€1,522)	Saxony (9.05 years)	Saxony (10.56%)	Saxony (€2,784)	Saxony (€17,148)	#12 Saxony (60)
13	Bremen (€1,480)	Bremen (9.34 years)	Bremen (10.14%)	Bremen (€2,372)	Bremen (€16,339)	#13 Bremen (65)
14	Mecklenburg-Vorpommern (€1,480)	Mecklenburg-Vorpommern (9.35 years)	Mecklenburg-Vorpommern (10.13%)	Mecklenburg-Vorpommern (€2,370)	Mecklenburg-Vorpommern (€16,335)	#14 Mecklenburg-Vorpommern (70)
15	Hamburg (€1,426)	Hamburg (9.72 years)	Hamburg (9.58%)	Hamburg (€1,837)	Hamburg (€15,291)	#15 Hamburg (75)
16	Berlin (€1,388)	Berlin (10.10 years)	Berlin (9.19%)	Berlin (€1,462)	Berlin (€14,555)	#16 Berlin (80)

Table 4: Ranking of Rooftop Value across Germany by State.

Germany's Sunlight Salary Map (By Region)

State	Region	Roofs analysed	Avg. annual bill savings	Avg. payback period	Avg.IRR	Avg. 10-year returns	Avg. 20-year returns
Bremen	Bremen	154,514	€1,480	9.34 years	10.14%	€2,372	€16,339
Hamburg	Hamburg	269,897	€1,426	9.72 years	9.58%	€1,837	€15,291
Lower Saxony	Braunschweig	586,794	€1,617	8.44 years	11.50%	€3,714	€18,971
	Hannover	718,898	€1,618	8.43 years	11.51%	€3,724	€18,991
	Lüneburg	799,808	€1,600	8.52 years	11.33%	€3,551	€18,651
	Weser-Ems	1,093,795	€1,617	8.44 years	11.50%	€3,717	€18,978
Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	639,382	€1,480	9.35 years	10.13%	€2,370	€16,335
Schleswig-Holstein	Schleswig-Holstein	1,055,556	€1,553	8.79 years	10.86%	€3,083	€17,734
Berlin	Berlin	358,730	€1,388	10.10 years	9.19%	€1,462	€14,555
Brandenburg	Brandenburg	1,203,592	€1,551	8.81 years	10.85%	€3,067	€17,703
Hesse	Darmstadt	1,072,401	€1,661	8.20 years	11.93%	€4,145	€19,816
	Gießen	423,182	€1,638	8.32 years	11.71%	€3,926	€19,386
	Kassel	492,215	€1,620	8.42 years	11.53%	€3,746	€19,034
North Rhine-Westphalia	Arnsberg	1,024,504	€1,601	8.51 years	11.34%	€3,559	€18,667
	Detmold	770,629	€1,592	8.57 years	11.23%	€3,474	€18,500
	Düsseldorf	1,379,687	€1,612	8.47 years	11.44%	€3,662	€18,870
	Köln	1,340,157	€1,617	8.45 years	11.49%	€3,711	€18,966
	Münster	891,155	€1,598	8.53 years	11.31%	€3,527	€18,604

Rhineland-Palatinate	Koblenz	639,446	€1,631	8.37 years	11.64%	€3,853	€19,244
	Rheinhessen-Pfalz	788,714	€1,688	8.04 years	12.19%	€4,415	€20,345
	Trier	251,531	€1,648	8.28 years	11.80%	€4,019	€19,569
Saarland	Saarland	403,225	€1,667	8.16 years	11.99%	€4,206	€19,937
Saxony	Chemnitz	497,424	€1,528	9.00 years	10.62%	€2,841	€17,260
	Dresden	528,139	€1,515	9.10 years	10.48%	€2,711	€17,005
	Leipzig	295,635	€1,526	9.03 years	10.59%	€2,817	€17,213
Saxony-Anhalt	Sachsen-Anhalt	977,937	€1,579	8.65 years	11.12%	€3,339	€18,236
Thuringia	Thüringen	899,741	€1,552	8.81 years	10.86%	€3,079	€17,727
Baden-Württemberg	Freiburg	750,717	€1,694	8.03 years	12.25%	€4,473	€20,459
	Karlsruhe	848,983	€1,663	8.21 years	11.95%	€4,170	€19,866
	Stuttgart	1,239,710	€1,672	8.16 years	12.03%	€4,256	€20,033
	Tübingen	697,667	€1,699	8.00 years	12.30%	€4,523	€20,557
Bavaria	Mittelfranken	618,632	€1,689	8.03 years	12.20%	€4,421	€20,358
	Niederbayern	650,643	€1,716	7.89 years	12.46%	€4,689	€20,883
	Oberbayern	1,316,509	€1,715	7.90 years	12.45%	€4,680	€20,864
	Oberfranken	496,201	€1,650	8.27 years	11.81%	€4,035	€19,601
	Oberpfalz	546,587	€1,696	7.99 years	12.27%	€4,495	€20,502
	Schwaben	740,762	€1,710	7.93 years	12.40%	€4,631	€20,768
	Unterfranken	579,861	€1,663	8.20 years	11.94%	€4,164	€19,853

Table 5: Summary of Rooftop Value across Germany by Region.

Top 10 Districts in Germany

Rank	Annual bill savings	Payback period	IRR	10-year returns	20-year returns
1	Kempten (Allgäu), Kreisfreie Stadt (€1,759)	Kempten (Allgäu), Kreisfreie Stadt (7.70 years)	Kempten (Allgäu), Kreisfreie Stadt (12.88%)	Kempten (Allgäu), Kreisfreie Stadt (€5,115)	Kempten (Allgäu), Kreisfreie Stadt (€21,719)
2	Memmingen, Kreisfreie Stadt (€1,750)	Memmingen, Kreisfreie Stadt (7.76 years)	Memmingen, Kreisfreie Stadt (12.78%)	Memmingen, Kreisfreie Stadt (€5,018)	Memmingen, Kreisfreie Stadt (€21,528)
3	Rosenheim, Landkreis (€1,742)	Unterallgäu (7.77 years)	Rosenheim, Landkreis (12.71%)	Rosenheim, Landkreis (€4,943)	Rosenheim, Landkreis (€21,381)
4	Rosenheim, Kreisfreie Stadt (€1,741)	Erding (7.79 years)	Rosenheim, Kreisfreie Stadt (12.70%)	Rosenheim, Kreisfreie Stadt (€4,934)	Rosenheim, Kreisfreie Stadt (€21,364)
5	Unterallgäu (€1,740)	Rosenheim, Landkreis; Mühldorf a. Inn; Rosenheim, Kreisfreie Stadt; Landsberg am Lech; Ostallgäu; Traunstein (7.80 years)	Unterallgäu (12.69%)	Unterallgäu (€4,921)	Unterallgäu (€21,338)
6	Kaufbeuren, Kreisfreie Stadt (€1,739)	Kaufbeuren, Kreisfreie Stadt; Neu-Ulm; Weilheim-Schongau; Fürstenfeldbruck (7.81 years)	Kaufbeuren, Kreisfreie Stadt (12.68%)	Kaufbeuren, Kreisfreie Stadt (€4,912)	Kaufbeuren, Kreisfreie Stadt (€21,321)
7	Traunstein (€1,738)	Lindau (Bodensee); Dingolfing-Landau; Günzburg; Ebersberg; Straubing, Kreisfreie Stadt; Altötting; München, Kreisfreie Stadt (7.82 years)	Traunstein (12.67%)	Traunstein (€4,900)	Traunstein (€21,296)
8	Ostallgäu (€1,736)	Dachau; München, Landkreis; Freising (7.85 years)	Ostallgäu (12.65%)	Ostallgäu (€4,883)	Ostallgäu (€21,264)
9	Lindau (Bodensee) (€1,734)	Landshut, Kreisfreie Stadt; Straubing-Bogen; Augsburg, Kreisfreie Stadt (7.86 years)	Lindau (Bodensee) (12.63%)	Lindau (Bodensee) (€4,863)	Lindau (Bodensee) (€21,224)
10	Erding (€1,733)	Rottal-Inn; Landshut, Landkreis (7.87 years)	Erding (12.62%)	Erding (€4,852)	Erding (€21,203)

Table 6: Top 10 Districts in Germany according to the five different metrics presented.

Our Observations:

01 Geography matters

South Germany is the clear national leader for rooftop solar value across every key metric analysed. It records the highest estimated average annual bill savings (€1,690), the shortest average payback period (8.05 years), the strongest IRR (12.20%) and the highest 10- and 20- year returns (€4,428 and €20,372 respectively), higher than the national averages of €3,744 and €19,030 on these same metrics. By contrast, North Germany generally ranks lowest across the metrics analysed including performing lower than the national average.

The north-south performance divide is more noticeable when breaking down the data into state and district levels:

State rankings

Bavaria, the southernmost state, performs the strongest across Germany, and is the only one to rank first across all five key metrics. Homeowners in Bavaria can expect an estimated annual average bill savings of €1,696, an average payback period of 8.00 years—almost half a year faster than the national average—and 20-year returns of €20,504. Baden-Württemberg follows closely behind, ranking second, with both southern states outperforming national averages. Meanwhile, most of the northern states feature in the bottom half of the rankings, with the exception of Lower Saxony (ranked 7th overall). The lowest-performing northern state, Hamburg, performs lower than both the geographical region and the national level across all key metrics.

District rankings

Many of Germany's highest-performing districts are also concentrated in southern Bavaria, particularly around the Allgäu and Upper Bavaria regions. Districts such as Kempten (Allgäu), Memmingen, Rosenheim and Unterallgäu dominate the national top 10 across multiple metrics, with Kempten achieving Germany's highest IRR (12.89%) and highest 20-year returns (€21,719). By contrast, the lowest performing districts are concentrated in the north, highlighting a pronounced regional clustering effect in rooftop solar value across Germany.

Regardless, our findings indicate that most German homes still have the potential to generate meaningful income and savings from solar generation regardless of location, and every region in Germany still presents a viable investment case. We should also re-emphasise: our findings are based on the Smart proposal configuration. Households who chose to adopt the Budget proposal configuration may have slightly overall lower savings and returns, but with a cheaper investment option and smaller system size, our estimations indicate a faster payback period and higher rate of return.

02 Geography and urban density go together

City states and dense urban areas consistently underperform. Berlin and Hamburg rank last and second-last respectively across every metric, both when comparing across the 16 states and 38 districts. In terms of urban density, they were also the most- and third-most populous districts analysed (358,730 in Berlin, 269,897 in Hamburg, with the second-most dense district being Region Hannover at 287,099). Northern states also tend to have higher urban density, compared to Southern states which feature more rural and suburban housing stock. This suggests that highly urbanised areas where roof sizing, shading, and building types may constrain rooftop solar potential, delivering less optimal (but still meaningful) financial outcomes than suburban and regional areas.

03 Performance across the metrics follow a consistent pattern

Across the rankings, the top state in one metric tends to perform best across the other metrics. While there is more variation in the district rankings, most of the same districts feature in the top 10, with the exception on payback periods where more districts are included due to rounding.

Performance gaps

The performance gap between the highest- and lowest-performing states is substantial, particularly over the long term. Bavaria's average 20-year returns (€20,504) exceed Berlin's (€14,555) by approximately €6,000, while Bavaria's average 10-year returns (€4,496) are more than 3 times higher than Berlin's (€1,462). Similarly, Berlin's payback period of 10.10 years is slightly over two years longer than Bavaria's 8.00 years.



On the Horizon: Outlook Beyond Private Homes

This report focuses on the opportunity presented by Germany's private residential rooftops. A 2026 study by the European Commission's Joint Research Centre found that Germany records one of the highest rooftop PV potential at 394 TWh, and residential solar accounts for more than 80% of that potential.[18]

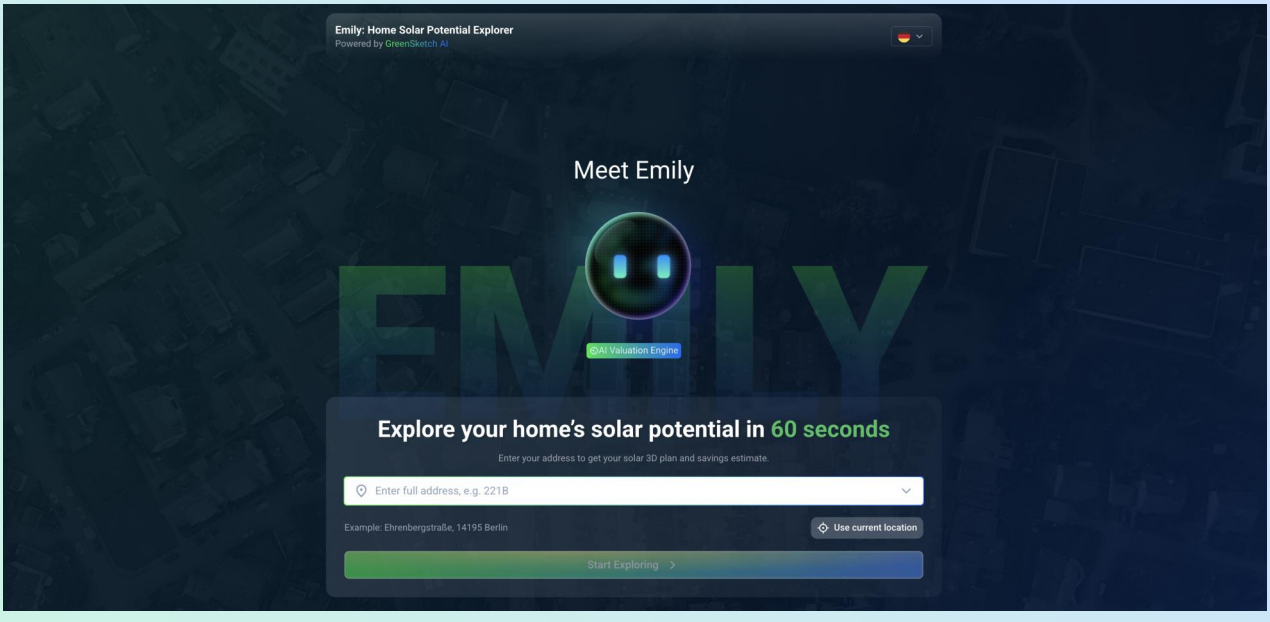
But private rooftops are only one part of the picture. For renters and apartment dwellers, Germany has become a leader in plug-in balcony solar, with more than one million systems installed between 2022 and 2025,[19] demonstrating the value of energy independence to residents across different dwelling types. The same European Commission study also found that non-residential rooftops could cover 50% or more of European Union member states' PV targets.

For Germany, adding commercial and industrial rooftops as well as balcony systems could unlock a second major wave of decentralised solar deployment. These additional rooftops and surfaces could support reduced exposure to volatile fossil fuel markets and strengthen Germany's long-term energy independence.



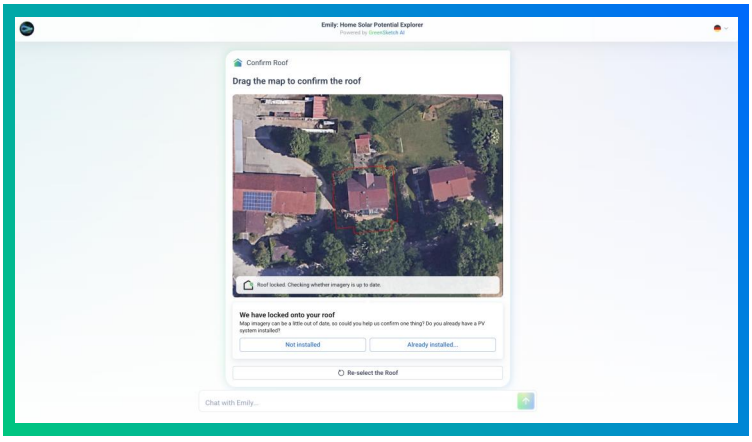
GENERATE YOUR SUNLIGHT SALARY

Transforming the potential of your roof into your Sunlight Salary is as simple as keying in your address on **Emily**, GreenSketch's AI agent, designed to deliver near-instant rooftop solar and financial assessments in real time.



Step 1: Free Assessment

Use our free online assessment tool to discover your home's solar potential. All you need is your postal code and a stable Internet connection. After keying in your address, you will receive a personalised rooftop value report tailored to your roof within a few minutes. The report estimates your solar generation potential, annual savings, net investment, IRR and payback period.

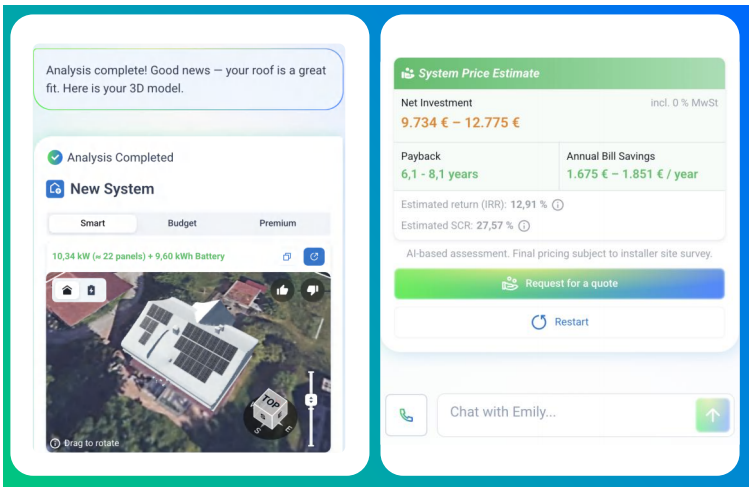


Step 2: Tailored Design

In the same rooftop value report, Emily provides three different proposals based on different solar system and battery configurations and financial considerations: Budget, Smart, and Premium.

Proposal	Considerations	System configuration
Budget	Designed to secure the best ROI, focusing on the lowest investment cost and fastest payback.	***7.05 kWp PV + 5 kWh Battery***
Smart	Offering the best overall value, with the best balance of savings, quality and future-readiness.	***10.34 kWp PV + 9.6 kWh Battery***
Premium	Focusing on maximum self-consumption, back-up capabilities and future expansion for the greatest energy independence.	***11.75 kWp PV + 16 kWh Battery***

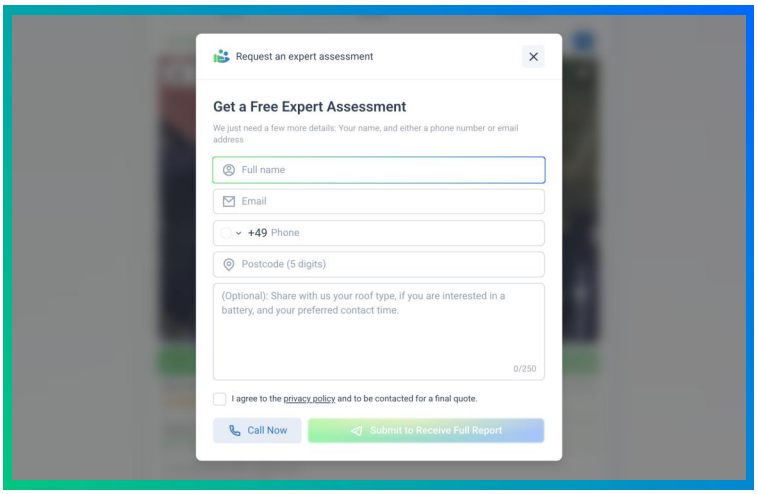
Depending on your existing set-up, Emily supports two different types of calculations: new systems (PV + battery), or system expansion (additional PV + battery, or battery-only).



This allows you to pick the option that best suits your energy consumption patterns and needs, and immediately see your estimated returns-on-investment on your rooftop solar and battery.

Step 3: Installation

The last step is making your chosen proposal a reality. Based on your location, Emily will suggest a list of installers near you, and your chosen installer will work together with you to develop on your system's final design. Once installed, you can start to enjoy the benefits of your solar and battery system.



Energy Alignment to Maximise your Returns

Installing rooftop solar is the first step toward greater energy independence. However, combining a solar system with a home battery, an electric vehicle, and a heat pump allows households to unlock the full value of their investment and actively participate in the country's clean energy transition.

Generating your own electricity is critical, but without efficient use and storage, a large share of solar production, particularly during midday, is exported to the grid. In Germany, feed-in tariffs under the EEG (Renewable Energy Sources Act) have steadily declined over time[20] and are now relatively low compared to retail electricity prices. As a result, the financial benefit of exporting excess electricity has become more limited. In contrast, every kilowatt-hour consumed within the home offsets some of Europe's highest household electricity prices. Maximising self-consumption has therefore become central to achieving both economic and energy efficiency gains.

The addition of an electric vehicle (EV), heat pump and home energy management system further strengthens the value of a solar system. EVs act as flexible loads, allowing households to absorb excess solar generation during the day, effectively reducing fuel costs for mobility. Heat pumps, increasingly popular as a low-carbon alternative to gas heating, can be powered by solar energy to significantly reduce heating costs and emissions. When paired with smart controls, heat pumps can operate during peak solar generation periods, further increasing self-consumption. A home energy management system can further help households manage their decentralised energy resources more effectively.[21]

An integrated solar, battery, heat pump and energy management system can deliver both financial benefits and energy security:

1. Financial optimisation

The average reported self-consumption rate in Germany was 17% in 2024, growing sharply from 13% in 2023.[22] Rates of combining solar with battery storage have also risen from 51% in 2020 to 86% in 2025.[23] In Germany, self-consumption accounted for 17% of net electricity generation[24] from photovoltaics in 2024, while typical self-consumption rates in German households range from around 20% to 40%.[25] Estimates have also shown that solar paired with storage can bring self-consumption rates to 60-90%.[26] This shift significantly reduces reliance on grid electricity and can improve the return on investment.

2. Energy security and system resilience

Germany is undergoing a major transformation of its energy system (Energiewende) marked by volatility in the political landscape—for instance, while nuclear power was officially phased-out in April 2023,[27] Minister for Economic Affairs and Energy Katherina Reiche in March 2026 called the decision by previous governments "a huge mistake."[28] Beyond politics, extreme weather events from floods, droughts and heatwaves place additional stress on infrastructure. Between 2000 and 2021, the country suffered a minimum of €145 billion in losses due to extreme events, and researchers estimate that this could range from €280-900 billion by the middle of the century.[29]

In this environment, decentralised energy systems that combine solar, storage, heat pumps and a home energy management system can improve household resilience. A battery can provide backup power (depending on system configuration) and help households navigate price volatility and reduce grid dependency, while a home energy management system makes the flexibility of their energy independence more tangible.

A simplified 24-hour renewable energy cycle might look like this:

1. Daytime solar generation directly supplies household electricity demand.
2. Excess solar energy powers appliances, charges an electric vehicle, and runs the heat pump—particularly for hot water or pre-heating.
3. Remaining surplus energy is stored in a home battery.
4. In the evening and overnight, the battery discharges to meet household demand, including continued operation of the heat pump if needed.

With this integrated setup, households are not only reducing their energy bills: they are optimising the use of their energy assets while lowering their carbon footprint. With dynamic tariffs gaining momentum and the opportunity at hand for Virtual Power Plants and Energy Management systems, long-term grid stability can be improved and beneficial to all.

CONCLUSION

Germany's energy transition is set to enter a new phase. At a time where subsidies may be abolished entirely, feed-in tariffs are declining, and a policy framework shifting towards a more market-oriented model under the forthcoming EEG 2027, it may be natural to think: why adopt solar and storage now?

Our analysis of over 28 million rooftops in Germany makes that financial case clear. The estimated €45.43 billion in annual electricity savings that German homes are modelled to collectively generate represent more than just savings: they are a distributed, decentralised national energy asset that provides a ballast resilient to future shocks and disruptions. The market data is already there: an analysis by SolarPower Europe found that solar energy saved Europe more than €3 billion in March 2026[30] as the war in Iran sent oil and gas prices skyrocketing. The 2026 European Commission Joint Research Centre study also found that rooftop solar on both residential and non-residential buildings could cover 40% of demand in a 100% renewable energy system by 2050,[31] and residential buildings could make-up 1,800 GWp or 78% of that share. Germany, with its large residential rooftop potential and mature solar industry, is uniquely poised to be a leader in realising this potential.

While the short-term policy landscape appears challenging and many industry groups have criticised the planned abolishment of fixed feed-in-tariffs[32] and reduction in rooftop solar auction volumes, others have also observed how its emphasis on grid stability and system integration will necessitate greater attention on increasing storage and self-consumption.[33] Particularly for a market that frequently records negative energy prices, battery storage becomes critical[34] — and the EEG 2027's planned cap of feed-in power for smaller installations at 50% of installed capacity sends a structural signal that is likely to increase the value proposition of battery storage for operators and homeowners seeking to maximise returns. Industry trends seem to follow suit, with PV self-consumption on the rise.[35] While battery storage for private homes has declined, it still represents almost three-quarters of the rise in capacity recorded in 2025.[36]

The next phase of the Energiewende appears marked by sweeping policy mandates but distracts away from the opportunity this report makes clear: the decisions of millions of individual homeowners will make the biggest difference in securing Germany's energy future. Residential solar is an asset that sits at the intersection of household finances, energy security and the clean energy transition. Empowered by data on the potential value of their roof, every homeowner in Germany can understand, act on and benefit from their Sunlight Salary, supported by intelligent, market-sensitive platforms like GreenSketch. It's time to put it to work.

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Supporting partners

We would like to thank our partners GoodWe and LONGi Solar for their contributions to the report. We would also like to thank our anonymous expert reviewers for providing a sounding board to the findings presented.

GOODWE | LONGi SOLAR

ABOUT US

GreenSketch is a full-stack, AI-driven solar industry ecosystem platform. Developed by OSW Group, it is the world's first free, end-to-end solar and battery design platform created for solar professionals, connecting the industry with homeowners, installers, and leading solar brands with unprecedented speed, intelligence and transparency. From rooftop mapping, battery system layouts, to instant quotes, GreenSketch supports lead generation to enhance efficiency across the clean energy industry.

greensketch.ai

Leveraging over a decade of experience and digital expertise, OSW has built a fully integrated one-stop platform for distributed solar smart energy solutions under its One Simple Way philosophy. The OSW ecosystem offers services spanning system design, product sales, carbon trading, and commercial Virtual Power Plant (VPP) software, streamlining operations and increasing efficiency for the entire industry.

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