E3 Analytics

Analytical Brief

Re-engaging FIT system owners and accelerating the Energy Transition

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This policy paper lays out an innovative concept for the German government to catalyse a new wave of investments in the Energy Transition, reduce the renewable energy surcharge (the *EEG Umlage*), and re-engage early investors in the Energy Transition.

Idea in a Nutshell:

1. Early adopters of solar PV systems would be offered a discounted payout for their remaining FIT payments.
2. The payout would be earmarked for energy transition-related investments.
3. The Government would specify which new investments are eligible (storage, heat pumps, EVs, etc.)
4. An entity like the KfW would manage the fund and issue the payouts to eligible customers.

Introduction

Wolf von Fabeck, a German citizen living in the West German city of Aachen in the mid-1980s, wanted what electric utilities had: cost-covering compensation for his power plants. The only difference is that his power plant was a 600 Watt solar array, purchased with the help of friends from his local church.

A few years later, in the late 1980s, Fabeck got what he wanted: the City of Aachen approved a resolution offering 2 deutsch marks per kWh for electricity from solar power projects (the equivalent of roughly EUR 1.81 in today's currency). With steps such as these, the foundations of Germany's Energy Transition were laid.[1]

The "Energiewende" grew from a few thousand such solar PV systems nationwide at the end of the 1990s to an estimated 1.65 million individual solar PV systems today, and the majority (in numerical terms) are still owned by individual households, farmers, churches, and cooperatives.

Despite these storied origins, the development of citizen-owned renewable energy projects in Germany has slowed dramatically in recent years, due in part to concerns over the higher incremental costs of these smaller systems. Both national and EU-level policy now favor larger installations, rendering the future of citizen energy in Germany increasingly uncertain.

1 See Morris, C., Jungjohann, A., (2016). ***Energy Democracy : Germany's Energiewende to Renewables***, p.128-9.

This Analytical Brief lays out a path to re-engage early FiT investors and fuel a new wave of Energy Transition investments, all while providing a range of benefits to electricity ratepayers, businesses, and to the communities on whom the success of the Energiewende ultimately depends.

Solar and the Energiewende

Germany's remarkable uptake of renewable energy sources was driven in large part by the country's Feed-in Tariff (FiT), in particular its 2004 Renewable Energy Law (EEG). The core principle at the heart of the EEG was cost-covering compensation for renewable energy projects, following the model adopted in Aachen several years prior.

Since solar power was still relatively costly in the mid-2000s, ratepayers had to cover the gap. While solar PV now supplies over 7% of Germany's total electricity supply, and 20% of its total renewable electricity generation, it represents fully 40% of the EEG surcharge that is passed on to customers through electricity retail rates. This surcharge has become a major stumbling block in the political negotiations on the future of the Energy Transition, and many different proposals have been put forward in recent years about how best to reduce it.

Leaving aside the fundamental flaw at the heart of the way the EEG surcharge is calculated (namely, that renewables like solar and wind power reduce spot market prices, and therefore increase the gap that needs to be covered by the surcharge), and the fact that recent forecasts suggest that the EEG surcharge is poised to start declining in the coming years, reducing the EEG surcharge continues to command broad political support. This short paper lays out a win-win scenario to help achieve just that.

Breaking Down the Costs

A key contributor to the EEG surcharge remains the legacy projects built in the early years of the policy when solar prices were significantly higher (particularly those signed between 2004 and 2012). These projects contribute disproportionately to solar's impact on the surcharge (see Table 1):

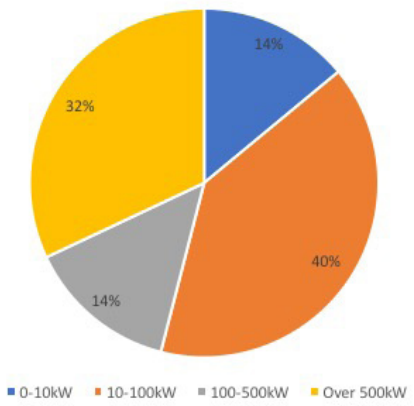
As can be seen in the table below, the rates paid ranged from over 54 cents/kWh for smaller system sizes in 2005 down to approximately 15 cents/kWh for larger projects in 2012. By comparison, current FIT prices range from 12.2 cents/kWh for small rooftop projects to roughly 8.5 cents/kWh for systems up to 100kW.

The graph on the following page shows the total breakdown of solar PV project development by project size, showing that over 50% of total installed PV capacity in Germany (which is currently estimated at over 43GW) is found in projects under 100kW in size (Figure 1, next page):

Table 1: Evolution of the regulated purchase price for a kWh of solar energy (in Euro cents/kWh)

Feed-in tariff Paid to Solar Installation by Project Size and Vintage (2005 – 2014, in Euro cents/kWh)					
Time Period	Up to 30 kW	30kW to 100 kW	100kW to 1MW	1MW and over (roof-mounted systems)	Ground-mounted systems
2005	54,53	51,87	51,30	51,30	43,42
2006	51,80	49,28	48,74	48,74	40,60
2007	49,21	46,82	46,30	46,30	37,96
2008	46,75	44,48	43,99	43,99	35,49
2009	43,01	40,91	39,58	33,00	31,94
01.01.2010 - 30.06.2010	39,14	37,23	35,23	29,37	28,43
01.07.2010 - 31.09.2010	34,05	32,39	30,65	25,55	25,02
01.10.2010 - 31.12.2010	33,03	31,42	29,73	24,79	24,26
01.01.2011 - 31.12.2011	28,74	27,33	25,86	21,56	21,11
01.01.2012 - 30.06.2012	24,43	23,23	21,98	18,33	17,94
01.07.2012 - 30.09.2012	20,76	19,75	18,68	15,58	15,25

Figure 1: Breakdown of Total Installed PV Capacity in Germany by Project Size



Source: Wirth 2018, p.33

This breakdown serves as a proxy for some of the calculations that follow. Figure 2 provides an overview of the development of solar PV projects by year.

Drawing on the data on the rates paid for solar PV output during each period, it is possible to estimate the total payout to residential solar system owners for the solar PV projects connected under the country's FIT policy (see Figure 3, bottom of the page).

The year 2014 was selected as the cut-off as this is the year in which auctions were introduced for certain renewable energy projects.

As such, **solar PV installations under 10kW that were connected to the system prior to 2014 represent the target group of this analysis.** There are two reasons for this choice: first, these systems represent the early-adopters who helped lay the foundations of Germany's Energy Transition.

The second reason (as pointed out previously) is that these projects received the highest per-kWh compensation.

Figure 2: Total Solar PV in Germany Uptake Across All Project Sizes (2001-2014)

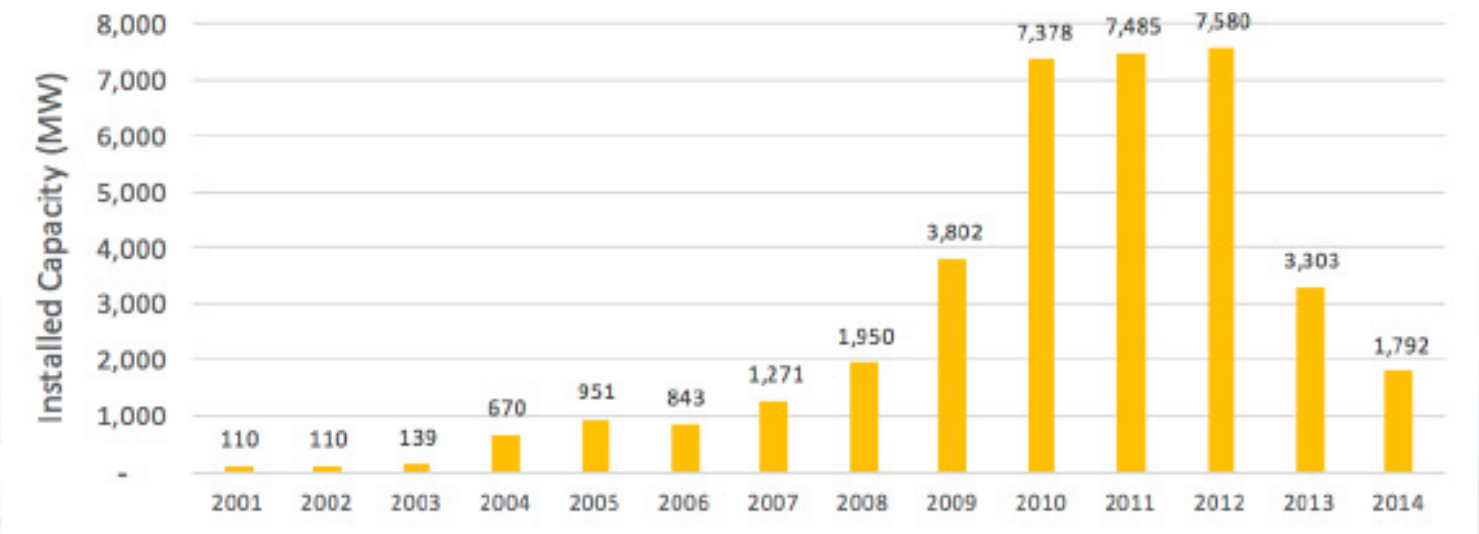
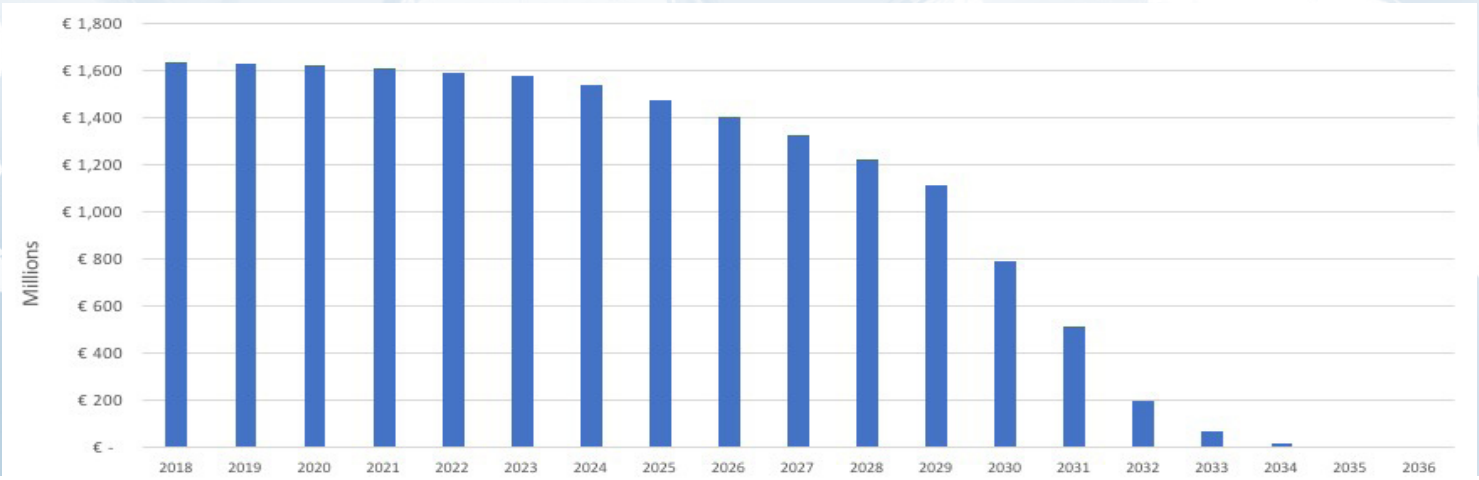


Figure 3: Total Annual Payments to Feed-in Tariff Customers with Solar PV Systems under 10kW (for projects installed up to 2014), in Millions EUR



Re-energizing FIT system owners and catalysing new investment

This paper proposes an innovative and potentially high impact concept to accelerate the Energy Transition, reduce the financial impact of the EEG surcharge, and spur a new wave of investment in innovative energy products and services, notably in storage, mobility, and renewable energy heating/cooling.

How would it work?

The concept takes the future FiT payments (lasting 20 years from the start of the project) owned by small-scale solar PV generators, and discounts these payments to provide the FIT customer with an upfront "payout", one that they can invest in a number of different alternatives (a storage system, an electric vehicle, a renewable heating/cooling system, etc.). The concept would work as follows (see Figure 4 below).

1 The FiT customer is presented with the option to convert the residual value of their FiT payments into one of a range of alternatives.

Depending on which option the customer selects there may be a co-contribution towards the investment (e.g. a larger home battery may need an additional co-contribution to fund the purchase). Each option is subjected to a different percentage discount based on the overall societal benefits of that investment.

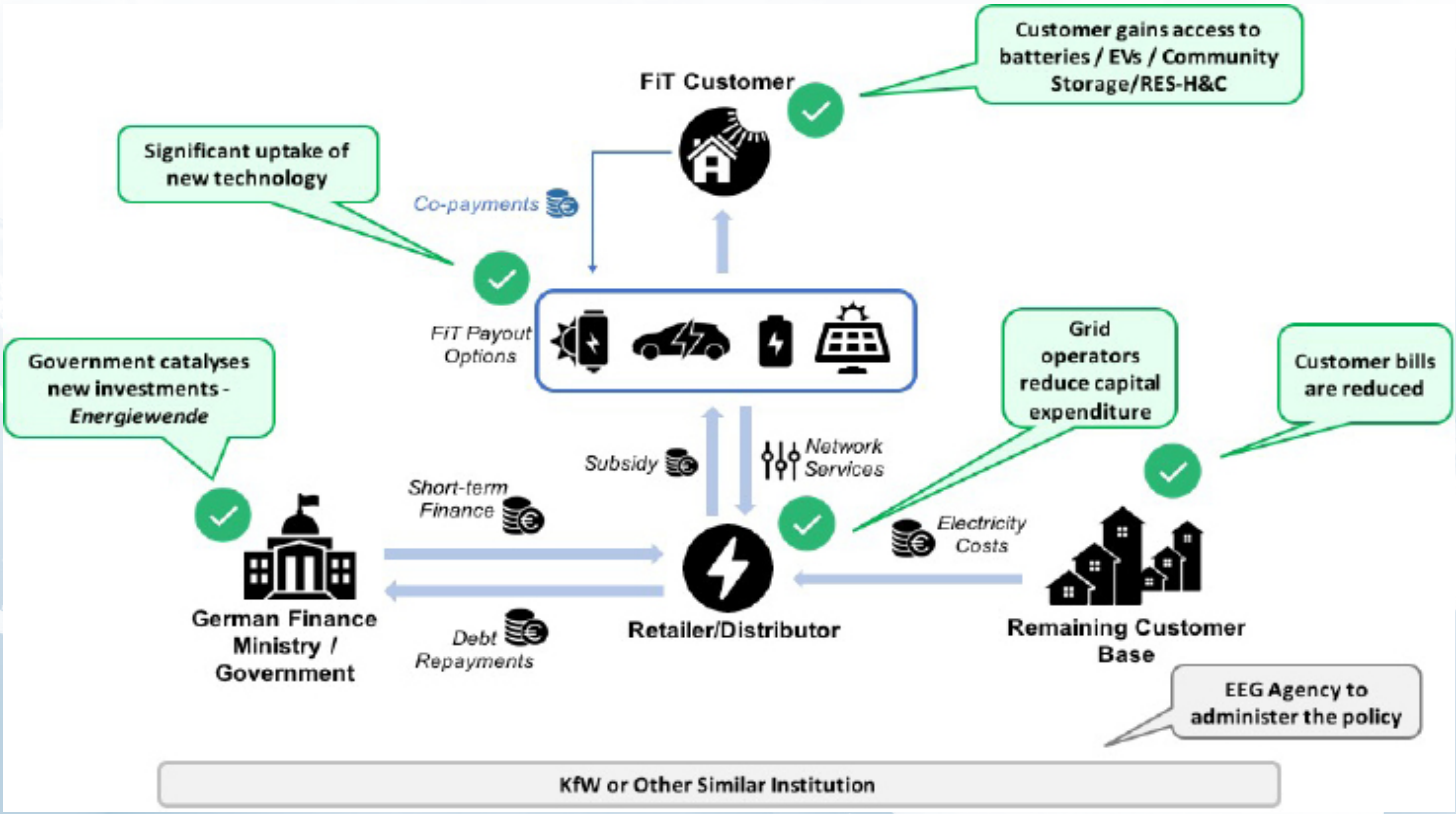
2 Customers can use their payout to invest in a wide range of qualifying investments:

a. Residential battery system
b. Electric vehicle
c. Community storage contribution: this option would allow the customer to reap the benefits of storage without any co-contribution
d. Community solar investment: the customer becomes a shareholder of a community solar project, and receives benefits via dividends or profits
e. Renewable heating/cooling investment.

3 The technology provider (battery provider, EV manufacturer, etc.) is provided with the payout from the termination of the FiT payments.

The payout would be transfered to the service provider or installer and used to offset the total investment cost. The customer would simply continue to export their solar power into the grid and receive the real-time electricity market price, further supporting market integration.

Figure 4: Concept to Catalyse a New Wave of Energy Transition Investments



As a result, customers would have a greater incentive to improve their rate of self-consumption, thereby reducing grid injection and potentially reducing other infrastructure-related costs.

4 The Government (via an intermediary such as the KfW) would fund the upfront payments.

The financing could be achieved at rates considerably lower than those obtained by private citizens for similar investments, thereby reducing the overall costs of this new wave of additional investments in the Energy Transition.

5 The Government would accelerate the reduction of the EEG surcharge, unlocking further societal benefits.

Accelerating the reduction in the EEG surcharge will help reduce pressure on ratepayers, in particular on lower income households as well as small businesses, many of whom are unable to tap into the benefits and exemptions offered to larger power users.

Implementation Challenges

As with any policy or strategy, there are a number of important challenges to consider:

First, there is the implementation risk: Ensuring the effective roll-out of such a scheme is key to its success. This includes clear rules for eligible investments, and a transparent process to calculate the customer payout.

Second, there are technical considerations for the grid. Analysis is already underway to understand the impact of installing large amounts of grid connected storage and EVs in Germany's power system. While there are undoubtedly benefits, both to the system and to society, of having access to more storage capabilities, the roll-out will need to be done in a coordinated way, particularly in areas with significant clusters of storage and EV investment.

Third, potential revenue loss for electricity distributors. As FiT customers gain access to storage and increase their self-consumption, the fixed costs of the existing grid infrastructure will need to be covered by fewer kWh, potentially increasing the fixed costs for the remaining customer base. A detailed study should be conducted to assess the cost and benefit analysis of all stakeholders, taking into account such a scenario.

Finally, the potential administrative burden. If designed right, the administrative burden could be kept fairly minimal. Indeed, the KfW already administers a number of low-interest loan programs for a wide range of qualifying investments including energy efficient homes, ground-source heat pumps, and battery storage systems.

Each re-investment option will have its own advantages and disadvantages, and each will be more or less attractive to each consumer depending on their individual context, behavioural preferences and the overall economic assessment of the different payout options.

The table below provides an overview of the main advantages of the four main options considered here.

Table 2: Overview of four primary payout options

Option	Advantages
Residential Battery Storage	• Aligns with the Energy Transition aim to increase network-connected storage • Customer has ownership of private residential battery to improve load control, PV self-consumption and increase property value • Benefit to the electricity network through accessing vast amounts of connected storage for demand management
Electric Vehicle	• Aligns with the Energy Transition objective of rapidly increasing the uptake of EVs and the electrification of the transport sector • Customer is provided with financial assistance to purchase an electric vehicle
Community Storage/Solar	• Aligns with the Energy Transition aim to increase network connected storage • Customer, electricity network and community all benefit through centralised management of a shared resource • No co-contribution requirements from the customer
Renewable Energy Heating and Cooling	• Customer can choose to invest their FiT payout in a state-of-the-art renewable energy heating and cooling (RES-H&C) system and save costs on their heating and cooling bills • Significantly accelerate the Energy Transition all while improving energy security and local air quality (particularly in urban areas) • Help increase the natural rate of turnover in heating and cooling assets while helping phase out older and less efficient technologies

Financial Impacts

The core of this proposal hinges on two aspects: first, engaging existing FiT investors to reinvest in the Energy Transition, and second, providing direct financial benefits to ratepayers by reducing the EEG surcharge.

This final section lays out some of the potential financial gains, depending on different levels of customer uptake of different technologies, as well as different discount levels. Under the policy, customers' total future FiT payments would be subject to a discount, or percentage reduction, to reflect the time value of money. This reduction is part of what helps generate the savings to society.

Battery Storage

Figure 5 to the right shows a potential of over 10 billion EUR of capital to be unlocked which would represent over 7,000MW (circa 14,000MWh) of installed distributed battery storage capacity. This value depends on a range of factors, one of which being the level of discount that the customer is willing to accept.

Ratepayer Savings

The other main financial beneficiary is ratepayers (including both residential customers as well as businesses) in the form of lower power bills. Figure 6 to the right shows that ratepayers could save over 13 billion EUR collectively, depending on the extent of the discount offered to different re-investment choices (EV, storage system, heating and cooling system, etc.)

As seen in the figure above, even at a low level of discount to the real value of the future FiT payments of 5-10%, the potential savings on the EEG surcharge versus business-as-usual could be considerable (4-7 billion EUR).

Figure 5: Total Customer Payouts in EUR and MW of Distributed Storage

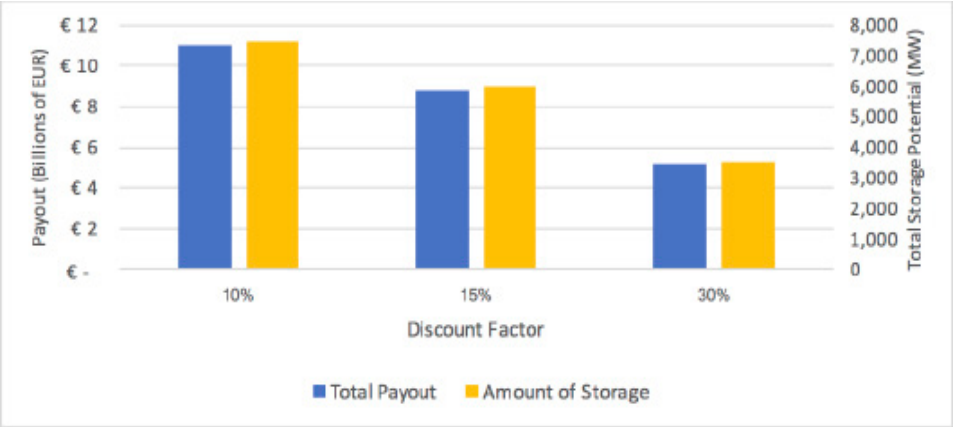
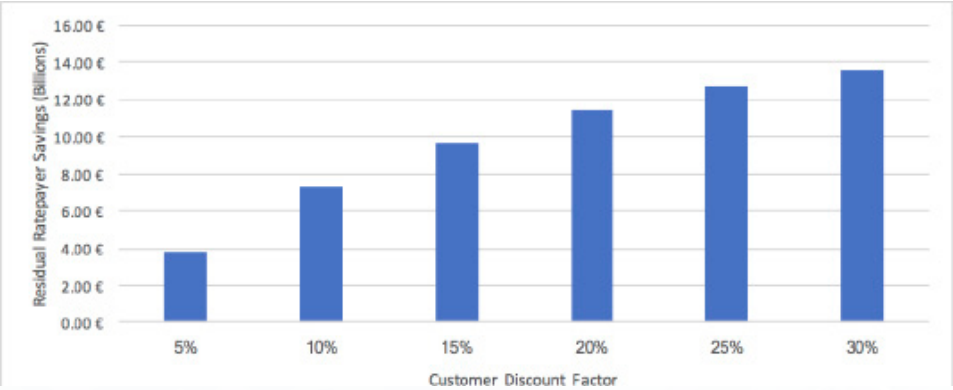


Figure 6: Residual Ratepayer Benefit Under Various Customer Discount Factors



Concluding remarks:

The success of the Energy Transition requires the continued and lasting support of citizens. Key to this support is the ability to participate, to engage, and to invest.

Although Wolf von Fabeck's 600W array will not qualify for the policy presented here, as it was built over 20-years ago and was implemented at the municipal level rather than as part of the nationwide EEG, it is such early adopters that helped unleash the Energy Transition: this policy gives them a chance to invest again, while helping accelerate the next phase of the Energy Transition.