Policy Options to Accelerate Distributed Solar PV in Ukraine

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Abstract

Accelerating distributed solar PV and battery energy storage deployment will support Ukraine in establishing energy security.

In the year following the Russian Federation's full-scale invasion of Ukraine in 2022, available dispatchable power generation capacity halved from roughly 38 GW to 19 GW. After severe attacks in spring 2024, capacity declined further, down to 12 GW. Towards the end of 2024 Ukraine was able to restore 3 GW and has worked to restore and add additional capacity throughout 2025, despite ongoing attacks.

Distributed solar PV has played a key role, providing cost effective and rapid increases in electricity generation capacity, contributing to system resilience and overall energy security. The move towards a greater level of decentralisation in power generation can also support Ukraine in meeting its long-term decarbonisation goals, as set out in the 2030 National Energy and Climate Plan and the 2050 Energy Strategy.

This report explores the current policy landscape for distributed solar PV in Ukraine and outlines three potential policy options to accelerate the deployment of this technology. It focuses on expanding the capacity of distributed solar PV to achieve the modelled results from IEA report Empowering Ukraine through a Decentralised Energy System, which outlines a pathway to rebuild and modernise Ukraine's power sector amid ongoing attacks on energy infrastructure.

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Chapter 1. Distributed solar PV in Ukraine

This report explores the current policy landscape for distributed solar PV in Ukraine and outlines three potential policy options to accelerate the deployment of this technology. It focuses on expanding the capacity of distributed solar PV to achieve the modelled results from IEA report Empowering Ukraine through a Decentralised Energy System, which outlines a pathway to rebuild and modernise Ukraine's power sector amid ongoing attacks on energy infrastructure.

The IEA estimates Ukraine would need to add around 4 GW of distributed PV per year until 2030 (over 24 GW in total) to create a more decentralised and secure power system and achieve the objectives laid out in its national energy and climate plan (NECP). Ukraine will also need an additional 5.6 GW of new BESS by 2030 (0.9 GW per year). In this context, a fast buildout of distributed solar PV and BESS is needed.

Status of solar PV in Ukraine

Ukraine had more than 9 GW of installed solar PV capacity prior to the Russian Federation's full-scale invasion in 2022. Most of the capacity was from distributed installations. Utility-scale capacity advanced rapidly from 2018 to 2020, driven by the feed-in tariff ("Green Tariff") policy.

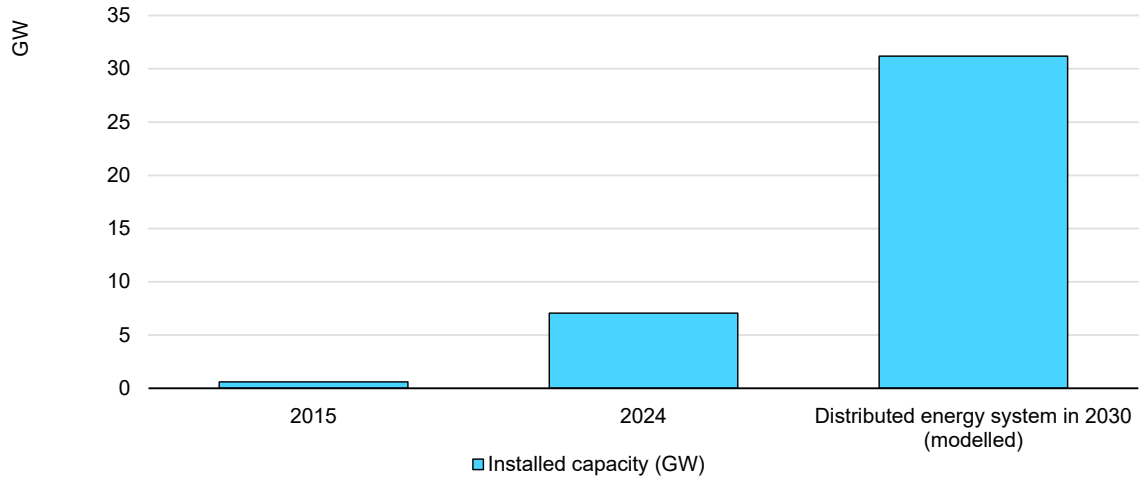
However, this capacity was affected by Russia's invasion of Ukraine, with roughly 1 GW of (mostly utility-scale) solar PV capacity damaged, destroyed or inaccessible due to occupation. Combined with hydropower (-1.5 GW) and wind power (-1.3 GW) losses, the drop in capacity resulted in a nearly 4 TWh decline in total renewable generation from 2021 to 2022. The war also had an impact on the pace of new utility-scale installations.

Solar power was a leader in renewables deployment in 2024. According to various sources, including the Ukrainian Ministry of Energy, around 300 MW (and up to 900 MW, depending on the source) of new solar PV was installed in 2024, including behind-the-meter installations[1], while 20 MW of new onshore wind power came online. Thus, reaching the required 24 GW of new distributed solar PV for a

[1] The Solar Energy Association of Ukraine (SEAU) estimates 800-850 MW of new solar PV capacity was added in 2024.

distributed energy system by 2030 implies that the total installed capacity more than quadruples from the estimated capacity of around 7 GW in 2024.

Total installed capacity of distributed solar PV in Ukraine, 2015-2030



Note: 2030 modelling results from IEA (2024), Empowering Ukraine Through a Decentralised Electricity System.
Sources: IEA (2025), Renewables 2025; IEA (2024), Empowering Ukraine Through a Decentralised Electricity System.

As Russia continues to strategically target Ukrainian energy infrastructure ahead of the fourth winter since the beginning of the war, large-scale plants, both conventional and renewable, are particularly vulnerable to attacks given their size and location. The areas of highest solar PV resource potential in the country are in the south. Other plants were also affected by flooding after the destruction of the Kakhovka hydropower dam in 2023. Damaged installations can be rebuilt (and will receive the same compensation they qualified for when commissioned), but the risk in these locations remains high from developer perspective.

Distributed solar PV applications can provide a solution to the challenges threatening infrastructure in Ukraine. First, given their small capacity, distributed solar PV applications can be deployed more rapidly (in a couple of months) than utility scale solar PV (in around one year) or wind power (two to three years). In addition, given the proximity to demand centres, the needs of distributed resources for repairs, upgrades or new build of transmission infrastructure would be minimal, reducing both cost and time required to provide power to the grid. Ukraine recognises the positive impact distributed energy resources can have, with distributed plants potentially removing vulnerabilities faced by large-scale installations, as they have no single points of failure, are more difficult to target in an attack, less complicated and faster to repair and less dependent on the overall health of the grid.

Current policy structure and challenges

The amount of distributed solar PV in Ukraine has grown significantly since 2019, with installations by around 70 000 households (under a fixed tariff scheme) seeking resilience and cost savings. Interest in installing solar PV on rooftops has remained strong while attacks on energy infrastructure and the frequency of outages have increased. Ukraine's international partners and the government have prioritised the installation of solar PV on hospitals and schools. The Government of Ukraine has introduced several incentives to help reduce the financial burden on individuals. Zero-interest loans (for up to EUR 10 000) are available to households for a 10-year period to spur continued investment, and there is an exemption on value-added tax (VAT) and import duty relating to solar PV systems, batteries and other technologies. The GreenDim programme helps fund rooftop solar PV on apartment buildings run by homeowners' associations and the "5-7-9% Affordable Loans" programme supports commercial and industrial customers. Ukraine's "Decarbonisation Fund" provides low interest loans for decarbonisation projects in schools, hospitals, industry and small and medium-sized enterprises.

Two programmes provide further incentives to generate power. Distributed solar PV systems can qualify for the Green Tariff: a programme that enables residential systems of up to 30 kW generating electricity from renewable sources to sell it to the Guaranteed Buyer. The Green Tariff provides a fixed payment for net energy provided to the grid and has an official end date of December 2029. Distributed energy systems can also qualify for the Net Billing Programme introduced in late 2023, which provides cost reduction based on the wholesale market price. Payment for each of these programmes depends on system size, with small systems receiving benefits from electricity suppliers and larger systems receiving payment from the Guaranteed Buyer, a publicly-owned organisation. In both cases, the end consumer relies either fully or partially on the state, with revenues for payment coming from wholesale market sales and a transmission tariff.

Additionally, many residential and industrial consumers installed solar PV capacities behind-the-meter (BTM) to ensure the security of electricity supply before winter 2024/2025. The distribution system operator is not informed in most cases (e.g. installation of 6-15 kW by residential consumers), as these consumers do not install meters and do not sign supply contracts. In addition, most solar PV systems, since 2023, have been installed with battery energy storage systems (BESS). Pairing distributed solar PV systems with BESS can provide power for longer and help with system integration and flexibility. Several hospitals and schools are already benefiting from this joint approach.

While Ukraine's programmes for solar PV and other renewable technologies have been effective in attracting investments, there have been concerns with the implementation of these programmes such as retroactive reductions of awarded feed-in tariff levels and developers not receiving payment. The Green Tariff

programme prompted a boom in renewable energy capacity in Ukraine. Despite its success in attracting investment in renewables, this feed-in tariff has so far resulted in developers going without payment due to financial challenges faced by the off taker. As a result, the tariff was reduced by 15% for solar installations in 2020. Despite these measures, the transmission system operator (TSO) Ukrenergo still owes the Guaranteed Buyer, the state-owned off taker of electricity from renewable sources around EUR 335 million, to compensate those that produced electricity under the Green Tariff programme from 2022 to 2025. Payments are being made, but as a result of this persistent indebtedness of the Guaranteed Buyer, most wind power producers decided to switch from the Green Tariff to market electricity sales when the opportunity arose in 2023.

Persistent power cuts due to Russian attacks on generation and transmission infrastructure continue to drive demand for distributed solar PV, as consumers intend to partly produce their consumed electricity themselves. However, the challenges of the existing programmes are reducing the uptake in Ukraine. The outstanding debts owed to renewable developers have decreased investor confidence, potentially reducing the number of developers willing to build projects that qualify for a programme receiving payment from the government. This was evident in the December 2024 pilot auction, when the 11 MW available received no bids. In addition to improving the financial situation of the off taker, alleviating, streamlining and removing barriers to system installation could facilitate increased deployment.

Chapter 2. Policy options and implications

Overview of policy instruments for distributed solar PV deployment

Globally, government policies and incentives have been the main driver for distributed PV deployment. These instruments can be differentiated 1) policies targeting investment costs and 2) policies focusing on consumption and the sale of electricity.

1) Policies targeting investment costs usually take the form of direct financial incentives that aim to reduce initial investment costs and make distributed PV systems more affordable for consumers. They include:

   - **Grants and rebates**: a fixed subsidy, usually with a one-time payment.
   - **Tax credits**: amounts taxpayers can subtract from taxes, usually based on a percentage of total solar PV system investments.
   - **Accelerated depreciation**: Solar PV owners can receive higher tax benefits by depreciating assets more quickly, usually in the first or second year.
   - **Tax exemptions**: sales tax, import duty or VAT reduction or exemption from the solar PV system price.

2) General policies and incentives targeting the consumption and sale of electricity focus on improving the economic attractiveness of solar PV systems over time:

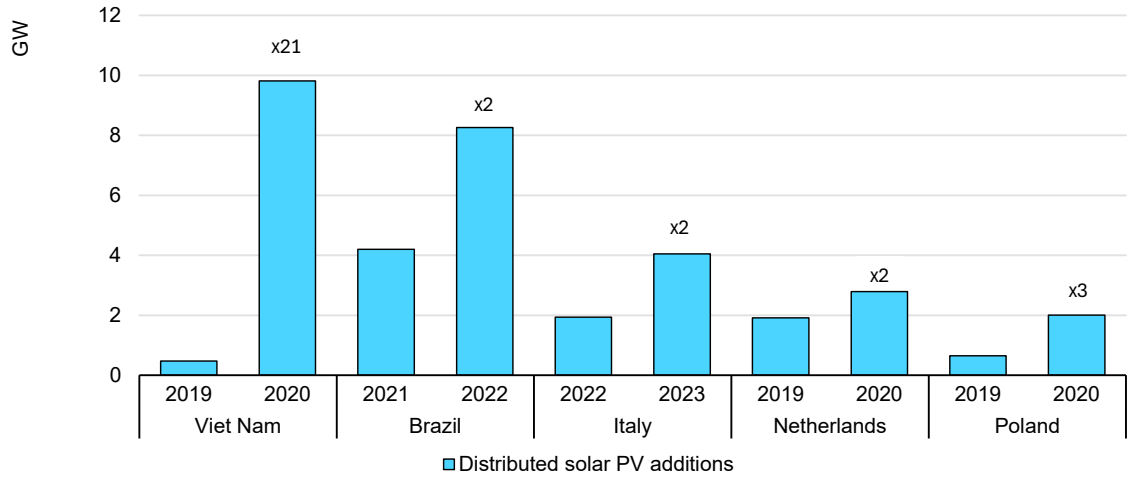
   - **Buy-all, sell-all**: All solar PV generation is sold to the utility, usually at a fixed price. The remuneration of solar PV electricity can be above, equal to or lower than the retail rate, while solar PV owners buy all electricity at the retail price to cover their demand. In this model, solar PV owners are like small power plants generating electricity under a long-term power purchase agreement (PPA). The higher the tariff compared to the PV system's levelised cost of energy (LCOE), the more attractive the scheme becomes, irrespective of the retail tariff.
   - **Net metering**: solar PV owners can use the electricity they generate, reducing their consumption from the network. In a net-metering scheme, a

solar PV owner receives an energy credit for any excess generation exported to the network during a specific time period. This energy credit can be deducted from network electricity consumed on future bills. In general, the higher the retail tariff compared to the solar PV system's LCOE, the more attractive the net-metering scheme becomes.

- **Distributed solar PV real-time self-consumption models**: solar PV owners can generate electricity for their own consumption and sell excess to the network. In contrast to net metering, energy accounting is done in real time and solar PV owners are paid for each unit of electricity exported, rather than earning energy credits towards future bills. The net billing scheme becomes more attractive, the higher the real-time selling price and retail tariffs are compared to the solar PV system's LCOE.

Given short installation timelines, policies can result in a boom in distributed solar PV installations from one year to another. For instance, in Viet Nam, solar PV net additions increased more than 20-fold between 2019 and 2020, indicating the importance of the existing feed-in tariff. Generous net-metering schemes doubled net additions in 2022 in Brazil, and in the Netherlands in 2020. The impending phase down of tax credit benefits doubled net additions of residential solar PV in Italy in 2023. In Poland, a grant scheme led to triple the net additions in 2020. However, it is important to note that some of these policies in Viet Nam, Brazil and Italy resulted in boom-and-bust deployment cycles as the level of incentives was reduced. Generous incentives led to a rapid uptake of distributed solar PV which quickly increased the cost of the programme.

Examples of distributed solar PV net additions in selected countries, 2019 - 2023



Source: IEA (2025), Renewables 2025.

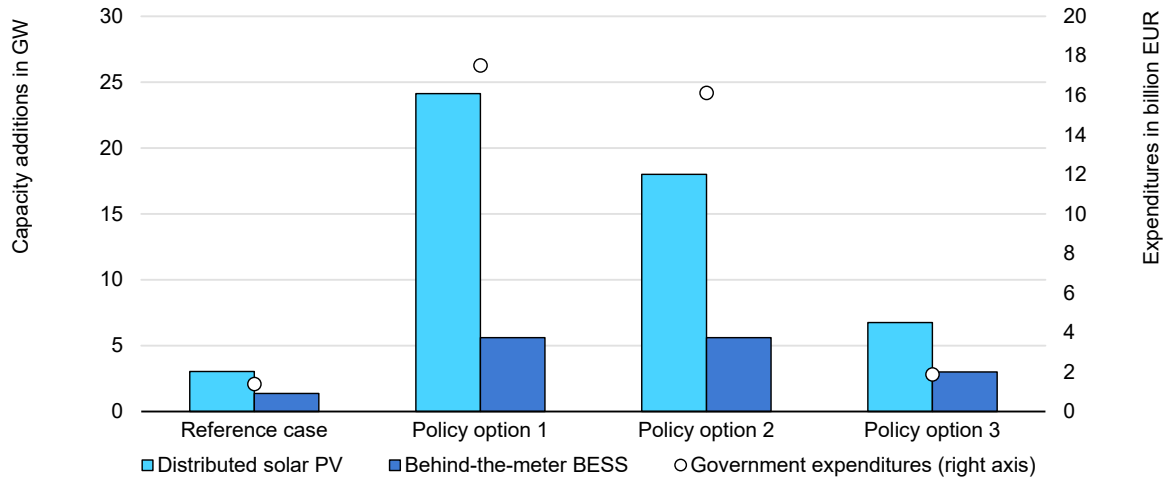
Policy options for Ukraine to accelerate small-scale solar PV additions for a more distributed electricity system

Accelerating the deployment of distributed solar PV with BESS may require additional incentives to reach the suggested 24 GW of new distributed PV and 5.6 GW of new BESS by 2030. However, this could increase the financial burden for the government budget in the short-term. Balancing the need to incentivise new distributed solar PV installations to improve electricity security and limiting government financial exposure remains a key policy challenge. As such, we propose three policy options for the period covering 2025-2030. These have different implications concerning the amount of distributed solar PV and BESS deployment and of the level of support the government needs to provide.

Implementing existing incentive programmes and encouraging the adoption of solar PV outside major urban areas remain challenging. Many countries have created agencies or programmes to reach areas outside cities. The government of Canada has a Clean Energy for Rural and Remote Communities programme which aims to increase the amount of clean energy used to produce electricity and heating in rural and remote communities in Canada. The programme has a streamlined application process and reporting system and has allocated more than USD 500 million for projects over 13 years. Nigeria's Rural Electrification Agency has programmes to increase electrification through special tariffs, and licence exemptions for systems under 100 kW capacity.

Additionally, the highest quality equipment should be used in Ukraine to ensure production and longevity. The government should provide a list of pre-selected equipment manufacturers sourced from lists of Tier one suppliers as defined by industry sources. Only solar PV systems from listed manufacturers should qualify for policy programmes and incentives.

Impact of the three policy options on distributed solar PV capacity additions and government expenditures, 2025-2030



Note: BESS = Battery energy storage systems.

Reference case: Existing policies

Ukraine's existing policies for distributed solar PV consist of the low interest loans provided by the government, the Green Tariff and the recently introduced net-billing scheme. The 5-7-9% loan programme provides low-cost loans at 5-7% interest rate for commercial and industrial applicants, at 7% for homeowners' associations, and at 0% for 10 years for households (the government compensates banks for the difference between the current loan rate, around 20%, and the programme's loan rate), but can only be combined with participation in the net-billing scheme. The Green Tariff currently offers around EUR 135/MWh for electricity produced from solar PV systems in private households, but will cease payments after 2029. Lastly, the net billing scheme specifies that households can sell surplus electricity at the hourly wholesale electricity price, minus distribution system operator (DSO) charges and taxes. Wholesale power prices are between EUR 70 and 210 per MWh, while DSO charges average EUR 41/MWh and range from around EUR 17/MWh to EUR 71/MWh, depending on location, as of the beginning of 2025. The current residential electricity price is around EUR 84/MWh but will eventually increase once subsidies are phased out.

Considering recent deployment trends, existing incentives and current retail electricity prices, we estimate these policies could lead to 3.1 GW of solar PV capacity addition and another 1.4 GW of BESS by 2030 with an estimated government spend of around EUR 1.4 billion through 2030 for financial support.

Assumptions for calculating the government expenditures, 2025-2030

	Reference	Policy option 1	Policy option 2	Policy option 3
Solar PV				
Net additions by 2030 (GW)	3.1 GW	24.1 GW	18.0 GW	6.8 GW
CAPEX (EUR/kW)	1 000 EUR/kW			
Full-load hours	1 200 FLH/year			
Net additions from zero-interest loans	1.52 GW	-	18.0 GW	-
Investment grant intensity	-	60%	-	-
Additional feed-in bonus	-	-	-	EUR 5/MWh
BESS				
Net additions by 2030 (GW)	1.4 GW	5.6 GW	5.6 GW	3.0 GW
CAPEX (EUR/kW)	1 200 EUR/kW			
Net additions from zero-interest loans	1.4 GW	-	5.6 GW	-
Investment grant intensity	-	60%	-	25%
General				
WACC/discount rate	20%			
Green Tariff	EUR 135/MWh	-	-	-
Tariff	-	EUR 70/MWh	EUR 135/MWh	-
Wholesale electricity price	EUR 80/MWh	EUR 80/MWh	EUR 80/MWh	-

Policy option 1: Fast and strong growth

Although financial incentives and low or zero-interest loans are currently available, initial investment costs for solar PV projects are still high for households and small businesses, limiting a stronger buildout.

Policy option 1 addresses this challenge by proposing the introduction of an **investment grant**. This direct incentive should cover at least 60% of the total investment costs for small-scale systems (including both the solar PV system and the BESS). In addition, a **fixed and stable tariff** for selling the entire production of the generated electricity to the energy supplier or another state-owned entity can provide additional financial support and mitigate the risk. As the investment costs are already subsidised, this tariff can be significantly below the typical LCOE

and thus even below today's wholesale market prices. The difference between the tariff and market prices leads to additional savings for the government, reducing the financial burden.

While this policy option facilitates a fast buildout of 24 GW of distributed solar PV and 5.6 GW of BESS, it entails rather high costs for the government, especially in the short-term. We estimate this policy option could cost around EUR 17.5 billion by the end of 2030[2]. It should be noted that the total expenses for policy option 1 decrease over time based on IEA calculations, as the government can gain additional revenue if the tariff remains below wholesale market prices.

Policy option 2: Enhancing current policies

The second policy option focuses on improving the existing policies and incentives. Currently, the Ukrainian government offers low or zero-interest loans for setting up distributed solar PV systems including BESS, the Green Tariff, and the net billing scheme. Nevertheless, the low or zero interest loans are difficult to obtain and payments under the Green Tariff are only foreseen until the end of 2029. The net billing scheme might not offer sufficient financial incentives at the current, subsidised retail tariffs, and entails an administrative burden for electricity suppliers and consumers with solar PV systems.

Policy option 2 addresses this challenge by **enhancing the existing incentives**. The low or zero interest loans should be made more widely available by providing capacity building for local banks and/or transforming local administrations to 'one-stop shops' for the loans. Loans should be available to interested parties that both produce and consume energy (prosumers), thus reducing existing administrative barriers. The government could also consider a new feed-in tariff exclusively for distributed solar PV customers beyond 2030 (although in order to qualify for this new tariff, the system must be installed prior to the end of 2030).

This policy option provides a compromise between the other two alternatives. We estimate enhancing the current policies will lead to expenses of around EUR 16.1 billion by 2030, which is around 90% of the cost of policy option 1 and almost 12 times the cost of the reference case. While policy option 2 might not lead to the required expansion, it should result in significant uptake of 18 GW of solar PV and 5.6 GW of BESS by 2030.

[2] Achieving the 24.1 GW of solar PV and 5.6 GW of BESS by 2030 with only a 30% direct incentive would decrease the support costs by around EUR 9.3 billion to roughly EUR 8.2 billion in total.

Policy option 3: System-friendly long-term scheme

This third policy option focuses on providing a system-friendly [3], long-term policy strategy. The other two policy options increase government spending significantly (and potentially also system costs) but can lead to fast and strong deployment, which is appropriate given the current exceptional situation.

Policy option 3 suggests introducing a **real-time/hourly self-consumption scheme**. Although similar to the current net billing scheme, surplus electricity should be remunerated with an extra benefit payment in addition to the wholesale market price. This scheme foresees a direct incentive for BESS which covers 25% of the cost of the storage asset.

This policy option requires the least expenditure of the three, but results in the lowest amount of new capacity, as it provides the lowest incentives. We estimate the expenses from the additional self-consumption benefit would amount to around EUR 55 million by 2030 and the incentive for the BESS to be around EUR 1.8 billion. The total amount is EUR 1.9 billion, around a third more than the reference case. The incentivised deployment would be almost 7 GW of solar PV and 3 GW of BESS by 2030.

[3] System-friendliness refers to planning, operating or contracting solar and wind power plants in a way that supports the overall outcomes for the system.

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