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# GREEN ENERGY IN UKRAINE: ECONOMIC ASSESSMENT OF SOLAR TECHNOLOGIES IMPLEMENTATION

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**Abstract**. The article addresses the economic assessment of introducing solar technologies as an essential component of green energy development in Ukraine. The issue is considered through the prism of the impact of solar generation on enterprise cost optimisation, energy independence, and increased resource efficiency. In the context of martial law and the destruction of the centralised energy infrastructure, the issue of decentralising electricity generation and transitioning to renewable sources is of particular practical importance. Based on a financial and economic model, the optimal parameters for a solar power plant (SPP) for a medium-sized enterprise are determined. The key indicators, in particular, the payback period by static and dynamic methods, are calculated. The plant's capacity is determined based on the enterprise's seasonal insolation and consumption structure. The results of the study demonstrate high profitability and rapid return on investment in SPP, provided that the capacity is appropriately configured to the consumption structure. Attention is paid to the model's sensitivity to changes in WACC and inflation, as well as to scenarios of overcapacity installation, which result in a decrease in profitability due to a generation surplus. The potential benefits and limitations of projects are assessed, in particular, the threat of reduced economic efficiency when the optimal installed capacity is exceeded without sufficient consumption. A model for evaluating the economic feasibility of SPP investments is presented, accounting for consumption, seasonality, equipment degradation, and the time value of money. The study confirms the financial feasibility of transitioning to green energy at the individual enterprise level. The results show high profitability for such investments, even under conservative estimates. However, it is emphasised that the optimal SPP capacity should be chosen to account for individual consumption characteristics to avoid energy overproduction.

**Keywords***:* green energy, solar technologies, solar power plants, investments, financial and economic model, efficiency, economic assessment.

**JEL Classification:** Q42, L94, G31

## 1. INTRODUCTION

In today's environment of rising electricity tariffs, unstable energy supply, and growing climate challenges, the transition to renewable energy sources is becoming increasingly relevant. Green energy, in particular solar energy, is seen not only as a means of reducing greenhouse gas emissions, but also as an effective tool for reducing electricity costs for businesses, strengthening energy security and decentralising energy infrastructure.

For Ukraine, which is undergoing a profound socio-economic transformation exacerbated by the consequences of a full-scale war, the development of green energy is an essential factor in ensuring energy security, modernising energy infrastructure, and improving the energy efficiency of the economy. Under martial law, the destruction of infrastructure and reduced generation from centralised capacities create demand for autonomous, decentralised energy sources, including solar power plants (SPPs). However, investment decisions require a detailed economic justification that takes into account the consumption profile, seasonality, and cost of capital, inflationary expectations, and equipment degradation.

## 2. THEORETICAL BACKGROUND

Green energy, as a component of sustainable development, involves gradual decarbonization of the energy sector, reductions in greenhouse gas emissions, and a transition to renewable energy sources. The development of green energy in Ukraine and the efficiency of renewable energy sources are the subject of numerous scientific and applied studies. For example, Mykhailova et al. (2023) focused on the development of green energy as a key factor in Ukraine's energy independence. At the same time, the researchers draw attention to the problems of green energy in Ukraine, in particular: damage, destruction and suspension of green energy facilities, financial crisis, suspension of construction of new wind farms, lack of state support, and lack of a single strategic document that defines the directions of green energy development in Ukraine.

Researchers (Zvarych & Masna, 2023) note that renewable green energy is fundamental to national energy security and independence and, in their study, revealed the issue of green energy transition in the context of post-war reconstruction in Ukraine.

Polishchuk & Kotsiubailo (2022) studied the issues of preventing the energy crisis in the country and ensuring the energy independence of domestic enterprises.

Shkvarylyuk (2024) studied the main vectors of green energy development in Ukraine, focusing on tariff policy. Prokhorova et al. (2024) also highlighted the peculiarities of tariff management in the context of the green economy.

The economic efficiency of renewable energy projects, in particular solar, is usually analysed using investment instruments. For example, Rychka (2024) conducted a financial analysis of the effectiveness of solar energy investments, focusing on payback, profitability, and potential risks. (Kurbatova et al., 2024) studied the economic efficiency of hybrid wind-solar power plants in the residential sector. The results of the study highlight the economic efficiency of the feed-in tariff compared to the net tariff for households investing in such facilities and emphasize the need to improve policy measures to increase their investment attractiveness.

Thus, most researchers focus on the impact of renewable energy sources on the country's energy independence. At the same time, insufficient attention has been paid to the economic assessment of the effectiveness of green energy technologies, particularly solar technologies, which makes this area relevant and warrants in-depth research.

## 3. RESEARCH OBJECTIVE, METHODOLOGY AND DATA

The purpose of the article is to build a financial and economic model of SPP implementation at a medium-sized enterprise based on a systematic approach and to analyse its economic efficiency in the context of modern energy transformation.

The article uses a combination of general scientific and specialised research methods to achieve its goal, including analysis and synthesis, induction and deduction, scientific abstraction, comparison, statistical methods, and methods of economic and mathematical modelling.

The study's information base comprised analytical materials of the National Bank of Ukraine, statistical sources, current regulations in the energy sector, scientific publications by leading domestic and foreign researchers, analytical reports by market experts, and technical characteristics of typical SPPs adapted to the conditions of regional isolation in Ukraine.

## 4. RESULTS AND DISCUSSION

In the context of rising electricity tariffs and unstable energy supply resulting from the destruction of energy infrastructure during military operations, the implementation of solar power plants for self-consumption is becoming an increasingly attractive investment option for Ukrainian enterprises. At the same time, the development of solar energy is a strategically crucial element of Ukraine's transition to a green economy. Justifying the economic feasibility of implementing SPPs in real business conditions is a prerequisite for effective decision-making and attracting investment in the renewable energy sector. Therefore, it is necessary to develop a financial and economic model that accounts for the specifics of solar energy generation, seasonal fluctuations, equipment degradation, and the enterprise's electricity consumption.

Assessing the economic efficiency of implementing solar technologies at an enterprise requires a comprehensive approach that includes an analysis of capital and operating costs, an assessment of projected savings, and the calculation of key indicators of investment attractiveness. The most relevant indicators for assessing investments in SPP are: net present value (NPV); internal rate of return (IRR); discounted payback period (DPP); profitability index (PI), and levelised cost of energy (LCOE) (Duldinger, 2023; Rychka, 2024).

To determine the optimal capacity of an SPP, it is necessary to analyse the enterprise's electricity consumption profile. As a hypothesis, let's assume that the plant's peak summer generation should not exceed its average monthly electricity consumption. This approach ensures the most efficient use of the generated energy for the company's own needs, without the need to sell surplus to the grid.

For modelling, let's consider a typical medium-sized manufacturing enterprise in Ukraine with the following electricity consumption profile:

- average monthly consumption: 50,000 kWh;
- average daily consumption: 1,620 kWh.

Medium-sized businesses were chosen as the object of modelling because small enterprises cannot afford to invest in expensive energy projects. For large enterprises, it does not make sense, as their energy consumption volumes are too large, requiring capital investments commensurate with the cost of the enterprise itself. In addition, under martial law, medium-sized enterprises have demonstrated high adaptability and mobility and are currently among the largest employers in Ukraine.

To accurately forecast SPP electricity production, seasonal fluctuations in solar insolation should be accounted for. According to Ukraine Invest (2024), the average annual solar insolation in Ukraine ranges from 1100 to 1500 kWh/m$^2$, depending on the region. At the same time, electricity production is uneven throughout the year.

To maximise the efficiency of the installed SPP, generation during the peak period should not exceed the average monthly consumption, namely 50 MW. Fig. 1 shows the absolute measurements of SPP generation.

The plant's average annual generation is 363 MW. At the same time, the company's average annual electricity consumption is 591.2 MW. Thus, by installing its own solar generation, the company can cover about 61.4% of its yearly electricity consumption. The value may vary depending on the SPP's location. The calculations were made for a conventional enterprise in the central part of Ukraine.

According to market experts, the calculation of the optimal capacity of the installed SPP is based on the average number of sunny days in Ukraine, namely about 70 days, as well as the average production efficiency, which depends on several factors, including the quality of inverters, and averages 80%. Given the average annual generation of 363,000 kW, the station's estimated capacity to provide it will be 300 kW. That is, a 300-kilowatt station operating 365 days with 4 hours of sunshine per year and an efficiency of 80% will generate approximately 363,000 kW per year.

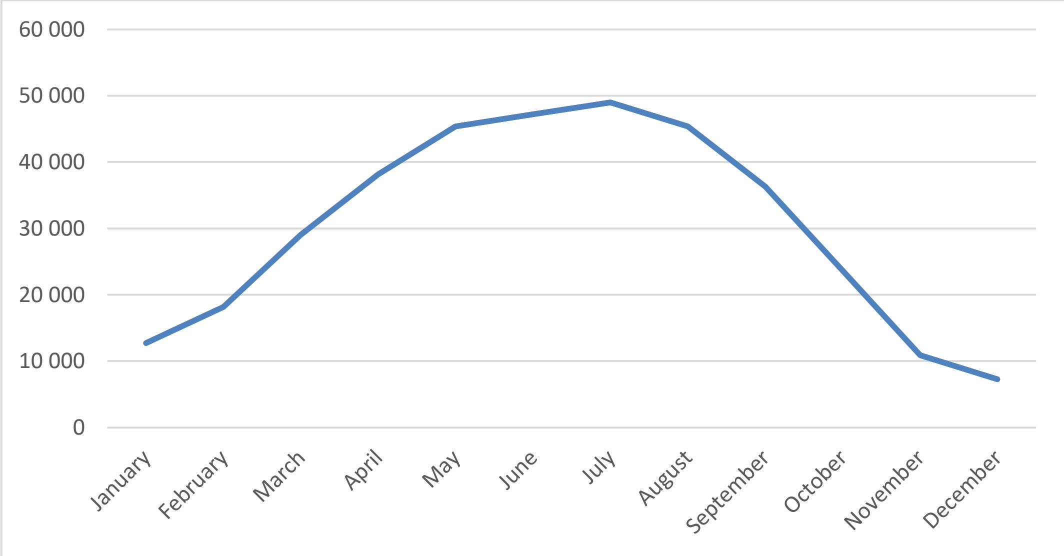


*Fig. 1. Distribution of SPP generation for the enterprise, kW*

*Source: calculated by the authors based on (Proper Power Supply, n. d.)*

According to solar panel distributors, as of Q1 2025, the estimated cost to install 300 kW of modules ranges from UAH 4.7 million to UAH 6.6 million. The main factors affecting this figure are the quality of the panels, the manufacturer's reputation, and the distributor's reputation. For the project calculation in this study, we will assume that the cost of a solar station with a nominal capacity of 300 kW is UAH 6.6 million (Yasno, n. d.).

Table 1 presents the data for forecasting the project's payback period using the static method.

*Tab. 1*

*Initial data for calculating the payback period of an SPP using the static method*

| Indicator | Value |
|---|---|
| Annual generation of SPP | 363 MWh |
| Base price of grid electricity (tariff + distribution + transmission) | 8 400 UAH/MWh |
| Inflation (CPI, % yoy) | 2025 – 8.4 %; 2026 – 5 %; 2027 – 5 %; 2028 – 5 % |
| Average exchange rate UAH/USD | 2025 – 42.3; 2026 – 43.1; 2027 – 44.7; 2028 – 46.2 |

*Source: compiled by the authors based on (National Bank of Ukraine, 2025; Minfin, 2025)*

According to the forecasting results presented in Table 2 and the estimated investment cost of UAH 6.6 million in the SPP, the project's expected payback period is ≈ 2.1 years. That is, in the first year, the company will avoid the cost of purchasing ≈ UAH 3 million of electricity from the grid; by the fourth year, the equivalent savings will increase to UAH 3.8 million per year. In dollar terms, the cost of alternative energy is growing more moderately (≈2% per year) due to the projected devaluation.

The static calculation enables the investor (company management) to estimate the payback period of investments using classical approaches to assessing project performance (Kuzheliev et al., 2025). However, the method's disadvantage is that it ignores the impact of factors such as reduced generation due to module degradation, capital costs (discounting), tax effects, and operating costs. Therefore, to eliminate the above disadvantages, it is advisable to use discounting methods to assess investment effectiveness.

*Tab. 2*

*Forecast of the cost of using electricity from the grid*

| Year | Inflation, % | Exchange rate, UAH/USD | Cost price, UAH | Cost price, USD |
|---|---|---|---|---|
| 2024 (year 0) | - | 41.1 | 3 049 200 | 74 190 |
| 2025 (year 1) | 8.40 | 42.3 | 3 305 333 | 78 140 |
| 2026 (year 2) | 5 | 43.1 | 3 470 599 | 80 524 |
| 2027 (year 3) | 5 | 44.7 | 3 644 129 | 81 524 |
| 2028 (year 4) | 5 | 46.2 | 3 826 335 | 82 821 |

*Source: calculated by the authors*

We will build a discounted cash flow (DCF) model to analyse the feasibility of a 300 kW photovoltaic (PV) plant. The choice of this approach is due to its compliance with the postulates of the modern theory of capital budgeting, according to which the cost of a project is equal to the sum of future cash flows, discounted to the present value at a rate that reflects the risk and expense of capital (Brealey et al., 2023).

Table 3 presents the data for building a model to calculate the SPP payback period using the dynamic method.

*Tab. 3*

*Initial data for building a model for calculating the payback period of an SPP using the dynamic method*

| Indicator | Designation | Value |
|---|---|---|
| CAPEX | $C_0$ | 6 600 000 UAH |
| Initial savings (2024) | $S_0$ | 3 049 200 UAH |
| Exchange rate, UAH /USD (2024) | $ER_0$ | 41.1 UAH /USD |
| OpEx in UAH (2024) | $OP_0$ | 147 960 UAH |
| Generation rate | $G_t$ | 0.98 in 2025, $G_1$<br>-0.007*t in the following years |
| Nominal discount rate | k | 15% |
| Inflation | $\pi_i$ | 8.4% in 2025<br>5% in 2026–2029 |

*Source: compiled by the authors based on (National Bank of Ukraine, 2025; European Business Association, n. d.; IEA PVPS, 2022; KPMG, n. d.)*

The nominal discount rate corresponds to the nominal flows, which reflect the projected inflationary dynamics of tariffs and costs. The inflationary component is accounted for through the cumulative price index ($\pi$i), which aligns with the National Bank of Ukraine's expectations for the medium-term dynamics of consumer prices (Kuzheliev et al., 2020).

Next, we present the calculation part of the proposed model:

1. Inflationary multiplier:

$$F_t = \prod_{i=1}^{t}(1+\pi_i) \tag{1}$$

2. Savings in year t:

$$S_t = S_0 \cdot F_t * G_t \tag{2}$$

3. OpEx in year t:

$$OP_t = OP_0 \cdot F_t \tag{3}$$

4. Net cash flow:

$$CF_t = S_t - OP_t \tag{4}$$

5. Discounted cash flow:

$$DCF_t = \frac{CF_t}{(1+k)^t} OP_t \tag{5}$$

6. Cumulative discounted cash flow:

$$CumDCF_t = \sum_{i=0}^{t} DCF_i \tag{6}$$

7. Generation rate

$$G_t = 0.98 * (1 - 0.007)^t \tag{7}$$

The technical degradation of PV modules is modelled as a multiplicative generation rate (Gt). This trajectory (2 % / 0.7 %) is within the range declared by Tier-1 module manufacturers for European countries (Fraunhofer Institute for Solar Energy Systems ISE, 2024).

The modelling results will be as follows (Table 4).

*Tab. 4*

*Results of building a model for calculating the payback period of a 300 kW SPP using the dynamic method*

| Year | $F_t$ | $S_t$, UAH | $OP_t$, UAH | $CF_t$, UAH | $DCF_t$, UAH | $CumDCF_t$, UAH |
|---|---|---|---|---|---|---|
| 0 (2024) | - | 3 049 200 | - | -6 600 000 | -6 600 000 | -6 600 000 |
| 1 (2025) | 1,084 | 3 239 109 | 160 389 | 3 078 720 | 2 677 152 | -3 922 848 |
| 2 (2026) | 1,1382 | 3 378 501 | 168 408 | 3 210 093 | 2 427 205 | -1 495 643 |
| 3 (2027) | 1,19511 | 3 522 389 | 176 828 | 3 345 561 | 2 199 136 | 703 493 |
| 4 (2028) | 1,25487 | 3 669 266 | 185 670 | 3 483 596 | 1 992 797 | 2 696 290 |
| 5 (2029) | 1,31761 | 3 829 939 | 194 953 | 3 634 986 | 1 807 647 | 4 503 937 |

*Source: calculated by the authors*

The results of the Calculation of net and discounted flows show that, despite the annual decline in technical output, the absolute value of nominal savings is growing, as the projected inflation rate (5%) exceeds the degradation rate of the PV modules (0.7%). At the same time, the discounted cash flow for 2025 is only 87% of the nominal cash flow, clearly illustrating the impact of the time value of money at a high WACC. Nevertheless, the cumulative discounted value crosses the zero mark at the end of the third operating year, indicating a payback period of 2.9 years and confirming the hypothesis of a high rate of return on invested capital.

The results empirically confirm the priority of renewable energy projects as a tool for reducing operating costs for industrial consumers. The model correctly integrates macroeconomic (inflation), technical (degradation), and financial (cost of capital) factors, which is in line with the IEA PVPS (2022) recommendations for a comprehensive assessment of PV investments. Under the above assumptions, the discounted payback period is ≈ 3 years, which is significantly less than the expected life cycle of the installation (≥ 20 years). Thus, even a conservative accounting of degradation processes does not negate the project's economic attractiveness.

Thus, the hypothesis of economic profitability of installing SPPs by Ukrainian enterprises for self-consumption has been confirmed. The payback period of the investment using the cash flow discounting method is estimated at 2.9 years, which is a medium-term project in line with the investment climate in Ukraine.

However, the problem of SPP's nominal capacity remains open. The model above assumes that the maximum SPP efficiency should not exceed consumption in the peak month (July). It is advisable to make specific adjustments to the proposed hypothesis, which assumes the most significant economic benefit from installing an SPP capable of fully covering its own consumption needs during the half-year (April-September).

According to Fig. 2, the lowest generation distribution in this period occurs in September, accounting for 10% of the annual SPP generation. Accordingly, to meet the company's demand of 50,000 kWh, it is necessary to install an SPP with a yearly generation of 500,000 kWh, which is 37.74% higher than the previous model's annual generation; i.e., the SPP's nominal capacity should be 413 kW.

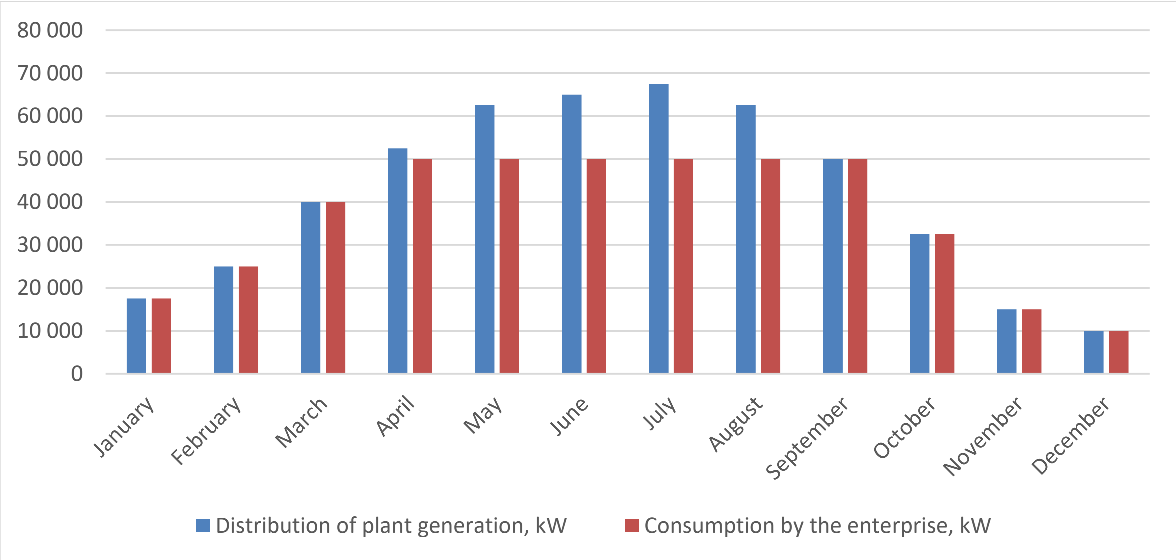


*Fig. 2. Distribution of 413 kW SPP generation and actual electricity consumption by the enterprise*
*Source: calculated by the authors*

Thus, the required nominal capacity of the plant increases from 300 kW to 413 kW, while capital costs increase to UAH 9 million (Yasno, n. d.). In addition, operating costs will also increase (+37.74%). On the other hand, the amount of money saved will also increase as self-consumption coverage rises.

Savings in monetary terms in the base year will already amount to UAH 3,696,000. At the same time, indicators such as inflation, panel degradation, and the average rate of return remain unchanged because they do not depend on the station's nominal capacity and are therefore constants. Table 5 shows the modelling results for the new hypothesis.

*Tab. 5*

*Results of building a model for calculating the payback period of a 413 kW SPP using the dynamic method*

| Year | $F_t$ | $S_t$, UAH | $OP_t$, UAH | $CF_t$, UAH | $DCF_t$, UAH | $CumDCF_t$, UAH |
|---|---|---|---|---|---|---|
| 0 (2024) | - | 3 696 000 | - | -9 000 000 | -9 000 000 | -9 000 000 |
| 1 (2025) | 1.084 | 3 926 335 | 220 802 | 3 705 533 | 3 222 203 | -5 777 797 |
| 2 (2026) | 1.138 | 4 093 994 | 231 842 | 3 862 152 | 2 920 342 | -2 857 456 |
| 3 (2027) | 1.195 | 4 268 811 | 243 434 | 4 025 378 | 2 646 751 | -210 705 |
| 4 (2028) | 1.255 | 4 451 094 | 255 606 | 4 195 489 | 2 398 784 | 2 188 080 |
| 5 (2029) | 1.318 | 4 641 161 | 268 386 | 4 372 775 | 2 174 042 | 4 362 122 |

*Source: calculated by the authors*

A 36% increase in investment costs (from UAH 6.6 million to UAH 9 million) will increase the initial negative discounted cash flow to UAH -9 million. OpEx will grow from UAH 147 960 to UAH 203 692, but will remain insignificant in the structure of current expenses (≈ 5% of net CF). The annual savings will increase from 363 MWh (UAH 3 049 200) to 440 MWh (UAH 3 696 000), thereby compensating for most of the additional capital expenditures. The nominal CF rates will be 20-25% higher, depending on the period, so the negative cumulative flow will decay faster than expected from increased capital expenditures alone.

The payback period of this project is ≈ 3.1 years, indicating that the investment is repaid in the first half of the fourth operating year.

The project's sensitivity analysis demonstrates the model's sensitivity to changes in WACC and inflation. For the WACC indicator, higher growth increases the discounted payback period and reduces the internal rate of return. Inflation has the opposite effect. Nevertheless, IRR and discounted payback remain high even with such fluctuations.

The analysis of the economic efficiency of the two SPP options showed that the 363 MWh model offers a faster payback period (≈2.9 years) at relatively lower capital and operating costs, resulting in a better return on investment. In contrast, the 440 MWh option, although requiring higher initial and operating costs due to its larger installed capacity, generates higher absolute net cash flow, resulting in a substantial overall economic benefit over five years.

In the context of optimal capital use, the results indicate that it is advisable to avoid overcapacity when electricity production exceeds the company's own consumption. Surpluses exported to the grid are often sold at lower feed-in tariffs, which generally reduces the financial return on additional investments. The balance between the plant's output and consumption profile is a key factor in determining the economic feasibility of a project: optimised capacity maximises self-consumption and minimises dependence on market tariff variations, ensuring a higher internal rate of return.

At the same time, an increase in installed capacity may be justified if there are positive expectations of higher electricity sales tariffs, the introduction of additional fiscal incentives, and the development of mechanisms for selling green certificates or netting at full cost. In the medium term, the decline in the cost of photovoltaic equipment and the reduction in the price of energy storage technologies will further shift the economic equilibrium toward greater capacity. Therefore, excess generation can generate revenues that offset higher capital and operating costs, especially in regions with unstable energy markets or long-term green electricity contracts.

Thus, the study confirms that investing in a solar power plant is financially justified for enterprises under many market and regulatory policy parameters. However, the optimal capacity design scheme should account for local consumption characteristics and tariff policy to avoid reducing economic efficiency from excess generation. Deeper modelling, incorporating scenarios of regulatory changes and technological innovations, will increase the reliability of forecasting and develop recommendations for strategic investment decisions.

## 5. CONCLUSIONS

The study confirmed the economic feasibility of introducing solar power plants as part of Ukraine's green energy development for enterprise self-consumption. The modelling results showed that, even under conservative investment conditions, accounting for technical equipment degradation, inflationary effects, and the cost of capital, the payback period is about 3 years. This figure is attractive to investors and meets modern requirements for energy efficiency and enterprise financial stability.

Comparison of two SPP implementation options, namely 300 kW and 413 kW, allowed us to assess the balance between capital costs, self-consumption coverage, and the scale of savings. The model with lower capacity demonstrates higher profitability relative to the more powerful installation, while the latter provides larger net cash flows, which may be advisable in the long term.

One of the essential conclusions of the study is the need for careful planning of SPP capacity in line with the enterprise's actual electricity consumption profile. Excessive generation without the ability to sell the residuals to the grid may reduce the investment's efficiency. Therefore, the optimal solution is to model generation for the period of active solar production (April-September), with a focus on meeting internal needs without generating a surplus.

Thus, investments in solar technologies are not only a tool for decarbonization and energy independence, but also a rational economic step in the current environment. Taking into account inflationary expectations, the cost of capital, and technological obsolescence allows us to get an objective picture of the economic benefits of implementing solar power plants. Successful scaling of such solutions can contribute to the sustainable development of Ukraine's energy sector and reduce the energy vulnerability of industrial consumers under martial law.

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## REFERENCES

[1] Brealey, R., Myers, S., Allen, F., & Edmans, A. (2023). *Principles of Corporate Finance.* New York: McGraw-Hill Higher Education.
[2] Duldinger, L. (2023). Net Present Value (NPV) - Project Finance. *RVI.* URL: https://surl.li/pjtszk
[3] European Business Association. (n. d.). URL: https://eba.com.ua/research/doslidzhennya-ta-analityka/
[4] Fraunhofer Institute for Solar Energy Systems ISE. (2024). Annual Report 2023/24. URL: https://surl.li/iifkyk
[5] IEA PVPS. (2022). Guidelines for Operation and Maintenance of Photovoltaic Power Plants in Different Climates. URL: https://surl.li/cxezlx
[6] KPMG. (n. d.). Cost of Capital Study. URL: https://kpmg.com/de/en/home/insights/overview/cost-of-capital.study.html
[7] Kurbatova, T., Sotnyk, I., Perederii, T., Prokopenko, O., Wit, B., Pysmenna, U., & Kubatko, O. (2024). On-Grid Hybrid Wind–Solar Power Plants in Ukraine's Residential Sector: Economic Justification of Installation Under Different Support Schemes. *Energies*, 17(20), 5214. https://doi.org/10.3390/en17205214
[8] Kuzheliev, M., Zherlitsyn, D., Rekunenko, I., Nechyporenko, A., & Nemsadze, G. (2020). The impact of inflation targeting on macroeconomic indicators in Ukraine. *Banks and Bank Systems*, 15(2), 94-104. http://dx.doi.org/10.21511/bbs.15(2).2020.09
[9] Kuzheliev, M., Zherlitsyn, D., Rekunenko, I., Nechyporenko, A., & Stabias, S. (2025). Expanding portfolio diversification through cluster analysis beyond traditional volatility. *Investment Management and Financial Innovations*, 22(1), 147-159. http://dx.doi.org/10.21511/imfi.22(1).2025.12
[10] Minfin. (2025). Electricity tariffs for enterprises. URL: https://index.minfin.com.ua/ua/tariff/electric/prom/
[11] Mykhailova, L., Semenyshyna, I., & Shpatakova, O. (2023). Green energy as a factor of energy independence of Ukraine. *Economy and Society*, 47. https://doi.org/10.32782/2524-0072/2023-47-10
[12] National Bank of Ukraine. (2025). Inflation report. URL: https://bank.gov.ua/ua/monetary/report

[13] Polishchuk, S. V., & Kotsiubailo, M. R. (2022). "Green" energy as a tool for the acquisition of energy independence by domestic enterprises. *Economic scope*, 181, 183-187. https://doi.org/10.32782/2224-6282/181-32
[14] Prokhorova, V. V., Us, Y. V., & Yukhman, Y. V. (2024). Features of tariff management in the context of the green economy. *The Problems of Economy*, 2(60), 53-60. https://doi.org/10.32983/2222-0712-2024-2-53-60
[15] Proper Power Supply. (n. d.). URL: https://surli.cc/gbcarp
[16] Rychka, R. (2024). Economic analysis of the efficiency of solar energy investments: profitability and risks. *Economy and Society,* 60. https://doi.org/10.32782/2524-0072/2024-60-146
[17] Shkvarylyuk, M. V. (2024). The main vectors of green energy development in Ukraine: tariff policy. *The Problems of Economy*, 1(59), 38-43. https://doi.org/10.32983/2222-0712-2024-1-38-43
[18] Ukraine Invest. (2024). Investment opportunity in the energy sector. URL: https://surl.li/czubzi
[19] Yasno. (n. d.). Solar stations from YASNO on a turnkey basis. URL: https://yasno.com.ua/solar-stations
[20] Zvarych, R., & Masna, O. (2023). Green energy transition in the concept of post-war reconstruction of Ukraine. *Herald of Economics*, 3, 170-181. https://doi.org/10.35774/visnyk2023.03.170

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У статті розглянуто питання економічної оцінки впровадження сонячних технологій як важливої складової розвитку зеленої енергетики в Україні. Розгляд проблематики реалізовано через призму впливу сонячної генерації на оптимізацію витрат підприємств, забезпечення енергетичної незалежності та підвищення ефективності ресурсного використання. В умовах воєнного стану та деструкції централізованої енергетичної інфраструктури національної економіки питання децентралізації генерації електроенергії й переходу до відновлюваних джерел набуває особливої практичної значущості. На основі побудови фінансово-економічної моделі визначено оптимальні параметри сонячної електростанції (СЕС) для підприємства середнього розміру. Розраховано ключові індикатори, зокрема термін окупності за статичним та динамічним методами. Визначено оптимальну потужність установки відповідно до сезонної інсоляції та структури споживання підприємства. Результати дослідження демонструють високу рентабельність та швидку окупність інвестицій у СЕС за умов правильної конфігурації потужності до структури споживання. Приділено увагу аспектам чутливості моделі до змін показників WACC, інфляції та сценаріїв встановлення завеликої потужності, що супроводжується зниженням рентабельності через профіцит генерації. Оцінено потенційні переваги та обмеження проєктів, зокрема загрозу зниження економічної ефективності при перевищенні оптимальної встановленої потужності без достатнього рівня самостійного споживання енергії. Представлено модель оцінки економічної доцільності інвестицій у СЕС з урахуванням споживання, сезонності, деградації обладнання та часової вартості грошей. Дослідження підтверджує економічну доцільність переходу до зеленої енергетики на рівні окремих підприємств в Україні. Отримані результати свідчать про високу рентабельність таких інвестицій навіть за консервативними оцінками. Однак наголошується, що вибір оптимальної потужності СЕС має враховувати індивідуальні характеристики споживання, щоб уникнути перевиробництва енергії.

**Ключові слова:** зелена енергетика, сонячні технології, сонячні електростанції, інвестиції, фінансово-економічна модель, ефективність, економічна оцінка.