

PRINOSNA VREDNOST FOTONAPONSKOG POSTROJENJA SREDNJEG KAPACITETA

*Vladislav Zekić¹, Nedeljko Tica², Dejan Janković³, Dragana Novaković⁴,
Tihomir Novaković⁵, Dragan Milić⁶*

Rezime

Analiza prinosa vrednosti investicije u postrojenje za proizvodnju električne energije korišćenjem fotonaponskih panela pokazuje da je projekat ekonomski opravdan, budući da je prinosa vrednost viša od potrebne investicije. Iako je razlika između prinosa vrednosti i investicionih troškova relativno mala, očekivani rast cena energije i povećanje potražnje, zajedno sa postepenim padom troškova investicija po jedinici kapaciteta u budućnosti, ukazuju na povoljnu dugoročnu perspektivu ove tehnologije.

Pored ekonomskih aspekata, posebno je značajan i društveni doprinos ovakvih ulaganja, koji se ogleda u smanjenju zagađenja životne sredine i povećanju energetske održivosti. Širenje primene posmatrane tehnologije predstavlja osnovu za efikasniju proizvodnju i distribuciju električne energije, uz istovremeno smanjenje troškova distribucije i gubitaka u energetskom sistemu.

Ključne reči: fotonaponska postrojenja, ocena investicija, prinosa vrednost.

1. Vladislav Zekić, koresponding autor, redovni profesor, Poljoprivredni fakultet, Univerzitet u Novom Sadu, Trg Dositeja Obradovića 8, 21000 Novi Sad, email: vladislav.zekic@polj.edu.rs; ORCID ID: <https://orcid.org/0000-0002-7377-2402>.
2. Nedeljko Tica, redovni profesor, Poljoprivredni fakultet, Univerzitet u Novom Sadu, Trg Dositeja Obradovića 8, 21000 Novi Sad, email: nedeljko.tica@polj.edu.rs; ORCID ID: <https://orcid.org/0009-0002-5696-686X>.
3. Dejan Janković, redovni profesor, Poljoprivredni fakultet, Univerzitet u Novom Sadu, Trg Dositeja Obradovića 8, 21000 Novi Sad, email: dejan.jankovic@polj.uns.ac.rs; ORCID ID: <https://orcid.org/0000-0002-2609-125X>.
4. Dragana Novaković, docent, Poljoprivredni fakultet, Univerzitet u Novom Sadu, Trg Dositeja Obradovića 8, 21000 Novi Sad, email: dragana.novakovic@polj.edu.rs; ORCID ID: <https://orcid.org/0000-0002-1924-6196>.
5. Tihomir Novaković, docent, Poljoprivredni fakultet, Univerzitet u Novom Sadu, Trg Dositeja Obradovića 8, 21000 Novi Sad, email: tihomir.novakovic@polj.edu.rs; ORCID ID: <https://orcid.org/0000-0002-8405-3403>.
6. Dragan Milić, redovni profesor, Poljoprivredni fakultet, Univerzitet u Novom Sadu, Trg Dositeja Obradovića 8, 21000 Novi Sad, email: dragan.milic@polj.edu.rs; ORCID ID: <https://orcid.org/0000-0003-0377-1540>.

1 Uvod

Obračun prinorne vrednosti izveden je za postrojenje srednje snage, pri čemu instalirana snaga solarnih panela iznosi 203 kWp, dok je, u skladu s predviđenim stepenom iskorišćenja, snaga na priključcima invertora projektovana na 150 kW. Na osnovu tehničkih specifikacija, postrojenje ostvaruje neto proizvodnju električne energije od 234.498 kWh godišnje, koja se, u zavisnosti od potreba i mogućnosti, koristi za sopstvene potrebe ili se isporučuje u mrežu. Ukupna investicija u posmatrano postrojenje iznosi 148.200 EUR.

U skladu sa navedenim, ovaj rad je usmeren na ekonomsku ocenu investicija u postrojenje za proizvodnju solarne energije za sopstvene potrebe, odnosno na obračun prinorne vrednosti investicije. Na ovaj način povećava se osnova za adekvatno informisanje budućih korisnika i omogućava brže uvođenje posmatrane tehnologije, što je od izuzetnog značaja imajući u vidu potencijal solarne energije u odnosu na ostale izvore obnovljive energije na planeti (Kamat, P.V., 2007).

2 Metod rada i izvori podataka

Procena vrednosti kapitala primenom dinamičkih metoda zasniva se na diskontovanju budućih vrednosti dobitka ili novčanog toka na sadašnju vrednost, kao jednoj od ključnih metoda za utvrđivanje vrednosti investicionih ulaganja. Prinorna vrednost investicije jednaka je zbiru sadašnje vrednosti budućih neto priliva koje potencijalni vlasnici mogu ostvariti u projektovanom periodu.

Neto novčani tok predstavlja iznos koji može pripasti vlasnicima kapitala, a da se time ne ugrozi poslovanje preduzeća. Brojni domaći i strani autori ističu važnost primene metoda prinorne vrednosti prilikom procenjivanja imovine i kapitala (Krištof, 1964; Tica, 1993, 1997, 2009; Marko i sar., 1998; Vukelić, 1996; Milić, 2010; Leko i sar., 1997; Beaves, 1988; DeFusco i sar., 2004; Pendlebury i Groves, 2004; Gitman, 2004; Ryan, 2007).

Efikasnost investicija u postrojenje za proizvodnju električne energije utvrđena je primenom metode prinorne vrednosti. Ova vrednost se zatim poredi sa sumom investicionih ulaganja potrebnih za izgradnju i puštanje postrojenja u rad. Poređenjem dobijenih vrednosti moguće je izvesti zaključak o ekonomskoj opravdanosti ulaganja.

Za procenu prinorne vrednosti posmatranog postrojenja korišćeni su diskontovani neto novčani tokovi, odnosno novčani tokovi posle servisiranja dugova. U novčani tok uključeni su svi prilivi i odlivi sredstava. Rezidualna vrednost procenjuje se na osnovu neto novčanog toka nakon protoka perioda projekcije, primenom Gordonovog modela, prema sledećem izrazu:

$$RV = (DNNT_r \times (1 + SR_r)) / (DS - SR_r) \quad RV = (DNNT_r \times (1 + SR_r)) / (DS - SR_r)$$

Gde je:

- **RV** – rezidualna vrednost,
- **DNNT_r** – diskontovani novčani tok u rezidualu (prva godina iza projektovanog perioda),
- **DS** – diskontna stopa,
- **SR_r** – stopa rasta u rezidualu.

Prilikom svođenja novčanih tokova na sadašnju vrednost koristi se diskontna stopa koja predstavlja cenu angažovanog kapitala. Diskontna stopa obračunata je prema faktorima koji imaju presudan uticaj na položaj i poslovanje preduzeća u ovom sektoru i sastoji se od:

- Stope rizika za posmatrano preduzeće, koja se obračunava prema relevantnim faktorima uticaja;
- Stope bez rizika, koja se utvrđuje na osnovu prinosa na državne obveznice Republike Srbije i koja prema raspoloživim podacima minimalno iznosi 2,69%;
- Stope rizika zemlje, koja predstavlja kompenzaciju za ulaganje u preduzeća koja posluju na tržištu određene zemlje, odnosno premiju za specifične rizike investitora.

Podatak o premiji za rizik zemlje preuzet je iz baze profesora Aswath Damodarana (<http://pages.stern.nyu.edu/~adamodar/> - Rating-based Default Spread), što predstavlja uobičajenu praksu prilikom obračuna. Stopa rizika za Srbiju iznosi 7,79%.

U modelu za utvrđivanje prinorne vrednosti ulaganja koriste se važeće cene na dan obračuna kao stalne. Projekcija novčanih tokova obezbeđuje međusobnu povezanost i usklađenost svih elemenata projekcije. Korišćen je diskontovani novčani tok uz neutralno servisiranje dugova. Kao osnov za predračun ekonomskih efekata korišćeni su projektni podaci koji se odnose na konkretno postrojenje (Zekić i sar., 2025).

Obračun prihoda zasniva se na utvrđivanju ukupnih prihoda postrojenja, pri čemu finansijski rezultat predstavlja ostvarenu dobit. Pored navedenih pokazatelja, obračun rezultata uključuje i bilans gotovinskih tokova, kao i obračun osnovnih pokazatelja efikasnosti i efektivnosti investicije.

3 Rezultati istraživanja i diskusija

Investiranje u kapacitete za proizvodnju električne energije primenom fotonaponskih panela predstavlja jedan od ključnih načina za obezbeđenje dovoljne količine obnovljive energije iz domaćih izvora.

Prema energetsom bilansu Republike Srbije za 2024. godinu, planirani ukupni kapaciteti za proizvodnju električne energije iznose 8.987 MW (snaga na pragu elektrana). Na solarne elektrane odnosi se snaga od 122,35 MW, od čega je 52,9 MW novi kapacitet aktiviran u 2024. godini.

Obračun prinosa vrednosti izveden je na osnovu prethodnih istraživanja koja su sadržala detaljnu ekonomsku analizu. Ona se zasniva na projektnoj dokumentaciji koja se odnosi na izgradnju solarne elektrane primarno za sopstvene potrebe, dok se višak proizvedene energije predaje u mrežu.

Prema dokumentaciji izvođača radova, ukupan iznos investicije, uključujući troškove montaže i puštanja postrojenja u rad, iznosi 148.200,00 € bez PDV-a. Navedena vrednost je u skladu sa troškovima investiranja po jedinici kapaciteta na području Srbije.

Analiza trendova u kretanju investicija u postrojenja za proizvodnju električne energije korišćenjem fotonaponskih panela pokazuje tendenciju pada troškova ulaganja – investicije u 2022. godini prosečno su iznosile 876 USD/kW (odnosno manje od 750 EUR/kW). Projekcije za 2030. godinu ukazuju na troškove ispod 400 EUR/kW.

Prema istom istraživanju, zabeležen je značajan rast od oko 22% u globalno instaliranom kapacitetu solarne energije između 2021. i 2022. godine. Procene pokazuju da u naredne tri decenije oblast solarnih fotonaponskih sistema može napredovati do te mere da postane drugi vodeći izvor proizvodnje električne energije, čime bi se obezbedilo približno 25% ukupnih svetskih potreba za električnom energijom (Pouras, H. i sar., 2023).

Iz prethodnih istraživanja preuzet je obračun rezultata finansijskog i ekonomskog toka investicije izražen u evrima, koji predstavlja polaznu osnovu za obračun prinosa vrednosti investicije.

Kao prvi korak izveden je obračun diskontne stope koja se primenjuje u diskontovanju neto novčanog toka za posmatrano postrojenje i koja iznosi 18,18%. Sastoji se od stope bez rizika i stope rizika ulaganja u Srbiju (ukupno 10,48%) i stope rizika ulaganja u postrojenje, koja se procenjuje na 7,70%.

Obračun strukture rizika ulaganja u postrojenje prikazan je u sledećoj tabeli.

Tabela 1. Obračun stope rizika ulaganja u posmatrano postrojenje

Opis	Skala rizika			
	0	1	2	3
Kvalitet organizacije, rukovodstva i kadrova				
Organizaciona struktura		1		
Kompaktnost rukovodećeg tima		1		
Strateško planiranje			2	

Opis	Skala rizika			
	0	1	2	3
Proizvodni program		1		
Specijalizovano znanje jednog stručnjaka		1		
Ponderisano	0	4	2	0
Zbir	6			
Broj parametara	5			
Specifični rizik	1,2			
Veličina preduzeća				
Broj radnika		1		
Vrednost poslovnih sredstava		1		
Ocena konkurencije		1		
Ponderisano	0	3	0	0
Zbir	3			
Broj parametara	3			
Specifični rizik	1,00			
Finansijski položaj				
Osnovna sredstva/kapital			2	
Osnovna sredstva i zalihe/Dugoročni kapital			2	
Sopstveni kapital/Ukupni kapital			2	
Kontrabucioni dobitak/Prihod			2	
Finansijski rashod/Dobit			2	
Ponderisano	0	0	10	0
Zbir	10			
Broj parametara	5			
Specifični rizik	2			
Proizvodno-prodajni potencijal				
Doprinos pojedinih proizvoda prihodu				3
Postojanje dugoročnih ugovora		1		
Značaj proizvoda za kupce		1		
Pristup tržištu EZ			2	
Ponderisano	0	2	2	3
Zbir	7			
Broj parametara	4			
Specifični rizik	1,75			

Opis	Skala rizika			
	0	1	2	3
Mogućnost predviđanja				
Starost preduzeća		1		
Stabilnost poslovnih rezultata			2	
Diskontinuitet u poslovanju				3
Promena privrednog ambijenta grane		1		
Ponderisano	0	2	2	3
Zbir	7			
Broj parametara	4			
Specifični rizik	1,75			
KONAČNA STOPA (%)	7,70			

Izvor: obračun autora

Kretanje potrebnog nivoa sredstava i izvora iz tekućeg poslovanja, kao i njihove promene tokom veka poslovanja, usled tehnoloških obeležja investicije, tretiraju se kao neutralne. Projekcija novčanih tokova prikazana je u narednoj tabeli (Tabela 2).

Tabela 2. Projekcija novčanih tokova (EUR)

Pozicija	Godina				
	1	2	3	4	5
Ukupan prihod	39.257	39.060	38.865	38.671	38.477
Operativni troškovi	8.570	8.570	8.570	8.570	8.570
Dobit <amortizacija-kamata-porez>	30.686	30.490	30.295	30.100	29.907
Amortizacija	3.705	3.705	3.705	3.705	3.705
Operativna dobit	26.981	26.785	26.590	26.395	26.202
Troškovi kamata	0	0	0	0	0
Bruto finansijski rezultat	26.981	26.785	26.590	26.395	26.202
Porez i doprinosi	0	0	0	0	0
Neto dobit	26.981	26.785	26.590	26.395	26.202
Amortizacija	3.705	3.705	3.705	3.705	3.705
Neto novčani tok	30.686	30.490	30.295	30.100	29.907
Diskontni faktor	0,846166	0,715998	0,605854	0,512653	0,433790
Neto sadašnja vrednost	25.966	21.831	18.354	15.431	12.973
Ukupna neto sadašnja vrednost					94.555

Izvor: obračun autora

U skladu sa prethodno iznetim pretpostavkama, rezidualna (terminalna) vrednost je određena primenom Gordonovog modela.“

Tabela 3. Obračun rezidualne vrednosti (EUR)

Pozicija	Vrednost (€)
Neto novčani tok poslednje godine	29.907
Stopa rasta u rezidualnoj godini	-0,42%
Neto novčani tok rezidualne godine	29.781
Diskontni faktor	0,3670591767
Sadašnja vrednost neto novčanog toka	10.931
Stopa kapitalizacije (diskontni faktor-stopa promene)	17,76%
Rezidualna vrednost	61.551

Izvor: obračun autora

Ukupna sadašnja vrednost diskontovanih novčanih tokova izvedena za petogodišnji period, u trenutku utvrđivanja prinostne vrednosti posmatrane investicije, iznosi 94.555 EUR, pri čemu sadašnja vrednost rezidualne vrednosti iznosi 61.551 EUR. Na osnovu ranije opisane metodologije, prinostna vrednost posmatranog postrojenja primenom pretpostavljene diskontne stope iznosi 156.106 EUR, što je neznatno više od investicionih ulaganja koja iznose 148.200 EUR. Ovakav odnos ukazuje na graničnu, ali pozitivnu investicionu opravdanost projekta, budući da neto sadašnja vrednost (NPV) pokazuje blago pozitivan rezultat.

4 Zaključak

Obračun prinostne vrednosti za postrojenje za proizvodnju električne energije korišćenjem fotonaponskih panela pokazuje da je analizirana investicija ekonomski opravdana, budući da je prinostna vrednost viša od potrebnih investicionih ulaganja. Ovaj rezultat potvrđuje da su ekonomske koristi od proizvodnje električne energije dovoljne da opravdaju inicijalna ulaganja.

Iako je prinostna vrednost samo neznatno viša od investicione, potrebno je imati u vidu pretpostavljeni rast cena električne energije i povećanje potražnje za istom, s jedne strane, te očekivano smanjenje investicionih troškova po jedinici kapaciteta u narednom periodu, s druge strane. Sve navedeno ukazuje da analizirana tehnologija ima povoljne dugoročne izglede.

Dodatno, širi društveni interes i doprinos smanjenju zagađenja životne sredine dodatno potvrđuju opravdanost ovakvih investicija. Uz pretpostavku da će se cena električne energije u budućnosti povećavati, ostaje otvoreno pitanje stvarne cene električne energije koju danas trošimo. Na to pitanje je teško dati konačan odgovor, jer je gotovo nemoguće precizno predvideti ekonomske posledice budućih ekoloških problema koji se ovim putem akumuliraju. Potpune efekte sadašnje politike korišćenja energetske resursa osetiće naredne generacije, dok je izvesno da je energija skupa i da je njena stvarna cena znatno veća nego što to danas izgleda (Zekić i Tica, 2010).

Ostvarenje složenih ciljeva energetskeg i društveno-ekonomskog razvoja nije moguće postići jednom politikom, već kombinacijom različitih sektorskih, globalnih, regionalnih i lokalnih politika, koje su međusobno povezane i uslovljene, pri čemu neke od njih mogu biti i delimično suprotstavljene (Janković i sar., 2025).

U svakom slučaju, potrebno je nastaviti istraživanja u ovom pravcu, imajući u vidu da analizirani pristup stvara osnovu za smanjenje troškova i gubitaka prilikom distribucije električne energije. Pored tehnološkog napretka, za efikasno iskorišćenje potencijala obnovljivih izvora energije neophodno je obezbediti povoljne ekonomske parametre, stimulatívne mere i regulativni okvir, kao i razvijenu društvenu svest o značaju tranzicije ka održivim izvorima energije.

Zahvalnica

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Sukob interesa

Autori izjavljuju da ne postoji sukob interesa.

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THE INCOME VALUE OF A MEDIUM-CAPACITY PHOTOVOLTAIC POWER PLANT

*Vladislav Zekić¹, Nedeljko Tica², Dejan Janković³, Dragana Novaković⁴,
Tihomir Novaković⁵, Dragan Milić⁶*

Abstract

The analysis of the income value of an investment in an electricity production facility using photovoltaic panels indicates that the project is economically justified, since the income value exceeds the required investment. Although the difference between the income value and investment costs is relatively small, the expected increase in energy prices and demand, together with the gradual decrease in investment costs per unit of capacity in the future, point to a favourable long-term perspective for this technology.

In addition to economic aspects, the social contribution of such investments is also particularly important, reflected in the reduction of environmental pollution and the enhancement of energy sustainability. The wider application of the observed technology provides a basis for more efficient electricity production and distribution, while simultaneously reducing distribution costs and losses in the energy system.

Keywords: *photovoltaic plants, investment appraisal, income value.*

1. Vladislav Zekić Full Professor, corresponding author, University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Republic of Serbia, e-mail: vladislav.zekic@polj.edu.rs; ORCID ID: <https://orcid.org/0000-0002-7377-2402>.
2. Nedeljko Tica, Full Professor, University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Republic of Serbia, e-mail: nedeljko.tica@polj.edu.rs; ORCID ID: <https://orcid.org/0009-0002-5696-686X>.
3. Dejan Janković, Full Professor, University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Republic of Serbia, e-mail: dejan.jankovic@polj.uns.ac.rs; ORCID ID: <https://orcid.org/0000-0002-2609-125X>.
4. Dragana Novaković, Assistant Professor, University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Republic of Serbia, e-mail: dragana.novakovic@polj.edu.rs; ORCID ID: <https://orcid.org/0000-0002-1924-6196>.
5. Tihomir Novaković, Assistant Professor, University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Republic of Serbia, e-mail: tihomir.novakovic@polj.edu.rs; ORCID ID: <https://orcid.org/0000-0002-8405-3403>.
6. Dragan Milić, Full Professor, University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Republic of Serbia, e-mail: dragan.milic@polj.edu.rs; ORCID ID: <https://orcid.org/0000-0003-0377-1540>.

1 Introduction

Based on the above, the subject of this study comprises small agricultural enterprises in the Autonomous Province of Vojvodina registered for the cultivation of cereals (excluding rice), legumes, and oilseeds. The aim of the research is to conduct an empirical analysis of bankruptcy risk based on publicly available financial statements and through the application of several models. The research seeks to contribute to the literature on sector-specific bankruptcy risk assessment while also providing practically relevant insights into the degree of financial vulnerability of small agricultural enterprises in one of the most important agricultural region of the Republic of Serbia. The calculation of the income value was conducted for a medium-capacity plant, with the installed capacity of the solar panels amounting to 203 kWp, while, in accordance with the projected utilisation rate, the capacity at the inverter terminals was designed at 150 kW. Based on the technical specifications, the plant achieves a net electricity production of 234,498 kWh per year, which, depending on needs and possibilities, is used for own consumption or delivered to the grid. The total investment in the observed plant amounts to EUR 148,200.

Accordingly, this paper focuses on the economic appraisal of investments in a solar energy production plant for own consumption, specifically on the calculation of the income value of the investment. In this way, the basis for adequately informing future users is strengthened and the faster introduction of the observed technology is enabled, which is of particular importance given the potential of solar energy compared with other renewable energy sources on the planet (Kamat, P. V., 2007).

2 Methods and materials

The income value of an investment is equal to the sum of the present values of future net inflows that potential owners may generate during the projected period.

Net cash flow represents the amount that may belong to the owners of capital without jeopardising the company's operations. Numerous domestic and foreign authors emphasise the importance of applying the income value method in the valuation of assets and capital (Krištof, 1964; Tica, 1993, 1997, 2009; Marko et al., 1998; Vukelić, 1996; Milić, 2010; Leko et al., 1997; Beaves, 1988; DeFusco et al., 2004; Pendlebury and Groves, 2004; Gitman, 2004; Ryan, 2007).

The efficiency of investment in a power generation plant was assessed using the income value method. This value is then compared with the total investment required for the construction and commissioning of the plant. By comparing the obtained values, it is possible to draw a conclusion regarding the economic justification of the investment.

Discounted net cash flows, i.e. cash flows after debt servicing, were used to estimate the income value of the observed plant. All cash inflows and outflows were included in the cash flow. The residual value is estimated based on the net cash flow after the end of the projection period, using the Gordon model, according to the following expression:

$$RV = (DNNTr \times (1 + SRr)) / (DS - SRr) \quad RV = (DNNTr \times (1 + SRr)) / (DS - SRr)$$

Where:

RV – residual value,

DNNCFr – discounted net cash flow in the residual period, i.e. the first year after the projected period,

DR – discount rate,

GRr – growth rate in the residual period.

When reducing cash flows to present value, a discount rate is used, representing the cost of the engaged capital. The discount rate was calculated according to the factors that have a decisive impact on the position and operations of companies in this sector and consists of:

the risk rate for the observed company, calculated according to the relevant influencing factors;

the risk-free rate, determined on the basis of yields on government bonds of the Republic of Serbia, which, according to available data, amounts to a minimum of 2.69%;

the country risk premium, which represents compensation for investing in companies operating in the market of a particular country, that is, a premium for investor-specific risks.

The data on the country risk premium were taken from the database of Professor Aswath Damodaran (<http://pages.stern.nyu.edu/~adamodar/> – Rating-based Default Spread), which represents a common practice in such calculations. The risk rate for Serbia amounts to 7.79%.

The model for determining the income value of the investment uses the current prices valid on the calculation date as constant prices. The cash flow projection ensures the interconnection and consistency of all elements of the projection. Discounted cash flow with neutral debt servicing was applied. Project data relating to the specific plant were used as the basis for estimating the economic effects (Zekić et al., 2025).

The calculation of revenue is based on determining the total revenues of the plant, with the financial result representing the realised profit. In addition to the aforementioned indicators, the calculation of results also includes the cash flow

statement, as well as the calculation of the basic indicators of investment efficiency and effectiveness.

3 Results and discussion

Investments in electricity generation capacity using photovoltaic panels represent one of the key ways to ensure a sufficient amount of renewable energy from domestic sources.

According to the Energy Balance of the Republic of Serbia for 2024, the planned total electricity generation capacity amounts to 8,987 MW, expressed as capacity at the power plant threshold. Solar power plants account for 122.35 MW of this capacity, of which 52.9 MW represents new capacity commissioned in 2024.

The calculation of the income value was performed on the basis of previous research that included a detailed economic analysis. This analysis is based on project documentation related to the construction of a solar power plant primarily intended for own consumption, while the surplus electricity generated is delivered to the grid.

According to the contractor's documentation, the total investment amount, including installation costs and commissioning of the plant, is EUR 148,200.00 excluding VAT. This value is in line with investment costs per unit of capacity in Serbia.

An analysis of investment trends in plants for electricity generation using photovoltaic panels shows a downward trend in investment costs. In 2022, investments averaged USD 876/kW, that is, less than EUR 750/kW. Projections for 2030 indicate costs below EUR 400/kW.

According to the same study, a significant increase of approximately 22% was recorded in globally installed solar energy capacity between 2021 and 2022. Estimates indicate that, over the next three decades, the field of solar photovoltaic systems may develop to such an extent that it becomes the second leading source of electricity generation, providing approximately 25% of total global electricity demand (Pourasl, H. et al., 2023).

The calculation of the financial and economic flow results of the investment, expressed in euros, was taken from previous research and represents the starting point for calculating the income value of the investment.

As the first step, the discount rate applied in discounting the net cash flow for the observed plant was calculated and amounts to 18.18%. It consists of the risk-free rate and the risk rate of investment in Serbia, which together amount to 10.48%, and the risk rate of investment in the plant, estimated at 7.70%.

The calculation of the risk structure of investment in the plant is presented in the following table (Table 1).

Table 1. Calculation of the investment risk rate for the observed plant

Description	Risk scale			
	0	1	2	3
Quality of organisation, management and staff				
Organisational structure		1		
Cohesiveness of the management team		1		
Strategic planning			2	
Production programme		1		
Specialised knowledge of one expert		1		
Weighted	0	4	2	0
Sum	6			
Number of parameters	5			
Specific risk	1,2			
Company size				
Number of employees		1		
Value of operating assets		1		
Competition assessment		1		
Weighted	0	3	0	0
Sum	3			
Number of parameters	3			
Specific risk	1,00			
Financial position				
Fixed assets/equity			2	
Fixed assets and inventories/long-term capital			2	
Equity/total capital			2	
Contribution margin/revenue			2	
Financial expenses/profit			2	
Weighted	0	0	10	0
Sum	10			
Number of parameters	5			
Specific risk	2			
Production and sales potential				

Description	Risk scale			
	0	1	2	3
Contribution of individual products to revenue				3
Existence of long-term contracts		1		
Importance of products to customers		1		
Access to the EU market			2	
Weighted	0	2	2	3
Sum	7			
Number of parameters	4			
Specific risk	1,75			
Predictability				
Age of the company		1		
Stability of business results			2	
Business discontinuity				3
Changes in the economic environment of the sector		1		
Weighted	0	2	2	3
Sum	7			
Number of parameters	4			
Specific risk	1,75			
FINAL RATE (%)	7,70			

Source: Authors' calculation

The movement of the required level of funds and sources from current operations, as well as their changes over the operating life, are treated as neutral due to the technological characteristics of the investment. The cash flow projection is presented in the following table (Table 2).

Table 2. Cash flow projection (EUR)

Item	Year				
	1	2	3	4	5
Total revenue	39.257	39.060	38.865	38.671	38.477
Operating costs	8.570	8.570	8.570	8.570	8.570
Earnings before depreciation, interest and tax	30.686	30.490	30.295	30.100	29.907
Depreciation	3.705	3.705	3.705	3.705	3.705
Operating profit	26.981	26.785	26.590	26.395	26.202
Interest expenses	0	0	0	0	0
Gross financial result	26.981	26.785	26.590	26.395	26.202

Item	Year				
	1	2	3	4	5
Taxes and contributions	0	0	0	0	0
Net profit	26.981	26.785	26.590	26.395	26.202
Depreciation	3.705	3.705	3.705	3.705	3.705
Net cash flow	30.686	30.490	30.295	30.100	29.907
Discount factor	0,84616	0,71599	0,60585	0,51265	0,43379
Net present value	25.966	21.831	18.354	15.431	12.973
Total net present value					94.555

Source: Authors' calculation

Table 3. Calculation of residual value (EUR)

Position	Value (€)
Net cash flow in the final year	29.907
Growth rate in the residual year	-0,42%
Net cash flow in the residual year	29.781
Discount factor	0,3670591767
Present value of net cash flow	10.931
Capitalisation rate (discount rate – growth rate)	17,76%
Residual value	61.551

Source: Authors' calculation

In accordance with the previously stated assumptions, the residual, i.e. terminal, value was determined using the Gordon model.

The total present value of discounted cash flows calculated for the five-year period, at the time of determining the income value of the observed investment, amounts to EUR 94,555, while the present value of the residual value amounts to EUR 61,551. Based on the previously described methodology, the income value of the observed plant, applying the assumed discount rate, amounts to EUR 156,106, which is slightly higher than the investment costs of EUR 148,200. This relationship indicates a marginal but positive investment justification of the project, since the net present value (NPV) shows a slightly positive result.

4 Conclusion

The calculation of the income value for a plant intended for electricity generation using photovoltaic panels shows that the analysed investment is economically justified, since the income value is higher than the required investment costs. This result confirms that the economic benefits of electricity production are sufficient to justify the initial investment.

Although the income value is only slightly higher than the investment value, it is necessary to take into account the assumed increase in electricity prices and growing demand for electricity, on the one hand, and the expected reduction in investment costs per unit of capacity in the coming period, on the other. All of the

above indicates that the analysed technology has favourable long-term prospects.

In addition, the broader social interest and contribution to reducing environmental pollution further confirm the justification of such investments. Assuming that the price of electricity will increase in the future, the question remains as to the real price of the electricity we consume today. It is difficult to provide a definitive answer to this question, since it is almost impossible to precisely predict the economic consequences of future environmental problems that are being accumulated in this way. The full effects of the current policy of energy resource use will be felt by future generations, while it is certain that energy is expensive and that its real price is significantly higher than it appears today (Zekić and Tica, 2010).

The achievement of complex goals of energy and socio-economic development cannot be accomplished through a single policy, but rather through a combination of different sectoral, global, regional and local policies, which are mutually connected and interdependent, while some of them may also be partly conflicting (Janković et al., 2025).

In any case, research in this direction should be continued, bearing in mind that the analysed approach creates a basis for reducing costs and losses in the distribution of electricity. In addition to technological progress, the efficient use of the potential of renewable energy sources requires favourable economic parameters, incentive measures and an appropriate regulatory framework, as well as developed social awareness of the importance of the transition towards sustainable energy sources.

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Conflict of interests

The authors declare no conflict of interest.

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