

POSSIBILITY OF USING SOLAR ENERGY IN SERBIA ANALYZED THROUGH THE PROSUMER CONCEPT

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INTRODUCTION

Solar energy has been used since ancient times primarily for heating buildings. Today, the conversion of solar energy into electricity is topical, and the field of photovoltaic power plants is highly dynamic. That assertion supports the fact that in the period from 2017 to 2022, the total global installed power of photo voltaic power plants (PVP) increased three times, from 400 GW to over 1200 GW.

CONSUMER CONCEPT AT ELECTRICITY MARKET

The basic idea of the **prosumer (PC)** concept is that he produces electricity for his own needs and hands over any surpluses to the **electricity distribution system (DSEE)**.

The role of PC is to refrain from constantly delivering energy to DSEE and thereby make a profit.

Tricky facts about PCs:

- PC can transfer excess power to the system and acquire "credit," but that credit is deleted every year at the end of March and counter-resets.
- PC can take power from the system only in the tariff in which the injection was made.

Consequences:

- PC injects more power into the system than he takes from him FREE OF CHARGE
- The payback period can be unacceptable long.

Table 1 shows the calculation of the payback period for all PC types. Users with smaller PVPs and without injection have a shorter payback period. Also, PCs with a large amount of injected power into the system have an unacceptable long payback period of over 20 years.

PC TYPE	Bill for spent energy [EUR/month]	Savings [EUR/month]	Price of PVP [EUR]	Payback period [years]
PC TYPE 1	148	47	1300	2
PC TYPE 2	26	125	3700	2
PC TYPE 3	23	172	6100	3
PC TYPE 4	17	178	12200	6

Table 2. The payback period for different PC types and four times higher price of electricity than the current in Serbia

DISCUSSION

This paper analyses the consumers with solar power plants of different power. The analyzed situation was:

- PC with monthly consumption of 600 kWh (HT 450 kWh, LT 150 kWh), PVP 1 kW with monthly production of 100 kWh, without injection into the DSEE – **PC TYPE 1**
- PC with monthly consumption of 600 kWh (HT 450 kWh, LT 150 kWh), PVP 3 kW with monthly production of 300 kWh, without injection into the DSEE – **PC TYPE 2**
- PC with monthly consumption of 600 kWh (HT 450 kWh, LT 150 kWh), PVP 5 kW with monthly production of 500 kWh, with monthly injection into the DSEE of 50 kWh – **PC TYPE 3**
- PC with monthly consumption of 600 kWh (HT 450 kWh, LT 150 kWh), PVP 10 kW with monthly production of 1000 kWh, with monthly injection into the DSEE of 500 kWh – **PC TYPE 4**

The price of electricity in Serbia for private users is about 6 € cents per kWh!

PC TYPE	Bill for spent energy [EUR/month]	Savings [EUR/month]	Price of PVP [EUR]	Payback period [years]
PC TYPE 1	47	13	1300	8
PC TYPE 2	26	34	3700	9
PC TYPE 3	13	46	6100	11
PC TYPE 4	11	48	12200	21

Table 1. The payback period for different PC types and current price of electricity in Serbia

Table 2 shows the calculation of the payback period for all PC types for four times higher **electricity price**, about **24 € cents per kWh**

CONCLUSION

The paper analyzes the cases of electricity calculation for a PCs with different powers of installed PVP and different amounts of injected energy in DSEE. For a successful comparison, consumers with the same approved power, connected to low voltage and the same monthly consumption were observed. The results show the optimal PVP power for individual consumers. The investment return period depends on the market's electricity price and the amount of injected energy into the system.

Key words: renewable energy sources, solar energy, prosumer.

Acknowledgment: This research (paper) has been supported by the Ministry of Science, Technological Development and Innovation through project no. 451-03-47/2023-01/200156 "Innovative scientific and artistic research from the FTS (activity) domain".