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7th AIEE Energy Symposium
virtual conference - 14-16 December, 2022

Conference Proceedings

Current and Future Challenges to Energy Security

the energy crisis, the impact on the transition roadmap



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Phone: +39.06.3227367 - e-mail: aiee@aieesymposium.eu ; assaiee@aiee.it

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Iryna Sotnyk and Tetiana Kurbatova

FORMING SOLAR BUSINESS PROSUMERS CLASS: THE CASE OF UKRAINE

Iryna Sotnyk, Sumy State University, Department of Economics, Entrepreneurship and Business Administration, Rymkoho-Korsakova str. 2, Sumy, 40007, Ukraine, e-mail: insotnik@gmail.com

Tetiana Kurbatova, Sumy State University, International Economic Relations Department, Rymkoho-Korsakova str. 2, Sumy, 40007, Ukraine e-mail: t.kurbatova@macro.sumdu.edu.ua

Overview

The concept of prosumerism plays an essential role in implementing the green energy transition for many nations worldwide since it involves the self-consumption of renewable energy generated by small energy producers. The development of prosumerism contributes to power supply decentralization, energy market liberalization, and the spread of using renewable energy technologies and smart grids.

The leading countries, which have significantly succeeded in green power advancement, have positive achievements in prosumerism promotion. For transition and developing economies, prosumerism is a new but prominent way to struggle with energy poverty and ensure energy security. A vivid example is the transition economy of Ukraine, which first experienced political pressure and gas blackmail, and later unprovoked military aggression by the former main energy importer - the Russian Federation. Therefore, the research aims to assess the prospects of forming a class of business prosumers in Ukraine in the solar photovoltaic energy sector.

Method

We examine the conditions to form a class of solar business prosumers in Ukraine: enterprises that use electricity generated by their solar power plants to meet their energy needs. To assess the feasibility of such an energy transition, we analyze the state policy for stimulating solar energy advancement in the industrial sector and the results of its implementation. We use investment analysis tools and compare the decision about the transition by green energy producers, namely industrial photovoltaic solar power plants, with that of prosumers. The net present value, profitability index, and discounted payback period of construction projects of industrial photovoltaic solar power plants with capacities of 100, 300, 500, and 700 kW located in the Sumy region were evaluated. Three options for the use of green electricity were considered: 1) sale of 20% of generated electricity at a feed-in tariff and self-consumption of 80% of electricity, 2) sale of 50% of generated electricity at a feed-in tariff and self-consumption of 50% of electricity, 3) self-consumption of 100% electricity.

Results

We have found that stimulating state policy remains the main factor in solar energy development in Ukraine. It ensured the growth of green energy in the total power mix up to 9% in 2009-2021. However, the formation of the prosumer class directly depends on the competitiveness of small solar power plants. The obtained results indicate that projects for constructing industrial photovoltaic solar power plants with a capacity of 300, 500, and 700 kW are profitable at the current market electricity prices and feed-in tariffs. However, constructing a 100- kW photovoltaic solar power plant is not competitive when selling 80% and 50% of the generated electricity at the feed-in tariff. The profitability of all projects rises with an increasing self-consumption share of the generated electricity. That is, the most profitable option for all projects is the third one with 100% of the generated electricity self-consumption.

Conclusions

By assessing the economic feasibility of 100-, 300-, 500- and 700-kW industrial photovoltaic solar power plants projects to implement in the Sumy region with three different energy-use options, we proved that Ukraine has all conditions to develop a solar business prosumer class.

We confirmed that an increase in the self-consumption share improves the projects' profitability and motivates the industrial photovoltaic solar power plants' owners to become prosumers. Therefore, with the preservation of current market conditions and state regulation of the sector, Ukraine has every opportunity to form a class of business prosumers in the photovoltaic solar energy segment.

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