# SOLAR PANELS NOT FULLY EMPLOYED IN MINGBULOQ DISTRICT, NAMANGAN PROVINCE

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**Abstract:** Renewable energy sources are resources that are naturally self-replenishing and considered environmentally sustainable. They play a crucial role in reducing greenhouse gas emissions and combating climate change. Renewable Energy Sources (RES) are becoming increasingly popular around the world because these sources are sustainable as they do not run out over time, unlike fossil fuels which are finite and contribute significantly to global warming. According to the official report of the International Energy Agency (IEA), from 2019, the demand for the use of fossil fuels for the production of electricity and the increase in the use of RES to meet the global energy requirements began to decrease. In this work, several objects that have not been fully installed and put into operation in the Mingbulok district of Namangan region, as well as suggestions for providing solutions and solving the problem are presented.

**Keywords*:*** On, Off, Hybrid systems, defective photoelectric plants in schools.

## СОЛНЕЧНЫЕ БАТАРЕИ НЕ ПОЛНОСТЬЮ ЗАДЕЙСТВОВАНЫ В РАЙОНЕ МИНГБУЛОК НАМАНГАНСКОЙ ОБЛАСТИ

**Аннотация:** Возобновляемые источники энергии — это ресурсы, которые естественным образом самовосстанавливаются и считаются экологически устойчивыми. Они играют решающую роль в сокращении выбросов парниковых газов и борьбе с изменением климата. Возобновляемые источники энергии (ВИЭ) становятся все более популярными во всем мире, поскольку эти источники являются устойчивыми, поскольку они не заканчиваются со временем, в отличие от ископаемого топлива, которое является конечным и вносит значительный вклад в глобальное потепление. Согласно официальному отчету Международного энергетического агентства (МЭА), с 2019 года спрос на использование ископаемого топлива для производства электроэнергии и увеличение использования ВИЭ для удовлетворения мировых потребностей в энергии начали снижаться. В данной работе представлены несколько объектов, которые не были полностью установлены и введены в эксплуатацию в районе Мингбулок Наманганской области, а также предложения по предоставлению решений и решению проблемы.

**Ключевые слова:** Вкл., Выкл., Гибридные системы, неисправные фотоэлектрические установки в школах.

## INTRODUCTION

Nowadays, due to global demands, especially in developed and developing countries, more sustainable energy technologies are required to replace traditional electricity generation resources such as fossil fuels [1]. Fossil fuel-based energy sources are causing harmful environmental problems such as global warming and climate change [2]. During the last few decades, the emission of greenhouse gases into the atmosphere due to energy production has increased exponentially [3]. Therefore, renewable energy (RES) technologies such as solar, wind, hydro, biomass, geothermal and hydrogen energy have been introduced to generate electricity to

overcome the current environmental crisis [[4], [5], [6]]. Because it produces energy using natural, renewable resources, electricity benefits the economy by reducing production costs [7]. It can also be a secondary source of income, as consumers can sell the generated electricity back to the grid. Although the adoption of RES sources for power generation is increasing, most power generation is still done using fossil fuels due to RES interruptions and high initial cost. For example, a photovoltaic system can only work during the day, a wind turbine can only work when there is enough air flow, and a hydro turbine can only work when there is potential energy from water flow**.**

**Current state of energy resources.** Now let's look at energy demand and fuel consumption around the world. Even in the 21st century, most countries depend on fossil fuels for electricity generation, and lack the technologies, resources, and conditions to fully exploit RES for electricity generation. Nevertheless, in the electric power sector, renewable electricity is growing rapidly today due to society's concern for the environment.

The figure below shows the total use of renewable energy for electricity generation from 2010 to 2020 [8]. According to the IEA's Global Energy Outlook 2021, the total use of renewable energy has grown significantly, from 4,098 TW/h in 2010 to 7,627 TW/h in 2020. The rate of hydropower is the lowest compared to other renewable energy. On the other hand, solar energy production shows an increasing trend.

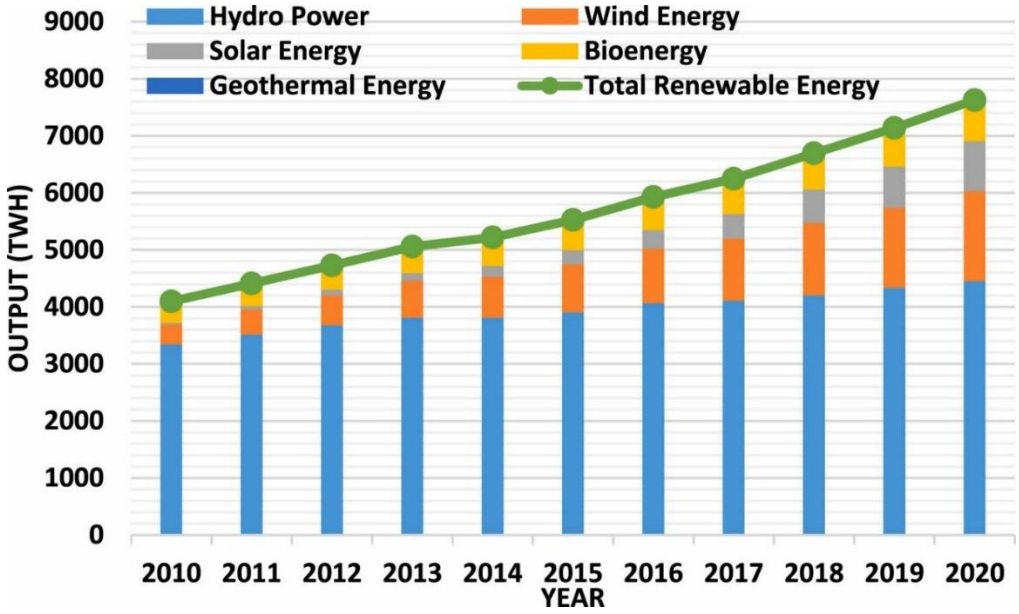


**Figure 1. General use of renewable energy sources (2010–2020) [8].**

**Solar energy.** Solar energy (SE) is the radiative ionizing energy emitted by the sun and is one of the most widely used energies globally [9]. In order to improve and increase the SE conversion efficiency, many researchers study various technologies to optimize the design of the SE system [10]. Researchers also reduce environmental impact while optimizing costs and energy conversion [11]. There are two main types of SE system, solar thermal energy and photovoltaic energy, which are commonly used in developing and developed countries. The use of renewable energy sources is a key tool for decarbonizing the energy sector and mitigating the effects of climate change [12]. Recent decades have seen unprecedented growth in two technologies, particularly in the last 5 years, solar photovoltaics (PV) and wind energy - a global share of

installed capacity of 4% and 7%, respectively, and an average annual growth of FES was 27% and 13%. [13,14].

We know that today there are on-grid, off-grid and hybrid systems, and people are using the system they need depending on their needs. Let's briefly touch on each of them.

**ON-GRID** system is the most common and simple type of Photoelectric Plant (FES). These systems are connected directly to local utility grids, allowing users to draw electricity from the grid when the solar panels are not producing enough power, such as at night or on cloudy days. Conversely, excess electricity produced by solar panels can be fed back into the grid [15], which often allows users to sell 1 kW of electricity for 1000 (thousand) so'm [16]

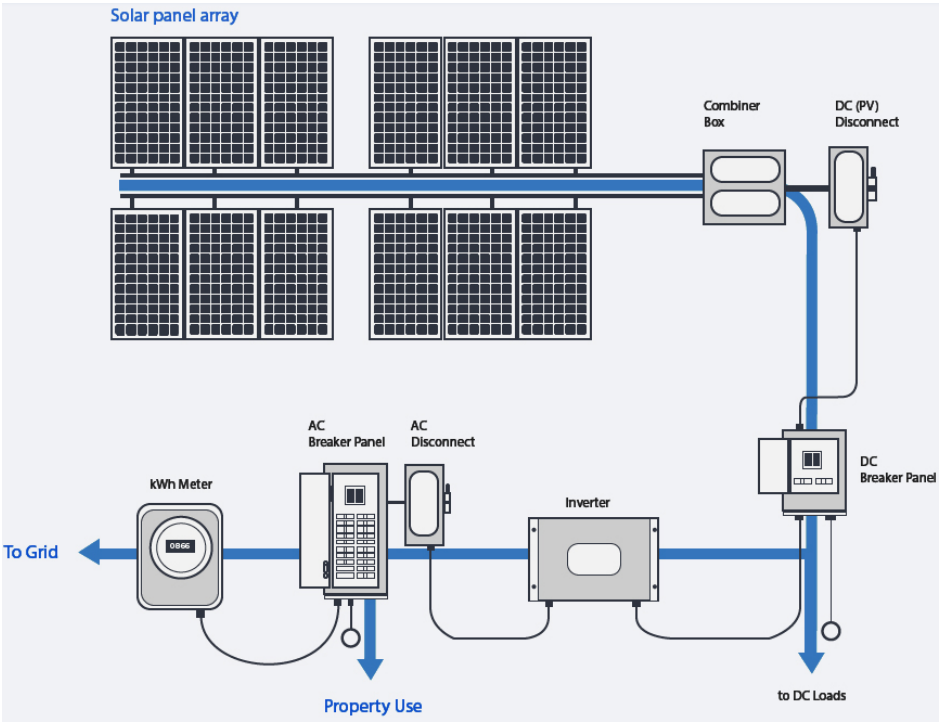


**Figure 2. Scheme of the on-grid system.**

***OFF-GRID AND HYBRID SYSTEM-*** Unlike on-grid FES, off-grid system operates independently of utility grids, while hybrid system operates both off-grid and grid-connected, making them practical for remote areas or grid connection. suitable for places where there is no or expensive. These systems include energy storage solutions such as batteries to store excess electricity generated during sunny periods and provide uninterrupted power supply during non-solar days [16].

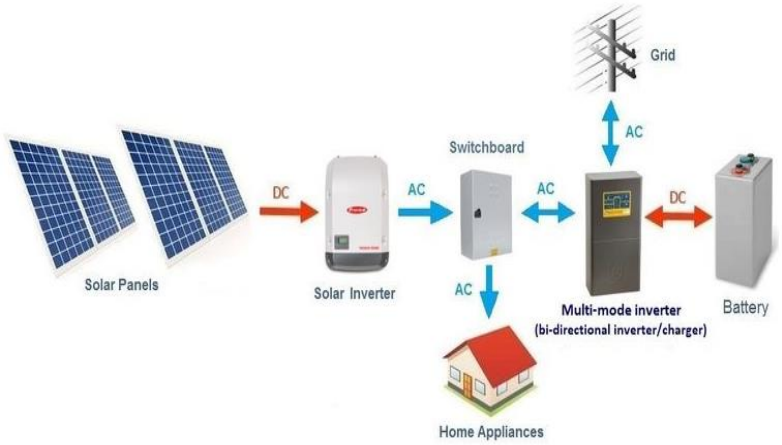


**Figure 3. Off-grid and Hybrid system [17].**

**Problem.** Errors and defects are observed in any work, various defects are also observed in the installation of photoelectric plants, for example:

Namangan Region, Mingbuloq District, Preschool Educational Organization **№** 49, Hybrid FES consisting of two blocks with a hybrid system with a total power of 30 kW was installed, block 1 was out of order, and due to the presence of an ERROR message on the inverter of block 2, the general Because the FES is not connected to the electricity network and the electricity meter is of an old model, no contract was concluded with

the electricity networks based on the decision of the Government of Uzbekistan No. 07.02.2024 signed by the President of the Republic of Uzbekistan [17].

***SOLUTION:*** Unit 1 is not set, the inverter of unit 2 has ERROR because there is a connection error, in the junction box it is necessary to connect the 1st lightning protection, 2nd DC Automate and then to the Saver, but there is only an AC Automate and the ATS (Automatic Tranfer Swich) device is not installed.

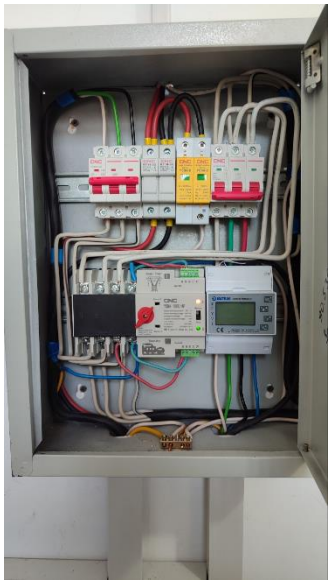

**Figure 4. Connecting a hybrid system using an ATS (Automatic Tranfer Swich) device.**

Since the mains input voltage is 380V and the inverter is 220V, they could not connect the Hybrid FES, the solution is: The Hybrid FES cannot be directly connected from high voltage to low voltage, only the voltage on both sides it can be connected using an ATS (Automatic Tranfer Swich) device only when it is uniform, i.e. 380 V. In the on-grid system, phases A, B, C are measured using KLESH and a line with a low load is determined, and from that line (L) and zero (N) wires are connected to the input of the inverter.

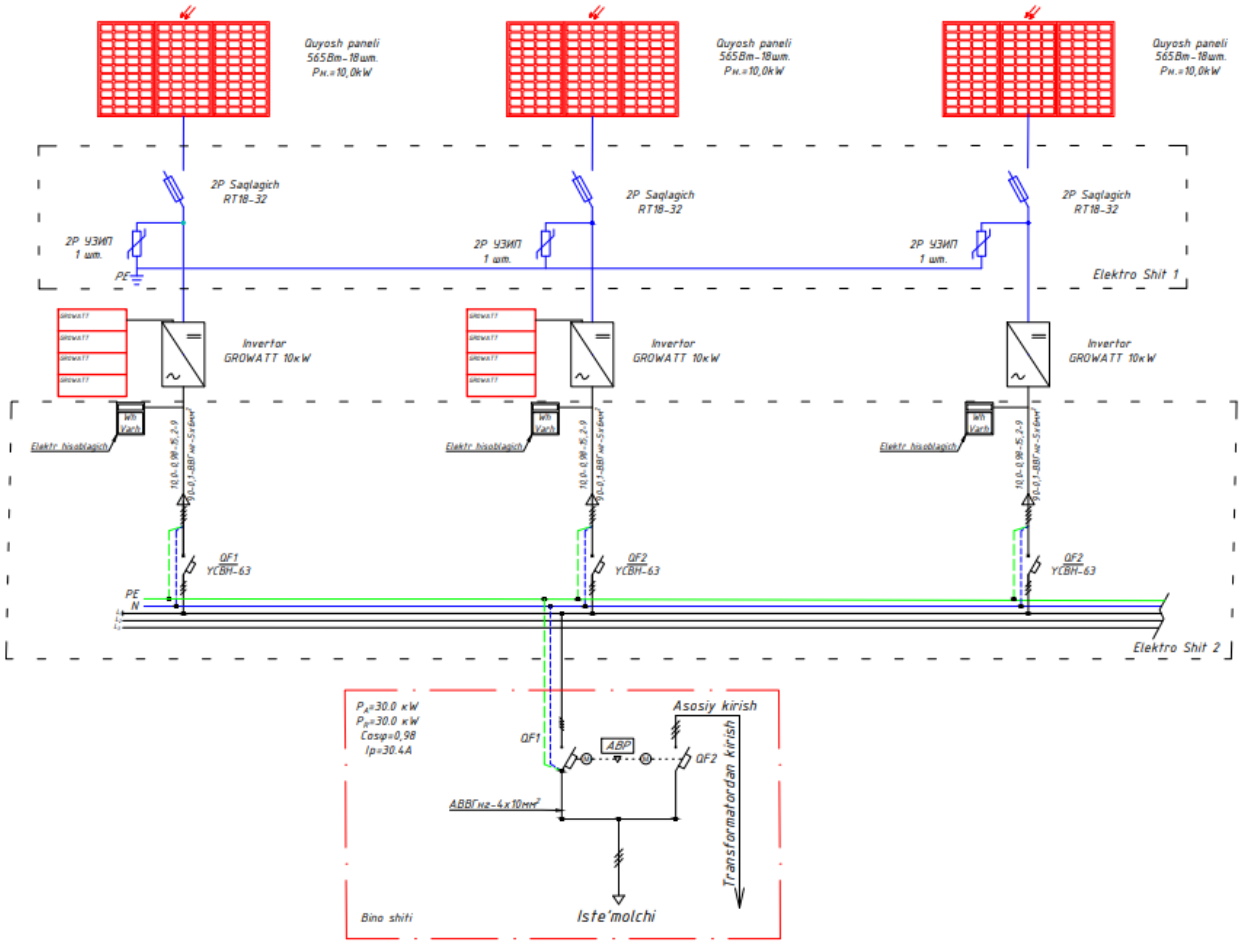


**Figure 5. The correct connection diagram of the 30 kW hybrid power plant**


**Figure 6. Part of the FES installed in Preschool Education Organization № 49.**

***2. PROBLEM***. Hybrid photoelectric plant with a total capacity of 100 kW was installed in the Mingbulok district medical association of Namangan region, the inverters were fixed to the wall, the wires were pulled from the panels and connected to the junction box, the energy storage system, i.e. energy stores, was installed but not connected**.**

***SOLUTION:*** The reason why the 100 kW Hybrid FES did not fully start when the facility was investigated: In the junction box, you need to connect 1st lightning protection, 2nd DC circuit breaker and then to the Storage, but there was only an AC circuit breaker and an ATS (Automatic Tranfer Swich) device is also not available. The DC cables from the panel and the battery came to the junction box, but only the cable from the panel was connected, the workers could not connect all the cables because they did not consider that the Hybrid station can only start when connected using an ATS (Automatic Tranfer Swich) device.

**Figure 7. FES inverters and junction box installed in Mingbulok District Medical Association.**

***3. PROBLEM.*** A hybrid photoelectric plant with a total capacity of 30 kW was installed in the 4th general secondary school of Mingbulok district, Namangan region, and the following malfunctions were detected in it:

**3.1.** Hybrid FES does not work when there is no electricity in the grid.

**3.2.** Due to the fact that the electric meter was of an old model, no contract was concluded with the electric networks based on the decision of the State Council of Uzbekistan dated 07.02.2024 signed by the President of the Republic of Uzbekistan **[17].**


**Figure 8. Connection box of the Hybrid FES installed in the 4th general secondary school of Mingbulok district.**

***SOLUTION:*** The main reason why the hybrid FES does not start when there is no electricity in the grid is when the workers connect the FES to the electricity grid in the On-grid way, but in fact the Hybrid FES is connected through the ATS (Automatic Tranfer Swich) device. Only then, when the power supply goes out, the AVR device automatically disconnects the consumer from the power supply and transfers it to the consumer from the reserve power, that is, from the battery.

**4. PROBLEM** On-grid system FES with a total capacity of 50 kW has been installed in Vocational School №1, Mingbuloq District, Namangan Region, and the detected deficiency is as follows:

**4.1.** It was found that after the installation of FES, the electricity meter of Vocational School №1 calculates electricity consumption more than before. ***SOLUTION:*** Today, many consumers are concerned about this issue, that is, the main reason is that after installing the FES, the electricity consumption is more than the previous consumption.

**5.** PROBLEM Hybrid FES with a total capacity of 15 kW was installed in the 14th general secondary school of Mingbulok District, Namangan Region, and during the research, the following shortcomings were found:

**5.1.** Hybrid FES is divided into 3 blocks. A short circuit occurred in block 1 (5 kW).

**5.2.** And for block 3, the DC cables from the solar panels are removed and not connected to the junction box.

**5.3.** Due to the fact that the electric meter was of an old model, no contract was concluded with the electric networks based on the decision of the State Council of Uzbekistan dated 07.02.2024 signed by the President of the Republic Uzbekistan [17].


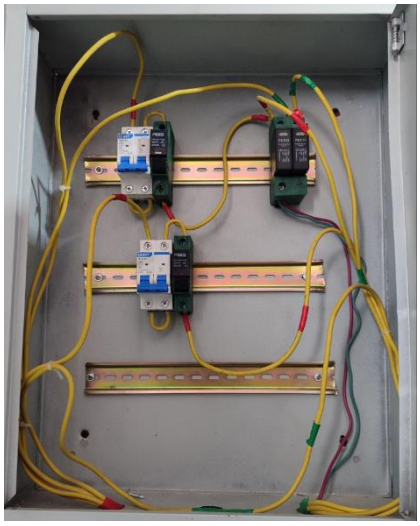

**Figure 9. FES inverters and a junction box installed in the 14th general secondary school of Mingbulok district.**

***SOLUTION:*** A fuse and DC Automat should be installed in the junction box and it is permissible to connect the load to the AC output of the inverter so that the system is fully operational.

**CONCLUSION**

Today, many non-specialists start a small company and install FES instead of ordinary workers, as a result, non-specialists leave their jobs without assembling the scheme of hybrid stations, which provides ordinary people, schools and kindergartens with uninterrupted electricity. It is an obstacle to its growth.

**USED LITERATURE**

1. F. Rizzi, N.J. van Eck, M. Frey. The production of scientific knowledge on renewable energies: worldwide trends, dynamics can challenge and implications for management. *Renew Energy, 62 (2014), pp. 657-671*
2. E. Vine. Breaking Down the Silos: The Integration of Energy Efficiency, Renewable Energy, Demand Respond and Climate Change, vol. 1, *Energy Efficiency (2008), pp. 49-63*
3. S. Manish, I.R. Pillai, R. Banerjee. Sustainability analysis of renewables for climate change mitigation Energy Sustain. *Dev., 10 (4) (2006), pp. 25-36*
4. W.G. Santika, M. Anisuzzaman, P.A. Bahri, G. Shafiullah, G.V. Rupf, T. Urmee. From goals to joules: a quantitative approach of interlinkages between energy and the Sustainable Development Goals. Energy Res. *Social Sci., 50 (2019), pp. 201-214*
5. A. Raheem, S. Samo, A. Memon, S.R. Samo, Y. Taufiq-Yap, M.K. Danquah, R. Harun. Renewable energy deployment to combat energy crisis in Pakistan. *Energy Sustain. Soc., 6 (1) (2016), p. 16*
6. N. Ahmad Ludin, N.I. Mustafa, M.M. Hanafiah, M.A. Ibrahim, M.A. Mat Teridi, S. Sepeai, A. Zaharim, K. Sopian. Prospects of life cycle assessment of renewable energy from solarphotovoltaic technologies: a review. Renew. Sustain. *Energy Rev., 96 (2018), pp. 11-28*
7. R. Kardooni, S. Yusoff, F. Kari. Renewable energy technology acceptance in Peninsular Malaysia. *Energy Pol., 88 (2016), pp. 1-10*
8. IEA. Global Energy Review 2021. International Energy Agency (IEA), Paris (2021). *Accessed date: 29th July 2021 Google Scholar*

9. I. Alhamrouni, M. Danial, M. Salem, L.J. Awalin, B. Ismail. Design of 2LC-Y DC - DC converter for high voltage/low current renewable energy application. *Test Eng. Manag., 83 (2020), pp. 2111-2117*
10. M. Alhuyi Nazari, M. Salem, I. Mahariq, K. Younes, B.B. Maqableh. Utilization of data-driven methods in solar desalination systems: a comprehensive review. *Front. Energy Res., 9 (2021), p. 541*
11. C. Diakaki, E. Grigoroudis, N. Kabelis, D. Kolokotsa, K. Kalaitzekis, G. Stavrakakis. A multi-objective decision model for the improvement of energy efficiency in buildings. *Energy, 35 (12) (2010), pp. 5483-5496*
12. E. Pean et al. Role of the GB-France electricity interconnectors in integration of variable renewable generation. *Renew. Energy (2016)*
13. R.A. Rodríguez et al. Transmission needs across a fully renewable European power system Renew. *Energy (2014)*
14. Understanding the differences between On-grid, Off-grid (Hybrid), and On-grid Solar Inverters with Energy Storage Systems. *FEBRUARY 8, 2024*
15. O‘zbekiston Respublikasi Prezidentining qarori, 16.02.2023 yildagi PQ-57-son.
16. https://www.cleanenergyreviews.info/blog/designing-off-grid-hybrid-solar-systems 25 OCT, 2023 WRITTEN BY JASON SVARC
17. O‘zbekiston Respublikasining Qonuni, 07.02.2024 yildagi O‘RQ-906-son