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Problems and Solutions in the Use of Alternative Energy Sources in Uzbekistan

Nodirbek Kimsanboev Shoirbek ugli
Andijan Machine Building Institute
E-mail: kimsanboev9401@gmail.com
Tel: 998909372694

Annotation: Alternative energy sources are the generation of electricity using solar, wind, water or geothermal heat from the Earth. Today, the use of renewable energy sources is one of the most important issues in the world, including in Uzbekistan.

Keywords: Alternative energy sources, renewable energy sources, wind power station, solar power station, geothermal energy sources,

Introduction: Today, manufacturing and the economy are growing, which will further increase the demand for electricity. The production of electricity using renewable energy sources will further reduce the cost of the product and, of course, reduce the harmful effects on the environment from nuclear power plants or thermal power plants. There are many processes going on this section in Uzbekistan.

Laws, resolutions and orders signed on the use of alternative energy sources in Uzbekistan.

Under the Program of measures for further development of hydropower in 2017-2021, the Program envisages a 1.7 times increase in the country's clean hydropower generation capacity by 2025 through the construction of 42 new hydropower plants and the modernization of 32 existing hydropower plants.

At the same time, despite the measures taken, the energy capacity of the national economy remains high, and the level of diversification of the fuel and energy balance due to the involvement of renewable resources in industrial production does not same as global trends. Natural gas and other conventional hydrocarbon fuels are used as primary fuels in the production of electricity and heat.

The existing high potential of renewable energy sources (solar, wind and biogas energy, hydropower of small natural and artificial streams) is not used in the production of electricity and heat. [1]

Despite the work done in our country, the use of renewable energy sources has not lost its relevance. In this regard, the President of the Republic of Uzbekistan Shavkat Mirziyoyev signed a number of new laws.

Today, the demand for energy resources is changing structurally, especially in the transition from hydrocarbon resources to renewable sources, the development of hydrogen energy is becoming a important issue.

At the same time, the analysis of the state of the industry shows that in the context of climate change, the country has problems with ensuring an efficient, resource-efficient and environmentally friendly economy.

In particular, accelerating industrialization and population growth are significantly increasing the economy’s need for energy resources, as well as exacerbating negative anthropogenic impacts on the environment.

To strengthen the energy security of the country, it is necessary to expand the use of renewable energy sources and create the necessary conditions for the sustainable development of hydrogen energy, including strengthening the scientific potential of this sector. [2]

History of alternative energy sources in Uzbekistan

The use of hydropower, one of the first renewable energy sources in the country, began in 1926 with the commissioning of the Bozsuv hydroelectric power plant. In 1987, the world's largest solar furnace was launched, accumulating more than 3,000 ° C. At present, the Asian Development Bank has invested and started construction of a 100-megawatt solar power plant on 400 hectares in Samarkand region of the country. [5].

Small-scale solar energy is used in all parts of the country. The theory and methods of wind energy production were developed in the 1950s, and in 1983 the first wind power equipment in the country was launched by farmers of Tomdi district of Navoi region.

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The production and use of biogas from animal manure and agricultural residues began in 1987. [6].

Solar energy or wind are not always available when renewable energy sources are used. Therefore, it is necessary to choose the most optimal from renewable energy sources or use a hybrid system of using both types of energy.

Figure 1. Hybrid systems of renewable energy sources

Methods and stages of renewable energy use in Uzbekistan.

Planning for a home renewable energy system is a process that includes analyzing your existing electricity use, looking at local codes and requirements, deciding if you want to operate your system on or off of the electric grid, and understanding technology options you have for your site.

Maybe you are considering purchasing a renewable energy system to generate electricity at your home. Although it takes time and money to research, buy, and maintain a system, many people enjoy the independence they gain and the knowledge that their actions are helping the environment.

A renewable energy system can be used to supply some or all of your electricity needs, using technologies like:

- Small solar electric systems
- Small wind electric systems
- Microhydropower systems
- Small hybrid electric systems (solar and wind).

Planning for a home renewable energy system is a process that includes analyzing your existing electricity use (and considering energy efficiency measures to reduce it), looking at local codes and requirements, deciding if you want to operate your system on or off of the electric grid, and understanding technology options you have for your site.

If you're **designing a new home**, work with the builder and your contractor to incorporate your small renewable energy system into your **whole-house design**, an approach for building an energy-efficient home.

Analyzing Your Electricity Loads

Calculating your electricity needs is the first step in the process of investigating renewable energy systems for your home or small business. A thorough examination of your electricity needs helps you determine the following:

- The size (and therefore, cost) of the system you will need
- How your energy needs fluctuate throughout the day and over the year
- Measures you can take to reduce your electricity use.

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Conducting a load analysis involves recording the wattage and average daily use of all of the electrical devices that are plugged into your central power source such as refrigerators, lights, televisions, and power tools. Some loads, like your refrigerator, use electricity all the time, while others, like power tools, use electricity intermittently. Loads that use electricity intermittently are often referred to as selectable loads. If you are willing to use your selectable loads only when you have extra power available, you may be able to install a smaller renewable energy system.

To determine your total electricity consumption:

- Multiply the wattage of each appliance by the number of hours it is used each day (be sure to take seasonal variations into account). Some appliances do not give the wattage, so you may have to calculate the wattage by multiplying the amperes times the volts. Generally, power use data can be found on a sticker, metal plate, or cord attached to the appliance.
- Record the time(s) of day the load runs for all selectable loads.

Considering energy efficiency measures in your home before you buy your renewable energy system will **reduce your electricity use** and allow you to buy a smaller and less expensive system. For information about determining the overall energy efficiency of your home, see **energy assessments**.

Local Codes and Requirements for Small Renewable Energy Systems

Each state and community has its own set of codes and regulations that you will need to follow to add a small renewable energy system to your home or small business. These regulations can affect the type of renewable energy system you are allowed to install and who installs it. They can also affect whether you decide to **connect your system** to the electricity grid or use it in place of grid-supplied electricity as a **stand-alone system**.

A local renewable energy company or organization, your state energy office, or your local officials should be able to tell you about the requirements that apply in your community. If you want to connect your system to the electricity grid, these groups may also be able to help you navigate your power provider's grid-connection requirements. Here are some of the state and community requirements you may encounter:

- Building codes
- Easements
- Local covenants and ordinances
- Technology-specific requirements
- Building codes.

Electrical and building inspectors ensure that your system complies with standards. Building inspectors are interested in making sure the structure you are adding is safe. Your system may be required to pass electrical and/or plumbing inspections to comply with local building codes.

Many building code offices also require their zoning board to grant you a conditional-use permit or a variance from the existing code before they will issue you a building permit. Check with your building code office before you buy a renewable energy system to learn about their specific inspection requirements.

You are most likely to gain the inspector's approval if you or your installer follow the National Electrical Code (NEC); install pre-engineered, packaged systems; properly brief the inspector on your installation; and include a complete set of plans as well as the diagrams that come with the system. In addition, you should be sure your system is composed of certified equipment, and that it complies with local requirements and appropriate technical standards (the links at the bottom of the page provide more information on technical standards).

Easements

Some states permit easements, which are a voluntary, legally binding agreement between owners of adjacent land regarding use of the land. For example, you might seek an easement specifying that no structure which blocks the renewable resource necessary to run a renewable energy system will be built. These agreements are binding regardless of changing land ownership. In addition, you may want to do a title search of your deed to determine if any prior easements or other agreements exist that could prevent you from adding a renewable energy system to your own property.

Local Covenants and Ordinances

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Some communities have covenants or other regulations specifying what homeowners can and can't do with their property. Sometimes these regulations prohibit the use of renewable energy systems for aesthetic or noise-control reasons. However, sometimes these regulations have provisions supporting renewable energy systems. Check with your homeowners association or local government for details. In addition, you may want to discuss your intentions with your neighbors to avoid any future public objections.

Grid-Connected or Stand-Alone System

Some people connect their systems to the grid and use them to reduce the amount of conventional power supplied to them through the grid. **A grid-connected system** allows you to sell any excess power you produce back to your power provider.

For grid-connected systems, aside from the major small renewable energy system components, you will need to purchase some additional equipment (called "**balance-of-system**") to safely transmit electricity to your loads and comply with your power provider's grid-connection requirements. This equipment may include power conditioning equipment, safety equipment, and meters and instrumentation.

Other people, especially those in remote areas, use the electricity from their systems in place of electricity supplied to them by power providers (i.e., electric utilities). These are called **stand-alone**(off-grid) systems.

For stand-alone systems, **balance-of-system components** include batteries and a charge controller in addition to power conditioning equipment, safety equipment, and meters and instrumentation.

Choosing the Right Renewable Energy Technology

To begin choosing the right small renewable electric system for your home, you will need a basic understanding of how each technology works, as well as:

- Renewable energy resource availability
- Economics and costs
- System siting
- System sizing
- Codes and regulations
- Installation and maintenance considerations.

Remember that all of these technologies can be used by themselves, combined, or used in conjunction with a fossil fuel system. When these technologies are combined or used with a fossil fuel generator, the result is a hybrid system.

Technology options include solar, wind, microhydropower, and hybrid electric systems (solar and wind).

- **Small solar electric systems** -- A small solar electric or photovoltaic system can be a reliable and pollution-free producer of electricity for your home or office. Small photovoltaics systems also provide a cost-effective power supply in locations where it is expensive or impossible to send electricity through conventional power lines.
- **Small wind electric systems** -- Small wind electric systems are one of the most cost-effective home-based renewable energy systems. They can also be used for a variety of other applications, including water pumping on farms and ranches.
- **Microhydropower systems** -- Microhydropower systems usually generate up to 100 kilowatts of electricity, though a 10-kilowatt system can generally provide enough power for a large home, small resort, or a hobby farm.
- **Small "hybrid" solar and wind electric systems** -- Because the peak operating times for wind and solar systems occur at different times of the day and year, hybrid systems are more likely to produce power when you need it.

Conclusion: At present, much attention is paid to the efficient use of renewable energy sources. However, the instability of sunlight or wind, which are sources of this type of energy, varies at different times of the day and at different times of the day, limiting the full use of these types of energy sources. As a result, these types of power sources can be used as an additional power source to a conventional power system or as a hybrid system in conjunction with diesel generators. However, measuring the amount of electricity used by each consumer and determining the amount of electricity needed for a given period of time and selecting an alternative energy source based on this will significantly reduce the cost of electricity.

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