D. Prokopchuk, A. Yavtoshuk,
Belarusian State Technological University, Minsk, Belarus

Scientific advisor I. Yermak

ALTERNATIVES TO NUCLEAR POWER

The operation of nuclear power plants is associated with unpredictable risks of environmental contamination by radionuclides, major accidents with large human casualties and enormous economic damage. Therefore, the use of alternative energy sources is promising.

Less than 25 years after the Chernobyl disaster, the world witnessed an accident at the Fukushima nuclear power plant in Japan, with its zone of exclusion and other consequences resembling Chernobyl's.

As compared to the four units of the Chernobyl nuclear power plant was destroyed, and the other three worked for another 10 years, at the Fukushima-1 four units were completely destroyed and will never work. Both accidents showed again that nuclear power is dangerous and can easily get out of hands.

By the time a new nuclear power plant was constructed in Belarus, 32 countries were currently operating nuclear power plants. Considering the potential danger of using nuclear power, many other countries have taken the path of refusing to use nuclear power plants by decommissioning and eliminating them.

Italy became the first country to shut down all existing nuclear power plants and completely abandon nuclear energy. Belgium, Germany, Spain, Switzerland, Taiwan are pursuing long-term policies to phase out nuclear power.

The Netherlands and Sweden also planned to abandon nuclear energy, although they suspended their intentions. Lithuania and Kazakhstan temporarily stopped using nuclear power, although they plan to build new nuclear power plants instead of the closed ones. Earlier, Armenia was considering to discontinue nuclear energy production, although it's the only nuclear power plant was later put back into production.

Austria, Cuba, Libya, North Korea, and Poland have stopped building their first nuclear power plants for political, economic or technical reasons (although North

Korea and Poland still plan to do so). Other countries have abandoned their nuclear power programs altogether, including Azerbaijan, Georgia, Latvia, Australia, Greece, Denmark, Ireland, Liechtenstein, Luxembourg, Malta, New Zealand, Norway, Portugal, Philippines, Ghana.

In addition to the complete rejection of nuclear energy, there are other reasons for its decline and stagnation. Both leaders in nuclear energy production, including the USA, UK, France, Germany, and especially Japan (after the accident at the Fukushima-1 nuclear power plant), and others countries with nuclear power plants have closed a significant number of them. According to the report on the state of the nuclear power industry, there is a global decline in the industry [1].

Today, the world gets its energy primarily from burning of fossil fuels and running nuclear power plants. Along with abandoning nuclear energy today (or reducing the number of reactors in use in the near future), many countries are actively moving towards the alternative/renewable energy sources. Alternative energy is significantly more sustainable and causes less harm to the environment. For example, the EU is actively progressing from using cars with internal combustion engine to electric vehicles, as well as bringing overall share of renewable energy sources to 30-50%, depending on the country. Additional incentives for this were the ever-increasing cost of hydrocarbons, and reluctance of the European countries to depend on the certain largest energy supplier.

The main renewable energy resources are sunlight, water flows, wind, tides, bio fuels (fuel from plants or animal products), and geothermal sources (heat coming from the Earth core). Of the above, the most promising renewable energy sources appear to be the solar and wind energy, and, to some extent, the hydropower.

Solar energy is one of the most powerful types of alternative energy sources. Most often it is converted into electricity by solar panels. The amount of energy that the sun sends to the Earth every day is enough to run the entire planet for a year. However, the annual amount of electricity generation from solar power does not exceed 2% of the total volume of generated electricity.

The biggest challenge is dependency on weather and time of day. It may not be profitable for northern countries to product solar energy. The construction of solar power plants is expensive; the plants need special care; the photocells contain toxic substances (lead, gallium, arsenic) that must be properly and timely disposed of; huge swats of area is required for the high output. In comparison, in warm countries with high electricity tariffs, solar energy can cover the needs of a typical home.

Wind power. The reserves of wind energy are 100 times greater than the reserves of energy of all rivers on the planet. Wind farms help convert wind into electrical, thermal and mechanical energy. This type of renewable energy is well developed in Denmark, Portugal, Spain, Ireland, and Germany. By the end of 2016, the capacity of all wind turbines exceeded the total installed capacity of nuclear power.

Hydropower. To convert the movement of water into electrical energy, hydroelectric power plants with dams and reservoirs are needed. It is more expensive and more difficult to build hydropower plants than conventional power plants, but the cost of electricity during their operation is two times lower. Turbines can operate in different power modes and it is possible to control the generation of electricity.

Mankind is not in danger of an energy crisis due to depletion of oil, gas, and coal reserves – if only it can master renewable energy technologies. In that case, the problems of environmental pollution from power plants and transport emissions will also be solved. Nuclear power, as we know by now, is fraught with major accidents.

The owners of alternative renewable energy sources do have higher energy security and independence.

New agile alternative energy based on innovative technologies does compete with nuclear energy. According to experts' forecasts, alternative energy will dominate the market of clean technologies by 2050, and by the end of the 21st century it will provide 75-90 percent of all the Earth's needs for electric energy.

---

1. Отказ от ядерной энергетики. – Википедия [Электронный ресурс]. – Режим доступа: https:/ru.wikipedia.org/wiki/ (дата обращения 19.03.2021).