

RENEWABLES

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Modern energetics is confidently moving toward a “green renaissance.” The shift in this direction is driven by the scarcity of natural resources, primarily fossil

fuels, as well as climate change (for example, global warming). This transition was preceded by the oil crisis of 1973.

The future of carbon-free energetics will be shaped by solar and wind power plants, as well as biogas – these sources are expected to occupy a key and dominant share in the energy mix.

Renewables are produced from a variety of resources (for example, solar panels are made from semiconductor, glass, and plastic materials), which may be abundant in nature (such as silicon) or specific to certain regions (such as agricultural waste). This directly affects their availability and accessibility.

The main challenge in the use of renewable energy sources is the instability of electric power generation, which requires the implementation of energy storage systems (battery stations).

Under the conditions of a transition to renewable generation capacities, humanity is moving toward distributed energy systems (microgrids). A microgrid is a localized electric power distribution system that operates either independently from the main power grid or in connection with it (Hrushevyy R.A., Lavrenova D.L., 2024, p.29). The Ukrainian power grid is not yet adapted for the integration of distributed generation, as it requires:

1. Installation of devices for monitoring and data acquisition.
2. Installation of equipment for power quality control.
3. Implementation of relay protection systems designed for automated distributed generation networks.
4. Application of new calculation methods for power flow analysis under both normal and emergency operating conditions.

For the effective integration of renewable energy sources into our power system, certain engineering measures must be implemented. In other words, the operation of the power grid must be adapted for parallel operation with renewable energy. This requires synchronizing consumption schedules with renewable generation profiles, managing power flows to reduce transmission losses, ensuring high power quality, and improving the reliability of the electricity generated by

renewable energy sources (O.V. Prudkyy, Zakolodyazhnyy V.V., 2023, p.18-19).

References:

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2. Prudkyy O.V. Perspektyvy zastosuvannya vidnovlyuvanykh dzherel enerhiyi razom z liniyamy postynoho strumu v Ukrayini / O.V. Prudkyy, V.V. Zakolodyazhnyy // Mizhnarodnyy naukovo-tekhnichnyy zhurnal "Suchasni problemy elektroenerhotekhniky". – 2023 – p.18-19. – Retrieved from <http://jour.fea.kpi.ua/article/view/301500> [In Ukrainian]