Задание 1. Переведите предложения, содержащий термины и аббревиацию. Запишите перевод ТОЛЬКО терминов/аббревиации, выделенных жирным шрифтом в именительном падеже (см. «Критерии оценивания»).

1. Emergency core cooling systems are vital components designed to maintain core integrity during **LOCA**s, ensuring reactor safety under extreme conditions.
2. The use of **OLTC** allows for real-time voltage regulation, enhancing the transformer ability to adapt to fluctuating load conditions without interrupting service.
3. DGA is routinely conducted in transformers to detect potential faults early, ensuring the transformer reliability at the substation.
4. The time constant of a **RC circuit** is fundamental in understanding how quickly the circuit responds to changes in voltage or current, essential for timing applications. Due to the presence of a resistor in the ideal form of the circuit, an RC circuit will consume energy, akin to RL circuit.
5. SO maybe initiated to update components, planned decommissioning, and completing infrastructure testing. SO occurs only once during the specified period of time.
6. The **modular switchgear assembly**, designed for both indoor and outdoor applications, provides robust control and protection for the interconnected busbars.
7. In the case where resistance is negligible, this reduces to the ratio of inductance to capacitance (actually, the square root of this ratio) and is called the **surge impedance of a line**.
8. To help maintain a satisfactory **earth fault loop impedance** it is essential to fit suit cable outdoor cable glands with earth tags for earthing to associated gland plate, equipment earthing terminal and adjacent cables.
9. **Battery energy storage system** is used to curtail the extra power during low demand times. This system is capable of absorbing and delivering real power to the grid. It is also critical to decarbonizing the power system and reducing greenhouse gas emissions.
10. The capital investment in a standby generating set is sometimes offset by using the equipment for **peak lopping duty** whereby the highest electrical tariff charges can be avoided by running the set in parallel with the mains supply during peak periods.

Задание 2. Прочитайте текст на английском языке и сделайте пересказ текста на русском языке. Прочитайте текст на английском языке и сделайте пересказ текста на русском языке. Объем русского текста должен быть 150-160 слов. Текст, объем которого меньше 135 или больше 180 слов, не проверяется.

Challenges of Applying Digital Twins to the Future Power System

Due to the increasing penetration of distributed renewable energy resources and active prosumers, the future power system must and will undergo a drastic transition in its operational strategy. On one hand, the uncertainty of the renewable energy availability and the installation of power electronic converters as grid-tied interfaces will inject not only stochastic but also deterministic disturbances into the grid. Furthermore, due to the growing drop-out of conventional synchronous generators, the available inertia in the system will drastically reduce, which threatens grid stability as intrinsic power reserves vanish. On the other hand, a significant optimization potential emerges in efficiency and economic benefit as the distributed power converters allow for increased flexibility, fast dynamic response, and the optimal (local) management of generation and consumption. The generation will consist of multiple renewable energy sources and storage systems, whereas the consumption will accommodate the local and individual needs by, e.g., economic dispatch and peak shaving. To tackle the challenges arising from this transition and embrace the disruptive opportunities, environmental, economical, and functional information of the interconnected system and its agents in real time is essential.

The concept of Cyber-Physical Systems (CPSs) has been gaining prominence in the last decade. Its core idea is to integrate computational and physical components into the virtual world to implement optimized processes in the real world and to transform and equip energy systems at all levels with intelligence, reliability, and security. The integration relies on modern modeling methods and the systematic investigation of the interaction between physical and cyber system. In this regard, digital twins (DTs), based on models of the physical systems and equipped with communication and computing technologies, are a popular and meaningful approach to realizing CPS. The ability to capture, predict, and visualize either virtual or real states for human–system interaction and to provide services for autonomous operation makes DT a key enabling tool for establishing cyber-physical power systems.

The goal is to enable flexible but stable operation of the overall system and also to allow for distributed and optimal energy management of the local subsystems. Depending on operation targets, communication and interaction can be required across component, unit, plant, and grid (system) levels involving timescales from microseconds to days. A holistic framework offering this communication and interaction to orchestrate data flow, storage, exchange, and analysis and to coordinate all subsystems in a standardized and generic way allowing for various data sources, protocols, and communication channels must be developed. Moreover, the capability of (pre-/post-) processing of massive amounts of data with small latencies must also be addressed while specifying such a framework architecture. In addition to these requirements, the modular nature of power systems due to several hundreds to thousands of individual units should be captured by its virtual representation as well. The modular design must not only provide the potential for "plug-and-play" functionality in physical systems but also minimize the adaption cost for system extensions by including more and more DTs. Based on modularity, large-scale power systems are expected to exhibit hierarchical structures, whose real-time control is usually performed on a multi-level basis. In brief, referring to DT design according to the addressed power system requirements, the following must be investigated and addressed by a holistic framework:

- Availability and integration of live data from physical systems;
- Flexibility in distributed definition and operation of applications and services;
- Generic capabilities for communication and coordination;
- Modularity and extensibility.

A DT solution, which covers all of the above-described requirements for power systems, is still not available and remains an unanswered research question