# DEVELOPMENT OF THE DIGITAL TWIN DATABASE FOR 6 KV RURAL POWER NETWORKS

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Developing a digital twin for **6 kV rural power networks** represents a critical step in enhancing energy supply efficiency and improving service quality. Digital twin technology enables **real-time monitoring** and analysis of the state of power networks, which is particularly useful for **preventing failures**, **reducing energy losses**, and **optimizing maintenance processes**. Additionally, by creating a comprehensive database, it becomes possible to collect and store valuable operational data about the power networks. Such a database plays a crucial role in further analysis and informed decision-making, allowing for better predictions and improvements in network performance.

The creation of a **data repository** serves as the foundational step in ensuring the effective operation of digital twins. This database aggregates information about various segments of the power networks, including parameters such as **voltage levels**, **current resistance**, **current status**, and other performance metrics. The database also archives historical data, which enables analysis of changes over time and facilitates accurate forecasting. Utilizing this information, **digital twin models** can be developed to simulate the condition of power networks and evaluate different operational scenarios. This simulation capability contributes significantly to improving overall efficiency and ensuring **safety** in energy supply.

To develop the digital twin of the research object, the database is organized into **three main categories** based on the specific characteristics of the system:

1. **Device-Related Data**: This includes information about equipment used for the distribution and transmission of electricity, such as transformers, protective elements, overhead and cable lines, and other relevant infrastructure. Accurate data on the condition, capacity, and operational performance of these components is essential for modeling and analysis.
2. **Weather Data**: Since external environmental factors like weather conditions significantly impact energy losses and the performance of power networks, including weather data is a necessary aspect of developing a reliable digital twin. Factors such as **temperature**, **humidity**, **wind speed**, and **precipitation** must be considered, as they can affect the efficiency and stability of power lines.

3. **Environmental Data**: The location and surrounding environment of power transmission lines, such as **vegetation**, **terrain**, and **ground conditions**, play a key role in determining the likelihood of failures and damages. For example, overgrown trees can cause line faults, and unstable soil can affect the integrity of poles and structures. Incorporating this data ensures the development of a **comprehensive** and **robust** digital twin model that accounts for all external factors.

In conclusion, the development of a **digital twin** for 6 kV rural power networks significantly improves the efficiency of energy supply systems by enabling real-time monitoring, failure prevention, and optimized maintenance. The creation and organization of a well-structured **database** allow for precise analysis of the system's current state and effective evaluation of various operational scenarios. By integrating **device-related**, **weather**, and **environmental** data, the digital twin provides a dynamic and accurate representation of the power network.

This technology enhances **reliability**, **safety**, and **energy efficiency**, contributing to the stability of power supply systems. Ultimately, it serves as a vital tool for achieving sustainable and optimized rural energy infrastructure, reducing operational costs, and ensuring uninterrupted electricity supply.