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**Evolution of digitalisation in the energy sector**

**REQUIREMENTS:**

**Requirements for developing a digital solution for renewable energy sector:**

* Installation of sensors and counters throughout the existing power plants to create smart grids.
* Integration of the new digital systems with the existing ones.
* Development of digital twins for modelling, forecasting, and testing for optimal performance.
* Deployment of management software capable of interconnecting all assets and centralizing their management.
* Utilization of renewable energy sources such as solar, wind, hydroelectric, and geothermal.
* Implementation of energy storage solutions such as batteries and pumped hydro storage.
* Adoption of energy efficiency measures such as LED lighting, building insulation, and smart thermostats.
* Integration of demand response programs to balance electricity supply and demand.
* Implementation of advanced metering infrastructure to provide real-time energy usage data to customers**.**

**TECHNOLOGIES , TOOLS , SYSTEMS AVAILABLE IN MARKET:**

1. **Installation of sensors and counters throughout the existing power plants to create smart grids:**

* Internet of Things (IoT) sensors and devices
* Wireless sensor networks (WSNs)
* Distributed Control Systems (DCS)

1. **Integration of the new digital systems with the existing ones:**

* Application Programming Interfaces (APIs)
* Microservices architecture
* Cloud computing platforms

1. **Development of digital twins for modelling, forecasting, and testing for optimal performance:**

* Advanced analytics and machine learning algorithms
* Computational Fluid Dynamics (CFD) simulations
* Virtual Reality (VR) and Augmented Reality (AR) simulations

1. **Deployment of management software capable of interconnecting all assets and centralizing their management:**

* Energy management systems (EMS)
* Distribution management systems (DMS)
* Outage management systems (OMS)
* Customer information systems (CIS)
* Geographic information systems (GIS)

1. **Utilization of renewable energy sources such as solar, wind, hydroelectric, and geothermal:**

* Solar photovoltaic (PV) panels and systems
* Wind turbines and wind farms
* Hydroelectric turbines and dams
* Geothermal heat pumps and power plants

1. **Implementation of energy storage solutions such as batteries and pumped hydro storage:**

* Lithium-ion batteries
* Compressed air energy storage (CAES)
* Pumped hydro storage
* Thermal energy storage (TES)

1. **Adoption of energy efficiency measures such as LED lighting, building insulation, and smart thermostats:**

* LED lighting systems
* Building insulation materials
* Smart thermostats and HVAC systems
* Energy-efficient appliances and equipment

1. **Integration of demand response programs to balance electricity supply and demand:**

* Automated demand response (ADR) systems
* Price-responsive demand (PRD) programs
* Critical peak pricing (CPP) programs

1. **Implementation of advanced metering infrastructure to provide real-time energy usage data to customers:**

* Smart meters and advanced metering infrastructure (AMI) systems
* Home energy management systems (HEMS)
* In-home displays (IHDs)
* Energy management apps and software