Software Engineering Assignment 2
CS-301

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Theme : Evolution of digitalisation in the energy sector

Objective: To develop Digital-based future energies

REQUIREMENTS:

a. Real-time monitoring and control of energy production and consumption.

b. Integration of renewable energy sources with the existing energy infrastructure

c. Data analytics and predictive maintenance for optimal performance and reduced downtime.

d. Seamless communication between different assets and systems.

e. Scalable and flexible solutions that can adapt to changing requirements.

f. Cybersecurity and data privacy measures to ensure secure and safe operations.

g. User-friendly interfaces and visualization tools for easy access and understanding of energy data.

h. Understanding of the challenges associated with digitalisation: A clear understanding of the challenges associated with digitalisation is necessary to appreciate the potential roadblocks that may arise during the adoption of digital technologies in the renewable energy sector.

Tools, technologies and systems :

1. **IoT Sensors:** IoT sensors can be installed in various energy-generation assets such as wind turbines, solar panels, and power grids to collect real-time data. The data collected by these sensors can be used to optimize asset performance and improve energy efficiency.
2. **Smart Meters:** Smart meters are digital energy meters that can be used to measure and record energy consumption in real-time. Smart meters can help energy companies to better manage demand, optimize energy consumption, and reduce energy waste.
3. **Energy Management Systems (EMS):** EMSs are software systems that can be used to monitor and manage energy consumption in real-time. These systems can help energy companies to optimize energy use and reduce energy costs.
4. **Energy Storage Systems:** Energy storage systems such as batteries can be used to store excess energy generated by renewable sources such as solar and wind power. These systems can help to provide a stable supply of energy even when renewable sources are not available.

5. **Big Data Analytics:** Big data analytics can be used to analyze the massive amounts of data generated by the energy sector. By analyzing this data, energy companies can gain insights into energy consumption patterns and optimize energy production.
6. **Artificial Intelligence (AI) and Machine Learning (ML)**: AI and ML can be used to develop predictive models that can help energy companies to optimize energy production and consumption. These models can be used to forecast energy demand and optimize energy generation to meet demand.
7. **Blockchain:** Blockchain can be used to create secure, transparent, and decentralized energy trading platforms. These platforms can help to facilitate peer-to-peer energy trading and enable energy companies to sell excess energy generated by renewable sources to consumers.
8. **Cloud Computing:** Cloud computing can be used to store and process large amounts of energy-related data. Cloud-based solutions can help energy companies to optimize energy production and consumption and reduce energy costs.
9. **Digital Twin:** Digital twin technology can be used to create virtual models of energy-generation assets such as wind turbines and solar panels. These models can be used to simulate various scenarios and optimize asset performance.
10. **Cybersecurity Solutions:** As the energy sector becomes increasingly digitized, it is important to ensure that energy systems and data are protected from cyber threats. Cybersecurity solutions can be used to protect energy systems and data from cyber attacks.