Automation Scenario: Borewell Water Consumption Monitoring System

✅ Objective:

Automate the measurement of daily water consumption from 35 borewells across multiple plants. Each borewell has a capacity of 65 KL/hour. Monitor this data in real-time via Azure Dashboard, along with alerts, reporting, and analytics.

🔧 1. Hardware Setup

🧰 Devices to Use:

Ultrasonic Flow Meters or Electromagnetic Flow Meters on each borewell outlet.

IoT Edge Devices (e.g., Raspberry Pi with industrial-grade casing, or Azure-certified IoT edge gateways)

Connectivity Modules (4G/5G SIM-based, LoRaWAN, or NB-IoT)

🌐 2. Data Collection and Transmission

Each borewell has:

Flow meter → Measures real-time water flow.

IoT device → Reads flow data every minute, calculates cumulative hourly and daily consumption.

Edge logic → Processes and filters data locally to reduce transmission load.

Transmission → Sends processed data to Azure IoT Hub or Azure IoT Central.

☁️ 3. Cloud Integration (Azure)

🔗 Services Involved:

Azure IoT Hub / IoT Central – Ingests telemetry data.

Azure Stream Analytics – Real-time data processing and anomaly detection (e.g., unexpected high consumption).

Azure Data Lake – Historical data storage.

Azure Functions – Alerting logic (e.g., send SMS/Email when usage crosses a threshold).

Azure Digital Twins – Visual representation of borewells across locations.

Azure SQL / Cosmos DB – Structured data storage for reporting.

Power BI Embedded in Azure Dashboard – Visual monitoring.

📊 4. Azure Dashboard Setup

Components:

Map View showing location of each borewell and current status (e.g., Active, Idle, Fault).

Real-time water consumption per borewell.

Daily/Weekly/Monthly trends.

Alerts and anomalies – e.g., excess usage, sensor offline.

Cumulative KPI Dashboard:

Total Water Used Today (Plant-wise & Overall)

Avg. Hourly Usage

Usage vs. Capacity (max 65 KL/h)

Historical comparisons

🚀 5. Extra Technologies to Enhance

Tech Purpose

AI/ML Models in Azure Machine Learning Predictive analytics – Forecast water demand, detect anomalies, preventive maintenance.

Edge AI Run basic models on IoT edge devices to pre-filter data and detect leaks or excessive flow.

Blockchain (Azure Blockchain Workbench) For auditable logs if needed in regulatory compliance.

Mobile App (via PowerApps) On-field staff can monitor or report issues.

Azure Logic Apps + Power Automate Automate workflows like generating daily reports or raising maintenance tickets.

🧠 Example Daily Logic Flow:

Every 1 minute: Flow data collected from each borewell.

Every 10 minutes: Aggregate to hourly usage.

End of Day: Send total usage to Azure SQL DB.

Real-time Alerts: If hourly usage > 65 KL, notify operations.

Dashboard: Visualize current and historical data on Power BI.