Predicting the health by integrating data-driven analytics into electrical digital twin model

SC B3 - PS2 – Question 1

F. Trichon - France

Schneider Electric

Predicting the health by integrating data-driven analytics into electrical digital twin model

- What are the management challenges to maintaining existing substations in both the short term and long term? What new ideas and concepts will provide insight on asset life extension and reduced cost while improving reliability?
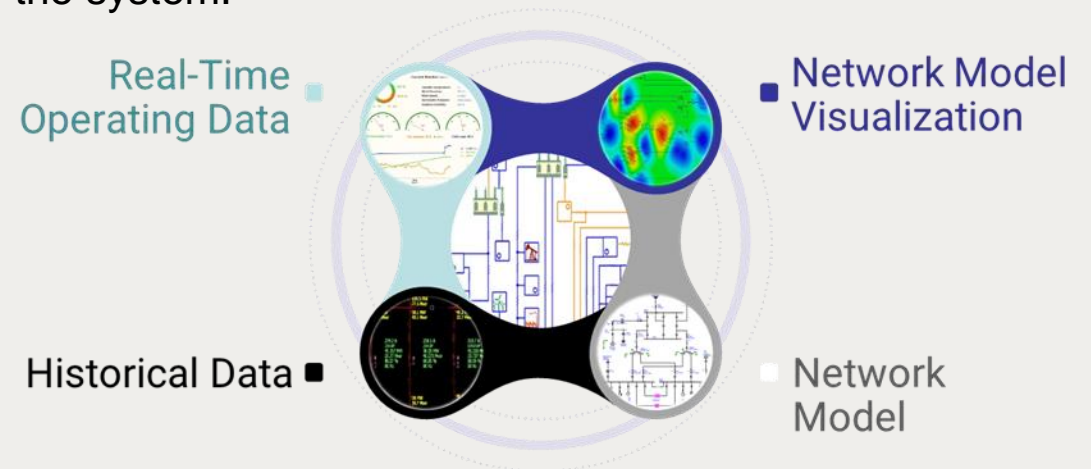
Answer

- Asset life extension in existing substations need to cope with several challenges:
  - **Reducing cost of substation equipment** including capital cost, operating and maintenance costs.
  - **Risk of system failure** (service interruptions) due aging equipment reaching end of service life.
  - **Aging equipment** requiring higher intervals of maintenance that impacts system availability and reliability.
  - **Lack of sufficient visibility of online substation assets** for tracking, monitoring, and assessment

- "Asset Advisors" can integrate new concepts such as:
  - **Logical schematic and geospatial topology** technologies (Electrical Digital Twin)
  - **Intelligent analytics and predictive tools**
  - **Scalable energy and power management systems**
  - **Smart automation and remote controls** with **embedded edge connectivity, mobility, and cyber security**
  - **Machine-Learning with condition-based maintenance** to gain predictive, preventive, and ultimately prescriptive maintenance of substation assets.

Group Discussion Meeting

Benefits for the equipment owner

- Alerting when the equipment is operating outside its normal range can provide sufficient time to react and correct the problem before an unplanned outage occurs, and then allows personnel to strike a balance between safety, plant uptime and operating cost based on the severity of the alert.

- Referring to CIGRE TB 858 on Asset health Indices, such "Asset Advisors" can offer Level 5 solution where **offline measurement and online monitoring are combined to offer comprehensive diagnostic strategy**.

- In fact, "**Asset Advisor" combined with digital Single Line Diagram** can offer a step beyond by integrating the data-driven analytics with the electrical digital twin model to provide a new insight for assessing and predictive the health and state of substation assets and the system.

- Other advanced benefits are:
  – Maintaining and updating digital model
  – Deliver advanced power system studies
     (Arc flash, protection coordination, and short circuits)
  – Empower / train the staff
  – Enhance the Electrical Monitoring & Control System
     to improve operational efficiency

Real-Time Operating Data

Network Model Visualization

Historical Data

Network Model