**Digitalization**

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The development of digital technology over the last decade has led to Industry 4.0, the 4th industrial revolution, which is enabled by the Industrial Internet of Things (IIoT). However, because remote monitoring and online machine monitoring is not new, and the advantages of IIoT not initially obvious, as well as concerns over cyber security and ownership of data, oil and gas, and power generation industries have been cautious to adopt digitalization. Business IT networks and business procedures need to be evolved to take advantage of digitalization, but for this to happen, the benefits of digitalization must be examined and understood. Since it is not fully clear what these benefits are, the following suggested topics are aimed at answering the concerns of end users, and highlighting the benefits of digital technology.

Development of Digital Twins

A digital twin refers to a digital replica of a corresponding physical system. It represents numerically the detailed elements of the physical system, as well as its dymanic behaviour, operation, and degradation throughout its life cycle. This section should look at advanced computer modelling technologies to develop digital twins for gas turbine power-generation systems. This involves using field data to adapt the computer models to the physical systems, and integration of the computer modelling, artificial intellence, machine learning, and software analytics with data to create digital simulation models that update and change as their physical counterparts change.

Data Management

Gas turbine power-generation systems may produce large amounts of data from their operations. It is important to manage the large data and extract useful information from the data for efficient, reliable and safe operation of the power systems. This section should develop and evaluate the technologies for data storage, data transfer via internet, data receiving, data security, and information extraction and processing.

Cyber Security

This section should consider remote connectivity, hardware firewalls, business risks, cloud solutions vs client-side networks, ownership and location of data, implementation of applications, and Quality Assurance.

Life Cycle Management

With the support of digital twins, this section should look at the development and evaluation of the technologies for optimal control, operation, condition monitoring, condition-based maintenance and life management of gas turbine power-generation systems.

Review Potential Architectures

Not all digital solutions will be suitable to industries involved with ETN, such as remote locations, offshore installations, FPSO ships, etc. Some solutions will work better than others, and this section will review the connectivity opportunities that digitalization/cloud access technologies can bring to end users.

Benefits

When machine data plus asset and business data come together, the opportunities of analysis increase dramatically. The effect of machine performance on an entire business and network can be analysed, and reliability and production forecasting can be performed quickly with greater accuracy. Further benefits may be revealed in the process. ETN should look into the ways digital solutions can help its end users.

Software as a Service

Having data in one place means that analysis tools and services can be deployed differently. The process of buying and installing software on a PC has evolved into a delivery of service business model that provides benefits with a monthly fee or charge per use. This section should look at what these options are for ETN members and what business KPI’s these can solve.