reports or recommendations to the product line marketing and to the sales service. In urgent cases the customer will be informed immediately.

Summarizing the Power Diagnostics™ Center is performing analysis and diagnostics using high sophisticated learning software modules, is providing trend analysis, problem identification and root-cause analysis done by human experts. The learning software solution prevents them from dealing with trivial problems. The engineers in the remote expert center are comparing and analyzing the incoming data from the whole fleet connected to the diagnostics center. Because of the pool of information coming from a huge fleet, the experience is growing much faster than it would be possible for a single operator.

Even if there is no problem the engineering experts are able to generate recommendations on plant operations and/or maintenance actions. The recommendations are designed to maximize the equipment's performance, reliability and availability and potentially, extend outage interval cycles.

The organization structure and the process flow is shown in **Figure 15** below.

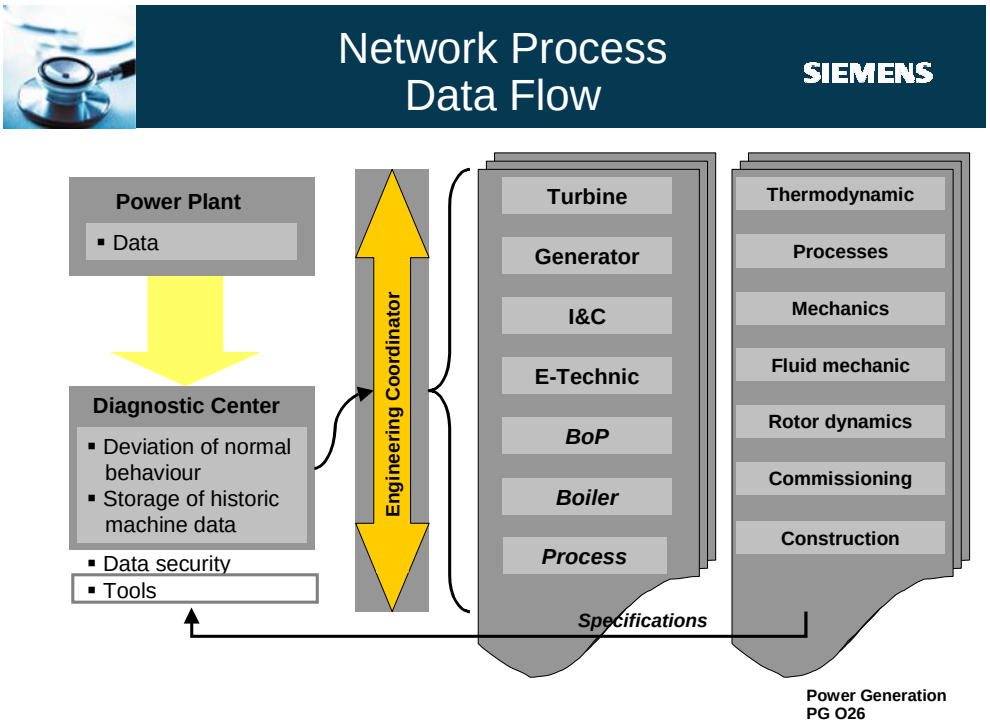

Fig. 15

The following diagnostic modules are available today, but the technology is proceeding fast. In addition to the more general development of faster computer networks, there is a fast development of new sensor technologies. **(Figure 16):**

- **Vibration Diagnostics:**
  Shaft vibration, bearing vibration, end-winding vibration using fiber optic accelerometers.
- **Thermodynamics Diagnostics "KRAWAL":**
  A tool developed for plant design and engineering of the thermodynamic processes integrated in the online diagnostic to compare current process data with expected values.
- **Turbine Operability Enhancement "TOE":**
  Historically steam turbine operation were designed for a market that was typically either base load or intermediate duty load operation. Applying the historical steam turbine start-up philosophy either limits the operating flexibility or exceeds steam turbine allowable stresses increasing service consumption.

  The demand for flexible operation leads to the development of innovative concepts to reduce start-up times of steam turbines while minimizing service time consumption thereby improving availability. This new concepts include plant operability enhancements, such as e.g.
  - steam turbine stress controller and stress monitoring system
  - high level of plant automation
  - plant systems designed to provide steam conditions necessary for a pre-selected start-up mode
  - remote online monitoring and diagnostics

- **Online Life Consumption Calculation:**
  Basis for TOE.

  RF Monitoring:
  In high-voltage equipment such as Generators, Terminal lead area, transformers and motors faults occur. To avoid repair costs or even loss of revenue due to unscheduled outages, it is necessary to identify these faults and rectify them in time

Faults in electrical equipment do not occur suddenly but, in most cases, are announced in advance by telltale partial discharges. They short-circuit across part of the high-voltage insulation and can be detected by radio frequency (RF) measurement methods because of their radio-frequency character.

Suitable selection of RF measuring points allows detection of partial discharge sources over the entire high-voltage range. To avoid intervention in the insulation system of the components itself, natural coupling points are preferred.

By digital unmasking of the partial discharge signals from the usually noisy complex mixture of RF signals it is possible to determine the causes of the discharge. With simultaneous measured data acquisition and different measuring points it is possible to locate possible source of faults.

- Other modules as shown in Figure 6

Figure 16 (Available Diagnostic Modules).

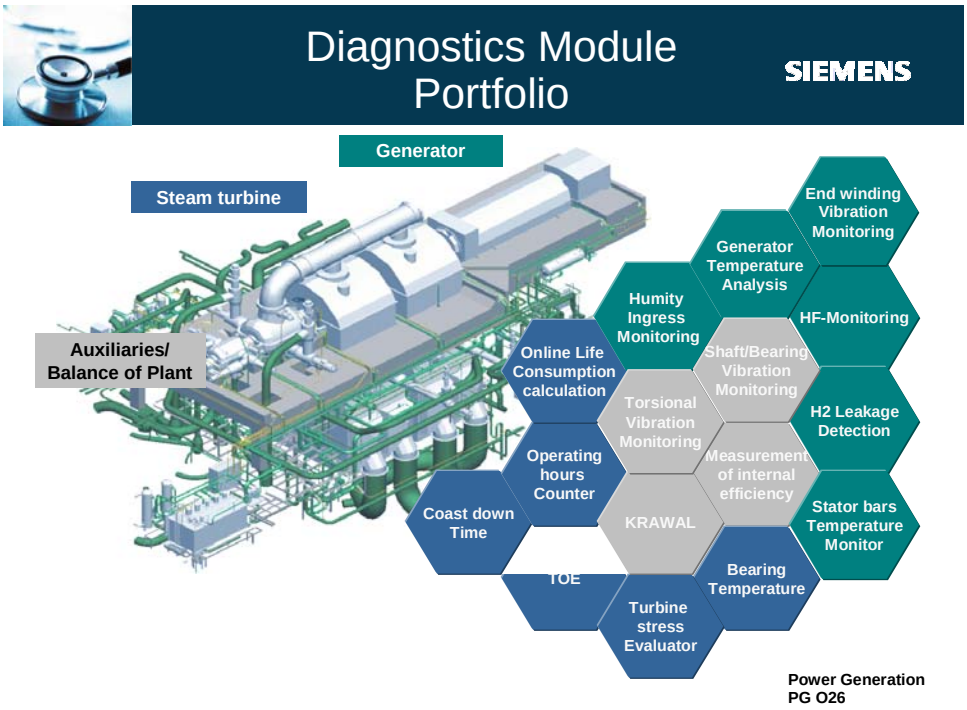

Fig. 16