Monitoring, diagnostics, and cable services

Analyze the past, monitor the present, predict the future

Answers for energy.
Monitoring, diagnostics, and cable services help network operators face today’s challenges and make it possible to meet key performance indicators consistently. The first step is the evaluation of a network’s actual state, enabling the precise definition of appropriate levels of condition determination and IT solutions to be implemented. The Siemens experts provide assistance when it comes to making an accurate evaluation based on the right information in order to allow a proper description of the current situation, analysis of the situation, and finally identification of the preventive or corrective actions to be taken.

Expertise and evaluation
The Siemens transmission and distribution specialists are there to provide expert support whenever knowledgeable and technically competent advice is required in the field of monitoring, control, and maintenance of power networks and their individual components.

The knowledge and wealth of information the Siemens field engineers usually pass on, as well as the engineering, design, and specialist expertise cultivated in Siemens’ transmission and distribution factories, are the firm basis for targeted advice on any actual network condition as well as on adequate solutions for network improvements that maintain or even enhance the value of the assets.

Detect, analyze, diagnose, and act
Of course, all components of a power network are highly valuable assets that should be taken care of. Nevertheless, some core equipment is vital for the reliable operation of the entire network, and its correct function needs to be ensured. This is where Siemens transmission and distribution monitoring, diagnostics, and cable services come into play, as they help ensure reliable network operation and maintenance.

Siemens’ modular service solution makes it possible to monitor all relevant network assets and obtain support from qualified experts, so network operators can take action on time whenever it becomes necessary in order to optimize the electrical installations.

Strategic use of asset condition
Knowing an asset’s condition is not a goal in its own right. That’s why Siemens provides the strategic implementation of monitoring, diagnostics, and cable services comprising:

- determination of asset relevance together with the customer
- determination of the most proper monitoring, diagnostics, and cable services solution (varying from “doing nothing” to ISCM implementation)
- determination of required service level according to expert advice

Each asset needs a required level of condition estimation

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Accuracy of condition estimation

<table>
<thead>
<tr>
<th>Method</th>
<th>Accuracy of Condition Estimation</th>
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<tbody>
<tr>
<td>Guessing</td>
<td>0%</td>
</tr>
<tr>
<td>Statistics</td>
<td>50%</td>
</tr>
<tr>
<td>Visual inspection with SAFE asset audits</td>
<td>75%</td>
</tr>
<tr>
<td>Statistics and visual inspection</td>
<td>90%</td>
</tr>
<tr>
<td>Extended inspection with SAFE asset audits (measurement)</td>
<td>100%</td>
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The Siemens experts keep the network operator’s strategic maintenance or even asset management approach in view, and they help monitor and reproduce the short, middle, and long term behavior of equipments such as
- transformers
- gas-insulated switchgear
- circuit breakers
- overhead lines
- cables
- surge arresters
- protection devices.

Even more important, the Siemens engineers can always provide the correct interpretation of the results. This means that a comprehensive interpretation of the findings and their context will always be provided along with the diagnostic results, ensuring that the real situation and the causes can be thoroughly understood in order to find the optimal solution for improvements.

Acquired data, along with the network operator’s knowledge of the system, can form the basis for an adaptable solution depending on individual operation and maintenance strategies, and always taking care of the level of service agreed, which suits individual specifications.

The combination of different monitoring solutions, diagnostics, and cable assessments enables customers to find the right level of condition accuracy. Therefore our portfolio comprises:
- SAFE asset audits
- cable assessments using LIRA®
- Integrated Substation Condition Monitoring (ISCM)
- single asset condition monitoring
- remote services

Your benefits at a glance
- optimal balance between economical and operational aspects
- reliable measurements, dependable diagnosis
- privacy and security of your data
- use of the current infrastructure as far as possible
- risk management
- investment referral
- meeting legislative requirements
- cope with geographical challenges
ISCM
Integrated Substation Condition Monitoring

For reliable energy supply and entrepreneurial success
Integrated Substation Condition Monitoring (ISCM) is an indispensable tool for efficiency optimization of existing networks. ISCM provides managers and operators with access to reliable condition data, so that they know which network components have to be maintained, repaired, or even replaced.

Monitoring enables well-founded decisions, and, thus, optimal asset management and operational support. The lifetime of existing infrastructure assets can be extended, which benefits business and the environment.

ISCM offers convincing advantages:
- an approach comprising expert knowledge, highest usability, and best practice
- a standard, but at the same time modular, approach
- various predefined monitoring modules available within a single platform.

Siemens’ innovative monitoring system contributes to network optimization down to each individual element of a grid in terms of efficiency and reliability. ISCM provides valuable information and reliable diagnostics, and it supports condition-based maintenance. Failures can be predicted, unscheduled downtime is thus reduced, and equipment life is extended to a significant degree.
A set of modules, each tailored to a specific monitoring task

Unlike individual condition monitoring systems for each asset, ISCM makes possible a combination of individual modules on a common communication platform. Hence, taken together, the modules form an overall analysis system for all major assets of a substation.

Thanks to their common IT platform, all relevant data is acquired, analyzed, and presented in a clear and understandable interface, that can also be connected to a SCADA system with a single customer-defined interface.

Innovative knowledge modules for precise diagnosis and excellent visualization

The user interface thus provides clear, well-structured data displays, and the dedicated software platform hosts the different knowledge modules for all primary assets, processing and transmitting information for visualization and actionable recommendations.

ISCM impresses with:

- a one-stop solution for all relevant asset groups
- its modular structure
- easy implementation into any existing energy automation infrastructure
- effortless connection to asset management systems.

ISCM is an extremely flexible solution that can be implemented in every existing substation infrastructure. Siemens supplies both fully integrated condition monitoring and single-asset embedded monitors – the choice is yours.
Remote services
Remote Diagnostic Center – RDC

The Siemens Remote Diagnostic Center (RDC) makes the detection of developing faults in an early stage available for every company.

The concept is simple and elegant: it is often more efficient and faster to first determine the causes of system problems via remote diagnosis and, where possible, correct the problem through remote repair.

However, in those cases where remote repair is not possible, the information obtained via remote diagnosis can support the Siemens expert engineers on-site.

Siemens’ proactive services make it possible to act in a preventive manner, rather than reacting after an emergency occurs.

Whether on-site or remotely, many problems can be detected and corrected based on technical data from the system. Remote services are available as a stand-alone service contract or as a module of more comprehensive service combinations.

The RDC provides support in attaining further optimized product utilization and life cycle costs.

The strength of central expert knowledge for asset and network analysis and local network knowledge for daily operation is combined in the RDC. It makes possible hosting and operation of ISCM in combination with available expert knowledge.

Furthermore, the RDC enables the operation of substations of any size, from standard local substations up to solar, wind, and HVDC plants. A network of local operation centers in combination with the RDC makes possible the reliable operation of local stations.

While the Siemens monitoring and diagnostics solution enables precise monitoring, the support provided by the RDC supplies the analysis required to take timely action whenever it is necessary in order to optimize the electrical installations.

Since ISCM does not have to be connected to existing control and protection systems, operational data can be kept private. On the other hand, ISCM can be synchronized with the Siemens RDC for expert analysis if so desired. If the automated knowledge module detects a critical situation, the Siemens experts will perform an extensive analysis of the situation and provide a highly knowledgeable recommendation.

Available optional modules*:
- ISCM supervision
- SCADA supervision
- SCADA operation
- operation and maintenance

*availability depending on region or country.
Tailored to individual necessities, the system monitors important system parameters and sends messages accordingly to the service center. The incoming message is then analyzed by the Siemens experts. If necessary, preventive remote repair is initiated with minimum interference to product usage.

ISCM supervision makes it possible to receive a warning and a ticket indicating the occurred alarms plus recommendations on the existing condition deficiencies.

Prioritization of the alarms and fault recording, as well as event list analysis using SCADA supervision, is available as additional or alternative solution.

Equally focusing on all users, the RDC considers the technical capabilities required and defined according to the individual business, and also the security infrastructure required to prevent malicious attacks.

Interpreting the acquired data from a system design point of view and also contributing years of practical experience acquired in projects around the world, the Siemens experts provide expertise, technical solutions, and advice. Siemens solutions have been successfully applied in various countries and different core businesses, always focusing on the efficiency of the maintenance strategy.

Data security

Establishing the degree to which access is granted to the system, the Siemens experts can assure comprehensive data protection. This ensures that only authorized staff have controlled access to the system.

Siemens uses the latest encryption methods to protect data from unauthorized access during transmission. This is achieved through central authentication and authorization, encrypted data transmission, and secure data storage within a DMZ (a “demilitarized zone,” separated by firewalls from other networks such as the Internet or LAN).

At Siemens alone, it is currently being used to monitor over 70,000 systems across the company’s entire product range.
SAFE asset audits are structured and objective audits for all types of transmission and distribution assets. They depict diagnosis results in a user-friendly way, allowing the diagnostic information to be utilized instantly by asset management decision makers. SAFE asset audits evaluate the information gathered during the audit and generate reports of the performed assessment, detecting aging and incipient faults that can be eradicated with confidence with the aid of technical expert support.

Condition assessments of the major assets of substations like high-voltage gas-insulated switchgear, high-voltage circuit breakers, medium-voltage switchgears and power transformers can be performed in three steps:

- general information
- visual inspection
- extended diagnosis.

**Unique features of SAFE asset audits:**

- SAFE asset audits deliver standard, comparable, structured audits
- SAFE asset audits support life cycle management of existing assets with objective condition data
- SAFE asset audits deliver input for spare parts management
- SAFE asset audits enable the use of cost-effective asset management solutions to improve asset performance
- a solution for reduced expertise in the market, downsizing and requirements
- local specialists will perform the basic condition assessment
- asset specialists will perform the extended diagnosis, which is the second step including measurement and in-detail analysis
Cable services with LIRA technology

Preventive and corrective cable assessments by LIRA® (line resonance analysis) technology prevent faulty operations and minimize the need for fault recovery, even when a fault has already occurred.

LIRA is a non-intrusive and non-destructive system that enables the real-time diagnosis and condition-based monitoring of installed electric cables by detecting degradation and locating faults. Based on the transmission line theory, this test method estimates and analyzes the complex line impedance as a function of the applied signal frequency, leaving both cables and all installed equipment virtually untouched.

LIRA can detect:
- degradation caused by temperature, bends, scratches, corrosion, water intrusion, mechanical stress, and fatigue
- insulation material degradation
- cable joints, for instance, between different cable types

Condition assessment
LIRA technology condition assessment, together with other inspection tools, provides grid operators with comprehensive diagnostic data on the condition of cables located in harsh environmental and operational conditions.
LIRA also assesses the mechanical impact exerted on cables, together with the degree of damage caused. This contributes to maximum operational reliability.
The recorded measurements are then stored in the database. They serve as subsequent fingerprints for deciding the future repetition frequency of cable condition assessment.
Requiring simply one access point for measurement, robust in design, and highly accurate, LIRA is built to withstand the toughest industrial environments.

Fault location
Trained staff and efficient equipment make the quick and accurate location of cable faults possible and keep resultant costs to a minimum.
LIRA is suitable for virtually all kinds of cables, including PE, XLPE, PVC, PILC, EPR, Hypolon, and Lipalon.

Network operation reliability is significantly enhanced, thanks to the preventive measures made possible by cable diagnostics and the assessment of potential outcomes and necessary corrective actions.
Customer support services

The Siemens Energy Customer Support Center plays a key role in providing customers with valuable diagnosis and expertise. It is open 24 hours a day to respond to questions concerning installation, equipment, and software, for example.

Working alongside local support, the Siemens Energy Customer Support Center uses a reliable ticketing system which allows customers to track their request directly as it is being processed.

Your benefits at a glance

- You can reach the Siemens Energy Customer Support Center 24 hours a day, seven days a week.
- The Siemens Energy Customer Support Center locates the right contact person or specialist for you.
These flexible solutions allow the scope of a given agreement to be defined by the customer, and, needless to say, the reliability of services is guaranteed at all times.

Siemens’ intrinsic know-how and methodologies are the cornerstone on which its service level agreements are built, whatever form they take in response to individual customer requirements. Flexibility is guaranteed, and modules can be added as required for additional technical and financial benefit.

Monitoring, diagnostics, and cable services as part of service level agreements

Thanks to the modular design of the service level agreement concept, monitoring, diagnostics, and cable services can also be included, in combination with various modules:

- operation and maintenance
- remote services
- maintenance services
- spare parts services
- technical support
- standard services
- pre-delivery services.

These services can be delivered as part of a customized service level agreement.