

**HITACHI**  
Inspire the Next



HVDC life-cycle service truly supports shaping the grid of the future. Long Term Service Agreements (LTSA) give you an uptime insurance for your HVDC system.

Life-cycle Services for HVDC

**Your uptime  
insurance**

 **Hitachi Energy**

Our mission is to keep the power flowing for the design life of the station and beyond.

This will enable our HVDC customers to feel safe that the system will be maintained and possible to upgrade during the full life-time of their investment - HVDC Service, the partner of choice.

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# Life-cycle services for HVDC

## Your partner to keep the power flowing for the design life of the station and beyond

HVDC (high-voltage direct current) is a highly efficient alternative for transmitting large amounts of electricity over long distances and for special purpose applications.

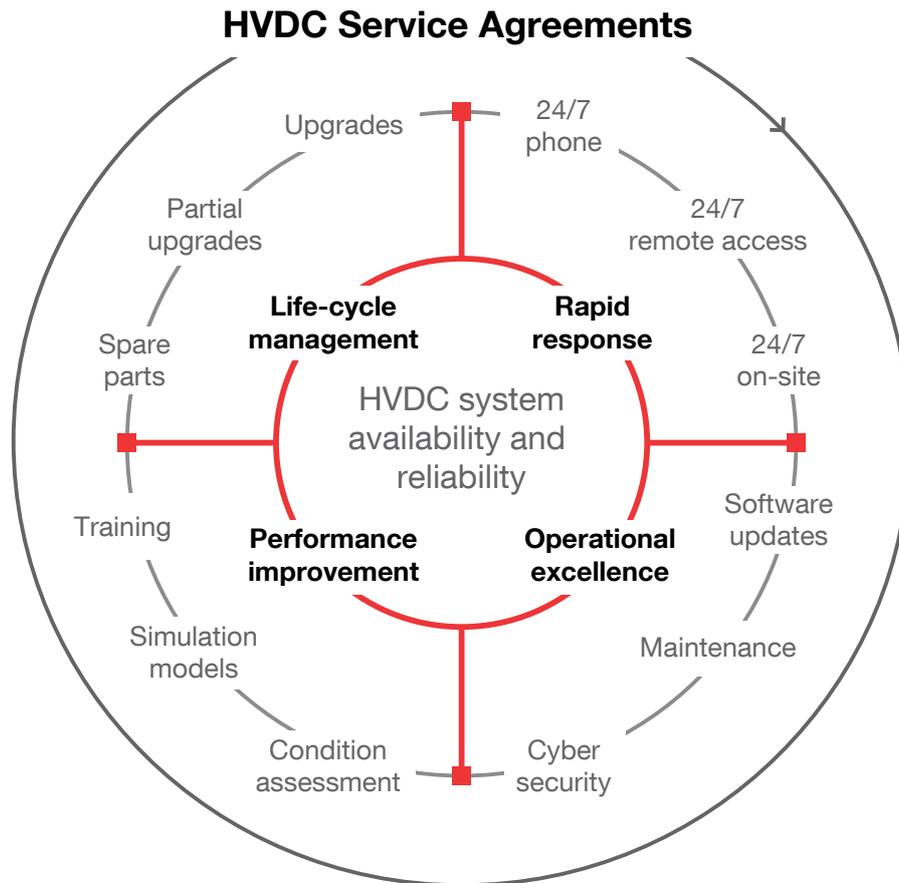
As a key enabler in the future energy system based on renewables, HVDC life-cycle service truly supports shaping the grid of the future. We divide our services into categories based on our customers needs. These categories are rapid response, life-cycle management, performance improvement, operational excellence, and HVDC Service agreements.

Life-cycle services from HVDC, HVDC Longterm Service Agreements (LTSA), HVDC upgrades, and other HVDC service agreements gives an uptime insurance for your installation. Production uptime, availability and reliability are of highest importance for our customers. In addition to LTSA, everything from other service agreements such as 24/7 rapid response, maintenance, spare parts, and partial upgrades to main upgrades are available.

Our commitment is to listen and be responsive to our customers. We deliver customer satisfaction by providing timely and responsive service, with integrity, and a passion for excellence. Digital solutions such as Remote service, Lumada and IdentiQ help our customers to take full advantage of digitalization and its possibilities.

Health and safety is always our first priority





## We always strive for our customers' trust

HVDC Service ensures continued support to the station throughout its lifetime. Hitachi Energy has long experience in providing maintenance service and delivering upgrades for HVDC links all around the world.

The cost of ownership throughout the system life-cycle should be relevant. And the capital expenditures, incurred when investing in the plant, need to be in balance with the operational expenditure, the ongoing maintenance (service) cost for running a product or system.

We value our customers, and always strive to earn their trust. Power companies tend to outsource services that are not seen as part of their core business. There is a trend that our customers want longer term service agreements and managed services, where manufacturers take a larger responsibility for various service products and processes to the extent of day-to-day management of the entire system. Already during design of the converter Hitachi Energy service experts are involved to prepare for serviceability, future operation, and minimized downtime.

Our services start already at take-over providing 24/7 and maintenance. Our support team strives to handle all issues that may arise during the warranty period. We stand fully behind the system delivery. During post-warranty (service) period, our support team continues to handle any issue that may arise. We also proactively minimize the risk of any issues by preventive scheduled activities.

### Think globally, act locally

Locally and globally we are one team, i.e. our local service engineers are an extension of the global team, so that our customers get access to the local service engineer and the global expertise.

### HVDC Service Agreements

Life-cycle Services for HVDC consists of service categories divided into service products. These can also be seen as a pallet that can be tailored into a Long Term Service Agreement (LTSA), each with a specific customer value.

# Rapid response

## We keep the power flowing 24/7

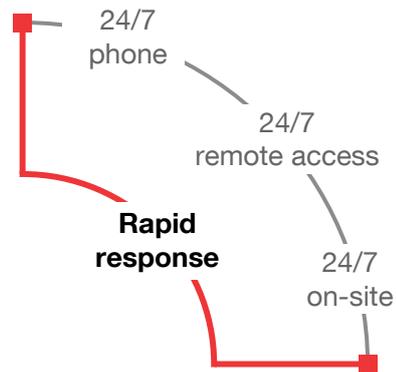
Corrective actions are needed from time to time when unscheduled problems occur. Hitachi Energy is committed to supplying support solutions that meet our customers' needs and specifications. To rectify a problem as soon as possible, we provide several support options. Rapid Response provides expert support via phone, e-mail, or other agreed means of contact. Short response-time to a knowledgeable Hitachi Energy engineer provides immediate access to solutions, saving valuable time. Minor incidents can be resolved quickly, and in the event of a major issue, immediate support is available.

### 24/7 phone

In the event of a problem, 24/7 phone support provides the security of a hotline at any time by phone, e-mail, or some other agreed upon means of contact. Quick connection to a skilled, knowledgeable Hitachi Energy engineer offers direct access to the solutions you need immediately, and saves valuable time. Minor incidents are usually solved quickly, and in the event of a major issue, you will have the right support from the start.

### 24/7 remote

The remote assistance for HVDC enables Hitachi Energy to immediately start troubleshooting and monitor a converter station from a secure remote location within the Hitachi Energy



network. Remote assistance is a key feature from both a monitoring management and corrective maintenance perspective. In addition, being able to perform a system data and alarm analysis from the HVDC system helps our customers to stay one step ahead.

### 24/7 on-site

The on-site corrective maintenance service offers you the assurance that there are skilled Hitachi Energy personnel on standby to assist you in the case of a problem. Besides 24/7 contact support, the service guarantees that a support engineer will arrive on your site within an agreed period of time.

24/7 access to HVDC experts and minimized downtime



# Operational excellence

## Together we manage your assets, operations, and risk

Our portfolio of digital solutions and the platform they are built upon helps customers take advantage of digitalization. Today, we offer solutions that range from remote monitoring systems to systems that maximize availability, reliability and security. Many customers have already deployed these solutions. Hitachi Energy has for many years worked with digital solutions, supporting the reliability and availability of our customers' installations. Our services are built from our HVDC knowledge, operational and information technology, digital expertise, knowledge of critical infrastructure, and comprise cyber security for HVDC, software updates and backups for HVDC, and maintenance based on digital tools and systems.



### Cyber security for HVDC

Using internet based communication technologies requires protection against cyber attacks. Viruses, ransomware and other malware have increased the awareness and need for cyber security methods. Cyber security must be addressed continuously, which requires a comprehensive program including human resources with the appropriate skills. Cyber security is a key requirement and we are committed to providing products, systems and services that clearly address this issue. We take a systematic approach to cyber security through our operations on a global level.

### Software updates

We offer update packages to bring older installations closer to the functionality we supply in today's installations. Software updates that improve reliability, add functionality and accessibility, secure spare part availability and increase overall performance. Software updates also includes updates to

computer operating systems, security, malware detection, or specific updates tailored to the customer needs, such as vulnerability management.

### Maintenance

We manage preventive and corrective maintenance programs. Preventive maintenance helps you to check the condition of your system and its components. It will determine the best solution to ensure system performance, safety, availability and reliability.

We design for maintainability, and use digital tools to minimize maintenance outage periods. In addition, our recommendations are based on input from our sub-suppliers, and experience from our field engineers and experts. These recommendations are continuously updated with new knowledge and experiences.



Increased availability, security, reliability, and performance



# Operational excellence

## Cyber security

Hitachi Energy’s Cyber Security portfolio includes solutions that are designed to secure our customers’ control systems. Our services can identify strengths and weaknesses, remediate security gaps, and maintain security.

### Why Hitachi Energy Power Grids?

- Reduce system vulnerability while increasing system security, availability, and reliability
- Solutions to cost-effectively meet corporate/regulatory requirements
- Maintain system data integrity and operational availability
- Our experts collaborate with our customers and trusted partners

We are committed to support cyber security standards and regulations such as NERC CIP, ISO 27001, IEC 62443, IEC 62351, IEEE 1686, BDEW, and others.

Security Update Management Service (SUMS) includes annual security refresh, security update management service, assessment, centralized data logging and monitoring, system



hardening, and other service tailored to the customer’s individual needs.

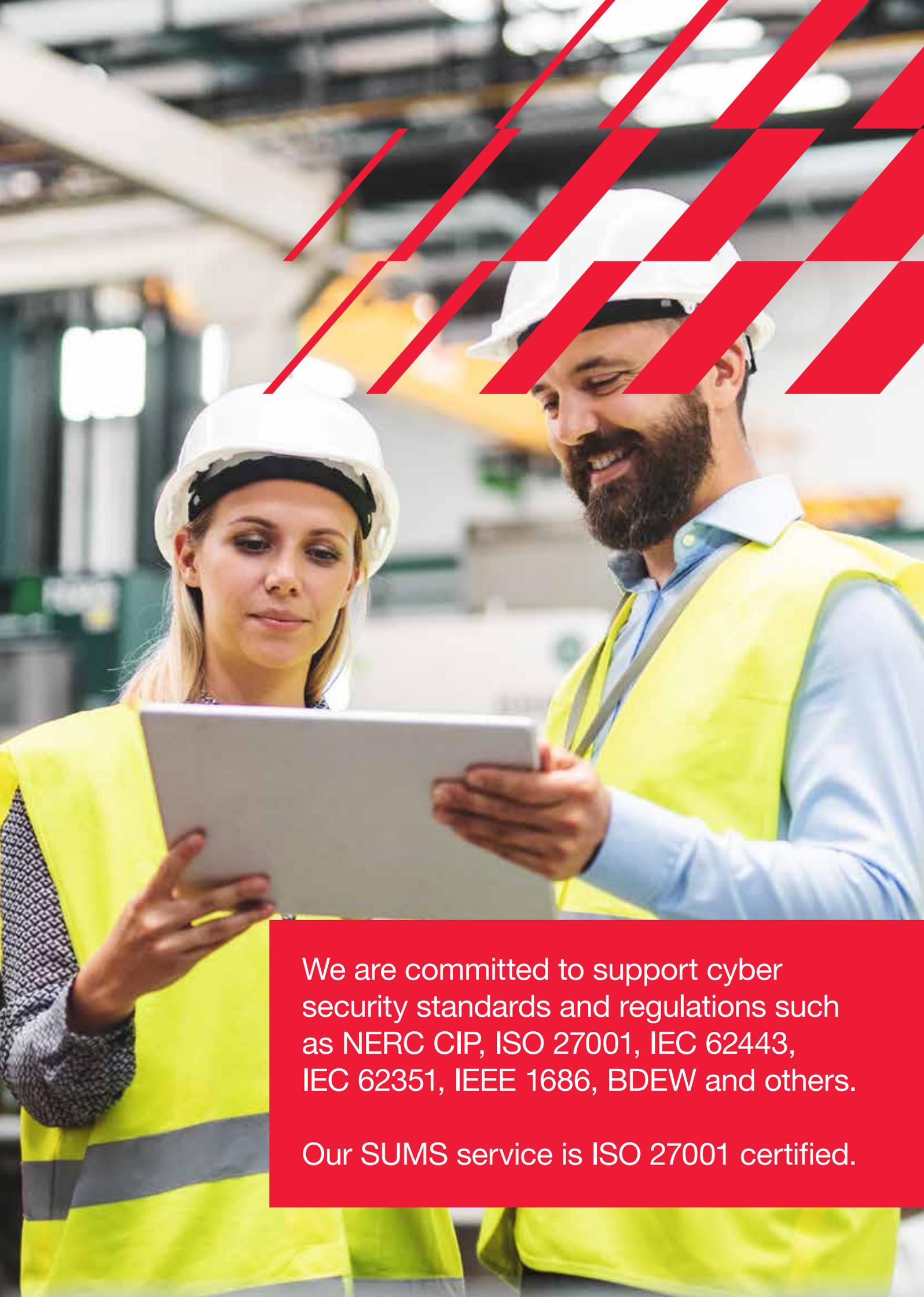
SUMS is meant to help you deal with the activities of identifying, tracking, testing and implementing a patch management program for their MACH control and protection system. It includes three different levels of SUMS to verify that all needed security updates are tested, documented, and installed safely.

It includes three different levels of security update services. Each level builds on the lower with further service enhancements designed to ease the compliance burdens faced by the customer.

The levels are called Bronze, Silver and Gold:

Keep your system secure using security update service 

Security Update Management Service Features	Bronze	Silver	Gold
Establish Hitachi Energy as the single security update source	■	■	■
Monthly listing of identified potential security updates	■	■	■
Validation of identified patches against a representative test system		■	■
Identified patches are tested for adverse reliability impacts		■	■
Identified patches are tested for adverse security control impacts		■	■
Monthly Security Patches Report of tested and recommended patches		■	■
Installation of approved patches			■
Annual security refresh			■



We are committed to support cyber security standards and regulations such as NERC CIP, ISO 27001, IEC 62443, IEC 62351, IEEE 1686, BDEW and others.

Our SUMS service is ISO 27001 certified.

# Performance improvement

## We optimize connectivity, reliability and efficiency of your assets

Performance improvement includes training and consultancy services that helps you identify ways to improve the reliability, availability and security of your HVDC system. Our team of experts can check the current status of your system.

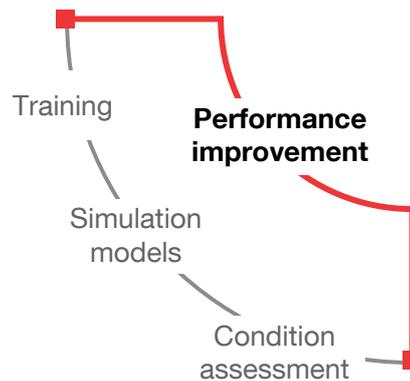
### Training

Hitachi Energy provides comprehensive training for engineers, operators, programmers and maintenance personnel, including up-to-date technical expertise and support for a full range of products, systems and applications.

Training is available at Hitachi Energy facilities worldwide, at customer sites and online. It includes theoretical and hands-on training sessions designed to provide operation and maintenance personnel with the skills they will need to maximize the reliability, productivity and safety of their systems.

### Simulation models

Hitachi Energy provides system simulation models for both



HVDC Classic and HVDC Light®. These can simulate the live system based on replicas for large scale systems, and simulate new functionality in realtime models.

### Condition assessment

Hitachi Energy can help assess/identify critical equipment and how to minimize risks. Via onsite visit, online digital solutions such as remote service and IdentiQ™ digital twin. We can do assessments based on remote access, age, visual inspection, reliability-models, real-time condition and failure risk.

Optimized asset management  
for life extension



# Life-cycle management

## We optimize and extend your equipment life

Modernizing an HVDC installation has been shown to extend system lifetime, improve availability and reliability, increase cost efficiency, improve performance, increase the capacity, and increase the power rating of the link.

### Upgrades

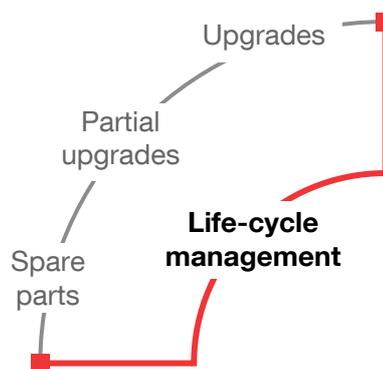
After some years of operation, an assessment and upgrade of the equipment or systems can extend a system's life-cycle and reduce downtime. Not only can new generation hardware and software provide new functionalities, but the upgrade can be completed within a relatively short downtime, and is a proven, efficient way to prolong high performance. Hitachi Energy is a world-leader in upgrading HVDC links, and upgrades older installations to modern systems.

Proactively upgrading a system before a severe outage occurs can save time and money. The need for upgrading depends mainly on age, the general condition of the equipment, and the potential unavailability of spare parts.

### Partial upgrades

An upgrade may consist of a new control system, new functionality and a new generation of hardware and software. Upgrades of one or more of the following, can be addressed as partial upgrades:

- MACH control system
- Cooling system
- Converter valve
- Main circuit



Partial upgrades of the MACH control system can be tailored to customer needs.

### Spare parts

The right part, at the right place, in the right time is our goal. Hitachi Energy strives to continuously increase the lifetime of your components. Using high-quality spare parts management, we are able to inform you what spare parts are needed to minimize unnecessary downtime.



Extended lifetime and new functionality

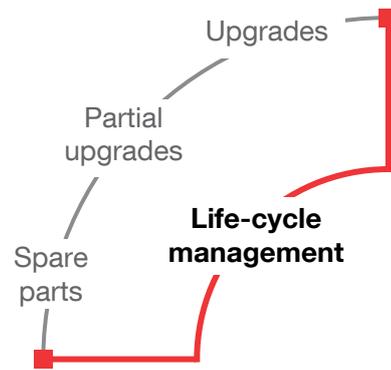


# Upgrades

## Extended operational lifetime

There are several reasons to upgrade a system. First, many installations are critical for the supported system, transmission, or network.

Parts from other equipment manufacturers may be unavailable, which causes long lead times and higher costs. Upgrades allow us to mitigate these risks. Upgrading will also help you keep maintenance costs on a controlled level, thanks to better design and state.



A partial upgrade, is a way to improve the MACH Station Control and Monitoring system to support new technologies and market requirements. Partial upgrades can also cover complete MACH control system, cooling system, converter valves, or the whole main circuit.

Proactive upgrade reduces risk of outage and long down period



# Long Term Service Agreements

## An uptime insurance tailored to your needs

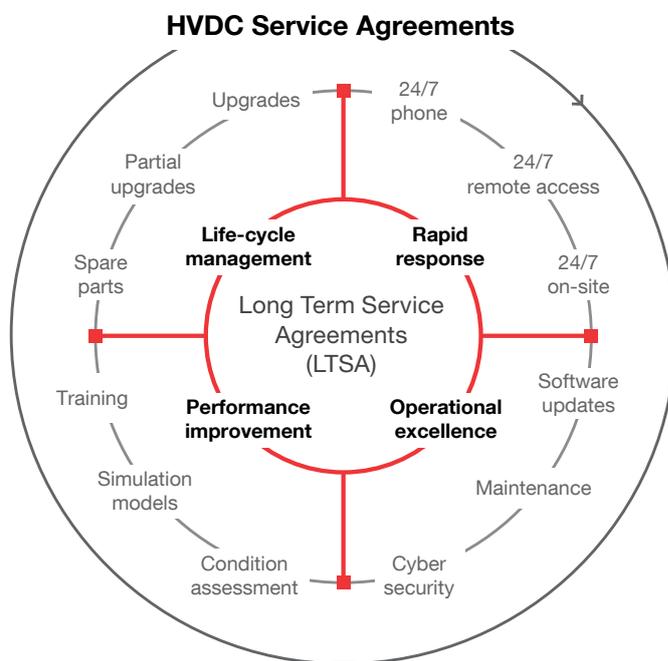
There is a growing demand for Long Term Service Agreements (LTSA), an uptime insurance for peace of mind, enabling the customer to focus on their core business. The best effect is achieved when implemented early in the system life-cycle.

Hitachi Energy LTSA Team Members can be integrated early during the Plan - Build stage to contribute to the project delivery and capture valuable knowledge of the Sites, System and plant equipment. Resulting in a customer specific Long Term Service Agreement, and paving the way for other necessary services that can be applied throughout all stages of the system life-cycle.

LTSA defines the service level, validity time, and whether it is a recurrent (licensed) or one-time delivery, and is available for all phases of an installation's life cycle. In many cases, corrective action is needed only occasionally and Hitachi Energy is committed to the concept of customized support, and provides several service options.

By signing a Long Term Service Agreement for all services needed for the converter station, maximized availability and reliability is obtained. Rapid response, life-cycle management, performance improvement, operational excellence, and other services are tailored to our customer needs.

HVDC Service products are a foundation for our Service agreements, and tailored to the customer needs. Hitachi Energy can in agreement with the customer be the sole provider, single-point-of-contact, to service your asset. This includes 24/7 support, and we follow international standards for maintenance.



## HVDC Long Term Service Agreements (LTSA)

<p><b>Rapid response</b></p> <p>We guarantee fast and flexible response to maximize your equipment uptime</p>	<p><b>Life-cycle management</b></p> <p>We employ powerful tools and knowledge to optimize and extend your equipment life</p>	<p><b>Performance improvement</b></p> <p>We optimize connectivity, reliability and efficiency of your assets to increase speed and yield</p>	<p><b>Operational excellence</b></p> <p>We together manage your assets, and risk to deliver strategic business results</p>
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# Long Term Service Agreements

## Service description

The HVDC Long Term Service Agreement is the key to ensuring the reliability and availability of an HVDC link during its entire lifetime.

By providing the technical support and the preventive maintenance package the contractor delivers the best possible services to achieve maximum of benefits from a proactive service culture and keeping the total costs of ownership as low as possible over the entire lifetime of the HVDC converter station.

Strict observation of health, safety and environmental issues, rules and regulations are built into all services provided.

**HVDC Long Term Service Agreement scope:**

- Technical support line
- 24/7 phone
- Corrective maintenance
- 24/7 remote

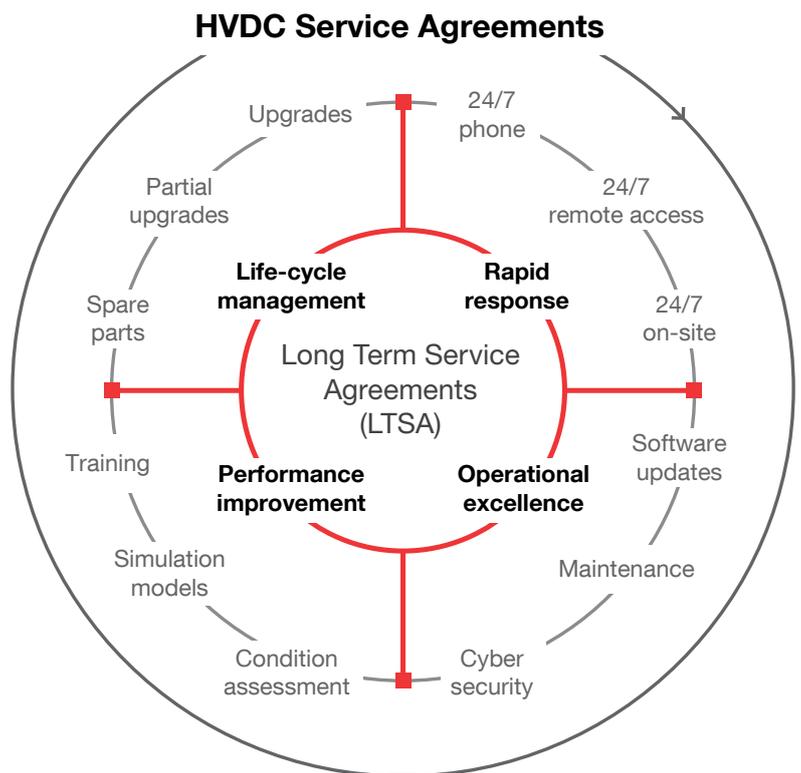
**Preventive maintenance**

- 10 years\* preventive maintenance plan
- Project management, review and reporting
- Asset management
- Spare parts management
- Other according to customer needs
- Improvements

Cyber security update service

Software preventive maintenance

\*or other term as agreed with the customer



# IdentiQ™ digital twin

## Increases the LTSA service level

IdentiQ is a new game-changing digital solution for Hitachi Energy products and solutions over the complete life cycle (Plan-Build-Operate-Maintain).

It combines digital twin technology with our unique domain expertise and installed base. The values of IdentiQ are accurate digital modelling (identic), intelligence (iQ) and truthful (strongly connected to the quality of the model, hence the capital Q). IdentiQ is a digital representation of your system.

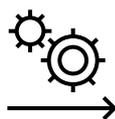
It's designed to monitor, automate and optimize the system it replicates, across its entire life-cycle, enable us to see better the right information. To step into clarity. IdentiQ enables you to operate and maintain your plant with state-of-the-art data visualization.

Some examples how IdentiQ can increase the service level:



### IdentiQ + 24/7 - Rapid Response

- Rapid Response Center (RRC)
- Reduced time to resolution
- Instant Remote support and troubleshooting
- Connect your station to our RRC
- Remote collaboration



### IdentiQ + Condition Monitoring

- Sensor datalogging and analytics
- Analysis of converter station equipment
- MIMS can continuously collect data
- Support decision making processes
- Improve the asset operation



### IdentiQ + Maintenance

- Support the field engineers
- Plan and execute maintenance
- Support during maintenance
- Continuously identify problems



### IdentiQ + Training

- Ensure the right knowledge
- User Training - detailed
- HSE support/preparatory training
- Digital Twin used for online training/learning



## Global HVDC Service Centers

**Hitachi Energy Australia  
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