



Power Generation

Control System Service

Life cycle management for Procontrol P13 and Advant Power

Control System Service

ABB is protecting your investment by step-wise evolution and updating of instrumentation, control and electrical systems.



Life cycle management for power plants

Today's demands on network availability, efficiency and capacity are increasing continuously. In many cases, the systems from earlier technology generations can't meet these new requirements. This is our challenge and we can solve it by utilizing our portfolio of upgrade and retrofit solution, which includes consulting and engineering activities at all stages of an assets' life cycle. It is important that maintenance activities or retrofits are carried out professionally according the actual needs for life cycle performance.

Continuous access to innovations

As partner to a large number of plant and main equipment suppliers, ABB has developed and carried out a comprehensive portfolio of relevant technologies and innovations. Extensive process know-how results from plant engineering, construction and commissioning over more than four decades.

Improvement of operation

Owner/operators are forced to focus on their core activities and, due to a leaner workforce, rely more on external support and services, which may include consulting and engineering activities. Hence, customer support is evolving beyond a traditional supply and service business. In all stages of a plant's life cycle the consulting, engineering, operation and maintenance services needed by customers to increase their operational and business performance are already available from ABB.

Lifetime-extension

Beside new installation activities in many countries, existing power plants will continue for many years. The present-day political environment in many countries, regarding large fossil fired power stations, requires for example that their life will be extended, including improvement of efficiency and environ-

mental conditions. Although the design-life of instrumentation, control and electrical systems can usually accommodate many of these requirements, the life cycle of operating and monitoring systems, in particular, is considerably shorter and they may be replaced several times over the plant's life cycle. In today's competitive market, there is a need for modular, scalable solutions that maximize the extent to which existing engineering can be reused and installed technologies can be gradually upgraded by a step-wise approach with a minimal impact on plant operation continuity.

Evolution and integration of existing installations

Being active assets, older installations have to be integrated into the enterprise-wide operation, information and management systems for resource-planning, trading, maintenance management and other systems to enable real-time information and decision support.

ABB's instrumentation, control and electrical systems are capable of controlling, protecting and monitoring all of the processes required in the operation of the various plant types involved. They have been installed in more than 4.000 power plants worldwide.



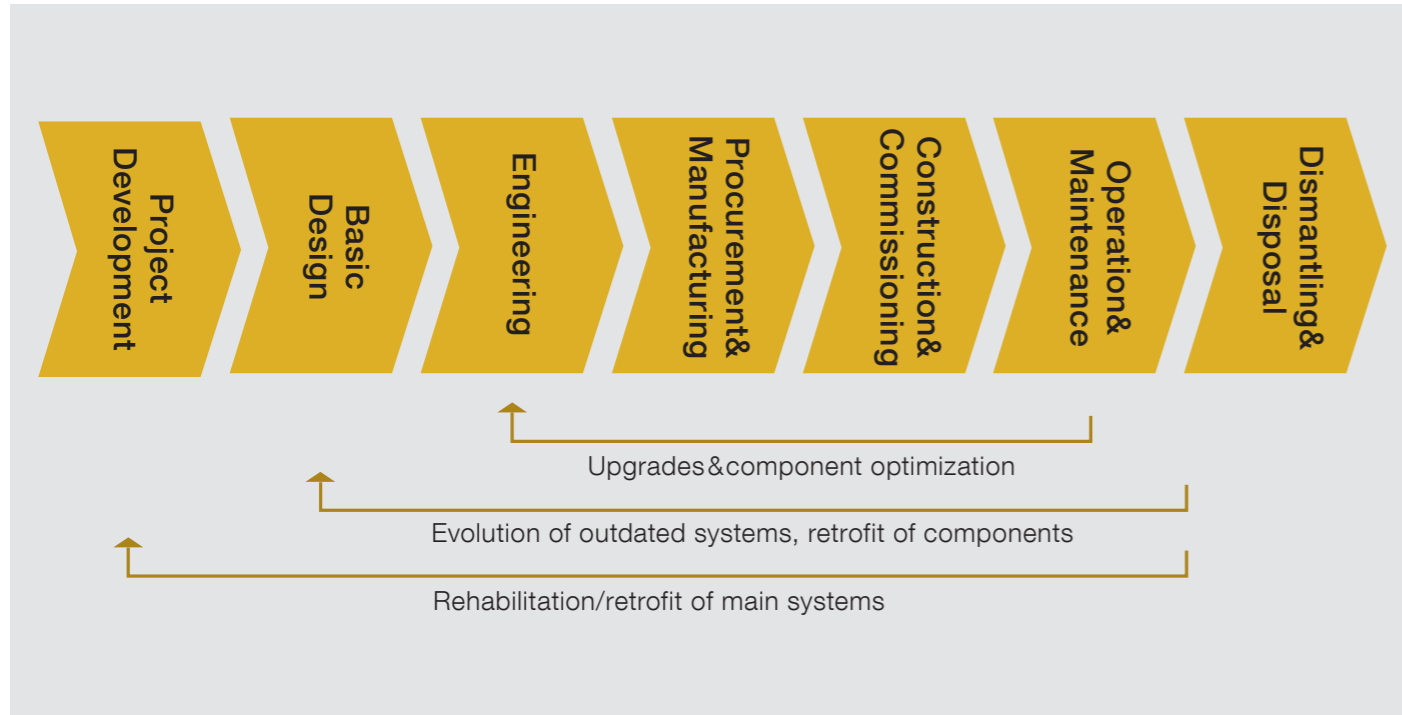
A complete portfolio of services

ABB offers professional life cycle services for your products and systems, including component reliability analysis. Through our assessments you will gain the information required for cost effective long-term decisions concerning overall system operation and maintenance.



Solutions for life-extension

Various ways of modernization



Increasing demands

Today's demands on plant availability, efficiency and maneuverability are increasing continuously. In many cases, older systems from former technology generations cannot meet these requirements.

State-of-the-art control systems provide more transparency and improved information for operating staff and faster elimination of disturbances.

ABB offers a wide range of automation technology – from local instrumentation through control systems and intelligent switchgear components to modern power plant management systems.

Numerous benefits

Modernization offers numerous benefits such as:

- Enhanced functionalities by upgrading to the latest system version using
- Protecting customers' financial and intellectual investment by evolution of outdated systems while re-using existing engineering data and still usable hardware
- Flexible concepts for step-wise or full-scale retrofit by replacing outdated equipment (if necessary)

Flexible solutions

The wide variety of ABB solutions available to our customers provides high flexibility in the implementation of improvements. Depending on the customer's needs, these improvements can be implemented in the form of a step-wise upgrade or a full-scale retrofit job.

As a leading supplier of instrumentation, control and electrical equipment, ABB possesses both the system technology and the process expertise required, as well as the qualified and skilled staff needed for successful implementation solutions.

Product life cycle management model

The life cycle management model divides a product's life cycle into four phases: active, classic, limited and obsolete. Each phase has different implications for the end user in terms of services and support provided.

In the "active" phase the end user benefits from warranty options and a full range of life cycle services, spare parts and maintenance materials.

The transition to the "classic" phase is dependent on economical and technological reasons. During the "classic" phase the product is available for extensions and is still fully supported. In the "classic" phase end users may start to evolve with ABB support to new technology by using upgrade and retrofit solutions providing improved performance and extension of the life cycle. This phase ends when the production of a particular product ends and the "limited" phase starts.

In the "limited" phase the manufacturing of new hardware is no longer supported but hardware availability continues a certain time. Obsolete components will not be replaced with the same technology but with evolution solutions and

throughout the course of time the use of reconditioned parts increases. Service support continues on special request and according availability. Half year before the end of the "limited" phase, an obsolete notice is distributed and the product goes obsolete after this period of time. ABB will not "Remove from Active Sales" any products or family of products until an equivalent replacement is available. Service will continue to support as long as possible in order to protect the investment and evolve to new technologies.

Benefits of product life cycle management

Product life cycle management maximizes the value of equipment and maintenance investments by:

- ensuring spare part and competence availability throughout the life cycle
- enabling efficient product support & maintenance for improved reliability
- adding functionality to the initial product by the following upgrade path
- providing a smooth transition to new technology at the end of a product's life cycle
- helping the end user to decide when an upgrade, retrofit or replacement is required



Measures: Asset Management Combined maintenance and upgrade and evolution planning

Economic climate

As a result of the current economic climate in the world, the number of new power plants being built is slowing down (this is valid for all fossil fired power plants). On the other hand the trend towards extending existing power plants' life-time is strongly increasing.

Change of existing and definition of new operation requirements

Key requirements are higher maneuverability of plants regarding MW output and load changes while maintaining high efficiency levels throughout the complete load range, i.e. also being efficient in lower load conditions. Primary measures for achieving these requirements concern adaptations of the mechanical and process part (i.e. boiler, turbine and valves). Secondary measures address implementation of efficient control of the combustion process, adaptations to instrumentation and control, process information and optimization programs.

Environmental regulations

New stringent environmental regulations target emission reduction which require achieving of specific parameters, i.e. reduction of CO² and NOx.

Availability and reliability

The requested availability and reliability of power generation remain on the high levels as during the previous years.

Life cycle management

Varying lifecycle periods of the many different components and systems must be managed while meeting performance targets and complying with law and regulations at the same time.

The sequence of the needed improvements is dependent on the life cycle of the questioned component on the one hand side and on the other side on changes requested from the operation. Typical intervals for improvements, changes, upgrades, evolutions (≠ exchange) are:

- Operator station 4 – 6 years
- Control system 10 – 15 years
- Instrumentation 10 – 15 years
- Electrical components 15 – 20 years

Thereby it must be considered that changes and improvements on the process/mechanical side may shorten these intervals whereas stable requirements will prolonge the intervals respectively.

Commercial pressure

Energy producers face commercial pressure for providing energy at reasonable price levels while meeting operational targets at the same time. Operational expenditures (OPEX) are under permanent observation and programs for cost reduction are constantly on the agenda. This results in the requirement to reduce total spending over asset lifetime.

Summary of market challenges

Summarizing the above mentioned stress fields, the current key market drivers are "lifetime extension" and "cost reduction", i.e. the measure to be taken is active Asset Management. Overcoming the market challenges make parallel investments inevitable in order to optimize installed assets so that they can meet their requirements longer and more efficient. These investments will only be beneficial when flexible approaches for all equipment installed in power plants are available.

Control System Service Products and solutions for migration and upgrades

1 Upgrade solution products

1.1 System 800xA/Symphony Plus integrated solution

- Integrated platform for the entire process
- Environment for an extended automation scope
- Intuitive, consistent user interface: Single operations, engineering and information management just one mouse click away
- Seamless evolution strategy for existing installation
- Replacement Prout 80.13 by Symphony Plus/800xA
- Replacement OS160 by Symphony Plus/800xA
- E.g. HSI Evolution from Advant OS500/Procontrol PMS to System 800xA (virtualized or non-virtualized)



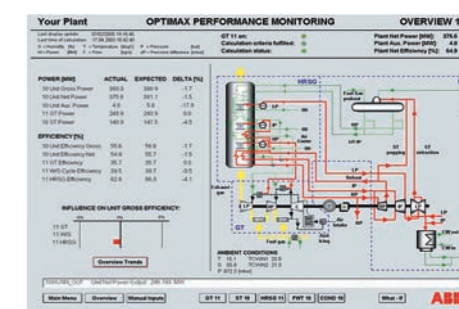
1.2 Plant management system PGIM

- Process information management solutions, improve economic performance and availability
- Plant information management combining data from different sources and types: Process values, events, costs, counter values, prices, etc.
- Combining plant management and information management with alarm/event management in one system
- (PIMS) Evolution from Procontrol PDS/ADVANT IMS/Optimax-prima



1.3 Plant management and optimization solutions (Optimax)

- Simulate different operating modes
- Non optimized operation is mirrored by cost deviations
- Early detection of instrumentation errors
- Long term performance history
- Service for retuning



1.4 Turbine control upgrades

- Hydro-, Gas-, and Steam turbine governor: Speed, frequency, temperature, load control, etc.
- Open loop control: Fully automatic start-up and shutdown
- Protection: Two or three channel protection system
- Turbine superrevision: Vibration
- Operating data counter
- Fast link to control network



Control System Service

Products and solutions for migration and upgrades

1.5 Advant controller upgrades

Advant AC160 PM645 to PM665

- PM645 controllers have entered from “limited” into “obsolete” life cycle phase beginning of 2009. Last buy for PM645 was announced end of 2007. By upgrading to PM665 your controllers will be in “active” life cycle phase again. Also changing from PM645 controllers to more powerful PM665 controllers will help to reduce CPU load for OLC and CLC to a level below the 65% recommendation.



1.6 Advant controller migration

Advant AC450 to AC800M controller

- S100 I/O interface, making it possible to upgrade from existing Advant Controller 410 or 450 – or even MasterPiece 200 – systems to AC 800M and retain existing I/O sections.

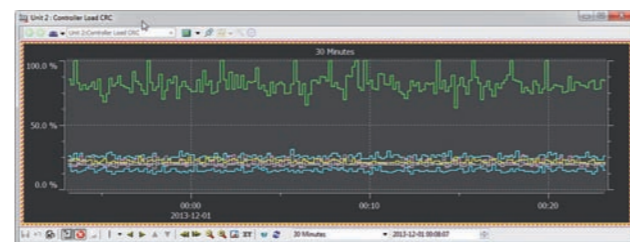


1.7 Advant AC450 performance optimization

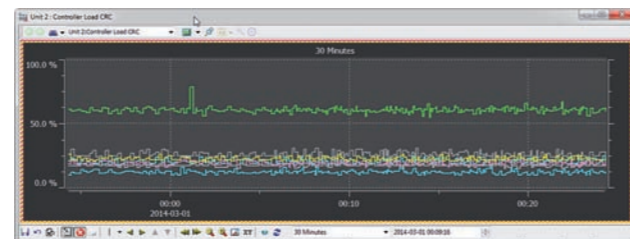
AC100 connect by OPC Interface in GT control

- Reduces CPU load of the AC450 controllers
- Faster root cause analysis based on alarm and event lists
- More accurate timestamps for BDQ (Bad Data Quality) signals
- Less engineering effort for modification in events

AC450 controller load before AC100 connect OPC Interface installation (load > 80 %)



AC450 controller load after AC100 connect OPC Interface installation (load < 60 %)



1.8 Firmware and module and I/O module upgrade

Controller (AC450, AC160, CI630,)

- Update by new Firmware (including rework)

I/O Module AX645/AX670 upgrade replacement

- Exchange the obsolete card by new input output cards



1.9 Procontrol controller upgrade

Procontrol P13 PR02/03 to PR05

The 70PR02 and 70PR03 automation applications are upwardly compatible with the 70PR05b. The increased 70PR05 capacity allows the extension of additional automation tasks. The new processor and engineering tools significantly simplify debugging tasks and allow remote simulation.

- PR02/PR03 replacement
- AS replacement
- UA379 speed control card replacement



1.10 Procontrol fitting

PROCONTROL P13/42 Hardware fitting

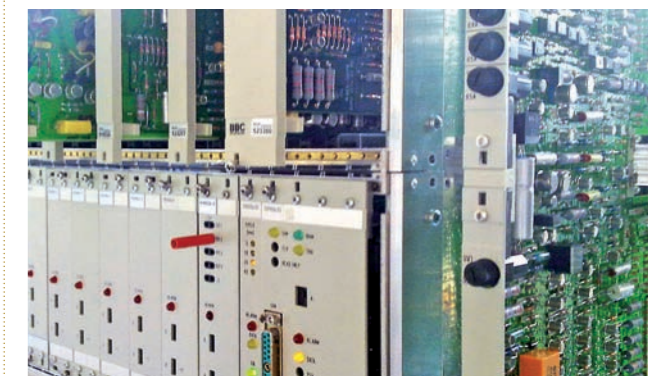
Extended lifetime with preventive maintenance and module fitting

Electrolytic capacitors

For ELCOs with wet aluminium the electrolyte lifetime is expected to be 10 to 20 years. 10 years rather apply to older types whereas 20 years can be reached with long-life types in combination with optimal operation conditions.

Aging and hereto related evaporation through the capacitor's end seal leads to a steady capacity-reduction which also happens with ELCOs held on stock. Therefore, ELCOs are the most ambient temperature sensitive components. In the worst case, for each temperature increase of 10°C, the lifetime can be shortened by half.

To ensure reliability and availability, we recommend a fitting every 10 years after initial installation of the equipment.



1.11 Engineering tool upgrade

Procontrol P13 Progress 2, Progress 3, EDS-P3

- Progress 3 the upgrade tool for Progress 2 and older tools
- Improved diagnostic functionality. PRAUT 80.13 diagnostic by Windows based application
- EDS-P3 new Linux version as replacement of EDS-P3 Unix. PC/Linux based version fully compatible with Unix version



Control System Service

Products and solutions for migration and upgrades

1.12 Procontrol P13 Ethernet

Interface card

- Used as engineering-, diagnostic stations, and 800xA Interface
- Real-time access
- Serial TCP/IP communication

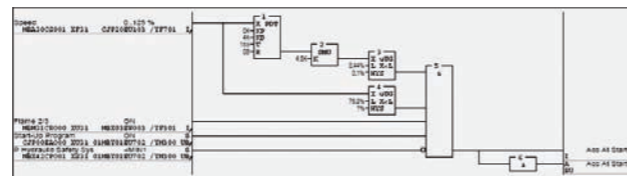


1.13 Procontrol P13 HEX to FUP conversion

The PROGRESS 3 Function Chart Editor provides functionality for graphical programming of PROCONTROL P13/42 control systems by function diagrams showing the language elements of PROCONTROL P10. The program code for the processing modules is generated from the function diagrams. Existing data created with Progress 2 can be imported into PROGRESS 3. Also the *.TCD files created with PROGRESS 3 are fully compatible with Progress 2. Because of this it is possible to import Progress 2 data, create *.TCD files with PROGRESS 3 and compare them with the original Progress 2 source data.

```

0020 C0A0 : FName: ADS
0021 4040 : 01CEA20EG010 XQ01
0022 4041 : 01CEA20EG010 XQ02
0023 5042 : 01CEA20EG010 XQ03
0024 5043 : 01CEA20EG010 XQ04
0025 A104 :
0026 C0C0 : FName: BEG
0027 2104 :
0028 D2AE :
0029 D000 :
002A A105 :
002B A004 :
002C A104 :
002D C0B2 : FName: >=1
002E 4210 : 01CEA20EG010 XG03
002F 4310 : 01CEA20EG010 XG04
0030 B0A0 : 01CEA20EG010 XB01
0031 C0CF : FName: TBT
0032 2105 :
0033 D000 :
0034 B050 : 01CEA20EG010 XJ01
    
```



1.14 Upgrade for generator island

Generator Control (package including protection, voltage regulator and synchronizing)

- Generator Control is an affordable integrated solution developed to cover all the requirements from small to large generators for hydro, industrial and utility power plants.
- Generator Control features a standardized modular combination of the generator systems Automatic Voltage Regulation (AVR), Protection and Synchronization in one cabinet.



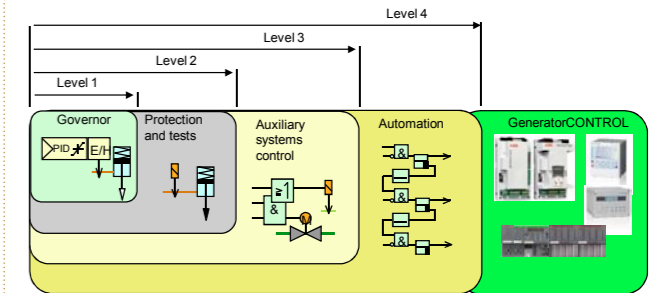
1.15 The modular solution for generators

Modular solution with Generator Control is a total solution, engineered and commissioned from a single source. It has several significant advantages:

- Reduces project execution risk by limiting the number of interfaces – one supplier takes responsibility for the complete control system
- High degree of standardization and modularity makes it possible to fast-track a project
- High degree of standardization
- Maximizes synergies between turbine and generator control

Modular solution for different applications available: GasCONTROL, HydroCONTROL, SteamCONTROL.

Turbine control levels and GeneratorCONTROL



1.16 Mechanical upgrade for Turbine Control

Mechanical, protection and hydraulic system

- Electro-Hydraulic converters EHC
- Hydraulic actuators
- Trip solenoid valves
- 2003 hydraulic trip block
- Oil stations and supply
- Optimization of hydraulic control and protection systems



1.17 Service contracts (support agreements)

Our goal is to provide world class services to support you throughout the complete lifecycle of your system. A Service Agreement extensively simplifies the required processes and allows for fast and efficient support, as you receive direct and guaranteed access to our service specialists. In addition we are able to provide you with reduced support rates for technical remote support compared to the official support rates.



Automation Sentinel Program structure

Designed to help customers actively manage the life cycle costs of assets, the ABB Automation Sentinel program enables ABB customers to keep their installed software products up to date and maintain a flexible and affordable path to evolve to the latest system software technology. It offers three subscription types.

Maintain

This level provides services and deliverables to maintain the system at its current version. It is ideal for customers focused on maximizing the availability of their system while minimizing the introduction of risk and/or changes. At this level the full support of ABB is available to maintain the system and to maximize the return on the original investment.

Maintain Plus

This level includes all the Maintain-level services, plus access to new software license versions as well as enhancements to installed products. With this option, customers may evolve to new software versions while maintaining its core control system platform or components. This level provides increased flexibility to those customers wishing to maintain their system but able to tolerate a moderate amount of risk in exchange for improved functionality.

Maintain and Evolve

This level includes all the services available in Maintain and Maintain Plus levels, plus the capability to evolve to state-of-the-art ABB control system products including System 800xA and Symphony Plus. This level provides the greatest flexibility to employ “leading edge” productivity and enhancement improvements.

For deliverables per subscription level please refer to “Program Levels and Deliverables” on the next page.

The following features are available to all Automation Sentinel subscriptions:

- Access to Websites to download software/firmware/product documentation as well as instruction manuals
- Notifications on technical updates and product release information filtered according to the installed system profile

The Automation Sentinel Program covers the following ABB control systems and products*:

- Advant/Master systems
- Advant OCS with Master Software
- Advant OCS with MOD 300 Software
- Compact 800
- Freelance system
- MOD 300 system
- Safeguard 400 Series
- Satt/SattLine
- Symphony DCI System Six
- Symphony Harmony/INFI 90/Network 90 systems
- Symphony Melody/Contronic systems
- Symphony Plus
- System 800xA
- Procontrol P13*
- Procontrol P14*

With the Automation Sentinel program, ABB customers can be assured that their automation assets have the extended capability to scale the dynamic changes in business objectives, with minimum impact on the total cost of ownership.

This is the power of evolution. For deliverables per subscription level please refer to “Program Levels and Deliverables” on the next page.

*this system can only be included in a Mantain and Evolve level subscription

Program levels and deliverables

Software maintenance and upgrades			
	Maintain	Maintain Plus	Maintain and Evolve
Software Maintenance	yes	yes	yes
Software Upgrades	–	yes	yes
Access to Expert Product Support	yes	yes	yes
Technical Telephone Support to troubleshoot the system	yes	yes	yes
Extended Software Support	yes	yes	yes
Selected System 800xA libraries	yes	yes	yes
3rd Party Hardware & Software Validation and Security Services	yes	yes	yes
ABB System Evolution Software Licenses	–	–	x
ABB System Evolution Planning & Engineering Services	n/a	n/a	yes
3rd Party System Evolution Software Licenses	–	–	yes
3rd Party System Evolution Planning & Engineering Services	n/a	n/a	x

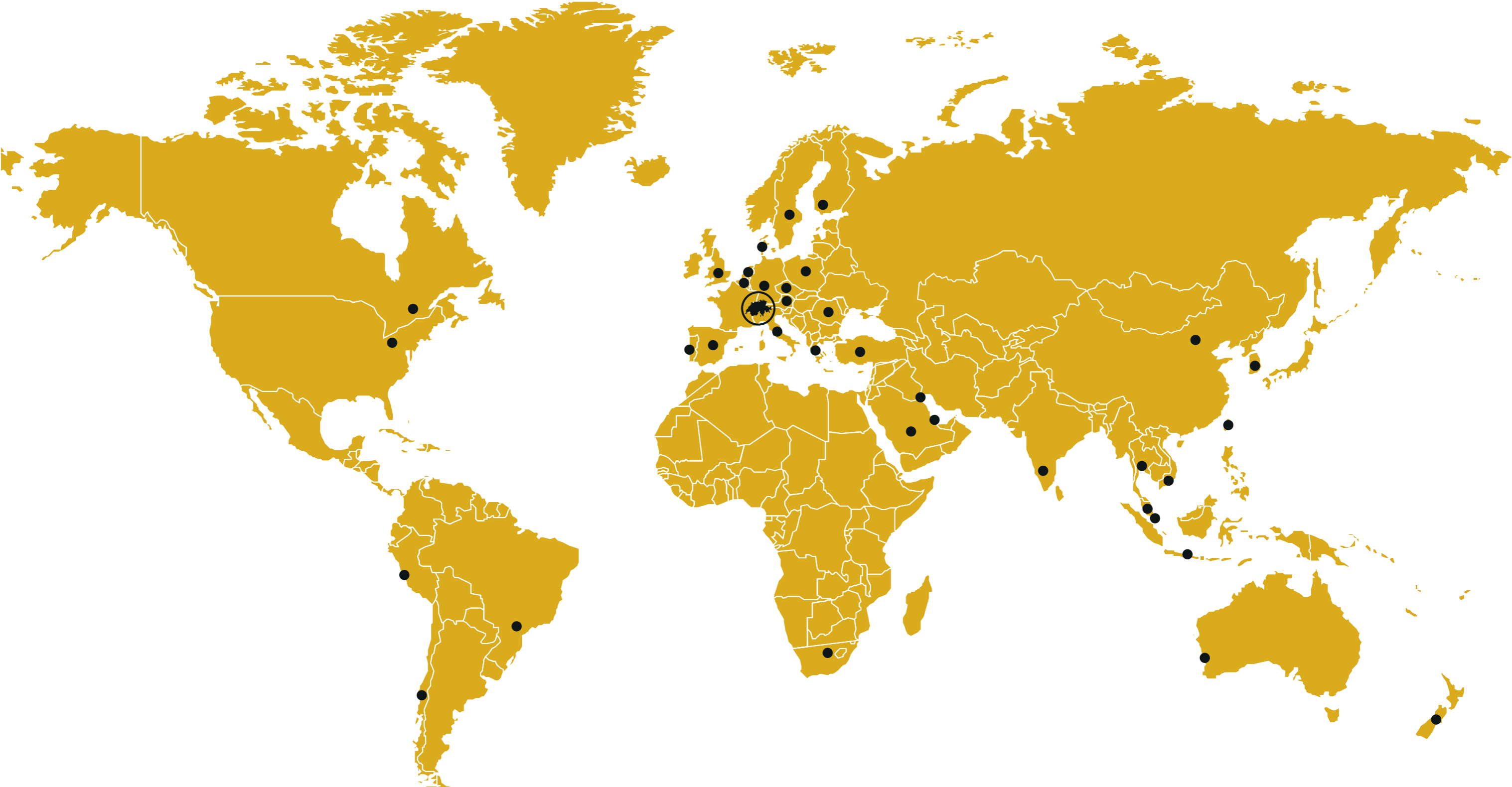
Legend

yes	included in active automation Sentinel subscription
–	not available
x	please contact your local sales representative for details
n/a	not applicable

Power Generation Service Presence worldwide

Power Generation Service offers comprehensive support and professional consultancy in all the listed countries below. Our competent engineers are networked worldwide and they have access to all ABB technologies.

- Power Generation Service presence
- GEC – CH (Global Execution Center) for Procontrol P13 and Advant



Control System Service

Important links for your quick reference

The screenshot shows the ABB Power Generation website. The main navigation bar includes 'HOME', 'PRODUCTS', and 'POWER GENERATION'. The ABB logo is in the top right corner. The page content is organized into several sections:

- Power Generation:** ABB is a leading provider of integrated power and automation solutions for conventional and renewable power generation plants. The company's extensive offering includes turnkey electrical solutions, automation, instrumentation and control systems, delivered on time, within budget, to the correct specifications pursuing execution excellence, and in compliance with health and safety regulations. Our offering is supported by a comprehensive service portfolio to optimize performance, reliability, and efficiency while minimizing environmental impact.
- News and features:** A carousel of four news items:
 - Newsletter: In Control - 01/2014
 - ABB to retrofit hydro turbine in Canada
 - ABB energy appraisal leads to improved power plant performance Indonesia
 - Greening up the grid
- Our offering:** A row of six service categories: Turnkey power plant solutions, Power plant automation, Power plant optimization, Turbine control, Instrumentation, and Service.
- Applications:** A row of six application types: Coal fired power plants, Gas fired power plants, Hydro power plants, Solar power plants, Wind power plants, and Distributed power generation. Below this is a 'Microgrids solutions' section.
- Links and downloads:** A row of six links: Videos, Blog (ABB Conversations), Customer newsletter (In Control - Power generation magazine), Special report (PEI special report on plant optimization), Library (Brochures), and Library (Project references).
- References:** A grid of four project highlights:
 - Fast-track solution for open cycle power plants in Kuwait: Major electrification equipment and distributed control system for to overcome the supply shortage in the summer months. → Read more
 - Innovative control solution cuts costs for Indian hydropower plant: Significant cost savings thanks to state-of-the-art human machine interface. → Read more
 - Protecting Venice and its lagoon – a UNESCO World Heritage Centre: Symphony Plus control system to help protect Venice from high water flooding. → Read more
 - Atlantic island deploys technology to green its microgrid: Software solution will allow the island to meet its goal of generating 75 percent of its electricity from renewable sources. → Read more
- Related offering:** A row of four links: Training and simulation, Water solutions, Solar solutions, and Substation systems.

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Automation Portal:
<http://new.abb.com/power-generation/power-plant-automation>

Symphony Plus:
<http://new.abb.com/power-generation/symphony-plus>

P13:
<http://new.abb.com/power-generation/power-plant-automation/p13>

Advant:
<http://new.abb.com/power-generation/power-plant-automation/advant>

Contact us

ABB Switzerland Ltd.

Power Systems

Bruggerstrasse 72

CH-5400 Baden, Switzerland

Telefon: +41 (0)58 585 88 80

Telefax: +41 (0)58 585 04 12

E-mail: plantcontrol.support@ch.abb.com

www.abb.ch/powergeneration

