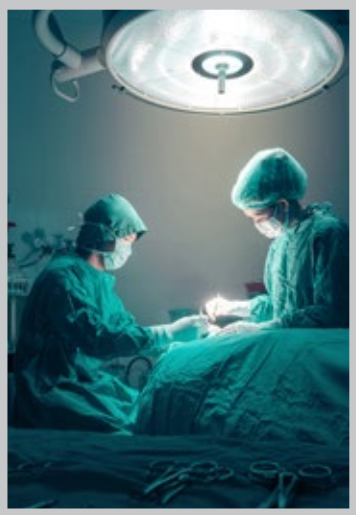
AB FOR THE HEALTHCARE & PHARMACEUTICAL SECTOR

AB
COGENERATION WORLD



Cogeneration World

AB
COGENERATION WORLD

Besides Healthcare & Pharmaceutical, AB expertise in the design and manufacture of cogeneration solutions extends across various other sectors and applications.

NATURAL GAS

SECTORS

HEALTHCARE & PHARMA

HEALTHCARE FACILITIES
- Hospitals
- Clinics
- Labs
- Psychiatric facilities
- Nursing homes

DRUG MANUFACTURERS
- Pharmaceutical companies
- Biotechnology companies
- Makers of generic drugs

MEDICAL EQUIPMENT MANUF.
- Standard familiar products (scalpels, forceps, bandages, gloves, etc.)
- Advanced medical equipment (MRI, surgical robots, etc.)

MANUFACTURING
- Beverages
- Ceramics and Bricks
- Dairy
- Food
- Metallurgy
- Paper Mills
- Plastics
- Textiles

COMMERCIAL
- Data centres
- District cooling
- District heating
- Hotels
- Shopping malls

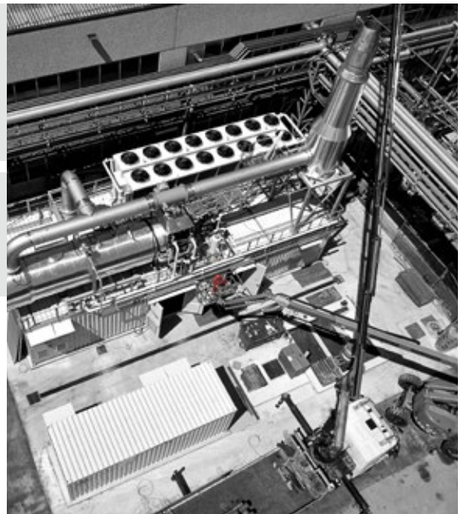
GREENHOUSES
- Horticulture - Fruits & Vegetables
- Horticulture - Cut flowers / Ornamental

BIOGAS

SECTORS
- Agriculture
- Landfills/MSW
- Agri-food waste
- WWT (waste water treatment)

SPECIAL GAS

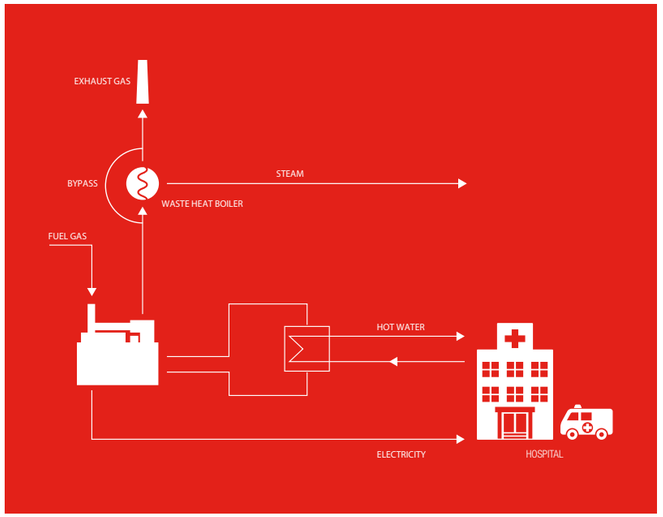
SECTORS
- Petroleum extraction and production (APG)
- Coal mines



Cogeneration: a perfect fit for hospitals

AB combined heat & power (CHP) systems enable hospitals to reduce energy costs, improve environmental performance and increase energy reliability. Resources saved are often redirected to improve patient care.

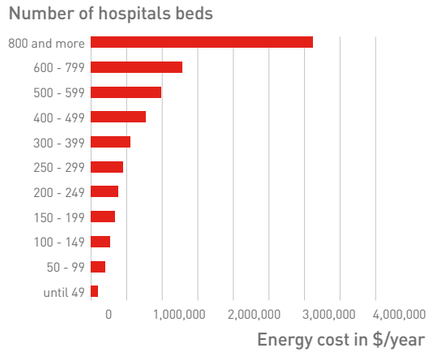
Many hospital buildings have relatively high energy loads for heating, hot water and sterilisation; operate around-the-clock, seven days a week; need guaranteed continuous power for mission-critical functions from operating theatres downwards. The criteria that optimize the economic case for CHP are high, reasonably steady energy loads and continuous facility operation for as many hours of the week or year as possible. Add the capability of AB solutions to also act as a standby power provider and the softer, green and PR advantages of maximizing fuel resource use and minimizing carbon emissions and the cogeneration offer is ideal for the healthcare sector.



AB COGENERATION SYSTEMS ARE IDEAL FOR THESE SPECIFIC HOSPITAL REQUIREMENTS:

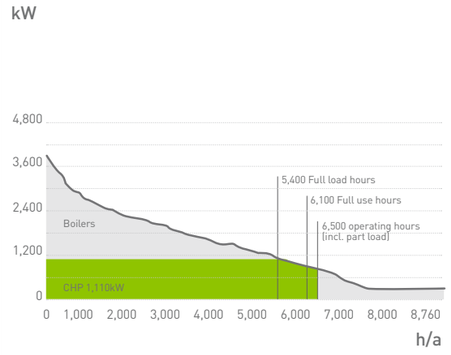
- High space-heating demand
- Year-round heating demand for hot water
- High power demand in consistent daily rhythms and constant base load
- Simultaneous heat and power demands
- Increasing cooling demands for space air conditioning
- Backup generator protection
- Small plant footprints that leave more space for treating patients

YEARLY ENERGY COSTS IN HOSPITALS WITH DIFFERENT ACCOMMODATION CAPACITY



Source: ASUE: Blockheizkraftwerke in Krankenhäusern (Cogeneration plants in hospitals)

STRUCTURED ANNUAL LOAD DURATION CURVE OF HEAT REQUIREMENTS. HEAT REQUIREMENT COVERAGE WITH CHP AND BOILERS



The AB CHP solutions benefits for your hospital

FINANCIAL ADVANTAGES

AB CHP solutions can offer financial advantages over power purchased from a local utility or produced by other energy systems. Those advantages follow.

- Lower, more predictable energy bills: total system energy efficiency is improved when power is produced onsite through a CHP system. By enabling hospitals to supply their own power, AB solutions also provide a hedge against the rising cost of electricity. Statistics have shown that in many hospitals energy costs can be reduced by 30 to 40 percent.
- Increased revenue potential: in some states, cogeneration can create an additional revenue stream by allowing hospitals to sell surplus electricity back to their utilities. A hospital's ability to do this depends on the net metering and rate policies of its utility. Typically, "selling back" during off-peak hours is not profitable for a hospital, but, given the right circumstances, it can be a revenue generator during peak hours.

MORE RELIABLE EMERGENCY POWER

AB CHP plants can be designed to maintain critical life-support systems, operate independently of the grid during emergencies and be capable of black start (the ability to come online without relying on external energy sources). The most effective distributed energy solution able to guarantee continuous duty operation during emergency situations.

ENVIRONMENTAL BENEFITS

AB solutions have a higher whole-system efficiency than systems that split heating and power generation because cogeneration captures waste heat from electricity generation and uses it to generate steam for heating and cooling.

KEY FACTORS TO CONSIDER

Incentives and rate structures: Many utilities are implementing "friendly tariffs" that facilitate CHP.

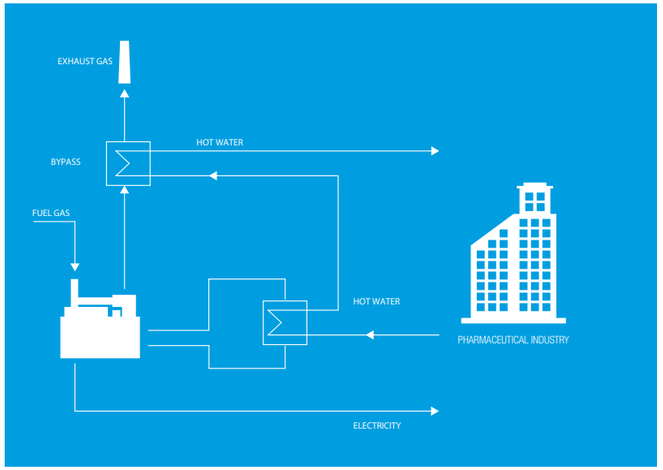
Black start capability: Hospital CHP systems should be configured for black start, or the ability to come online without relying on the electric grid.

Cogeneration: a strategic choice for the pharmaceutical industry

Cogeneration is strategic for the pharmaceutical industry, which is highly energy-intensive in terms of both heat and power and requires a continuous flow of energy for the conditioning of clean rooms, laboratories and storage warehouses.

For pharmaceutical manufacturing, there are important needs that should be considered in an energy strategy: providing thermal energy to equipment and processes, such as reactors and sterilizers; managing electrical production and distribution to most efficient way; delivering compressed air for production; cooling using absorption chillers.

Today, in most instances, power and heat are generated separately, with a combined efficiency of about 45 percent whereas cogeneration systems can reach efficiency levels of 80 percent using the waste heat for process applications without the need for boilers within each building.



AB COGENERATION SYSTEMS ARE IDEAL FOR THESE SPECIFIC PHARMACEUTICAL INDUSTRY REQUIREMENTS:

- Year-round thermal energy demand for equipment and process
- High power demand in consistent daily rhythms and constant base load
- Simultaneous heat and power demands
- Increasing cooling demands for space air conditioning
- Backup generator protection

Benefits of AB CHP solutions for Pharmaceutical Manufacturing Facilities

RELIABILITY

CHP improves reliability serving as a primary source of energy. When CHP is part of a facility's energy infrastructure, the risks associated with brownouts, blackouts or damage to the poles and wires of the local utility's electric grid are mitigated.

COST SAVINGS

Economic savings are another important benefit of CHP. Because CHP can supplement or substitute for traditional utility electric supply, a great deal of energy cost can be avoided. Properly designed CHP systems are capable of delivering a combination of power, heating and/or cooling at a favorable price. For example, CHP can eliminate the need, and the cost associated with, redundant utility electric feeds to a facility.

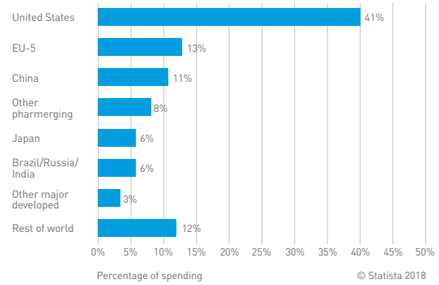
ENVIRONMENTAL IMPACT

CHP is a "green" energy initiative (by virtue of its ability to significantly lower the volume of fossil fuels consumed) that pharmaceutical companies can implement as a complement to their core business. In the same way that it reduces fuel costs, CHP reduces pollution by displacing less efficient grid electrical generation. The efficiency gains of CHP coupled with a high availability (typically available more than 90 percent of the time) permit a significant reduction in the carbon footprint of a facility.

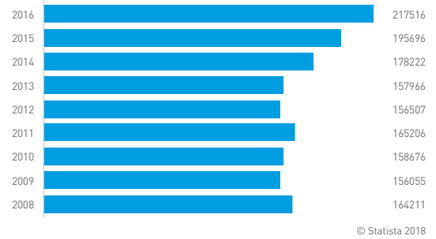
FUEL DIVERSITY

CHP plants may be designed for input of multiple sources of fuel. Not only do they require lower volumes of fossil fuels to produce useful energy, but they can be designed to run on renewable fuels such as biomass or biogas. In some cases, a pharmaceutical facility may produce byproducts that could serve as the fuel. This multi-fuel ability increases energy security and can also mitigate volatility in fuel commodity prices.

FORECAST OF GLOBAL MEDICINE SPENDING DISTRIBUTION IN 2020, BY REGION*



U.S. PHARMACEUTICAL PREPARATION MANUFACTURING GROSS OUTPUT FROM 1998 TO 2016 (IN MILLION U.S. DOLLARS)*



KEY FACTORS TO CONSIDER

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ARIA HEALTH HOSPITAL (USA)

INDUSTRY: Hospital
APPLICATION: Natural gas
CHP PLANTS: ECOMAX® 12 NGS
ELECTRICAL OUTPUT: 1,137 kW

COMPANY:
Aria Health Hospital is the largest healthcare provider in Northeast Philadelphia and Lower Bucks County. With three leading-edge community hospitals and a strong network of outpatient centers and primary care physicians, Aria upholds a longstanding tradition of bringing advanced medicine and personal care to the many communities it serves.

REQUIREMENT:
Aria Health looked at the drop in natural gas prices and the administration saw they could take advantage of this. It developed a plan to use natural gas to provide electricity as well as hot water for the hospital. The hospital has a large heat load and demand for electricity, it runs just over 3MW on an average hot day in the summer.

SOLUTION:
Ecomax® 12 Natural Gas will supply 1,137 kW of electricity. The heat will be used to produce hot water, a very important asset for several hospital functions, in the amount of 4,470,469 BTU with a temperature varying between 160°F to 204°F. The efficiency of the AB CHP saves Aria Health Hospital a significant amount of money on energy bills and expects to see additional financial saving after upgrading internal systems to make better use of the hot water generated by the CHP plant.

→ Watch the video at
www.cogenerationchannel.com

CASE HISTORY

STRATFORD GENERAL HOSPITAL (CANADA)
INDUSTRY: Hospital
APPLICATION: Natural gas
CHP PLANTS: ECOMAX® 11 NGS
ELECTRICAL OUTPUT: 1,137kW

COMPANY:
The Stratford General Hospital is part of the Huron Perth Healthcare Alliance, that is made up of 4 hospitals (Clinton Public Hospital, St. Marys Memorial Hospital, Seaforth Community Hospital and Stratford Hospital). They are located in South Western Ontario Canada and providing a wide range of healthcare services to individuals living in and around Huron, Perth, Oxford and Middlesex counties.

REQUIREMENT:
Like most hospitals in the province, Stratford General Hospital consumes large amounts of natural gas and electricity to provide their services to patients. They would like to reduce their annual electricity consumption.

SOLUTION:
Ecomax® 11 Natural Gas will supply 1,137 kW of electricity. Hot water reclaimed from the engine is also used by the facilities to preheat domestic and heating water loops. The facility already had a heat recovery system on the boiler exhaust stacks, so they were able to tie into this distribution system to boost the delivery temperature, allowing them distribute more efficiently. To maximize the heat recovery, additional heat exchangers were added to provide preheatig to other areas of the facility. All of these systems significantly reduce the steam consumption.

→ Watch the video at
www.cogenerationchannel.com

CASE HISTORY

Bruyère

SAINT VINCENT HOSPITAL (CANADA)

INDUSTRY: Hospital
APPLICATION: Natural gas
CHP PLANTS: ECOMAX® 6 NGS
ELECTRICAL OUTPUT: 633 kW

COMPANY:
Saint-Vincent Hospital is a part of Bruyère Continuing Care, the sole provider of complex continuing care in Ottawa.
Saint-Vincent Hospital offers a specialized program of care which aims to improve and maintain function for patients with complex care needs, by providing them with required services, support and a possibility of transition back into the community.

REQUIREMENT:
The hospital previously had a cogeneration plant, but when it crashed in 2010 they started looking into newer technology with higher efficiencies and reliabilities.

SOLUTION:
The hospital electrical profile average just over 600kW with the biggest loads being in the summer when mechanical cooling is used. The hospital runs in parallel with the grid so in the winter it should be generating around 90 percent of its power needs and 60% in the summer months. Heat from the engine cooling jacket is used to heat or supplement the 2 hospital heating loops and preheat the domestic hot water. The exhaust goes through a waste heat steam generator taking some load off of the gas fire steam boilers. Even to the point of low demand, it is the only source of steam.

→ Watch the video at
www.cogenerationchannel.com

CASE HISTORY

FONDAZIONE
POLIAMBULANZA
Istituto Ospedaliero

FONDAZIONE POLIAMBULANZA (ITALY)
INDUSTRY: Hospital
APPLICATION: Natural gas
CHP PLANTS: ECOMAX® 20 NGS
ELECTRICAL OUTPUT: 2,004 kW

COMPANY:
Fondazione Poliambulanza is a not-for-profit private multi-speciality hospital, affiliated with the National Health Service. Over more than a century of care and service it has become a leading centre in the cardiovascular, oncological and orthopaedic areas.

REQUIREMENT:
The hospital has for years set itself the aim of rationalising its energy consumption by building high-efficiency installations, acquiring energy from renewable sources, continually monitoring consumption and reducing waste through the use of "Demand Response" systems.

SOLUTION:
The trigeneration plant installed at Fondazione Poliambulanza is a very high-yield system able to meet 80% of the hospital's electricity needs in addition to producing heat and cooling energy by reclaiming the plant's surplus in thermal output. It is an ECOMAX® 20 NGS, a modular container-based solution housed within a purpose-built unit; it supplies a nominal electrical power of 2,004 kW and a cogenerated thermal power of 1,900 kWt. The electricity produced is entirely for self-consumption to meet the needs of the hospital complex, with any surplus passed on to the grid. The surplus output of thermal energy - above all in the summer months - is fed to a lithium bromide absorber to produce refrigerated water at 7-12° C, used for the hospital air conditioning system.

→ Watch the video at
www.cogenerationchannel.com

PFIZER (ITALY)
INDUSTRY: Pharmaceutical industry
APPLICATION: Natural gas
CHP PLANTS: ECOMAX® 18 NGS
ELECTRICAL OUTPUT: 1,824 kW

COMPANY:
Pfizer Group, one of the most important international groups worldwide in the field of applied research into pharmaceuticals.

REQUIREMENT:
Sensitivity towards the themes of eco-sustainability and awareness of the advantages of cogeneration led Pfizer engineering to request development of a cogeneration plant able to meet its efficiency goals and the growing needs of their production lines at one of their facility plants.

SOLUTION:
AB advised Pfizer engineering to opt for the container solution ECOMAX®18 NGS with electrical power of 1824 KW rather than the 2000 initially hypothesized by the company. Maximum attention was also paid to the elimination of polluting substances and emissions into the atmosphere. This solution enabled Pfizer to obtain the best possible performance from cogeneration in line with its efficiency, economic and environmental targets.

→ Download the full case history
www.gruppoab.com

CASE HISTORY

CASE HISTORY

ELI LILLY (ITALY)
INDUSTRY: Pharmaceutical industry
APPLICATION: Natural gas
CHP PLANTS: ECOMAX® 24 NGS
ELECTRICAL OUTPUT: 2,433 kW

COMPANY:
Eli Lilly and Company started doing business in 1876 in Indianapolis, USA, where Col. Eli Lilly founded the company that still bears his name today.
The Italian subsidiary started about 50 years ago and is located in Sesto Fiorentino. It's the largest bio-technology factory producing pharmaceuticals in Italy.

REQUIREMENT:
Analysis regarding the factory's emission change confirmed that, as well as a significant amount of electrical energy required for the new production, there was a standard annual demand for thermal energy that allowed the heat that would have been created by a cogeneration plant to be used.

SOLUTION:
In 2012 the company installed a 2.7 MWe system that allows it to be almost entirely self-sufficient with regard to electricity and thermal energy production. The economic savings are clearly visible (-6 cents euro on the cost of power) and the reduction in emissions is ensured.

→ Watch the video at
www.cogenerationchannel.com

YOUR BEST PARTNER

AB, the best-in-class partner for the Healthcare & Pharmaceutical sector

Over the past 35 years, AB has consistently emerged as the trusted international partner for energy efficiency within the healthcare & pharma sectors. AB solutions, across more than **30** plants installed within the healthcare & pharma sectors, are characterized by their **design flexibility** to client's process requirements and best-in-class **availability**.

Some of the world's leading companies in the healthcare & pharma sectors have selected AB as a partner for achieving their **energy efficiency targets, on site-resiliency and long-term economic benefit.**

LIST OF REFERENCES

HOSPITALS & REHAB CENTRE	TIPOLOGY	ECOMAX®	kW
Versilia Hospital	Hospital and rehab center	10 NGS	1,000
Piacenza Hospital	Hospital and rehab center	10 NGS	922
Terni Hospital	Hospital and rehab center	14 NGS + absorber	543
San Camillo Hospital	Hospital and rehab center	24 NGS	2,400
Silvestrini Hospital	Hospital and rehab center	14 NGS	1,410
Sant'Orsola Hospital	Hospital and rehab center	2x 33 NGS	2 x 3,300
Saint Vincent Hospital	Hospital and rehab center	6 NGS	635
Aria Health Hospital	Hospital and rehab center	12 NGS	1,189
Servizi Italia Hospital	Hospital services and industrial laundry	8 NGS	851
Stratford Hospital	Hospital and rehab center	11 NGS	1,127
Fondazione Poliambulanza Hospital	Hospital and rehab center	20 NGS +1,300 kWf	2,004

PHARMACEUTICAL	PRODUCTION	ECOMAX®	kW
Bidachem, Gruppo Boehringer Ingelheim	Production of active pharmaceutical ingredients	20 NGS	2,004
Corden Pharma	Drugs	12 NGS	1,189
Doppel Farmaceutici	Drugs for third party	12 NGS	1,203
Doppel Farmaceutici	Drugs for third party	12 NGS	1,203
Eli Lilly	Medicine	24 NGS	2,433
Farmacéutica Aragona	Medicine	11 NGS	1,190
Farmacéutica Cataluña	Medicine	33 NGS	3,349
Fatro	Veterinary medecine	14 NGS	1,415
Hospira	Injectable drugs	20 NGS	2,004
Indena	Active ingredients derived from medicinal plants	27 NGS	2,697
Kedrion	Plasma-derived products	2x 10 NGS	2,012
Patheon	Medicine for third party	20 NGS	2,002
Patheon	Medicine for third party	20 NGS	2,002
Pfizer Italia	Medicine	18 NGS	1,824
Sandoz	Basic pharmaceutical compounds	5 BIO	526
Solmag - Olon	Basic pharmaceutical components	20 NGS	2,002
Valpharma International	Medicinal products in granules form	8 NGS	836
Wyeth Lederle	Medicine	10 NGS	1,064

ABOUT AB

AB is the global leader in cogeneration with over **1,150** plants, totalling over **1,350 MW** worldwide. Our expertise covers engineering, manufacturing, installation and maintenance of top quality CHP solutions.

+1,150
DESIGNED AND INSTALLED SYSTEMS

+1,350MW
MW INSTALLED

+900
PLANTS SUPPORTED

+1,000
PLANTS MONITORED

+260
SPECIALISED TECHNICIANS

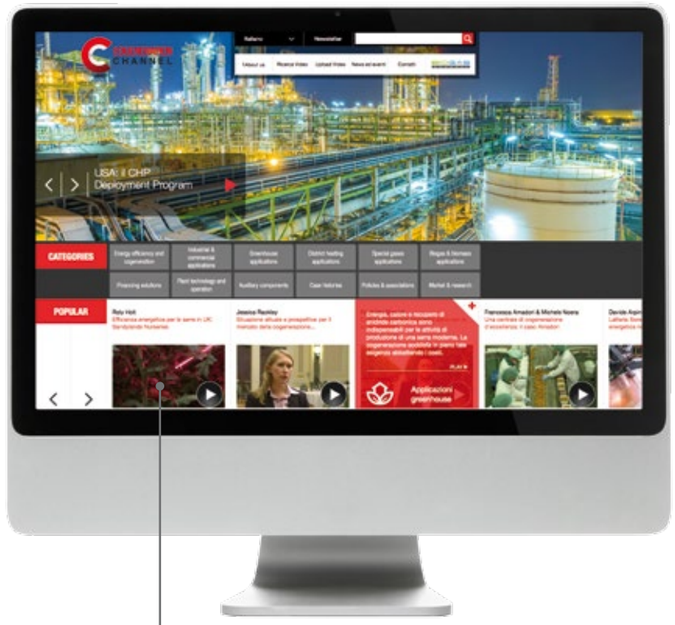
AB Service: an advantage that makes all the difference

With over 260 specialised technicians worldwide, AB Service is completely dedicated towards the support and maintenance of AB installed base. Over 90% of our installed plants are covered by a "Full Service" contract, that provides 24-hour assistance 365 days a year, with remote monitoring of the plants and the supply of original spare parts.
The benefits for our customers are: minimal downtimes, excellent performance, total peace of mind. A strategic choice to achieve guaranteed paybacks on investments.

WEB CHANNELS

COGENERATION CHANNEL

www.cogenerationchannel.com



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