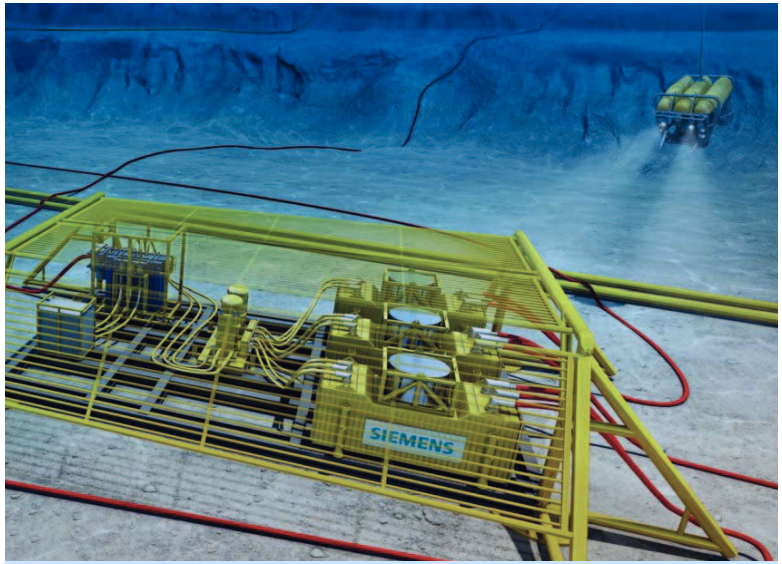
"In terms of cost, hydropower will continue to be the least expensive energy source in Brazil for quite some time."

Reliable Heat

In terms of cost, hydropower will continue to be the least expensive energy source in Brazil for quite some time, amounting to less than US$50 per MWh. There is a different price to pay in the new model for hydroelectric facilities, though. Their design involves a natural decrease in reliability of generation, especially when the rain season is not favorable and, of course, during the dry season. That is why a diversification of the Brazilian energy matrix, particularly with the thermoelectric facilities component, as well as other plants fueled by renewable sources, are key to the safety of the system as a whole.
Fortunately, the country also has what could be fairly said to be a privileged position in that regard. In the last couple of decades, thanks largely to the efforts of the state company Petrobras, Brazil has achieved a major leap in its oil and natural gas production. With the exploration of the extremely deep presalt layer off the coast during this decade and the next, it's fair to expect a much more comfortable situation in terms of fossil fuels supply for the foreseeable future. At the same time, a flourishing ethanol industry – building upon the tradition of sugarcane agriculture in the country and originally stimulated by the government as a means to further reduce the national reliance in hydrocarbon sources – has made Brazil a leader in biomass production. And it must not be forgotten that the southern state of Santa Catarina possesses important reserves of coal.
All this is auspicious news for the reliability of the Brazilian energy system, if we manage to use thermoelectric facilities as a way to supplement the low points of hydropower generation rationally. That could be done without making our energy matrix significantly dirtier (see Facts & Figures). Furthermore, the use of thermoelectric energy fired by renewable sources is promising when we look at the potential complementarity between biomass and hydropower. The sugarcane harvest goes from May to October – almost exactly coinciding with the dry season in most of the Brazilian territory, and particularly in the southeast, where energy demands are most exacting.
Wind energy is another nearly untapped source in Brazil, with great potential to increase regional energy generation in a clean way. The vast Brazilian shore, particularly in the northeastern states, is at least theoretically in a better position to exploit wind power than most sites in Europe that are leaders in the field today. That has to do mainly with natural conditions that seem to make the Brazilian winds less prone to generate fluctuations in the power system's production. In terms of price, the current tendencies indicate that wind power may soon become as competitive as thermoelectric energy.
A challenge to this purpose is to integrate what we hope would be a diverse and flexible matrix in a national system that is both interconnected and able – for example under extreme climatic circumstances – to behave regionally in an independent way, so that disruptions will not swamp the entire system. To that end, huge advances in transmission (an increase of 36,000 kilometers in extra-high-voltage transmission lines – 230 kV and higher, or around 30 percent of the existing network – in just twelve years) are a major focus. Particularly significant for the Madeira power plants, and probably for the Belo Monte power plant interconnection to the main grid, is the use of DC transmission links, as well as the integration of the Itaipu power plant into the Brazilian grid. During the last few years, this very large, fast-growing transmission grid has been equipped with the so-called smart grid equipment and control systems, and no doubt this will be progressively implemented.
Finally, it should be mentioned that the most important current challenges to the operation of the Brazilian power system are the integration of very geographically sparse renewable-energy-sourced power plants, the operation of the long, high-capacity DC links, and – last but not least – the linking, both legal and operational, of the Brazilian power system to those of neighboring countries, especially in the Southern Cone. ■



The subsea grid from Siemens: a safe, reliable, environmentally friendly solution for the oil and gas industry.

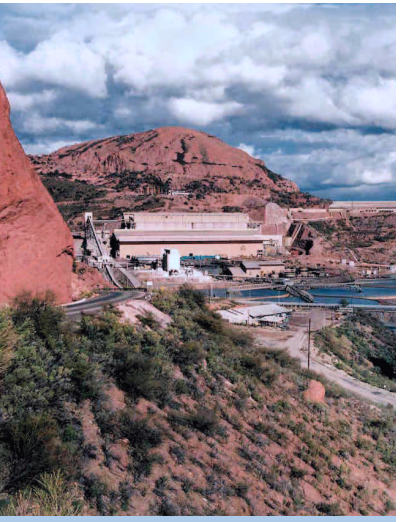
Photo: Siemens

Siemens Strengthens Position in Subsea Power Market

Siemens has acquired Norwegian subsea specialists Bennex Group AS and Poseidon Group AS. Bennex develops and manufactures subsea components such as marinized cable connections for power supply to oil and gas production operations at depths of as much as 3,000 meters. Poseidon Group AS provides subsea marinization, engineering and consulting for companies in the oil and gas industry and is capable of marinizing existing Siemens equipment and technology to the subsea environment. The two companies posted combined revenues of €75 million in 2009.
"Subsea processing is a fast-growing and technologically challenging market in the oil and gas industry," says Tom Blades, CEO of the Siemens Oil and Gas Division. "With the acquisition of Poseidon and Bennex, we're strengthening our portfolio and competence in subsea power grids."
Siemens anticipates that the subsea market will enjoy double-digit growth, especially in power grid applications, to become a multibillion market in 2020.

Efficient Solutions for Unconventional Gas

Siemens has received an order to supply up to ten compressor trains to Australia Pacific LNG (APLNG) in Queensland, Australia, with delivery starting in early 2012. Each compressor train consists of two compressor skids, one low pressure and one high pressure. The trains are designed to transport about 84 million standard cubic feet of gas per day.
The APLNG project involves the development of coal seam gas fields in south central Queensland over a 30-year period and includes construction of upstream gas-gathering and processing facilities as well as a 450-kilometer main transmission pipeline from the gas fields to the facility being built on Curtis Island near Gladstone, where it will be compressed and cooled into liquefied natural gas.
Coal seam gas is a natural gas which is mainly composed of methane. It is a by-product of ancient plant matter that has formed over millions of years by the same natural processes which produce coal.



Siemens to Build CCPP in Mexico

Siemens has been awarded a contract for the turnkey construction of the combined cycle power plant (CCPP) La Caridad in Sonora State, Mexico. The customer is Grupo Mexico, the country's largest mining company and one of the world's largest copper producers. The plant will begin operation in 2013, supplying electricity to Grupo Mexico copper mines in Sonora, reducing its production costs and thus further strengthening its competitive position. Siemens will build the plant with an installed capacity of 250 MW. Deliverables include the SGT6-5000F gas turbine, SST-900 steam turbine, electric generators, heat-recovery steam generator, and the complete electrical and SPPA-T3000 instrumentation and control equipment. Siemens will also maintain the plant through a Long Term Program (LTP).

First New Generation GIS Installed in Germany

Siemens' new 8DN8 enhanced gas-insulated switchgear (GIS) for the 145-kV voltage level boasts state-of-the-art technology that makes it suitable for either indoor or outdoor installation, customizable for each customer's needs, and virtually maintenance-free. In certain configurations (e.g., breaker and a half), this new generation GIS requires up to 57 percent less space – a small enough footprint to be used in even confined spaces – making it ideal for urban applications. And the height of every configuration of these GIS bays has been decreased by around 350 millimeters, which of course also has an effect on the height of the building that houses it.
The 8DN8 also scores points for its eco-friendly design, which uses mostly recyclable materials and consumes 15 percent less SF6 gas than the previous model. The first switchgear bays of this type were put into operation at the municipal public utilities headquarters in Kassel, Germany, on June 15, 2011. Installation of the GIS bays in Kassel is part of a large-scale renovation plan to convert the city's entire electrical supply from its present 60 kV to 110 kV by 2015.
"The 8DN8 enhanced was the best solution for this substation," says Jorg Aschpurwis, project manager of Siemens' High Voltage Substations Business Unit. "Thanks to its modular design, it fits comfortably in the room and allows easy extension of the switchgear." Siemens has been manufacturing the 8D range of gas-insulated switchgear for 40 years, over which time they have continued to prove their safety, reliability and efficiency, with very low life cycle costs.

The 8DN8 enhanced gas-insulated switchgear in Kassel.

The nacelle of the SWT-6.0-120 prototype being hoisted to the top of the tower.

New 6-MW Wind Turbine Debuts in Denmark

Siemens Energy has installed the first prototype of its next generation offshore wind turbine in Høvsøre, Denmark, and initiated the first trial operation in June. The new SWT-6.0-120 wind turbine, which has a power rating of 6 MW and a rotor diameter of 120 meters, uses the innovative Siemens direct drive and proven rotor technology. The combined weight of the nacelle and rotor of the SWT-6.0-120 is less than 350 tons, setting a new low-weight standard for large offshore machines. This low-weight design will reduce costs for future offshore wind projects.
"Large wind turbines have always tended to be heavier per MW than small ones. The SWT-6.0-120 breaks this rule, having a weight per MW similar to that of many turbines in the 2- to 3-MW range," says Henrik Stiesdal, Chief Technology Officer of the Siemens Wind Power Business Unit. "Reaching this low weight with such a strong and robust machine is the result of targeted innovation combined with our more than 30 years of wind industry experience."
The SWT-6.0-120 makes use of several key technologies that are well-proven in offshore applications of the market-leading Siemens 3.6-MW turbine. The first series of the 6-MW wind turbine will feature the same proven B58 blade as is now used on the SWT-3.6-120. Other proven technologies employed in the new SWT-6.0-120 wind turbine include the Siemens IntegralBlade design for blades manufactured without glue joints.
The new wind turbine is also designed and optimized for service and maintenance work. It features the Siemens advanced diagnostics systems to reduce customer risk and enable maximum reliability and availability. A particular offshore feature is a helicopter-hoisting platform which is integrated in the nacelle rear and allows easy and safe access for service technicians.
Siemens will install additional prototypes of the SWT-6.0-120 wind turbine at several sites between 2011 and 2013 to further test and validate their performance before the product will be officially launched for sale. Serial production is scheduled to begin in 2014.

Molten Salt Solar Thermal Test Facility in Portugal

As part of the High-Performance Solar Thermal Power research project sponsored by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Siemens and four German partner companies – the German Aerospace Center, K+S AG, Senior Berghöfer GmbH, and Steinmüller Engineering GmbH – plan to build a solar thermal power plant test facility that concentrates sunlight using mirrors on a receiver tube containing a heat transfer medium – in this case, molten salt. Over a period of three years, the technology will be tested and optimized on the premises of the University of Evora southeast of Lisbon, Portugal, with the aim of discovering the potential offered by different types of salt. The aim of the research project is to enhance the economy and reliability of parabolic-trough power plants.

Photos: Siemens

New European HVDC Link Inaugurated

The new BritNed HVDC transmission system, designed and installed by Siemens, connects converter stations on the Isle of Grain in Kent in southeastern England and in Maasvlakte near Rotterdam.

On April 1, 2011, BritNed Development Ltd. and Siemens Energy put the BritNed HVDC low-loss transmission link between Britain and the Netherlands into operation. BritNed is a joint venture of the British energy supplier National Grid and the Dutch electricity company TenneT. The 260-kilometer-long subsea cable connection, boasting a transmission capacity of 1,000 MW, links the 400-kV grids in southern England and in the south of the Netherlands.

Siemens was responsible for the design of the complete HVDC system and installed both turnkey converter stations, one located on the Isle of Grain in Kent in southeastern England and the other situated in Maasvlakte near Rotterdam. The order's scope included the supply, installation, and commissioning of core components such as converter valves with directly light-pulse-fired power thyristors, converter transformers, smoothing reactors, protection and control systems, and AC filters.

"The BritNed HVDC transmission system we've installed will stabilize the power supply grids in both Britain and the Netherlands, and thus increase supply reliability in Europe. The advantages of low-loss HVDC transmission technology become fully apparent, especially with regard to long-distance subsea cable links," said Dr. Udo Niehage, CEO of the Power Transmission Division of Siemens Energy.

BritNed also serves as an energy-trading hub, promoting more competition in northwestern Europe's grid and increased price transparency, with a broader range of choices and more options for local power companies to participate in the European power markets. The HVDC transmission connection meets the European Commission's requirements to interconnect power grids to a greater extent.

More Siemens Photovoltaic Plants in Italy

Siemens Energy has received a follow-up order for the turnkey construction, engineering and project management of eight photovoltaic plants in the Marche and Abruzzo regions of Italy. The scope of supply includes the full range of Siemens components, such as inverters, medium-voltage equipment and monitoring systems. The customer for these solar power plants is Viridis Energia, a joint venture between Echidna S.p.A. and La.G.I. S.r.l.

After completion of the plants, the combined rating of 14 MWp will provide about 5,000 households in Italy with environmentally friendly power. "The Italian market is one of the key large-scale photovoltaic markets in Europe," says Martin Schulz, Vice President of Siemens Photovoltaics. "This year the market will continue to grow significantly, and we want to participate in this growth."

Photovoltaic panels from Siemens will capture solar energy to provide environmentally friendly power to thousands of homes in east central Italy.

Michael Suess, CEO of Siemens Energy Sector, with Lee Wan-Kyoung, President and CEO of GS EPS, and Huh Myung Soo, President and CEO of GS Engineering & Construction, at the signing ceremony for the new CCPP in Seoul.

A Model of Efficiency: the SGT6-8000H Class Combined Cycle Power Plant

Siemens will supply a turnkey combined cycle power plant (CCPP) equipped with its latest high-efficiency gas turbine, the SGT6-8000H. Purchaser is Seoul-based GS Electric Power and Services Co., Ltd. (GS EPS). The 400-MW Bugok 3 plant will attain an efficiency level that exceeds the record figure of 60 percent and will supply electricity to more than 300,000 people. In addition to the SGT6-8000H, the scope of the turnkey project includes an SST6-5000 steam turbine, the hydrogen-cooled generator SGen6-2000H, a Benson HRSG, all electrical equipment, and the instrumentation and controls system SPPA-T3000. A long-term maintenance service agreement as well as Operation & Maintenance (O&M) support were also concluded for the main components.

"We place special emphasis on maximized efficiency and environmental friendliness. For that reason, we opted for a solution provided by Siemens, which features cutting-edge power plant technology," says Lee Wan-Kyoung, President and CEO of GS EPS.

Mid of May 2011 Siemens has achieved a new world record in power plant efficiency with the SGT5-8000H gas turbine at the Irsching 4 plant in Germany. With an output of more than 578 MW and an efficiency level of 60.75 percent (net), Siemens has markedly surpassed the targeted efficiency mark of "more than 60 percent" during the test phase, making history in the field of power plant technology.

Bugok 3 will be the ninth combined cycle power plant built by Siemens in South Korea in the last ten years. With a combined installed capacity of 13,000 MW, these power plants are capable of generating sufficient electricity for approximately 10 million people.

Graphic: Siemens, Photos: Siemens

Friends of the Supergrid

The EU's energy goal is a "zero-carbon power supply" for Europe by 2050 while still meeting consumer demand for electricity, which is expected to double by that time. In support of that initiative, 21 European companies, including founding member Siemens, came together in Brussels, Belgium, in December 2010 to form the nonprofit Friends of the Supergrid association. The organization's aim is to create a platform on which Europe's energy future, the Supergrid, will be built. Enabling large-scale power generation to be transmitted over large distances to consumers, the high-voltage system will connect European countries to an enormous sustainable energy resource – bringing national markets together and altering the way Europe produces, transmits and consumes electricity.

Phase 1 could already begin in 2015 with construction of so-called SuperNodes in the North Sea to connect offshore wind generators and deliver electricity in large quantities to existing grids by 2020. Subsequent phases will unify the northern grid with those from the south, east and west into a single Supergrid.

Further Information
www.friendsofthesupergrid.eu