HVDC technology helps make the Murraylink project an environmental and engineering success

A high profile power project in Australia, using ABB technology, has been awarded a second prestigious environmental award.

The 177-kilometers long Murraylink underground high-voltage interconnection is the world's longest, and earlier this year it won for the Murraylink Transmission Company the Engineering South Australia Award 2003. This is the second prestigious award to be won by the project; in 2002 it received the Case EARTH Award for Environmental Excellence for best practice and innovation in the environmental management of civil construction projects.

The project connects the electricity grids in the states of Victoria and South Australia, allowing power to be traded directly between the two states. Underground cables were used because a large proportion of the terrain between the two states is made up of national parks with sensitive wildlife, as well as large privately owned agricultural areas. In addition to the visual and environmental impact, underground cables offer protection against Australia's traditional causes of power outages, such as lightning and damage caused by wild life or bush fires.

The underground interconnection uses ABB's unique HVDC (high-voltage direct current) Light™ technology to increase the capacity and reliability of South Australia's electricity supply system. Capacity has been increased by about 220 MW, enough to meet the electricity needs of around 120,000 households. Also, due to their robust technology, HVDC Light systems cannot be overloaded and are not exposed to the risk of cascade tripping.

According to Peter Smits, head of ABB's Power Technologies division, "The award is further confirmation of the value of our HVDC Light technology. Grid stability and security are higher on the agenda after recent electricity blackouts. With HVDC, ABB is providing grid operators with solutions to a widely recognized challenge."

Murraylink Transmission Company is a subsidiary of TransÉnergie, the transmission division of Hydro-Québec, Canada.

Qatar Petroleum chooses Industrial^{IT}

In 2002, Qatar Petroleum (QP), owner of the world's largest gas field, awarded ABB a contract to upgrade and commission two of its facilities with Industrial^{IT} technology. In the past year, ABB has successfully improved operator interfaces at two of QP's facilities – the NGL 3 gas processing plant and the offshore PS4 gas platform – by installing Operate^{IT} consoles[1)].

The upgrade includes the ABB asset optimization workplace module, which lays the groundwork for remote asset condition monitoring. By combining the Industrial IT asset monitoring software with remote access capabilities, Qatar Petroleum can benefit through:

- Higher asset effectiveness and reduced maintenance cost
- Increased availability, increased output and reduced quality losses
- Improved coordination of asset availability and production strategy
- Reduced conversion costs
- Increased return on assets and capital

A key advantage of this combination of technologies is flexibility. The asset's condition may be stored locally, captured and sent by e-mail or directly accessed by remote experts. The exact use will depend on how Qatar Petroleum's needs change.

All of this meant a changeover of about 7000 data tags from the existing operator interface system to the new Operate^{IT} consoles, and the development of 400 3-dimensional process graphics to replace the previous 2-dimensional ones.

QP chose ABB's Industrial IT platform to further enhance its world-class operational performance by allowing the development of true asset optimization strategies. Frank Duggan, head of ABB's Petroleum, Chemicals and Consumer business area says, "The Operate^{IT} platform will allow QP to take advantage of all Industrial IT benefits, including unparalleled fieldbus technology – a true enabling technology for asset optimization."

The entire design, engineering and software development were carried out by

1) The Operate^{IT} product suite covers products that enable data and information on each control and information device in a plant to be deployed rapidly and uniformly throughout the enterprise in real time.

ABB off-site, and the communication modules were changed during a three-week maintenance shutdown.

Future issues of *ABB Review* will feature more in-depth articles on remote access to plants.

Electrifying speed

ABB completed construction of a 943-km transmission line in Brazil months ahead of time, providing a power corridor that links the north and northeast areas of the country to the national grid system.

As part of a US$ 227 million project to develop the Brazilian transmission system, Empresa Amazonense de Transmissão de Energia (EATE), together with a consortium that included ABB, has managed to interlink the Amazon region – an area with enormous hydroelectric potential – with the grid that feeds the remainder of the country. In full operation since March 2003, this new system is allowing energy generated in the Amazon region to be used by Brazilians on the frontiers with Argentina and Uruguay.

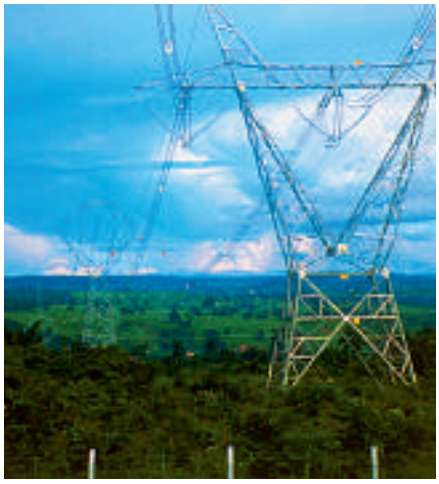
The line brings together existing substations in the towns of Tucuruí and Marabá (both in the state of Pará) with those in Açailândia, Presidente Dutra and Imperatriz (in Maranhão state).

ABB was contracted to construct the power transmission system in June 2001, and the last stretch was completed by March 2003. According to Marcelo Tosto, a director at EATE, the date originally contracted to put the system into operation was the middle of April 2003. In fact, the first stretch was handed over at the end of January 2003, two and a half months ahead of schedule! Tosto added that the "scheduled time-scale of 21 months was already a benchmark."

One of the critical elements that helped achieve this 'before-schedule' delivery was the fact that 943 km of transmission line (between Tucuruí and Presidente Dutra) were constructed in only 12 months! According to ABB's Geraldo Vieira, "What was built and mounted in 12 months would normally have taken 24 to 30 months." To achieve this, the teams were required to work at a blistering pace: Per day, an average of 7.73 tower foundations were built, 9.30 towers erected and 6.10 km of cables laid. For this to happen, a well-distributed support network capable of supplying all the required material to the operation on a daily basis was essential. This meant there had to be a support field team every 100 km along the project.

Quality challenge

One of the greatest challenges that faced ABB in building the transmission line was to ensure power quality. ABB used flexible AC transmission systems (FACTS) on the line, a solution that provides both reliability and stability. To improve voltage control and increase the dynamic stability of the link, the 500-kV power line included four series compensation banks, a FACTS technology used to reduce the transfer reactance of the long power transmission corridor.



Without these, additional transmission lines would have been necessary to transmit an equal amount of energy. Shunt reactor compensation was also inserted at intervals along the line to maintain satisfactory system conditions over the full range of power transfer.

Two lines

The 943-km transmission line between Tucuruí and Presidente Dutra was built in parallel to another system. A 324-km line between Tucuruí and Vila do Conde was also contracted to ABB in June 2001 and completed in August 2002, some 14 months later.

Though considerably shorter in length, geographical and terrain problems made construction of this transmission line extremely difficult. During one part of the construction phase, teams of buffaloes were needed to transport equipment to the work sites. On average 4.23 tower foundations were built, 4.36 towers erected and 6.10 Km of cables were laid per day. This line currently reinforces the provision of electrical energy to the Pará state capital, Belém, previously served by only one transmission circuit.

Together, these lines (each with a capacity of 1200 MW) are making a significant contribution to the development of the Brazilian electrical energy system.