Cahora Bassa HVDC transmission link
Apollo station refurbishment project

The Cahora Bassa HVDC link transmits 1,920 MW from a generating station on the Zambezi River in northern Mozambique to South Africa. The original transmission link was put into service in three stages from 1977 to 1979. The converter stations were originally built by the ZAMCO consortium (AEG, BBC and Siemens).

The Apollo station refurbishment

In 2006, ABB was awarded a contract to refurbish the Apollo converter station in South Africa. The upgraded Apollo substation contributes to an expansion in transmission capacity from 1,920 MW to a planned 3,960 MW.

The refurbishment project encompassed:

- Replacement of thyristor valves and valve cooling systems
- Replacement/refurbishment of AC filters
- Replacement of control and protection system
- Replacement and integration of converter station HMI systems
- Replacement of system transient-fault recording equipment
- Replacement of the DC-line fault-recording equipment
- Provision and optimization of associated auxiliaries/ancillaries

The upgrade significantly increases the availability and reliability of the link and reduces the maintenance of the Apollo station.

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ABB's unique air-insulated, outdoor thyristor valves replace the old, oil-insulated valves and are mounted on the existing support insulators used for the old valves. Since minimum changes needed to be made to the physical arrangement and no new valve halls needed to be built, significant savings can be made.

The MACH2™ HVDC Control and Protection System replaced the old analogue control systems, originally installed in the 1970s.

The upgrade was performed in shortest possible time, and with minimum disruption of the power transmission capacity of the link. The transmission capacity was reduced by 50 % for a period of three months, and by 25 % during two months.

More information can be found on: www.abb.com/hvdc

POW-0055 rev.0

Reference list for ABB HVDC Upgrades

Project	Commissioning year		Power MW	Scope	Power company
	Original	Upgrade			
Skagerrak 1 & 2	1976 - 77	1991	500	Replacement of valve control and valve electronics.	Elsam, Denmark Statkraft, Norway
New Zealand DC Hybrid Link	1965	1992	2 x 300	Paralleling of mercury-arc poles. Total replacement of control system.	Trans Power New Zealand Ltd., New Zealand
CU-project	1978	2001	1000	Replacement of valve control and valve electronics.	Great River Energy, USA
CU-project	1978	2002	1000	Voltage upgrade ±10 kV (2.5 %), + 25 MW.	Great River Energy, USA
CU-project	1978	2004	1025	Control and protection system upgrade.	Great River Energy, USA
Square Butte HVDC scheme (Originally built by GE)	1977	2004	500	Control and protection system upgrade.	Minnkota Power Coop., Minnesota Power, USA
Pacific HVDC Intertie Sylmar replacement project	1970, 1985 and 1989	2004	3100	Rebuilding of Sylmar East converter station from 1,100 to 3,100 MW.	LADWP, USA
Skagerrak 1 & 2	1976 - 77	2007	2 x 250	Control and protection system upgrade.	Energinet. dk, Denmark, Statnett, Norway
Cahora Bassa Apollo Upgrade	1977 - 79	2008	1920	New outdoor valves, AC filters. Control and protection system.	ESKOM, South Africa
Blackwater	1985	2009	200	Valve cooling, control and protection system upgrade.	Public Service Company of New Mexico, USA
Châteauguay	1984	2009	2 x 500	Control and protection system upgrade.	Hydro-Québec Canada

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