

Integration of an 88 km 220 kV AC cable into the Victorian Electricity Network in Australia

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ABSTRACT

The Victorian Desalination Plant is connected to Victoria's electricity network via an 88 km 220 kV AC underground transmission line. The cable is the longest of its type in the world. The technical challenges associated with the implementation of long HVAC cable systems have been presented at previous Jicable conferences [1] - [4]. This paper describes how the challenges were addressed for the Victorian Desalination Plant 220 kV cable system.

KEYWORDS

Long underground HVAC cable, 220 kV XLPE

BACKGROUND

The Victorian Desalination Plant was commissioned in 2012 to provide a rainfall independent water supply for Melbourne, Geelong and the surrounding area. The plant is located near Wonthaggi approximately 135 km southeast of Melbourne. It treats seawater to potable standards using reverse osmosis technology. It has a production capacity of 150 GL pa with the capability to expand to 200 GL pa. It is the largest desalination plant in Australia and one of the largest reverse osmosis plants in the world. The plant's electrical consumption is 100 % offset by the purchase of renewable energy credits.

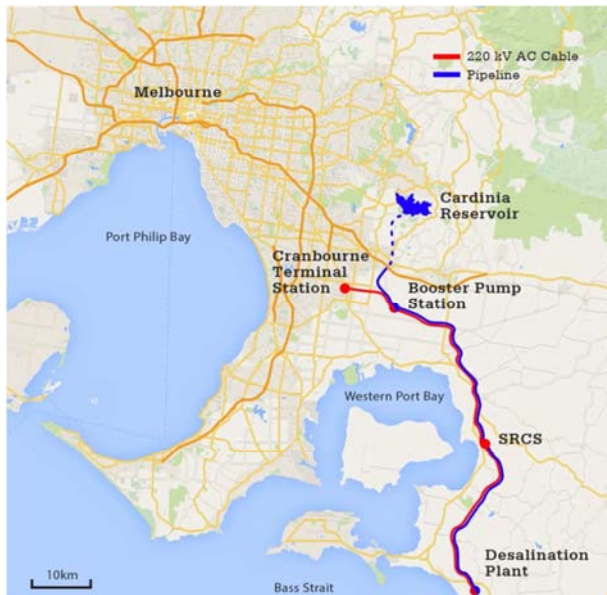


Figure 1: Cable and pipeline routes

The plant is connected to Victoria's water and power networks via an 84 km transfer pipeline and an 88 km underground transmission line. The transfer pipeline and underground transmission line are both rated for the ultimate capacity of the plant and share the same easement for most of their length. The project also included a Booster Pump Station and a shunt reactor station at SRCS.



Figure 2: Victorian Desalination Plant

TRANSMISSION LINE OPTIONS

Many options were considered for the desalination plant electrical supply. A supply via overhead line was long seen as the most appropriate option. The original overhead option was to feed the plant as well as augment the power supply to the surrounding region.

Public concerns for visual amenity and the impact on local landowners later resulted in an underground option becoming the focus of design efforts. The requirements for the link were also changed to a dedicated supply for the desalination plant.

Underground HVDC and HVAC options were considered. An HVAC link was finally selected as it offered a shorter construction period, lower electrical losses and lower cost [5]. The HVAC option also presented operation and maintenance benefits as it utilised equipment and technology used throughout the Victorian electricity network.

PROJECT REQUIREMENTS

The project was delivered as a Public Private Partnership where the overall project scope and requirements were specified by the state of Victoria. The key project requirements related to the 220 kV cable system are listed below.

- The cable system is to be connected to the Victorian 220 kV network at Cranbourne Terminal Station (CBTS)
- The cable system is to be an underground HVAC system located in one trench
- The cable system is to be a dedicated supply for the desalination plant and booster pump station
- The cable system is to provide 165 MW capacity for the desalination plant (145 MW) and booster pump station (20 MW)
- The electrical losses in the 220 kV cable and shunt reactors are not to exceed specified limits