

An aerial night view of a city, likely Copenhagen, with a digital network overlay of glowing nodes and lines connecting various points across the cityscape. The sky is a mix of orange and blue, suggesting dusk or dawn. The city lights are visible, and a large body of water is in the foreground.

SIEMENS

Ingenuity for life

Security in power supply

World's first successful retrofit of
an existing HVDC PLUS system with
black-start capability

[siemens.com/energy/hvdc](https://www.siemens.com/energy/hvdc)

Black-start capability for fast, efficient restart of power grids



In our modern world, safe and reliable power supply is of utmost importance. In case of a power outage, for example due to network interruptions or environmental reasons like an earthquake, power supply has to be restored as quickly and efficiently as possible. That's why Siemens has retrofitted the Trans Bay Cable transmission link, running from Pittsburg to San Francisco, with black-start capability. What's more, Siemens is the world's first provider that has upgraded an existing plant with black-start capability – and has successfully performed a live test.



© Hawkeye Photography

Black-start capability from Siemens – benefits

- VSC (HVDC PLUS) from Siemens is world's first to be successfully tested for black-start capability with active and reactive load banks connected
- Quick and efficient power restoration in the event of a blackout
- Easy upgrade of existing HVDC PLUS transmission system with black-start capability
- Sustainable protection and stabilization of power networks

Reliable power supply for San Francisco

The Trans Bay Cable Project is a submarine High Voltage Direct Current (HVDC PLUS) transmission link, running under the San Francisco Bay. Transmitting existing energy from Pittsburg with a transmission capacity of 400 MW, it ensures highly reliable and sustainable power supply for San Francisco.

Innovative HVDC PLUS technology

The Trans Bay Cable transmission link was the first application to use the innovative HVDC PLUS technology from Siemens. Its modular multi-level voltage-sourced converters (VSC) make it the preferred solution whenever space for converter stations is limited – and it's also a prerequisite for delivering better performance with respect to dynamic behaviors and harmonics as well as for black-start or System Recovery Ancillary Services (SRAS) capability.

Black-start capability for quick power grid restoration

Existing plants with VSC can be easily retrofitted with black-start capability. The biggest advantage: Black-start capability allows operators to restore their power to an islanded grid quickly and efficiently – without the need of additional power stations. Critical infrastructures like hospitals, fire stations, and emergency centers will benefit from expedited restoration of power to the grid.

Easy upgrade of an existing plant: Trans Bay Cable transmission link

The Trans Bay Cable upgrade project implemented black-start capability into the existing HVDC PLUS transmission system without having to exchange any HV equipment like converters or transformers, with the only upgrade the Control and Protection system. The onsite upgrade was successfully completed within the planned outage period.

First successful live test of the black-start capability

The VSC system from Siemens is the world's first that has been successfully tested for black-start capability with load banks of 50 MW and 30 Mvar. The advantage: Load banks allow testing black-start capability without actually having to access the transmission grid.

**Published by
Siemens AG 2016**

Energy Management
Freyeslebenstr. 1
91058 Erlangen, Germany

For more information and technical descriptions,
click on the „Contact“ navigation point on our Web site.
www.siemens.com/energy/hvdc

Contact:
support.energy@siemens.com

Article-No. EMTS-B10020-00-7600
Printed in Germany
Dispo 30003
GB160575

Subject to changes and errors. The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract.

