

# France - UK Transmission Link High Rated Submarine Interconnection

The Cross-Channel IFA 2000 transmission link provides electricity to over 3 million people in England and continental Europe via France.







45 km Submarine and 26 km Underground HVDC Line

## Project Overview

Countries:	UK and France
Project:	IFA 2000 link
Customer:	National Grid and RTE
Technology:	High Voltage Direct Current (HVDC), Line Commutated Converter (LCC)
Scope (1986):	Bulk power transmission link between English and French electricity systems via HVDC
Scope (2012):	Refurbishment of IFA 2000 converter stations, including thyristor valves, control and cooling plant
Rating:	2000 MW, $\pm 270$ kV
Length:	45 km submarine and 26 km underground
Commercial operation:	2012



Valve hall after renovation

## Customer Challenges

In the early 1960s, the operators of the UK and French power utilities built the IFA 160, a 160 MW cross-channel interconnection between English and French electricity grids.

In the mid-1980s, GE replaced the link with a new High Voltage Direct Current (HVDC) system with a much higher transmission capacity of 2000 MW. This cross-channel link has been transmitting electricity between continental Europe and the UK ever since, providing electricity to over 3 million people.

### Refurbishing IFA 2000 for the London 2012 Olympics

Twenty-five years later, the equipment reached the end of its designed life. GE refurbished this HVDC link, which remains the highest rated HVDC submarine interconnection in the world today.

The refurbishment project covered the replacement of the converter equipment of the 2000 MW system. Completing the renovation in time for the 2012 London Olympic Games was paramount to ensuring steady power supply during the games.

The replacement of the first bipole of 1000 MW was completed in 2011. The second bipole was completed in March 2012. To complete the work as quickly as possible, GE teams from UK, Canada and France gathered the best skills and knowledge, including the expertise of engineers who were involved in the original 1986 equipment design.



Valve stack during construction





*During the refurbishment*



*After the refurbishment*

## Project Challenge

The biggest challenge was to perform all the dismantling and installation work at the same time, especially since the original converter equipment at each end was completely different. There were approximately 400 people on site at any one time, performing many different activities in different parts of the building.

## The Solution

The primary technology installed was a new generation of thyristor valve and HVDC control system. A new water/glycol liquid cooling system also replaced the old fans, improving the reliability of the link.

Several factors were key to the efficient refurbishment, including the extent of pre-outage work carried out, and minimizing the amount of structural work. To ensure that the outage period for the converters was minimized, these tasks were performed:

- Series V control system was installed and tested as far as possible prior to the outage
- A specially-designed floor-mounted version of the H400 thyristor valves, to avoid modifying the building roof structure

## In Time For the Summer Olympics in London

The IFA 2000 link was fully renovated in time for the London Olympic Games, and for future energy exchange between the UK and France.

The two utility owners of the refurbished IFA 2000 link now own the same type of HVDC converter equipment at both stations, whereas previously, they had different equipment provided by different suppliers. They may now share common training, maintenance, diagnostics, spares and other benefits, which they have been unable to do in the past.

## Key Highlights

- Converter locations: Les Mandarins, near Calais, France and Sellindge, near Kent coast, UK
- Converter scheme: four 500 MW poles arranged as two 1000 MW bipoles
- Converter stations are linked via eight 270 kV DC submarine cables, buried in trenches 1.5 meters deep
- Latest generation H400 floor-mounted thyristor valves are more robust, improving power transmission reliability
- As a result of the refurbishment only 1968 thyristors now achieve a power rating which previously required 9216 thyristors



*Looking over AC Yard 2, Les Mandarins converter station, France*

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Imagination at work