**2026 IERE-KEPCO Seoul Energy Equation Workshop**
Seoul, South Korea
May 19–22, 2026

# System Design of BorWin6 Offshore Wind Power VSC-HVDC Transmission System

**Bingjian YANG**
**Project Manager, Department of HVDC, China Electric Power Research Institute**

**Keywords**: *offshore wind power, VSC-HVDC, system design, system control, converter valve design*

**Abstract**
The BorWin6 project is a VSC-HVDC connection for offshore wind farm, which is scheduled for completion in 2027. China Electric Power Research Institute (CEPRI) is responsible for the system design, manufacture, supply, installation and commissioning of both onshore and offshore converter stations in BorWin6 project.

For system design, CEPRI has completed the entire process from system parameter design to equipment technical specification. Through harmonic injection, the capacitance of the converter valve has been reduced by 30%, and the weight of the converter valve has been significantly decreased. Adopting a low inductance arm reactance without current limiting reactance, which meets the requirements of low cost and compact design. Through the high charge-rate design of the surge arresters, the overvoltage level of the DC submarine cable has been reduced by 10%

The grid forming control has been adopted in VSC-HVDC project for the first time. Through a control scheme based on DC voltage virtual synchronization without “inner current loop”, the BorWin6 project can achieve full operating condition voltage source characteristic to AC power grid. The HVDC converter with grid forming control is superior to conventional grid following control at AC grid disturbances, such as phase angle jump, fast frequency change, and voltage dip, can provide inherent inertia and voltage support.

By increasing the maximum operating voltage of IGBT and control of multiple physical fields to reduce voltage overshoot, the rated voltage of submodules can be increased to 2.4 kV, and the number of submodules can be reduced by 11%. To avoid damage to the converter valve during sea transportation, an analysis of the anti-vibration stress considering the transportation of the platform has been conducted, which can achieve long-term 0.1g and extreme 0.8g anti-vibration requirements.

CEPRI will continue to promote the progress of HVDC technology through technological innovation and promote the application of HVDC technology.