# CI9.S.2.4 Power Transmission and Storage: integrating systems into smart grids

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| Term: | Summer  |
| Contact hours: | 25 |

## 1.0 Aims

High voltage direct current (HVDC) is often a preferred technology for overhead power transmission over long distances and under-ground cables for relatively shorter distances. A bulk of the new offshore transmission infrastructure in the UK and worldwide is envisaged to be employing HVDC. In this context, this part of the course would give an introduction to the HVDC technology; its advantages (and disadvantage) over conventional AC transmission; operation and control and possible interaction with the existing AC transmission network. Emerging technologies through use of voltage source converters would be covered.

## 2.0 Syllabus

* Large scale deployment of Heat pumps in the grid
* The Smart grid principles and prospects
* Controlling embedded generation
* The developing quality issues of power supply
* Demand side management

## 3.0 Intended learning outcomes

* Students will be able to appreciate the advantages (and disadvantages) of using HVDC for bulk power transmission, benefits and limitations associated with LCC and VSC HVDC technology and their application areas.
* Students are expected to develop a basic understanding about the operation and control of both LCC and VSC HVDC and how they interact with the host AC systems.

## 4.0 Assessment

* Assessment of this module is in the form of progress tests usually given as in class group work.

## 5.0 Recommended textbooks

C = Core, S = Supplementary

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| S | High Voltage Direct Current Transmission’ by Jos Arrillaga, IEE Press |
| S | ‘Power System Stability and Control’ by Prabha Kundur, McGraw Hill (Material on LCC is mostly taken from this book ) |
| S | ‘Voltage-Sourced Converters in Power Systems’ by Yazdani and Iravani, IEEE press |
| S | Flexible Power Transmission – The HVDC Option’ by Arrillaga, Liu and Watson, Wiley |
| S | ‘Manufacturers’ website and research papers for latest developments in VSC HVDC |