HVDC TRANSMISSION
INTRODUCTION

• Now a days large blocks of power are needed to be transmitted.
• There arises some technical problems of transmitting power to such a long distance using ac.
• In the view of the draw backs of ac the HVDC transmission has come into picture.
• The first dc link was set up in 1954 in between Swedish main land and the island of Gotland.

• The use of an HVDC link in an ac system requires converter stations at each end of the line.
ADVANTAGES

Advantages of dc transmission

- Technical Advantages
- Economic Advantages
Technical Advantages

- Reactive power requirement
- System stability
- Short Circuit Current
- Independent Control of ac system
- Fast change of energy flow
- Lesser Corona Loss and Radio interference
- Greater Reliability.
• No limits in transmitted distance
• Direction of power flow can be changed very quickly
Economic advantages

- DC lines and cables are cheaper than ac lines or cables.
- The towers of the dc lines are narrower, simpler and cheaper compared to the towers of the ac lines.
- Line losses in a dc line are lower than the losses in an ac lines.
AC - System  Versus  DC - System

50 to 80 km  Max. cable length  No Limitations

Requirement: length > 200 km
Comparison between the prices of AC & DC Transmission
Types of DC links

- Monopolar
- Bipolar
- Homopolar
Monopolar link
Bipolar Link
Incorporating HVDC into AC systems

- Two terminal DC link point to point transmission.
- Back to Back DC link
- DC line in Parallel with AC link.
- Multi-Terminal DC link.
CONVERTER STATION EQUIPMENT

- Thyristor valves
- Converter Transformer
- DC Reactor
- Harmonics Filtering Equipment
- Control Equipment
- Reactive power compensation
GROUND RETURN

• Most dc transmission lines use ground return for reasons of economy and reliability.

• Ground return are used by the monopolar and the bipolar link for carrying the return current.

• The ground path has a low resistance and, therefore low power loss as compared to a metallic conductor path provided the ground electrodes are properly designed.

• The resistance of the ground path is independent of the depth of the line.
PROBLEMS

• The Design of grounding electrodes for low cost of installation and maintenance
• Location and screening of electrodes so that ground currents cause negligible electrolytic corrosion of buried and immersed metallic structures.
EARTH ELECTRODE

- HVDC system requires a properly designed earth electrode at each station.
- The electrode is situated at a safe distance (5 to 30 km) from the station.
- The earth electrode at one of the station acts as a anode and at the other end acts as a cathode.
RECENT ADVANCES

- GTO’s have come into use.
- Use of active ac and dc filters.
- Advanced fully digital control systems using optical fibers.
CONCLUSION

- Recent studies indicate that HVDC systems are very reliable.
- The data collected from 31 utilities says that forced unavailability of energy due to the converter station is 1.62%.
- The scheduled unavailability of energy is about 5.39%.
Thank you!