**Unit I Introduction**

**Session 1-Structure of an Electric Power System**

**Quiz**

1. What is the meaning of transmission?
2. What is a power system?
3. What are the components of a power system?
4. What is the need for transmission?
5. List the functions of power system.

Ref: <http://oxforddictionaries.com/>

Presentation

Giving detailed explanation on structure of an electric power system

 Generation

 Transmission

 Distribution



Board activity

Drawing the one line diagram of the power system

Ref: <http://www.webpages.uidaho.edu/sustainability/chapters/ch06/ch06-p3a.asp>

**Session 2-Advantages of high voltage transmission system**

**Quiz**

1. What are the major sections of a power system?
2. What machine is used to generate power?
3. What are the functions of a power system?
4. What is the main component in a transmission system?
5. List out the different voltage levels used in various sections of power system.

Ref: <http://www.webpages.uidaho.edu/sustainability/chapters/ch06/ch06-p3a.asp>

Presentation

Giving detailed explanation on structure of an electric power system

 Reduced conductor size

 Reduced losses

 Simple support

**Advantages:**

* With increase in the transmission voltage size of the conductors is reduced (Cross section of the conductors reduce as current required to carry reduces).
* As the reduction in current carrying requirement losses reduces results in better efficiency
* Due to low current voltage drop will be less so voltage regulation improves

Read more: <http://electricalquestionsguide.blogspot.com/2010/11/high-voltage-transmission-advantages.html#ixzz2jBfSRa6F>

Board activity

Deriving the expressions necessary for proving that high voltage transmission is more advantageous

Comparing low voltage and high voltage transmission

Ref: <http://electricalquestionsguide.blogspot.in/2010/11/high-voltage-transmission-advantages.html>

**Session 3-An Introduction to High Voltage AC Transmission**

**Quiz**

1. What are the advantages of AC?
2. What is the most common form of AC system adopted?
3. What are the advantages of AC generation?

Ref: <http://www.webpages.uidaho.edu/sustainability/chapters/ch06/ch06-p3a.asp>

Presentation

Giving detailed explanation on structure of an electric power system

 Reduced conductor size

 Reduced losses

 Simple support

**HVDC:**

The most common reason for choosing HVDC over AC transmission is that HVDC is more economic than AC for transmitting large amounts of power point-to-point over long distances. A long distance, high power HVDC transmission scheme generally has lower capital costs and lower losses than an AC transmission link.

Even though HVDC conversion equipment at the terminal stations is costly, overall savings in capital cost may arise because of significantly reduced transmission line costs over long distance routes. HVDC needs fewer conductors than an AC line, as there is no need to support three phases. Also, thinner conductors can be used since HVDC does not suffer from the [skin effect](http://en.wikipedia.org/wiki/Skin_effect).

Board activity

Deriving the expressions necessary for proving that high voltage transmission is more advantageous

Comparing low voltage and high voltage transmission

Ref: <http://www.dciinsulator.com/shownews.asp?id=155>

**Session 4-Types of DC links**

**Quiz**

1. What are the advantages of DC?
2. What is the most common form of DC system adopted?
3. What are the disadvantages of DC generation?

Ref: <http://www.webpages.uidaho.edu/sustainability/chapters/ch06/ch06-p3a.asp>

Presentation

Giving detailed explanation on structure of dc links

 Types of dc links

 Diagram

 Comparison

BIPOLAR dc link:

 

Board activity

Deriving the expressions necessary for proving that high voltage transmission is more advantageous

Comparing low voltage and high voltage transmission

Ref: <http://en.wikipedia.org/wiki/High-voltage_direct_current>

**Session 5-An Introduction to Extra high voltage DC transmission**

**Quiz**

1. What are the advantages of DC?
2. What is the most common form of DC system adopted?
3. What are the disadvantages of DC generation?

Ref: <http://www.webpages.uidaho.edu/sustainability/chapters/ch06/ch06-p3a.asp>

Presentation

Giving detailed explanation on extra high voltage dc transmission

EHVAC line in India

Dehar-panipat

Obra-sultanpur

Srinagar-jammu Kashmir

Agra-gwalior

Board activity

Deriving the expressions necessary for proving that high voltage transmission is more advantageous

Comparing low voltage and high voltage transmission

Ref: <http://en.wikipedia.org/wiki/High-voltage_direct_current>

**Session 6-An Introduction to FACTS**

**Quiz**

1. What are the advantages of FACTS?
2. What are the types of FACTS devices?
3. What are the advantages of FACTS?

Ref: <http://www.electrotechnik.net/2010/09/surge-arrestors-introduction.html>

Presentation

Giving detailed explanation on FACTS

FACTS-Flexible AC Transmission System

Facts –are power electronics based controllers capable of changing of one or more parameter of power system

Types of facts controller:

 Shunt connected controller

 Series connected controller

 Combined series and shunt connected controller

**Board** activity

Deriving the expressions necessary for proving that high voltage transmission is more advantageous

Comparing low voltage and high voltage transmission

Ref: <http://www.electrotechnik.net/2010/09/surge-arrestors-introduction.html>

**Session 7-Benefits of FACTS**

**Quiz**

1. What are the applications of FACTS?
2. What are the types of FACTS devices?
3. What are the factors affecting benefits of FACTS?

Ref: <http://www.google.co.in/url?sa=t&rct=j&q=Benefits%20of%20%20FACTS%20&source=web&cd=3&ved=0CDkQFjAC&url=http%3A%2F%2Fwww.meppi.com%2Fservice%2Fpses%2Fdocuments%2Ffacts%2520applications.pdf&ei=E_nxUeKoFMvQrQf2uIG4DQ&usg=AFQjCNG3kP9yumRfYeSVAKhibsMA0W8UCw&bvm=bv.49784469,d.bmk>

Presentation

Giving detailed explanation on benefits of FACTS

The emerging technology of Flexible AC Transmission System (FACTS) enables planning and operation of power systems at minimum costs, without compromising security. This is based on modern high power electronic based on controllers

**Board activity**

Listing out the different applications of FACTS devices

Comparing the benefits of FACTS with HVDC

Ref: <http://www.hiturko.com/ebooks/201426-hvdc-and-facts-controllers-applications-of-static-converters-in-power-systems-by-vijay-k-sood.html>

**Session 8-Sag and tension calculation**

**Quiz**

1. What are the factors affecting sag?
2. What are the types of supports?
3. Define sag

Ref: [http://udini.proquest.com/view/mechanical-state-estimation-of-pqid:1863891431/](http://udini.proquest.com/view/mechanical-state-estimation-of-pqid%3A1863891431/)

Presentation

Giving detailed explanation on sag calculation

 Diagram

 Terms

 Derivation

**Expression**

 SAG S=wl2/8T m



Board activity

Deriving the expressions necessary for calculation of sag

Different cases

Ref: [http://udini.proquest.com/view/mechanical-state-estimation-of-pqid:1863891431/](http://udini.proquest.com/view/mechanical-state-estimation-of-pqid%3A1863891431/)

**Session 9-Tutorial on sag calculation**

**Presentation**

Giving detailed explanation on how to solve the problem

 Reading the given data

 Understanding the question

 Simple problems

Board activity

Solving a problem by a student

Interpreting the results

**HOW TO SOLVE A PROBLEM**

Sag at same height s=wl2/8T

 Sag at different height s=wl2/2T



Ref: <http://www.electrotechnik.net/2010/09/surge-arrestors-introduction.html>

**Session 10-Effct of ice and wind pressure**

1. What are the effects of ice loading?
2. What are the effects of wind pressure?
3. How to include the net effect?

Ref: <http://electrical-engineering-portal.com/sag-tension-transmission-distribution-lines>

Presentation

Giving detailed explanation on calculation of net force

 Calculation of net force

 Explaining the terms

Board activity

Finding solution for a problem with effect of ice and wind pressure

 Wi=density of ice \*volume of ice/unit length

$$wi=density of ice×πt\left(d+t\right)$$

 vertical sag sv=s$\cos(θ)$



Comparing the solution with problem neglecting wind pressure

Ref: <http://www.electrotechnik.net/2010/09/surge-arrestors-introduction.html>

**Session 11-Tutorial on ice effect**

**Presentation**

Fecilitating the students in solving the

 Reading the given data

 Calculating sag

 Calculation of vertical sag

Board activity

Writing the steps on the board

 Calculate height above the ground at which the conductor to be supported

 Calculate tension

 Calculate minimum clearance

 Calculate sag at mid point

Inferring the results

Ref :<http://www.docstoc.com/docs/88387979/Sag-tension-Calculations>

**Session 12- Sag calculation with both ice and wind loading**

**Presentation**

Solving a problem with wind pressure

 Collecting data

 Finding the solution

Board activity

Solution of a problem by a student

Comparing the results 

Ref: <http://www.docstoc.com/docs/88387979/Sag-tension-Calculations>