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It serves power to the following purpose 1 It transmits power to S. For this purpose isolator is needed, which can break the system physically. Generally isolator is a mechanical switching device and they are operated under no load condition to avoid heavy flashing. So it should never be opened until the Circuit Breaker in the same circuit has been opened and should always be closed before the circuit breaker is closed. The breaker are so designed that they can be operated manually under normal condition and automatically under faulty condition. For this purpose they use different relays. The specification of breaker of different companies used in this sub-station is given below: T connected to the system elements which are to be protected. In the sub-station we have an idea that most of relay are electromagnetic type or induction type. It operates when the system takes more current than the safe operating current that is also predetermined in the relay. The disc of the relay rotates and it makes the trip circuit and alarm circuit and the flag I dropped from which we can understand that the relay has been operated. The over-current relays used in the substation are of following ratings: It operates when an earth fault occurs in the system where it is connected. Although an earth fault and over current relay are the same in construction, still they operate on different principle. The earth fault relay used in sub-station are of following ratings: Buchholz is used in a transformer to detect any internal fault with in a transformer, placed in between the transformer tank and the oil conservator, and this relay is connected to alarm circuit, to alert the operating personnel to take necessary action against the fault. It is a gas actuated relay. There are two elements upper element and lower element consists of mercury type switch. The circuit below is the basic circuit of buchholz relay. This type of relay operates when the phase differ or there is difference in quantity ratio of two or more similar electrical quantities. It gives sufficient protection to transformer internal fault. Except these the following relays are also used in the sub-station as auxiliary relay because they sense condition from the main relay e. The relay contact are immediately closed after the current in the relay coil exceeds the minimum calibrated value. In the training we have the knowledge about various metering instrument as stated below: For high or extra high line volt the meter are connected with secondary of P. These are connected with secondary Metering winding of C. Actually it consists of three meter all together with a special summator mounted between them. All the meter drive the summator through a complicated gearing system. This is achieved by insulator, which are most commonly made of porcelain. There are several type of insulators e. These are used depending upon service requirements. Strain type insulator are used to provide the tension of the conductor at the dead end. On KV line nine discs are used in series by metal links. The insulator are glazy smooth enough to prevent deposition of dust, and ultimately for preventing the leakage of current and corona. There are capacitor bank. So now power factor: These are basically copper or aluminium rods. They may also be made of A. In Kv side there are two bus-bar arrangements one main bus and the other transfer bus One is at a time operated. In 33kv side two bus , bus A and bus B are operated parallel. They are connected by bus-coupler for protection and continued purposes. In duplicate bus bar system once at a time one bus in operation and other is at rest. So whenever there need to repair the used bus bar then by this bus coupler arrangement the service can be continued without power interruption. Here in KV side two bus bar are connected with the bus coupler arrangement. It is essentially consist of C. All protection of feeder of bus is obtained by this arrangement. The function of this trap is that it traps the unwanted waves. Its function is of trapping wave. Its shape is like a drum. It is connected to the main incoming feeder so that it can trap the waves which may be dangerous to the instruments here in the substation. Low pass filter when power frequency currents are passed to switch yard and high frequency signals are blocked. Line Isolator with E. To isolate the line from Sub Station and earth, it under shut down. The Sub-station buses can be of the following typesa Rigid buses of solid conductor or tube bus b Strain buses As the cost of copper is very high and it is not so available so most conductor are made from aluminium. In

the transmission line A. R Aluminium Conductor Steel Reinforce type conductor are used to give sufficient tension. So the control cable and conduits are necessary for affecting such automatic control. These conductor are generally placed in the ducts to run from control room to the junction boxes or where it is needed 3. There are a no. The system is provided with a battery charger system from a low voltage A. They are- 1 Station battery: From this control room, operator performs all type of control operations , recording of like lead, maximum demand etc. For handling a large amount of power oftenly used transformer are known as power transformer. The two transformer are operated in parallel. It is used for protection purpose. Actually these transformer operated at no-load condition in the secondary side. But in practice it is not possible. The main purpose is to accommodate expanded oil due to heat. Silica gel crystals calcium chloride are used for this purpose. It shall always be ensure that the bottom hole of the breather remains open. Successful effective operation of power supply system largely on effective protection of transformer as the replacement against each failure is not only costly but time sharing. Following protections are normally used: No- Electrical Specification no. Transformer total Its 8. In general the line supports should have the following properties: Power line carriers is used in almost all the countries of the world to transfer information via HV transmission lines and has become an important instrument for the management and safety of electrical power system. Multiple uses of PLC channel for speech, data, and protection have been become widely established. T, Circuit Breaker, Isolator etc. Other side Primary connection of CVT is grounded. Output of CVT is also used for synchronization purpose. Communication is possible in Duplex mode. Even data communication is possible. The carrier can communication voice and data by superimposing an analog signal over the standard 50Hz alternating current. More recently, high speed data transmission has been developed using the lower voltage transmission lines used for power distribution. A short range from of power line carrier is used for home automation and intercoms. The technology of PLCC is of two types as follows: The sub-station receives power at kv from kolaghat thermal power station, three phases, double circuit. And then it delivers power at33KV. The main activities of the sub-station are to operate the equipment present in the sub-station and to have a proper co-ordination among mentioned sub-station. So they are sometime badly damage. It is the routine work to do the maintenance operation once in a weak. Each pole of the breaker is provided with an oil level indicator, a breather and a gas discharge valve from venting the gases formed during the current interruption. An extinguishing chamber of a contraction type is build into the interrupting chamber insulator. The fixed contact is tripped with heat resistance contact metal and is provided with an arcing ring. The base frame contains the operating shaft operating spring, starting buffers and oil dash pot. Circuit breaker which have in closed position for an extended period get a coating on the current transmitting surfaces on the contacts which increases the resistance in the main circuit. This operation is also favorable for the parts of the mechanism incorporated and contributed to a high degree of preparedness and at the same time is to check on operating end signal devices. The powerhouses may be far away from the load centers. So the transformer network is inevitable.

## Chapter 2 : report on kv sitapura gss

*Training Report in a k.v Substation. Report on to KV Substation. Documents Similar To Training Report on to KV Substation.*

Voltage ac to dc freq. The present day electrical power system is a. The electric power is produced at the power station, which are located at favorable places, generally quite away from the consumers. It is delivered to the consumer through a large network of transmission and distribution. At many places in the line of power system, it may be desirable and necessary to change some characteristic e. Voltage, ac to dc, frequency p. This is accomplished by suitable apparatus called sub-station for example, generation voltage 11KV or 6. This job is again accomplished by suitable apparatus called sub-station. The substation in Bhinmal, Jalore, Rajasthan is one of the largest power grids in the state of Rajasthan and the northwest area India. The most important of any substation is the grounding Earthing System of the instruments, transformers etc. An earthing system comprising of an earthing mat buried at a suitable depth below ground and supplemented with ground rods at suitable points is provided in the substations. These ground the extra high voltage to the ground. As it is dangerous to us to go near the instrument without proper earth. If the instruments are not grounded properly they may give a huge shock to anyone who would stay near it and also it is dangerous for the costly instrument as they may get damaged by this high voltage. It has a vital influence of reliability of service. Apart from ensuring efficient transmission and Distribution of power, the sub-station configuration should be such that it enables easy maintenance of equipment and minimum interruptions in power supply. The voltage level of power transmission is decided on the quantum of power to be transmitted to the load center. This is because water is required for various construction activities especially civil works, earthing and for drinking purposes etc. Equipment in a KV Sub-Station: The equipment required for a transformer Sub-Station depends upon the type of Sub-Station, Service requirement and the degree of protection desired. The bus is a line in which the incoming feeders come into and get into the instruments for further step up or step down. The first bus is used for putting the incoming feeders in LA single line. There may be double line in the bus so that if any fault occurs in the one the other can still have the current and the supply will not stop. The two lines in the bus are separated by a little distance by a Conductor having a connector between them. This is so that one can work at a time and the other works only if the first is having any fault. They support the conductor or bus bar and confine the current to the conductor. The most commonly used material for the manufacture of insulators is porcelain. There are several types of insulator i. This is accomplished by an isolating switch or isolator. An isolator is essentially a knife Switch and is designed to often open a circuit under no load, in other words, isolator Switches are operated only when the line is which they are connected carry no load. For example, consider that the isolator are connected on both sides of a circuit breaker, if the isolators are to be opened, the C. These circuit breaker breaks for a fault which can damage other instruments in the station. It is so designed that it can be operated manually or by remote control under normal conditions and automatically under fault condition. There are mainly two types of circuit breakers used for any substations. They are SF6 circuit breakers; b spring circuit breakers. For the latter operation a relay wt. For still higher voltage, air blast vacuum or SF6 cut breaker are used. The use of SF6 circuit breaker is mainly in the substations which are having high input kv input, say above kv and more. The gas is put inside the circuit breaker by force ie under high pressure. When if the gas gets decreased there is a motor connected to the circuit breaker. The motor starts operating if the gas went lower than There is a meter connected to the breaker so that it can be manually seen if the gas goes low. The circuit breaker uses the SF6 gas to reduce the torque produced in it due to any fault in the line. The circuit breaker has a direct link with the instruments in the station, when any fault occurs alarm bell rings. The relay detects the abnormal condition in the electrical circuit by constantly measuring the electrical quantities, which are different under normal and fault condition. The electrical quantities which may change under fault condition are voltage, current, frequency and phase angle. Having detected the fault, the relay operates to close the trip circuit of C. The measuring instrument and protective devices are designed for low voltage generally V and current about 5A. Therefore, they will not work satisfactorily if mounted directly on the power lines. This

difficulty is overcome by installing Instrument transformer, on the power lines. There are two types of instrument transformer. Current transformers are basically used to take the readings of the currents entering the substation. This transformer steps down the current from amps to amp. This is done because we have no instrument for measuring of such a large current. The main use of this transformer is a distance protection; b backup protection; c measurement. The primary of these transformer consist of a large number of turn of fine wire connected across the line. The secondary way consist of a few turns and provides for measuring instruments and relay a voltage which is known fraction of the line voltage. Ammeters, Voltmeters, energy meter etc. The instrument transformer are invariably used with them for satisfactory operation. In case of a KV or more KV line station auto transformers are used. Transformer is static equipment which converts electrical energy from one voltage to another. As the system voltage goes up, the techniques to be used for the Design, Construction, Installation, Operation and Maintenance also become more and more critical. If proper care is exercised in the installation, maintenance and condition monitoring of the transformer, it can give the user trouble free service throughout the expected life of equipment which of the order of years. Hence, it is very essential that the personnel associated with the installation, operation or maintenance of the transformer is through with the instructions provided by the manufacture. The transformer is based on two principles: Changing the current in the primary coil changes the magnetic flux that is developed. The changing magnetic flux induces a voltage in the secondary coil. This lightning arrestor has an earth switch, which can directly earth the lightning. The earth switch can be operated manually, by pulling the switch towards ground. This also helps in breaking the line entering the station. By doing so maintenance and repair of any instrument can be performed. This isolator prevents the instruments to get damaged. It also allows the only needed voltage and rest is earthed by itself. The potential transformer uses a bus isolator to protect itself. The main use of this transformer is to measure the voltage through the bus. This is done so as to get the detail information of the voltage passing through the bus to the instrument. There are two main parts in it a measurement; b protection. These lightning arrestors can resist or ground the lightning if falls on the incoming feeders. The lightning arrestors can work in a angle of 30 degrees around them. They are mostly used for protection of the instruments used in the substation. As the cost of the instrument in the station are very high to protect them from high voltage from lightning these lightning arrestors are used. Metal oxide varistors MOVs have been used for power system protection since the mid s. The typical lightning arrester also known as surge arrester has a high voltage terminal and a ground terminal. The function of this trap is that it traps the unwanted waves. Its function is of trapping wave. Its shape is like a drum. It is connected to the main incoming feeder so that it can trap the waves which may be dangerous to the instruments here in the substation. Low pass filter when power frequency currents are passed to switch yard and high frequency signals are blocked. Line Isolator with E. Frequency to carrier panels and power frequency parameters to switch yard. The fire protection device should be kept in store yard for safety of equipments during storage. The instruments have their usual functioning. They are as follows in the single line diagram. Isolators with earth switch 6. Potential transformer with a bus isolator Lightning arrestors with earth switch A capacitor bank attached to the bus. The line diagram of the substation: This substation has the capacity of kv and can step down to kv using two input lines through the incoming feeders.

## Chapter 3 : training report 33kv substation

*33 kv substation training report pdf file download ABSTRACT The project work assigned to us was to design a /33 KV EHV sub-station. We considered incoming power at KV and the power was transferred to main bus through isolator-circuit breaker-isolator combination.*

All necessary materials, adjustments, dismantling, remedial and tidying-up work in order to complete the work specified shall be included in the contract price. The scope of work comprises the following: The configuration of the kV busbar shall be double busbar scheme. Switchyard layout shall be designed such as to accommodate double bus U type configuration. Associated control, metering, protection equipment, synchronizing scheme and substation automation system for complete substation. Requirements Complete design, supply and construction of all civil items required for land development. All required electrical signals shall be transmitted to the NLDC through the Industrial Gateway of the substation automation system. All HV breakers, motorized disconnectors, tap changer, etc. All necessary modification works in the software of master station of NLDC are to be carried out. The materials shall have to be handed over to the designated store as per instruction of the Engineer. Complete design, supply and construction of all civil items required for land development. The configuration of the existing kV busbar is ring bus arrangement and consists of two 2 line bays and two 2 transformer bays. Civil Works, Building and Foundation: The existing control room building shall be renovated internally with all civil items and facilities as required including placing of new floor tiles. All HV breakers, motorized disconnectors etc. The configuration of the existing kV busbar is single bus arrangement and consists of two 2 line bays and one 1 transformer bay and a sectionalizer breaker bay. The existing 33kV indoor type AIS single bus shall be extended to accommodate one 1 bustie bay for connecting new outdoor bus. Requirements Associated control, metering, protection equipment, synchronizing scheme and substation automation system for new four 4 kV overhead line bays, and replacement of existing two 2 line bays, existing one 1 transformer bay and existing one bus tie bay. Complete design, supply and construction of all civil items required for land development filling by carried earth for new area to be extended under this turnkey bid. Requirements materials shall have to be handed over to the designated store as per instruction of the Engineer. The existing bus shall be extended to accommodate two overhead line bays. Associated control, metering, protection equipment, synchronizing scheme for new two 2 kV overhead line bays. Requirements Mymensingh is situated at the north side, about km away from the capital city Dhaka.. The configuration of the existing kV busbar is double bus arrangement and consists of two 2 line bays, two 2 power station bays and a bus tie bay. Associated control, metering, protection equipment and synchronizing scheme for new two 2 kV overhead line bays. The configuration of the existing kV busbar is double bus arrangement and consists of two 2 line bays, three 3 transformer bay and a bus tie bay. The existing bus shall be extended to accommodate two 2 overhead line bays one shall be fully equipped and the other shall be kept unequipped as future provision. Requirements kV AIS switchyard for extension of new one 1 kV overhead line bays in order to connect kV overhead line Sunamganj Associated control, metering, protection equipment and synchronizing scheme for new one 1 kV overhead line bay.

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Through the columns of this project file, I would like to take the opportunity to thank Prof. Director, ASET for encouraging us in doing the summer training. I would also like to thank Prof. Singh HOD, Department of Electronics and Communication who gave us valuable suggestions during the execution of the project. I would like to thank my external guide Mr. At last I would like to thank all those around me who helped me in any way to bring the project in its present form. Any suggestions for the improvement of this project file would be highly accepted. These modifications were necessarily responsible for the management and planning of electrical power industry while considering electricity power generation, transmission, distribution and supply. The sub-station, in which I did my internship, is located near Gudumba Bus station, Lucknow. Here the supply from Chinhut is used as a primary feed to the sub-station whereas the NKN supply is used for backup. At first a Lightning Asserter is used in a 3-phase transmission setup in order to protect the grid from surges due to lightning. After this comes the need to measure the voltage and current in the transmission lines. Just like an ammeter and a voltmeter, a CT is connected in series with the transmission line whereas a CVT is connected parallel to the transmission line. Since they both are transformer they must have a transformation ratio. In Khurram Nagar sub-station the transformation ratio of these to instrument transformers is Now comes the time of implementing some safety features in the transmission line setup. For that we first use a Line Isolator and then a Bus Isolator. But these alone are not enough, so we use a Gas Circuit Breaker. These circuit breakers can be operated via control panel in the operating room. A lightning arrestor, current transformer and some control equipment are used on both sides of the transformers for better monitoring. The transformers step down the KV supply to 33KV supply. Then this 33KV supply is fed to the nine feeders that are installed in the sub-station. These feeders deliver the power to the following power houses under the control of LESA: It is used as a backup feeder when some other feeder is under maintenance. Also there is another step down transformer installed in the sub-station which is used to supply electricity to the sub-station. Furthermore, use of only one conductor is also possible but with earth as return path. Thereby reducing the insulation cost. They protect the conductors, insulators, transformers and other equipment that are attached to it. Usually a lightning arrester is made up of a high voltage terminal and a ground terminal. The lightning arrester easily channels to the earth any lightning surge that travels to it through the transmission line. In the absence of lightning arrestor, thousands of kilovolts of electricity can be introduced causing serious damage to the transmission system. Costly instruments such as transformers are very much sensitive too these kind of surges and once damaged they are very expensive to repair. Chances of fire hazards also increase in these situations. In transmission systems, lightning arrestors are made up of porcelain tube. They are high usually several feet and several inches in diameter. Disks of zinc oxide are generally filled in them. They are provided with a safety port on the side to dissipate occasional internal explosions without harming the porcelain cylinder. Lightning arresters are graded by: Let there be an instrument which is connected to terminal A and terminal E is earthed. In normal conditions, no current flows through terminal A to terminal E because of the large resistance between B and C; and C and D. But when lightning strikes, the voltage is very high and even those large resistances have no effect. So electricity gets channeled to earth without destroying the instrument. The lightning arresters installed in the sub-station were of ABB. All the arresters were carefully placed so as to avoid any sort of damage to the sub-station due to lightning strikes and surges. To achieve that, Electrical Isolators are used. These are like mechanical switches which are used to completely isolate a part of transmission circuit so that some maintenance work can be performed. Electrical isolators are of various types: This is done to avoid arcing. Therefore an isolator must be opened only after opening the circuit breaker and must be closed before closing the circuit breaker. The isolator mechanism can be operated both manually by hand and using a motor that is operated from a distance. Motor system is costly and hence must be chosen properly, whereas hand operated system is cost effective. Usually hand operated systems are used for voltages

upto KV and motorized system are used for higher voltages. Khurram nagar KV sub-station has single break isolators which are used on bus side, line side as well as on transfer bus side. They all are operated using hand held mechanism. Modern power systems deal with huge amount of current so the designing of these circuit breakers should be such that no arc is produced and hence we get safe and loss free functioning. The potential energy can be stored in the circuit breaker by different ways: This causes tremendously fast sliding of the moving contact. All circuit breaker have operating coils tripping coils and close coil , whenever these coils are energized by switching pulse, the plunger inside them gets displaced. This operating coil plunger is typically attached to the operating mechanism of circuit breaker and the moving contacts are mechanically connected with this operating mechanism through a gear lever arrangement. There is a conversion of stored potential energy into kinetic energy, which makes the moving contact to move. Once the cycle of circuit breaker operation is complete, the total energy is again stored in the form of potential energy by means of spring charging motor or air compressor or by any other means. The circuit breaker has to carry large rated or fault power. While carrying this large power there is always a risk of dangerously high arcing between the moving and the fixed contacts during the circuit breaker operation. For safe arc quenching in the circuit breaker, the dielectric strength between the current carrying contacts should be increased rapidly during every zero current crossing of the alternating current. The dielectric strength of the media in between contacts can be increased in numbers of ways: SF6 gas has a high affinity of absorbing free electrons as its electro-negativity is very high. Moreover, SF6 is an excellent insulator. The SF6 molecules absorb the free electrons from the arc, and hence form a negative ion. These negatively charged ions have a very low mobility compared to the free electrons. Hence there is no arcing as the mobility of the charges is the main reason of movement of current through the gas. Electron can be attached to SF6 molecule in two different ways: The gas can also transfer heat very efficiently through convection due to its low viscosity. Considering all these properties of SF6, it becomes times more effective than air to be used in circuit breakers. Hence they can be used for voltage ranges from 33KV to KV and beyond. This setup is generally used for arc quenching in medium voltage applications. Vacuum interrupter is a vacuum chamber in the breaker where all the operations of opening and closing of contacts and linked arc quenching takes place. The vacuum pressure inside the vacuum interrupter is generally maintained at bar. The interrupter is basically a steel arc chamber in the center of symmetrically arranged ceramic insulators. CuCr is generally used to make vacuum circuit breaker contacts, because these current carrying contacts are very important for the performance of these circuit breakers. Its size has been greatly reduced and the contact geometry has evolved from butt contact to spiral shape, cup shape and axial magnetic field contact. These are one of the most reliable medium voltage switchgears and require least maintenance. Here the AC power so generated by these plants is then transmitted over all parts of the country. The power should be transmitted at appreciably high voltage to reduce the losses and increase the transmission efficiency. On contrary, at the consumer end, the power should be transmitted at low voltages based on the nature of load. Such transformation of AC power from one voltage level to another is obtained by the use of a device known as transformer. Transformer is an alternating current dependent machine that is employed to transfer electrical energy from one electrical circuit to another. It does so without change in frequency and follows the principle of electromagnetic induction. It has two electric circuits that are linked with a common magnetic circuit. These are kept in use 24 hours a day whether they are carrying any load or not. They have very good voltage ratio and are designed for small value of leakage resistance. They are used to step up and step down voltages greater than 33kV and upto kV. They are used to transmit very heavy loads and are usually rated upto MVA. They are maintained to have very high efficiency so that minimum power is lost during the transmission process. They are bigger in size as compared to distribution transformers. They have high insulation levels. Their type generally is according to needs: They are used to isolate and transform voltage and current levels. The most common use of these transformers is to operate instruments or measuring from high voltage and current circuits. They can safely isolate the secondary low voltage current circuit from the primary high voltage current circuits thus ensuring that the secondary circuit is not harmed by such high voltage current.

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### Chapter 8 : training report on to 33kv substation

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### Chapter 9 : Training Report on to KV Substation

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