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Analysis and Selection for Overhead Conductor Sizes for Distribution and Transmison Lines

[1]Dieokuma, [2]Adebayo Adeniyi .D.
[1]Tamunosiki Department of Physic Federal University Otuoke, P.M.B. 126 Yenagoa, Bayelsa State, Nigeria.
[2]Department of Electrical Electronic Engineering Federal University Otuoke, P.M.B. 126 Yenagoa, Bayelsa State, Nigeria.

--*ABSTRACT*--
A novel pulsed power generator based on IGBT stacks is proposed for wide pulsed power applications because it can generate high voltage pulsed output without any step-up transformer or pulse forming network, it has advantages of fast rising time, easiness of pulse width variation, high repetition rate and rectangular pulse shapes. Proposed scheme consists of multiple power stages which were charged parallel from series resonant power inverter. Relying on the number of power stages it can boost maximum voltage up to 60 kV or higher with no limits of power stages. To minimize component for gate power supply, a simple and robust gate drive circuit which delivers gate power and gate signal simultaneously by way of one high voltage cable is proposed. For gating signal and power a full bridge inverter and pulse transformer generates on-off signals of IGBT gating with gate power simultaneously and it has very good characteristics of protection of IGBT switches over arcing condition. It can be used for various kinds of pulse power application such as plasma source ion implantation, sterilization, water and gas treatment which needs few kHz pulse repetition rate with few to ten of microseconds pulse width.
KEYWORDS: *Power System Protection, Drive Circuit, Pulse Techniques, Time Current Characteristics and Pulse Power Supply.*

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I. INTRODUCTION

In recent years, the making of underground cables with extruded insulations, like cross linked polyethylene (XLPE), and their enhanced performance has shifted the focus of attention from the fitting of ordinary overhead lines to the fitting of underground Extra-High Voltage (EHV) and High Voltage (HV) transmission circuits. The liberalization of the energy market and the need to connect new power plants to grids has stimulated rising need to extend existing transmission schemes. However, the preference of whether to use overhead line (OHL) or underground cable (UGC) must be consistent with safety, reliability and operational constraints to ensure that the ability of the transmission grid efficiently matches the supply and demand of electrical energy. The preference amid OHL and UGC is driven by technical, ecological and economic considerations. Today's transmission scheme is being used at power flow levels that reach the voltage, stability and thermal limits of cables and conductors. Transmission constraints and instabilities can cause negative effect on the entire power scheme. Transmission lines need endurance against higher electrical and mechanical stresses in order to sustain the reliability of scheme operations. Overhead transmission networks are an essential part of a country's infrastructure and are generally massive undertakings implemented in the developing regions. Overhead conductors are classified by the sortof materials used for conductors, types of reinforcing cores used, and either it is bare or insulated.

The allotment scheme is a largest portion of network in electrical power scheme. It starts with the allotment substation that is fed by one or more sub transmission lines. Some of the substations are directly fed through the High-Voltage transmission line in that case there is no sub transmission scheme. This rely upon company to company. Each allotment substation serve one or more primary feeders. Generally the feeders are radial, which means that there is only one path for power to flow from the Allotment substation to the user. It is the defined as the part of power scheme this distributes power to various customers in ready-to-use form at their place of consumption. Hence, utilities have to ensure reliable and efficient cost effective service, while providing service voltages and power quality within the specified range. This is a very challenging task. Utilities, traditionally ascertain future scheme developments based on a top down approach, all over the world are competing for improvement in service to consumers. Mostly the power utilities emphasize on power generation and transmission scheme to minimize the overall cost of the scheme. Many of the allotment schemes experience uncontrolled expansion, minimum monitoring, under/overutilization and development in unplanned manner.

Conductor is often the biggest contributor to allotment scheme losses. Economic conductor sizing is therefore of major importance. The power loss is notably high in allotment schemes because of lower voltages and higher currents, when compared to that in high voltage transmission schemes. Studies have indicated that as much as 13% of total power generated is consumed as I2R losses in allotment level. Reduction of total loss in allotment schemes is very essential to improve the overall efficiency of power delivery. The capital investment in laying allotment network lines accounts for a considerable fraction of total capital, investment.
The preference of conductors rely on the cost and efficiency. An ideal conductor has following features.

- It has maximum electrical conductivity
- It has high tensile strength so that it can withstand
- mechanical stresses It has least specific gravity i.e. weight/unit volume
- It has least cost without sacrificing other factors
- Choosing a larger conductor design will have higher up front capital costs, but this may lead to lower overall life cycle cost.

Consequently, much attention has to be given to the careful selection of a conductor design to meet the present and predicted future load need. A process needs to be followed to choose a conductor for transmission and allotment.

I.I. Importance

The main aim of the study is to do an analysis and selection for overhead conductor sizes for allotment and transmission lines. It specific objectives are:

1. To evaluate the various overhead conductor sizes suitable for allotment and transmission lines
2. To identify the criteria in the determination of a good overhead conductor
3. To develop a valuable guide to assist with the selection of conductor size for overhead transmission and allotment lines.
4. To highlight the significance of incorporating planning and load forecast considerations, power quality constraints, voltage collapse in selecting overhead conductor sizes.

II. REVIEW OF LITERATURE

Overhead Conductor

An overhead power line is a structure used in electric power transmission and allotment to transmit electrical energy across large distances. It constitute of one or more conductors (commonly multiples of three) suspended by towers or poles. Since most of the insulation is offered by air, overhead power lines are generally the lowest-cost method of power transmission for large quantities of electric energy. Towers for support of the lines are made of wood (as-grown or laminated), steel or aluminum (either lattice structures or tubular poles), concrete, and occasionally reinforced plastics. The bare wire conductors on the line are generally made of aluminum (either plain or reinforced with steel or composite materials such as carbon and glass fiber), though some copper wires are used in medium-voltage allotment and low-voltage connections to customer premises. A major goal of overhead power line design is to sustain adequate clearance amid energized conductors and the ground so as to prevent dangerous contact with the line, and to offer reliable support for the conductors, resilience to storms, ice loads, earthquakes and other potential damage causes. Today overhead lines are routinely operated at voltages exceeding 765,000 volts amid conductors. The most common conductor in use for transmission today is aluminum conductor steel reinforced (ACSR). Also seeing much use is all-aluminum-alloy conductor (AAAC). Aluminum is used because it has about half the weight and lower cost of a comparable resistance copper cable. It does, however, need a larger diameter than copper because of lower specific conductivity). Copper was more popular in the past and is still in use, especially at lower voltages and for grounding. While larger conductors lose less energy because of their lower electrical resistance, they cost more than smaller conductors. An optimization rule called *Kelvin's Law* states that the optimum size of conductor for a line is found when the cost of the energy wasted in a smaller conductor is equal to the annual interest paid on that additional cost of the line construction for a larger conductor. The optimization problem is made more complex by additional factors such as varying annual load, varying cost of fitting, and the discrete sizes of cable that are commonly made. A minimum overhead clearance must be sustained for safety. Since the temperature of the conductor boosts with increasing heat produced by the current through it, it is sometimes possible to boost the power handling ability (uprate) by changing the conductors for a sort with a lower coefficient of thermal expansion or a higher allowable operating temperature.

Conventional ACSR (left) and modern carbon core (right) conductors

Two such conductors that offer minimized thermal sag are known as composite core conductors (ACCR and ACCC conductor). In lieu of steel core strands that are often used to boost overall conductor strength, the ACCC conductor uses a carbon and glass fiber core that offers a coefficient of thermal expansion about 1/10 of that of steel. While the composite core is nonconductive, it is substantially lighter and stronger than steel, which allows the incorporation of 28% more aluminum (using compact trapezoidal-shaped strands) without any diameter or weight penalty. The added aluminum content helps minimize line losses by 25 to 40% compared to other conductors of the same diameter and weight, relying upon electric current. The carbon core conductor's minimized thermal sag allows it to carry up to twice the current ("capacity") compared to all-aluminum conductor (AAC) or ACSR.

Type of conductor

There is no unique process by which all transmission and /or allotment lines are designed. It is clear, however, that all major cost components of lines design rely upon the conductor electrical and mechanical parameters. There are four major types of overhead conductor used for electrical transmission and allotment.

- AAC- All Aluminium Conductor
- AAAC- All Aluminium
- Alloy Conductor
- ACSR- Aluminium conductor
- Steel Reinforced ACAR- Aluminium Conductor
- Aluminium – Alloy Reinforced

The various amalgamation and modification of these conductor types offer a wide variety of possible conductor designs.

Types of Conductor in Transmission Line

Aluminium alloy conductors have higher tensile strength than the conductor of EC grade Aluminium or AAC, ACSR consists of a central core of steel strands surrounded by layers of Aluminium strands. ACAR has a central core of higher strength Aluminium Alloy surrounded by layer of Electrical-Conductor-Grade Aluminium.

The alternate layers of a stranded conductor are spiraled in opposite direction to prevent unwinding and make the outer radius of one layer coincide with the inner radius of the next. Standing offers flexibility for a large crosssectional area. The number of strands rely on the number of layers and on whether all the strands are of the same diameter. The total number of strands in concentrically stranded conductors, where the total annular space is filled with strands of uniform diameter is 7,19,37,91 or more.

TABLE 2.1: Standard sizes of conductor for lines of various voltages

No.	Voltage in volt	Size in milimeter
1	132 KV lines	'Panther' ACSR having 7-strands of steel of dia 3.00 mm and 30-Strands of Aluminium of dia 3.00 mm
2	220 KV lines	'Zebra' ACSR having 7-strand of steel of dia 3.18 mm and 54-Strands of Aluminium of dia 3.18 mm
3	400 KV lines	Twin 'Moose' ACSR having 7-Strands of steel of dia 3.53 mm and 54-Strands of Aluminium of dia 3.53 mm.

The composite conductors are subjected to following sort tests: (a) DC Resistance (b) Ultimate Tensile Strength (c) Surface condition Test (d) Corona Test e) Radio-Interference Voltage Test Recently AAAC are being used in some SEBs to overcome menace of pilferage of ACSR and AAC conductors, particularly lower voltage lines. AAAC cannot be re-cycled and it does not have any common use for other purposes, as that in case of pure Aluminium. AAAC is made out of heat treated Aluminium-MagnesiumSilicon Alloy designed as 64401 T 81 covered under IS:9997:1991 containing 0.6-0.9% Magnesium and 0.5- 0.9% Silicon. Besides use of AAAC on lower voltage lines from the point of view of avoiding its pilferage, it is also better for use in coastal areas to avoid corrosion problem prevalent in Steel core of ACSR conductors. It is clear that all the major cost components of a transmission lines rely upon conductor physical, mechanical and electrical parameters.

Lists of these basic parameters are:

- Diameter of conductor
- Weight of per unit length
- Conductivity area
- Modulus of elasticity
- Rated breaking strength
- Coefficient of thermal expansion
- Cost of material
- Maximum unloaded design tension
- Resistance to vibration and or galloping
- Surface shape/drag coefficient
- Fatigue resistance

These basic parameters are not necessarily independent of one another. However, certain parameter can be varied independent over a range of design considerations.

Transmission and allotment Line

Electric power transmission is the bulk movement of electrical energy from a generating site, such as a power plant, to an electrical substation. The interconnected lines which facilitate this movement are known as a transmission network. This is distinct from the local wiring amid high-voltage substations and customers, which is typically referred to as electric power allotment. The combined transmission and allotment network is known as the "power grid" in North America, or just "the grid". A wide area synchronous grid, also known as an "interconnection" in North America, directly connects many generators delivering AC power with the same relative *frequency* to many consumers. For example, there are four major interconnections in North America (the Western Interconnection, the Eastern Interconnection, the Quebec Interconnection and the Electric Relyability Council of Texas (ERCOT) grid). In Europe one large grid connects most of continental Europe.

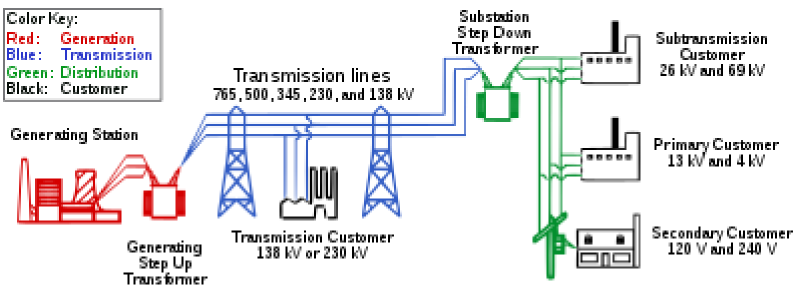

Diagram of an electric power scheme; transmission scheme is in blue

Electricity is transmitted at high voltages (115 kV or above) to minimize the energy loss which occurs in long-distance transmission. Power is usually transmitted through overhead power lines. Underground power transmission has a notably higher fitting cost and greater operational limitations, but minimized maintenance costs. Underground transmission is sometimes used in urban areas or ecologically sensitive locations. A lack of electrical energy storage facilities in transmission schemes leads to a key limitation. Electrical energy must be generated at the same rate at which it is consumed. A sophisticated control scheme is needd to ensure that the power generation very closely matches the demand. If the demand for power exceeds supply, the imbalance can cause generation plant(s) and transmission equipment to automatically disconnect or shut down to prevent damage. In the worst case, this may lead to a cascading series of shut downs and a major regional blackout. Examples include the US Northeast blackouts of 1965, 1977, 2003, and major blackouts in other US regions in 1996 and 2011.

Overhead Transmission Line

High-voltage overhead conductors are not covered by insulation. The conductor material is nearly always an aluminum alloy, made into several strands and possibly reinforced with steel strands. Copper was sometimes used for overhead transmission, but aluminum is lighter, yields only marginally minimized performance and costs much less. Overhead conductors are a commodity supplied by several companies worldwide. Improved conductor material and shapes are regularly used to allow boostd ability and modernize transmission circuits. Conductor sizes range from 12 mm^2 (#6 American wire gauge) to 750 mm^2 (1,590,000 circular mils area), with varying resistance and current-carrying ability. For normal AC lines thicker wires would lead to a relatively small boost in ability due to the skin effect (which causes most of the current to flow close to the surface of the wire). Because of this current limitation, multiple parallel cables (called bundle conductors) are used when higher ability is needed. Bundle conductors are also used at high voltages to minimize energy loss caused by corona discharge. Today, transmission-level voltages are usually considered to be 110 kV and above. Lower voltages, such as 66 kV and 33 kV, are usually considered sub-transmission voltages, but are occasionally used on long lines with light loads. Voltages less than 33 kV are usually used for allotment. Voltages above 765 kV are considered extra high voltage and need diversedesigns compared to equipment used at lower voltages.

Empirical Review

Below are the literature review on fault parameters used in transmission line using diversetechnique by some authors and their main observations: HVDC Power Transmission Scheme introduced by Author K.R Padiyar projected the HVDC transmission technology is fast and its application are rapidly expanding in addition is also include the analysis and simulation of AC-DC scheme interaction which are of important in the planning .The unique component of HVDC scheme such as thyristor valves, converter ,control protection and harmonics filter by conventional protection schemes because of the low fault current due to the high impedance fault at fault point. These faults often occur when an overhead conductor breaks or touches a high impedance surface such as asphalt road, sand, cement or tree and pose a threat on human lives when neighboring objects become in contact with the line's bare and energized conductors. Multi-Agents for Fault Detection and Redesign of Power Allotment Schemes: Author introduced scheme model for fault detection and redesign based on graph theory and mathematical programming. The multi-agent models are simulated in Java Agent Development Framework and MATLAB and are applied to a power scheme model designed in the commercial software, the Distributed Engineering Workstation, By K. Nareshkumar. Most of the existing schemes are reliable on various applications but not perfect for electrical applications. Electrical environment will have lots of disturbance in nature, Due to natural disasters like storms, cyclones or heavy rains transmission and allotment lines may lead to damage. The electrical wire may cut and fall on ground, this leads to very harmful for human beings and may become fatal. So, a rigid, reliable and robust communications like GSM technology instead of many communication techniques used earlier. An Embedded based hardware design is developed and must acquire data from electrical sensing scheme. A powerful GSM networking is designed to send data from a network to other network. Any change in parameters of transmission is sensed to protect the entire transmission and allotment. By M. S. Sujatha.A Transmission scheme comprises of terminal substation, intermediate substation, transmission line and other related control and auxiliaries. The task delegated to a transmission scheme are: 1 Transfer of electrical power at specific voltage and frequency. 2 Control over power transfer in term of magnitude direction. By Manoj Nair.

III. METHODOLOGY

Diversetypes of technique used for the selection of finest size of conductor in allotment scheme

- Genetic Algorithm
- Developmentary Strategies
- Maximum Loss Reduction
- Time varying load
- Mixed-Integer LP Approach
- Colonial Selection Algorithm
- Imperialist competitive algorithm
- Plant growth Simulation Algorithm (PGSA)

Finest Conductor Size Selection in Power Allotment Schemes Using Developmentary Strategies

Mendoza, et al,2012 had presented a method, called Developmentary Strategy (ES), for the selection of finest size of conductor in radial Allotment Schemes. ES works on biologically inspired structures and operators such as reamalgamation, mutation and fitness based selection. According to the author it had been proved that ES is more successful when compared with other iterative methods on most problems. In this paper, the proposed optimization problem consists in select a conductor sort for each feeder of radial Power Allotment Schemes. The optimization procedure is subject to some technical constraints, which are the Kirchhoff's current law constraints for all the nodes, the ability constraints for the feeders and substations, and the voltage drop constraints. The Objective function was optimized considering several conductors. The cost for the obtained finest solution has been calculated. The test case shows that the ES possess high robustness to find the finest conductor sizes. From this reason, the development strategy can be used effectively to solve the optimization problem stated in this work.

Amalgamation of Finest Conductor Selection and Capacitor Placement in Allotment Schemes for Maximum Loss Reduction

Vahid et al.,2009 had presented a technique for finest placement of the capacitor banks and also finest conductor selection in radial allotment networks to minimize the losses and enhancement of voltage. The objective function included the cost of power losses, capacitors and conductors. Constraints included voltage limit, maximum permissible carrying current of conductors, size of available capacitors and sortof conductors. The optimization problem is solved by the genetic algorithm method and the size and the sortof the capacitors and conductors is ascertaind. Author simulated the results and investigated on a radial allotment network consisting of 27 buses. Author had been defined the best place of the capacitor and best conductor by making a new objective function and solved the optimization problem by GA method.

Finest selection of conductors in allotment schemes with time varying load

Falaghi et al,2008 had presented a new and efficient algorithm to the finest selection of conductors of feeder sections of radial allotment networks is proposed. In optimization procedure, cost of conducting material, cost of energy losses, bus voltage profile and current carrying ability of conductors are considered. According to author this algorithm is easy to programming and needs no approximation of actual condition. The proposed method can be applied for finest planning of radial allotment schemes. Author had shown the effectiveness of the proposed method by case study in a radial network. This study had presented a novel approach to solve the finest conductor selection problem in a radial allotment network. The main attempt had been made to minimize of capital investment and power loss, subject to voltage drop and current carrying ability constraints.

Finest conductor selection for Allotment networks using genetic algorithm

Lakshmi Devi et al.,2010 had presented the methodology for the selection of finest conductors, in radial allotment schemes . The main objective is to minimize the real and reactive power losses in the scheme and also to maximize the total saving in cost of conducting material while sustaining the acceptable voltage levels. Author obtained the finest selections of conductor sizes by conventional method and genetic algorithm method.

Conductor size selection in planning of allotment schemes for productivity improvement using imperialist competitive algorithm

Mozaffari Legha et al.,2009 had examines the use of diversedevelopmentary algorithms, imperialist competitive algorithm (ICA), to finest branch conductor selection in planning radial allotment schemes with the objective to minimize the overall cost of annual energy losses and depreciation on the cost of conductors and reliability to improve productivity. Author adopted the backward-forward sweep iterative method to solve the radial load flow analysis. Author had carried out the simulation on 69-bus radial allotment network using ICA approach in order to show the accuracy as well as the efficiency of the proposed solution technique. Finest selection of conductor sort for planning radial allotment schemes using developmentary approaches is presented with the objective to minimize the overall cost of annual energy losses and depreciation on the cost of conductors and reliability in order to improve productivity. The power losses, voltage magnitude, and current flow magnitudes are calculated using the backward-forward sweep method.

Heuristic optimization techniques to ascertain finest capacitor placement and sizing in allotment networks

Kartikeya Sarma et al.,2008 had examine the capacitor placement problem which solved using heuristic optimization techniques which are diverse and have been the subject of ongoing enhancements . This work presented a survey of the literature from the last decade that has focused on the various heuristic optimization techniques applied to ascertain finest capacitor placement and size.

Finest Selection of Capacitors for Allotment Schemes Using Plant Growth Simulation Algorithm

Deepak Sharma et al.,2012 had presented a new and efficient approach for capacitor placement in radial allotment schemes that ascertain the finest locations and size of capacitor with an objective of improving the voltage profile and reduction of power loss . Author divided the methodology in two parts: in the first part the loss sensitivity factors are used to select the candidate locations for the capacitor placement and in the second part a new algorithm that employs Plant growth Simulation Algorithm (PGSA) is used to estimate the finest size of capacitors at the finest buses ascertain in the first part. According to the author the main advantage of the proposed method is that it does not need any external control parameters. The other advantage is that it handles the objective function and the constraints separately, avoiding the trouble to ascertain the barrier factors. Author proposed the technique on 33, 34 and 69-bus radial Allotment schemes. The solutions obtained by the proposed method are compared with other methods. The proposed method has outperformed the other methods in terms of the quality of solution.

IV. OVERHEAD CABLE PREFERENCE

Non-Specular (NS)

Overhead aluminum electrical conductors, when installed, typically have a shiny surface appearance. This "reflective" or "specular" surface can make a transmission line more noticeable in appearance against the background landscape. A factory treatment process of the outer surface of the aluminum wires can render the surface finish into a dull, non-specular matte gray finish. This non-reflective or "de-glared" surface finish allows the conductor to become less visible when observed from a distance and enables the transmission line to blend in with the skyline or landscape background.

High-Conductivity Aluminum (HC)

The normal 1350 hard-drawn aluminum material used for an ACSR-sortconductor has a minimum average conductivity value of 61.2% IACS (International Association Copper Standard). By carefully selecting the feed stock of the raw materials and manufacturing process used to refine the aluminum and convert it into rolled rod, a purer grade of 1350 aluminum can be manufactured. When this is done, the aluminum conductivity value is boostd to 62.2%.

Mischmetal" Alloy-Coated Steel

Inside an ACSR and ACSS conductor, there is the stranded steel core. To offer corrosion protection for the steel, traditionally zinc has been used to coat (galvanize) the steel. In recent years, a zinc alloy material has also been used. This material, a 95% zinc/5% aluminum alloy, is available as a preference steel wire coating material. The alloy, known as zinc-5% aluminum "mischmetal", demonstrates improved corrosion resistance and high temperature exposure as compared to regular zinc.

Ultra-High-Strength Steel

In response to industry needs, there are new high strength carbon steel materials now available for ACSR and ACSS conductors. The higher strength steel overcomes some of the previous transmission line design limitations encountered with available conductor selection preferences. The availability of these new steel materials boosts the conductor rated strength and can enable enhanced sag and tension calculation results. General Cable identifies the new ultra-high-strength steel as GA5 (for zinc coated steel) and MA5 (for the zinc-5% aluminum "mischmetal" alloy coated steel) strength grade designations. General Cable participated in the creation of two new ASTM Standards to introduce these new steel types (ASTM B957 for GA5 steel and ASTM B958 for MA5 steel).

Aluminum-Clad Steel (AW)

In the USA, the "AW" identifier is used for aluminum-clad steel. Elsewhere in the world, other designations are used. Aluminum-clad steel is chosen for coastal locations or applications where there are severe corrosion concerns for the steel core and a zinc or "mischmetal" coated steel will not last. Aluminum-clad steel also offers the advantage of having a higher conductivity than conventional galvanized steel wires. The higher conductivity will minimize the line loss parameters of the transmission line, saving energy and reducing the day to-day operating cost. In an ACSS conductor, aluminum-clad steel can allow the conductor to be operated up to 250°C.

Compact (Smooth Body) Conductors

While not popular in the USA, compact AAC and ACSR sort conductors for allotment conductor sizes are used in Canada and elsewhere in the world. General Cable can supply compact AAC (to ASTM B400) and compact ACSR (to ASTM B401) “smooth body” sort conductor products. Compact conductors minimize the overall diameter of the conductor, thus lowering the resultant wind and ice loads on the conductor. In heavy ice load locations, the compact conductor preference may be an interesting design preference to explore. Contact your General Cable sales representative for additional information.

Recommendations for more economic conductor selection

Overhead Conductor Scheme Short-Time Overload Characteristics

Copper annealing begins at relatively low temperature, but the material loses its strength at about 200°C. It is therefore conceivable that, on occasions, the conductor temperature limit could be exceeded. Since it is possible to ascertain the number, magnitude, and length of temperature excursions above the steady-state maximum recommended conductor temperature of 75°C, or 167°F, it would be beneficial to know how many and how high short-term temperature excursions above the conductor temperature limit would be permissible. The Current Approach would need determination of current-time I*t coefficient or I versus t capability curve for individual overhead conductors and amalgamation of conductors. This would mean that the current capability of the overhead scheme would need to be compared to the currents supplied by the scheme. However, strictly speaking, neither current, power, nor energy anneal conductors. It is the temperature and its duration that cause annealing and loss of conductor strength. Therefore, it would be more appropriate and meaningful to ascertain temperature-time T*t coefficient or T versus t capability curve for overhead conductors and amalgamation of conductors. In this case, it would be the temperature capability of the overhead scheme that would be compared to temperatures reached by the overhead conductors. Conductor wire manufacturers’ assistance in determining these characteristics would be essential.

Conductor Manufacturing Advances

It is believed that, taking into account the recent advances in conductor manufacturing technology which improved the traditional mechanical properties of materials, revisiting the steady-state, capacity-based approach to conductor selection would result in more economic overhead scheme designs. This effort should include development of dynamic, transient, or short-time capability characteristics of conductors that would be advantageous, especially for schemes operating close to the temperature limit.

V. CONCLSUION

The transmission line design engineering is confronted with choosing a conductor sort form among this bewildering assortment. This preference must be based on basic conductor parameter. This is important for two principal reasons. Firstly, they offer an opportunity to understand the effects of the parameters of the line on bus voltages and the flow of power. Secondly, they help in developing an overall understanding of what is occurring on electric power scheme .The conductor of an overhead power line is considered as the most important component of the overhead line since its function is to transfer electric power, and its contribution towards the total cost of the line is significant. The conductor costs (material and fitting costs) associated with the capital investment of a new overhead power line can contribute up to 40% of the total capital costs of the line. Furthermore, power losses in the lines account for the bulk of the transmission scheme losses. These are critical economic factors which need careful analysis when selecting a conductor for a new overhead line, which will be in operation for an excess of 25 years.

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