Analysis of 220kv Transmission Line

Mr. Sanjib Hazarika
Assistant Professor Dept of EE
GIMT, Azara, India

Abstract- *India has a large population residing all over the country and the electricity supply need of this population creates requirement of large transmission and distribution system. Also, the disposition of the primary resources for electrical power generation viz., coal, hydro potential is quite uneven, thus again adding to the transmission requirements. Transmission line is an integrated system consisting of conductor subsystem, ground wire subsystem and one subsystem for each category of support structure. Line losses play an important role in its efficiency. Reduction in its losses will improve the power scenario in India. With this view, this paper describes the effect of conductor replacement on its efficiency.*

I. INTRODUCTION

In recent years availability of power in India has increased and improved but demand has consistently outstripped supply and substantial energy and peak shortages prevailed in 2009-10. In order to meet the deficit between demand and supply, 25000 MW to 35000 MW of power is being produced by diesel generation system. In the past, the selection of an energy resource for electricity generation was dominated by finding the least expensive power generating plant. Although such an approach is essential, there is growing concern about other aspects of power generation such as social, environmental and technological benefits and consequences of the energy source selection.

1.1. Scenario of Electricity Generation

From the scenario of world electricity generation, it is clear that thermal generation plays huge role in production as compared to other, that is, renewable sources. Other sources include solar, wind, geothermal, combustible renewable and waste and heat.

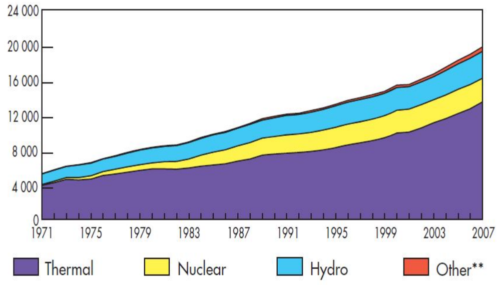

Fig1: World electricity generation by fuel (TWh)

In order to improve power generation capacity economically and environmentally, new renewable power plants have to be implemented reducing the dependence on coal, gas and oil. In 2007, the usage of gas and coal is increased as compared to the use in 1973. On the other hand use of oil decreased by a sizable amount during the above mentioned period. Oil usage is reduced from 24.5% in 1973 to 5.6% in 2007. [2]

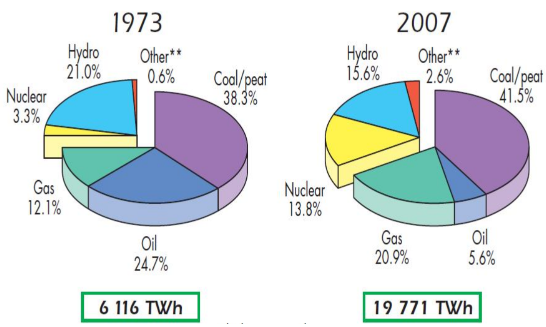

Fig 2: Fuel shares of generation[4]

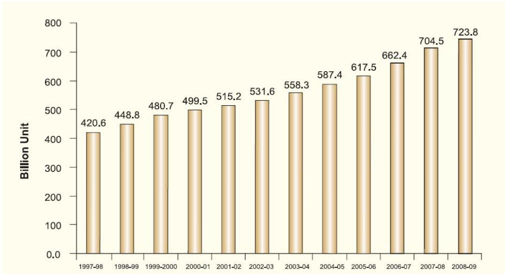

Fig3: Power generation of India

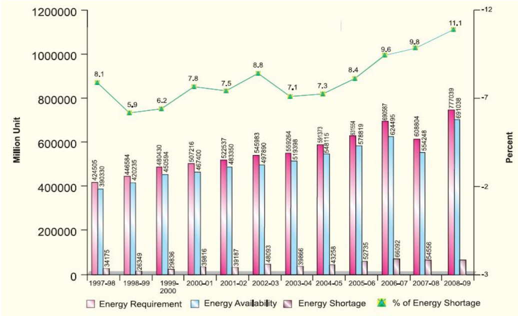

Fig4: Power supply positions energy

The most useful way of harnessing solar energy is by directly converting it into electricity by means of solar photo-voltaic cells. The photo-voltaic effect is defined as the generation of an electromotive force as a result of the absorption of ionising radiation. [3].

1.3. The Energy Scenario

The electricity consumption per capita for India is just 566 KWh and is far below most other countries or regions in the world. Even though 85% of villages are considered electrified, around 57% of the rural households and 12% of urban households, i.e. 84 million households in the country, do not have access to electricity. Electricity consumption in India is expected to rise to around 2280 BkWh by 2021-22 and around 4500 BkWh by 2031-32 [5].

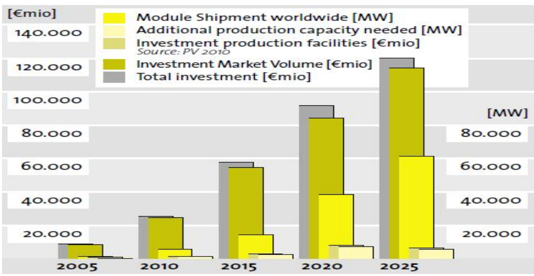

Fig5: Global Investment in new PV production facilities. [2]

From Fig5 it will be predicted that in the near future solar is the prime source for power extraction. Along with power production it also improves the environment by reducing CO gas emission which is forecasted in Fig 6. In environmental terms, it would have reduced annual CO_2 emission by 353 million tonnes. This reduction is equivalent to the emissions from 150 coal fired power plants.

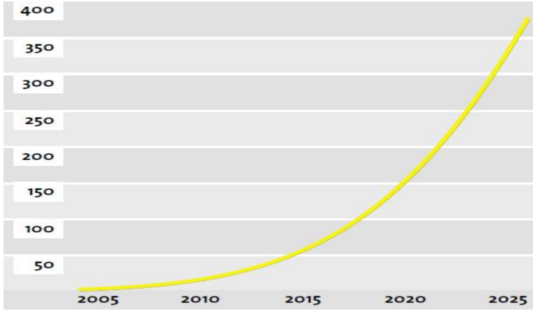

Fig6: Annual Global CO_2 savings in millions of tonnes. [2]

1.4. Power Scenario in Assam

Electricity demand in Assam is likely to rise to the level of 2293 MW by the end to Twelfth Five Year Plan from the present demand of 1200 MW Anurag Goel Anurag Goel , Commissioner & Secretary, IT & Power Departments, Government Of Assam, Dispur The own generation of the Assam Power Generation Company Ltd. (APGCL) is around 320 MW and from the share of the Central Sector Generating Stations (CSGSs) viz. NEEPCO, NHPC along with bilateral power, the total import is around 750 MW, thus the total availability of power now stands at only 1070 MW.

1.5. Objectives of the paper

Considering all the mentioned points we are going to investigate a practical transmission line and aiming to improve the performance of the line. The objective of this project is to analyse the line losses and to improve the performance of transmission line using Re-conductoring methods to the existing network. For this purpose we are going to replace the existing conductor i.e. AAAC Zebra by AAAC Moose.

II. STUDY AREA AND OBJECTS

The electrical network between Sarusajai substation to Mirza substation has been selected as the study area of the project. The transmission line length is 40 KM. Here the existing conductor used for transmission is AAAC Zebra. Reconductoring method is used for analysis. Object is to replace the existing conductor by AAAC Moose.

2.2. Conductor details

The conductor used this study is tabulated below along with their specifications.

Table1: Details of conductor

NAME	RESISTANCE/KM	DIAMETER(CM)
AAAC Zebra	0.06869 Ω/km	3
AAAC Moose	0.05596 Ω/km	3.55
AAAC Morculla	0.04331 Ω/km	3.81

2.3. Voltage drop analysis during OFF Peak hours.

The voltages of different phases during Off Peak hours have been calculated and summarised as follows.

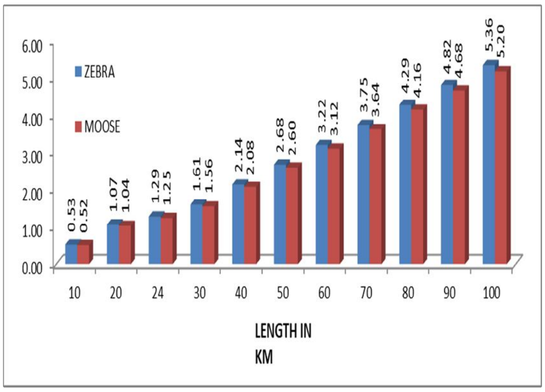

Fig 7: Voltage drop (KV) off peak (R-phase)

It is reflected from the Fig 2 that the voltage drop reduces if the existing conductor is replaced by AAAC Moose conductor in R Phase.

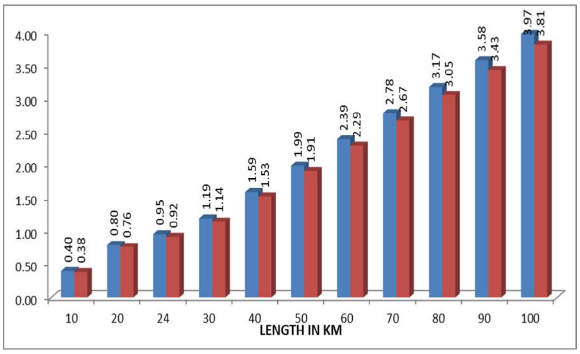

Fig 8: Voltage drop (KV) off peak (Y-phase)

It is found that the voltage drop reduces if the existing conductor is replaced by AAAC Moose conductor in Y phase.

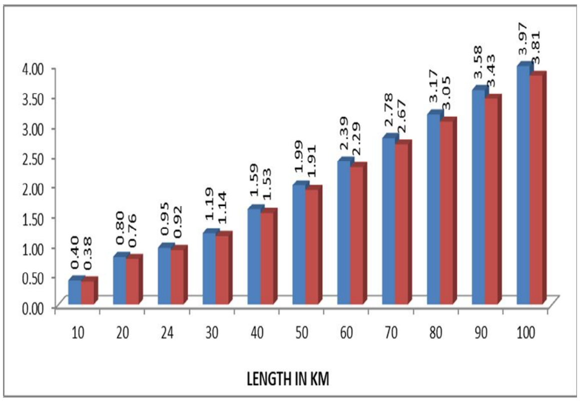

Fig 9: Voltage drop (KV) off peak (B-phase)

In B phase also the voltage drop can be reduced if the reconductoring method is used.

2.4. Voltage drop analysis during ON Peak hours.

The voltages of different phases during ON Peak hours have been calculated and summarised as follows.

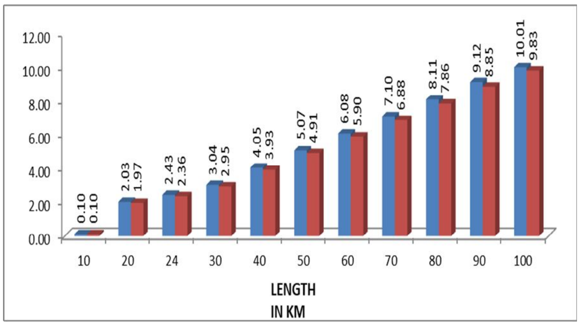

Fig 10: Voltage drop (KV) On peak (R-phase)

It is also calculated on ON peak hours for Y phase abd B phase respectively.

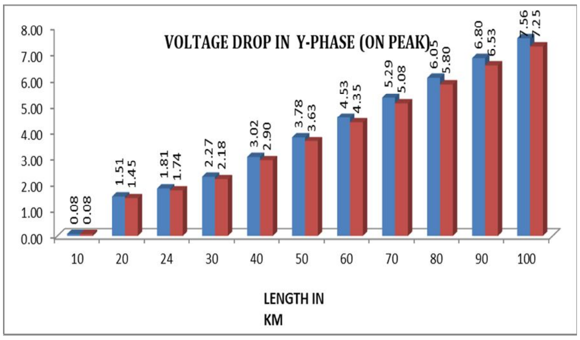

Fig11: Voltage drop (KV) On peak (Yphase)

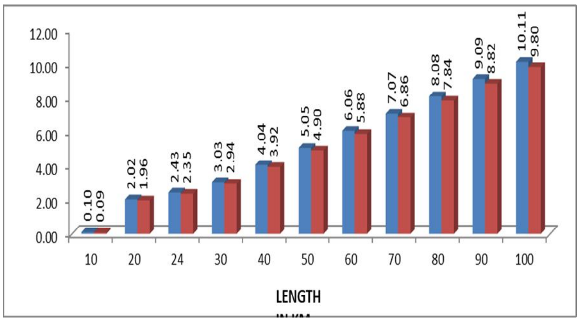

Fig12: Voltage drop (KV) On peak (Bphase)

2.5 Efficiency and Line losses calculations

The efficiency is calculated from Vs and Vr and using the classical method. It is found that in case of Zebra conductor the efficiency is 83% as compared to Moose conductor 85%. So it can be concluded that using reconductoring method the efficiency can be improved for a long transmission line.

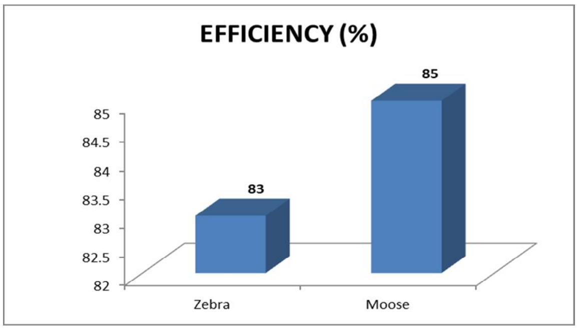

Fig13: Efficiency calculations

The line losses also calculated considering R, Y, B separately.

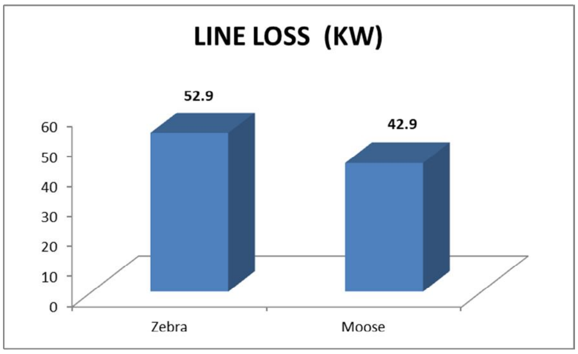

Fig14: Line loss calculations.

It is found that the lines loss for Zebra conductor is 52.9 Kw and for Moose is 42.9 Kw. It can be concluded that by reconductoring method the line losses can be minimized.

III. CONCLUSION

The voltage drop per phase (R,Y&B) gives us a clear picture of decreasing voltage drop by replacing the existing AAAC zebra conductor by AAAC moose. The Efficiency will also increase by using the AAAC moose.

REFERENCES

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