Transmission Line Improvement Using Reconductoring Method

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Abstract:-**The improvement in power scenario will affect the economic development of a country. So it is necessary to give prior importance in power improvement. India is a large populated country and the electricity supply need of this population creates requirement of large transmission and distribution system. 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 about the reconductoring method and its affect in power system.**

1.1. Introduction

Electricity Generation needs to be increased to meet the required demand in India. 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.

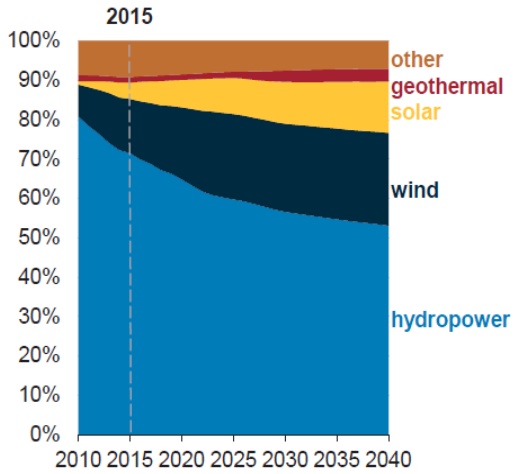

Fig 1: Source wise electricity production

Fig 1 shows the generation scenario of electricity in India by different source. 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.

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.

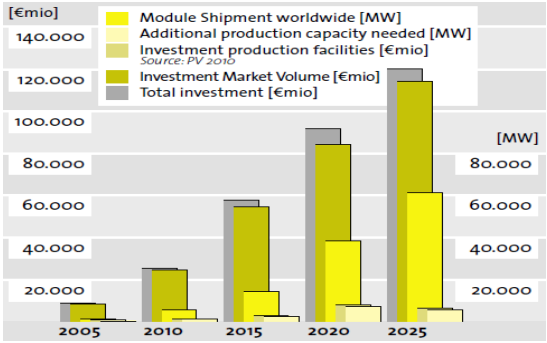

Fig 2: Global Investment in new PV

1.2. 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].

1.3. 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.

1.4. Objectives of the paper

This paper aims to investigate the effect of applying re-conducting method in reducing loss and efficiency improvement. 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 of the study area. . For this purpose we are going to replace AAAC Zebra by AAAC Morculla.

2.1. 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 Morculla.

2.2. Conductor details

AAAC Zebra conductor is used to transmit the power at present. The replacement conductor will be AAAC Morculla. The details of these conductors are listed below along with their specifications.

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

Table1: Details of conductor

2.3. Voltage drop during OFF Peak hours.

Off peak hour voltages have been calculated for different length and plotted for analysis.

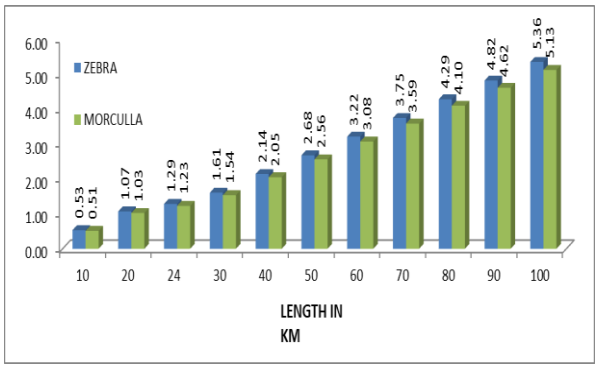

Fig 3: Voltage drop (KV) off peak (R-phase)

Fig 3 reflects that the voltage drop reduces if the existing conductor is replaced by AAAC Morculla conductor in R Phase during off peak hours as length is varied upto 100 KM..

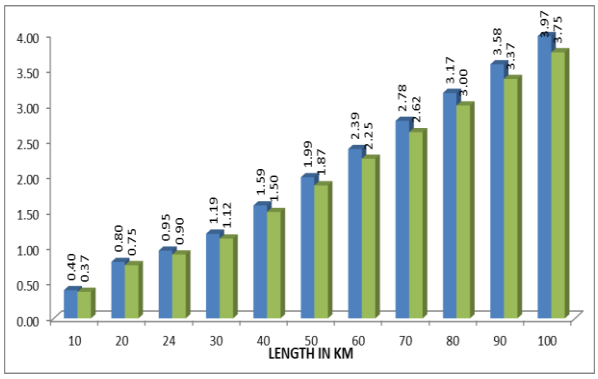

Fig 4: Voltage drop (KV) off peak (Y-phase)

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

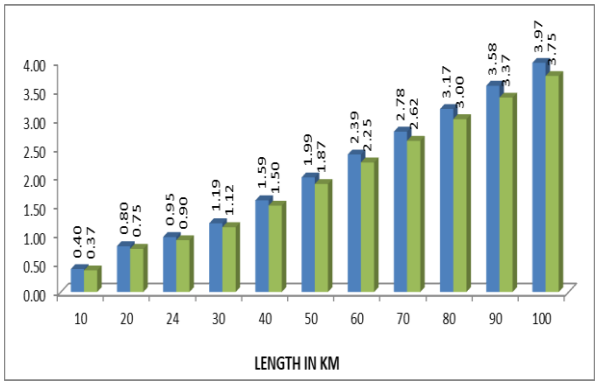

Fig 5: Voltage drop (KV) off peak (B-phase)

In B phase also the voltage drop can be reduced during off peak hours using re-conductoring method as shown in Fig 5.

2.4. Voltage drop analysis during ON Peak hours.

Reducing the voltage drop can lead to system improvement. Voltage drops have been calculated during on peak hours and are listed below.

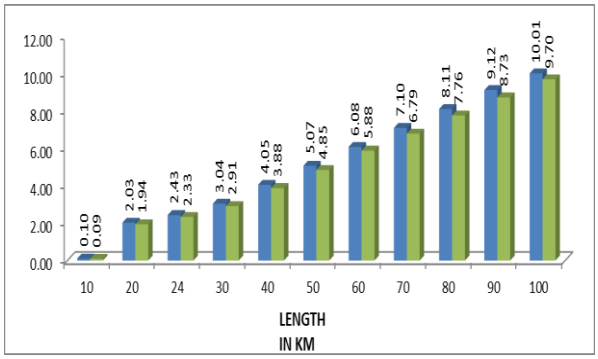

Fig 6: Voltage drop (KV) On peak (R-phase)

Fig 6 shows the variation of voltage drop during on peak hours in case of R phase.

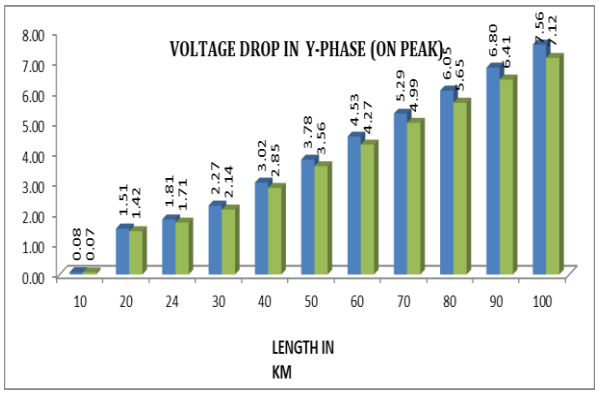

Fig7: Voltage drop (KV) On peak (Yphase)

It is also calculated on ON peak hours for Y phase and B phase respectively. Fig 7 shows the variation during on peak hours for Y phase.

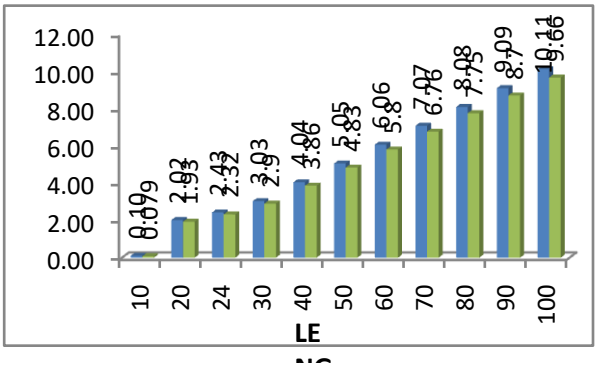

Fig 8: Voltage drop (KV) On peak (Bphase)

The variations of voltage drops during on peak hours for B phase are reflected in Fig 8.

2.5 Efficiency improvement

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 Morculla conductor 88.5%. So it can be concluded that using reconductoring method the efficiency can be improved for a long transmission line.

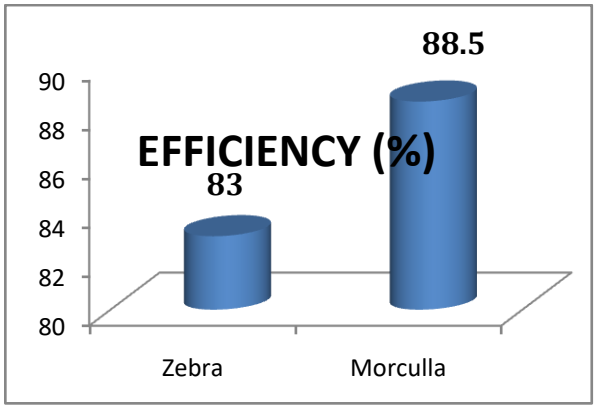

Fig9: Efficiency improvement

Fig 9 shows the comparison of efficiencies between Zebra and Morculla conductor. Improving efficiency can lead to system improvement.

2.6. Line loss reduction

Line loss or I^2R loss plays a vital role in system improvement. It will also reduce the gap between demand and supply in long term. It The line losses for zebra and Morculla have been calculated and reflected in Fig 10.

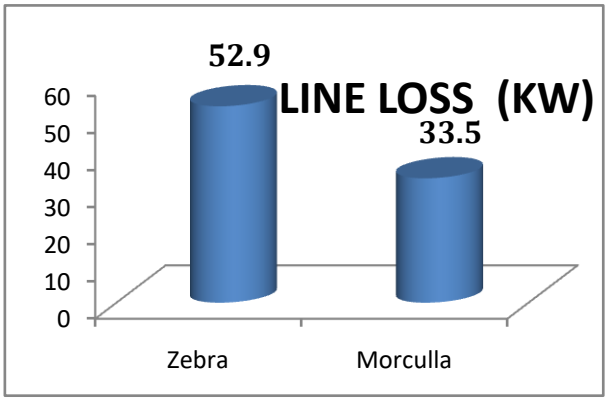

Fig14: Line loss reduction.

It is found that the lines loss for Zebra conductor is 52.9 Kw and for Morculla is 33.5 Kw. It can be concluded that by reconductoring method the line losses can be minimized.

2.6 Conclusion

With the help of this investigation the following conclusions can be obtained.

1. 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 morculla.
2. The Efficiency will also increase by using the AAAC morculla (2.5% can be increased in place of Zebra)
3. The line loss can be minimized using Re-conductoring method. Approximately 20 % loss can be minimized using this re-conductoring method

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