REDUCTION OF POWER LOSSES WITH ADMS – METHODOLOGY, STUDY AND EXPERIENCE

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Abstract:

In advanced utilities worldwide, optimal utilization of the existing energy resources and preservation of the environment are the main reasons why reduction of power losses is one of the key focuses. What is more, regulators impose high reliability targets on grid operation, which directly requires optimization of the energy distribution.

The amount of total energy losses directly indicate the utility operation efficiency. In advanced countries the total losses are 5 – 10%, while in countries in development the losses are over 10% and in some extreme cases much higher. On one hand, in advanced countries, about half of the total losses present technical losses. Seeing that network reinforcement and replacement of the old and faulty equipment are the biggest investments for a utility, the motivation to better utilize the existing devices and optimize using software optimization features is clear. On the other hand, the non-technical losses may vary from under one percent in advanced utilities, up to 10 - 20 % in inefficient utilities. There are many extreme cases in undeveloped countries where 30 - 40% of commercial losses are registered. Therefore, it is clear why reduction of the non-technical losses presents a significant way to improve utilities operation efficiency

The common thing for all of these utilities is that regardless of their amount, technical losses can be reduced, while non-technical losses are almost completely avoidable and present a pure loss of revenue, energy and efficiency to any utility.

Considering that reduction of power losses brings direct environmental and financial savings and increases revenue of the utility, it is clear that utilities are motivated to invest in new technologies for power losses reduction.

Emerging development and integration of smart grid systems, such as advanced distribution management systems (ADMS), smart metering and billing systems have opened doors for the new opportunities in grid optimization. Using ADMS optimization features, it is possible to achieve several optimization targets which can reduce the cost of grid operation and improve the power quality and customer service, among which the power losses minimization is the key one.

This paper presents methodology of different advanced approaches, study results as well as real-utilities experiences, focused on detection and reduction of the technical and non-technical losses. The paper is organized and presented within following topics:

- Power losses overview (nature and reasons of occurrence)

- Technical losses reduction using ADMS optimization features :
  - Technical power losses reduction with network reconfiguration
  - Technical power losses reduction with volt var optimization
  - Real experiences of the utilities worldwide
- Non-technical losses reduction:
  - The current state of technology for non-technical losses detection and reduction
  - The future possibilities and areas of research for the improvement of the current technologies
  - Real experiences of the utilities worldwide