ENERGY LOSSES MANAGEMENT

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ABSTRACT

Electric energy losses management becomes one of the main utility concerns as a result of the current energy prices. Non-technical losses are the main problem in developing countries, and utilities are striving to obtain reduction and control.

The greatest challenge is understand where the non-technical losses are and their causes to focus on it. Making a precise estimation requires the knowledge of the technical losses across the network and geographies. Utilities are knowledgeable about the total energy losses, but they must make technical calculations for technical loss determination to obtain the non-technical losses estimation. The key issue is to have a precise technical loss determination methodology across the network and geographies that allows the non-technical loss estimation by energy balances comparing it with billing.

New methodologies and IT tools are now available for precise determination of technical losses using the load profile distribution across the different network components, and the network configuration history.

Appropriate information is a key issue for the decision making process, and reduce utilities efforts in energy losses management.

INTRODUCTION

The main problem resulting from utilities' insufficient information on the load profile across their network is the difficulty in determining the losses across the different components. The current network studies required high-level effort and information from very different sources, making it a tough task to reach accurate loss determination and investment needs. A problem also arises from the lack of network configuration history knowledge, which leads to difficulties in obtaining reliable energy balances between billing and measurements.

It's possible to determine the non-technical losses across different geographical areas and network components when comparing with billing for a defined period. Every time the network topology or load profile changes, the methodology considers it load balances.

New IT tools for technical management provide electric utilities precise information about losses across the network considering customers load profile.

This information is fundamental in the decision making process to address efforts for non technical losses mitigation.

METHODOLOGY

The applied methodology is based on hourly /15 minutes energy balances, and requires the knowledge of the following key information:

- Historic network configuration information
- Customers load profile
- Load measurement across the network

Historic network configuration information

As the distribution network is the main asset in these businesses, it is imperative to have an information system based on a high quality network model to achieve maximum performance. New IT systems allow the management of network connectivity, geographical distribution and network's evolution in time.

Aside from geographic information administration, new systems simultaneously manage connectivity aspects and network temporality. Track all historical changes a particularly important issue in the electric power distribution industry considering that networks have manoeuvrable elements that are designed to change according to the needs of the operation. Although it is beneficial to know the current state of the network configuration, it's even more valuable to know for how long the configuration was maintained outside its state of design (state that optimizes network utilization).

Customers load profile

Distribution companies have long yearned to capture demand distribution through their installations. Previously this could only be accomplished through a complex process that often produced results that immediately became obsolete due to the lack of an automated updating system. The possibility of a client – network link obtained through the current systems, the availability of the load profiles of each customer type and the SCADA metering in specific points of the network enable a dynamic load profile definition across the network, following the continuous changes produced.

Customers load profiles are essential for methodology applying, given a good estimation of network load profile according to the consumption characteristics.

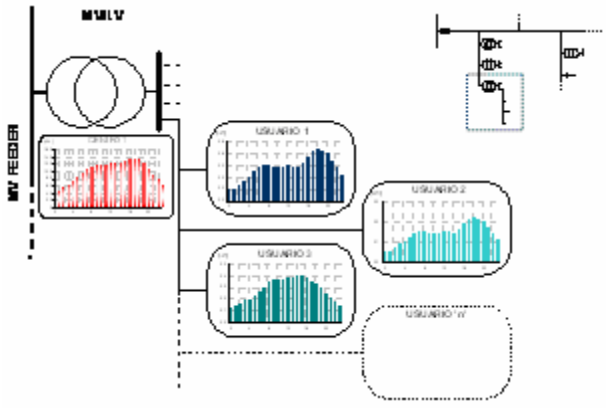

Figure 1. Load profiles across the network

Load profile knowledge across the network allows periodic load flow analysis considering network configuration at each moment.

Customers load profiles are determined through periodically field measurements campaigns in different customers categories (residential, commercial, industrial), and with additional measurements in key network points.

Consumption measurements across the network

Consumption measurements across the network are essential for energy balances. Results accuracy of the process depends on the number of energy balances done. Experiences recommend not less than one measurement on MV feeder headers. On critical non technical losses areas it's necessary increase the number of measurements to each MV/LV transformers.

The availability of information at each MV/LV transformer plus graphics tools allows a geographical analysis by plotting technical and non technical losses of different areas.
It's also possible an analysis by network section like HV/MV substation, MV feeder, or MV/LV transformer.

Energy balances

Knowing the network configuration at each moment and customers linked to it, it's possible to make accurate periodically energy balances between billing and network measurements, considering technical energy losses through a load flow process.

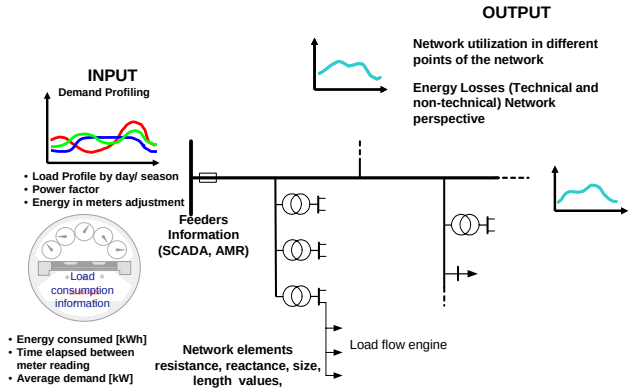

Figure 2. Energy balances

Balances could be making it hourly or every 15 minutes, according to the billing and network measurements information.

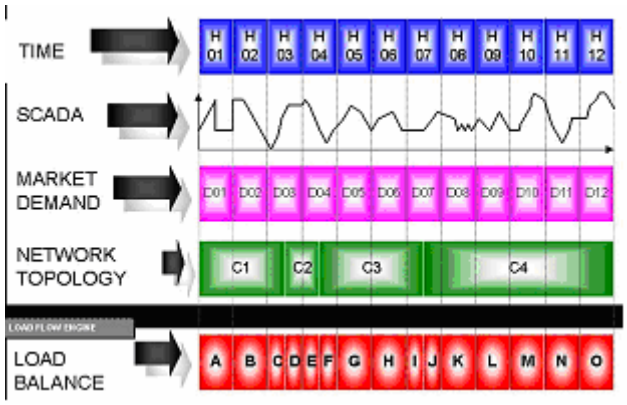

Figure 3. Multiple load balances across the day

For each period it's possible the determination of the technical losses through a load flow analysis. Non technical losses are determined by difference for each period. Discrimination by geographical areas is related to the load measurements possibilities across the network.

The integration in monthly/yearly periods allows the determination of Technical and Non Technical Losses across geographies and network (substation HV/MV; MV feeder).

Scorecard

Technical management for subsequent decision-making requires adequate monitoring systems. It is therefore necessary to count on control panels that periodically demonstrate the status of key parameters. The following table shows an example that proved to be effective for energy losses control.

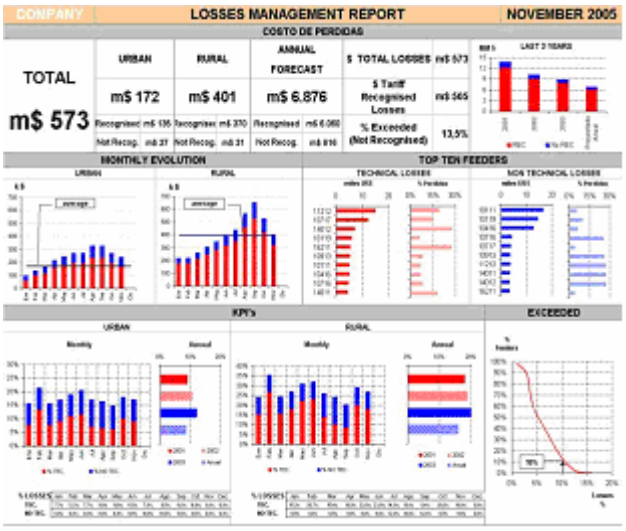

Figure 4. Scorecard example

The total integration of information in a corporate system enables the graphic representation of technical and non technical losses allowing a simple identification of possible trouble areas.

Graphic representations are good tools for the action taken decision making process. An example of non technical losses is shown in the next figure.

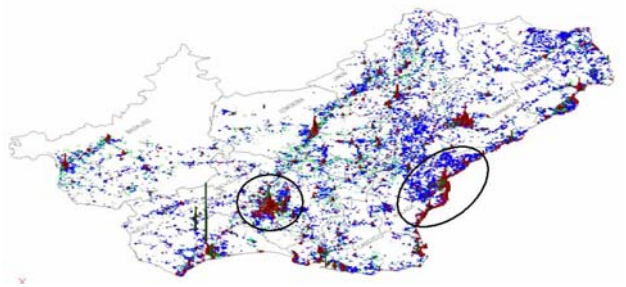

Figure 5. Geographical graphics

CONCLUSIONS

Technical management systems throughout the entire corporation allow the integration of different sources of information and are an essential tool for decision making in the non technical losses management process. Routinely monitoring in order to verify actions effectiveness facilitates the implementation of new corresponding corrective actions.

These tools proved to be useful in utilities with medium/low non technical losses, where critical areas identification it's very difficult, and sophisticated methodologies need to be applied. Benefits of the implementation are tremendous, and usually with repaid periods in order of one year.

Further integration with the financial-economical management system make it a powerful tool in the management of a modern company dedicated to the maximization of performance levels through cost optimization.

REFERENCES

[1] Claudio Guidi / Jorge García / Alejandro Spiritoso, 2006, "NEW MANAGEMENT POSSIBILITIES THROUGH THE USE OF CORPORATE TECHNICAL SYSTEMS", *CIDEL 2006.*