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Implementation of DMS Calculations in the Distribution Network Control Centers of Elektra Zagreb and Elektroslavonija Osijek

DOMAGOJ PEHARDA, TOMISLAV STUPIĆ, IVONA SIČAJA
KONČAR-KET
Croatia

INTRODUCTION

- Upgrade of SCADA/DMS System in distribution control center of electric power providers Elektra Zagreb and Elektroslavonija Osijek.
- Network Manager (NM), version 2.3 to version 6.4.
- Upgrade and extension of DMS system functionalities.

NEW CALCULATION FUNCTIONALITIES

LOAD CALIBRATION / STATE ESTIMATION FUNCTION

- Major upgrade: Addition of WLS algorithm.
- Function is performed following the sequence of these sub-functions:
    - Static load calibration.
    - Electrical network topology calculation.
    - Identification of gross mistakes or Plausability Check.
    - Calculation of network observable part and identification of incorrect measurements.
    - Topological load calibration.
    - Complete solution.
    - Presentation of results on single line diagrams and DMS reports.

POWER FLOW FUNCTION

- All overloaded branches and nodes for which voltage limits are exceeded are marked with a special colour on the displays.
- Generator operational curves are implemented to observe limits of the active and reactive power. If the calculated value exceeds the limits, the node with a constant voltage becomes a node with a constant load with the adjusted reactive power at the limit.
- An enhanced LFC algorithm with an external power flow calculation loop is used for calculation of the position of the tap changer of transformers with automatic voltage regulation, a reactor and switched capacitor banks.

SAVING OF CASES

- Major upgrade: automatic save of all input and output of DMS function in a file.
- The user can configure the saving of cases on the user interface, e.g. data can be stored every 5, 15 or more minutes.
- Save case files can be restored in a study database environment. User can specify type of elements to be resorted, e.g. generation, load.

SHORT CIRCUIT FUNCTION

- Automatic execution on predefined cycle time: three phase short circuit on the whole network model according to the IEC 60909.
- Alarm if breaker short circuit limit is violated.
- Manual execution on selected elements (busbars or lines): symmetric and unsymmetrical short circuit calculation.

DYNAMIC NETWORK COLORING

- New modes connected to DMS functions: coloring of observability, load, graph profile of results along the line, coloring of the open lines.

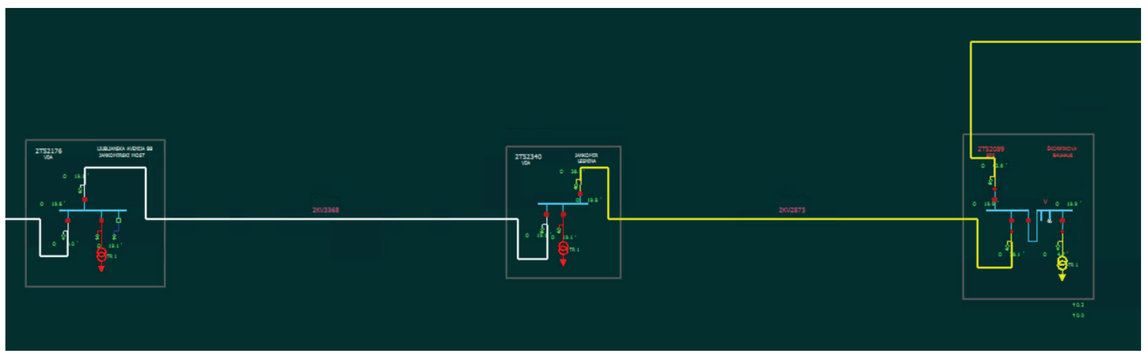

Figure 1 Loading coloring with the legend

Figure 2 Observable network coloring

DYNAMIC CONTOUR COLORING

- Intelligent visualization of the electric power grid.
- Function monitors deviation of voltage or some other value from the required condition at individual points using a special display.
- Technique colors not only points with values, but the surround area as well.

Figure 3 An example of dynamic contour coloring

CONCLUSION

Upgrading of SCADA/DMS system to a new version has provided to distribution system operators utility a modern system for monitoring, control and energy analyses of the corresponding distribution network. The enhanced DMS system together with its upgraded network analyzing functions enables planning and development of the future distribution network and analyses of the current network.