The Solutions Provider

QDMS
DISTRIBUTION MANAGEMENT SYSTEM

Automation & Supervisory Control for Electric, Transit & Water Utilities since 1960

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1. INTRODUCTION

The Distribution Management System (DMS) may be considered as the control center of the smart grid. The DMS uses fault location, Geographic Information Systems (GIS) and Outage Management System (OMS) to improve the reliability of the smart grid by reducing outages and sustaining the frequency and voltage levels.

If you are looking for a smart all-in-one solution to monitor and control your energy grids, QEI will be a great fit for your DMS, with a wide range of applications that will make your operations secure, stable and efficient.

QEI QDMS is a solution for monitoring and optimization of your electrical grids, control your distribution management system with trust and benefit from quick project configuration, easy operation, increase reliability and efficiency of your network. Among many applications, QDMS stands out for load flow, demand projection, fault location, fault isolation, load transfer and its simulation in real time using SCADA measurements.

QEI offers the entire ADMS system (Advanced Distribution Management System) platform, which includes the integrated systems SCADA, DMS, OMS, and GIS.

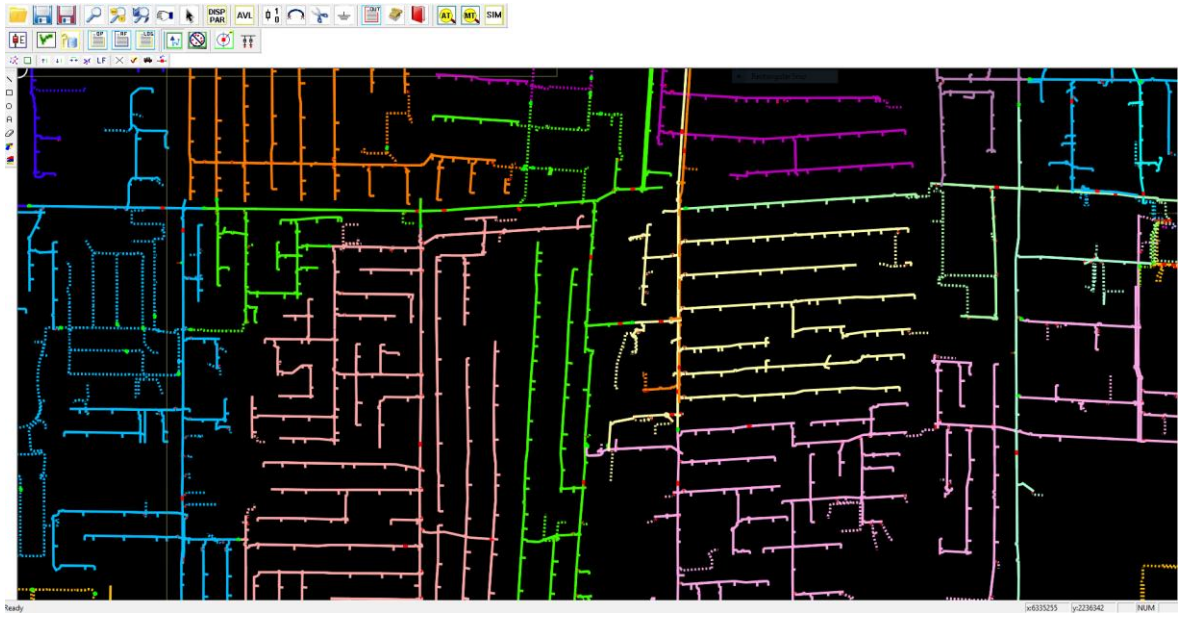

Figure 1 Graphical interface of QDMS

2. QDMS Benefits

- Electrical simulation in real time.
- Modeling the optimum operating point for the distribution system.
- Modeling current and future demand with high reliability.
- Early detection of overloads and violations in the voltage limits.
- Optimization of personnel resources (crews)
- Accuracy of the fault location is of plus-minus one node.
- Improved response time to failures.
- Improvement of the network operator service indicators.
- Improved demand response capabilities

3. Interactions with SCADA

QDMS works in real-time with SCADA by reading the data instantaneously. The data can be used as inputs parameters to perform demand projections, the reading of variables under fault conditions are performed to execute the applications associated with the process called FLISR. The variables read from SCADA are:

- Breakers Status: It reports whether the breaker has a state closed or open
- Current: It reports the value of the current for each phase of each feeder.
- Active Power: It reports the value of the active power that flows through each phase of each feeder.
- Reactive Power: It reports the value of the reactive power that flows through each phase of each feeder.
- Voltage: It reports the voltage of each feeder of circuit header.
- Fault Current: Reads the value of fault current peak to execute the FLISR applications.

4. State Estimation

QDMS has two (2) modules delivering more accurate estimate of your electrical calculations in any given switching configuration:

- Load Estimation - Capable of modeling the estimated consumption of the system at all times, this module uses historical data that can be fed by SCADA or manually entered into the database.
- Load Allocation – With real-time data reading obtained by SCADA from feeders, accurate calculations can be made to maintain optimal voltage and load, while taking into account smart-grid technologies.

5. Demand Projection

QDMS is a powerful tool that constantly updates the load curves, using the values measured by the SCADA. For each load of the system, different curves can be shaped based on a daily arrangement. QDMS allows utilities to create different typical days according to their experimental knowledge of the network. A typical day assignment in the calendar will indicate to the software which curve of each feeder it must use to perform the electrical analysis.

6. Balanced and Unbalanced Power Flow

Power flow analysis is a very important tool for the analysis of any power system as it is used in the planning and design stages and to determine the best operation of existing systems. Power and currant flowing in the lines can be determined with the data obtained by filed IEDs, this will provide the operator state of the system at any time, and make simulations for short-term planning. The balanced power flow uses voltage from one (1) phase and the sum of the powers of the three phases to perform the flow. Unbalanced power flow uses the powers and voltages of each phase as input data.

7. Distribution Short Circuit

Different types of failure (three-phase, single-phase, two-phase, and between phases) can be simulated with or without fault impedance. QDMS allows to know the short circuit levels in all the nodes downstream of a feeder.

8. Reactive Control

QDMS uses a parametrizable genetic algorithm to determine the positions of the Taps and the capacitors to be connected or disconnected. The objective of the Reactive Control is to maintain the voltages throughout the distribution network within acceptable levels, so that there are no over voltages or under voltages especially at the terminal points of the circuits and at the same time minimize the losses of active power in the system. The solutions are tested using the power flow, as well as the calculation of the objective function.

9. Load Shedding

Load Shedding Application detects predetermined trigger conditions in the distribution network and performs predefined sets of control actions, such as opening or closing non-critical feeders, reconfiguring downstream distribution or sources of injections, or performing a tap control at a transformer.

QDMS cover various activities like a set up limit in active power, undervoltage limit, Under frequency Load Shedding (UFLS)...etc, results and opearions are sent to the SCADA system.

10. FLISR (Fault Location, Isolation and Service Restoration)

Fault Location Isolation and Service Restoration (FLISR) provides automated response to faults, reroute power around faults within seconds, resulting in minimizing the duration and extent of power outages. The loaction module can help narrow down the potentiel serach area, enbaling filed crews to resolve the problem faster, the isolation and restoration modules minimize the time of disconnection, suggesting operations on tele-controlled breakers, transferring load to feeders not affected by the fault.

The algorithm automatically executes many tools sequentially when the triggering of a circuit or a re-closer occurs due to the presence of a fault. The module works with the control center and the information received from SCADA.

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