Active Transformer Load and Voltage Monitoring

Distributed Intelligence

Managing distribution transformer utilization has been a challenge to utilities for decades. Without the tools to monitor transformer load in real-time, you have to rely on offline, low-resolution load profiles to identify transformer loading and voltage issues, which can be highly inaccurate especially as the percentage of solar generation and electric vehicles (EVs) increases on the grid.

Many utilities currently lack real-time visibility into the secondary network of the grid. Having this visibility is critical as the grid gets more dynamic due to increasing penetration of EV charging and solar generation, and as you are asked to extract more out of existing grid assets. Distributed intelligence (DI) combines high-resolution data capture, edge computing and peer-to-peer capabilities to enable real-time monitoring and control at the edge of the grid. Active Transformer Load and Voltage Monitoring (ATLM/ATVM) utilizes data from service points using the power of DI-enabled meters to calculate transformer loading and voltage statistics in real-time and relay that information to the backoffice. The backoffice stores and presents real-time data, historical data and threshold-based alarms to third-party utility systems, such as ADMS and DERMS, via a standard API. DI provides unique peer-to-peer communications and edge-computing capability that, for the first time, allows real-time awareness of distribution transformer loading and voltage information at scale.

With this application, all meters connected to the transformer share the required measurements (real power, reactive power, voltage, etc.) with each other in real-time via peer-to-peer communications. The collection of meters on the transformer then communicates results via a locally determined “spokesmeter” which acts as a single reporting point for the transformer. Results are transmitted by the spokesmeter to the backoffice on a configurable period in real-time. Additionally, when transformer loading and voltages downstream deviate from acceptable values, the application provides immediate alerts to users.

The loading and voltage information, which is aggregated to a service transformer level, is sent to the your ADMS in real-time via a standard DNP3 interface, which allows the ADMS to have a more accurate view of the grid that is based on full coverage of field measurements. The transformer monitoring data can be used as input to Power Flow and State Estimation applications to drive more informed decisions and optimal control, such as capacitor bank and load tap changer (LTC) control to optimize Volt/VAr or perform peak load reduction.

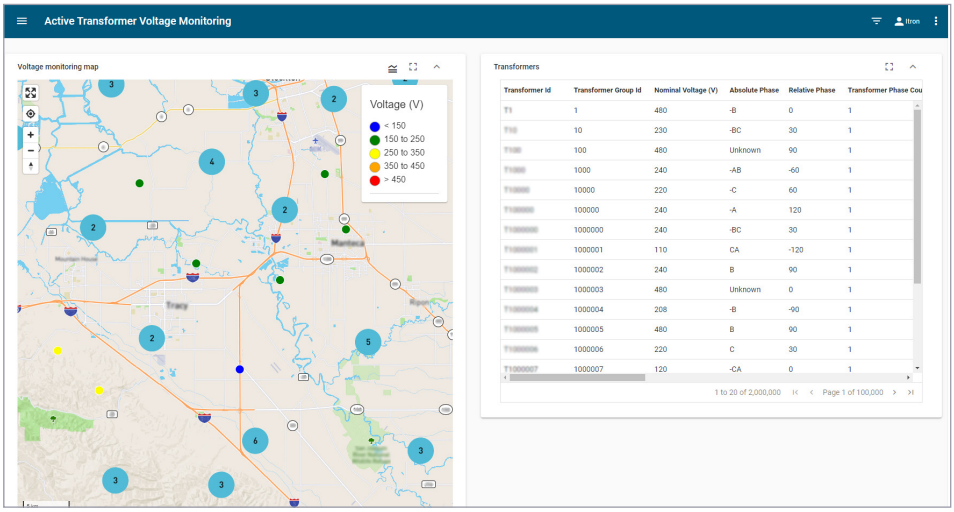
Along with having access to real-time stream of ATLM/ATVM data, you can access historical daily summary information such as overload, minimum/maximum/average voltage, load profiles and duration curves through a standardized API. Having this first-of-its-kind capability enables you to obtain immediate awareness of transformer loading and voltage, which opens up several use cases as outlined below.

WITH ACTIVE TRANSFORMER LOAD AND VOLTAGE MONITORING, YOU BENEFIT BY:

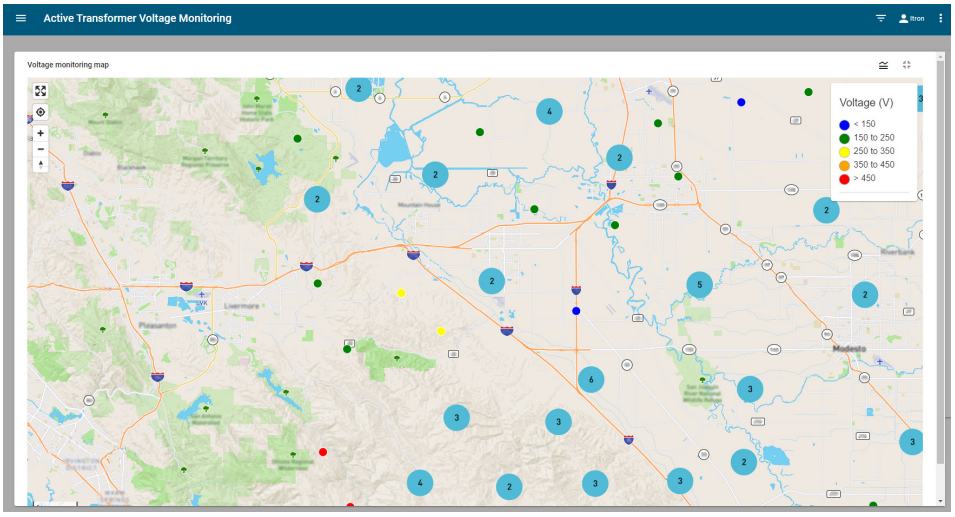
- Estimating load flow/state more accurately and optimizing voltage (VVO/CVR), resulting in improved grid efficiency
- Planning for EV and solar generation hosting capacity on the grid
- Obtaining desired transformer life through reduction of failures due to overloading
- Gaining awareness of DER impacts on the grid in near real-time
- Reducing technical losses through optimal power flow
- Reducing unplanned outages through preventative maintenance of transformers that are consistently stressed
- Reducing the number of truck rolls/analysis through proactive identification of problems
- Improving planning studies through better modeling of distribution transformers

FEATURES

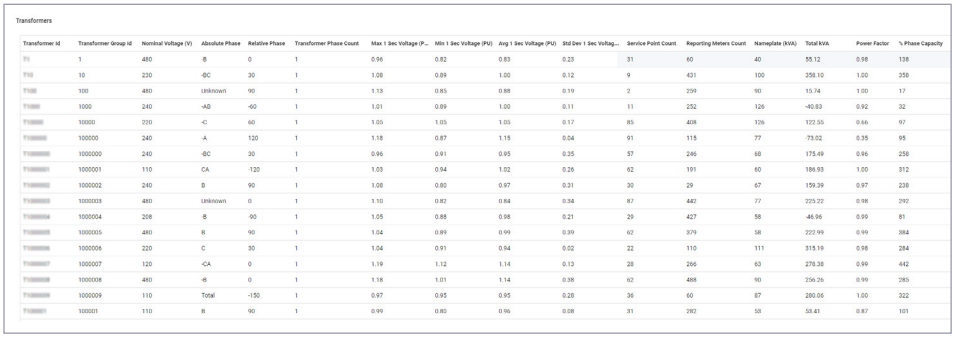
Along with the capability to stream ATLM/ATVM results to utility operational systems such as ADMS and DERMS in real-time, the application also includes an intuitive and thoughtful user interface that helps you see the current and historic conditions and issues in your area. The summary pages below include a map view that can be expanded to show the locations of transformers along with color codes to represent their loading and voltage statistics information. The pages also include high-level statistics of each of the transformers such as their percentage loading relative to capacity, min and max voltages.



Summary page showing key transformers on a map along with key attributes



Maximized map view showing transformers in a given territory



Tabular view provides the user with detailed information about the transformer loading and voltage statistics at each time stamp over the past few hours

Join us in creating a more **resourceful world**.

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