



**IDENTIFYING AND MONITORING WORST
PERFORMING CIRCUITS**

APPLICATION GUIDE



Introduction

Develop a methodology to report Worst Performing Circuits (WPC), submit a quarterly action plan, and improve WPCs to avoid penalties.



Figure 1: Hot stick installation

Utilities seeking to improve reliability and track WPCs turn to Aclara's Grid Monitoring platform. Aclara's Grid Monitoring platform is made up of Medium Voltage (MV) line sensors that measure voltage, current, power (real, reactive and apparent) and operate on overhead circuits. The smart grid sensors have integrated communications and can transport data over public or private communications networks. The solution is managed by Aclara Sensor Management System (SMS) software allowing utilities to customize and configure parameter settings based on the unique needs of their network. Because of the flexibility of the system, the platform is trusted by the world's leading utilities including Duke Energy. In the last few years, the platform has won over ten awards, was named market share leader in Smart Grid Sensors for North America and was recently

recognized by President Bill Clinton for Aclara's commitment to build a "Predictive Grid" with DTE Energy in Detroit. The solution is currently used by a number of the world's leading utilities on three continents to monitor network operations and improve reliability.

This application guide describes how Aclara's Grid Monitoring platform can be used to identify and track WPCs and gives an example of a North American utility that was able to target tree trimming activities based on knowledge from the system and make improvements before the circuit landed on the WPC list. This guide outlines how Aclara's platform: 1.) Provides trends of monthly performance event type; 2.) Allows utilities to compare the Grid Monitoring platform event reporting of circuits against the WPC list that is generated; and 3.) Enables utilities to pro-actively develop and implement a recovery plan prior to the circuit being added to the WPC report (for example, targeted tree trimming).

Deployment and Installation

Aclara's Smart Grid Sensors are designed for applications on standard distribution size conductors and neutrals. These purpose-built sensors offer utilities the easiest installation process available. Aclara holds the design patent for the way its sensors clamp onto the line so that crews need only use the hot-stick once. Only one lineman is needed with a hot stick or insulated gloves and sensors are deployed on the line in a matter of minutes.

Deployment is quick and easy because Aclara's line sensors are lightweight and do not require calibration or pole mounted cabinets. In addition, Aclara's sensors are inductively powered; there are no solar panels to manage and no batteries to maintain. Once installed, Aclara's line sensors are 100% maintenance-free. Smart Grid Sensors with integrated cellular communications do not require any ancillary equipment to be installed.

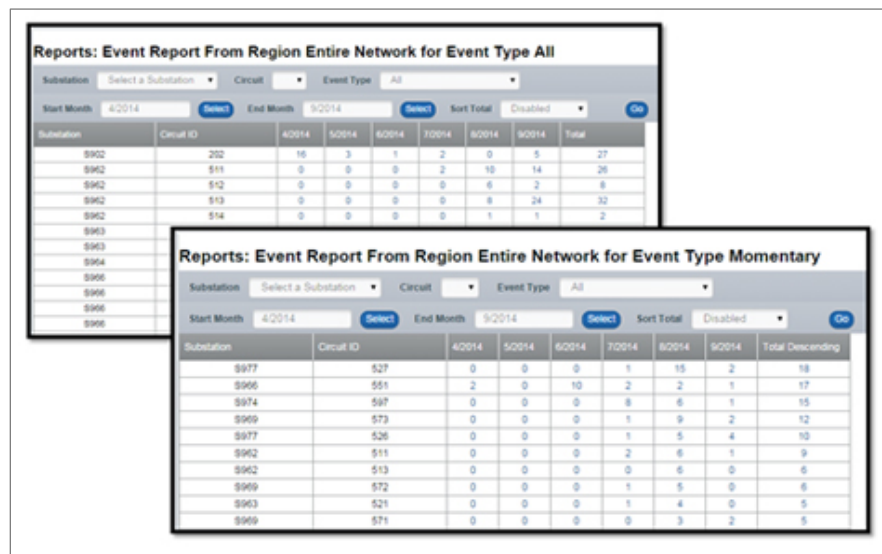


Figure 2: Powerful WPC and Circuit Event Reporting Available in the LightHouse platform

software, events are automatically categorized and recorded in SMS dashboard reports. These categories include momentaries, permanent faults, line disturbances and high current alarms. Power quality events such as voltage sag/surges and harmonic events are also recorded. Statistical counts of these events are provided in a dashboard report that allows you to filter by event and compare events across all circuits. This allows utilities to determine WPCs by not only looking at the events captured within the Grid Monitoring platform but also by analyzing voltage sag/swells, load, etc.

While an in-depth analysis of each event can be performed in the system, Aclara SMS software offers a summary event report which provides a concise view of all of the activity on each circuit by month. The system also has the ability to filter the results by date range or by event type.

Tracking Worst Performing Circuits

Aclara Medium Voltage (MV) Sensors detect all events and faults on the circuit

(even if a circuit breaker or recloser did not trip) and provides this information automatically to the SCADA systems as well as to Aclara Sensor Management System (SMS) software. Using powerful waveform analysis

For example, the WPCs for momentary outages can be determined by filtering on this type of event to produce a customized report. The results can also be sorted so the circuits with largest number of momentaries will appear at the top of the report. Utility engineers can drill down on a specific month to look at each event and look for possible root causes. The Grid Monitoring platform continually monitors and reports the performance of circuits and this information can be easily shared with engineers and operators to pro-actively identify problematic circuits and to track trends in circuit performance as well as seasonal variations.

Using Smart Grid Sensors to Target Tree Trimming Budgets and Improve Reliability

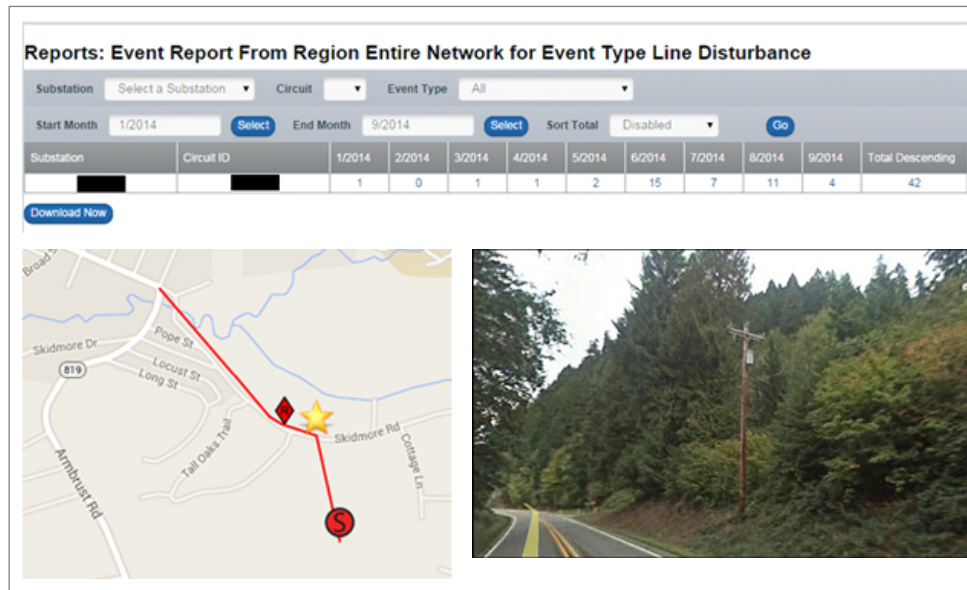


Figure 3: Example of sensor helping a Utility to Perform Targeted Tree-Trimming to Improve Circuit Conditions

of the other line disturbances revealed that most were occurring between the second and third sensor locations. The utility identified that this area of the line had dense vegetation and it had been three years since the last trimming. The utility performed targeted tree trimming to resolve the line disturbances before the faults manifested themselves into momentary or permanent outages which may have put the circuit on the WPC listing. By performing spot trimming, the utility was better able to apply their vegetation management O&M budget. They trimmed the section of line that was poor performing rather than trimming the entire feeder, and moved this circuit out of their WPC category.

In a recent deployment, Aclara's Grid Monitoring platform identified an increasing number of line disturbances at one North American utility. This utility had deployed Aclara's Medium Voltage (MV) sensors at multiple locations along the circuit. Aclara's SMS software plotted the location of the sensor experiencing the line disturbances. A review



“Getting data from the grid through sensors makes business sense. We are now of the mind set to monitor everything”

Vince Dow
Vice President, Distribution Operations,
DTE Energy

Conclusion

Utilities are constantly working to improve circuit performance and more efficiently manage O&M budgets. Once circuits are identified as a WPC, the utility has a limited amount of time to make enough improvements that can positively impact reliability to avoid penalties.

Aclara Grid Monitoring platform has the ability to continually monitor and report the performance of circuits. Aclara's platform consists of Medium Voltage (MV) line sensors and Sensor Management System (SMS) software that measures and records events by circuit so that you can quickly develop WPC rankings and more economically plan improvement actions such as targeted tree trimming activities. Statistical counts of these events are provided in a dashboard report that allows you to filter by event and compare events across all circuits. A summary event report (with in-depth analysis only a mouse click away) provides a concise view of all of the activity on each circuit by month.

Now, utilities can pro-actively monitor circuits for increasing patterns of faults and outages. They can also take steps to mitigate these issues before the circuit becomes a WPC. With this powerful reporting, utilities can more specifically target O&M dollars to the areas that need it the most.

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