

# Use the LINE Platform to Push Real-time Information on Voltage Sag

Electric Power Lab: Ke, Chiao-Yuan; Liao, Ching-Jung

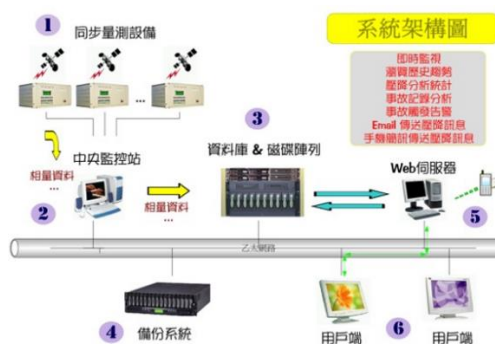
## 1. Origin

The power quality monitoring system currently has 104 stations built in important power plants or substations. Its main functions include wide-area measurement applications and voltage sag detection. The applications of wide-area measurement are as follows: real-time power flow monitoring, accident playback, frequency change prediction, and generator set parameter testing. Voltage sag detection mainly focuses on the substations of various science parks. Since the semiconductor industry is very sensitive to voltage sag, the dispatch center needs to know the voltage drop information in real-time. Our company needs to collect data on voltage dips in each science park every month as a basis for quarterly review by the high-tech park power quality team to improve the overall power supply reliability.

## 2. Voltage sag monitoring system architecture

To complete the voltage sag monitoring in a specific area, synchronous measurement equipment must be installed in the substation to monitor the voltage of each busbar. When the trigger condition is met (voltage drop rate > 10%), the synchronous measurement equipment will send the voltage drop event waveform file to the central monitoring station through the company's intranet. After being processed by the database and web server, the voltage drop information will be provided on the

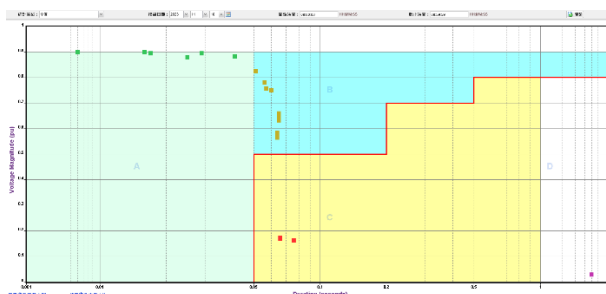
web page in real time; the structure is shown in Figure 1.



Source: Voltage sag monitoring webpage

Figure 1. Voltage sag monitoring architecture

When a voltage drop event occurs, the web page's analysis and statistics function can instantly query the degree of pressure drop at each station affected by the event and display the distribution chart according to the SEMI F47 curve, as shown in Figure 2. This function helps dispatch center personnel clarify the scope of the pressure drop and determine the source of the accident. One can select the distribution point and double-click to further display the three-phase waveform (about 20 cycles) and voltage RMS value.



Source: Voltage sag monitoring webpage

Figure 2. Statistical analysis of pressure drop events

### 3. LINE push system construction

Traditional mobile phone text messages are limited to text descriptions, and the only information provided is the occurrence time, location, voltage drop rate, and the value of each phase. If you want to check the actual waveform changes, you still need to connect to the voltage sag monitoring webpage. To enable mobile phones to receive complete voltage drop information and send it to multiple colleagues simultaneously, TPRI has developed voltage drop information combined with the LINE push system function. Anyone who joins the LINE group successfully can receive the latest voltage drop information. TPRI applied for a virtual host from the TPC's Department of Information Management to connect to the LINE push host and asked the equipment manufacturer to compile a sending program. Under this architecture, the only communication port used is 80, and the communication method between the virtual host and our server adopts the HTTP protocol of the network for polling work. The current setting is to poll every five minutes. Once a voltage drop event is found in the power grid, analysis will be started, and the results will be displayed immediately. When a pressure drop occurs, the platform will first push a map of the location of the pressure drop event and display the analysis of the most severe pressure drop in the event. The image size is 2900x1400 pixels, which can be continuously enlarged on a mobile phone. The text format is monitoring station name, line name, voltage drop amplitude, voltage drop duration in milliseconds (number of cycles), ABC

three-phase voltage standard value, and voltage drop classification. Then, the platform will push the second one, sending the voltage drop report image file with the incident three-phase voltage waveform. The image can also be enlarged on a mobile phone if needed. The screenshot of the message pushing to the LINE group is shown in Figure 3.



Source: Screenshot by the author

Figure 3. Push the voltage sag to the LINE group

In addition to voltage drop detection, when the voltage at the monitoring point is abnormal (such as voltage waveform distortion), it can also be pushed. With this platform, our staff can instantly confirm whether there is any abnormality in related equipment, which is helpful for power grid maintenance. Although this platform is still in the testing phase, it has worked smoothly. It is expected to be officially launched in the first half of this year.