

THE ELECTRICAL POWER PROJECT AT SNS*

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Abstract

The Electrical Power Project consisted of recording data on all power-distribution devices necessary to SNS operations and how they are connected, assigning a valid name to each device and describing it, along with loading this information and the relationships into the SNS Oracle database. Interactive web-based applications allow users to display and easily update power-related data. In the case of planned electrical outages, a complete list of affected devices (including beam-line devices) is available to controls, diagnostics, and other groups in advance. The power-tree information can be used to help diagnose electrical problems of any specific device. Fast access to device characteristics and relations from any web browser helps technical personnel quickly identify hazards and prevent electrical accidents, thereby ensuring SNS electrical safety. The project was completed by a special task team containing individuals from different groups. The paper covers the project history, description, quality assurance (QA) issues, technology used, and current status.

INTRODUCTION

The Electrical Power Project started as two small independent projects for the Control Systems and Beam Instrumentation groups at SNS. The goal of these small projects was to collect information on the power sources for devices. The relationships could then be used to track issues in case of device malfunction. For example, the power supply to each input output controller could be traced. These projects developed into a larger SNS project.

The SNS Electrical Group actively participated in collecting data for all electrical devices (e.g. power panels, substations, etc.), user interface design, testing of online Electrical Power Maintenance Toolset and QA efforts.

The project now tracks power from the SNS TVA substation to the circuit breaker level in power panels. This data combined with that done in the original two projects allows users to track power from substation to affected beam line devices.

POWER MAINTENANCE TOOLSET

The Electrical Power Maintenance Toolset is a set of web-based reports and tools that takes advantage of the SNS Oracle database [1], [2] and is a part of Reports Online for Control Systems (ROCS) system [3].

Reports developed include:

- The Power Tree Report which allows users to traverse up and down the power tree.
- The Electrical Load Analysis Report which generates a list of loads or devices dependent on a particular device. This includes all of the components that rely on that device such as beam line devices.
- The Electrical Device Information Report which provides the device description and location, along with a list of process variables and their characteristics, and panel schedules where applicable.

The Official Outage Request tool allows an authorized user to request a planned power outage and to make an announcement to SNS staff. The announcement includes an Official Outage Report specifying the electrical device to be turned off, date, time and outage duration, as well as purpose of the outage. The Outage Report also includes a list of all affected devices sorted by the type of power backup available. The information for each outage is also available using the Outages History Report.

The Electrical Power Maintenance tool allows authorized users to update and add data within the Oracle database. This tool, however, limits updates to only relevant data such as power sources, electrical device descriptions, circuit breaker configurations, and restricts the creation of new database items to electrical system devices only.

USER SIDE

Access

Access to the electrical data was divided into two groups, general access and restricted access. General access allows all users with internet access to generate reports that provide read only information from the SNS Oracle database. Restricted access includes in addition all data management tools which allow users to update the SNS database and requires users to request a role from the electrical project team. Users with restricted access must log in when making changes. All users can access reports and data management tools from the Electrical Power Distribution webpage or through ROCS.

Look and Feel

The look and feel of the Electrical Power Maintenance Toolset is similar for all (see Fig. 1). This similarity has allowed users to quickly understand additional features or reports. The log in panel is located on the top of the screen. All selection panels which allow users to choose a device or group of devices, and select a report or tool, are located on the left. Because different groups have

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different needs the set of reports and tools shown on the left depends on a group password entered at the beginning of the session. The report or tool requested is shown on the largest panel in the middle of the page.

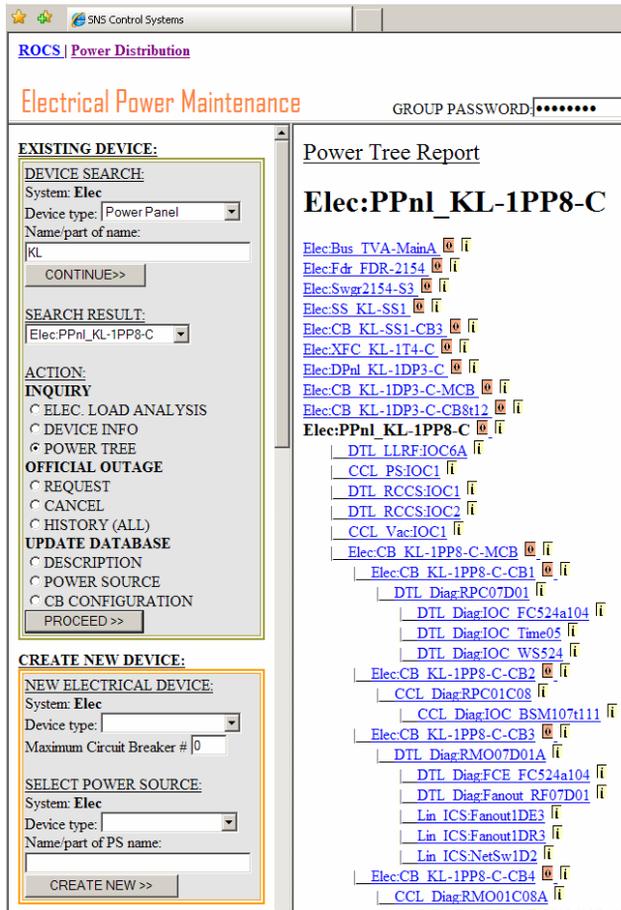


Figure 1: General Layout.

A special PRINTER FRIENDLY button is provided to open the report in a new window for printing, unless the report had already been designed to open in a separate window, like the Panel Schedule (see Fig. 2).

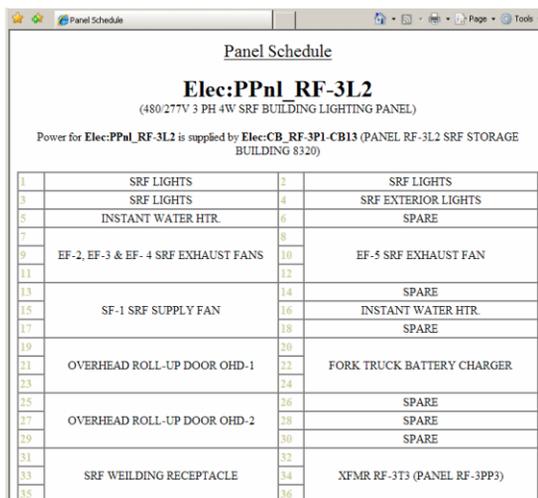


Figure 2: Panel Schedule.

We tried to provide an intuitively easy way to deal with complex issues (e.g. naming according to SNS standards, descriptions limitations, configuration and reconfiguration of circuit breakers). Users, with no SQL knowledge, are able to enter the information through a series of mouse clicks and selections with the user-friendly interface developed. This minimizes the probability of an error.

Most reports include links to other reports, which allow users to start with a general report, and then drill down for more specific information. For example, from the Power Tree report you can get Electrical Load Analysis report or Electrical Device Information Report on any device in the tree with just one click.

Updating Existing Electrical Devices

Updates of existing electrical panels are completed using the forms which look like panel schedules (see Fig. 3). This is more convenient and user-friendly to all users, especially to electrical technicians and engineers, because it complies with the standard panel schedule format. All selections are made from drop down lists, which are automatically taken from the SNS Oracle database.

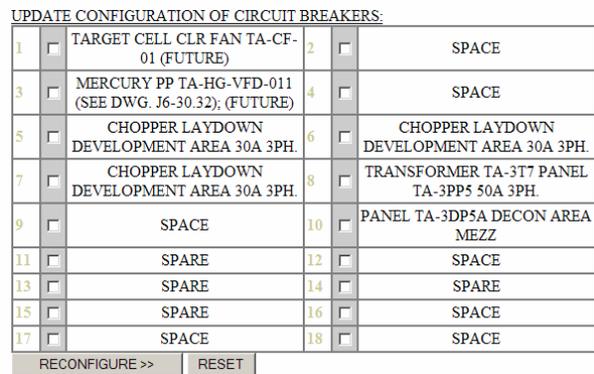


Figure 3: Update Panel Configuration form.

Creating New Electrical Devices

New panels are configured through a series of clicks with radio buttons and check boxes (see Fig. 4). Because users are not creating a database item using text entries, the new devices are assured to conform to the SNS standard.

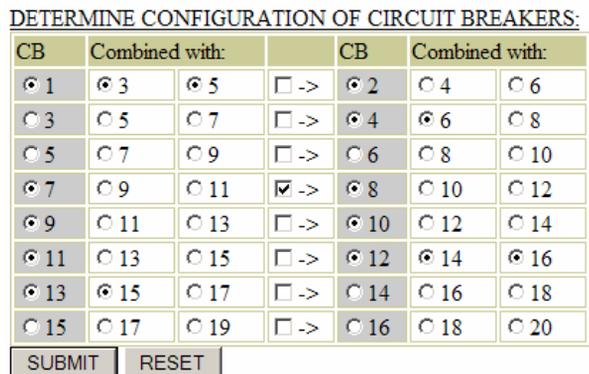


Figure 4: New Panel Configuration form.

The associated power source for a device is selected from the drop down list. This assures that the related power source is an actual device in the SNS database. Descriptions can be entered using a schedule looking form (see Fig. 5).

Figure 5: New Panel Description form.

Before saving new device information to Oracle, users have a chance to check the results of their work on the Confirmation page. Once satisfied they can save the data to Oracle by confirming what they see on the page.

Naming New Electrical Devices

All devices entered into the SNS database must be named according to the SNS naming convention. However, the electrical group had its own naming standard and we did not want to lose this. So, the device names appear complex but to the users they are self explanatory.

For example, **Elec:CB_KL-1DP3-C-CB8t12** is a device named strictly according to SNS rules. The name conveys that this electrical device is a circuit breaker of distribution panel KL-1DP3-C located in the SNS Klystron gallery. Moreover, this circuit breaker is a 3-pole breaker located at circuit breaker locations 8, 10 and 12.

Again, in order to minimize the possibility of creating errors, the circuit breakers are named automatically based on user selections.

PROJECT DEVELOPMENT

Data

Initially data were collected and loaded into SNS Oracle database from spreadsheets by the SNS database support team. Currently new electrical devices information can be entered by authorized users using the forms provided as part of the project, and this data can be saved to the database from online.

Quality Assurance

As part of quality assurance, all user interfaces were designed to meet the Electrical Group's specifications. These interfaces are task-oriented and user-friendly to electrical technicians and engineers. Data accuracy, however, was the most significant and involved part of

quality assurance. To guarantee data accuracy, electrical distribution devices were field checked, and all reports were tested extensively.

Technology Used

The toolset was built using JavaServer Pages (JSP) technology with Apache Tomcat 5.5 on Linux, and JDBC to connect to the SNS Oracle database.

JSP technology provides a fast way to create dynamic web content. This we found to be very convenient and allowed us to build data queries on the fly based on user selections. Another advantage of this inexpensive technology is that JSP allows creating web-based applications that are server- and platform- independent. Our reports and maintenance tools are therefore accessible any time from any machine and any location using a web browser.

CONCLUSIONS AND PLANS

The Electrical Power Project is now completed and has been successfully implemented at SNS. Official Outage Report is now the standard notification method for planned power outages. Authorized electrical technicians use the online tools to update existing electrical device information, and to create and enter new electrical devices into SNS oracle database. The reports are also used for troubleshooting.

Based on this experience we plan to develop similar applications for other SNS groups.

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