Overview

Campus Primary Electrical Distribution System

The campus is served by an open loop electrical primary system that serves approximately seven transformers around the campus. This type of system allows for isolation of faults within the system and limits how much of the campus is affected by an on-site power outage. The primary electrical loop has had one major upgrade in 1993 which included replacing most of the transformer switches and replacing the conductors on the west half of the loop. The east half of the loop still has the original conductors form the 1960’s.

A recent capacity study in February of 2005 revealed a potential overload of the system with the Science Building coming online in 2007. To address this, a partial upgrade of the system is scheduled to occur in the summer of 2006. This involves the replacement of the main service switch and an upgrade of the Tacoma Public Utilities power connection. This should yield about 65 amps of future growth capacity after the Science Building comes online. This translates into enough energy to support approximately 150,000 – 200,000 sq/ft of new buildings before additional upgrades are required. The existing loop conductor capacity will then become the next limiting factor and replacement of the loop power cables with larger ones, would then be necessary.

The question is: Should this upgrade be part of the Short Term Master Plan or the Mid Term Master Plan? The answer will depend on building use, density and timing of when those new buildings will be connected to the network. One positive is that for each new building added, there may be demolition of older buildings which will help reduce load and extend overall capacity. Periodic monitoring or testing for available loop capacity will need to be performed on a regular basis and immediately after each new building comes online. This is a tedious and costly process that involves the installation of temporary monitoring and recording instruments along with the services of an electrical engineering consultant. Consideration should be given to the installation of an automatic power metering system so that the electrical energy for each building can be monitored on a continual basis.

Recent legislation adopting “sustainable” designs for state funded schools require that individual building energy monitoring and consumption be tracked and managed. By complying with this mandate, a “two for one” situation would result. The same metering equipment used to satisfy state requirements could be used to track available loop capacity on a continuous or “real time” basis. The system would monitor the power characteristics of each transformer and would provide a running history of how and where power is being used in the network. By having current energy capacity information, other short term or emergency type projects involving the need for additional power, their feasibility could be evaluated quickly and safely.

Another potentially weak link in the primary distribution system is related to the age of many of the building power transformers. A few appear to be from the original construction and should be looked at closer for potential problems. An inspection of each transformer along with laboratory analysis of the coolant oil and gases inside the transformer can provide reliable information and indicator to the remaining life of this equipment. As mentioned above, about half of the existing loop conductors are from the original construction in 1964. Examination and testing of these aged conductors, and transformers, should be completed soon, to assess their current condition. The results may determine that replacement activities of select components are necessary before this system is operated near or at its peak load handling capacity.
Recommended Improvements to Campus Primary Electrical Distribution System

E1 Replacement of primary loop conductors. Estimate is based upon reuse of existing raceways. Estimated cost range of $230,000 - $300,000.

E2 The testing and evaluation of existing distribution transformers and aged primary conductors for operation at peak capacities. Installation of permanent energy metering equipment. Estimated cost range of $165,000 – $180,000