SECTION 9
Line Preventive Maintenance

Distribution Line Preventive Maintenance

Preventive maintenance is defined as periodic, condition based, planned and predictive maintenance activities.

The goal of preventive maintenance is to minimize outages due to in-service failure and to reduce shutdowns due to malfunctions. Table 9-1 lists the distribution system in-service quantities for the PM cycle and the basis for the PM cycle.

Table 10-1

Distribution System Equipment Quantities

Equipment	In Service Quantities	PM Cycle	Basis for PM Cycle
Overhead Switch	2,667	10 years	District experience and industry practice
Padmount Switchgear	1,889	5 years	District experience and industry practice
Network Protector	410	3 years	District experience

Distribution line maintenance planning has historically been scheduled on a time or operation based PM cycle. The District is in the process of converting from the periodic PM maintenance to Reliability Centered Maintenance (RCM). The conversion will take several more years to implement. The implementation is being accomplished in small stages.

The maintenance plans for some distribution line equipment have been lengthened from a constant time or operations to schedules based upon, the type of equipment, the results of the visual and detailed inspections, and operating experience. Table 9-2 lists the annual quantities of the equipment to be maintained based upon the above PM cycles.

Table 9-2

Distribution System Equipment Maintenance Quantities

Equipment	Quantities to be Maintained
Overhead Switch	150 - 10-year cycle
Padmount Switchgear	350 - 5-year cycle
Network Protector	137 - 3 year-cycle

During 2002, overhead capacitor bank PM was evaluated to determine if the PM strategy was effective in reducing failures and outages. The strategy was found not to be effective as the capacitor banks were still failing at about the same rate as without maintenance. The effects of overhead capacitor bank failures were found to be minimal and did not usually result in

outages or severe voltage problems. Based on this evaluation, the overhead capacitor bank maintenance strategy has been changed from PM of all banks on a three-year cycle to corrective maintenance only. The capacitor banks are to be inspected annually for leaks, blown fuses or failure to operate. Additionally, when banks fail and are taken out of service, CM SAP notifications are created for the repair of the cap bank.

Distribution line preventive maintenance work is being issued utilizing SAP as the scheduling tool. Once the SDIT program is implemented and all of the distribution line equipment is input into SAP, maintenance plans will be created in SAP. The maintenance plans will include the scheduling and task lists. The maintenance plans will issue orders when the work is due. The task lists provide the guidelines for the work that is required. The task list also provides a list of the materials and tools suggested to perform the maintenance.

The PM work completed in 2003 was less than budgeted due to labor resource issues. There were 369 SAP Work Orders completed in 2003 out of 704 Work Orders issued in 2003 and carried over from previous years.

The majority of the completed PM work was for the network equipment. The network system maintenance is discussed in Section 12.

Transmission Line Preventive Maintenance

Transmission line preventive maintenance planning has included the annual transmission line helicopter patrols, detailed inspections of the structures, replacement of the sacrificial anodes for the underground transmission lines and vegetation management activities on the transmission line right of ways. The transmission line disconnect switches will be maintained on a five-year cycle. Of the 3 SAP orders created in 2003 for transmission line preventive maintenance, 3 were completed. The work performed included the two helicopter patrols and the transmission line tower inspections to verify that the towers did not have bolts removed.

The Distribution Network crews perform the replacement of sacrificial anodes on the transmission underground line cathodic protection systems on the locations in Table 9-3 on an annual cycle.

Table 9-3
Cathodic Protection System

CIRCUITS WITH CATHODIC PROTECTION				
CIRCUIT	FROM	TO	NUMBER OF TEST LOCATIONS	Location Addresses
115kV (Circuit 1)	North City	Station A	5	1) North City 2) 20th & E St. 3) 13th & E St. 4) 7th & E St. 5) Station A
115kV (Circuit 2)	North City	Station A	5	1) North City 2) 20th & E St. 3) 13th & E St. 4) 7th & E St. 5) Station A
115kV (Circuit 1)	North City	Station B	4	1) North City 2) 20th & E St. 3) 20th & J St 4) Station B
115kV (Circuit 2)	North City	Station B	4	1) North City 2) 20th & E St. 3) 20th & J St. 4) Station B
230kV	Transition Station @ Watt & Auburn Blvd.	Carmichael	8	Transition Stn, Manhole #s 1,2,3,4,5,6, & Carmichael Sub.
230kV	Carmichael	Orangevale	12	Carmichael Sub. loc.1, 2 at 5920 Madison, 3, 4,5,6,7,8,9,10, & Orangevale Sub.