

FIRE SAFETY PROGRAM ASSESSMENT  
Western Area Power Administration: Sierra Nevada Region  
September 2002

Final Report  
Prepared by: Dennis Kubicki

## Executive Summary

Between September 16<sup>th</sup> and the 19<sup>th</sup>, 2002, an assessment was performed of the Western Area Power Administration (Western) Sierra Nevada Region (SNR) fire safety program and facilities. Mr. Dennis Kubicki, P.E., Senior Fire Protection Engineer with the DOE Headquarters' Office of Corporate Safety Assurance conducted the review. Assisting with this effort were Ms. Cindy Foster, SNR Safety and Occupational Health Manager, Ms. Victoria Anderson, SNR Safety Specialist and Ms. Doris Martinez Western Corporate Services Office Safety Specialist. The focus of this assessment was on the completeness and adequacy of the fire safety program generally, as well as on facility-specific fire hazards, fire prevention activities and fire protection features. The program and facilities were reviewed in comparison to the fire protection requirements contained in 29 CFR 1910, Subparts E and L, Western fire safety criteria, and applicable DOE and National Fire Protection Association (NFPA) codes and standards. The assessment methodology consisted of facility tours, document reviews, and personal interviews.

On the basis of this evaluation it was concluded that there are no significant unmitigated fire hazards that represent an **imminent** threat to public health and safety, the safety and health of Western employees, the continuity of operations, or property conservation. Nevertheless, a number of significant programmatic weaknesses and facility deficiencies were observed which warrant expeditious attention to enhance the effectiveness of the existing fire safety program, to prevent fires or to mitigate the consequences of a fire or related event if one should occur. The most significant of these conditions is the vulnerability to fire of substation transformers and control buildings. Further elaboration is provided below and in the main body of this report.

A number of positive aspects of the fire safety program were noted in conjunction with this assessment. They are also delineated below in an effort to provide a more complete perspective and a degree of balance.

### Positive Program Attributes:

- Management, including personnel that are responsible for safety within facilities, exhibits a sincere commitment to adequate fire protection.
- There is a noticeably good working relationship among the Western staff that has responsibilities for safety and health.
- Regular fire safety and related training is provided for all employees, including annual emergency evacuation drills. CPR, first aid and defibrillator training is offered for select employees.
- SNR has published an easy-to-use, yet comprehensive, desktop reference Emergency Preparedness Manual.

#### Programmatic Weaknesses:

- Western safety policy, as manifested in current and pending ES&H directives, does not completely define minimum expectations regarding the provision of fire safety features for its critical facilities and equipment. Specific reference is made to the absence of explicit fire safety criteria for substations, control buildings, and transmission lines. Additionally, Western directives do not explicitly adopt relevant fire safety criteria, such as applicable National Fire Protection Association Codes and Standards or the fire protection guidelines developed by Factory Mutual Research Corporation.
- Despite recent improvements, the existing fire protection system inspection, testing and maintenance program is not yet comprehensive. Based on available documentation and personnel interviews, it appears that all fire safety features are subject to periodic inspections and tests. Yet this documentation lacks sufficient detail to confirm that the inspections and tests for any given component or system are complete and proper.
- The SNR Safety Inspection Checklist, used during annual inspections, does not address all important fire safety issues.

#### Positive Facility Attributes:

- A generally effective housekeeping program exists which minimizes unwanted accumulations of combustibles and sources of ignition.
- Employees receive routine CPR, First Aid and defibrillator training (all facilities).

#### Facility Deficiencies:

##### General

- Substation transformers and control buildings have not been provided with fire protection in accordance with prevailing industry norms as delineated in Factory Mutual (FM) Loss Prevention Data Sheet 5-4, the FM Handbook of Industrial Loss Prevention, and DOE Order 420.1, "Facility Safety," and its Implementation Guide. A transformer fire or a fire of significant magnitude in a Control Building has the potential of causing significant monetary loss and interruption of capability. This lack of fire protection is in contrast to some Western Vehicle Storage Buildings (Garages), which are protected by automatic (fire) sprinkler systems.
- Local fire departments have not had an opportunity to conduct a routine site familiarization tour of all Western facilities within the recent past, nor have substation personnel been provided with procedures and training to be able to effectively coordinate emergency response with these organizations.

Folsom SNR Regional Office:

- A recent hydrant flow test has revealed that the existing public water distribution system is incapable of supplying the maximum anticipated demand of the building (fire) sprinkler system.
- The fire doors between the SOC and SESC are being held open with unapproved devices (kick-stand-type door holders). This would permit products of combustion to spread through the opening in a fire.

Tracy Substation:

- See discussion above regarding insufficient protection for transformers and Control Building. See also the discussion regarding lack of recent fire department orientation tour and emergency response training.
- The area around the sprinkler system riser is used for storage. A free space is required to avoid damage to the sprinkler piping and to facilitate fire department access.

Redding Maintenance Facility:

- Sprinkler heads were found capped underneath the overhead doors in the garage.
- Two exit doors were found to be in need of maintenance.
- Extension cords were being used improperly.
- The parts cleaning basin cover was broken.

Keswick Substation:

- See discussion above regarding insufficient protection for transformers and Control Building. See also the discussion regarding lack of recent fire department orientation tour and emergency response training.
- Fire doors between the first and second floors of the control building are being held open with unapproved devices.

Elverta Maintenance Facility:

- The existing (fire) sprinkler system does not extend to all areas of the facility. Several areas are unprotected.
- The New Vehicle Storage Building is not protected by an automatic (fire) sprinkler system.
- There has been no recent fire department orientation visit to the facility.
- Two emergency lighting units were found to be inoperable.
- There is no sign on the emergency shut off switch for the fuel pumps.
- Fire extinguishers on all vehicles were not charged.

## Olinda Substation

- See discussion above regarding insufficient protection for transformers and Control Building. See also the discussion regarding lack of recent fire department orientation tour and emergency response training.
- Substantial barriers have not been installed around the propane tank.
- The hazardous material spill kit was incompletely supplied.

### **1.0 Introduction:**

In accordance with applicable CFR, Department of Energy (DOE) and Western Area Power Administration (Western) safety criteria, an assessment was performed of the Sierra Nevada Region fire protection program and facilities. Mr. Dennis Kubicki, P.E., Senior Fire Protection Engineer with the DOE Headquarters' Office of Corporate Safety Assurance conducted the review. Assisting with this effort were Ms. Cindy Foster, SNR Safety and Occupational Health Manager, Ms. Victoria Anderson, SNR Safety and Security Specialist, and Ms. Doris Martinez of the Western Corporate Services Office, Safety & Security Office. The focus of this assessment was on the completeness and adequacy of the fire safety program generally, as well as on facility-specific fire hazards, fire prevention activities and fire protection features.

The program was reviewed in comparison to the fire protection requirements contained in 29 CFR 1910, Subparts E, "Means of Egress," and Subpart L, "Fire Protection;" the criteria contained in WAPA 3790.1B, "Occupational Safety and Health Program" and other directives; applicable DOE requirements, such as DOE O 420.1, "Facility Safety" and its Implementation Guide; and NFPA Standards, such as NFPA 101, "Life Safety Code," among others.

The assessment methodology consisted of facility tours, document reviews and personal interviews. Additionally, the results the fire protection assessments in 1998 were reviewed to determine the degree of compliance with previous recommendations. Except for a small cable structure at Keswick, tours were conducted of all buildings at the Sierra Nevada sites that were within the scope of this review. The approach taken was to physically enter every room to observe conditions, including areas below raised floors and above suspended ceilings, as appropriate.

### **2.0 Results:**

#### **Fire Safety Program**

The Western fire safety program is manifested in a number of source documents including WAPA 3790.1B, "Occupational Safety and Health Program" (to be replaced by WAPA O 440.1) and the "Power System Safety Manual," among others. Supplementing these criteria are Operating Instructions, which focus on issues requiring more focused attention, and other forms of safety communication. This collection of published material reflects the organization's collective sense of priorities with regard to safety and health management. The (draft) WAPA O 440.1 represents

a distinct improvement over the current Order with regard to fire protection because it is more explicit and complete.

SNR has published a "quick-reference" Emergency Preparedness Manual which simply yet effectively presents essential information such as emergency phone numbers, general emergency procedures and actions to take when dealing with specific incidents (fires, explosions, bomb threats, etc.). **As noted in the 1998 fire safety assessment report, this reference is considered a positive program attribute and has been used as a model for a similar publication at DOE Headquarters.**

In reviewing the collected body of fire protection criteria that has been promulgated by Western it was noted that they are not yet comprehensive with regard to all facets of an effective fire safety program. For example, the Order (both current and draft revision) does not define the applicability of relevant industry fire protection criteria, such as the codes and standards promulgated by the National Fire Protection Association (NFPA) or fire safety criteria developed and implemented by DOE. Such criteria are the foundation of all fire safety programs, including those within the Department.

More importantly, Western has not explicitly defined its minimum expectations with regard to the protection of facilities and equipment that are unique to the electric power industry and critical to its mission. There are no fire safety criteria governing the protection of transformers and related electrical equipment, control buildings, and transmission lines. (For transmission lines the issue is the implementation of safeguards against the threat from wildland fires to conductors and fiber optics.) This lack of definition has resulted in a situation where Western vehicle storage buildings (in essence garages) have a higher level of fire safety than critical transmission facilities. Suitable industry criteria exist in the form of "Data Sheets" that are published by Factory Mutual (FM) Research Corporation. But Western has not adopted these criteria formally. Collectively, these shortcomings in documented fire protection program requirements may allow fire-vulnerable facilities and equipment to remain with an insufficient level of protection

**Recommendation 02-1: Working in conjunction with the safety professionals in the Corporate Services Office (Western Headquarters) in Lakewood, Colorado, the draft Order and/or Power System Safety Manual should be expanded to address, in a comprehensive manner, fire safety for all facets of Western responsibilities, activities and facilities. Consideration should be given to adopting relevant NFPA Codes and Standards and applicable FM data sheets, such as Data Sheet 5-4 governing transformers.**

The degree of management interest in and support for fire safety is critical to an effective fire protection program. Western management commitment to adequate fire safety is manifested in a number of ways. These include support for safety initiatives (such as ongoing Fire Prevention Week activities, and "Safety Recognition" Program), budget allowances for program activities and facility improvements, and endorsement of enhancements to environment safety and health (ES&H) policies and practices. "Mid-level" management, here defined as individuals with collateral responsibilities for assuring adequate fire safety, also exhibits a high level of commitment to safety. This was particularly noticeable at the Regional Office in Folsom, CA, in

conjunction with the overall cleanliness and the high state of repair of fire protection equipment and systems within the facility. **This is considered a positive program attribute.**

During the personnel interviews and in other conversations during the course of this assessment, it became apparent that the SNR safety staff had developed and was striving to maintain good working relationships with those individuals within Western that are most responsible for assuring adequate fire safety. This was particularly true with foremen, but was also noted with regard to employees in general. Such a relationship also exists between the Sierra Nevada safety staff and those within CSO. **This is considered a positive program attribute.**

Under a policy established by the SNR Safety and Occupational Health Manager, all craft employees at field facilities and employees on a volunteer basis at the Folsom facility receive annual CPR, First Aid and Defibrillator Training. This is in addition to periodic fire safety training for all employees, which includes emergency evacuation drills. **This is considered a positive program attribute.**

In the 1998 fire safety assessment, it was noted that not all fire protection equipment and systems were being inspected, tested and maintained (IT&M) in accordance with an established program. In response to this observation, Western has implemented changes in their safety management system to encompass all fire safety features within an IT&M program. This consists of either contracts to private fire protection equipment service companies or “in-house” programs, with work performed by Western staff. A review of available documentation and interviews with cognizant personnel during this assessment were the basis for confirming that the equipment and systems were subject to surveillance. However, documented reports were presented only from the equipment service companies. Documentation was limited-to-nonexistent for in-house IT&M activities on fire protection features (e.g. fire dampers and battery powered emergency lighting units). Consequently, there was an insufficient basis to conclude that these features would function during a fire. (A test of some individual emergency lighting units revealed them to be inoperable.)

Similarly, the inspection reports from the fire protection equipment contractors were not in accordance with the format established by the NFPA. For example, some of the reports for the (fire) sprinkler systems did not show required water flow test results. Some of the reports for fire detection systems did not indicate if all devices were tested. Consequently, it could not be independently confirmed that the tests were complete and adequate.

**Recommendation 02-2: In accordance with the provisions of governing NFPA Standards (such as NFPA 25 for water-based fire suppression systems and NFPA 72 for fire alarm and signaling systems), the results of fire protection equipment and systems inspections and tests should be completely documented. Service contractors should be required to document their work on standard inspection and testing forms. Internal (to Western) fire protection IT&M activity should be documented in an appropriate log or report.**

The SNR safety staff, in concert with management and union representatives, performs annual ES&H and Security inspections. A “Safety and Security Checklist has been developed to facilitate this effort. A review of the checklist reveals a number of items relating to fire safety. However, the checklist does not include verification of the status of fire suppression systems (e.g. open control valve, system pressure) and other fire safety hardware (fire dampers, hydrants, etc.). Nor does the checklist encompass administrative aspects such as employee training or fire protection equipment IT&M records. The consequence of this condition is that important fire safety program attributes may not be confirmed as part of the annual inspection.

**Recommendation 02-3: The Safety and Security Checklist should be reevaluated with the goal of making it more comprehensive, yet remain convenient to use.**

### Facilities in General

The assessment team observed a limited spectrum of fire hazards within each building. Typical are varying degrees of flammable and combustible materials in relation to certain sources of ignition, such as energized electrical equipment. These hazards are consistent with the occupancy of the buildings (offices, storage, mechanical/electrical equipment, data processing and control, vehicle repair and storage, etc.). The potential sources of ignition (smoking, cutting torches, electrical equipment, etc.) are subject to appropriate safeguards such as administrative controls, barriers and routine maintenance. Additionally and with the exception of certain features, the facilities are provided with an appropriate level of fire protection. This includes automatic (fire) sprinkler systems, carbon dioxide suppression systems, fire detectors, an alarm and signaling system, adequate emergency egress capability, and portable fire extinguishers, among other safeguards. Collectively, these features constitute fire protection defense-in-depth, as required by DOE fire safety criteria.

The exceptions to the above are substation transformers and control buildings as well as segments of transmission lines in areas of high vegetation. Critical equipment within the substations is spatially separated to varying degrees. The criteria contained in IEEE STD 979-1994 and NFPA Standard 850 was applied in part. However, the hard packed surface and slope of the drainage fields would permit burning oil to spread to adjacent units. Recorded fire events have revealed that spatial separation alone will not prevent damage from fire and shrapnel. The control buildings are single fire areas with neither active or passive fire protection systems to limit loss.

Other than isolated fire events elsewhere, such as the recent transformer fire in the Los Angeles area, there is no evidence to suggest that Western transformers and control buildings are prone to loss by fire or related event. In fact, Western fire loss history reveals no adverse trends. Additionally, the transmission equipment is subject to a comprehensive IT&M program, including themographic assessments, hot gas analysis and twice-yearly inspections. Western appears to be doing all that can reasonable be expected to **prevent** fires. Western (SNR) has also taken precautions to keep spare equipment on site in the event of loss or malfunction.

Despite these efforts, fires can and will occur. (DOE fire safety philosophy is predicated on the assumption that the probability of fire is “1.”) The transformer fire previously mentioned (and

others that are documented in industry sources) resulted despite a comprehensive utility IT&M program. If a significant fire should occur in either a control building or in a substation, Western is vulnerable to suffer millions of dollars in property and revenue loss as well as unpredictable down time. (The loss potential came from SNR subject matter experts.) If DOE fire safety criteria were applicable, this loss potential would require the installation of fire barriers and/or automatic fire suppression system to reduce the risk.

An additional factor is adverse publicity and public perception of Western if an unmitigated transformer fire were to cause dense clouds of black smoke to spread to the surrounding community. A calculation was performed (see Appendix) that attempts to define the duration of a credible transformer fire. Depending on the event and the quantity of mineral oil that remains in the reservoir, a fire has the potential for burning over twelve hours.

With the exception of the Lawrence Livermore Fire Department, Livermore, CA, local emergency services organizations would not be capable of responding in a timely and effective manner to substation fires because of their location in relation to the site, limited water for fire fighting, limited staffing and insufficient training and experience. Additional considerations include the risk to fire fighters from a transformer explosion and the potential for fire spread by the injudicious use of water on burning mineral oil or sensitive equipment within the control buildings.

Considering the circumstances associated with each substation and reflecting the fire safety guidance published by FM, a prudent course of action would be to install passive fire protection (free-standing fire walls and rock-filled containment pit) for the transformers and gaseous (Halon-substitute) automatic fire suppression systems for the control buildings. The passive protection is reliable, relatively inexpensive and easy to maintain. Properly designed and positioned, such barriers would not adversely affect system performance and will not hinder maintenance activities. The gaseous fire suppression systems, while costly, will quickly and cleanly suppress a fire in its developing stages. Such systems will compensate for the limited water supply at most substations and will minimize dependence on local fire departments.

**Recommendation 02-4: Install freestanding masonry firewalls between substation transformers. Supplement the existing drainage system with a rock filled containment system around each transformer that can accommodate the mineral oil inventory.**

**Recommendation 02-5: Install a gaseous automatic fire suppression system in accordance with applicable NFPA Standards to completely protect substation control buildings.**

The Power System Safety Manual and supplementary safety criteria applicable to the Right of Ways include requirements for limits on vegetation. The principle safety focus is to maintain system reliability and prevent fault paths to ground by precluding step and touch potentials. Fire safety is addressed from the standpoint of preventing ignition by maintaining adequate vertical clearance from trees to overhead lines. The criteria do not address vulnerability of transmission lines to direct flame impingement or from smoke migration/deposition from wildland fires. Portions of the transmission lines that were observed during this assessment appeared to be vulnerable to both. Additionally, sections of the right of ways are also being utilized for routing

of fiber optic cable. This cable is also vulnerable to fire damage. The most vulnerable points along the right of ways are locations where lines cross ridgelines. It is there that the most intense fire conditions will occur. A prudent course of action would be to reduce vegetation in these areas to limit combustible loading that would contribute to a more intense fire.

**Recommendation 02-6: Institute a program of vegetation reduction at ridgelines within the right of ways to minimize the potential for damage to transmission lines and fiber optic cables from wildland fires.**

With two exceptions, local fire departments have not been invited to tour Western (SNR) sites to enable them to become familiar with the interior layout of the facilities, the hazards and available fire protection features. Additionally, although Western personnel are well trained and experienced, they do not benefit from the availability of emergency procedures in relation to the roles and responsibilities of the fire department. Nor has any joint training/orientation been conducted. In the absence of such procedures and training, coordination of emergency response will be constrained and risk to individuals and equipment may be increased.

**Recommendation 02-7: Institute a program of routine site familiarization tours by local fire departments. These tours should be supplemented by emergency procedures and training for Western personnel to facilitate effective coordination during fires and other emergencies.**

With the exception of flammable liquid storage cabinets in almost every location, which were generally packed with unused/unusable paint cans, housekeeping, storage and the overall state of facility repair and cleanliness was good throughout the Region. Regarding excess paint, it appears that the general tendency is to partly use paint from a new can and then deposit the remainder in the cabinet, where it remains unused. While the paint does not represent a hazard while in the cabinet, the lack of room within these cabinets contributes to an excessive quantity of flammables generally.

Isolated areas within individual buildings were cluttered. Some storage areas appeared to contain material that had not been accessed for some time. No such condition was considered to represent a significant fire hazard. Nevertheless an institutionalized housecleaning effort (such as an annual clean up day) could reduce fire risk further and contribute to the overall appearance of cleanliness.

**Recommendation 02-8: Implement a routine (annual) clean up day to facilitate the removal of excess quantities of flammable and combustible material throughout the facilities.**

#### Folsom Regional Office

Housekeeping practices were observed to be effective in limiting the accumulation of unwanted combustible material (such as waste paper, excess storage, etc.) and unapproved electrical

appliances (space heaters, hot plates, etc.). In general, the facility was considered to be well maintained and well kept. **This is considered a positive facility attribute.**

A recent hydrant flow test has revealed that the existing public water distribution system is incapable of supplying the maximum anticipated demand of the building (fire) sprinkler system. While this condition does not warrant immediate attention in light of the capabilities of the local fire department to compensate for it, consideration should be given to the installation of a booster pump to supplement the municipal water distribution capability.

**Recommendation 02-9: Install a booster pump in accordance with NFPA Standard 20 to assure an adequate water supply for the building sprinkler system.**

The fire doors in the corridor between the SOC and SESC areas of the building are being routinely propped open with rubber doorstops. This condition, during a fire, could allow smoke and heat from one fire area into another, resulting in higher levels of damage. A high level of foot traffic characterizes the location. Consequently, removing the stops is not considered long term effective.

**Recommendation 02-10: Install electromagnetic-type hold-open devices on the above-referenced fire doors, which should be designed to release upon activation of the building fire alarm system.**

#### Tracy Substation

Housekeeping practices were observed to be effective in limiting the accumulation of unwanted combustible material (such as flammable liquids, waste paper, excess storage, etc.) and unapproved electrical appliances (space heaters, hot plates, etc.). In general, the facility was considered to be well maintained and well kept. **This is considered a positive facility attribute.**

The area around the sprinkler system riser in Building 6 is used for storage. A free space is required to avoid damage to the sprinkler piping and to facilitate fire department access.

**Recommendation 02-11: Remove storage and create a designated clear space around the sprinkler system riser.**

#### Redding Maintenance Facility

The following minor fire safety deficiencies were noted:

- Sprinkler heads were found capped underneath the overhead doors in the garage.
- Two exit doors were found to be in need of maintenance.
- Extension cords were being used improperly.
- The parts cleaning basin cover was broken.

**Recommendation 02-12: Initiate a maintenance work order to correct these conditions.**

### Keswick Substation

The fire doors in the stairway between the 1st and 2nd floors of the Control Building are being routinely propped open with kick-stand-type doorstops. This condition, which was noted in previous assessment reports, could allow smoke and heat from a fire on the first floor up into the second floor, resulting in higher levels of damage. A high level of foot traffic characterizes the area. Consequently, removing the stops is not considered long term effective.

**Recommendation 02-13: Install electromagnetic-type hold-open devices on the above-referenced fire doors, which should be designed to release upon activation of the building fire alarm system.**

### Elverta Maintenance Facility

The existing (fire) sprinkler system does not extend to all areas of the building. Principle exceptions include areas below mezzanine areas, within storage racks in the warehouse area, and in the battery room. The lack of complete sprinkler protection was noted in the previous assessment report; although additional unprotected areas were created below the new mezzanine. These conditions could result in significant damage if a fire occurred because of the obstructions to ceiling level sprinkler discharge.

**Recommendation 02-14: Arrange for a qualified local (fire) sprinkler system contractor to provide additional sprinkler distribution piping and heads in the building to achieve complete protection in accordance with NFPA Standard 13.**

The New Vehicle Storage Building contains assets valued at over \$3 million. The building is not protected by an automatic (fire) sprinkler system, as are other Western structures with a similar purpose and comparable value. The consequence of an unmitigated fire in the building is a total loss.

**Recommendation 02-15: Install an automatic sprinkler system in accordance with NFPA Standard 13 to completely protect the building.**

The following minor fire safety deficiencies were noted

- Two emergency lighting units were found to be inoperable.
- There is no sign on the emergency shut off switch for the fuel pumps.
- Fire extinguishers on all vehicles were not charged

**Recommendation 02-16: Initiate a maintenance work order to correct these conditions.**

### Olinda Substation

The hazardous material spill kit was incompletely supplied. Substantial barriers have not been installed around the propane tank.

**Recommendation 02-17: Reconstitute the hazardous material spill kit. Also substantial barriers should be installed around the propane tank.**

### **3.0 Status of Previous Fire Safety Assessment Recommendations**

**Recommendation 98-1: Working in conjunction with the safety professionals in the WAPA Office in Golden, Colorado, existing fire safety criteria should be expanded to address, in a comprehensive manner, all facets of Power Administration responsibilities, activities and facilities. Consideration should be given to utilizing (some of) the "model" program requirements delineated in the DOE Fire Safety Handbook (DOE-HDBK-1062-96).**

Status: Open. While some enhancements were made to the draft WAPA O 440.1, the lack of comprehensiveness in WAPA fire safety criteria is still at issue. This recommendation was rewritten in this report as Recommendation 02-1.

**Recommendation 98-2: Obtain from other (DOE) sites that have implemented computerized safety issues/lessons learned management systems the software necessary to institute such a system within the Power Administration.**

Status: Closed. An alternate method was implemented by CSO.

**Recommendation 98-3: In accordance with WAPA 3790.1B and DOE O 420.1, submit new facility and facility remodeling packages (specifications and drawings) which feature fire protection details to a qualified fire protection engineer who should verify that the design and installation conforms with applicable NFPA Standards and DOE requirements.**

Status: Closed. A qualified fire protection engineer will review drawings and specifications for future significant construction activity.

**Recommendation 98-4: Issue an internal memorandum, which directs the adoption of the DOE-recommended set of fire safety program performance measures, as applicable.**

Status: Closed. Refer to FY 2002 Action Plan

**Recommendation 98-5: Develop and publish a set of established emergency response procedures for use by the electrical distribution professionals in the Dispatch Area. This should include the appropriate response to fire alarms. Regular (annual) training on these procedures should be provided to all such dispatch technicians.**

Status: Complete. Procedures reviewed and professionals interviewed randomly to confirm their knowledge of their responsibilities in an emergency.

**Recommendation 98-6: Expand the existing service contract for fire protection system inspection, testing and maintenance to include all fire protection features.**

Status: Complete. See narrative on page 6 and new Recommendation 02-2.

**Recommendation 98-7: Install electromagnetic-type hold-open devices on the above-referenced fire doors, which should be designed to release upon activation of the building fire alarm system.**

Status: Open. Modification is pending. This condition has been rewritten as Recommendation 02-9.

**Recommendation 98-8: Extend the existing fire detection system within the control cabinets in accordance with the requirements of NFPA Standard 72.**

Status: Open. WAPA response was that the enhancements recommended were not warranted. This condition was rewritten as Recommendation 02-5.

**Recommendation 98-9: Construct a concrete block or reinforced concrete barrier between mineral oil insulated transformers in accordance with the above-referenced FM Data Sheet.**

Status: Open. WAPA response was that the enhancements recommended were not warranted. This condition was rewritten as Recommendation 02-4

**Recommendation 98-10: The results of routine thermographic inspections should be documented in a report and transmitted to the appropriate facility manager as well as the Safety and Occupational Health Manager.**

Status: Closed. Initiated by Mike Morales in February 1999.

**Recommendation 98-11: Contact the representative of the Redding Fire Department to invite their personnel to perform regular site familiarization tours for the purpose of updating their pre-plans.**

Status: Open. This condition was rewritten as Recommendation 02-7.

**Recommendation 98-12: Extend the existing fire detection system within the control cabinets in accordance with the requirements of NFPA Standard 72.**

Status: Open. WAPA response was that the enhancements recommended were not warranted. This condition was rewritten as Recommendation 02-4

**Recommendation 98-13: Similar to other WAPA facilities, a contract with a local fire protection system service company should be established for the regular inspection, testing and maintenance of fire protection systems in accordance with NFPA standards.**

Status: Complete. See narrative on page 6 and new Recommendation 02-2

**Recommendation 98-14: Install electromagnetic-type hold-open devices on the above-referenced fire doors, which should be designed to release upon activation of the building fire alarm system.**

Status: Open. This condition was rewritten as Recommendation 02-13

**Recommendation 98-15: Arrange for a qualified local (fire) sprinkler system contractor to provide additional sprinkler distribution piping and heads in the building to achieve complete protection in accordance with NFPA Standard 13.**

Status: Partially complete. This condition was rewritten as Recommendation 02-14

**Recommendation 98-16: Make arrangements to provide a capability to transmit water flow alarms and trouble conditions from the existing sprinkler system to either the Dispatch Area or a local central station supervisory service.**

Status: Complete. Alarms are now transmitted to Dispatch.

#### **4.0 Conclusion:**

There are no significant unmitigated fire hazards that represent an imminent threat to public health and safety, the safety and health of Western employees, the continuity of operations, or property conservation. Some positive program attributes were noted which have contributed to Western's success in minimizing fire losses over the years. A number of significant programmatic weaknesses and facility deficiencies were observed which warrant expeditious attention to enhance the effectiveness of the existing fire safety program, to prevent fires or to mitigate the consequences of a fire or related event if one should occur. The most significant of these weaknesses relate to the provision of fire protection for substation transformers and control buildings.

## **5.0 Documents Reviewed:**

- WAPA 3790.1B, "Occupational Safety and Health Program," dated 10-5-98
- WAPA O 440.1, "Occupational Safety and Health Program," (draft)
- Safety and Security Fiscal Year 2002 Action Plan
- Sierra Nevada Region Substation Safety & Security Checklist
- November 1998 Fire Safety Assessment Report
- Western "Power System Safety Manual," dated 2002
- Western "Power System Operations Manual"
- Western "Emergency Preparedness Manual"
- Several Inspection Reports From Fire System Service Contractors.
- FY 2002 Performance Plan Summary
- Sierra Nevada Operating Instruction # 21, "Emergency Communications"
- City of Folsom Fire Department Inspection Report, dated September 13, 2002

## **6.0 Personnel Interviewed:**

James Keselburg, Regional Manager  
Chuck Cooper, Maintenance Manager  
Fred LeBlanc, Operations Manager  
Cindy Foster, SNR Safety and Occupational Health Manager  
Victoria Anderson, SNR Safety and Security Specialist  
Doris Martinez, Western CSO Safety Specialist  
Jim McHan, Lead Electrical Engineer (TL)  
Barry Vandermolen, Foreman II Electrician  
Don Clifton, Foreman III C&I Craftsman  
Art Forrester, Power Systems Maintenance Specialist  
Steve Kerr, Foreman II C&I Craftsman  
Bryan Dwinell, Property Management Officer  
Ross McFate, Foreman III Electrician  
Mike Morales, Electrical Engineer  
Gene Mann, Facilities Manager  
Richard Perry, Foreman III Electrician  
Bruce Thomas, Lead Environmental Protection Specialist (TL)

## Appendix

Volume	Gallons	ft3	m3				
	17000	2272.9	64.36136				
area	ft2	m2					
	300	27.87091					
density (kg/m3)	760	*					
mass (kg)	48914.63						
mass loss rate (kg/sec-m2)	0.039						
fire duration	sec	min	hour				
100%	45001.09	750.0181	12.5003				
50%	22500.54	375.0091	6.250151				
33%	15000.36	250.006	4.166767				
* From Babrauskas and Grayson, "Heat Release Rate in Fires"							

### Cell Formula

Volume	gallons	ft3	m3		
	17000	=B2*0.1337	=C2*0.3048^3		
area	ft2	m2			
	300	=B5*0.3048^2			
density (kg/m3)	760	*			
mass (kg)	=B6*D2				
mass loss rate (kg/sec-m2)	0.039				
fire duration	sec	min	hour		
1	=B7/(B8*C5)	=B11/60	=C11/60		
0.5	=B11/2	=B12/60	=C12/60		
0.33	=B11/3	=B13/60	=C13/60		
* From Babrauskas and Grayson, "Heat Release Rate in Fires"					