CALIFORNIA DAILY HERALD

All about power

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Fires consume California

This fire season has been a bad one in California. Fires came closer to major metropolitan areas than any time in the recent past, with fires reaching the outskirts of Bakersfield, Burbank, Glendale, and Pasadena. Sacramento was shrouded in the fire fog for most of the past two months. Scorched hillsides are visible along interstates throughout the state.

The fires claimed at least 2000 houses, displaced tens of thousands throughout the state, and claimed 30 lives including 3 firefighters. Tens of thousands of acres of undeveloped land and national forest have burned pushing wildlife into urban areas in search of food and water.

The California Governor has requested and received a disaster declaration for fire. The cleanup will cost millions of dollars and take several months.

The fires not only burned out thousands of families but they have also affected infrastructure. LADWP alone has lost two high voltage lines feeding power into LA. Burbank, Thousand Oaks, and Simi Valley were without power for half a day while crews worked to restore power after the Big Sky fire damaged lines across the mountains north of Pasadena.

And thats just in LA. Northern California and the Sierras were particularly hard his this season. The mountains to the west of Sacramento saw ten different major fires. At least six were allowed to burn out on their own. About 500 houses in northern California were destroyed and 2000 were permanently displaced while roads and infrastructure are restored.

The cost of the restoration of roads, power, and other utilities is expected to be in the millions of dollars.

Beyond LA fires in the central and northern Sierra have denuded acres of hillsides of ground cover. Federal and state land managers are reporting that runoff from the fire burned areas could accelerate erosion, increase sediment load in streams and rivers, and produce potentially hazardous dust as the dry areas are affected by continuing summer windstorms.

Forecasters are also concerned about the coming rainy season, which usually lasts from September through February. Areas burned over can enhance runoff, and are also vulnerable to slides.

State emergency planners are taking no chances and have already begun preparing for the potential of massive mudslides. “We are beginning to contract for earthmoving equipment.” Says the head of California Office of Emergency Services.

Mayor asks for solutions on heat reliability

After the outages of this summer the Mayor of Los Angles is asking for reliability solutions from both the Department of Water and Power (DWP) and Southern California Edison. DWP has already embarked on a half billion dollar a year program of improving system reliability. Replacing underground cables, installing new utility poles, and swapping out aging infrastructure all are said to provide an increase in system reliability and fewer incidents like those we saw over the summer.

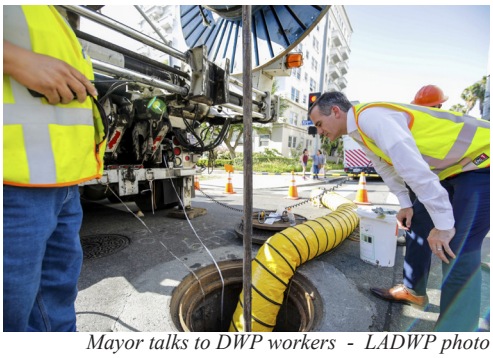
Energy efficiency is also a major goal of the DWP.

However major outages in Westchester/LAX and San Pedro/Terminal Island were not heat related. DWP has said that two substations were affected, and restoration delays were due to having to repair control systems in both substations.

The Mayor has responded to complaints from both the Council and constituents that loss of electrical during the hottest days of the year is particularly burdensome. He is asking for an assessment by DWP of how the reliability measures it is taking will relate to the loss of power. As DWP has an extensive reliability program in place the planned report is expected to take several months.

The DWP General Manager says “Despite having some of the oldest infrastructure in the State of California, DWP offers some of the lowest rates for power compared to other California utilities, and we are in the top quartile for reliability. We also have lower operating costs than most other utilities. However we are continuing to improve DWP’s reliability by replacing infrastructure that has aged out, and brining our systems into the 21st century with secure, efficient, data collection and automation.”

The claims on rates and reliability are backed up by a 2015 benchmarking study that showed DWP was amongst the lowest rates, top half in reliability, and top 25% on low operating costs.



Mayor talks to DWP workers - LADWP photo

In his statement the Mayor said: “While DWP is among the most efficient and effective utilities we also need to understand what has led to the heat effects on the system we’ve seen. We cannot be complacent as reliable electric power is the basis for economic and social success within the City.”

Power continues to flow despite fires

Recent fires in the mountains around Los Angeles have placed stress on some of the high-capacity lines that feed power into the LA basin. The Gates King/Saddletree fire consumed about 1000 acres north of Los Angeles. Few structures were damaged because the area was open space. Santa Clarita issued a stay indoors order due to smoke and the fire shut down the 5 for a short time.

But what worries electrical planners is the potential damage that might occur to high voltage transmission lines that run through the area. LADWP has a substantial infrastructure in Sylmar, right at the base of the pass, that is designed to receive power coming in from hydro and other generating stations to the north.

The towers are tall, but not tall enough to escape the smoke that can rise up and contaminate transmission lines, or the heat which can affect insulators. After the fire the towers need to be inspected to determine if insulators were affected by the heat, or the lines by smoke. Smoke can even cause a line to short, forming a pathway for the electricity to the ground. The towers themselves, while robust, can also be affected by the heat of a fire that crosses the electrical right of way.

But towers were not the only parts of the system affected by recent fires. LADWP runs several hydro-electric generating stations in the Castaic State Recreation Area. The Castaic fire burned approximately 1500 acres, including areas around the hydro generating plants in Boulder Canyon. The plants were closed prior to the fires so that internal equipment and turbines were not affected. A DWP spokesperson noted that exterior lines and connectors will need to be replaced, and the pipes that carry the water to the generators will have to be inspected for any damage.

The effects on reliability were minimal, according to the DWP spokesperson: "we have multiple redundancies and interconnections with SCE and other so that we can re-route the power through other circuits. And we can buy additional power on the market when generating stations are temporarily out of service."

Multi-year systems upgrades promise reliability

Between the heat and the fires, the reliability of the electrical grid seems under attack by Mother Nature. About ten years ago DWP realized that its infrastructure is always under attack by Mother Nature and began a program of modernization. Many years, and several billion dollars later, DWP is still modernizing. Modernization programs include replacing poles, running new cables, especially high voltage underground cables, and upgrading generating capacity. One special area of emphasis has been on renewables, both in generation and in consumption.

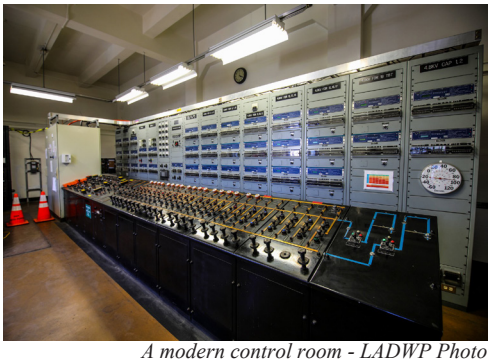
DWP has brought several solar and wind plants online to provide additional power to the city. Some of the power used in LA comes from wind farms in Oregon and solar systems in Nevada. They are also embarked on an ambitious program to replace their fleet of vehicles with 100% electric vehicles in five years.

DWP is also upgrading its transmission system. They are replacing lines and poles along with heavier transformers that step down voltage from production plants to levels that can be more easily distributed to customers. The plan is to replace two of these large-scale transformers per year until 2020.

In addition DWP is also upgrading its control systems. The plan is to automate all substations by 2038 in order to allow them to be managed remotely. This should improve operational reliability while lowering overall operating costs. The systems being upgraded include the installation of Remote Terminal Units (RTUs) that collect data from analog sensors within the substation systems. For example, there are multiple temperature and voltage sensors within a single large, high-voltage, transformer. These generate signals that the RTU digitizes and sends out over a Supervisory Control and Data Acquisition (SCADA) system. The SCADA system reports to an Human Machine Interface (HMI) that allows controllers in remote control rooms to visualize the outputs and take action.

The sensors and RTUs that run in these environments must be able to operate under the high voltages and temperatures these systems generate. Improper sensor placement, or the wrong sensor at the wrong location, can produce drift or errors in the readings. One expert we talked to suggested that the recent outage at LAX and the Port of Los Angeles may have been the result of sensor drift or noise in the systems.

A CalTech electrical engineering professor commented: "As these systems get hotter the ability to withstand voltage fluctuations decreases. This can produce crosstalk between sensors or circuits or even sensor failure. This can propagate up the system into the digitizer (RTU) resulting in faulty readings being displayed in the control room. Fortunately in this situation the system "failed high" and was only shut down unnecessarily. If it had "failed low" then an overheating situation might have been missed and the equipment permanently damaged. And these systems are complex and expensive to replace."



A modern control room - LADWP Photo

In addition the Department of Homeland Security is concerned about the vulnerability of SCADA systems. A computer control expert from Kaspersky Labs told us: "SCADA systems are likely targets for potential enemies to hack into. They are usually vulnerable, widely used, and the effects can be

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devastating. While DHS and NIST have promulgated security rules for SCADA they are always playing catch-up as new security vulnerabilities are discovered."

DWP does not believe the recent failures are related to intrusion, rather some systems malfunction, possibly interactions between sensors and high voltage fields, were responsible.

Central Valley avoids outages

This summer has been hard on Southern California cities, the heatwave not only started fires in the mountains, but it also affected the electrical system, causing multiple outages. Los Angeles experienced several widespread outages due to heat, as did San Diego. While coastal areas suffered in the heat, the Central Valley cities and towns fared batter. Only a small number of outages were attributed to the heat, with most coming from overheated transformers or summer storms. Modesto, Sacramento, and Stockton reported only sporadic outages.

MID and SMUD both attributed the lack of outages to upgrades in their electrical distribution and control systems. With much of the infrastructure underground, and better information about system temperatures, both utilities were able to manage what outages they did have.

Fire in Upland/Moreno Knolls Shows Dangers

A recent fast-moving fire in the Upland Hunting District shows that Moreno Valley is not immune to fire and flooding. The fire, believed to have been caused by a spark from an ATV, burned approximately 2000 acres before it was put out. Lake Perris State Recreation Area was evacuated as multiple fire crews worked to contain and put out the fire. There were also worries that the fire would spread to nearby ranches or the Moreno Natural Gas Compressor station. As it was the fire was contained to the hillsides and no structures were damaged.

SCE lost several utility poles to the fire and had to cut power to one of its distribution lines in the area. SCE customers experienced some brown outs and flickering. SCE was about to re-route power along the ring circuit that travels around Moreno Valley so few customers actually lost power.

The area to the east of the city has traditionally been subject to flooding. Heavy rains can cause flooding around Gilman Springs Rd and areas to the west. Flooding is made worse by the runoff from the surrounding hills, both from the hills around Lake Perris as well as runoff from the San Timoteo Badlands. The ponding of water has frequently closed Gilman Springs Rd, and can flood nearby ranches.

Heat caused substation outages

The heat took out transformers and lines, but, according to DWP it also took out two major substations. The Westchester and Port of Los Angeles outages were not caused by the usual overheating of lines, but the overheating of two major substations.

"Our monitoring and control systems recorded high temperatures at both substations," said the DWP spokesperson, "so controllers immediately switched off the major transformers located there." Crews were delayed in their ability to fix the issues due to the effects of the high heat on lines and smaller transformers.

"While some heat related events are expected this large-scale outage was unexpected and has resulted in an engineering evaluation of causes and potential fixes. Its likely more than one system failed in order for such a large area to be down so long, and we're looking into it."

DWP has been upgrading systems for its major equipment, and these stations had just been upgraded.

Preparing for climate change in Vernon

Driving through the city of Vernon you would get the view that the city has to be impervious to almost all natural disasters other than earthquake. It sits high above the Los Angeles River, right where the spillway is wide and the banks are high. Its nestled in the center of Los Angeles, with a lot of land and infrastructure between it and the ocean. Few things other than earthquakes could seem to threaten Vernon.

But businesses in Vernon are still concerned about the potential effects of disaster. In particular heavy rains and high winds could lead to several different types of problems. Debris could fly around, potentially impacting other business if its not tied down. Standing water from lack of drainage could close roads, flow into industrial areas, and stop businesses from operating. Worse, water intrusion or flying debris could cause industrial accidents. With many chemical storage and process industries located in Vernon that could become a significant hazard.

Workers move hazardous waste

Several business have raised the issue with the Vernon City and all parties have been exploring ways to increase resiliency against non-earthquake hazards. One key aspect of this challenge is for businesses to become as transparent as possible as to the current status of their systems, and processes. Businesses admit that many items they either manufacturer or store on their premises could be hazardous, but inventories change so frequently that it can be hard to keep the Vernon Public Safety Department informed about what exactly is going on. With so many businesses to account for Vernon City Government also has a big challenge.

However businesses in Vernon are beginning to realize that climate change, and the changes in the atmosphere that come with it, may create new dangers. Even though they have little risk of either flooding or winds, everyone in the city knows that in order to stay safe they have to examine every possibility.