Campus Electricity Service & Research Infrastructure

Some recent wildfires in California occurred due to problems with power transmission lines. To reduce the risk of similar events, some power utility companies have developed policies to cut power to specific regions during adverse weather conditions associated with increased risk of wildfires. Consequently, researchers have asked whether SCE might instigate blackouts that could affect the UCI campus? This document provides information about (1) How power is provided to the UCI Campus; (2) The historical reliability of power transmission to UCI; (3) Existing capacity for emergency power generation at UCI; (4) Contingency procedures during SCE power outage; and (5) Considerations for researchers regarding emergency power needs and protection of mission-critical research infrastructure.

1. How is power provided to the UCI campus?
The campus core receives electricity from Southern California Edison (SCE) via a 66kV transmission line. The line can be served from two different SCE substations. The existing line and substations are sized to carry all of UCI’s current demand.

2. Historical reliability of electricity service to UCI
Historically, UCI has enjoyed superior power service from SCE. Outages attributed to SCE in the past did not exceed 30 minutes, and only 2 outages have occurred in the last 14 years. The likelihood of a public safety power shutoff for campus is extremely low. Most Irvine circuits are underground, the transmission system is loop fed, and the campus is fed on from the sub-transmission network utilizing large poles, greater wire spacing, and longer insulator strings than the more likely impacted distribution networks.

3. Existing capacity for emergency power generation at UCI
Campus power generation exists at two levels – (i) Building diesel generators and (ii) Campus combined heat and power plant (CoGen).

Diesel building generators produce power to support fire, life, and safety aspects of a building's function as well as providing a limited amount of power for research equipment via emergency backup power receptacles. Service to fire, life and safety is prioritized over service to backup outlets. The emergency outlets should not be confused with an uninterruptable power supply (UPS). In the event of a power outage to a building, power will be interrupted for ~ 10 sec while the diesel generator is starting up in order to produce power. (Testing of these generators and the automatic power transfer switches is conducted each month).

The next level of generation is the campus combined heat and power plant (CoGen plant). The CoGen plant is powered by high pressure natural gas. No reserve storage exists for this plant; i.e. without a gas supply it cannot run. Cooling and heating of the buildings is provided from the Central Plant. Without SCE or the CoGen, or both, the cooling and heating cannot be distributed to the buildings. If the supply and exhaust fans are operating using diesel backup power, the air moved through the building will be at the outside air temperature and humidity.

4. Contingency procedures during SCE power outage
Forecasted loss of power - In the event of forecasted loss of power from SCE, Facilities Management would utilize the CoGen plant to serve the campus to the extent possible. Depending on power demands at the time of service interruption, load may need to be shed in order to maintain CoGen plant operation. In the event of a campus wide notification of an impending power loss, Facilities would request curtailment of all non-essential loads. The communication will come from the Office of Emergency Management. The
campus would isolate itself from SCE’s service until SCE service was restored. An important issue concerns the ability to re-start the CoGen plant in the event the plant trips offline during this time. At present, the capability to restart does not exist. “Black Start” capability (i.e. the ability to restore a power plant to operation without relying on an external power supply) are currently in design with construction scheduled to finish December 2020.

Power outages without warning - Forced outages, or outages where SCE does not provide warning to the campus, would result in a loss of SCE and the plant generation. In these events, the diesel generators would start, and the campus would begin a diesel-refueling plan until SCE service was restored. The ability to detect and decouple from SCE under a forced outage is currently in design and is scheduled to finish in December 2021.

In the event of an outage on campus, the power outage annex maintained by the Department of Emergency Management will be implemented. Depending on the extend of the outage and the expected duration, department operation centers and the emergency operation center would be activated. Campus alerts would be sent via Zot Alert and additional information provided through the campus webpage.

5. Considerations for researchers regarding emergency power needs

It is impractical to expect a research building’s emergency diesel generator to produce sufficient power to support all needs. However, after meeting the power requirements to support fire, life, and safety functions, some limited additional capacity is usually available (via dedicated emergency power outlets) that can be dedicated to support mission-critical research needs. The limited nature of additional emergency power necessitates thoughtful planning about which pieces of equipment are vital to support during a blackout, versus those that can sustain a power outage without negatively impacting a research program. Given the diversity of research, each faculty member and their research associates are encouraged to evaluate their specific research program and to develop a contingency plan for loss of electricity, as well as cooling, heating, and water.

For example, regarding loss of power for refrigeration and freezers, researchers can re-purpose “cold-packs” used in temperature-controlled shipments as short-term cooling devices. These packs can be stored in a -20°C or -70°C freezer to provide additional ballast that serves as a cooling-sink during a power outage. These packs can also be removed and placed in Styrofoam containers, with the containers being stored in cold rooms to maintain cooling of critical samples during a power outage. Segregating research samples, creating restore points, working with offsite and remote storage may provide a level of redundancy and resiliency that can help insure research samples.

An uninterruptable power supply (UPS) can be used to sustain power to equipment during a blackout. The capacity of a UPS is usually insufficient to sustain long-term operation of equipment. However, it can be invaluable in allowing equipment, including computers, to shut down in a manner that protects the equipment and data being generated or analyzed at the time of the blackout.