

Power and Utility Failures

General Information

The Puget Sound region has a history of major power outages, typically caused by large storm events. Utility outages could also be caused by equipment failure or damage. One example being Seattle's Great Blackout of 1988. During this event a construction crew hit an unmarked, buried Seattle City Light electric cable. This caused a short circuit that started a fire at a nearby underground utility vault. Over 50 blocks of downtown were without power for four days. The area incurred significant economic losses as many restaurants and retail shops were unable to open for Labor Day weekend and Seattle City Light spent \$730,000 repairing the fire damage.

A seemingly new kind of outage was prevalent during the summer of 1996 when problems with line loading caused major regional power outages along the west coast. Washington state is connected to a regional electrical transmission grid which has major connections with other grids out-of-region, including British Columbia, Montana, California, and other southwest states. In general, even if Washington is short of electricity, (due to drought, for example), it can be purchased from elsewhere. The result is higher cost electricity, rather than inadequate supply.

Utility companies build on a N-1 capacity. This means the utility is prepared for one of each kind of line to go down without a disruption to service. If two of the same type of lines goes down, some may lose power. In these recent events, multiple lines were affected and the utilities were unable to compensate or shut down lines quickly enough. During the August 10, 1996 event, Portland was forced to take everything off line to avoid melting of transmission lines from the overload of power.

Electricity

Because most out-of-region power is thermal, it is not affected by drought. In fact, a shortage of electricity is not a major concern in Western Washington. This is because a substantial amount of electricity is transmitted from Canada to California via Washington and Oregon, therefore providing easy access to external power supplies. Hot weather and increased use often associated with droughts can be a concern for electric utilities, however. Increased loads cause electric lines to heat up; when lines get too hot they sag. Lines sagging into trees and other vegetation is a major concern and therefore loads must be monitored to control sagging.

The process of deregulation of the electric utilities industry may increase the number of outages, at least in the short run. Deregulation allows many parties to act as buyers and sellers. This makes it difficult to monitor and balance the loads on transmission lines. These types of problems will most likely increase the possibility of regional outages similar to those experienced during the summer of 1996.

Growth management is also a constraint which could possibly lead to outages or shortages. Most new development expects access to electricity but does not want to be in close proximity to sub stations. The political difficulty in sighting these sub stations make it difficult for the utility to keep up with regional growth.

Natural Gas

The vulnerabilities of the natural gas system are quite different than the electric energy system. Because the natural gas infrastructure is underground, this area is not as susceptible to major gas outages like those associated with electricity. In fact a natural gas outage of 300 households is an

extremely rare event.

This area's natural gas system is vulnerable to earthquake damage, third party damage and landslide damage. Earthquake damage could include a catastrophic systems failure in which ground movement causes a pipeline to sever allowing gas to escape. Natural gas companies are less concerned with gas escaping in wild settings, where life and property are not threatened. This is because natural gas is lighter than air and will quickly dissipate, minimizing risks. Gas escaping into buildings or heavily populated areas is a bigger concern. The current infrastructure does include control valves for shutting down pipelines in the event of such problems.

Third party damage is the most common natural gas related problem. This damage typically occurs when contractors dig into gas lines. Puget Sound Energy works closely with local fire departments in responding to these incidents. Additionally, they are training contractors in system design so that they will be more aware of where pipelines are likely to be.

Individual customer systems are vulnerable to flood damage and earthquake damage. Floods can put pilot lights out that can lead to leaking. Earthquakes can cause water heaters to fall over causing leaking or fires. Natural gas users should be educated in water heater safety, including methods of strapping down water heaters as well as the option of earthquake protection valves which stop the flow of gas when the earth shakes.

Natural gas shortages are rare but tend to occur during cold weather. These shortages are a function of infrastructure and demand. During unusually cold weather events the demand for natural gas can exceed the carrying capacity of the natural gas company's pipeline infrastructure.

Effects

The Puget Sound region is vulnerable to localized, short term energy emergencies brought about by accidents and storms. Most of these emergencies are handled by the affected industry. The effects of energy shortages could include inconvenience to consumers, reduced heating and lighting capability, reduced production in all sectors, potential failure of transportation, water and waste, communication, information, and banking systems. Secondary hazards associated with these events could include traffic accidents as traffic lights are out, limited patient care at local hospitals due to power capacities of back-up generators, injuries due to downed power lines, and fires due to gas leaks.

Conclusions

Government agencies work with the energy industry to ensure effective distribution and emergency response. The Defense Electric Power Administration of the US Department of Energy has the responsibility of working with the electric power industry to ensure maximum generation, transmission, and distribution of electric power to meet essential needs within the state of Washington, as well as other states which depend on common sources of electric power by virtue of interconnections. The US Department of Energy has the responsibility of working with the gas industry to ensure maximum production and for the release of natural gas in transmission systems to meet the most essential needs.

Energy customers, including businesses and home users, need to educate themselves in dealing with energy outages and shortages to ensure safety. Mitigation of risks is paramount. Strapping down water heaters, preparing emergency kits with battery operated radios and flashlights, and learning how to properly shut off utilities are first steps to safely dealing with these events.