All Outages Are Not Created Equally

Lines near Eureka loaded with heavy snow and ice.

Photo by Adam Warwas, CVEA Field Services Representative

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In a perfect world, the lights would turn on every time you flip the switch and the lights would stay on until you flipped the switch to turn them off. While many of us living in Valdez and the Copper Basin believe this is the perfect place to live, the reality is there are many obstacles that keep the lights from staying on.

In this very real world, we have 50 foot, 60 foot and even taller, trees that aren't content on standing tall forever. We have curious squirrels, inquisitive ravens, majestic bald eagles with wing spans greater than seven feet, other birds of prey, migrating ducks, herons, and avian species of all kinds that live permanently or are literally snow birds that head south for the winter along with the RV'ers.

We have 30 plus feet of snow that falls annually in the Valdez area and at times weeks upon weeks of -40 degree and below cold snaps in the Copper Basin. We get hurricane force winds, blowing snow, rime ice build-up, and snow and ice packed roads; not to mention an avalanche now and again.

With all that said, our mission is to provide exceptional customer service through safe, reliable, cost-effective electric service and programs.

Safety is our number one priority. We must also deliver reliable electric service while maintaining our fiscal responsibility of protecting the financial health of your cooperative. Wrapping together all three of these mission objectives creates a complex stand-alone system where we generate, transmit, and distribute electricity to all of our member-owners.

A stand-alone system is a system that is entirely dependent on itself. CVEA only receives energy from our own generation sources. As a stand-alone system, we have the disadvantage of being what is called a low inertia system. The inertia in an electrical system refers to the robustness and literally spinning mass of the generators providing power. Generally the system events that you see when the lights blink are the result of a system fault and due to the low inertia system characteristics.

For example, if a tree falls into the line, that tree can act like a very large load to our generators. Just one tree touching one of our energized lines can easily look like a 1,500 kilowatt load to our generators. To put that into perspective, CVEA usually has a maximum system wide load around 13,000 kilowatts.

The magnitude of the fault energy, created by the tree, is enough to momentarily cause the generators to slow down, causing the voltage and frequency of the system to dip. That momentary dip, or blink, is what you see when there is a fault on the system. Put simply, a fault is an event where one or more electric conductors contact the ground and/or each other.

Sometimes the fault is on an isolated circuit and you see a single blink. Other times the fault is on a main distribution line

and you see multiple blinks.

The blinks are generally due to the operation of system protective devices called oil circuit reclosers (OCR) or line fuses. OCRs are designed to temporarily open the electric circuit between a fault and the generating source. CVEA's OCRs will cause up to four blinks before they completely open up and isolate that circuit from the generating source. The line fuses, on the other hand, have one operation and isolate the circuit upon the first operation.

The causes behind the faults vary greatly. It can be as simple as a tree branch blowing into the energized line or it can be very complicated and the true cause of the fault is not determined.

One question we hear a lot is, "What are you doing to prevent outages?" The quick answer is simple, everything we can. The long answer is a bit more complicated…

A major cause of outages has to do with trees falling into the line either through natural decay, natural growth, wind, heavy snow and ice loading, human caused events, etc. Each year CVEA clears and maintains portions of our dedicated right of way, usually within 15 to 25 feet from the centerline of the line. Due to private, state, and federal property limitations, we can only maintain what is in our permitted route or what is dictated on an easement. A 50 foot tree can easily come into contact with our lines from outside of our existing right of way. You may have seen the cottonwoods in Valdez that dwarf our lines or the spruce trees around ten-mile or the Basin that are at least twice as tall as our poles.

A second major cause of outages has to do with our furry and feathered friends. It doesn't take much for a curious squirrel to touch the wrong part on top of a transformer to cause big problems. Every time we have an animal caused event on our system, we go through great lengths to ensure that particular section will not have the same problem again. Some of the items we install after an animal caused outage are transformer bushing shields (Squirrel Guards), insulated cable cover, anti-perching devices, and "bird flappers", which have a high-visibility plastic piece installed on the overhead lines that provide a visual indicator to birds cruising through the area and "flap" around when the wind blows. When new overhead lines are built, the pole tops are designed to be raptor friendly and new transformer installations are built with Squirrel Guards and insulated cable cover.

Believe it or not, the weather in our paradise is not conducive to reliable transmission and distribution of electricity. It is not possible to design a distribution system that can take anything and everything Mother Nature has to offer while still being financially responsible or aesthetically pleasing. While our poles and lines are designed to withstand extreme weather, there are times when the system is designed to fail on a small scale before a catastrophic event occurs on a larger portion. The "designed to fail" concept means that the distribution system is designed such that a tree will break through the wire before breaking a pole or poles. Sometimes the forces are too great and a pole or poles will also fail but the entire system is designed to prevent a domino effect resulting in widespread damage due to a localized event.

The three previous categories are definitely not all of the causes of outages we experience at CVEA, but they are a very large portion of them. Once the protective devices like the OCR and line fuse do their job to isolate the problem, it's up to the generation protective schemes to keep the entire system up and running. A small interference is generally not a threat to the entire system but a fault on a main feeder can significantly affect the entire system.

A feeder is a term used in the electric industry to describe a trunk line originating at a substation that can be either an overhead or underground line providing service to one customer or thousands of customers. For example, downtown Valdez is broken into three feeders all controlled at the Don Smith Substation attached to the Valdez Diesel Plant. In the Copper Basin, there are two main feeders originating in the Glennallen Diesel Plant Substation; one feeder, called the West Line, provides service to some customers in Glennallen and all of the customers between Mile 186 and 109 of the Glenn Highway, and the other feeder currently provides service to the rest of Glennallen up to the Hub, all of the customers north of the Hub, and all of the customers south to Copper Center.

The first thing that happens to the generators during a fault is they will try to provide power to the load. When a generator attempts to provide more power than it is rated to do, the system frequency will begin to degrade. There are protective relays located within CVEA's main generation plants that will open up entire feeders when the system frequency decays to a set value, this is called load shedding.

The idea of load shedding is to take a large portion of the load off of the generation system so the system frequency can be stabilized. This is a much faster operation than if the generators shut down on an emergency stop if the load shedding relays were not in place.

At no time is the entire CVEA load powered by a single generator. So, if a generator that is providing power shuts down due to a mechanical failure, the load shed relays will operate to keep the other generator(s) from shutting down. There are times when the loss of generation is so great that the remaining generator(s) cannot recover fast enough and are shut down by their own protective relays.

As you can see, there are a myriad of ways a power outage can occur. While we cannot guarantee 100% reliable power, we can guarantee that we are doing everything we can do to deliver your power through safe, reliable, and cost-effective means. ■