LOWER RESERVOIR TROUBLE

Power Outage Generator Failure

If the generator started during the power outage and ran as normal, it will not be necessary to touch anything. It will be running to maintain power to the Reservoir, or it may be running after the shore power was restored due to a “cool-down” engine feature. The power may be restored before the operator arrives at the station. This does not mean the generator will be off. Remember the cool-down feature. If the generator is not running by the time the operator arrives, but the pump/pumps are running, then shore power was restored while the operator was enroute.

First, it is necessary to ascertain whether the power is out at the Lower Reservoir and the Upper Reservoir. If the Lower Reservoir is running on a generator, the system line pressure will be slightly different than normal. This is because the Upper Reservoir may be running on generator also. When the Upper Reservoir is running on generator, it is wired to run on a big pump. This changes line pressure slightly. The power will not always be out at both reservoirs.

When approaching the reservoir running on generator during a power outage, glance at the power meter. You will know instantly if the generator is still supplying power or if the Shore Power is back on. (The generators will often run extra minutes for “cool down.”

The new smart meters have a round “pie chart” that indicates phases. It is in four parts. You should see all four pieces of the pie on the meter when on shore power. This is handy for seeing if you have a burned-out line from the telephone pole or underground feed power line.

Second, check to see if the LED display on the pump panel is illuminated. This is an indicator that power is making it into the pump panel. The shore power vs generator power is also indicated on the transfer switch LED panel. There are LED

lights (green), that display which direction the power supply to the building is routed, whether from the generator, or from shore power (grid). If the LED panel on the pump skid electrical panel is not lit or powered up, there is no power into the building.

The transfer switch is held open by a spring that keeps the switch from joining the generator to the building power. It is held open by the presence of shore power. If shore power fails, the spring is released and the transfer switch moves to the generator supply side for power. So, if the pump skid electrical panel LED is not lit, no power is entering the building from either the generator or the shore power. Check the MAIN FUSE PANEL. It will be necessary to pull down the main power arm to access this panel. There are three very large “buss” style fuses in this panel. An electrician is preferred to test these fuses. All power from the generator or shore power must travel through these fuses. If one is blown, pumps, logic controllers, and VFDs are going to be misbehaving or completely dead.

Third, if power is making it through the main power meter outside the building with all three phases, and making it through the breakers and fuses, then look to the transfer switch panel where power passes through three phase switches and then on to the VFDs (Variable Frequency Drives).

Fourth, and most commonly, a VFD may have tripped out. If so, did it trip out all four pumps? Of the four booster pumps, two of them are controlled by the VFDs and two will run straight across the line at 60 Hz. This is to say that when 3 or 4 pumps are running, the third and fourth pumps will behave just as though they are running in “hand”, or flat-out full speed. If there is a tripped-out VFD, you may have two pumps available or you may have zero pumps available. A tripped-out VFD can be discovered by opening the pump skid electrical panel. There will be a red blinking light on the VFD that is in error. There is a reset option available on the VFD keypad. Press this button to reset the VFD

There is also a red reset option on the regular LCD. display outside the pump skid panel. This will trigger a full reset of ladder logic, (PLC's) and may reset VFD errors without opening the electrical panel.

Most errors with pumps occur after AC power is restored. If pumps are in error after AC is restored, push the reset displayed on the LCD. panel on the outside of the electrical panel (the normal one you see every day). Take into consideration if the Upper Reservoir is running and able. A total reset will reset all ladder logic, (P.L.C's) and VFDs. This is called a "soft reset." The PLC. can take up to 90 seconds to start "hunting" proper pressures. It will look like it is out of control for those seconds as the line pressure will be in the 90-psi range. After the 90 seconds, you will hear the system "ramp down", as the VFDs come into hunting mode. Pressures will start being properly controlled at this point. The pumps will slow down as control is gained. The slowdown will be very obvious.

It is important to know whether the VFD should be reset or the "soft reset" on the outside of the electrical panel LCD should be reset. The advantage to a VFD reset is the ability to reset just two pumps while the other two are running. This does not reset the entire PLC settings and avoids the delay of power down/power up, and the delay of waiting for the hunting and in-control-of-pressure feature. If a soft reset does not restore the pumps, open the electrical cabinet and check the VFDs for red blinking lights (they should be green).

If the pumps do not come on after the soft reset is preformed, but everything appears normal, most likely the Upper Reservoir is maintaining pressure above 79 psi. The pumps will not come on until a condition of 79 psi or lower is encountered for thirty seconds or more. This is the trigger pressure threshold at the Lower Reservoir. A sudden momentary spike will restart the thirty second count down all over again. Delays are built into the ladder logic and are imperative to prevent massive water hammer, over reactions to power glitches, etc.

Reset the VFD

The VFDs can malfunction with serious power spikes, fast pump stops, or out-of-sync phases. To reset a VFD, the electrical panel will have to be opened. To open the panel door without powering down the system, it will be necessary to bypass the black safety handle, by using a flat tipped, small screwdriver to depress the handle release.

For safety, this handle will shut down the main power to the whole panel if turned Off without depressing the bypass release. This will kill everything, forcing a long restart. To avoid this, use the bypass feature to open the electrical panel without powering it down. After the large black panel handle is bypassed, it will still be necessary to also turn the stainless-steel silver handle below the black handle. The door will open. If the light on the VFD is blinking red, or is a steady red, the VFD is tripped out. Press “Reset” on the keypad. Then press “Home” and F1. Press reset again if necessary. The VFD should now reset and be ready to run.

In the event a “soft reset” is not successful. (This is a reset from the LCD. outside the electrical panel.) –

Reset Skid – When a Soft Reset (from LCD outside electric panel) Is Not Successful

When a soft reset is unsuccessful, and a VFD reset is also unsuccessful, but power is present, a hard reset may be necessary. Ladder logic may be compromised, (confused), and a VFD is waiting on ladder logic. Or, if the operator is confused or cannot quickly figure out the issue, a hard reset can help. UNDERSTAND - If the Upper Reservoir is running, this will go smoother, as the hard reset is going to take some time for system to regain function. If the Upper Reservoir is not running, a hard reset of the Lower Reservoir may result in a loss of system pressure throughout the entire system of Sunland.

For the hard reset, it is not necessary to bypass the electrical panel safety lock. Turn the large black handle to the right, or towards the “Off” position. It is spring loaded and will resist a little. This will shut off the entire skid, and the LCD. panel will go dark. Wait a couple minutes before turning this power back on, as the large bank capacitors need some time to discharge before powering back up. This avoids damage to the circuits. The VFDs must discharge for two to three minutes to avoid damage to the capacitors by turning the power back on too fast. This is why it is very helpful to have the Upper Reservoir in service when a hard reset is performed.

If the Upper Reservoir is not operational, and a skid restore is imperative at the Lower Reservoir due to VFD errors or a soft reset having no success, then a hard reset (total power down), will be more serious as the entire system line pressure will be in peril. Complete the system hard reset. The Operator will have to make a choice as to how long he/she wants to let the capacitors discharge. Watch the pressure setting. Depressurization of the water lines for too long a period can introduce contamination to the lines.

In the event the Upper Reservoir is not functioning, a hard reset can be done expediently; however, recommended capacitor discharge time is two to three minutes. Hard resets in less than two minutes have been performed in the past, but is not recommended due to the risk of damage to VFDs. Fortunately, the SunLand Water District has never experienced this scenario.

There may or may not be pumps left running after a VFD error. Fatal errors can disable all four booster pumps. (Fatal does not mean destruction of circuits, but does mean the device registering the fatal error has responded by shutting down). Non-fatal errors simply display a warning without shutting anything down. A fatal error can disable the four booster pumps, making a hard reset non-conditional. Other, less serious VFD errors, can leave some pumps running and can be corrected with a soft reset.

The VFD's are set to run only two pumps, or one each, with changing speeds. (ramp up/ramp down). They will be running at 57 Hz at their full potential. The other two pumps run on extra demand and will run "across the line." So, the third and fourth pump to come on will be running in manual mode at a full 60 Hz, just as though they were directly powered by "hand setting". The third and fourth pumps that are running do not ramp up and down, they just drop out when not needed, according to pressure and flow settings.

NEVER Leave a Pump Switch on Manual!

It is prudent to always focus on the Lower Reservoir to produce most of the water being consumed by the entire SunLand system. The Lower Reservoir has VFDs for two of the pumps. This saves money during the winter months, as the pumps controlled by the VFD drives will ramp down on power consumption that is not needed.

The Upper Reservoir has yet to achieve power-saving VFD capabilities and is controlled by manual PRVs. (Pressure Reducing Valves). The Lower Reservoir has been upgraded more recently, making it the leader in SunLand water production.