
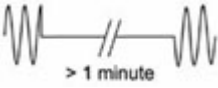





## Electrical Power System Problems and Solutions

Problem	Description	Duration	Cause	Effect	Possible Solution
<b>Momentary Interruption</b> 	Very short planned or accidental power loss	0.5 cycles to 3 sec	Switching Operations attempting to isolate electrical problem and maintain power to your area	<ul style="list-style-type: none"> <li>▪ Equipment trips off</li> <li>▪ Programming is lost</li> <li>▪ Disk drive crashes</li> </ul>	UPS or standby power supply (SPS) for critical loads
<b>Temporary Interruption/ Long-term outage</b> 	Planned or accidental total loss of power in a localized area of the service area	<ul style="list-style-type: none"> <li>▪ Temporary (3 sec-1 min)</li> <li>▪ Long-term (over 1 min)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Equipment failure</li> <li>▪ Contractors digging into underground conductor wires</li> <li>▪ Vehicle hitting pole</li> <li>▪ Storms</li> </ul>	System shuts down	Uninterruptible power supply (UPS) for critical loads
<b>Sag/Swell</b> 	Brief reductions or increases in voltage	0.5 cycles to 1 minute. Sags or swell longer than 1 minute are called under voltages or over voltages	<ul style="list-style-type: none"> <li>▪ Major equipment start-up or shut-down</li> <li>▪ Short circuits (faults)</li> <li>▪ Undersized electrical wiring</li> </ul>	<ul style="list-style-type: none"> <li>▪ Memory loss</li> <li>▪ Data errors</li> <li>▪ Dim or bright lights</li> <li>▪ shrinking display screens</li> <li>▪ Equipment shutdown</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relocate equipment to different electrical circuit within facility</li> <li>▪ Power conditioners or UPS Systems for Critical Loads</li> </ul>
<b>Surge</b> 	Sudden change in voltage up to several thousand volts (also called impulse, spike, or transient)	< 1msec	<ul style="list-style-type: none"> <li>▪ Lightning</li> <li>▪ Turning major equipment on or off</li> <li>▪ Utility switching</li> </ul>	<ul style="list-style-type: none"> <li>▪ Processing Errors</li> <li>▪ Data loss</li> <li>▪ Burned circuit boards</li> </ul>	Install surge suppressor at main panel (best when used in combination with branch circuit surge suppressor)
<b>Noise/Harmonic Distortion</b> 	Continuous distortion of normal voltage	Steady State	<ul style="list-style-type: none"> <li>▪ Electromagnetic interference from appliances, machines, radio, and TV broadcasts</li> <li>▪ Harmonic distortion from nonlinear loads (computers, lights)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Continuous distortion of normal voltage</li> <li>▪ Random data errors</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use a noise filter designed for application (sometimes incorporated with surge suppressors)</li> <li>▪ Power conditioner</li> </ul>