

Docket Number	Link	Link Address	Date	Summary description of event	1. DVR/LOV working status 2. Deg. Voltage or Loss of Voltage condition	Lessons and Insights	Reference Information
254	2542018005	PDFView.ashx (nl.gov)	10/24/2018	during performance of a second level undervoltage surveillance, Class-1 E 4.16 KV Bus 13-1 tripped on an Undervoltage signal. The associated EDG started but could not load due to surveillance alignment. Unit 1 Failure of a Timing Relay During a Technical Specification Surveillance. The PDF file is not easily readable. Main conclusion is as follows: There have been many occurrences where the as-found condition of this or similarly functioning timing relays were found out of acceptance criteria or outside Technical Specification criteria. However all events involved the old model E7000 timers. It is important to note that the older model relays are diaphragm type designs, while the new relay timers are solid state designs. Since these timers were replaced (starting in 2012) this condition is the first case of its kind.	No LOVR/DVR actuation (but findings are applicable) NO LOVR or Degraded Voltage Condition No LOVR/DVR actuation (but findings are applicable) NO LOVR or Degraded Voltage Condition	Errors during surveillance and calibration of DVR/LOVR could become risk significant. It appears Solid state relays generally used for DVRs are much more resilient to setpoint drift.	Xelon Generation", Licensee Event Report 254/2018-005-01 "Loss of Safety Bus and Automatic Actuation of a Safety System During Undervoltage Relay Surveillance," Quad Cities Nuclear Power Station Unit 1, November 21, 2019;
498	4982017001	PDFView.ashx (nl.gov)	3/10/2017				South Texas Project Unit 1 Docket No. SIN 50-498 Licensee Event Report 2017-001-00 Unit 1 Failure of a Timing Relay During a Technical Specification Surveillance
251	2512013002	https://nersearch.in.gov/PDFView	4/19/2013	While doing the third harmonic test for generator relay drop off, they received a degraded voltage condition. The trip occurred as a result of degraded voltage at the 480V load centers (down to 440 volts for 60 Seconds). Wrong procedure was used.	DVR worked (actuated) Degraded Voltage condition (Internal causes) LOVR did not work	Response of LOVR and DVR to OPC should be evaluated.	Turkey Point Unit 4 Docket No. 50-251 Reportable Event: 2013-002-00 Reactor Trip Due to Loss of Offsite Power Resulting From Generator Testing, June 18, 2013
455	4542012001	https://nersearch.in.gov/PDFView	1/30/2012	The electrical insulator failure resulted in a sustained open phase event and a low level ground fault occurred on the SAT 242-1/2 side of the open phase. The 4.16 KV Engineered Safety Feature (ESF) bus undervoltage protection scheme did not satisfy due to open phase condition and it did not automatically switch over to the emergency Diesel Generators (DG). Following a scram, the Auxiliary Power System transferred from its main power source to the reserve power source, as designed. During this transfer, the Unit 2/3 Emergency Diesel Generator automatically started. This automatic start occurred as the result of the EDG start logic momentarily sensing both the main power source breaker and the reserve power source breaker contacts being open concurrently. Since there was no undervoltage signal received, the automatic start of the EDG is considered invalid.	Sustained open phase condition (OPC) not LOVR No LOVR actuation (Not Applicable)		Byron Station, Unit 1 05000454 12 OF 12 2, Docket No. 05000454, September 28, 2012
249	2492010001	https://nersearch.in.gov/PDFView	10/11/2010	Electrical supply breaker was inadvertently opened, which caused the "C" Reserve Station Service Transformer (RSS1) to de-energize. There was issue with calibrating the bus transfer during UV condition but not for the emergency buses. The event is generally of interest since it identifies generic calibration issues for UV relays including delay time (Part of utility Corrective Action Program (CAP), not discussed)	NO LOVR or Degraded Voltage Condition No LOVR actuation (Not Applicable)	Calibration methods for timing relays will be examined so that specific methods may be required or disallowed for certain circuits.	Exelon, Dresden Nuclear Power Station, Unit 3 Renewed Facility Operating License No. DPR-25 NRC Docket No. 50-249 - December 10, 2010
339	3382009004	https://nersearch.in.gov/PDFView	12/9/2009	Both Units of Turkey Point tripped and undervoltage relays were actuated after a one second time delay. The grid voltage disturbance occurred due to human error when a Protection and Control (P&C) field engineer disabled both levels of local protection at an electrical substation which then failed to actuate when a fault occurred during equipment troubleshooting (manual clearing of the fault took 1.7 second more than 1 second time allotted).	NO LOVR or Degraded Voltage Condition LOVR properly actuated		Virginia Electric and Power Company, North Anna Power Station, Docket No.: 50-338, February 3, 2010
250	2502008001	https://nersearch.in.gov/PDFView	2/26/2008	While off-site power was lost to several on site buildings, it was never lost to the busses supplying the power block area. Although the safeguards bus voltage was swinging as a result of the grid transient, the voltage did not reach the undervoltage setpoints. However, the Operators determined that the off-site supply was unreliable, manually started the Emergency Diesel Generators (EDGs), and then manually transferred the safeguards busses to the EDGs. This resulted in declaring an Unusual Event that was terminated after power was later transferred back to the off-site sources.	LOV condition (Grid fault) DVR was not actuated but the offsite power was manually stripped	Manual transfer should be considered as a back up to DVR for Grid instabilities.	FPL, Turkey Point Units 3 and 4, J5000250, April 25, 2008
244	2442003002	https://nersearch.in.gov/PDFView	8/14/2003		Grid instability due to switching transients		RGE, LER 2003-002, Major Power Grid Disturbance Causes Loss of Electrical Load and Reactor Trip R.E. Ginna Nuclear Power Plant Docket No. 50-244, October 9, 2003
272	2722003002	https://nersearch.in.gov/PDFView	7/29/2003	On an event started by ground fault in 500 KV breaker, generator separated, turbine tripped and reactor scrammed. The E-buses were transferred to preferred power source in addition of three of the Circulating Water (CW) pumps per design. The 4KV vital bus voltages dropped below the second level undervoltage setting of 95.1%. Voltage on the Salem Unit 1 4KV vital busses did not recover to the reset setpoint before the relay timeout caused the relay logic to separate the vital busses from offsite power.	DVR worked (actuated) but not as intended Degraded Voltage condition (Internal causes)	Design time delay and voltage recovery setpoint may not have been correct. Time delay and voltage recovery setpoint should have accounted for voltage dip and recovery time caused by start of 3 CW pump.	PSEG, Salem Generating Station Unit 1, "Reactor Trip due to Turbine Trip Caused by a 500KV Switchyard Breaker Trip" LER 272, September 24, 2003
374	3742001003	https://nersearch.in.gov/PDFView	9/3/2001	CCF (Common Cause failures) of fuses caused actuation of the Division 1 undervoltage (UV) protective circuit	LOVR actuated due to fuse failures		Exelon, LaSalle County Station, Unit 2, Docket No. 50-374, October 21, 2001
247	2471999015	https://nersearch.in.gov/PDFView	8/31/1999	A complex event during maintenance of bistable in RPS logic caused trip. Low voltage on 480 bus, striped the emergency bus and connected to EDGs. One bus tripped off due to overcurrent trip. Post trip evaluation found that the actual over current trip setpoint for its Ampmeter was at 3200 amps, rather than the 6,000 amps setting as designed. In addition the event might have been prevented if the Station Auxiliary Transformer Tap Changer was not in manual mode due to a defective voltage control relay.	No low voltage condition DVR worked (actuated) Degraded Voltage condition (Internal causes)		Indian Point No. 2, Docket No. 05000274, "Reactor Trip, ESF Actuation, Entry into TS 3.0.1, and Notification of Unusual Event." August 31, 1999
219	2191997010	https://nersearch.in.gov/PDFView	8/1/1997	During a bus voltage transfer from Aux. Transformer to SU transformer, A degraded voltage condition was experienced on 4160 emergency buses resulting in separation from offsite power. The cause of degraded voltage was the inappropriate setting of the SU transformer voltage regulator below the Degraded voltage setting.	DVR worked (actuated) Degraded Voltage condition (Internal causes)		GPU Nuclear, Oyster Creek Nuclear Generating Station Docket No. 50-219, Licensee Event Report 97-010: Manual Reactor Scram, Engineered Safety Feature Actuation and Design Deficiencies Noted As a Result of Main Generator Exciter Preventive Maintenance, September 2, 1997
331	3311994012	Licensee Event Report Search I NRI	10/4/1994	during the performance of an increased frequency surveillance test, 4 out of 8 Essential Bus Degraded Voltage relays were found high outside Technical Specification (TS) test using an improved calibration technique. On October 17, 1994 all 8 relays were found low outside the TS voltage limits using the improved calibration method. A 4.7 to 5.1% power source distortion (Harmonics) was identified which subsequently equated to approximately 4.0 to 5.0 volt variance in the relay trip set points. The recommended vendor maximum distortion was 3%.	No LOVR/DVR actuation (but findings are applicable) NO LOVR or Degraded Voltage Condition	The calibration source should be free from harmonics per NRC guidance. The distortion could be reduced by filters. The filters should attenuate higher harmonics below 3%. IEEE std 141 should be consulted.	Duane Arnold Energy, DOCKET NUMBER: 05000-331, Essential Bus Degraded Voltage Relay Calibration Errors Due to Harmonics, October 14, 1994
311	3111994008	https://nersearch.in.gov/Index.asp	6/3/1991	On June 3, 1991, the 91.6% sustained undervoltage relay minimum drop out trip setpoint voltage, for two (2) of the three (3) of the 2A 4KV Vital Bus undervoltage relays and for all three (3) 2B 4KV Vital Bus undervoltage relays, were found to be below the Technical Specification minimum allowable value of 91%. The lowest as-found trip setpoint, of the five subject relays was 90.5%. The causal factors of the setpoint variance are relay design inadequacy and procedure inadequacy. The 4KV Vital Bus 91.6% undervoltage Rochester relays (both Salem Units) were replaced with ASEA Brown Boveri type 27N relays.	No LOVR/DVR actuation (but findings are applicable) NO LOVR or Degraded Voltage Condition	The type of relay and calibration method with harmonic free source will affect the relay setpoints. Certain relay types such as ASEA Brown Boveri type 27N relays appear to have less setpoint drift.	Salem Generating Station Unit 2, DOCKET NUMBER: 05000311, "4KV Vital Bus UV Relay Setpoints Found Below Minimum Tech. Spec. Allowable Value." EVENT DATE: 06/03/91 LER #: 91-008-01 REPORT DATE: 07/09/92
301	3011989002	https://nersearch.in.gov/PDFView	3/29/1989	spurious actuation of the Unit 2 X01C phase fire deluge spray system. The spurious deluge spray apparently induced a flashover from the transformer to ground, which was detected by protective circuitry causing generator and turbine trip followed by reactor scram. The emergency diesel automatically started because of bus undervoltage. The undervoltage condition was the result of the premature actuation of the generator stuck breaker protection relay, which isolated a Unit 1 bus section cross-connection. Voltage dips to 3700 volts on the normal 4160 v system were experienced.	LOVR actuated properly (worked) LOV condition (Internal causes)	This event also highlights the potential complications that may be introduced in setting the LOVR set point if there is cross connections between units.	Point Beach Nuclear Plant Unit 2, Docket No. 05000301, Fire System Actuation Induced 2X01C Fault and Unit Trip, March 29, 1989
249	2491989001	https://nersearch.in.gov/PDFView	3/25/1989	A phase-to-ground fault occurred, causing the loss of reserve auxiliary transformer (TR) 32 which is fed from 345 KV Bus 8. Bus 32 feed breaker transfer from TR 32 to TR 31 was slow resulting to loss of the bus.	LOVR worked (actuated) Loss of voltage condition		Dresden Nuclear Power Station, Unit 3, DOCKET NUMBER: 05000249, Turbine Trip and Reactor Scram on Stop Valve Closure Due to Slow Transfer of House Loads During Loss of Offsite Power, March 25, 1989