

# Power Failure Recovery Test Guide

“Lights out call power failure”



# definition of power outage

- Sub cycle  $1/60 = 0.1666$  sec (spikes)
- Momentary or short term 1.0 sec (faults)
- Multiple second (utility trip & reclose)
- Minutes – Long term (equipment failures)
- Single phase – ( fuses or utility phase trip)
- Brown out (low voltage – sags)
- CBEMA, IEEE, EPRI Data



# power sources

- Utility supply – single ended (source)
- Utility supply – multiple ended (source)
- Utility supply – network (paralleled sources)
- Standby Generators
- Cogeneration
- UPS systems



# power outage causes

- Tripped breaker, blown fuse
- Utility Company fault
- Weather (lightning, wind or ice)
- Human errors (switching)
- Improper protective device coordination
- Nuisance tripping cause unknown



# power outage affect on HVAC equipment & controls

- Sub cycle – PLC, BMS & Network lock ups
- 1 Second – Motor control interruption
- 1 Minute – Plant outage & restart
- Minutes - Lost process or Building
- Phase loss – Burned out motors
- Hours – Days – Dead in the water



# power failure restoration

- Automatic power restoration (generator)
- Manual power restoration (reset breaker)
- Utility restores power
- Disaster recovery plan



# emergency power transfer switching

- Open transition
- In phase transfer
- Closed transition transfer
- Sub cycle transfer
- Uninterruptible power



# power systems testing

- NETA acceptance testing of equipment
- Power failure scenario simulations
- HVAC plant, control or system response



# prevention of power outages

- Discussions with power company
- Alternate sources of power
- Isolation, surge protection, grounding
- Proper system design
- Proper system commissioning & testing



# stories

- ARTCC (LIGHT POLE HIT/Coordination)
- Federal Data Center (nuisance trip)
- High security prison (training)
- Federal command center (no start up)
- Office Building (water leakage)
- Electronic Equip. Mfg (utility impulse)