EPO (Emergency Power Off) INFO

Over the last 15 years I have been called in more than two dozen times to restart data centers after EPOs. I have been asked to provide post mortem reports and design modifications and training /procedures after about half of them because operators and owners do not have a ready source of specialists on EPOs.

EPO system management breaks down into two basic parts, Prevention and Recovery.

Prevention means designing the EPO systems and Procedures to accidental discharges are avoided.

Recovery means designing the EPO systems and Procedures to quickly and safely reset the main power systems.

EPO systems that interface to gas fire suppression systems like FM 200 or Halon are very complicated and often require many more considerations and options than the more simple EPO systems deployed with Pre action systems. If I am asked to work with an owner on a gas suppressed design I usually ask the client to bring in a particular PE that I've worked with on many of these designs. Indeed even on the basic systems that require a rebuild asking the PE to provide good CAD documents and PE oversight can be money well spent.

PREVENTION

EPOs are often in accidentally deployed. Sometimes a disgruntled employee will trigger a EPO as a way of "getting back" for some grievance.

CAMERA , real or fake deployed flagrantly at each exit/control point is a good deterrent.

COVERS, A good cover can deter accidental or deliberate malicious operation. There is a common large plastic cover that can be fitted over the EPO switch. The cover has a battery operated "squealer" built into it. If someone removes the cover to hit the switch a very loud (in excess of 100 dBA) alarm sounds.

BAS, some building automation systems have sub modules that interface BAS and building monitoring systems and point addressable fire systems. Host a meeting with those vendors, the programmers and the installers to make absolutely sure that any means by which the EPO or the gas suppression can be remotely commanded through the software or the firmware is identified. I prefer to completely eliminate and remove that function. At the very least make sure such deployment is protected by multiple password or very strict defense protocols.

LOCATION, All exits areas should be ***configured and located exactly the same way.***

EXIT SWITCHES, if the security system requires an electrical switch to be operated for egress make it clearly marked. A PIN Operation will also help to prevent confusion with the EPO button which is the most common source of accidental deployment of EPOs. Contractors and cleaners often not familiar with the site should be escorted and trained, preferably both. If that is not feasible then the exit switch might be converted to a motion type.

Many options exist but in any case consideration, thought and planning and testing are a key to this source of EPO problems.

MULTIPLE OPERATION. This is a case of variation of the deadman's switch or two handed multi stage operation.

Several options can be designed. One option is to use three separate EPO switches, one operates the A side power system the second the B side and the third the critical mechanical systems. Operation of any one will not "dump" the data center if it is designed as a high tier A/B or 2 N type system.

A two switch "Enable" operation switch works by making the operator close and hold a first switch in series with the second operating switch. Like a "deadman's switch on a locomotive two deliberate tasks are required by the operator in order to deploy the device or operate the system.

POWER ON Normally OPEN or NORMALLY Closed (NO or NC) are terms that can be confusing to describe the electrical operation of the EPO. The easiest most simple and safest way to design an EPO to prevent accidental deployment is to use the "POWER ON MODEL" In this case the EPOs require a 120 volt signal to trip their downstream devices offline. By using this configuration the accidental turning off of

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a switch or a circuit breaker tripping or any electrical failure can trigger the EPO adding to the confusion and problem already occurring.
The power on type means that a deliberate 120 volt switch must be activated. Power is rarely accidentally applied to a circuit whereas accidental ***LOSS*** of power is a much more common problem. The Power on model has another advantage in that the source breaker to the EPO can be turned off and isolated allowing service to the device or the system without deploying the EPO.
RECOVERY Murphy's Law is that something always can and will go wrong. If made by man it can fail. Even if we've designed the safest system we can we still need to make recovery of a data center after a EPO as quick and safe as possible.
Most UPSs offer the option to activate their local EPO remotely (REPO) most PDUs offer that same option and any electrical panel main breaker can be equipped with a "shunt trip"
We have found that restarting a UPS module after a EPO can be a problem. Some UPS's require a detailed sequence of operation that is beyond the local staff's expertise even with training. It often seems that operating the UPS' EPO creates problems as if the emergency shutoff sequence is an invitation to "blow' internal components. For these reasons we usually prefer to operate the R-EPOs by tripping the power off at the panel mains and PDU main CBs.
We write a simple procedure to put the UPS on internal bypass (Optionally the wrap") and one by one re-close the PDU mains and then the mechanical mains. The "stagger start" method allows the UPS bypass to provide the inrush currents to each PDU one at a time from the bypass. The alternative with some systems is to hit the UPS inverters with the full inrush current from all the PDUs inviting an overload. Once the system is stable then the UPS can be put onto the inverter or normal operation without undue stress and strain.
A system carefully designed and operated by a trained crew that occasionally does a training drill (once a quarter) can routinely recover even a large data center quite efficiently.
On one large site we had a main circuit breaker fail internally and trip. The system was designed as I mentioned above. Effectively the failure created exactly the same situation as if the EPO had been deployed. That data center was recovered and functional in 1 minute 40 seconds. That crew was well trained but still to recover a 20,000 square-foot raised floor with 12 PDUs , 20 CRACs , a multi module 4000 amp UPS system speaks well of the system design and the level of training and retention by that staff.

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