PJM Emergency Procedures Terms

Note - generally speaking:

- alerts are supposed to occur the day before emergency procedures;
- warnings occur the morning of the operating day that an emergency event is imminent; and
- actions are issued at the onset of an emergency event.

However, in certain situations the implementation order of these levels may change. Sometimes PJM must omit a warning or alert and immediately implement an emergency procedure. Certain emergency situations do not have an alert, warning and action level.

NOTE: *This document provides plain language explanations of PJM's emergency procedures to help interpret them to the public and non-technical audiences. It is **NOT** intended to be a technical or operational reference. PJM or member personnel should **NOT** rely on this document for system or market operations.*

Indicates procedures that occur most often.

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Message	Definition
Cold Weather Alert	A Cold Weather Alert prepares personnel and facilities for expected extreme cold weather conditions, when actual temperatures fall near or below 10 degrees Fahrenheit. The alert provides the following information: • the area for the alert, • the forecasted low temperature, • the forecasted duration of the situation, and PJM communicates with generator owners and tells them to be prepared to call in additional staff to get all generating units running for the morning load pickup. They must take extra care to maintain the equipment so that it doesn't freeze in the cold weather. **Cold Weather Alert is not followed by a Warning or Event. See Note.**
Curtl Bldg Load (Curtailment of Non-essential Building Load)	The Curtailment of Non-Essential Building Load action limits energy use before a Voltage Reduction (See Voltage Reduction). This step does not take place after voltage reduction has been issued. Transmission and generation dispatchers, and load serving entities switch off all non-essential lights and uses of power at their own offices and facilities. Load serving entities might also consider asking retail customers to cut their electricity usage.
Emergency Energy Request	An Emergency Energy Request is made when there is not enough generation in the PJM RTO to meet load. It is a request by PJM for emergency purchases of energy from market participants in neighboring control areas such as NYISO and the Midwest ISO. The member supplying the energy is responsible for the delivery and transmission of the service. PJM tries to provide 60 minutes notice before emergency energy is required. This request would be made in an emergency situation, such as Max Emerg Gen. (See Max Emerg Gen)
Heavy Load Voltage Warning	The warning is issued to generation and transmission owners requesting that they schedule for maximum voltage support on the power system. It can be issued in all of PJM or smaller areas, such as within a utility's service territory. PJM gives notice four hours prior to requesting actual implementation of heavy load voltage schedule. (See Heavy Load Voltage Action)
High System Voltage Warning	This condition can occur on the system on low-load days (e.g. three-day holiday weekends when people are on vacation and not using as much electricity) that cause voltage on the system to rise above normal limits. In order to keep the system voltages within safe operating limits, generator owners are requested to take generating units offline to relieve the high voltage condition on the system.
HLV Action (Heavy Load Voltage Action)	This action is issued to generation and transmission owners during a peak load period to request maximum voltage support and increase energy reserves. More units must be running, and units must be run at a higher output in order to produce more energy, to meet the heavy load. This action normally would occur in warm weather months when

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	energy use is high. Retail customers are not affected. Transmission dispatchers should ensure that control equipment is switched on or off to maintain voltage levels.
Hot Weather Alert	The Hot Weather Alert prepares transmission/generation personnel and facilities for extreme hot and/or humid weather conditions that may cause capacity problems on the grid. (e.g. There is not enough generation capacity to meet customers' use of electricity.) Generally, this alert is issued if projected temperatures exceed 90 degrees Fahrenheit with high humidity for multiple days. Transmission/generation operators determine if any maintenance or testing on any generation or substation equipment can be deferred to a later date or even cancelled. When the equipment is being tested or worked on, it is offline and not producing energy. By deferring maintenance or testing on generating units, they will continue to run and produce power that can be used on the grid. **Hot Weather Alert is not followed by a Warning or Event. See Note.**
Load Mgmt Curtail (Load Management Curtailment) **Long Lead Time**	Retail (end-use) customers that have contracts under load management programs with their electricity provider are asked to cut electricity use. The PJM dispatcher provides an estimate of the amount of energy that must be cut and the duration of time for the curtailment. The purpose of this step is to provide additional load relief so that lines do not get overloaded. Load relief is expected to be required after initiating or in anticipation of a Maximum Emergency Generation (See Max Emerg Gen). **Contracted customers reduce electricity use in 1-2 hours.**
Load Mgmt Curtail Short Lead Time	(See above) **Contracted customers reduce electricity use in 1 hour or less.**
Load Reduction Action	A Load Reduction Action requests that retail customers who participate in PJM's Emergency Load Response Program reduce energy use during emergency conditions. This step most likely would occur during Maximum Emergency Generation (See Max Emerg Gen). Note: These customers are part of PJM's programs; load management customers (see Load Management Curtailment above), on the other hand, are part of a PJM member's (e.g. a utility's) programs.
Local Min Gen Warning	Occurs the day of a possible Local Min Gen Event.
Local Min Generation Event (Local Minimum Generation Event)	A Local Minimum Generation Event is implemented by PJM when there is an excess of generation in a certain area(s), which can result in stability issues on the grid. If there is more generation than customers are using, the frequency becomes high and equipment motors run faster, causing stress on the equipment. PJM instructs generation

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	dispatchers to take generating units offline to reduce the output of their generating units in order to restore normal voltage levels.
Low Voltage Alert	The Low Voltage Alert tells members to prepare for heavy energy demand which may cause low voltages the next day. The alert is issued when not enough generation is expected to be available to cover load, a capacity shortage. In a low voltage situation, the frequency declines, voltages drop and generation equipment motors run slower or disconnect automatically, causing instability on the grid that can result in a blackout.
Low Voltage Event	In a low voltage situation, the frequency declines, voltages drop and generation equipment motors run slower or disconnect automatically, causing instability on the grid that can result in a blackout. Member transmission/generation dispatchers halt all deferrable maintenance or testing affecting capacity or critical transmission. Also, any monitoring or control maintenance work that may affect operation of the system is halted.
Manual Load Dump Warning	The Load Dump Warning warns PJM members that present operations are critical, such as overloaded lines in danger of tripping (i.e. losing power), which may require interrupting electric service to some end-use customers. The amount of load and the location of areas(s) are specified. It is issued when available primary reserve capacity is less than the largest operating generator or when the loss of a transmission facility jeopardizes reliable operations, and after all other possible measures are taken to increase reserve. PJM and transmission/generation dispatchers reinforce communications with each other so that, if a load reduction must be implemented, it can be coordinated without delay.
Manual Load Dump	PJM directs system operators to begin brief, temporary rotating power outages to prevent the failure of the entire electric power supply system. This event occurs when customers' use of electricity, such as during hot weather conditions, is beyond available power supplies. During this event, rotating power outages will interrupt electric service to some customers for a period of time. When service is restored to them, electric service to a different group of customers will be interrupted. The controlled power interruptions share limited power supplies among all customers. This procedure prevents the failure of the entire electric power supply system. The power interruptions are implemented to prevent a catastrophe within the PJM region and to maintain reliability in the other interconnected regions. This action would occur when there is no reserve to replace the largest generating unit on line should it shutdown unexpectedly or in the instance of the loss of a transmission facility that jeopardizes reliability. If all PJM areas are short on power, each utility interrupts service to enough customers to cover its share of the power shortage. The utility's share is a percentage based on

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	the power demand in its area compared to the overall system demand for power. If only certain areas are short on power, they are the only ones required to interrupt service to customers. PJM and system operators urge customers to reduce electricity use by turning off electric appliances and equipment that they do not need or are not using, as health permits. PJM also asks customers to set thermostats higher than usual, if health permits.
Max Emergency Generation Alert (Maximum Emergency Generation Alert)	The Maximum Emergency Generation Alert provides a day-ahead alert that system conditions may require generation to be loaded above the maximum economic level and that use of the PJM emergency procedures may be implemented. (See Max Emerg Gen Event for definition of "maximum economic level") This alert occurs when PJM forecasts that current reserves may not be high enough to meet the operating reserve requirement. This requirement varies each day and is required by PJM to back up the grid in the event of an emergency. Operating reserve is generation available from either offline or online units within 30 minutes of PJM's request. It is scheduled to meet operating reserve requirements in the Day-Ahead Market. This alert is targeted at transmission/generation owners, who then determine if any maintenance or testing on any equipment can be deferred or cancelled. When units are taken offline, they are not producing energy. By deferring maintenance, the units stay online and continue to produce energy that is needed.
Max Emerg Gen Event (Maximum Emergency Generation)	Max Emergency Generation increases generation above the maximum economic level. The maximum economic level is the point where all economic megawatts have been used from the generators running on the system. Max Emergency Generation refers to additional power available when generators are run in unusual ways (e.g. boiler over-pressure) or using generation that has limits (e.g. environmental or fuel supply) on how many hours it can run. This action only happens in the case of an extreme emergency, such as the unexpected and sudden loss of a generating unit generally coupled with a capacity emergency which results in not enough megawatts on the system to meet load. In a Max Emerg Gen event, PJM also would initiate the emergency bid process (See Emergency Bid Process) to purchase available energy from energy suppliers outside of PJM, such as NY ISO or Midwest ISO. Max Emerg Gen is most likely to be called in summertime on a peak load day. Having a large number of generators on the system tends to prevent this situation. However, transmission constraints can cause a need in a local area.
Minimum Generation Alert (Minimum Generation Alert**)**	The Minimum Generation Alert provides a day-ahead alert that system conditions may require the use of the PJM emergency procedures. There is too much power on the grid. Therefore, generating resources must operate at or below normal minimum levels to keep generation and power use in balance. The alert is implemented when the expected generation level is within 2,500 MW of normal minimum generation limits, which is the minimum level at which generators can

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	operate without damaging equipment. When the generation equipment is running below the minimum level, it is running slower than it should be and can be damaged or automatically shut down, causing instability on the grid. PJM generation dispatchers schedule generating unit maintenance during expected light load periods in order to take the units offline so that they stop producing electricity. This alert occurs when power use is very low and generation cannot be reduced low enough to match the low load.
Min Generation Declaration (Minimum Generation Declaration)	A Minimum Generation Emergency is declared when further generation reductions are needed to match the minimum during the low point of energy use from overnight to early in the morning before energy use picks up as people get ready for school and work. It is implemented two hours prior to the light load period (low electricity use period) or after any subsequent system re-evaluation. This declaration notifies members of data that helps them determine how much generation they can reduce (by percentage) and the duration that energy can be reduced. PJM instructs generation dispatchers to reduce generation. System operators avoid turning off generators altogether because they may be needed as electricity use picks up following the valley. PJM dispatch communicates with system operators to tell them when generation should be reduced and when it can be increased again to normal levels.
Min Generation Event (Minimum Generation Event)	Minimum Generation Event is implemented when the PJM dispatcher can no longer match the decreasing load by reducing the dispatch (price) signal. When the PJM dispatcher reduces the signal, it shows that additional electricity is no longer needed in certain areas. The reduction of the signal tells generators to stop producing power in that area. Units that aren't required will be shut down. Energy output of generators that are in use is reduced. PJM operators determine the timing of reductions and shutdowns so that generation can be increased quickly to meet the morning load pickup.
Post Contingency Local Load Relief Warning	To provide advanced notice to a transmission owner of the potential for a manual load dump in their area only (See "Manual Load Dump"), generally required as a last resource if local transmission system overloads or shutdowns occur.
Primary Reserve Alert	The Primary Reserve Alert notifies members of the anticipated shortage of operating reserve capacity for a future critical period. It is implemented when estimated operating reserve capacity is less than the forecast primary reserve requirement. Primary Reserve is resources held in reserve that can begin producing electricity within 10 minutes from a PJM request. The reserve can replace generation that unexpectedly shuts down. Current approved value for this reserve is 1,700 MW for the *ReliabilityFirst* region of PJM. PJM requires a certain amount of reserves each day to back up the grid in the event of an emergency. Reserves are based on the forecast power use for that day. There must be enough reserve megawatts on the system to cover the power produced by the largest generating unit on the system in the event that the largest unit would

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	unexpectedly stop producing electricity. Transmission and generation owners determine if any maintenance or testing on any equipment or facilities can be deferred or cancelled. When equipment is taken offline for testing, other energy must be brought in to make up for it.
Primary Reserve Warning	This warning is issued to warn members that the available primary reserve is less than the required amount and that present operations are becoming critical. Transmission/generation dispatchers move secondary reserve to primary status (so that it can be producing electricity within 10 minutes from a request) and schedule all available generation. Secondary reserve is reserve capability that can be fully supplying electricity within 10 to 30 minutes following the request of PJM. Transmission/generation dispatchers ensure that all deferrable maintenance or testing affecting capacity or critical transmission is halted. By deferring maintenance or testing, the equipment can remain online to provide energy and the system will not have to draw from emergency backup sources.
Solar Magnetic Disturbance	A disturbance caused when the sun emits a stream of charged particles that disturb the earth's magnetic field. The resulting electrical currents flow through power system equipment and can cause equipment damage and a disruption of interconnected system operation. When a solar disturbance is identified, PJM operates the system with more conservative power limits, in case the unexpected additional power from the solar disturbance flows on the system. Generation dispatchers may need to follow more restrictive plant procedures to protect equipment, which may result in less power being produced.
Special Notice	Miscellaneous message
Transmission Loading Relief (TLR)	Transmission Loading Relief (TLR) is a North American Electric Reliability Corporation (NERC) procedure that is used to reduce the flow of power on the transmission system to prevent overloads. A TLR curtails scheduled energy contracts over the transmission lines. PJM monitors designated transmission facilities within its region as well as tie lines with adjacent interconnected control areas. When PJM determines overload conditions exist on any designated facility, or would exist if another facility failed, PJM acts to correct the situation using the TLR process.
TLR Level 0	Level 0 is Conclusion; cancellation of the TLR. Problems have been addressed and energy flow trend is continuing downward, returning to normal. All curtailed transactions can be restored.
TLR Level 1	Level 1 is Notification. Reliability coordinators, transmission providers and control areas are notified that the transmission system is secure, but energy levels are following a trend that will likely surpass acceptable operating limits, in which case curtailments are

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	likely to occur. PJM implements all non-cost measures to control transmission flows. This action does not have a substantial effect on sales of electricity.
TLR Level 2	Level 2 is Hold; A flowgate is at or approaching its operating security limit and a transmission provider receives a request to implement new interchange transactions (use of the transmission system to sell electricity from on party to another) that will cause an overload. A flowgate is a group of tie lines lumped together as one entity that connect different power systems. For example, transmission lines that connect NY ISO and PJM are considered tie lines. Those lines can be considered a group of tie lines called a flowgate. PJM curtails transactions with transmission service in PJM that are "not willing to pay through congestion" (i.e. the transmission users are not willing to pay to run more expensive generators, which would allow the power sale to continue). The purpose is to hold energy at the existing level. Allowed to hold at that level for 20 minutes; seldom used.
TLR Level 3a	Level 3a is Re-Allocation Non-firm transactions. Curtailment of non-firm point-to-point transactions. These transactions have 5 percent or greater impact on the energy flow. The effect is to curtail interchange transactions and allow higher priority transactions that have a greater impact on the energy flow to start or increase. Re-dispatch options are also identified to reduce load on certain equipment. Occurs at top of upcoming hour.
TLR Level 3b	Level 3b is Curtailment Non-firm. The flowgate is above its operating security limit. Curtailment of non-firm point-to-point transactions (see "TLR Level 3a"); curtails lower priority and allows higher priority energy transactions to start or increase, by using re-allocation. Holds new interchange transactions using non-firm transmission service until the flowgate is at or below the operating security limit. Occurs ASAP, instead of at the top of the upcoming hour.
TLR Level 4	Level 4 is Reconfiguration; Energy levels are above operating security limit. Nothing can be curtailed to solve the problem. PJM re-dispatches to the fullest extent possible, not including Maximum Emergency Generation. By re-dispatching, PJM moves the electricity around to different areas to alleviate congestion.
TLR Level 5a	Level 5a is Reallocation affected Non firm and Firm schedules. The flowgate is above its operating security limit.. PJM curtails external transmission customers not willing to pay through congestion and charges other external customers willing to pay for the cost of congestion. Occurs at the top of the upcoming hour.
TLR Level 5b	Level 5b is Curtailment of affected Non firm and Firm schedules. The flowgate is above its operating security limit.. PJM curtails external transmission customers not willing to pay through congestion and charges other external customers willing to pay for the cost

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	of congestion. Occurs ASAP, instead of at the top of the upcoming hour.
TLR Level 6	Level 6 is Emergency Procedure. PJM curtails all effective transmission customers. Prior actions can't solve the problem. Critical level is reached and emergency actions are required. Voltage collapse, cascading or other emergencies may occur. Voltage collapse occurs when the system collapses due to unstable generation. Cascading means that it is like a domino effect. If one line goes down, it causes another line to take on its power then that line gets overloaded and goes down too, and so on. Possible actions include demand-side management, emergency re-dispatch, voltage reduction, interruptible and firm load shedding.
Voltage Reduction Alert	This alert prepares transmission dispatchers at member organizations to be ready for a voltage reduction on short notice. (See Voltage Reduction) The alert tells control centers that synchronized reserve will be less than required and a voltage reduction may be required. Synchronized reserves – generation and demand response– are resources that are not in use currently but are synchronized to the system and can be used on short notice. PJM requires a certain amount of reserve each day that is calculated according to the load on that given day. A general requirement for reserves is that there has to be enough reserve megawatts available on the system that would cover the power produced by the largest unit on the system should that unit shut down unexpectedly. Non-spinning, also known as quick start, reserve is off-line capacity that can be turned on and loaded onto the grid within 10 minutes.
Voltage Reduction Warning	Transmission dispatchers prepare to reduce voltage, if requested. All generating stations are instructed to curtail non-essential station light and power (see Curtl Bldg Load), meaning that they cut energy usage at their own facility. Doing so makes more energy available for end-use customers. This real-time warning notifies members that the available synchronized reserve is less than the requirement and that a voltage reduction may be required. Synchronized reserve is generation that can begin producing electricity or customer use of electricity load that can be removed from the system within 10 minutes.
Voltage Reduction	Power grid operators order voltage reductions on the distribution system in order to reduce the strain on the transmission system during times of heavy electricity usage. Because of the laws of science, reducing the voltage reduces the amount of power being used. The effects are not noticeable to most people and equipment. All areas of PJM can implement a voltage reduction. In some cases, a visit may be required to each substation, taking some time to implement. Due to the time required to implement a reduction, problems must be anticipated, and the reduction request made soon enough to allow time to respond. In general, equipment can continue to operate without damage within plus or minus 10 percent of normal voltage. For the 120 volt system in the U.S., this range is from 132

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	volts to 108 volts. Five percent is the greatest voltage reduction used by PJM

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