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ERCOT Grid Insights

Addressing issues important to maintaining a reliable and resilient grid

Black Start

In this issue: An overview of ERCOT's black start plan that Transmission Operators (TOs), in coordination with ERCOT, would implement in the event of a blackout or a partial blackout in the ERCOT Region. While ERCOT has implemented many layers of protection that are intended to preserve the ongoing operation of the power system in Texas, up to and including controlled load shed when necessary, it is possible that an even more extreme but unlikely event could occur that would result in the blackout or partial blackout in the ERCOT Region. If such a situation should occur, many power plants would be unable to turn back on because they need electricity to start. In these extreme situations, a reliable black start procedure is required to restore electricity to the ERCOT System in a timely manner.

BLACK START PROCEDURE

What: Black start is a procedure that focuses on restarting and restoring power to the grid in the event of a blackout or a partial blackout. If a blackout were to occur, power could not be restored immediately across the entire grid; it must be systematically restored according to a predetermined plan.

How it Works: Black start plan implementation is a complex, multistep process that could take multiple days to weeks to restore power to the entire ERCOT Region. In the event of a blackout, TOs individually initiate their black start plans by directing black start resources to turn on in their footprint. Each black start resource is typically a larger generator that has the ability to utilize a smaller generation resource, such as a diesel generator, to facilitate its startup. The black start resource, once started, will begin energizing another nearby generator, called a next start resource. At this point, the TOs will use the power from these generators to energize transmission lines, restore power to a limited number of customers, and restart additional generators to form a black start island.



There will be multiple black start islands across the ERCOT System performing the same process. This process will continue in an ever-increasing manner until all the independent black start islands join and the ERCOT System is restored. The final process of the system restoration process is to restore ERCOT's real-time energy only market.

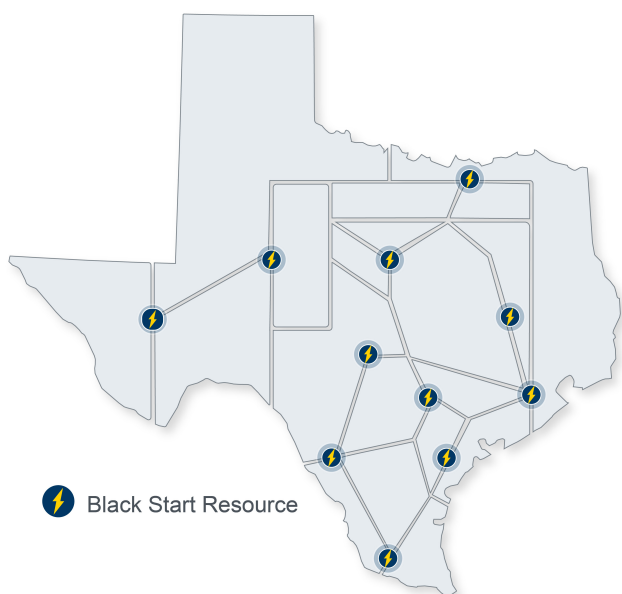
Grid Significance: Restoring power to customers in the ERCOT Region as quickly as possible is the most important goal in the event of a major blackout. Electricity is essential to the lives of Texans and to the Texas economy.

BLACK START RESOURCES

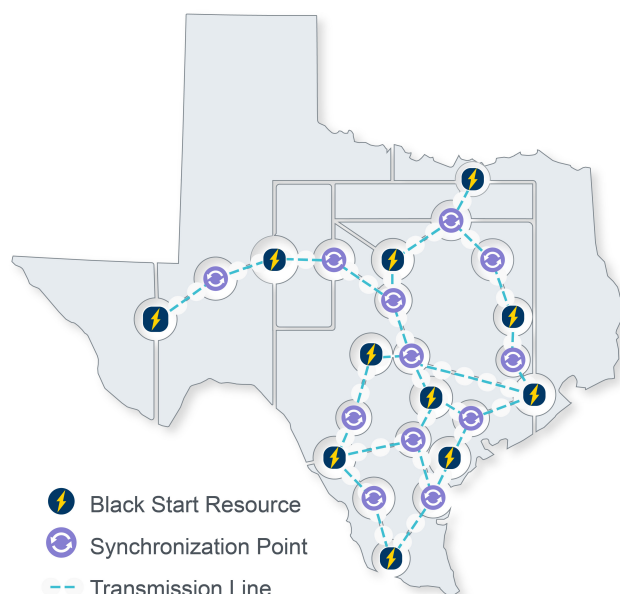
What: Every three years, ERCOT selects and contracts with generators across the Texas grid that are designated to restart independently without external assistance. These generators are called "black start resources." Black start-capable generators bid into a [Request for Proposal \(RFP\)](#) process and are selected based on a variety of criteria, including, but not limited to, proximity to load centers, proximity to critical facilities such as nuclear generators, speed at which a generator can restart its black start island, and cost.

How it Works: These generators are required to pass multiple physical black start capability tests demonstrating their ability to start without assistance from the grid prior to being awarded a contract to provide black start service. ERCOT can even do unannounced testing to verify that black start resources are operable and available at any time. The cost to procure black start resources is allocated to all consumers in the ERCOT territory as all consumers benefit from a resilient grid.

Grid Significance: Black start resources are critical to helping ERCOT restore power to the grid in the event of a blackout or partial blackout. The black start resources are the starting point of the restoration process – a process designed to be most efficient when all black start resources are working as expected, but one that is also designed to work if some of the black start resources are unable to perform. Like putting a puzzle together, all of the pieces (generators) need to work together to bring the ERCOT System back online after a blackout.



Black start resources as separate islands
before restoration begins



Black start resources connected as
restoration process concludes

These maps are representations and do not show the actual islands or generators that may be used in a black start condition.

BLACK START GAS COORDINATION

What: The Black Start Gas Coordination Group (BSGCG) promotes coordination between ERCOT, TOs, black start resources, and the gas pipeline operators who provide gas supply to black start resources.

How it Works: During a blackout, the goal of the BSGCG is to ensure that electricity is provided to natural gas facilities critical to supplying fuel to black start resources. This ensures that fuel is available and supplied to black start resources during a blackout.

Grid Significance: Gas operator participation is vital to the development of an effective black start plan so that the generators relied upon to initiate the black start process have the fuel needed to operate.