

3.3.2.3 Coordinated Reactive Testing (* This is the section of ERCOT Operating Guides that needs revising)	NERC MOD-025	ERCOT Coordinated Test
<p>(1) <u>“Coordinated Testing”</u> is the testing of a Generation Resource’s reactive capability to verify the Generation Resource’s most current CURL. The verification test will be a coordinated effort <u>between the Resource Entity, the Resource Entity’s QSE, the TO which the Resource Entity is connected, and ERCOT Operations</u>. Coordinated Testing is at the option of the Resource Entity. <u>Coordinated Testing can be ordered by ERCOT if a retest is required.</u></p> <p>(2) The Resource Entity requesting to perform a Coordinated Test will provide ERCOT Operations and the TO with <u>notice of the proposed test date before 1500 on the day prior to the day of the test</u>. Requests shall be made <u>between 0800 and 1700 on Business Days</u>. Upon receipt of a request for test, ERCOT Operations and the TO will <u>evaluate the expected conditions</u> and determine whether ERCOT System conditions conducive to a valid test can be created through coordinated network switching, modification of the generation reactive dispatch of nearby Generation Resources, or by some other means. Having established that suitable ERCOT System conditions exist or can be created, <u>ERCOT Operations, and the TO shall confirm</u> with the Resource Entity and the QSE <u>the agreed upon test time and date</u> or a rejection of the test time and date before 1700 on the day prior to the day of the test.</p> <p>(3) The Coordinated Test <u>shall begin and end within the standard work day (nominally 0800 to 1700)</u>. Since <u>leading tests will often occur in off-peak periods</u>, the coordinated leading test shall begin and end <u>at times agreed to by ERCOT, the TO, QSE and Resource Entity</u>. The minimum duration for any reactive verification test, leading or lagging, is 15 minutes. The CURL should be provided to ERCOT Operations and posted in the Resource Entity’s control room and at the QSE’s Real-Time/generation dispatch desk. The testing period shall be <u>scheduled such that sufficient time is given for any transmission switching</u>. During the test, the <u>QSE shall be in communication with the TO</u> in order to coordinate the reactive output of adjacent Generation Resources, capacitor switching, reactor switching, and any other activity needed to perform the scheduled reactive test accurately.</p>	<p>real power AND reactive power at same time (separate testing is also allowed)</p> <p><= 66 calendar months between tests (5.5 years)</p> <p><12 calendar months of discovery of change that affects Real Power or Reactive Power capability (>10% change & expected to last >6 months)</p> <p><u>within 12 mos. of commercial, if mothballed >5 years, within 12 mos.</u></p> <p>staged verification OR verification using operational data (1st test must be staged verification)</p>	<p>tests on separate dates</p> <p>every <u>2</u> years</p> <p><u>before</u> commercial</p> <p><u>all</u> staged verification</p>
<p>(4) <u>Lagging</u> Reactive Tests - <u>Generation Resources</u> shall be tested to verify lagging reactive capability <u>at or above 95% of net dependable real power output</u> as indicated on the CURL. Generation Resources that are classified as <u>IRRs</u> shall be tested when generating <u>at or above 60% of their seasonal HSL</u>. Maximum lagging capability is most likely to be needed during times when ERCOT System Loads are typically high, and transmission system voltages are relatively low, such as during the months of May through September. ERCOT has the authority to not allow a reactive capability test to be conducted if it believes ERCOT System conditions at the requested time of the test are unfavorable. <u>The transmission voltage at the switchyard to which the Generation Resource is connected should be at or below the ERCOT currently scheduled voltage prior to starting the test</u>. If the Generation Resource being tested is unable to achieve adequate lagging reactive capability per the CURL, the Generation Resource, at its discretion, may utilize the capability of another Generation Resource in the same plant to offset (take in VARs) the lagging test that is under way. This circulation of VARs must leave the high side of the GSU of the Generation Resource being tested and flow through the GSU of the Generation Resource taking in the VARs. Under no circumstances shall VARs be circulated between Generation Resources on the same low side bus.</p>	<p>NERC MOD-025</p> <p><u>NERC Tests</u></p> <p>'Verify max. MW output.</p> <p>@ max. MW output, measure max. Gross LAG MVAR (for 1 hour)</p> <p>@ max. MW output, measure min. Gross LEAD MVAR (momentarily)</p> <p><u>Defined Lagging GEN MW:</u> Conv @ verified max. MW output</p> <p>IRR @ Max. MW available on Test day with >90% of IRR plant's turbines online</p> <p><u>Lagging Test Voltage:</u> at scheduled voltage (Voltage Profile) or <u>within tolerance band</u></p>	<p>ERCOT Coordinated Test</p> <p><-- <u>ERCOT Test #1</u> (Net MVAR @ POI) Pass if >= .328 x Defined GEN MW (for 15 minutes) [Protocol 3.15 (3)]</p> <p><-- <u>ERCOT Test #2</u> (Gross MVAR - Aux Load MVAR) Pass if- >= 90% latest CURL (for 15 minutes) [Op. Guide 3.3.2.3(8)]</p> <p><u>Defined Lagging GEN MW:</u> Conv >95% SUM HSL, IRR >60% SUM HSL [Protocol 8.1.1.2.1.4 (3)]</p> <p><u>Lagging Test Voltage:</u> at or <u>below</u> scheduled voltage (Voltage Profile)</p>

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<p>(5) <u>Leading Reactive Tests - Generation Resources</u> shall be tested to verify leading reactive capability at a MW loading level representative of expected Generation Resource MW loading during minimum Load conditions as indicated on the CURL. Generation Resources that are classified as <u>IRRs</u> shall be tested when generating below 60% of their seasonal HSL. Maximum leading capability is most likely to be needed when ERCOT System Loads are typically light and transmission system voltages are relatively high, such as during the months of October through April. ERCOT has the authority to not allow a reactive capability test to be conducted if it believes the system conditions at the requested time of the test are unfavorable. <u>The transmission voltage at the switchyard to which the Generation Resource is connected should be at or above the ERCOT currently scheduled voltage prior to starting the test.</u> At ERCOT's sole discretion, the requirement to test leading capability may be waived for peaking Generation Resources which seldom, if ever, run during light Load conditions.</p> <p>(6) The Resource Entity shall measure the tested reactive capability at the Generation Resource terminals. The reading recorded shall represent the net MVAR output of the generator and shall have the Generation Resource's <u>auxiliary reactive consumption deducted from the Generation Resource's gross reactive output</u> at the machine's terminals. Additionally, the tested reactive capability shall be measured at the high side of the GSU transformer if metering is available. If metering is not available at the high side, the Resource Entity shall calculate the reactive capability at the high side. Both high side and generator terminal values are required for proper submittal of the test results.</p> <p>(7) The QSE representing a Generation Resource shall be <u>responsible for scheduling reactive tests</u> in accordance with the conditions outlined above, and for the timely and accurate reporting of test results to ERCOT. All test documents (the CURL and the CURL with the test point indicated) shall be submitted by the Resource Entity's QSE. The Resource Entity must properly complete all required data fields on the MIS Certified Area for a test to be considered complete.</p>	<p style="text-align: center;"><u>'NERC Tests</u></p> <p>@ min. MW output, measure max. Gross LEAD MVAR (momentarily)</p> <p>@ min. MW output, measure max. Gross LAG MVAR (momentarily)</p> <p style="text-align: center;"><u>Defined Leading GEN MW:</u> min. MW output "at which they are normally expected to operate"</p> <p style="text-align: center;"><u>Leading Test Voltage:</u> at scheduled voltage (Voltage Profile) or <u>within tolerance band</u></p> <p>nuclear units not required to test @ min. MW output</p> <p><u>all</u> aux. equipment for normal operation in-service</p> <p style="text-align: center;"><u>AVR</u> in-service</p>	<p><-- <u>ERCOT Test #1 (Net MVAR @ POI)</u> Pass if <= -.328 x Defined GEN MW (for 15 minutes) [Protocol 3.15 (3)]</p> <p><-- <u>ERCOT Test #2 (Gross MVAR - Aux Load MVAR)</u> Pass if <= -90% latest CURL [Op. Guide 3.3.2.3(8)]</p> <p style="text-align: center;"><u>Defined Leading GEN MW:</u> Conv= "typical output during light Load conditions" IRR= <60% Fall HSL [Protocol 8.1.1.2.1.4 (4)]</p> <p style="text-align: center;"><u>Leading Test Voltage:</u> at or <u>above</u> scheduled voltage (Voltage Profile)</p>
<p>(8) The <u>minimum duration</u> for any reactive verification test, leading or lagging, is <u>15 minutes</u>. The CURL should be posted in the Resource Entities control room, where the tests are conducted, at the QSE's Real-Time/generation dispatch desk, and copies should be provided to ERCOT Operations. During any test, the Generation Resource must <u>maintain its generator cooling system at normal operating level</u>. Tests will be conducted to produce MVARs at a level <u>not less than 90% of the amount indicated by the existing reactive capability curve (original manufacturer's unit reactive capability curve, or the most recent CURL)</u>.</p> <p>(9) The QSE representing a Generation Resource shall be <u>responsible for the timely and accurate reporting of test results to ERCOT</u>. The QSE representing a Generation Resource shall be responsible for the timely submittal to ERCOT of an <u>updated CURL</u> reflecting any known changes in the reactive output of the Generation Resource. A QSE must <u>properly complete all required data fields</u> on the MIS Certified Area for a test to be considered valid.</p>	<p style="text-align: center;"><u>minimum duration 1 hour</u></p> <p>generator cooling system @ normal operating <u>hydrogen pressure</u></p> <p style="text-align: center;"><u>Data Recorded:</u></p> <p>NERC records <u>Gross only</u> for real/reactive outputs</p> <p>voltage schedule (Voltage Profile) test voltages</p> <p>xfmr voltage ratios, tap settings</p>	<p style="text-align: center;"><u>minimum duration 15 minutes</u></p> <p>@ normal operating <u>level</u></p> <p style="text-align: center;"><u>Data Recorded:</u></p> <p>ERCOT records <u>both</u> Gross & Net at POI for <u>both</u> real & Reactive outputs</p> <p><u>Voltage Profile</u> not recorded, only test voltages</p> <p>X <u>relative humidity</u></p> <p>X <u>simplified one-line</u></p>