

**Amendment-IX dated 08.06.2026 on the RFP Documents for Selection of Bidder as Transmission Service Provider to establish Inter-State Transmission system for “Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-5: 6 GW) [Barmer Complex] Barmer-II: 6 GW (Solar) (LCC Configuration)” through tariff based competitive bidding process**

Sl. n.	Clause No.	Existing Clause	New/Revised Clause																																				
1.	ANNEXURE C  Specific Technical Requirements for Synchronous Condenser  <b>Clause no. 2.1.2 Steady state operation study</b>  RFP & TSA	<p>..... In addition to above following study shall also be carried out.</p> <p>1) Open circuit and short-circuit characteristics tests 2) Negative sequence impedance tests.</p> <p>Following test as indicated in “IEEE 115-Guides for Test Procedures for Synchronous Machines” shall also be carried out.</p> <table border="1"> <thead> <tr> <th>Test No.</th> <th>Test Name</th> <th>Purpose / Determination</th> <th>Key Reference (IEEE 115-2019)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Visual &amp; Mechanical Inspection</td> <td>Verify nameplate data, connections, physical condition, alignment, cooling system, bearing, and mechanical integrity.</td> <td>Clause 6.1</td> </tr> <tr> <td>2</td> <td>Insulation Resistance &amp; Polarization Index</td> <td>Measure stator and field insulation condition using a megger test (1 min and 10 min readings).</td> <td>Clause 6.2</td> </tr> <tr> <td>3</td> <td>Measurement of DC Resistance</td> <td>Determine stator winding resistance (per phase) and field winding resistance for copper loss calculation.</td> <td>Clause 6.3</td> </tr> <tr> <td>4</td> <td>No-Load Saturation Curve (Open-Circuit Characteristic, OCC)</td> <td>Plot generated voltage vs. field current at rated speed — defines excitation requirements and saturation.</td> <td>Clause 7.1</td> </tr> <tr> <td>5</td> <td>Short-Circuit Characteristic (SCC)</td> <td>Plot armature current vs. field current at rated speed with terminals shorted — used with OCC to compute synchronous reactance.</td> <td>Clause 7.2</td> </tr> <tr> <td>6</td> <td>Synchronous Impedance and Reactance Determination</td> <td>From OCC and SCC — obtain per-phase synchronous reactance <math>X_s = E_{oc}/I_{sc}</math>.</td> <td>Clause 7.3</td> </tr> <tr> <td>7</td> <td>Zero Power Factor (ZPF) or Potier Test</td> <td>For large machines — determine leakage reactance and field current for rated voltage at full-load condition.</td> <td>Clause 7.4</td> </tr> <tr> <td>8</td> <td>Load (Performance) Test</td> <td>Operate under various loads and power factors to measure efficiency, voltage regulation, and temperature rise.</td> <td>Clause 8.1</td> </tr> </tbody> </table>	Test No.	Test Name	Purpose / Determination	Key Reference (IEEE 115-2019)	1	Visual & Mechanical Inspection	Verify nameplate data, connections, physical condition, alignment, cooling system, bearing, and mechanical integrity.	Clause 6.1	2	Insulation Resistance & Polarization Index	Measure stator and field insulation condition using a megger test (1 min and 10 min readings).	Clause 6.2	3	Measurement of DC Resistance	Determine stator winding resistance (per phase) and field winding resistance for copper loss calculation.	Clause 6.3	4	No-Load Saturation Curve (Open-Circuit Characteristic, OCC)	Plot generated voltage vs. field current at rated speed — defines excitation requirements and saturation.	Clause 7.1	5	Short-Circuit Characteristic (SCC)	Plot armature current vs. field current at rated speed with terminals shorted — used with OCC to compute synchronous reactance.	Clause 7.2	6	Synchronous Impedance and Reactance Determination	From OCC and SCC — obtain per-phase synchronous reactance $X_s = E_{oc}/I_{sc}$ .	Clause 7.3	7	Zero Power Factor (ZPF) or Potier Test	For large machines — determine leakage reactance and field current for rated voltage at full-load condition.	Clause 7.4	8	Load (Performance) Test	Operate under various loads and power factors to measure efficiency, voltage regulation, and temperature rise.	Clause 8.1	<p>..... In addition to above, following test as per relevant International Standard shall also be carried out.</p> <p>(a) No-Load Saturation Curve (Open-Circuit Characteristic, OCC)-Plot generated voltage vs. field current at rated speed — defines excitation requirements and saturation.</p> <p>(b) Short-Circuit Characteristic (SCC)- Plot armature current vs. field current at rated speed with terminals shorted — used with OCC to compute synchronous reactance.</p> <p>(c) Excitation System Performance Test (Steady-State)- Measure field current, voltage, and reactive power under rated voltage conditions.</p> <p>(d) V-Curve (for Synchronous Condenser)-Plot stator current vs. field current at constant terminal voltage; determines stability margin and reactive power range.</p> <p>(e) Reactive Capability Curve Test (for Condenser)-Determine leading and lagging VAR capability vs. field current and stator current limits.</p> <p>TSP shall also submit Negative sequence impedance value.</p>
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Sl. n.	Clause No.	Existing Clause		New/Revised Clause
		9	Efficiency Test (Direct or Indirect) Compute efficiency using segregation of losses or input-output method.	Clause 8.2
		10	Temperature Rise Test Verify compliance with permissible temperature rise limits under rated load conditions (stator, rotor, bearings).	Clause 8.3
		11	Excitation System Performance Test (Steady-State) Measure field current, voltage, and reactive power under rated voltage conditions.	Clause 9.1
		12	Field Discharge and De-excitation Check Confirm safe decay of field energy upon trip or fault.	Clause 9.2
		13	Magnetic Balance / Unbalanced Loading Test Verify current and voltage symmetry among phases.	Clause 10.1
		14	Loss Segregation Tests Separate core loss, friction & windage, and stray-load losses for efficiency evaluation.	Clause 8.2.3
		15	Voltage Regulation Test (Calculated) From OCC and SCC, determine regulation under various power factors using synchronous impedance or Potier method.	Clause 7.3.2
		16	Armature Reaction Test Assess effect of armature current on main field under lagging/leading conditions.	Clause 7.5
		17	Open-Circuit and Short-Circuit Ratio Tests (SCR) Compute short-circuit ratio (SCR = field current for rated voltage / field current for rated short-circuit current).	Clause 7.6
		18	V-Curve (for Synchronous Condenser) Plot stator current vs. field current at constant terminal voltage; determines stability margin and reactive power range.	Clause 8.4
		19	Reactive Capability Curve Test (for Condenser/Generator Mode) Determine leading and lagging VAR capability vs. field current and stator current limits.	Clause 8.5

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2.	ANNEXURE C	<u>Table 2</u>			<u>Table 2</u>				
	Specific Technical Requirements for Synchronous Condenser  <b>Clause no. 5 Power System Requirements</b>  RFP & TSA	<b>Sl. n.</b>	<b>Power System Characteristic</b>	<b>Value</b>	<b>Unit</b>	<b>Sl. n.</b>	<b>Power System Characteristic</b>	<b>Value</b>	<b>Unit</b>
		9.	Maximum continuous ac system frequency	<b>52</b>	Hz	9.	Maximum continuous ac system frequency	<b>52.5</b>	Hz
		...	.....	.....	.....	...	.....	.....	.....
		14	1) Maximum three-phase fault current a) for performance requirements b) for rating of SynCon	1 a) 63 1 b) 63	kA kA for 1s	14	1) Maximum three-phase fault current a) for performance requirements b) for rating of SynCon	1 a) 63 1 b) 63	kA kA for 1s
			2) X/R (Positive/Negative Seq)	2) 31			2) X/R (Positive/Negative Seq)	2) 31	
			3) X/R (Zero Seq)	<b>3) 12</b>			3) X/R (Zero Seq)	<b>3) 10.6</b>	
			4) Clearing time - normal	4) 0.10	s		4) Clearing time - normal	4) 0.10	s
			5) Clearing time – backup	5) 0.75	s		5) Clearing time – backup	5) 0.75	s
		15	Maximum three-phase fault current (with IBR contribution)*	<b>51.1</b>	kA	15	Maximum three-phase fault current (with IBR Contribution <b>&amp; without Syncon</b> )*	<b>47.6</b>	kA
			Maximum three-phase fault current (without IBR contribution)*	<b>42.7</b>	kA		Maximum three-phase fault current (without IBR contribution <b>&amp; without Syncon</b> )*	<b>39.3</b>	kA
		16	Minimum three-phase fault current (without IBR contribution)* -for performance requirements -for safe operation	<b>38.7</b> <b>38.7</b>	kA kA	16	Minimum three-phase fault current (without IBR Contribution <b>&amp; without Syncon</b> )* <b>with depleted system</b> # -for performance requirements -for safe operation	<b>29.3</b> <b>29.3</b>	kA kA
		17	Maximum single-phase fault current (with IBR contribution)* Maximum single-phase fault current (without IBR contribution)*	<b>43.6</b> <b>35.6</b>	kA kA	17	Maximum single-phase fault current (with IBR Contribution <b>&amp; without Syncon</b> )* Maximum single-phase fault current (without IBR contribution <b>&amp; without Syncon</b> )*	<b>34.8</b> <b>26.4</b>	kA kA
		18	Minimum single-phase fault current (without IBR contribution)*	<b>32.8</b>	kA	18	Minimum single-phase fault current (without IBR contribution <b>&amp; without Syncon</b> )* <b>with depleted system</b> #	<b>19.8</b>	kA
		...	.....	.....	.....	...	.....	.....	.....
	36	Sound pressure level (SPL) when measured at approximately 1 m distance from the Synchronous condenser surface during normal operation at rated ratings & ambient conditions.	<b>≤95</b>	<b>dB</b>	36	Sound pressure level (SPL) when measured at approximately 1 m distance from the Synchronous condenser surface during normal operation at rated ratings & ambient conditions.	<b>≤ 90</b>	<b>dB (A)</b>	
	37	.....	.....	.....	37	.....	.....	.....	
		*values calculated as per studies				*values calculated as per studies			
						<b># Depleted system- one ckt of 400kV Barmer-II-Barmer-I (formed by LILO), Barmer-II-Fatehqarh-IV and Barmer-II-Barmer-I (direct line) out simultaneously.</b>			

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3.	ANNEXURE C  Specific Technical Requirements for Synchronous Condenser  <b>Clause no. 7 Short Circuit Contribution</b>  RFP & TSA	The Synchronous condenser unit for project /substation shall be able to supply a short circuit power (Short-circuit power must be calculated according to <b>IEEE 551-2006</b> , using saturated sub-transient reactance and transformer impedance).  ...	The Synchronous condenser unit for project /substation shall be able to supply a short circuit power (Short-circuit power must be calculated according to <b>IEC 60909-0:2016</b> , using saturated sub-transient reactance and transformer impedance).  ...
4.	ANNEXURE C  Specific Technical Requirements for Synchronous Condenser  <b>Clause no. 8.5 Damper Winding</b>  RFP & TSA	A low resistance damper winding made of full-length copper rods or copper rotor wedges shall be provided on all the poles to dampen rotor oscillations. They shall be short circuited at the ends by a completely connected ring on either side. The damper windings shall be strong enough to withstand all the electrical and mechanical stresses occurring during operation.  ...	A low resistance damper winding made of full-length copper rods or copper rotor wedges shall be provided on all the poles to dampen rotor oscillations. They shall be short circuited at the ends by a completely <b>electrically</b> connected ring on either side. The damper windings shall be strong enough to withstand all the electrical and mechanical stresses occurring during operation.  ...
5.	ANNEXURE C  Specific Technical Requirements for Synchronous Condenser  <b>Clause no. 8.8 Instrumentation</b>  RFP & TSA	All temperature sensors shall be Resistance Temperature Detectors (RTDs) of duplex type and be wired to a terminal box with shielded cables	All temperature sensors shall be Resistance Temperature Detectors (RTDs) of <b>preferably duplex type (alternatively suitable nos. of single element RTDs with spares in place of duplex RTDs are also acceptable)</b> and be wired to a terminal box with shielded cables.

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6.	ANNEXURE C Specific Technical Requirements for Synchronous Condenser  <b>Clause no. 8.8.2 Rotor winding</b> RFP & TSA	Rotor winding temperature shall be measured using the resistance method as per IEC 60034-1.  Sufficient number (at least 12) of Duplex RTDs shall be provided, distributed as per OEM design to monitor the temperature.	Rotor winding temperature shall be measured using either the resistance method <b>or through RTDs</b> as per IEC 60034-1.  <b><u>In case of RTDs</u></b> , Sufficient number (at least 12) <b><u>of preferably duplex type RTDs (alternatively suitable nos. of single element RTDs with spares in place of duplex RTDs are also acceptable)</u></b> shall be provided, distributed as per OEM design to monitor the temperature.																																																							
7.	ANNEXURE C Specific Technical Requirements for Synchronous Condenser  <b>Clause no. 8.10 Bearings</b> RFP & TSA	.....  The <b><u>contractor</u></b> shall ensure complete protection, control, and measurement for the bearing’s safety and diagnosis, consisting of RTDs, at least one triple element per bearing, to monitor bearing metal temperature.	.....  The <b><u>TSP</u></b> shall ensure complete protection, control, and measurement for the bearing’s safety and diagnosis, consisting of RTDs, at least one triple element ( <b><u>or two dual element</u></b> ) per bearing, to monitor bearing metal temperature.																																																							
8.	ANNEXURE C Specific Technical Requirements for Synchronous Condenser  <b>Clause no. 12.1 General Requirements</b> RFP & TSA	<b><u>Table-3</u></b>	<b><u>Table-4</u></b>																																																							
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Sl. n.	Clause No.	Existing Clause	New/Revised Clause
		<p>...</p> <p>The SynCon Station shall continue to absorb reactive power during HVRT Conditions in a controlled manner as per the following for symmetrical and asymmetrical cases:</p> <p>...</p> <p>The SynCon Station shall remain connected to the grid and shall be able to operate at rated reactive power capability at PCC when the applicable voltage at the interconnection point dips up to the level depicted by the thick lines in the following curve (for specified time):</p> <p>...</p>	<p>...</p> <p>The SynCon Station shall continue to absorb reactive power (rated reactive power up to 1.1 p.u., and inherent reactive power beyond 1.1 p.u.) during HVRT Conditions as per the following Table-3.</p> <p>...</p> <p>The SynCon Station shall continue to inject reactive power (rated reactive power down up to 0.9 p.u., and inherent reactive power below 0.9 p.u.) during LVRT Conditions as per the following Curve (Figure-3) for the specified time.</p> <p>...</p>
12.	<p>ANNEXURE C</p> <p>Specific Technical Requirements for Synchronous Condenser</p> <p><b>Clause 8.14.2 Shaft Current online Monitoring of Synchronous condenser</b></p> <p>RFP &amp; TSA</p>	<p>A low-voltage ring type current transformer in a parted form of construction shall be used for measurement of shaft current. The current transformers design shall be suitable for the intended installation location (i.e. ambient conditions). Thus, the shaft current relay shall detect a transient current in the synchronous condenser shaft.</p>	<p>A suitable shaft current online monitoring of Synchronous Condenser shall be provided to detect transient current in the synchronous condenser shaft.</p>

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13.	ANNEXURE C  Specific Technical Requirements for Synchronous Condenser  <b>Clause 2.1 System Studies and Compliance</b>  RFP & TSA	...  SynCon unit shall be designed to operate at rated MVAR capacity upto an ambient temperature of 40° C. Beyond ambient temperature of 40o C, TSP shall provide the derating curve, however, derating rate shall not be more than 1% of rated MVAR per degree Centigrade. There shall not be any impact on rated Short circuit current and Inertia due to increase in ambient temperature beyond 40o C. OEM/TSP shall submit temperature to MVAR derating curves (continuous & time limited). The SynCon shall be designed to support grid operation within a voltage range of ±10% and a frequency range of 47.5 Hz to <b>52 Hz</b> at the PCC.	...  SynCon unit shall be designed to operate at rated MVAR capacity upto an ambient temperature of 40o C. Beyond ambient temperature of 40o C, TSP shall provide the derating curve, however, derating rate shall not be more than 1% of rated MVAR per degree Centigrade. There shall not be any impact on rated Short circuit current and Inertia due to increase in ambient temperature beyond 40o C. OEM/TSP shall submit temperature to MVAR derating curves (continuous & time limited). The SynCon shall be designed to support grid operation within a voltage range of ±10% and a frequency range of 47.5 Hz to <b>52.5 Hz</b> at the PCC.
14.	ANNEXURE C  Specific Technical Requirements for Synchronous Condenser  <b>Clause 6.3 Continuous Ratings</b>  RFP & TSA	...  4) The Synchronous Condensers Units shall be capable of continuous uninterrupted operation for system frequencies in the ranges of 47.5 Hz to <b>52 Hz</b> .  ...	...  4) The Synchronous Condensers Units shall be capable of continuous uninterrupted operation for system frequencies in the ranges of 47.5 Hz to <b>52.5 Hz</b> .  ...