

**WHOLESALE ELECTRICITY SPOT MARKET
RULES CHANGE COMMITTEE**

RESOLUTION NO. 2016-03

**Proposed Amendments to the WESM Manual on System Security and
Reliability Guidelines**

WHEREAS, on 21 July 2015, the Rules Change Committee (RCC) received the NGCP-System Operator's (NGCP-SO) Proposed Amendments to the WESM Manual on System Security and Reliability Guidelines;

WHEREAS, said proposal sought to align the pertinent provisions of the WESM Manual on System Security and Reliability Guidelines with the changes in practices in the power industry due to growing technical requirements and stricter implementation of applicable/amended rules of the Grid Code;

WHEREAS, the proposal was presented before the RCC during its 103rd and 104th Regular Meetings held on 05 August and 02 September 2015, respectively, and was thereafter approved for posting to solicit comments of participants and interested parties, subject to the proponent's re-submission of the proposal in proper format and based from the correct version of the WESM Manual on System Security and Reliability Guidelines;

WHEREAS, the proposal was published on 28 October 2015 in the Market Information Website, with the corresponding notice to participants;

WHEREAS, the RCC deliberated on the proposal during its 109th Regular Meeting on 03 February 2016, taking into consideration the comments received from PEMC, the Technical Committee, MERALCO and North Luzon Renewables Corporation;

WHEREAS, the discussions centered on the specific conditions that must be present in order for the grid to be declared as being in a particular state (i.e., Normal State, Alert State, Emergency State) and the mitigating measures either performed by the System Operator or coordinated by the same with concerned WESM Participants to address threats to the security and reliability of the grid;

WHEREAS, during its 111th Special Meeting on 03 March 2016, the RCC finalized the revisions to the proposal, particularly adding a new section in the subject WESM Manual providing the specific responsibilities of the System Operator to restore the grid's normal operating state in the existence of a threat;

WHEREAS, the RCC subsequently approved the NGCP-SO's Proposed Amendments to the WESM Manual on System Security and Reliability Guidelines, as discussed;

NOW THEREFORE, we, the undersigned and in behalf of the sector we represent, hereby resolve as follows:

RESOLVED, that the Proposed Amendments to the WESM Manual on System Security and Reliability Guidelines, as revised, is hereby approved by the RCC;

RESOLVED FURTHER, that the attached Proposed Amendments to the WESM Manual on System Security and Reliability Guidelines (Annex A) is hereby endorsed to the PEM Board for approval and endorsement to the DOE

Done this 03 March 2016, Pasig City.


Approved by:
RULES CHANGE COMMITTEE



Maila Lourdes G. de Castro
Chairperson
Independent


Members:

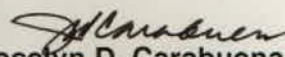

Concepcion I. Tanglao
Independent



Francisco L.R. Castro, Jr.
Independent

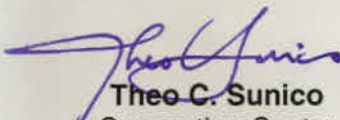

Allan C. Nerves
Independent



Isidro E. Cacho, Jr.
Market Operator
Philippine Electricity Market Corporation
(PEMC)



Ambrocio R. Rosales
Transmission Sector
National Grid Corporation of the Philippines
(NGCP)



Joselyn D. Carabuena
Generation Sector
Power Sector Assets and Liabilities Management
Corporation (PSALM)


Jose Ferlino P. Raymundo
Generation Sector
SMC Global



Theo C. Sunico
Generation Sector
Vivant Corporation

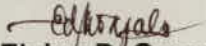

Ciprinilo C. Meneses
Distribution Sector (PDU)
Manila Electric Company
(MERALCO)


Jose P. Santos
Distribution Sector (EC)
Ilocos Norte Electric Cooperative, Inc.
(INEC)


Gilbert A. Pagobo
Distribution Sector
Mactan Electric Company
(MECO)


Ludovico D. Lim
Distribution Sector
Antique Electric Cooperative, Inc.
(ANTECO)


Lorreto H. Rivera
Supply Sector
TeaM (Philippines) Energy Corporation
(TPEC)

Certified True and Correct:

Elaine D. Gonzales
RCC Secretary
PEMC

Proposed Amendments to WESM Manual on System Security and Reliability Guidelines

Section	Original Provision	Proposed Amendment	Rationale
2.	<p>Definition of Terms</p> <p>Special Protections System (SPS) is an automatic protection scheme (requiring no operator intervention) installed on the grid that is generally applied to keep the power system intact in the event of an N-2 contingency.</p>	<p>Definition of Terms</p> <p>Special Protections System (SPS) is an automatic protection scheme (requiring no operator intervention) installed on the grid that is generally applied to keep the power system intact in the event of an N-2 contingency</p> <p><u>System Integrity Protection Scheme (SIPS) is a protection system that is designed to detect abnormal or predetermined system conditions, and take automatic corrective actions.</u></p>	
5.1	<p>Normal State Operation</p> <p>The grid shall be operated so that it remains in the normal state, i.e.:</p> <p>a. The operating margin is sufficient.</p> <p>b. System frequency is within the limits of 59.7 and 60.3 Hz.</p> <p>c. Voltages at all connection points are within the limits of 0.95 and 1.05 of the nominal value.</p>	<p>5.1 Normal State Operation</p> <p>The grid shall be operated so that it remains in the normal state, i.e.:</p> <p>a. The operating margin is sufficient.</p> <p>b. <u>The System-grid</u> frequency is within the limits of 59.7Hz and 60.3Hz.</p> <p>c. Voltages at all connection points are within the limits of 0.95 and 1.05 of the nominal value.</p>	<p>Retain the original provision of the WESM guidelines from items a to f but to include an additional in item g regarding the single - outage contingency criterion</p>

Section	Original Provision	Proposed Amendment	Rationale
	<p>d. The loading levels of all transmission lines and transformers are below 90% of their continuous ratings.</p> <p>e. The grid configuration is such that any potential fault current can be interrupted and the faulted equipment can be isolated from the grid.</p> <p>f. The static and dynamic stability of the power system is maintained.</p>	<p>d. The loading levels of all transmission lines and transformers are below 90% of their <u>maximum</u> continuous ratings.</p> <p>e. The grid configuration is such that any potential fault current can be interrupted and the faulted equipment can be isolated from the grid.</p> <p>f. The static and dynamic stability of the power system is maintained.</p> <p><u>g. The Single Outage Contingency (N-1) Criterion is met.</u></p>	
	New Provision: Alert State	<p><u>5.2 Alert State</u></p> <p><u>The Grid shall be considered to be in the Alert State when any one of the following conditions exists:</u></p> <p><u>a. The voltages at the Connection Points are outside the limits of -5% and +5% but within the limits of -10% and +10% of the nominal value;</u></p> <p><u>b. There is Critical Loading or Imminent Overloading of transmission lines or substation Equipment;</u></p> <p><u>c. A weather disturbance has entered the Philippine area of responsibility, which may affect Grid operations;</u></p>	<p>To include a new provision on Alert State.</p> <p>To clearly emphasize existence of an alert state if any of the conditions as enumerated are not met.</p>

Section	Original Provision	Proposed Amendment	Rationale
		<p><u>d. Peace and order problems exist, which may pose a threat to Grid operations.</u></p> <p><u>e. The operating margin is not sufficient to replenish the sudden loss of the largest generating unit capacity synchronized to the grid;</u></p> <p><u>f. The grid frequency is beyond the limits of 59.7 Hz and 60.3 Hz but within the thresholds of 59.4Hz and 60.6Hz.</u></p>	
	New Provision: Emergency State	<p><u>5.3 Emergency State</u></p> <p><u>The grid shall be considered in the Emergency State when:</u></p> <p>a. <u>Single Outage Contingency (N-1) Criterion is not met. Imminent threat in system security would exist should a credible n-1 contingency occur that would result in the cascading outages of lines and equipment if not corrected immediately.</u></p> <p>b. <u>There is generation deficiency or Operating Margin is zero;</u></p> <p>c. <u>Grid transmission voltage is outside the limits of -10% or +10% of the nominal value;</u></p> <p>d. <u>The loading levels of all transmission lines and substation Equipment are beyond the threshold as set by the PGC.</u></p>	To include provision on emergency state and the conditions for the same.

Section	Original Provision	Proposed Amendment	Rationale
		e. <u>The grid frequency is beyond the limits of 59.4Hz and 60.6Hz</u>	
5.2	<p>Single Outage (N-1) Contingency Criterion</p> <p>a. The security and reliability of the grid shall be based on the single outage contingency (N-1) criterion. This criterion specifies that the grid shall continue to operate in the normal state following the loss of one generating unit, transmission line or transformer.</p> <p>b. The power system shall be operated at all times in such a manner that system instability, islanding, cascading outages, or voltage collapse will not occur as a result of the most severe single contingency. A single contingency may generally be assumed to mean the loss of a single system element; however, the outage of multiple system elements should be treated as a single contingency if caused by a single event of sufficiently high likelihood</p> <p>c. Multiple contingency outages of a credible nature shall be examined, and the system shall be operated to protect against system instability, islanding or cascading outages for these contingencies.</p>	<p>5.24 Single Outage (N-1) Contingency Criterion</p> <p>a. XXX</p> <p><u>b. Credible Single Outage Contingency (N-1) Contingencies:</u></p> <p><u>The N-1 Criterion is related to one of the following contingencies:</u></p> <ul style="list-style-type: none"> • <u>Loss of a single-circuit transmission line, except those radial circuits which connect loads using a single line or cable;</u> • <u>Loss of one circuit of a double-circuit transmission line;</u> • <u>Loss of submarine cable;</u> • <u>Loss of a single transformer, except those which connect loads using a single radial transformer;</u> • <u>Loss of a Generating Unit, whether grid-connected or embedded; and</u> • <u>Loss of compensating devices, i.e., Capacitor/Reactor/SVC</u> <p><u>c. In the event of a credible N-1 Contingency, the system or any part thereof shall be operated up to its operational thermal limit capacity, beyond which the System Operator shall intercept to restore system stability.</u></p>	<p>Re-numbering</p> <p>Item b is in reference to G.O. 6.2.1 and ERC Resolution 21</p>

Section	Original Provision	Proposed Amendment	Rationale
	d. A planned activity notice or request for shutdown shall be issued by a grid user to the System Operator for any planned activity such as a planned shutdown or scheduled maintenance of its equipment at least seven (7) days prior to the actual shutdown or maintenance. This is to allow the System Operator sufficient time to evaluate if the planned outage can be accommodated by the power system and to coordinate the outage with other affected users. The System Operator shall notify the user of its approval or disapproval of the user's request at least five (5) days before the actual work commences.	<u>For the avoidance of doubt, manual corrective interventions shall not be imposed to delimit the power transfer capabilities of equipment/transmission lines in anticipation of a secondary outage (N-1-1). However, if a significant threat to system security exists following the occurrence of a credible N-1 Contingency the System Operator may intervene and shall make the necessary manual corrective actions as required, to protect the integrity of the grid.</u> b.d. xxx e.e. xxx d.f. xxx	Re-numbered due to insertion of items b and c
5.3	5.3 Voltage and Reactive Power Control xxx	5.3-6 Voltage and Reactive Power Control xxx	Renumbering from item 5.3 to 5.6 due to insertion of new provision for item 5.5 Grid Operation Notices
5.4	5.4 Frequency Control a. The system frequency shall be controlled by the frequency regulating and load following reserve during normal conditions, and by the timely use of spinning reserve, backup reserve, automatic load dropping (ALD) and/or manual load dropping (MLD) during emergency conditions. b. The load following and frequency regulating reserve shall include the	5.4-7 Frequency Control a. The system-grid frequency shall be controlled by the frequency regulating and load following reserve during normal conditions, and by the timely use of spinning Frequency Regulating Reserve, backup Contingency Reserve, and Demand Control such as automatic load dropping (ALD) and/or manual load dropping (MLD) during emergency conditions.	Renumbering to 5.7; PGC 6.6.1.1 cited as reference. To only describe how the RR and CR reserves can be operated either on primary or secondary response.

Section	Original Provision	Proposed Amendment	Rationale
	<p>primary response and secondary response of generating units.</p> <p>c. XXX</p> <p>d. XXX</p> <p>e. XXX</p> <p>f. XXX</p> <p>g. A generating unit providing spinning reserve as an ancillary service shall be synchronized with the grid and be available to automatically respond to any sudden loss or significant reduction in generating capacity.</p> <p>h. A generating unit providing backup reserve shall have fast start capability and its capacity shall be sustainable for a minimum period of eight (8) hours.</p> <p>i. xxx</p>	<p>b. The load following and frequency regulating reserve shall include the primary response and secondary response of generating units. <u>A generating unit providing Regulating and/or Contingency Reserves may be operated either in an automatic Frequency-sensitive mode (also known as free-governor mode) with primary response or in an Automatic Generation Control (AGC) mode with secondary response.</u></p> <p>c. XXX</p> <p>d. XXX</p> <p>e. XXX</p> <p>f. XXX</p> <p>g. A generating unit providing spinning Contingency reserve as an ancillary service shall be synchronized with the grid and be available at the start of every trading interval to be able to automatically respond to any sudden loss or significant reduction in generating capacity.</p> <p>h. A generating unit providing backup reserve shall have fast start capability and its capacity shall be sustainable for a minimum period of eight (8) hours.</p>	<p>For deletion since the term "load following" is no longer of use in the application of reserves.</p> <p>Retain items c to f of the original provision.</p> <p>For clarity on the actual application for this type of reserve.</p> <p>For deletion since the term "backup" reserve is no longer of use for this type of reserve application.</p>

Section	Original Provision	Proposed Amendment	Rationale
		i. <u>h. XXX</u>	Item i to be retained and re-numbered as item h.
	New Provision: Grid Operation Notices	<u>5.5 Grid Operation Notices</u> <u>The following notices shall be issued , without delay, by the System Operator to notify all Grid Users of an existing alert state:</u>	
		<u>(a) Yellow Alert when the Contingency Reserve is less than the capacity of the largest Synchronized Generating Unit or power import from a single interconnection, whichever is higher;</u>	<p>From PGC Amendment No. 1, section 6.6.1.3 – Contingency Reserve shall include Spinning Reserve (SR) and Backup Reserve (BUR);</p> <p>From PGC definition: Operating Margin = the Available Generating Capacity in excess of the sum of the System Demand plus losses; Example:</p> <p>Avail Cap = 9000MW Demand = 8000MW Losses = 0MW; Operating Margin = 9000MW-8000MW = 1000MW which is also equal to RR (4% of demand) + SR+BUR; Where CR=SR+BUR, Then OM = RR+CR Hence, if CR is less than highest unit → Yellow Alert and if CR=0 → Red Alert.</p> <p>Note: RR is not included in the calculation of Alert Notices.</p>
		<u>(b) Red Alert when the Contingency Reserve is zero or generation deficiency exists or if</u>	

Section	Original Provision	Proposed Amendment	Rationale
		<p><u>there is Critical Loading or Imminent Overloading of transmission lines or Equipment;</u></p> <p><u>For clarity, when the Operating Margin net of the Regulating Reserve capacity is less than the capacity of the largest Synchronized Generating Unit or power import from a single interconnection, whichever is higher, the System Operator shall issue Yellow Alert Notice.</u></p> <p><u>Likewise, if the Operating Margin less the Regulating Reserve capacity becomes zero, the System Operator shall issue Red Alert Notice.</u></p> <p>(c) <u>Weather Disturbance Alert when a weather disturbance has entered the Philippine area of responsibility;</u></p> <p>(d) <u>Blue Alert when a tropical disturbance is expected to make a landfall within 24 hours; and</u></p> <p>(e) <u>Security Red Alert when peace and order problem exist, which may affect the Grid operations.</u></p>	
5.5	<p>5.5 System Reserve Requirements</p> <p>a. Sufficient generating capacity shall be available at all times to maintain</p>	<p>5.58 System Reserve Requirements</p> <p>a. Sufficient System Reserves generating capacity shall be available at all times to maintain</p>	<p>Renumbering to 5.8</p> <p>To clearly explain the meaning of sufficient operating margin.</p>

Section	Original Provision	Proposed Amendment	Rationale
	<p>acceptable system frequency, including capacity necessary to supply requirements for load variations and errors in load forecasting and to replace generating capacity lost due to forced outages of generation and transmission equipment. Adequate frequency regulating reserve and contingency reserve shall be available to stabilize the system and facilitate the restoration to the normal state following a multiple outage contingency.</p> <p>b. The operating margin of the grid shall include the generating capacity for the load following and frequency regulating (LFFR) reserve, which is required to respond to changes in demand during normal conditions and the contingency reserve needed to respond to a sudden reduction in generation during emergency conditions.</p> <p>c. The required system reserves shall be at least equal to:</p> <ul style="list-style-type: none"> • Spinning Reserve, % =(Capacity of Largest Generating Unit On Line ÷ System Peak Demand) x 100 	<p>acceptable system frequency, including capacity necessary to supply requirements <u>to cope with any</u> load variations and errors in load forecasting and to replace generating capacity lost due to forced outages of generation and transmission equipment. Adequate frequency regulating reserve and contingency reserve shall be available to stabilize the system and facilitate the restoration to the normal state following a multiple outage contingency.</p> <p>b. The eOperating mMargin of the grid shall include the generating capacity for the load following and frequency regulating (LFFR) reserve, which is required to respond to changes in demand during normal conditions and the contingency reserve needed to respond to a sudden reduction in generation during emergency conditions <u>is sufficient if the available generating capacity in excess of the sum of the system demand plus losses is greater than the capacity of the highest synchronized generating unit within a specific period of time to cover loss of a generating unit or the power import from a single circuit interconnection whichever is higher.</u></p> <p>c. The required system reserves for <u>Regulating and Contingency</u> shall be in accordance with the latest ERC approved Ancillary Service Procurement Plan. <u>at</u> least equal to:</p>	<p>For clarity</p> <p>For clarity in reference to the latest ERC approved ASPP.</p>

Section	Original Provision	Proposed Amendment	Rationale
	<ul style="list-style-type: none"> • Load Following and Frequency Regulating Reserve (LFFR), % = Average Load Forecast Variance (4% in Luzon) • Backup Reserve, % = System Planning Reserve – Spinning Reserve where System Planning Reserve = Loss-of-Load Probability (LOLP) for one year 	<ul style="list-style-type: none"> • Spinning Reserve, % = (Capacity of Largest Generating Unit On Line ÷ System Peak Demand) x 100 • Load Following and Frequency Regulating Reserve (LFFR), % = Average Load Forecast Variance (4% in Luzon) • Backup Reserve, % = System Planning Reserve – Spinning Reserve where System Planning Reserve = Loss-of-Load Probability (LOLP) for one year 	For deletion - not applicable
	New Provision: Demand Control	<p><u>5.9 Demand Control</u></p> <p><u>a. If Demand Control due to generation deficiency needs to be implemented, the System Operator shall issue a Red Alert Warning by 1600H, a day ahead. The Red Alert Warning shall specify the amount, the period during which the Demand reduction will be required and the reason of the generation deficiency.</u></p> <p><u>b. The System Operator shall issue Demand Control Imminent Warning when a demand reduction is expected within the next 30 minutes. The Demand Control Imminent Warning shall be effective for one (1) hour and shall be automatically cancelled if it is not re-issued by the System Operator.</u></p> <p><u>c. During Demand Control, the implementation of Real Time Dispatch shall cease and the System Operator, in coordination with the</u></p>	<p>In reference to PGC 6.6.6.1</p> <p>PGC 6.6.6.2</p> <p>This is the current practice of the System Operator in coordination with the Market Operator.</p>

Section	Original Provision	Proposed Amendment	Rationale
		<p><u>Market Operator, shall declare <i>market intervention</i>.</u></p> <p>d. <u>The User shall provide the System Operator with the amount of Demand reduction actually achieved after the implementation of Demand Control.</u></p> <p>e. <u>The User shall abide by the instruction of the System Operator with regard to the restoration of Demand. The restoration of Demand shall be achieved as soon as possible and the process of restoration shall begin within two (2) minutes after the instruction is given by the System Operator.</u></p> <p>f. <u>The Demand Control shall include the following:</u></p> <ul style="list-style-type: none"> • <u>Automatic Load Dropping</u> • <u>Manual Load Dropping</u> • <u>Demand Reduction on instruction by the System Operator</u> • <u>Voluntary Demand Management</u> 	
5.6	Automatic Load Dropping (ALD) and Manual Load Dropping (MLD) xxx	5.6 10 Automatic Load Dropping (ALD) and Manual Load Dropping (MLD) xxx	Renumbering to 5.10
5.7	System Restoration xxx	5.7 11 System Restoration xxx	Renumbering to 5.11

Section	Original Provision	Proposed Amendment	Rationale
5.8	Grid Protection Requirements	5.8-12 Grid Protection Requirements	Defines what a System Integrity Protection Scheme is, and revises the item (i) accordingly .
	a. xxx	. xxx	
	b. xxx	b. xxx	
	c. xxx	c. xxx	
	d. xxx	d. xxx	
	e. xxx	e. xxx	
	f. xxx	f. xxx	
	g. xxx	g. xxx	
	h. xxx	h. xxx	
	i. System Protection Systems (SPSs) shall be applied at specific points in the grid to trip generators and/or to disconnect loads in order to mitigate the risks of double line outages and other contingencies that may cause system instability and eventual collapse. Each SPS shall be designed with inherent security to minimize the probability of an improper operation, even with the failure of a primary component. Each SPS shall be reviewed frequently to determine if it is still required and will still perform the intended functions.	i. System Protection Systems (SPSs) shall be applied at specific points in the grid to trip generators and/or to disconnect loads in order to mitigate the risks of double line outages and other contingencies that may cause system instability and eventual collapse. Each SPS shall be designed with inherent security to minimize the probability of an improper operation, even with the failure of a primary component. Each SPS shall be reviewed frequently to determine if it is still required and will still perform the intended functions.	
	j. xxx	<u>Following a Credible N-1 Contingency where the Rules for a minimum grid performance are compromised, a temporary security measure</u>	

Section	Original Provision	Proposed Amendment	Rationale
		<p><u>such as a System Integrity Protection Scheme (SIPS) shall be employed to avoid the subsistence and spreading of the disturbance.</u></p> <p><u>The temporary employment of SIPS shall be coordinate with concerned users and shall only be applied specific to parts of the system determined to be exposed to a high degree of likelihood for a secondary contingency (N-1-1) or a subsequent multiple contingency (N-x) such that the risk is of cascaded blackout is avoided.</u></p> <p><u>Information on all available SIPS shall be provided to the Grid Management Committee and at the same time, it shall be coordinated with the concerned users.</u></p>	
5.9	Telecommunication Requirements xxx	5.9.12 Telecommunication Requirements xxx	Renumbering to 5.12
	NEW	<p><u>Section 6. RESPONSIBILITIES</u></p> <p><u>The System Operator shall:</u></p> <p><u>a. Make the necessary manual interventions upon existence of an imminent threat in system security or a credible N-1 Contingency to restore</u></p>	Included a section on the SO's responsibilities

Section	Original Provision	Proposed Amendment	Rationale
		<p><u>back, without delay, the grid operating condition to Normal state.</u></p> <p>b. <u>Initiate, upon the existence of a credible N-1 contingency, any or a combination of manual corrective interventions as follows:</u></p> <ol style="list-style-type: none"> 1) <u>Switch off, or re-route, energy delivery from a Generation Company;</u> 2) <u>Call equipment into service;</u> 3) <u>Take transmission line or equipment out of service;</u> 4) <u>Commence operation of generating units or maintain, increase or reduce active or reactive power output of the same;</u> 5) <u>Increase, reduce output of generating units or shut down or otherwise vary operation of the same; and shed or restore load;</u> <p>c. <u>Notify the user of its approval or disapproval of the Planned Activity Notice (PAN) request at least five (5) days before the actual work commences.</u></p> <p>d. <u>Constrain-on/constrain-off or make use of MRUs whenever all available ancillary reserves are depleted or exhausted.</u></p>	

Section	Original Provision	Proposed Amendment	Rationale
		<ul style="list-style-type: none"> e. <u>Implement Demand Control as a last resort in order to ensure the stability and security of the Grid.</u> f. <u>Propose a uniform required deadband applicable to all generators.</u> g. <u>Issue necessary alert notices upon existence of qualifying threat</u> 	