



WHOLESALE ELECTRICITY SPOT MARKET RULES CHANGE COMMITTEE

RESOLUTION NO. 2020-04

Proposed Amendment to the WESM Manual on Metering Standards and Procedures

WHEREAS, the WESM Manual on Metering Standards and Procedures (WESM Metering Manual) provides the pertinent metering procedures and standards for WESM Participants and WESM Metering Services Providers (WMSP);

WHEREAS, on 29 November 2019, the Manila Electric Company (MERALCO) submitted the proposed amendments to the WESM Metering Manual, for both the current one (1) hour trading interval and enhanced five (5) minute dispatch interval markets, regarding Current Transformer Requirements;

WHEREAS, the proposal aims to align and clarify the rated burden requirement of Current Transformers based on the Philippine Grid Code (PGC) 2016 Rules and the latest revision of IEC 61869-2 which supersedes IEC 60044-1 and to update the term "ANSI C57.13" to "IEEE C57.13";

WHEREAS, during its 159th Meeting on 06 December 2019, the RCC approved the publication of the proposal in the PEMC website to solicit comments from industry stakeholders and interested parties;

WHEREAS, following the 30-working day commenting period from publication date on 12 December 2019, comments were received from Philippine Electricity Market Corporation (PEMC), Technical Committee (TC), Cebu III Electric Cooperative, Inc. (CEBECO III), Tarlac Electric, Inc. (TEI), Cebu Energy Development Corp (CEDC), and National Grid Corporation of the Philippines (NGCP):

WHEREAS, during the 161st RCC Meeting last 21 January 2020, the RCC reviewed the proposal and gave due course to the comments received and corresponding proponent's responses, which are summarized as follows:

- a) CEBECO III, TEI, TC and CEDC agreed with the proposal in aligning the rated burden requirement of current transformers with the revised

international standards. They deemed that the proposal maintains the CT accuracy within specified limits;

- b) NGCP, on the other hand, opined that with the proposal, Grid Users may use higher burden rated CTs in which the permissible ratio error (accuracy class) may not hold at the lower range of the burden rating. NGCP deemed that the proposed amendment would contradict the objective of Chapter 9 of the PGC which is to ensure accuracy of the measurements/recording of the energy delivered and absorbed by the Grid with the objective of the proposal and suggested to follow what is required in the PGC; and
- c) One of the Generator Representatives, Mr. Carlito Claudio, pointed out that the PGC sets the minimum requirement for the technical standards and specifications;

WHEREAS, the RCC agreed to align the rated burden requirement of current transformers with the revised international standards, thereby adopting MERALCO's proposal, as amended, and to update the WESM Metering Manual to reflect the appropriate references to the PGC;

WHEREAS, upon final review of the proposed amendments to the WESM Metering Manual, it was determined that there were missing provisions under RCC Resolution No. 2019-10 dated 19 July 2019 approving NGCP's proposed amendments to the WESM Metering Manual for the enhanced market design, which likewise aimed to align the said manual with the procedures and standards under the PGC, issuances from the DOE and Energy Regulatory Commission (ERC) and other international and national standards;

WHEREAS, during the 162nd RCC Meeting on 13 March 2020, the RCC noted that the said missing provisions were part of the proposed amendments of NGCP submitted on 03 April 2019, and agreed to adopt said proposed amendments to ensure consistent provisions of the WESM Metering Manual;

WHEREAS, in consideration of the aforementioned proposed amendments of MERALCO and NGCP and for consistency with the PGC, the RCC also adopted that the burden of current and voltage transformers shall be compliant to the IEC 61869-3 or ANSI C57.13 Standard (or the latest version/s) under the following sections of the WESM Metering Manual:

- a) Section 2.5.7 and Section 2.5.8 for the current one (1) hour trading interval; and
- b) Appendix N (Specifications for Current Transformers) and Appendix O (Specifications for Voltage Transformers) for the enhanced five (5) minute dispatch interval;



WHEREAS, to address the NGCP's opposition to MERALCO's proposal, the RCC agreed that clarification should be sought from the ERC regarding the interpretation of GRM 9.2.3.2 of the PGC, specifically on the following requirements:

*xxx (b) The Accuracy Class for Load metering service shall be in accordance to the **Appendix 2** or better. For Generation Company metering service, the Accuracy Class of the Current Transformers shall be such that the ratio and phase accuracies are certified by factory test reports over the entire operating current range when the Generation Company is both generating and consuming electricity;*

*(c) The total burden of the metering circuit, consisting of the burdens coming from all the connected devices and the secondary cable shall not exceed fifty percent (50%) of the specified burden of the Current Transformer in **Appendix 2**; xxx*

WHEREAS, in view of the foregoing, the RCC approved the proposals, as amended, and its endorsement to the PEM Board;

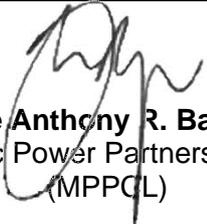
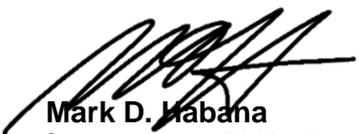
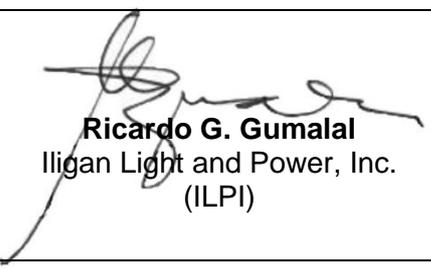
NOW THEREFORE, we, the undersigned, in behalf of the sectors we represent, hereby resolve as follows:

RESOLVED, that the RCC approves the Proposed Amendments on the WESM Manual on Metering Standards and Procedures (WESM Metering Manual), for both the current one (1) hour trading interval and enhanced five (5) minute dispatch interval markets;

RESOLVED FURTHER, that the said Proposed Amendments on the WESM Manual on Metering Standards and Procedures (attached as Annex A and B) are hereby endorsed to the PEM Board for approval and subsequent transmittal to the DOE for promulgation;

Done this 13 March 2020, Pasig City.



| Approved by: THE RULES CHANGE COMMITTEE | |
|---|---|
| Independent Members: | |
|  Maila Lourdes G. de Castro Chairperson |  Francisco L.R. Castro, Jr. |
|  Allan C. Nerves |  Concepcion I. Tanglao |
| Generation Sector Members: | |
|  Dixie Anthony R. Banzon Masinloc Power Partners Co. Ltd. (MPPCL) |  Cherryl A. Javier Aboitiz Power Corp. (APC) |
|  Carlito C. Claudio Millennium Energy, Inc./ Pansia Energy, Inc. (MEI/PEI) |  Mark D. Habana Vivant Corporation - Philippines (Vivant) |
| Distribution Sector Members: | |
|  Virgilio C. Fortich, Jr. Cebu III Electric Cooperative, Inc. (CEBECO III) |  Ryan S. Morales Manila Electric Company (MERALCO) |
|  Ricardo G. Gumalal Iligan Light and Power, Inc. (ILPI) |  Nelson M. Dela Cruz Nueva Ecija II Area 1 Electric Cooperative, Inc. (NEECO II – Area 1) |



Supply Sector Member:



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

Market Operator Member:

Isidro E. Cacho, Jr.
Independent Electricity Market Operator of the Philippines
(IEMOP)

System Operator Member:



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

Annex A

Proposed Amendment on the WESM Manual on Metering Standards and Procedures regarding Current Transformer Requirements

| WESM Manual on Metering Standards and Procedures Issue 11.0 | | | | |
|---|--------|--|---|--|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| Current Transformer Burden | 2.5.7 | Shall not exceed the rated burden limit of 12.5 VA for the IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 (see Table 1) | <u>Shall be based on the standard rated burden as specified in the latest revision of IEC 61869-2 or ANSI/IEEE C57.13, or their latest equivalent standards.</u> | <p>To consider the latest revision of International Standard IEC 61869-2 (2012) which cancels and replaces the first edition of IEC 60044-1 published in 1996 and to update the term “ANSI” to “IEEE”.</p> <p>Installation of a higher accuracy and functionality than the standards set by the PGC and WESM and its conformance to IEC and IEEE standards are supported by Sections 2.1.1 and 2.5.4.1 of WESM Metering Standards and Procedures which is also consistent with PEMC-TC’s opinion issued last April 2019 to Mactan Electric Corp. in which “the TC is of the opinion that the specifications of MECO’s current transformer comply with the metering accuracy class of 0.3 as well as the rated burden of B-1 (25VA), which is higher and therefore better than the burden B-0.2 (5VA) specified in PGC Appendix 2.” Refer to the attached letter (Annex “A”).</p> <p>Refer also to the attached Factory Test Reports (FAT) and MERALCO acceptance tests that certifies that the CT maintains its accuracy within specified limits when tested at different primary current and burden. Factory Test Reports</p> |

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| WESM Manual on Metering Standards and Procedures Issue 11.0 | | | | |
|--|---------------|------------------------|---------------------------|---|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| | | | | (FAT) also certifies that it conforms to IEC 61869-1, IEC 61869-2 and IEEE C57.13 Standard requirements. The rules change should also be reflected in the WESM Metering Standards and Procedures Issue 12.0, Appendix "N". |
| Requirements for Grid Revenue Meters | 2.4.1. | [See attached Annex B] | [See attached Annex B] | Document Reference for consistency with the Philippine Grid Code 2016 Edition |
| Requirements for Distribution Revenue Meter | 2.4.2. | [See attached Annex B] | [See attached Annex B] | Document Reference for consistency with the Philippine Distribution Code 2016 Edition |
| Current Transformer | 2.5.7. | [See attached Annex B] | [See attached Annex B] | Document Reference for consistency with the Philippine Grid Code 2016 Edition |
| Voltage Transformer | 2.5.8. | [See attached Annex B] | [See attached Annex B] | Document Reference for consistency with the Philippine Grid Code 2016 Edition |

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| WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design) | | | | |
|--|--------|---|---|--|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| Instrument Transformers | 2.5 | <p>2.5.3.1. Selection of Current Transformer Ratios</p> <p>Current transformer ratios shall be selected according to the following factors:</p> <p>a. The maximum sustained primary current in a current transformer shall not exceed the primary tap multiplied by the primary factor of the current transformer; and</p> <p>b. The minimum sustained primary current during normal operation shall not be less than 10% of the primary tap.</p> | <p>2.5.3.1. Selection of Current Transformer Ratios</p> <p>Current transformer ratios shall be selected according to the following factors:</p> <p>a. The maximum sustained primary current in a current transformer shall not exceed the rated primary tap current multiplied by the primary current rating factor of the current transformer; and</p> <p>b. The minimum sustained primary current during normal operation shall not be less than 10% of the primary tap the lowest primary current that the current transformer can measure wherein the measurement accuracy is still guaranteed</p> | <ul style="list-style-type: none"> ▪ To be consistent with the terms used by ANSI and IEC standards ▪ To consider the improvements in measurement range of new designs of extended range current transformers which can already measure down to 1% of rated current at guaranteed accuracy ▪ In reference to RCC-RESO-19-10 (19 July 2019) |
| Instrument Transformers | 2.5 | <p>2.5.5.1. Burden Calculation – All Current Transformers</p> <p>The burden calculation for a current transformer shall include:</p> <p>a. the impedance of the secondary wiring;</p> <p>b. the impedance of all devices connected to the current transformer;</p> <p>c. the apparent impedance associated with the interconnection of current transformer secondaries;</p> | <p>2.5.5.1. Burden Calculation Measurement – All Current Transformers</p> <p>The actual connected burden calculation for a current transformer shall include be measured using a CT burden measuring instrument. If manual calculation will be employed, the calculation shall consider the following:</p> | <ul style="list-style-type: none"> ▪ To recommend an alternative and easier method in determining the connected burden using test equipment ▪ Items c-h are recommended for deletion as most of the conditions are no longer present in existing metering facilities i.e., common return conductor, parallel connected CT etc. Also, for consistency with Section 2.7.3.7. of this WESM Manual |

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| | | d. the apparent impedance associated with the sharing of a common current path through a measuring device with another current transformer; e. the apparent impedance associated with the sharing of an approved common-return conductor; f. the apparent impedance associated with the impedance of any other current transformer(s) connected in parallel with subject instrument transformer; g. burden under balanced power system conditions; and h. worst-case unbalance, including single-phase power | a. the impedance of the secondary wiring; b. the impedance of all devices connected to the current transformer; c. the apparent impedance associated with the interconnection of current transformer secondaries; d. the apparent impedance associated with the sharing of a common current path through a measuring device with another current transformer; e. the apparent impedance associated with the sharing of an approved common-return conductor; f. the apparent impedance associated with the impedance of any other current transformer(s) connected in parallel with subject instrument transformer; g. burden under balanced power system conditions; and h. worst-case unbalance, including single-phase power | prescribing separate conductors for each secondary terminal of each instrument transformer ▪ In reference to RCC-RESO-19-10 (19 July 2019) |
| Instrument Transformers | 2.5 | 2.5.5.3. Burden Calculations – All Voltage Transformers The burden calculation for a voltage transformer shall include the apparent power and power factor at the secondary terminals of the instrument transformer. | 2.5.5.3. Burden Calculations Measurement – All Voltage Transformers The actual connected burden calculation for a voltage transformer shall include the be measured using a VT burden measuring instrument. If manual calculation will be employed, | ▪ To have an alternative and easier option in determining the connected burden using test equipment ▪ In reference to RCC-RESO-19-10 (19 July 2019) |

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|--|--------|---|--|---|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| | | | <p><u>the calculation shall consider the following:</u></p> <p>a) the apparent power and power factor at the secondary terminals of the instrument transformers.</p> | |
| Instrument Transformers | 2.5 | <p>2.5.6. General Requirements for Grounding System</p> <p>2.5.6.1. The installation shall be in accordance but not limited to the following provisions of the Philippine Electrical Code:</p> <p>a. ... b. ... c. ... d. ... e. ...</p> <p>f. The minimum size of copper conductor to be used for metering grounding shall be 8 mm².</p> <p>g. Connections to all bonded parts shall be made in accordance to Article 2.50.1.8 of the Philippine Electrical Code 2009 Part 1.</p> | <p>2.5.6. General Requirements for Grounding System</p> <p>2.5.6.1. The installation shall be in accordance but not limited to the following provisions of the Philippine Electrical Code:</p> <p>a. ... b. ... c. ... d. ... e. ...</p> <p>f. <u>For voltage level 69kV and higher,</u> the minimum size of copper conductor to be used for metering <u>instrument transformer</u> grounding shall be <u>8 125</u> mm².</p> <p><u>g. For voltage lower than 69kV the minimum size of copper conductor to be used for metering instrument transformer grounding shall be 70 mm².</u></p> | <ul style="list-style-type: none"> ▪ To provide clarity on the application of the requirements for minimum size of equipment grounding. <p>(The selected values were based on the prescribed minimum size in the Philippine Electrical Code. PEC in no case requires the equipment grounding conductor to be larger than the circuit conductors supplying the equipment)</p> <ul style="list-style-type: none"> ▪ In reference to RCC-RESO-19-10 (19 July 2019) |

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| | | | <p><u>h. The minimum size of copper conductor to be used for the secondary circuits of instrument transformers shall be 3.5mm².</u></p> <p>gi. Connections to all bonded parts shall be made in accordance to Article 2.50.1.8 of the Philippine Electrical Code 2009 Part 1.</p> | |
| Instrument Transformers | 2.5 | <p>2.5.7. Current Transformer Requirements</p> <p>Current Transformers installed as the main metering shall adhere to the prevailing requirements of the Philippine Grid Code.</p> <p>The current specifications are provided as Appendix N of this Manual.</p> | <p>2.5.7. Current Transformer Requirements</p> <p>Current Transformers installed as the main metering shall adhere to the prevailing requirements of the Philippine Grid Code.</p> <p>The current specifications are provided as Appendix N of this Manual.</p> | The revision is being proposed since it will be replaced by additional provision under Section 2.5.1.1 as approved by the RCC-RESO-19-10 (19 July 2019) |
| Instrument Transformers | 2.5 | <p>2.5.8. Voltage Transformer Requirements</p> <p>Voltage Transformers installed as the main metering shall adhere to the prevailing requirements of the Philippine Grid Code.</p> <p>The current specifications are provided as Appendix O of this Manual.</p> | <p>2.5.8. Voltage Transformer Requirements</p> <p>Voltage Transformers installed as the main metering shall adhere to the prevailing requirements of the Philippine Grid Code.</p> <p>The current specifications are provided as Appendix O of this Manual.</p> | The revision is being proposed since it will be replaced by additional provision under Section 2.5.1.1 as approved by the RCC-RESO-19-10 (19 July 2019) |

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|--|-----------|---|---|---|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| Secondary Connections for Instrument Transformers | 2.7 | <p>2.7.1.1. Size of Secondary Cabling</p> <p>The secondary cabling between the current transformers and the meter test switch/block shall be of a sufficient size that the rated burden for the IEC 0.2 or ANSI 0.3 accuracy class is not exceeded when current, equivalent to the rated current, flows in the secondary winding.</p> | <p>2.7.1.1. Size of Secondary Cabling</p> <p>The secondary cabling between the current transformers and the meter test switch/block shall be of a sufficient size that the rated burden for the IEC 0.2 or ANSI 0.3 specified in Sec. 2.5.4.1 accuracy class is not exceeded when current, equivalent to the rated current, flows in the secondary winding.</p> | <ul style="list-style-type: none"> The revision is being proposed to refer appropriate section of the WESM manual for amendment In reference to RCC-RESO-19-10 (19 July 2019) |
| Site Equipment Identification | Section 3 | Section 3 Site Equipment Identification (SEIN) | Section 3. Site Equipment Identification <u>Label</u> (SEILN) | <ul style="list-style-type: none"> To change SEIN to SEIL, in all affected clause, as standard term for labelling Metering equipment, where L stands for Label. N stands for Number In reference to RCC-RESO-19-10 (19 July 2019) |
| Site Equipment Identification | 3.2 | <p>General Procedures</p> <p>The assignment of the Site Equipment Identification Number (SEIN) shall be done by the Metering Service Provider. For embedded generators and load customers to be registered in the WESM, the responsibility to assign the SEIN is with the Market Operator.</p> | <p>General Procedures</p> <p>The assignment of the Site Equipment Identification <u>Label</u> Number (SEILN), in general, shall be done by the Metering Service Provider. However, for embedded generators and load customers to be registered in the WESM, with the concerned DU as their MSP, the responsibility to assign the SEILN is with the Market Operator.</p> | <ul style="list-style-type: none"> To clarify responsibility in the assignment of SEIL. To recommend the use of SEIL instead of SEIN In reference to RCC-RESO-19-10 (19 July 2019) |
| Requirements for Registration | 4.3 | | <u>4.3.5. All requests of the Trading Participant for clarifications and/or reconsideration concerning the</u> | <ul style="list-style-type: none"> To provide additional provision to clarify the roles of the MSP and MO in |

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| Title | Clause | Provision | Proposed Amendment | Rationale |
| of Metering Installations | | | <u>approval of registration of metering facility shall be addressed to the Market Operator for resolution.</u> | <p>the registration of a metering facility to the WESM</p> <p>While the Metering Service Provider is responsible for the assessment and certification of readiness of a WESM Metering Facility, the approval of registration is within the jurisdiction and function of the Market Operator.</p> <ul style="list-style-type: none"> ▪ In reference to RCC-RESO-19-10 (19 July 2019) |
| Performance Standards | 9.5 | Performance Standards | Performance Standards | <ul style="list-style-type: none"> ▪ The revision is being proposed to provide a more reflective measure of the important deliverables of the MSP as far as monthly billing and settlement in the WESM is concerned. <p>The re-allocation in the percent weight would provide more emphasis on the parameters which are relatively significant in the billing and settlement process which is the end goal of an effective metering services.</p> <ul style="list-style-type: none"> ▪ In reference to RCC-RESO-19-10 (19 July 2019) |

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|--|--------|-----------------------|--|--|----------------|-----------------|-----------------------|--|--|-------------------------|-----------------|-----------|
| Title | Clause | Provision | | | | | Proposed Amendment | | | | | Rationale |
| | | Performance Indicator | Category | Performance Measures | Percent Weight | Percent Passing | Performance Indicator | Category | Performance Measures | Percent Weight | Percent Passing | |
| | | Service Delivery | Daily Meter Data Delivery | Number of metering installations successfully retrieved | 25 | 95 | Service Delivery | Daily Meter Data Delivery | Number of metering installations successfully retrieved | 25 <u>15</u> | 95 | |
| | | | Integrity of Meter Data | Meter Data that passed the validation processes | 25 | 95 | | Integrity of Meter Data | Meter Data that passed the validation processes | 25 <u>15</u> | 95 | |
| | | | Timeliness and Percentage Resolution to the Daily Meter Trouble Report | Resolution to the Meter Trouble Report within 10 calendar days | 15 | 90 | | Timeliness and Percentage Resolution to the Daily Meter Trouble Report | Resolution to the Meter Trouble Report within 10 calendar days | 15 | 90 | |
| | | | Timeliness and Percentage Resolution to the Monthly Meter Trouble Report | Resolution to the Meter Trouble Report within 2 business days | 10 | 90 | | Timeliness and Percentage Resolution to the Monthly Meter Trouble Report | Resolution to the Meter Trouble Report within 2 business days | 10 <u>20</u> | 90 | |
| | | | Timeliness of Monthly Meter Data Delivery | Complete delivery of all meter data within 3 calendar days after the billing period. | 15 | 100 | | Timeliness of Monthly Meter Data Delivery | Complete delivery of all meter data within 3 calendar days after the billing period. | 15 <u>25</u> | 100 | |

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|--|--------|---|--|--|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| Metering De-registration | 10.0 | <p>10.3 Timeline for De-Registration</p> <p>The Metering Service Provider shall issue a notification to the Market Operator when de-registering a metering installation within the 15-day period before its actual disconnection.</p> <p>The Market Operator shall facilitate the processing of the deregistered metering installation and shall also inform the responsible groups of the de-registration of the same.</p> | <p>10.3 Timeline for De-Registration</p> <p>The Metering Service Provider shall issue a notification to the Market Operator when de-registering a metering installation within the 15-day period before its <u>scheduled de-registration and/or</u> actual disconnection.</p> <p>The Market Operator shall facilitate the processing of the deregistered metering installation and shall also inform the responsible groups of the de-registration of the same.</p> | <ul style="list-style-type: none"> The revision is being proposed for the inclusion of de-registration in the provision since not all de-registration requires actual disconnection <p>In the case of totalization of metering facilities, the metered trading participants have the option to retain the downstream metering facilities, subject to MSP charge, to serve as check metering facilities.</p> <ul style="list-style-type: none"> In reference to RCC-RESO-19-10 (19 July 2019) |
| Metering De-registration | 10.0 | <p>10.5 Workflow for De-Registration of Metering Installation</p> | <p>10.5 Workflow for De-Registration of Metering Installation</p> <p><u>(See attached Workflow)</u></p> | <ul style="list-style-type: none"> To recommend deletion of steps involving the WESM Member initiating request for de-registration of MI. The MSP shall represent the WESM Member in the de-registration process (same as in the registration process in Section 4) Transactions between the WESM Member and the MSP is covered by Metering Service Agreements (MSA). In reference to RCC-RESO-19-10 (19 July 2019) |

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|--|---|---|---|---|----------------------|------|--------|-------------------|--------|---|---|--|---|----------------------|--------|---------------------------------------|---|---|--|--|--------|---|--|--------------|---|--------------|--|---|
| Title | Clause | Provision | Proposed Amendment | Rationale | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <p style="text-align: right;">Public Page 89 of 166</p> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Metering De-registration | 10.0 | <p>10.6 Procedural Steps for De-Registration of Metering Installation</p> <p style="text-align: right;">Effective Date: -</p> <table border="1"> <thead> <tr> <th>Ref.</th> <th>Task Name</th> <th>Task Detail</th> <th>When</th> <th>Method</th> <th>Completion Events</th> </tr> </thead> <tbody> <tr> <td>DMI 01</td> <td>WESM Member requests to deregister its MI</td> <td>WESM Member notify the MSP and MO by submitting letter of deregistration due to the If cases: Case 1 – Straight Deregistration (Retirement) Case 2 – Deregistration due to transfer of MI</td> <td>WESM Member decided to deregister its MI</td> <td>By e-mail, courier or fax and official letter address to MSP and MO</td> <td>Notice to MSP and MO</td> </tr> <tr> <td>DMI 02</td> <td>MSP receives notice of deregistration</td> <td>WESM Member sends notice of deregistration to the MSP. Reason of deregistration must be specified in the notice</td> <td>WESM Member sends notice of deregistration to MSP</td> <td>By e-mail, courier or fax and official letter address to MSP</td> <td></td> </tr> <tr> <td>DMI 03</td> <td>MSP submit MI deregistration to MO and request to deregister the MI</td> <td>MSP sends MI deregistration letter to MO containing the reason of deregistration and other pertinent details</td> <td>After DMI 02</td> <td>By e-mail, courier or fax and official letter address to MO</td> <td>Notice to MO</td> </tr> </tbody> </table> | Ref. | Task Name | Task Detail | When | Method | Completion Events | DMI 01 | WESM Member requests to deregister its MI | WESM Member notify the MSP and MO by submitting letter of deregistration due to the If cases: Case 1 – Straight Deregistration (Retirement) Case 2 – Deregistration due to transfer of MI | WESM Member decided to deregister its MI | By e-mail, courier or fax and official letter address to MSP and MO | Notice to MSP and MO | DMI 02 | MSP receives notice of deregistration | WESM Member sends notice of deregistration to the MSP. Reason of deregistration must be specified in the notice | WESM Member sends notice of deregistration to MSP | By e-mail, courier or fax and official letter address to MSP | | DMI 03 | MSP submit MI deregistration to MO and request to deregister the MI | MSP sends MI deregistration letter to MO containing the reason of deregistration and other pertinent details | After DMI 02 | By e-mail, courier or fax and official letter address to MO | Notice to MO | <p>10.6 Procedural Steps for De-Registration of Metering Installation</p> <p><u>(See attached Procedural Steps)</u></p> | <ul style="list-style-type: none"> To provide detailed steps consistent with the proposed revisions on the workflow for de-registration In reference to RCC-RESO-19-10 (19 July 2019) |
| Ref. | Task Name | Task Detail | When | Method | Completion Events | | | | | | | | | | | | | | | | | | | | | | | |
| DMI 01 | WESM Member requests to deregister its MI | WESM Member notify the MSP and MO by submitting letter of deregistration due to the If cases: Case 1 – Straight Deregistration (Retirement) Case 2 – Deregistration due to transfer of MI | WESM Member decided to deregister its MI | By e-mail, courier or fax and official letter address to MSP and MO | Notice to MSP and MO | | | | | | | | | | | | | | | | | | | | | | | |
| DMI 02 | MSP receives notice of deregistration | WESM Member sends notice of deregistration to the MSP. Reason of deregistration must be specified in the notice | WESM Member sends notice of deregistration to MSP | By e-mail, courier or fax and official letter address to MSP | | | | | | | | | | | | | | | | | | | | | | | | |
| DMI 03 | MSP submit MI deregistration to MO and request to deregister the MI | MSP sends MI deregistration letter to MO containing the reason of deregistration and other pertinent details | After DMI 02 | By e-mail, courier or fax and official letter address to MO | Notice to MO | | | | | | | | | | | | | | | | | | | | | | | |

Annex A

| WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design) | | | | |
|--|------------|---|--|---|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| | | <p>The screenshot displays a table with columns: Ref., Task Name, Task Detail, When, Method, and Completion Events. It lists tasks such as 'MI and notify the MCO', 'MCO verify if the MI is disconnected', 'MCO deregister the MI', 'MSP to delete the MI', and 'MCO to update the MI in the Metering Masterfile'. A logo for 'Wholesale Electricity Spot Market' is also visible.</p> | | |
| Appendices | Appendix C | Clause 4.4.3 If a Trading Participant is a Customer and also a Network Service Provider, the Trading Participant may register as a Metering Services Provider only for connection points that it does not own. | <p>Clause 4.4.3 If a Trading Participant is a Customer and also a Network Service Provider, the Trading Participant may register as a Metering Services Provider only for connection points that it does not own.</p> <p><u>If there are no other party interested, capable and legally authorized to assume the role of the Metering Services Provider, the Network Service Provider may be permitted to act as the MSP provided that it has a valid Certificate of Authority as WESM MSP granted by the ERC</u></p> | <ul style="list-style-type: none"> To provide an option in case there are no willing, capable and ERC Certified MSP which can assume the role In reference to RCC-RESO-19-10 (19 July 2019) |
| Appendices | Appendix F | Meter Trouble Report Form | (see attached Appendix F) | <ul style="list-style-type: none"> To update the old Meter Trouble Report Form |

Annex A

| WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Title | Clause | Provision | Proposed Amendment | Rationale | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <p style="text-align: center;">APPENDIX F</p> <p style="text-align: center;">METER TROUBLE REPORT FORM</p> <p style="text-align: center;">Meter Trouble Report</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Form Completion Date (mm/dd/yyyy):</td> <td style="width: 50%;"></td> </tr> <tr> <td>SEIN:</td> <td></td> </tr> <tr> <td>MDEF File Number:</td> <td></td> </tr> <tr> <td>Substation:</td> <td></td> </tr> <tr> <td>Initial Findings (Gap/Overlap/Uncertain):</td> <td></td> </tr> <tr> <td>Actual Start Date (mm/dd/yyyy):</td> <td></td> </tr> <tr> <td>Actual Start Time (hh:mm):</td> <td></td> </tr> <tr> <td>Actual End Date (mm/dd/yyyy):</td> <td></td> </tr> <tr> <td>Actual End Time (hh:mm):</td> <td></td> </tr> <tr> <td>Initial Action Taken(Edit/Estimation):</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center;">MSP Verification</td> </tr> <tr> <td>Remarks (Findings and Action Taken):</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>Proposed Adjustment (Estimated Value):</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>Report Close Date (mm/dd/yyyy):</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center;"><small>Note: Detailed Completion Report for submission within 48 Hours to MO.</small></td> </tr> <tr> <td style="text-align: center;">_____ Market Operator (Signature over Printed Name)</td> <td style="text-align: center;">_____ Meter Service Provider (Signature over Printed Name)</td> </tr> </table> | Form Completion Date (mm/dd/yyyy): | | SEIN: | | MDEF File Number: | | Substation: | | Initial Findings (Gap/Overlap/Uncertain): | | Actual Start Date (mm/dd/yyyy): | | Actual Start Time (hh:mm): | | Actual End Date (mm/dd/yyyy): | | Actual End Time (hh:mm): | | Initial Action Taken(Edit/Estimation): | | | | MSP Verification | | Remarks (Findings and Action Taken): | | | | Proposed Adjustment (Estimated Value): | | | | | | Report Close Date (mm/dd/yyyy): | | | | <small>Note: Detailed Completion Report for submission within 48 Hours to MO.</small> | | _____ Market Operator (Signature over Printed Name) | _____ Meter Service Provider (Signature over Printed Name) | | <ul style="list-style-type: none"> ▪ In reference to RCC-RESO-19-10 (19 July 2019) |
| Form Completion Date (mm/dd/yyyy): | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SEIN: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MDEF File Number: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Substation: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Initial Findings (Gap/Overlap/Uncertain): | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Actual End Date (mm/dd/yyyy): | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Actual End Time (hh:mm): | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Initial Action Taken(Edit/Estimation): | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| MSP Verification | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Remarks (Findings and Action Taken): | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Proposed Adjustment (Estimated Value): | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Report Close Date (mm/dd/yyyy): | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <small>Note: Detailed Completion Report for submission within 48 Hours to MO.</small> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| _____ Market Operator (Signature over Printed Name) | _____ Meter Service Provider (Signature over Printed Name) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Instrument Transformers | 2.5 | <p>2.5.3.2. Selection of Current Transformer Ratios</p> <p>Current transformer ratios shall be selected according to the following factors:</p> <p>c. The maximum sustained primary current in a current transformer shall not exceed the primary tap multiplied by the primary factor of the current transformer; and</p> <p>d. The minimum sustained primary current during normal operation shall not be less than 10% of the primary tap.</p> | <p>2.5.3.2. Selection of Current Transformer Ratios</p> <p>Current transformer ratios shall be selected according to the following factors:</p> <p>c. The maximum sustained primary current in a current transformer shall not exceed the rated primary tap current multiplied by the primary current rating factor of the current transformer; and</p> | <ul style="list-style-type: none"> ▪ To be consistent with the terms used by ANSI and IEC standards To consider the improvements in measurement range of new designs of extended range current transformers which can already measure down to 1% of rated current at guaranteed accuracy ▪ In reference to RCC-RESO-19-10 (19 July 2019) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Annex A

| WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design) | | | | |
|--|----------------|--|--|---|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| | | | d. The minimum sustained primary current during normal operation shall not be less than 10% of the primary tap <u>the lowest primary current that the current transformer can measure wherein the measurement accuracy is still guaranteed</u> | |
| SPECIFICATIO NS FOR CURRENT TRANSFORME RS Burden | Appendi x N | Shall not exceed the rated burden limit of 12.5 VA for the IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 (see Table 1) | <u>Shall be based on the standard rated burden as specified in the latest revision of IEC 61869-2 or ANSI/IEEE C57.13, or their latest equivalent standards.</u> | To consider the latest revision of International Standard IEC 61869-2 (2012) which cancels and replaces the first edition of IEC 60044-1 published in 1996 and to update the term “ANSI” to “IEEE”. Installation of a higher accuracy and functionality than the standards set by the PGC and WESM and its conformance to IEC and IEEE standards are supported by Sections 2.1.1 and 2.5.4.1 of WESM Metering Standards and Procedures which is also consistent with PEMC-TC’s opinion issued last April 2019 to Mactan Electric Corp. in which “the TC is of the opinion that the specifications of MECO’s current transformer comply with the metering accuracy class of 0.3 as well as the rated burden of B-1 (25VA), which is higher and therefore better than the burden B-0.2 (5VA) specified in PGC Appendix 2.” Refer to the attached letter (Annex “A”). |

Annex A

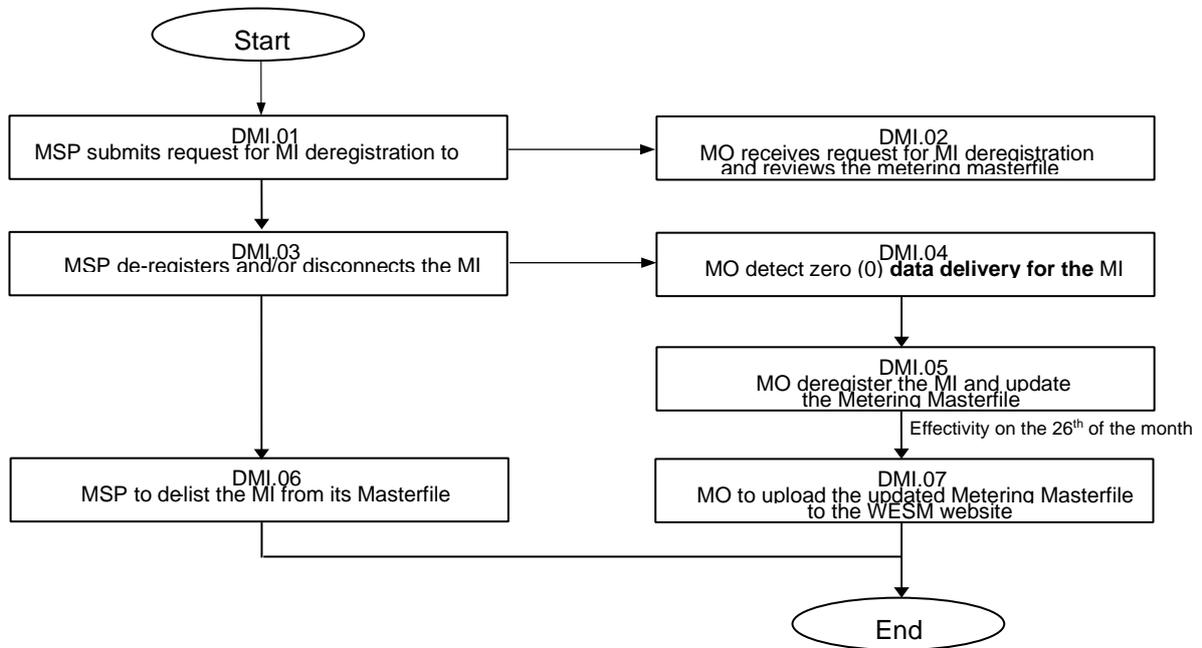
| WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design) | | | | |
|---|---------------|------------------------|---------------------------|--|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| | | | | Refer also to the attached Factory Test Reports (FAT) and MERALCO acceptance tests that certifies that the CT maintains its accuracy within specified limits when tested at different primary current and burden. Factory Test Reports (FAT) also certifies that it conforms to IEC 61869-1, IEC 61869-2 and IEEE C57.13 Standard requirements. The rules change should also be reflected in the WESM Metering Standards and Procedures Issue 12.0, Appendix "N". |
| SPECIFICATIONS FOR TRANSMISSION REVENUE METERS | APPENDIX L | [See attached Annex B] | [See attached Annex B] | Document Reference for consistency with the Philippine Grid Code 2016 Edition |
| SPECIFICATIONS FOR REVENUE METERS FOR EMBEDDED GENERATORS REGISTERED AS WESM PARTICIPANTS | APPENDIX M | [See attached Annex B] | [See attached Annex B] | Document Reference for consistency with the Philippine Distribution Code 2016 Edition |

Annex A

| WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design) | | | | |
|--|----------------|------------------------|------------------------|---|
| Title | Clause | Provision | Proposed Amendment | Rationale |
| SPECIFICATIO NS FOR CURRENT TRANSFORME RS | APPEN DIX N | [See attached Annex B] | [See attached Annex B] | Document Reference for consistency with the Philippine Grid Code 2016 Edition |
| SPECIFICATIO NS FOR VOLTAGE TRANSFORME RS | APPEN DIX O | [See attached Annex B] | [See attached Annex B] | Document Reference for consistency with the Philippine Grid Code 2016 Edition |

Annex A

Workflow for De-Registration of Metering Installation



Annex A**Procedural Steps for De-Registration of Metering Installation**

| Ref. | Task Name | Task Detail | When | Method | Completion Events |
|--|--|---|--|---|--------------------------|
| DMI.01 | WESM Member request to deregister its MI | WESM Member notify the MSP and MO by submitting letter of deregistration due to the ff. cases: Case 1 — Straight Deregistration (Retirement) Case 2 — Deregistration due to transfer of MI | WESM Member decided to deregister its MI | By e-mail, courier or fax and official letter address to MSP and MO | Notice to MSP and MO |
| DMI.02 | MSP receives notice of deregistration | WESM Member sends notice of deregistration to the MSP. Reason of deregistration must be specified in the notice | WESM Member sends notice of deregistration to MSP | By e-mail, courier or fax and official letter address to MSP | |
| <u>DMI.01</u> <u>DMI.03</u> | MSP submits <u>request for</u> MI deregistration to MO and request to deregister the MI | MSP sends MI deregistration letter to MO containing the reason of deregistration and other pertinent details <u>including the schedule of deregistration.</u> | <u>After reaching an agreement with the WESM member to de-register the MI</u> After DMI.02 | By e-mail, courier or fax and official letter address to MO | Notice to MO |
| <u>DMI.02</u> <u>DMI.04</u> | MO receives MI deregistration | After receiving the letter of deregistration of MI, MO validates reviews the request of the WESM Member through the MSP. MO review the Metering Masterfile and issue instructions to deregister the MI | After assessment of MSP that the MI is subject for deregistration <u>After DMI. 01</u> | By e-mail, courier or fax and official letter address to MO | |

Annex A

| Ref. | Task Name | Task Detail | When | Method | Completion Events |
|--------------------------------|---|--|--|--|-------------------------------------|
| <u>DMI.03</u> <u>DMI.05</u> | MSP <u>de-registers and/or</u> disconnects the MI and notify the MO | MSP <u>de-registers and/or</u> disconnects the MI <u>on the agreed schedule</u> , within 15 days after issuing notice of deregistration and inform the MO of the MI disconnection. <u>MSP to cease sending of data of de-registered MI to the MO</u> | <u>At the agreed de-registration or disconnection schedule</u> | <u>By e-mail, courier or fax and official letter address to MO</u> | <u>Notice to MO</u> |
| <u>DMI.04</u> <u>DMI.06</u> | MO detect zero (0) registered readings of <u>data delivery for the MI</u> | MO verify if the MI <u>is de-registered and/or disconnected</u> by detecting zero (0) registered readings of <u>data delivery for</u> the said MI | After MI <u>de-registration and/or</u> disconnection | By meter data inspection | |
| <u>DMI.05</u> <u>DMI.07</u> | MO deregisters the MI | MO deregister the MI and update the Metering Masterfile <u>Effectivity of de-registration to the market shall be on the 26th of the month following the actual de-registration or disconnection of the WESM Member by the MSP under DMI.03</u> | After <u>DMI.04</u> <u>DMI.06</u> | | |
| <u>DMI.06</u> <u>DMI.08</u> | MSP to delist the MI | MSP to delist the MI from its masterfile and old MIRF shall be deregistered | After <u>DMI.05</u> <u>DMI.07</u> | | End of deregistration process of MI |
| <u>DMI.07</u> <u>DMI.09</u> | MO to update the MI in the Metering Masterfile | MO to upload the updated Metering Masterfile to the website and old MIRF shall be deregistered | After <u>DMI.06</u> <u>DMI.08</u> | | End of deregistration process of MI |

Annex A

METER TROUBLE REPORT FORM

| Day, Month Date, Year | | | MTR SUMMARY | | | | | | | | | TOTAL MTR: | 63 | TOTAL REMAINING MTR: | | REMARKS | | |
|----------------------------|---------|------|-------------|----|----|---------------|----|----|-----------------|----|----|----------------------|----|----------------------|---------|---------|----------|--|
| MTR_2019-02-13_(1ST ISSUE) | | | TOTAL DATA | | | TOTAL MISSING | | | TOTAL UNCERTAIN | | | INC DATA | 3 | INC DATA | | | | |
| | | | TD | TM | TU | TD | TM | TU | TD | TM | TU | INC DATA & UNCERTAIN | 1 | INC DATA & UNCERTAIN | | | | |
| | | | | | | | | | | | | NO DATA | 45 | NO DATA | | | | |
| | | | | | | | | | | | | UNCERTAIN | 14 | UNCERTAIN | | | | |
| No. | TP NAME | SEIN | KWH DEL | | | KVARH DEL | | | KWH REC | | | KVARH REC | | | REMARKS | | REMARKS | |
| | | | TD | TM | TU | TD | TM | TU | TD | TM | TU | TD | TM | TU | WESM | MSG | CLOSED/C | |
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Annex B: Amendments to the Reference Documents

Proposed Amendment on the WESM Manual on Metering Standards and Procedures regarding Current Transformer Requirements

| WESM Manual on Metering Standards and Procedures Issue 11.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Provision | Proposed Amendment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>2.4.1. Requirements for Grid Revenue Meters</p> <p>Meters installed as the main revenue meter, shall meet the minimum requirements listed below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #ffff00;">ITEMS</th> <th style="background-color: #ffff00;">SPECIFICATIONS</th> <th style="background-color: #ffff00;">REFERENCE DOCUMENTS</th> </tr> </thead> <tbody> <tr> <td>Accuracy Class</td> <td>IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better</td> <td>Grid Code 9.3.3.1</td> </tr> <tr> <td>No. of Stator</td> <td>Blondel's Theorem compliant / 3-element</td> <td></td> </tr> <tr> <td>Rating</td> <td>115V 1 A or 5 A 60 Hz</td> <td>The rating should be suitable to the secondary rating of the instrument transformers.</td> </tr> <tr> <td>No. of Quadrants (Measurement)</td> <td>Active Energy/Power Measurement: Bi-directional Reactive Power Measurement: 4 Quadrant</td> <td>Grid Code 9.3.3.2</td> </tr> <tr> <td>Interval Data</td> <td>Programmable to 1, 5, 15, 30, and 60 minute interval</td> <td>Grid Code 9.3.4.1</td> </tr> <tr> <td>No. of Channels</td> <td>At least eight (8)</td> <td>Grid Code 9.2.4.1 Grid Code 9.2.4.2</td> </tr> <tr> <td>Mass Memory</td> <td>Minimum 60 day recording of a 5-minute time-stamped demand interval for 8 recording channels</td> <td>WESM 4.5.1 (g) Grid Code 9.3.4.3 Grid Code 9.2.5.3</td> </tr> <tr> <td>Billing Function</td> <td>The meter shall be capable of measuring and recording the following electrical parameters per billing interval: <ul style="list-style-type: none"> • Kwh (Delivered) • Kwh (Received) </td> <td>Grid Code 9.2.4.1 Grid Code 9.2.4.2 Grid Code 9.3.3.1 Grid Code 9.3.3.2 Grid Code 9.5.4</td> </tr> </tbody> </table> | ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS | Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | Grid Code 9.3.3.1 | No. of Stator | Blondel's Theorem compliant / 3-element | | Rating | 115V 1 A or 5 A 60 Hz | The rating should be suitable to the secondary rating of the instrument transformers. | No. of Quadrants (Measurement) | Active Energy/Power Measurement: Bi-directional Reactive Power Measurement: 4 Quadrant | Grid Code 9.3.3.2 | Interval Data | Programmable to 1, 5, 15, 30, and 60 minute interval | Grid Code 9.3.4.1 | No. of Channels | At least eight (8) | Grid Code 9.2.4.1 Grid Code 9.2.4.2 | Mass Memory | Minimum 60 day recording of a 5-minute time-stamped demand interval for 8 recording channels | WESM 4.5.1 (g) Grid Code 9.3.4.3 Grid Code 9.2.5.3 | Billing Function | The meter shall be capable of measuring and recording the following electrical parameters per billing interval: <ul style="list-style-type: none"> • Kwh (Delivered) • Kwh (Received) | Grid Code 9.2.4.1 Grid Code 9.2.4.2 Grid Code 9.3.3.1 Grid Code 9.3.3.2 Grid Code 9.5.4 | <p>2.4.1. Requirements for Grid Revenue Meters</p> <p>Meters installed as the main revenue meter, shall meet the minimum requirements listed below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #ffff00;">ITEMS</th> <th style="background-color: #ffff00;">SPECIFICATIONS</th> <th style="background-color: #ffff00;">REFERENCE DOCUMENTS</th> </tr> </thead> <tbody> <tr> <td>Accuracy Class</td> <td>IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better</td> <td>Grid Code 9.3.3.1 <u>PGC 2016 GRM 9.2.3.3</u></td> </tr> <tr> <td>No. of Stator</td> <td>Blondel's Theorem compliant / 3-element</td> <td><u>PGC 2016 GRM 9.2.2.1</u></td> </tr> <tr> <td>Rating</td> <td>115V 1 A or 5 A 60 Hz</td> <td>The rating should be suitable to the secondary rating of the instrument transformers.</td> </tr> <tr> <td>No. of Quadrants (Measurement)</td> <td>Active Energy/Power Measurement: Bi-directional Reactive Power Measurement: 4 Quadrant</td> <td>Grid Code 9.3.3.2 <u>PGC 2016 GRM 9.2.2.2</u> <u>PGC 2016 GRM 9.2.3.3</u></td> </tr> <tr> <td>Interval Data</td> <td>Programmable to 1, 5, 15, 30, and 60 minute interval</td> <td>Grid Code 9.3.4.1 <u>PGC 2016 GRM 9.2.3.3</u></td> </tr> <tr> <td>No. of Channels</td> <td>At least eight (8)</td> <td>Grid Code 9.2.4.1 Grid Code 9.2.4.2 <u>PGC 2016 GRM 9.2.2.2</u> <u>PGC 2016 GRM 9.2.3.3</u></td> </tr> <tr> <td>Mass Memory</td> <td>Minimum 60 day recording of a 5-minute time-stamped demand interval for 8 recording channels</td> <td>WESM 4.5.1 (g) Grid Code 9.3.4.3 Grid Code 9.2.5.3 <u>PGC 2016 GRM 9.2.3.3</u></td> </tr> </tbody> </table> | | ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS | Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | Grid Code 9.3.3.1 <u>PGC 2016 GRM 9.2.3.3</u> | No. of Stator | Blondel's Theorem compliant / 3-element | <u>PGC 2016 GRM 9.2.2.1</u> | Rating | 115V 1 A or 5 A 60 Hz | The rating should be suitable to the secondary rating of the instrument transformers. | No. of Quadrants (Measurement) | Active Energy/Power Measurement: Bi-directional Reactive Power Measurement: 4 Quadrant | Grid Code 9.3.3.2 <u>PGC 2016 GRM 9.2.2.2</u> <u>PGC 2016 GRM 9.2.3.3</u> | Interval Data | Programmable to 1, 5, 15, 30, and 60 minute interval | Grid Code 9.3.4.1 <u>PGC 2016 GRM 9.2.3.3</u> | No. of Channels | At least eight (8) | Grid Code 9.2.4.1 Grid Code 9.2.4.2 <u>PGC 2016 GRM 9.2.2.2</u> <u>PGC 2016 GRM 9.2.3.3</u> | Mass Memory | Minimum 60 day recording of a 5-minute time-stamped demand interval for 8 recording channels | WESM 4.5.1 (g) Grid Code 9.3.4.3 Grid Code 9.2.5.3 <u>PGC 2016 GRM 9.2.3.3</u> |
| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | Grid Code 9.3.3.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. of Stator | Blondel's Theorem compliant / 3-element | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rating | 115V 1 A or 5 A 60 Hz | The rating should be suitable to the secondary rating of the instrument transformers. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. of Quadrants (Measurement) | Active Energy/Power Measurement: Bi-directional Reactive Power Measurement: 4 Quadrant | Grid Code 9.3.3.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Interval Data | Programmable to 1, 5, 15, 30, and 60 minute interval | Grid Code 9.3.4.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. of Channels | At least eight (8) | Grid Code 9.2.4.1 Grid Code 9.2.4.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mass Memory | Minimum 60 day recording of a 5-minute time-stamped demand interval for 8 recording channels | WESM 4.5.1 (g) Grid Code 9.3.4.3 Grid Code 9.2.5.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Billing Function | The meter shall be capable of measuring and recording the following electrical parameters per billing interval: <ul style="list-style-type: none"> • Kwh (Delivered) • Kwh (Received) | Grid Code 9.2.4.1 Grid Code 9.2.4.2 Grid Code 9.3.3.1 Grid Code 9.3.3.2 Grid Code 9.5.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | Grid Code 9.3.3.1 <u>PGC 2016 GRM 9.2.3.3</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. of Stator | Blondel's Theorem compliant / 3-element | <u>PGC 2016 GRM 9.2.2.1</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rating | 115V 1 A or 5 A 60 Hz | The rating should be suitable to the secondary rating of the instrument transformers. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. of Quadrants (Measurement) | Active Energy/Power Measurement: Bi-directional Reactive Power Measurement: 4 Quadrant | Grid Code 9.3.3.2 <u>PGC 2016 GRM 9.2.2.2</u> <u>PGC 2016 GRM 9.2.3.3</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Interval Data | Programmable to 1, 5, 15, 30, and 60 minute interval | Grid Code 9.3.4.1 <u>PGC 2016 GRM 9.2.3.3</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. of Channels | At least eight (8) | Grid Code 9.2.4.1 Grid Code 9.2.4.2 <u>PGC 2016 GRM 9.2.2.2</u> <u>PGC 2016 GRM 9.2.3.3</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mass Memory | Minimum 60 day recording of a 5-minute time-stamped demand interval for 8 recording channels | WESM 4.5.1 (g) Grid Code 9.3.4.3 Grid Code 9.2.5.3 <u>PGC 2016 GRM 9.2.3.3</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Annex B: Amendments to the Reference Documents

| WESM Manual on Metering Standards and Procedures Issue 11.0 | | | | | |
|---|---|-----------------------------------|--------------------|--|--|
| Provision | | | Proposed Amendment | | |
| | <ul style="list-style-type: none"> • Kvarh (Quadrant 1) • Kvarh (Quadrant 2) • Kvarh (Quadrant 3) • Kvarh (Quadrant 4) • Kvah (Delivered) • Kvah (Received) • Max Kw (Delivered) • Max Kw (Received) • Kvar (Quadrant 1) • Kvar (Quadrant 2) • Kvar (Quadrant 3) • Kvar (Quadrant 4) • Kva (Delivered) • Kva (Received) A. Power Factor <ul style="list-style-type: none"> • Frequency • Per Phase Current • Per Phase Voltage | Grid Code 9.5.5 | Billing Function | The meter shall be capable of measuring and recording the following electrical parameters per billing interval: <ul style="list-style-type: none"> • Kwh (Delivered) • Kwh (Received) • Kvarh (Quadrant 1) • Kvarh (Quadrant 2) • Kvarh (Quadrant 3) • Kvarh (Quadrant 4) • Kvah (Delivered) • Kvah (Received) • Max Kw (Delivered) • Max Kw (Received) • Kvar (Quadrant 1) • Kvar (Quadrant 2) • Kvar (Quadrant 3) • Kvar (Quadrant 4) • Kva (Delivered) • Kva (Received) A. Power Factor <ul style="list-style-type: none"> • Frequency • Per Phase Current • Per Phase Voltage | Grid Code 9.2.4.1 Grid Code 9.2.4.2 Grid Code 9.3.3.1 Grid Code 9.3.3.2 Grid Code 9.5.4 Grid Code 9.5.5 <u>PGC 2016 GRM 9.2.2.2</u> <u>PGC 2016 GRM 9.2.3.3</u> |
| Loss Compensation | A flexible transformer loss compensation for both copper and iron losses and transmission/ distribution line loss compensation with a simple user set-up for Site Specific adjustments. Losses can be measured and segregated separately from other billing parameters. | Grid Code 9.2.3.1 WESM 4.5.2.2 | Loss Compensation | A flexible transformer loss compensation for both copper and iron losses and transmission/ distribution line loss compensation with a simple user set-up for Site Specific adjustments. Losses can be measured and segregated separately from other billing parameters. | Grid Code 9.2.3.1 <u>WESM 4.5.2.2</u> |
| Security | The meter shall have provisions for securing the meter data, meter configurations and programs by electronic means and/or passwords. It shall also be secured physically by way of security seals. | WESM 4.5.6 Grid Code 9.4.5 | Security | The meter shall have provisions for securing the meter data, meter configurations and programs by | WESM 4.5.6 Grid Code 9.4.5 <u>PGC 2016 GRM 9.3.8.1</u> |

Annex B: Amendments to the Reference Documents

| WESM Manual on Metering Standards and Procedures Issue 11.0 | | | | | |
|---|---|--|---------------------------------|--|--|
| Provision | | | Proposed Amendment | | |
| Communication Capability | The meter shall have at least minimum of three (3) independent communication ports that could operate independently. Each port can communicate simultaneously, with each one using a different protocol. It should be capable of a two-way communication. | WESM 4.5.7.1 WESM 4.5.1(c) Grid Code 9.3.4.2 Grid Code 9.5.1.1 Grid Code 9.5.1.4 | | electronic means and/or passwords. It shall also be secured physically by way of security seals. | <u>PGC 2016 GRM 9.3.8.2</u> <u>PGC 2016 GRM 9.3.8.3</u> |
| Internal Clock | The meter shall have an internal clock with an allowable error of +/-1 second per demand interval. | WESM 4.5.8.1 Grid Code 9.3.4.4 | Communication Capability | The meter shall have at least minimum of three (3) independent communication ports that could operate independently. Each port can communicate simultaneously, with each one using a different protocol. It should be capable of a two-way communication. | WESM 4.5.7.1 WESM 4.5.1(c) Grid Code 9.3.4.2 Grid Code 9.5.1.1 Grid Code 9.5.1.4 <u>PGC 2016 GRM 9.2.3.3</u> |
| Time Synchronization | Line frequency or crystal synchronization. The internal clock shall be capable of being reset set by the data collection software during normal collection operations. | WESM 4.5.8.1 Grid Code 9.3.4.4 | Internal Clock | The meter shall have an internal clock with an allowable error of +/-1 second per demand interval. | WESM 4.5.8.1 Grid Code 9.3.4.4 <u>PGC 2016 GRM 9.2.3.3</u> |
| Digital Display | The meter shall have a digital display with a minimum of 5 digits. | WESM 4.5.1 (c) Grid Code 9.3.3.1 | Time Synchronization | Line frequency or crystal synchronization. The internal clock shall be capable of being reset set by the data collection software during normal collection operations. | WESM 4.5.8.1 Grid Code 9.3.4.4 <u>PGC 2016 GRM 9.2.3.3</u> |
| Codes and Standards Compliance | The meter shall adhere to established International Standards (IEC, etc.). | Grid Code 9.3.3.1 | Digital Display | The meter shall have a digital display with a minimum of 5 digits. | WESM 4.5.1 (c) <u>PGC 2016 GRM 9.2.3.3</u> |
| Applicable and Compliance Tests | These tests shall include material tests and established practice and/or other approved standards. Routine tests prescribed by the applicable standards shall be performed. In particular, the following tests shall be performed for the revenue meters: a. Power frequency tests (insulation) b. Impulse voltage test (insulation). c. HF interference test d. Surge withstand and fast transient tests | Grid Code 9.3.3.3. IEC 255-1 IEC 255-A (Class III) IEC 245-4 | Codes and Standards Compliance | The meter shall adhere to established International Standards (IEC, etc.). | Grid Code 9.3.3.1 <u>PGC 2016 GCR 4.2.10</u> |
| | | | Applicable and Compliance Tests | These tests shall include material tests and established practice and/or other approved standards. Routine tests prescribed by the applicable standards shall be performed. In particular, the following tests shall be performed for the revenue meters: a. Power frequency tests (insulation) b. Impulse voltage test (insulation). c. HF interference test | <u>PGC 2016 GRM 9.2.5.2</u> <u>PGC 2016 GRM 9.2.5.3</u> <u>PGC 2016 GRM 9.2.8.1</u> Grid Code 9.3.3.3. IEC 255-1 IEC 255-A (Class III) IEC 245-4 |

Annex B: Amendments to the Reference Documents

WESM Manual on Metering Standards and Procedures Issue 11.0

| Provision | | | Proposed Amendment | | |
|-----------|---|--|--------------------|---|---|
| Battery | Capable of retaining readings and time of day for at least two days without external power source | Grid Code 9.2.5.3 Grid Code 9.3.3.2 WESM 4.5.1 (g) | | d. Surge withstand and fast transient tests | |
| Enclosure | The meter shall be provided with the necessary cover to protect the internal component against the harmful elements of environment that may affect its measuring circuit and operation. | ANSI 12.1 4.3.4 | Battery | Capable of retaining readings and time of day for at least two days without external power source | PGC 2016 GRM 9.2.3.3 Grid Code 9.2.5.3 Grid Code 9.3.3.2 WESM 4.5.1 (g) |
| | | | Enclosure | The meter shall be provided with the necessary cover to protect the internal component against the harmful elements of environment that may affect its measuring circuit and operation. | ANSI 12.1 4.3.4 PGC 2016 GRM 9.2.2.3 PGC 2016 GRM 9.2.2.4 PGC 2016 GRM 9.3.8 |

2.4.2. Requirements for Distribution Revenue Meter

Meters installed as the main revenue meter, shall meet the minimum requirements listed below:

| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS |
|----------------|---|---|
| Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | IEC 687 4.6 |
| No. of Stator | Corresponds to the service type and complying with Blondell's Theorem | Dist. Code 8.4.3.1 ANSI C12.1 |
| Voltage Rating | Corresponds to the secondary voltage rating of voltage transformers used | Dist. Code 5.5.1.1 |
| Current Rating | Corresponds to the secondary current rating of current transformers used (typically 1A or 5A) | ANSI or IEC Standard |
| Frequency | 60 Hz | Dist. Codes 3.2.2.1 - |
| Measurement | Bi-directional active metering (delivered & received) and 4-quadrant reactive metering | Dist Codes 8.3.3.1 Dist. Codes 8.3.4.2 Dist. Code 8.4.3.2 |
| Interval Data | Programmable to 5, 15, 30 minute interval | Dist. Code 8.4.4.1 |

2.4.2 Requirements for Distribution Revenue Meter

Meters installed as the main revenue meter, shall meet the minimum requirements listed below:

| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS |
|----------------|---|--|
| Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | IEC 687 4.6 PDC 2016 7.2.7 |
| No. of Stator | Corresponds to the service type and complying with Blondell's Theorem | PDC 2016 7.2.7 Dist. Code 8.4.3.1 ANSI C12.1 |
| Voltage Rating | Corresponds to the secondary voltage rating of voltage transformers used | Dist. Code 5.5.1.1 PDC 2016 7.2.7 |
| Current Rating | Corresponds to the secondary current rating of current transformers used (typically 1A or 5A) | ANSI or IEC Standard PDC 2016 7.2.7 |
| Frequency | 60 Hz | Dist. Codes 3.2.2.1 - PDC 2016 7.2.7 |

Annex B: Amendments to the Reference Documents

| WESM Manual on Metering Standards and Procedures Issue 11.0 | | | | | |
|---|---|---|-----------------------------------|---|---|
| Provision | | | Proposed Amendment | | |
| No. of Channels | At least Six (6) Channels | This satisfies the minimum requirements as stated under: Dist. Codes 8.3.3.2 Dist. Codes 8.3.4.3 | Measurement | Bi-directional active metering (delivered & received) and 4-quadrant reactive metering | Dist. Codes 8.3.3.1 Dist. Codes 8.3.4.2 Dist. Code 8.4.3.2 <u>PDC 2016 7.2.7</u> |
| Mass Memory | At least 60 days | Dist Code 8.3.5.3 | Interval Data | Programmable to 5, 15, 30 minute interval | Dist. Code 8.4.4.4 <u>PDC 2016 7.2.7</u> |
| Recording Billing Quantities | Display and record TOU energy and power parameters (kWh, kVarh, max. kW & cum. kW) for all rates | Dist. Code 8.4.3.1 | No. of Channels | At least Six (6) Channels | This satisfies the minimum requirements as stated under: Dist. Codes 8.3.3.2 Dist. Codes 8.3.4.3 <u>PDC 2016 7.2.7</u> |
| Loss Compensation (if applicable) | A flexible transformer loss compensation for both copper and iron losses and transmission/ distribution line loss compensation with a simple user set-up for Site Specific adjustments. Losses can be measured and segregated separately from other billing parameters. | WESM 4.5.2.2 | Mass Memory | At least 60 days | Dist Code 8.3.5.3 <u>PDC 2016 7.2.7</u> |
| Security | The meter shall have provisions for securing the meter data, meter configurations and programs by electronic means and/or passwords. It shall also be secured physically by way of security seals. | WESM 4.5.6 | Recording Billing Quantities | Display and record TOU energy and power parameters (kWh, kVarh, max. kW & cum. kW) for all rates | Dist. Code 8.4.3.4 <u>PDC 2016 7.2.7</u> |
| Communication Capability | The meter shall be equipped with a means of communication channel capable of electronic data transfer. Either an integrated telephone modem, and/or RS-232 communication port for interface to an external communication medium are considered acceptable. | WESM 4.5.7.1 WESM 4.5.1(c) Dist. Code 8.4.4.2 | Loss Compensation (if applicable) | A flexible transformer loss compensation for both copper and iron losses and transmission/ distribution line loss compensation with a simple user set-up for Site Specific adjustments. Losses can be measured and segregated separately from other billing parameters. | WESM 4.5.2.2 |
| Internal Clock/Battery | With long life lithium battery for clock/ calendar maintenance | WESM 4.5.8.1 Dist Code 8.4.4.6 | Security | The meter shall have provisions for securing the meter data, meter configurations and programs by electronic means and/or passwords. It shall also be secured physically by way of security seals. | WESM 4.5.6 <u>PDC 2016 7.4.7</u> |
| Time Synchronization | The meter can be programmed to synchronize time without change in measured billing parameters. | | Communication Capability | The meter shall be equipped with a means of communication channel capable of electronic data transfer. | WESM 4.5.7.1 WESM 4.5.1(c) Dist. Code 8.4.4.2 |

Annex B: Amendments to the Reference Documents

WESM Manual on Metering Standards and Procedures Issue 11.0

| Provision | | | Proposed Amendment | | |
|--------------------------------|---|---------------------------------------|--------------------------------|---|--|
| Digital Display | The meter shall have a digital display with a minimum of 5 digits. | WESM 4.5.1 (c) Dist Code 8.4.3.1 | | Either an integrated telephone modem, and/or RS-232 communication port for interface to an external communication medium are considered acceptable. | <u>PDC 2016 7.2.7</u> |
| Codes and Standards Compliance | The meter shall adhere to the IEC Standards or their equivalent national standards for metering | | Internal Clock/Battery | With long life lithium battery for clock/ calendar maintenance | WESM 4.5.8.1 Dist Code 8.4.4.6 PDC 2016 7.2.1 |
| Enclosure | The meter shall be provided with the necessary cover to protect the internal component against the harmful elements of environment that may affect its measuring circuit and operation. | ANSI 12.1 4.3.4 | Time Synchronization | The meter can be programmed to synchronize time without change in measured billing parameters. | |
| | | | Digital Display | The meter shall have a digital display with a minimum of 5 digits. | WESM 4.5.1 (c) Dist Code 8.4.3.1 <u>PDC 2016 7.2.7</u> |
| | | | Codes and Standards Compliance | The meter shall adhere to the IEC Standards or their equivalent national standards for metering | IEC, ANSI/IEEE <u>PDC 2016 7.2.7</u> |
| | | | Enclosure | The meter shall be provided with the necessary cover to protect the internal component against the harmful elements of environment that may affect its measuring circuit and operation. | ANSI 12.1 4.3.4 |

xxx

2.5.7. Current Transformer

Current Transformer installed as the main metering, shall meet the minimum requirements listed below:

| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS |
|-----------------------|--|--|
| Type | Outdoor Type; Minimum oil filled, Dry Type or Gas-filled | |
| Cooling | Oil immersed, Self-cooled; Butyl, Cast resin | |
| Construction | Single phase, wound type, free standing | |
| Accuracy Class | IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 or better | Grid Code 9.3.2.1 |
| Burden | Shall not exceed the rated burden limit of 12.5 VA for the IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 (see Table 1) | Grid Code 9.3.2.2 Grid Code 9.4.1.2 |
| Rated Primary Current | The thermal rating factor shall not be less than 1.0. | |

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2.5.7. Current Transformer

Current Transformer installed as the main metering, shall meet the minimum requirements listed below:

| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS |
|-------|--|---------------------|
| Type | Outdoor Type; Minimum oil filled, Dry Type or Gas-filled | |

Annex B: Amendments to the Reference Documents

| WESM Manual on Metering Standards and Procedures Issue 11.0 | | | | | |
|---|---|--|-------------------------|--|---|
| Provision | | | Proposed Amendment | | |
| Secondary Current | 1A or 5A | Grid Code 9.3.2.2 IEC 4.2 Standard values of rated secondary currents | Cooling | Oil immersed, Self-cooled; Butyl, Cast resin | |
| Rating Factor | Minimum of 1.0 at 30°C | | Construction | Single phase, wound type, free standing | |
| Frequency | 60 Hz | | Accuracy Class | IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 or better | Grid Code 9.3.2.4 PGC 2016 GRM 9.2.3.2 |
| Ambient Air Temperature | -5°C and 50°C for very hot climate | IEC 3.2.1 1996 | Burden | Shall not exceed the rated burden limit of 12.5 VA for the IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 (see Table 1) Shall be based on the standard rated burden as specified in the latest revision of IEC 61869-2 or ANSI/IEEE C57.13, or their latest equivalent standards. | Grid Code 9.3.2.2 Grid Code 9.4.1.2 PGC 2016 GRM 9.2.3.2 |
| BIL | Refer to Table 2 for applicable BIL | | Rated Primary Current | The thermal rating factor shall not be less than 1.0. | |
| Creepage Distance | Refer to Table 3 for applicable creepage distance | | Secondary Current | 1A or 5A | Grid Code 9.3.2.2 PGC 2016 GRM 9.2.3.2 IEC 4.2 Standard values of rated secondary currents |
| Number of Core | Preferably Two (2) metering core | Grid Code 9321 Grid Code 9.3.2.2 | Rating Factor | Minimum of 1.0 at 30°C | |
| Mounting | Depend on the applications | | Frequency | 60 Hz | |
| Grounding | | Grid Code 9.3.2.2 | Ambient Air Temperature | -5°C and 50°C for very hot climate | IEC 3.2.1 1996 |
| Security | Seal holder shall be provided to the CT secondary terminal box (see Figure 1) | Grid Code 9.4.5 Meter Equipment Security | BIL | Refer to Table 2 for applicable BIL | |
| | | | Creepage Distance | Refer to Table 3 for applicable creepage distance | |
| | | | Number of Core | Preferably Two (2) metering core | Grid Code 9321 Grid Code 9.3.2.2 PGC 2016 GRM 9.2.3.2 |
| | | | Mounting | Depend on the applications | |

2.5.8. Voltage Transformer

Voltage Transformer installed as the main metering, shall meet the minimum requirements listed below:

| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS |
|---------|--|---------------------|
| Type | Outdoor Type; Minimum oil filled, Dry Type or Gas-filled | |
| Cooling | Oil immersed, Self-cooled; Butyl, Cast resin | |

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| Provision | | | Proposed Amendment | | |
|-----------------------|--|--|--------------------|---|---|
| Construction | Single phase, Inductive type, single bushing | | Grounding | | Grid Code 9.3.2.2 PGC 2016 GCR 4.4.1.3.2 PGC GRM 9.2.2.1 (g) |
| Termination | Line-to-ground | Grid Code 9.3.1. | Security | Seal holder shall be provided to the CT secondary terminal box (see Figure 1) | Grid Code 9.4.5 Meter Equipment Security PGC 2016 GRM 9.3.8.2 PGC 2016 GRM 9.2.4.1 |
| Accuracy Class | IEC 6044-2 Class 0.2 /ANSI C57.13 Class 0.3 or better | Grid Code 9.3.1.1 | | | |
| Burden | Shall not exceed the rated burden limit for the IEC 6044-2 Class 0.2 /ANSI C57.13 Class 0.3 or better. (see Table 4) | Grid Code 9.4.1.2 | | | |
| Ratio | See Table 5 | | | | |
| Secondary Voltage | See Table 5 | | | | |
| Frequency | 60 Hz | | | | |
| Operating Temperature | 55°C average ambient temperature, with max ambient temperature not exceeding 65°C | | | | |
| BIL | Refer to Table 2 for applicable BIL | | | | |
| Creepage distance | Refer to Table 3 for applicable creepage distance | | | | |
| Number of Core | Preferably Two (2) | | | | |
| Mounting | Depend on the applications | | | | |
| Grounding | | Grid Code 9.3.1.1 | | | |
| Security | Seal holder shall be provided to the CT secondary terminal box (see Figure 1) | Grid Code 9.4.5 Meter Equipment Security | | | |

2.5.8. Voltage Transformer

Voltage Transformer installed as the main metering, shall meet the minimum requirements listed below:

| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS |
|----------------|--|---|
| Type | Outdoor Type; Minimum oil filled, Dry Type or Gas-filled | |
| Cooling | Oil immersed, Self-cooled; Butyl, Cast resin | |
| Construction | Single phase, Inductive type, single bushing | |
| Termination | Line-to-ground | Grid Code 9.3.1. PGC 2016 GRM 9.2.3.1 PGC 2016 GCR 4.4.1.3 |
| Accuracy Class | IEC 6044-2 Class 0.2 /ANSI C57.13 Class 0.3 or better | Grid Code 9.3.1.1 PGC 2016 GRM 9.2.3.1 |
| Burden | Shall not exceed the rated burden limit for the IEC 6044-2 Class 0.2 /ANSI C57.13 Class 0.3 or better. (see Table 4) Shall be compliant to the IEC 61869-3 or ANSI C57.13 Standard (or the latest version/s) | Grid Code 9.4.1.2 PGC 2016 GRM 9.2.3.1 |
| Ratio | See Table 5 | |

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|---|-----------------------|---|---|
| Provision | Proposed Amendment | | |
| | Secondary Voltage | See Table 5 | |
| | Frequency | 60 Hz | |
| | Operating Temperature | 55°C average ambient temperature, with max ambient temperature not exceeding 65°C | |
| | BIL | Refer to Table 2 for applicable BIL | |
| | Creepage distance | Refer to Table 3 for applicable creepage distance | |
| | Number of Core | Preferably Two (2) | |
| | Mounting | Depend on the applications | |
| | Grounding | | <u>Grid Code 9.3.1.4</u> PGC 2016 GCR 4.4.1.3.2 PGC GRM 9.2.2.1 (g) |
| | Security | Seal holder shall be provided to the CT secondary terminal box (see Figure 1) | <u>Grid Code 9.4.5 Meter Equipment Security</u> PGC 2016 GRM 9.3.8.2 PGC 2016 GRM 9.2.4.1 |

Annex B: Amendments to the Reference Documents

WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design)

| Provision | | | | Proposed Amendment | | | |
|---|--|---|---|---|--|---|--|
| APPENDIX L SPECIFICATIONS FOR TRANSMISSION REVENUE METERS | | | | APPENDIX L SPECIFICATIONS FOR TRANSMISSION REVENUE METERS | | | |
| ITEMS | SPECIFICATIONS | | REFERENCE DOCUMENTS | ITEMS | SPECIFICATIONS | | REFERENCE DOCUMENTS |
| | MAIN METER | BACK- UP METER | | | MAIN METER | BACK- UP METER | |
| Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | Same as the main meter | Grid Code 9.2.3.3 | Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | Same as the main meter | PGC 2016 GRM 9.2.3 Grid Code 9.2.3.3 |
| No. of Stators | Blondel's Theorem compliant /3-element | Same as the main meter | Grid Code 9.2.2.1 | No. of Stators | Blondel's Theorem compliant /3-element | Same as the main meter | PGC 2016 GRM 9.2.2.1 Grid Code 9.2.2.1 |
| Rating | 115V 1 A or 5 A 60 Hz | Same as the main meter | The rating should be suitable to the secondary rating of the instrument transformers. | Rating | 115V 1 A or 5 A 60 Hz | Same as the main meter | The rating should be suitable to the secondary rating of the instrument transformers. |
| No. of Quadrants (Measurement) | Active Energy/Power Measurement: Bi-directional Reactive Power Measurement: 4 Quadrant | Bi-directional or as required by its application | Grid Code 9.2.2.2 Grid Code 9.2.3.3 | No. of Quadrants (Measurement) | Active Energy/Power Measurement: Bi-directional Reactive Power Measurement: 4 Quadrant | Bi-directional or as required by its application | Grid Code 9.2.2.2 Grid Code 9.2.3.3 PGC 2016 GRM 9.2.2.2 PGC 2016 GRM 9.2.3.3 |
| Interval Data | Programmable to 1, 5, 15, 30, and 60 minute interval | Same as the main meter | Grid Code 9.2.3.3 | Interval Data | Programmable to 1, 5, 15, 30, and 60 minute interval | Same as the main meter | Grid Code 9.2.3.3 PGC 2016 GRM 9.2.3.3 |
| No. of Channels | The 8-channels are as follows: 1. KWH (Delivered) 2. KWH (Received) 3. KVARH (Quadrant 1) 4. KVARH (Quadrant 2) 5. KVARH (Quadrant 3) 6. KVARH (Quadrant 4) 7. KVAH (Delivered) 8. KVAH (Received) | Minimum requirements of 4 channels as follows: 1. KWH (Delivered) 2. KWH (Received) 3. KVARH (Quadrant 1) 4. KVARH (Quadrant 2) | Grid Code 9.2.2.2 Grid Code 9.2.3.2 | No. of Channels | The 8-channels are as follows: 9. KWH (Delivered) 10. KWH (Received) 11. KVARH (Quadrant 1) 12. KVARH (Quadrant 2) 13. KVARH (Quadrant 3) 14. KVARH (Quadrant 4) 15. KVAH (Delivered) | Minimum requirements of 4 channels as follows: 1. KWH (Delivered) 2. KWH (Received) 3. KVARH (Quadrant 1) 4. KVARH (Quadrant 2) | Grid Code 9.2.2.2 Grid Code 9.2.3.2 PGC 2016 GRM 9.2.2.2 PGC 2016 GRM 9.2.3.3 |
| Mass Memory | Minimum 60 day recording of a 5-minute time- | Same as main meter | WESM 4.5.1 (g) Grid Code 9.2.3.3 | | | | |

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| Provision | | | | Proposed Amendment | | | |
|-------------------|--|--|--|--------------------|--|--|--|
| | stamped demand interval for 8 recording channels | | | | 16. KVAH (Received) | | |
| Meter Registers | The meter shall be capable of measuring, registering and recording the following electrical parameters per dispatch interval: <ul style="list-style-type: none"> • KWH (Delivered) • KWH (Received) • KVARH (Quadrant 1) • KVARH (Quadrant 2) • KVARH (Quadrant 3) • KVARH (Quadrant 4) • KVAH (Delivered) • KVAH (Received) • Max KW (Delivered) • Max KW (Received) • Power Factor • Frequency • Per Phase Current • Per Phase Voltage | Minimum requirements <ul style="list-style-type: none"> • KWH (Delivered) • KWH (Received) • KVARH (Quadrant 1) • KVARH (Quadrant 2) • KVARH (Quadrant 3) • KVARH (Quadrant 4) • KVAH (Delivered) • KVAH (Received) • Max KW (Delivered) • Max KW (Received) | Grid Code 9.2.2.2 Grid Code 9.2.3.3 | Mass Memory | Minimum 60 day recording of a 5-minute time-stamped demand interval for 8 recording channels | Same as main meter | WESM 4.5.1 (g) Grid Code 9.2.3.3 PGC 2016 GRM 9.2.3.3 |
| | | | | Meter Registers | The meter shall be capable of measuring, registering and recording the following electrical parameters per dispatch interval: <ul style="list-style-type: none"> • KWH (Delivered) • KWH (Received) • KVARH (Quadrant 1) • KVARH (Quadrant 2) • KVARH (Quadrant 3) • KVARH (Quadrant 4) • KVAH (Delivered) • KVAH (Received) • Max KW (Delivered) • Max KW (Received) • Power Factor • Frequency • Per Phase Current • Per Phase Voltage | Minimum requirements <ul style="list-style-type: none"> • KWH (Delivered) • KWH (Received) • KVARH (Quadrant 1) • KVARH (Quadrant 2) • KVARH (Quadrant 3) • KVARH (Quadrant 4) • KVAH (Delivered) • KVAH (Received) • Max KW (Delivered) • Max KW (Received) | Grid Code 9.2.2.2 Grid Code 9.2.3.3 PGC 2016 GRM 9.2.2.2 PGC 2016 GRM 9.2.3.3 |
| Loss Compensation | Optional | Optional | WESM 4.5.2.2 | Loss Compensation | Optional | Optional | WESM 4.5.2.2 |
| Security | The meter shall have provisions for securing the meter data, meter configurations and programs by electronic means and/or passwords. It shall also be secured physically by way of security seals. | Same as the main meter | WESM 4.5.6 Grid Code 9.3.8.1 Grid Code 9.3.8.2 Grid Code 9.3.8.3 | Security | The meter shall have provisions for securing the meter data, meter configurations and programs by electronic means and/or passwords. It shall also be secured | Same as the main meter | WESM 4.5.6 Grid Code 9.3.8.1 Grid Code 9.3.8.2 Grid Code 9.3.8.3 PGC 2016 GRM 9.3.8.1 PGC 2016 GRM 9.3.8.2 |

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| Provision | | | | Proposed Amendment | | | |
|--------------------------------|---|------------------------|--|--------------------------------|---|------------------------|--|
| Communication Capability | The meter shall have at least a minimum of two (2) independent communication ports that could operate independently. Each port can communicate simultaneously, with each one using a different protocol. It should be capable of a two-way communication. | Same as the main meter | WESM 4.5.7.1 WESM 4.5.1 (c) Grid Code 9.2.3.3 | | physically by way of security seals. | | <u>PGC 2016 GRM 9.3.8.3</u> |
| Internal Clock | The meter shall have an internal clock with an allowable error of +/-1 second | Same as the main meter | WESM 4.5.8.1 Grid Code 9.2.3.3 | Communication Capability | The meter shall have at least a minimum of two (2) independent communication ports that could operate independently. Each port can communicate simultaneously, with each one using a different protocol. It should be capable of a two-way communication. | Same as the main meter | WESM 4.5.7.1 WESM 4.5.1 (c) Grid Code 9.2.3.3 <u>PGC 2016 GRM 9.2.3.3</u> |
| Time Synchronization | Crystal synchronization. The internal clock shall be capable of being reset set by the data collection software during normal collection operations. | Same as the main meter | WESM 4.5.8.1 Grid Code 9.2.3.3 | Internal Clock | The meter shall have an internal clock with an allowable error of +/-1 second | Same as the main meter | WESM 4.5.8.1 Grid Code 9.2.3.3 <u>PGC 2016 GRM 9.2.3.3</u> |
| Digital Display | The meter shall have a digital display with a minimum of 5 digits. | Same as the main meter | WESM 4.5.1 (c) Grid Code 9.2.3.3 | Time Synchronization | Crystal synchronization. The internal clock shall be capable of being reset set by the data collection software during normal collection operations. | Same as the main meter | WESM 4.5.8.1 Grid Code 9.2.3.3 <u>PGC 2016 GRM 9.2.3.3</u> |
| Codes and Standards Compliance | The meter shall adhere to established International Standards | Same as the main meter | Grid Code 4.2.10.1 IEC, ANSI/IEEE | Digital Display | The meter shall have a digital display with a minimum of 5 digits. | Same as the main meter | WESM 4.5.1 (c) Grid Code 9.2.3.3 <u>PGC 2016 GRM 9.2.3.3</u> |
| Applicable Compliance Tests | These tests shall include material tests and established practice and/or other approved standards. Routine tests prescribed by the applicable standards shall be performed. In particular, | Same as the main meter | Grid Code 9.2.5.2 Grid Code 9.2.5.3 Grid Code 9.2.8.1 IEC 255-1 IEC 255-A (Class III) IEC 245-4 | Codes and Standards Compliance | The meter shall adhere to established International Standards | Same as the main meter | Grid Code 4.2.10.1 <u>PGC 2016 GCR 4.2.10</u> IEC, ANSI/IEEE |

Annex B: Amendments to the Reference Documents

| WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design) | | | | | | | |
|--|--|------------------------|--|-----------------------------|--|------------------------|--|
| Provision | | | | Proposed Amendment | | | |
| | the following tests shall be performed for the revenue meters: a. Power frequency tests (insulation) b. Impulse voltage test (insulation). c. HF interference test d. Surge withstand and fast transient tests | | | Applicable Compliance Tests | These tests shall include material tests and established practice and/or other approved standards. Routine tests prescribed by the applicable standards shall be performed. In particular, the following tests shall be performed for the revenue meters: e. Power frequency tests (insulation) f. Impulse voltage test (insulation). g. HF interference test h. Surge withstand and fast transient tests | Same as the main meter | Grid Code 9.2.5.2 Grid Code 9.2.5.3 Grid Code 9.2.8.1 PGC 2016 GRM 9.2.5.2 PGC 2016 GRM 9.2.5.3 PGC 2016 GRM 9.2.8.1 IEC 255-1 IEC 255-A (Class III) IEC 245-4 |
| Battery | Capable of retaining readings and time of day for at least two days without external power source | Same as the main meter | WESM 4.5.1 (g) Grid Code 9.2.3.3 | Battery | Capable of retaining readings and time of day for at least two days without external power source | Same as the main meter | WESM 4.5.1 (g) Grid Code 9.2.3.3 PGC 2016 GRM 9.2.3.3 |
| Enclosure | Minimum requirements Indoor: Protected against dust limited ingress (no harmful deposit) and Protection against vertically falling drops of water e.g. condensation Outdoor: Totally protected against dust and Protection against vertically falling drops of water e.g. condensation | Same as the main meter | ANSI 12.1 4.3.4 Grid Code 9.2.2.3 Grid Code 9.2.2.4 Grid Code 9.3.8 | Enclosure | Minimum requirements Indoor: Protected against dust limited ingress (no harmful deposit) and Protection against vertically falling drops of water e.g. condensation Outdoor: Totally protected against dust and Protection against | Same as the main meter | ANSI 12.1 4.3.4 Grid Code 9.2.2.3 Grid Code 9.2.2.4 Grid Code 9.3.8 PGC 2016 GRM 9.2.2.3 PGC 2016 GRM 9.2.2.4 PGC 2016 GRM 9.3.8 |

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| Provision | | | | Proposed Amendment | | | |
|--|---|------------------------|---|--|---|------------------------|--|
| APPENDIX M | | | | APPENDIX M | | | |
| SPECIFICATIONS FOR REVENUE METERS FOR EMBEDDED GENERATORS REGISTERED AS WESM PARTICIPANTS | | | | SPECIFICATIONS FOR REVENUE METERS FOR EMBEDDED GENERATORS REGISTERED AS WESM PARTICIPANTS | | | |
| | | | | | vertically falling drops of water e.g. condensation | | |
| ITEMS | SPECIFICATIONS | | REFERENCE DOCUMENTS | ITEMS | SPECIFICATIONS | | REFERENCE DOCUMENTS |
| | MAIN METER | BACK-UP METER | | | MAIN METER | BACK-UP METER | |
| Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | Same as the main meter | IEC 687 4.6 | Accuracy Class | IEC 687 Class 0.2 / ANSI 12.20 Class 0.3 or better | Same as the main meter | IEC 687 4.6 <u>PDC 2016 7.2.7</u> |
| No. of Stators | Corresponds to the service type and complying with Blondel's Theorem | Same as the main meter | Dist. Code 8.4.3.1 ANSI C12.1 | No. of Stators | Corresponds to the service type and complying with Blondel's Theorem | Same as the main meter | Dist. Code 8.4.3.1 ANSI C12.1 <u>PDC 2016 7.2.7</u> |
| Voltage Rating | Corresponds to the secondary voltage rating of voltage transformers used | Same as the main meter | Dist. Code 5.5.1.1 | Voltage Rating | Corresponds to the secondary voltage rating of voltage transformers used | Same as the main meter | Dist. Code 5.5.1.1 <u>PDC 2016 7.2.7</u> |
| Current Rating | Corresponds to the secondary current rating of current transformers used (typically 1A or 5A) | Same as the main meter | ANSI or IEC Standard | Current Rating | Corresponds to the secondary current rating of current transformers used (typically 1A or 5A) | Same as the main meter | ANSI or IEC Standard <u>PDC 2016 7.2.7</u> |
| Frequency | 60 Hz | Same as the main meter | Dist. Codes 3.2.2.1 | Frequency | 60 Hz | Same as the main meter | Dist. Codes 3.2.2.1 <u>PDC 2016 7.2.7</u> |
| Measurement | Uni-directional active metering (delivered) and 2-quadrant reactive metering) Or Bi-directional depending on the purpose | Same as the main meter | Dist Codes 8.3.3.1 Dist. Codes 8.3.4.2 Dist. Code 8.4.3.2 | Measurement | Uni-directional active metering (delivered) and 2-quadrant reactive metering) Or Bi-directional depending on the purpose | Same as the main meter | Dist Codes 8.3.3.1 Dist. Codes 8.3.4.2 Dist. Code 8.4.3.2 <u>PDC 2016 7.2.7</u> |
| Interval Data | Programmable to 5, 15, 30 minute interval | Same as the main meter | Dist. Code 8.4.4.1 | | | | |

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| Provision | | | | Proposed Amendment | | | |
|------------------------------|---|------------------------|---|------------------------------|---|------------------------|---|
| No. of Channels | At least four (4) channels for bi-directional meters: a. kWh (Delivered) b. kVARh (Delivered) c. kWh (Received) d. kVARh (Received) At least two (2) channels for unidirectional meters: a. kWh (Received) b. kVARh (Received) | Same as the main meter | This satisfies the minimum requirements as stated under: Dist. Code 8.3.3.2 Dist. Code 8.3.4.3 | Interval Data | Programmable to 5, 15, 30 minute interval | Same as the main meter | Dist. Code 8.4.4.1 PDC 2016 7.2.7 |
| | | | | No. of Channels | At least four (4) channels for bi-directional meters: e. kWh (Delivered) f. kVARh (Delivered) g. kWh (Received) h. kVARh (Received) At least two (2) channels for unidirectional meters: c. kWh (Received) d. kVARh (Received) | Same as the main meter | This satisfies the minimum requirements as stated under: Dist. Code 8.3.3.2 Dist. Code 8.3.4.3 PDC 2016 7.2.7 |
| Mass Memory | Minimum of 60-day recording of a 5-minute time-stamped demand interval for 4 recording channels for bi-directional meters or 2 recording channels for uni-directional meters | Same as the main meter | Dist. Code 8.3.5.3 | Mass Memory | Minimum of 60-day recording of a 5-minute time-stamped demand interval for 4 recording channels for bi-directional meters or 2 recording channels for uni-directional meters | Same as the main meter | Dist. Code 8.3.5.3 PDC 2016 7.2.7 |
| Recording Billing Quantities | Display and record TOU energy and power parameters (kWh, kVarh, max. kW & cum. kW) for all rates | Same as the main meter | Dist. Code 8.4.3.1 | Recording Billing Quantities | Display and record TOU energy and power parameters (kWh, kVarh, max. kW & cum. kW) for all rates | Same as the main meter | Dist. Code 8.4.3.1 PDC 2016 7.2.7 |
| Loss Compensation | Optional | Optional | WESM 4.5.2.2 | Loss Compensation | Optional | Optional | WESM 4.5.2.2 |
| Security | The meter shall have provisions for securing the meter data, meter configurations and programs by electronic means and/or passwords. It shall also be secured | Same as the main meter | WESM 4.5.6 | Security | The meter shall have provisions for securing the meter data, meter configurations and programs by electronic | Same as the main meter | WESM 4.5.6 PDC 2016 7.4.7 |

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| Provision | | | | Proposed Amendment | | | |
|--------------------------------|---|------------------------------------|---|--------------------------------|--|------------------------------------|---|
| | physically by way of security seals. | | | | means and/or passwords. It shall also be secured physically by way of security seals. | | |
| Communication Capability | The meter shall have one (1) independent communication port in addition to the optical port. | Minimum requirements: Optical port | WESM 4.5.7.1 WESM 4.5.1(c) Dist. Code 8.4.4.2 | Communication Capability | The meter shall have one (1) independent communication port in addition to the optical port. | Minimum requirements: Optical port | WESM 4.5.7.1 WESM 4.5.1(c) Dist. Code 8.4.4.2 PDC 2016 7.2.7 |
| Internal Clock/Battery | With long life lithium battery for clock/ calendar maintenance | Same as the main meter | WESM 4.5.8.1 Dist. Code 8.4.4.6 | Internal Clock/Battery | With long life lithium battery for clock/ calendar maintenance | Same as the main meter | WESM 4.5.8.1 Dist. Code 8.4.4.6 PDC 2016 7.2.1 |
| Time Synchronization | Shall be crystal synchronization time-based. The internal clock shall be capable of being reset/set by the data collection software during normal collection operations. | Same as the main meter | | Time Synchronization | Shall be crystal synchronization time-based. The internal clock shall be capable of being reset/set by the data collection software during normal collection operations. | Same as the main meter | |
| Digital Display | The meter shall have a digital display with a minimum of 5 digits. | Same as the main meter | WESM 4.5.1 (c) Dist. Code 8.4.3.1 | Digital Display | The meter shall have a digital display with a minimum of 5 digits. | Same as the main meter | WESM 4.5.1 (c) Dist. Code 8.4.3.1 PDC 2016 7.2.7 |
| Codes and Standards Compliance | The meter shall adhere to established International Standards | Same as the main meter | IEC, ANSI/IEEE | Codes and Standards Compliance | The meter shall adhere to established International Standards | Same as the main meter | IEC, ANSI/IEEE PDC 2016 7.2.7 |
| Enclosure | The meter shall be provided with the necessary cover to protect the internal component against the harmful elements of environment that may affect its measuring circuit and operation. | Same as the main meter | ANSI 12.1 4.3.4 | Enclosure | The meter shall be provided with the necessary cover to protect the internal component against the harmful elements of environment that may affect its | Same as the main meter | ANSI 12.1 4.3.4 |

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| Provision | | | Proposed Amendment | | |
|--|--|--|--|--|--|
| APPENDIX N SPECIFICATIONS FOR CURRENT TRANSFORMERS | | | APPENDIX N SPECIFICATIONS FOR CURRENT TRANSFORMERS | | |
| | | | measuring circuit and operation. | | |
| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS | ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS |
| Type | Outdoor Type; Minimum oil filled, Dry Type or Gas-filled | | Type | Outdoor Type; Minimum oil filled, Dry Type or Gas-filled | |
| Cooling | Oil immersed, Self-cooled; Butyl, Cast resin | | Cooling | Oil immersed, Self-cooled; Butyl, Cast resin | |
| Construction | Single phase, wound type, free standing | | Construction | Single phase, wound type, free standing | |
| Accuracy Class | IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 or better | Grid Code 9.2.3.2 Grid Code Appendix 2 | Accuracy Class | IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 or better | Grid Code 9.2.3.2 Grid Code Appendix 2 PGC 2016 GRM 9.2.3.2 |
| Burden | Shall not exceed the rated burden limit of 12.5 VA for the IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 (see Table 1) | Grid Code 9.2.3.2 Grid Code Appendix 2 | Burden | Shall not exceed the rated burden limit of 12.5 VA for the IEC 44-1 Class 0.2 /ANSI C57.13 Class 0.3 (see Table 1) Shall be based on the standard rated burden as specified in the latest revision of IEC 61869-2 or ANSI/IEEE C57.13, or their latest equivalent standards. | Grid Code 9.2.3.2 Grid Code Appendix 2 PGC 2016 GRM 9.2.3.2 |
| Rated Primary Current | The thermal rating factor shall not be less than 1.0. | | Rated Primary Current | The thermal rating factor shall not be less than 1.0. | |
| Secondary Current | 1A or 5A | Grid Code 9.2.3.2 IEC 4.2 Standard values of rated secondary currents | Secondary Current | 1A or 5A | Grid Code 9.2.3.2 PGC 2016 GRM 9.2.3.2 |
| Rating Factor | Minimum of 1.0 at 30°C | | | | |
| Frequency | 60 Hz | | | | |
| Ambient Air Temperature | -5°C and 50°C for very hot climate | IEC 3.2.1 1996 | | | |

Annex B: Amendments to the Reference Documents

WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design)

| Provision | | | Proposed Amendment | | |
|--|--|---|-------------------------|---|---|
| BIL | Refer to Table 2 for applicable BIL | | | | IEC 4.2 Standard values of rated secondary currents |
| Creepage Distance | Refer to Table 3 for applicable creepage distance | | | | |
| Number of Core | Preferably Two (2) metering cores | Grid Code 9.2.3.2 | | | |
| Mounting | Depend on the applications | | | | |
| Grounding | | Grid Code 9.2.2.1 (g) | | | |
| Security | Seal holder shall be provided to the CT secondary terminal box (see Figure 1) | Grid Code 9.2.4.1 | | | |
| APPENDIX O | | | | | |
| SPECIFICATIONS FOR VOLTAGE TRANSFORMERS | | | | | |
| ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS | | | |
| Type | Outdoor Type; Minimum oil filled, Dry Type or Gas-filled | | | | |
| Cooling | Oil immersed, Self-cooled; Butyl, Cast resin | | | | |
| Construction | Single phase, Inductive type, single bushing | | | | |
| Termination | Line-to-ground | Grid Code 9.3.1. | | | |
| Accuracy Class | IEC 6044-2 Class 0.2 /ANSI C57.13 Class 0.3 or better | Grid Code 9.2.3.2 Grid Code Appendix 2 | | | |
| Burden | Shall not exceed the rated burden limit for the IEC 6044-2 Class 0.2 /ANSI C57.13 Class 0.3 or better. (see Table 4) | Grid Code 9.2.3.2 Grid Code Appendix 2 | | | |
| APPENDIX O | | | | | |
| SPECIFICATIONS FOR VOLTAGE TRANSFORMERS | | | | | |
| | | | Rating Factor | Minimum of 1.0 at 30°C | |
| | | | Frequency | 60 Hz | |
| | | | Ambient Air Temperature | -5°C and 50°C for very hot climate | IEC 3.2.1 1996 |
| | | | BIL | Refer to Table 2 for applicable BIL | |
| | | | Creepage Distance | Refer to Table 3 for applicable creepage distance | |
| | | | Number of Core | Preferably Two (2) metering cores | Grid Code 9.2.3.2 PGC 2016 GRM 9.2.3.2 |
| | | | Mounting | Depend on the applications | |
| | | | Grounding | | Grid Code 9.2.2.1 (g) PGC 2016 GCR 4.4.1.3.2 PGC GRM 9.2.2.1 (g) |
| | | | Security | Seal holder shall be provided to the CT secondary terminal box (see Figure 1) | Grid Code 9.2.4.1 PGC 2016 GRM 9.3.8.2 PGC 2016 GRM 9.2.4.1 |

Annex B: Amendments to the Reference Documents

WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design)

| Provision | | | Proposed Amendment | | |
|-----------------------|---|-----------------------|-----------------------|---|--|
| Ratio | See Table 5 | | ITEMS | SPECIFICATIONS | REFERENCE DOCUMENTS |
| Secondary Voltage | See Table 5 | | Type | Outdoor Type; Minimum oil filled, Dry Type or Gas-filled | |
| Frequency | 60 Hz | | Cooling | Oil immersed, Self-cooled; Butyl, Cast resin | |
| Operating Temperature | 55°C average ambient temperature, with max ambient temperature not exceeding 65°C | | Construction | Single phase, Inductive type, single bushing | |
| BIL | Refer to Table 2 for applicable BIL | | Termination | Line-to-ground | Grid Code 9.3.1. PGC 2016 GRM 9.2.3.1 |
| Creepage distance | Refer to Table 3 for applicable creepage distance | | Accuracy Class | IEC 6044-2 Class 0.2 /ANSI C57.13 Class 0.3 or better | Grid Code 9.2.3.2 Grid Code Appendix 2 PGC 2016 GRM 9.2.3.1 |
| Number of Core | Preferably Two (2) | | Burden | Shall not exceed the rated burden limit for the IEC 6044-2 Class 0.2 /ANSI C57.13 Class 0.3 or better. (see Table 4) Shall be compliant to the IEC 61869-3 or ANSI C57.13 Standard (or the latest version/s) | Grid Code 9.2.3.2 Grid Code Appendix 2 PGC 2016 GRM 9.2.3.1 |
| Mounting | Depend on the applications | | Ratio | See Table 5 | |
| Grounding | | Grid Code 9.2.2.1 (g) | Secondary Voltage | See Table 5 | |
| Security | Seal holder shall be provided to the CT secondary terminal box (see Figure 1) | Grid Code 9.2.4.1 | Frequency | 60 Hz | |
| | | | Operating Temperature | 55°C average ambient temperature, with max ambient temperature not exceeding 65°C | |
| | | | BIL | Refer to Table 2 for applicable BIL | |
| | | | Creepage distance | Refer to Table 3 for applicable creepage distance | |
| | | | Number of Core | Preferably Two (2) | |
| | | | Mounting | Depend on the applications | |

Annex B: Amendments to the Reference Documents

| WESM Manual on Metering Standards and Procedures Issue 12.0 (for enhanced market design) | | |
|--|--------------------|--|
| Provision | Proposed Amendment | |
| | Grounding | <p>Grid Code 9.2.2.1 (g) <u>PGC 2016 GCR 4.4.1.3.2</u> <u>PGC GRM 9.2.2.1 (g)</u></p> |
| | Security | <p>Seal holder shall be provided to the CT secondary terminal box (see Figure 1)</p> <p>Grid Code 9.2.4.1 <u>PGC 2016 GRM 9.3.8.2</u> <u>PGC 2016 GRM 9.2.4.1</u></p> |