ACTIVITY COMPLETION REPORT

Assistance to Market Participants for the development of the electricity Commercial Metering Code in Ukraine CWP.02.UA

INOGATE Technical Secretariat and Integrated Programme in support of the Baku Initiative and the Eastern Partnership energy objectives

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Implemented by:
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LDK Consultants S.A.
MVV decon GmbH
ICF International
Statistics Denmark
Energy Institute Hrvoje Požar
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## Abbreviations and acronyms

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<th>Abbreviation</th>
<th>Description</th>
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</thead>
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<tr>
<td>AA</td>
<td>Association Agreement</td>
</tr>
<tr>
<td>CWP</td>
<td>Country Work Plan</td>
</tr>
<tr>
<td>DCFTA</td>
<td>Deep and Comprehensive Free Trade Area</td>
</tr>
<tr>
<td>ECT</td>
<td>Energy Community Treaty</td>
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<tr>
<td>ECS</td>
<td>Energy Community Secretariat</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<td>ITS</td>
<td>INOGATE Technical Secretariat</td>
</tr>
<tr>
<td>PCs</td>
<td>INOGATE Partner Countries</td>
</tr>
<tr>
<td>UA</td>
<td>Ukraine</td>
</tr>
</tbody>
</table>
1 PART 1 – EUROPEAN COMMISSION

1.1 Background

<table>
<thead>
<tr>
<th>Assignment Title:</th>
<th>Assistance to Market Participants for the development of the electricity Commercial Metering Code in Ukraine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country and Dates:</td>
<td>Ukraine, April 2016</td>
</tr>
<tr>
<td>Beneficiary Organisation(s):</td>
<td>Ukrenergo, NEURC, Ministry of Energy &amp; Coal Industries</td>
</tr>
<tr>
<td>Beneficiary Organisation’s key contact persons – name and e-mail address</td>
<td>Mr Olexander Karpenko, Deputy Head of IT Department, Ukrenergo. Email: <a href="mailto:olexa.karpenko@gmail.com">olexa.karpenko@gmail.com</a></td>
</tr>
</tbody>
</table>

Deliverables Produced

1. Meeting #1 with Beneficiary – 22nd February 2016
2. Meeting #2 with Beneficiary – 23rd February 2016
3. Meeting #3 with Beneficiary – 24th February 2016
4. Initial Workshop 1 – 3rd March 2016
5. Final Workshop 2 – 22nd April 2016

<table>
<thead>
<tr>
<th>Expert Team Members</th>
<th></th>
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<tbody>
<tr>
<td>1. Team Leader - Adrian Twomey</td>
<td></td>
</tr>
<tr>
<td>2. Senior NKE - Jorgen Bircher</td>
<td></td>
</tr>
<tr>
<td>3. Senior NKE - Alejo Aloira</td>
<td></td>
</tr>
</tbody>
</table>

1.2 Essence of the Activity

With the signature of the Association Agreement (AA) between Ukraine and the European Union in 2014, the introduction of the Deep and Comprehensive Free Trade Agreement (DCFTA), and the obligations the country has to meet the Energy Community Treaty (ECT), it will be required for Ukraine to adopt and implement a large number of electricity European and international standards as part of the Energy acquis communautaire. In order to be able to do so, and thus fulfil its obligations under the AA and ECT, Ukraine will have to develop a Commercial Metering Code as part of the Market reforms and to facilitate the development and implementation of the Market rules.

This assignment, requested by Ukrenergo, will help to ensure that the organisation is able to adopt new rules that will facilitate the operation of a competitive and unbundled Electricity market that is compliant with the Third Energy Package.
1.3 Key Findings

Ukraine is now facing the challenge of having to adopt the 3rd Energy Package – including a range of technical rules and procedures. The workshops performed by ITS has been able to bring together a range of stakeholders which represent the different players within the electricity.

The activities performed included:

- Meetings with relevant stakeholders (mainly Working Group on technical support provision to WEM Council)
- Presentation to the stakeholders on the approach proposed to improve the initial draft of the Commercial Metering Code
- Development of a new (complete) Draft of the Commercial Metering Code, including the development of new sections and annexes related with the commercial aspects of the Code (technical aspects were considered adequately covered in the initial draft)
- Conducting a Workshop with most relevant stakeholders on the most important aspects of the CMC and, particularly, the changes or additions introduced.

1.4 Ownership and Benefits of the Activity

The main benefits of the activity for the Beneficiary are:

1. A new (complete) draft of the Commercial Metering Code (CMC) was developed, based on the (original) initial draft which has taken into consideration the technical aspects contained in the original version;

2. A draft CMC which has adapted the processes and procedures established in the Code to make them compatible with the global objective of establishing a new Electricity Market in Ukraine;

3. A draft CMC which has included new Sections and/or sub-sections to more clearly define the commercial aspects of metering (objection to the metered values, data transferring among stakeholders, rules for aggregating results, publication of results, etc.)

4. A draft CMC which has developed specific Annexes dealing with the methodology for profiling the consumption of customers without hourly metering, validation checks to be performed on the collected data and rules for substitution or data estimation.

The Beneficiary took ownership in the following way:

1. Adopted the draft of the Commercial Metering Code
2. Will implement the Commercial Metering Code.

1.5 Recommendations

In order to make the developed Code operational, following activities need to be carried out:
• Detailed review of the Ukrainian version of the Code. The Code has been developed in English and translated into Ukrainian. A full review is necessary to be performed by the Working Group on technical support provision to WEM Council in order to:

  • Adapt terminology and expressions to those currently being used in Ukraine;
  • Agree (or amend if considered appropriate) on some concepts and/or procedures which have been proposed by the Consultants.

Eventually, this review may lead to new (amended) versions of the Code proposed by the Consultants

• Agree, with other stakeholders in charge of the development of the rules of the new electricity market, on the prescriptions included in the Code and their inter-relation with these rules. In particular, the rules that should be established for the settlement (preliminary and final), including dates for information interchange, shall be fully compatible with those proposed in the new Draft of the Code. Eventually, through these necessary discussions, some other (minor) amendments would be necessary.

• Produce a final review of the Code by Ukrainian lawyers, to assure full compatibility of the proposed draft with other national legislation.

• Issue the final version of the Code.

It is highly advisable that the CMC will not be issued until a final agreement has been reached on the rules for the electricity market. Otherwise, once the rules of the market are established, it is highly probable that some provisions of the CMC need to be adapted and then re-issued.

1.6 Challenges Faced

The main challenges that have been faced include:

1. During the workshop there was a lengthy debate on application of the profiling – which method to apply – the recommendation being the simplest in line with the draft Market Rules;

2. Settlement Period – what should be the appropriate period of settlement;

3. Transition period – how to move to the final metering system from the current system and the hierarchy of responsibilities.

1.7 Impact Matrix

<table>
<thead>
<tr>
<th>Impact Area</th>
<th>Developments</th>
<th>2012</th>
<th>2015 / Apr 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation</td>
<td>New Draft Electricity Law to be approved by Rada</td>
<td>No Commercial Metering Code</td>
<td>Draft Commercial Metering Code aligned with the new draft Electricity Law and aligned with common European practice and with the ENTSO-E Harmonized Role Model.</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------</td>
<td>-----------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Technology</td>
<td>Upgrade and modernisation of the Electricity infrastructure</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Economics</td>
<td>More efficiently-derived pricing — arising from unbundling opportunities and greater transparency of costs within electricity value chain</td>
<td>No unbundling (compliant with 3rd Energy Package)</td>
<td>Draft Commercial Metering Code will facilitate competitive and transparent electricity market — with ultimately lower more efficient pricing structures</td>
</tr>
<tr>
<td>Social</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
2 PART 2 - BENEFICIARIES

2.1 Executive Summary

The activity was requested by Ukrenergo as part of the CWP available to stakeholders of the INOGATE ITS project. A range of meetings and two workshops took place in Kiev between the 22nd February and 22nd April 2016.

The main objective of the workshops was to explain and discuss the draft Commercial Metering Code. The participants were active and engaged throughout the workshops and raised a number of technical issues covering profiling, settlements and transition period.

The final workshop achieved an excellent result: the adoption of draft commercial metering code.

2.2 Draft Commercial Metering Code – Final Presentation
Introduction and Objectives

- **Overall objective:**
  - to support the effort of NEURC, NEC Ukrenergo, Energorynok and the Ministry of Energy and Coal Industry to develop the secondary legislation acts provided for in the new draft Electricity Law of Ukraine.

- **Assignment objectives:**
  - To develop a Commercial Metering Code (CMC) aligned with the new draft Electricity Law of Ukraine
  - To respect principles of Directive 2009/72/EC
  - To align the CMC with common European practice and with the ENTSO-E Harmonised Role Model

Summary of main changes (i)

- Several new sections/provisions added or heavily modified:
  - Definition of several important expressions
  - Review and amendment of the CMC
  - Technical requirements for communications and data interchange
  - Data estimation and data substitution procedures
  - Procedures for determining the “Best Value of Metering”
  - Roles distribution between CMA and CEMSPs
  - Transitory provisions on the Metering management system at the CMS and on the Initial Appointment of CMA and CEMSPs
  - Other minor issues
Summary of main changes (ii)

- Residential customers now have the same rights and responsibilities as other consumers types
- Provisions for technical requirements of operational metering equipment kept in the CMC
- Clarification of the difference and phases for Automated Remote reading and Local meter reading

New CMC structure (i)

- New code structure and organization
  - I. Introduction
  - II. Review and amendment of the Commercial Metering Code
  - III. Organization of the commercial metering service
  - IV. Accreditation of entities involved in Commercial Metering
  - V. Technical requirements for commercial metering
  - VI. Technical requirements for communications and data interchange
  - VII. Data Collection and Management
  - VIII. Validation of commercial electricity metering data by the metered data responsible
  - IX. Processing of metered data
New CMC structure (ii)

- X. Storage of metered data
- XI. Aggregation of metered data
- XII. Metrological provision of commercial metering devices
- XIII. Verification and Inspection of metering systems
- XIV. Sealing of commercial metering systems
- XV. On site inspection of metering systems
- XVI. De-energisation of metering systems
- XVII. Dispute resolution procedure
- XVIII. Financing the measures for commercial metering
- Transitory Provision 1: Adaptation of the Metering System
- Transitory Provision 2: Metering Management System at the CMA
- Transitory Provision 3: Initial Appointment of CMA and CEMSPs
- Annex M-1: Method for metering data processing (Profiling)

Glossary and Definitions (i)

- Market Participant
  - As defined in the "On Basic Principles of the Electricity Market Functioning"
  - CMC applies only to Market Participants (+ NEURC and the CMA)
- CEMSP of Last Resort
  - CEMSP appointed by default in case the PRCM has not identified/nominated a CEMSP
- Metering Time Step
  - Time step used by the Settlement Administrator performs the settlements of each Market Participant.
  - Currently, one hour. It may be changed in the future
- Best Value of Metering
  - The metered (or estimated) value which will be used for settlement (single value per MTS and connection point).
Glossary and Definitions (ii)

- Differences between “Connection Point” and “Metering Point”
  - The Connection Point is where two or more Market Participants joins
    - It is the frontier point used for settlement
  - The Metering Point is the point where the meters are actually located
  - In most of the cases it will be the Connection Point, but there may be cases in which they are different.

Glossary and Definitions (iii)

- Clear differentiation between Meter and Metering System
**Glossary and Definitions (iv)**

- Two different Types of backup metering
  - **Redundant Metering**
    - Both equipment located at the same physical point
  - **Verification Metering**
    - Equipment(s) are located at physical points
    - The value at the connection point is obtained through simple algebraic operations

**Review and amendment of the CMC**

- New specific provisions to rule the review and amendment of the Code itself.
- Responsible party: the Code Administrator, that is, the CMA
  - The Code Administrator shall allow any party directly or indirectly affected by this Code to submit proposals to review specific aspects or contents of the Code
- Code Administrator proposes to NEURC, which approves it or not,
  - a) To accept or review amendment proposals that has been presented to the Code Administrator;
  - b) Amendments to correct, complete or improve this Code and, eventually, the Market Rules; and
  - c) New or updated Commercial Metering Procedures for implementation of this Code.
Review and amendment of the CMC

- Annually, the Code Administrator prepares and sends to NEURC, all CEMSPs and other Market Participants a Commercial Metering Report including:
  - a) Problems identified in the implementation and the results of the Commercial Metering Code and the Commercial Metering Procedures;
  - b) Conflicts of interpretation with CEMSP or Market Participants;
  - c) Compilation of all proposals for amendment and additions to this Code received since the start of the previous year, or upon request
  - d) Any other relevant matter to identify any problems in the performance, feasibility, efficiency and design of this Code.

- Any stakeholder can send an Amendment Submission and:
  - The Code Administrator submits all of them with an evaluation to NEURC
  - If deemed necessary, and amendment to the Code is proposed by Code Administrator to NEURC
  - NEURC approves or reject the proposed Amendment based on a specific list of criteria

Organisation of the metering service

- Commercial Metering Administrator
- CMA – Data Hub
- Commercial Electricity Metering Service Provider
- Party Responsible for Commercial Metering
- Code Administrator
- Metering Points Administrator
- Metered Data Aggregator
- Metered Data Responsible
- Meter Data Collector
- Meter Operator
- Owns Metering Equipment
- Selects CEMSP
- Can be its own CEMSP if accredited
Some hints on Roles allocation (i)

- **Metered Data Collector** collects metering data from each (and all) metering devices at a Connection Point (for which it is responsible).
  - It may be a single meter or multiple meters
  - It performs initial checks and problems with the Metering System damages or broken seals.
  - It transfers all data to the Metering Data Responsible

- **The Metered Data Responsible**:
  - Perform checks that involves more than one Meter
  - Perform plausibility checks
  - Estimate and/or substitute data (it is the only institution allowed to do this)
  - Determine the Best Value of Metering for each Connection Point (for which is responsible)
  - Store all metered data and calculations which ends up with substitution / estimation
  - Transfer the BVM to the Metering Point Administrator

Some hints on Roles allocation (ii)

- **The Metering Data Aggregator**
  - Perform integrity checks (inconsistencies between data in the Registry and data received from the Metered Data Responsible), but it does not perform any kind of validation/checks on the accuracy of the received data.
  - Allowed to substitute data only in exceptional cases (analysed below)
  - Perform profiling for all Connection Points which are not equipped with hourly (or sub-hourly) metering
  - Using information from the Metering Registry, operated by the Metering Point Administrator, aggregates metering data per Market Participant and Metering Time Step.
  - Aggregates the data per Market Participant
  - Transfer the aggregated data to the Settlement Administrator
CEMSP of Last Resort

- Definition of Commercial Electricity Metering Service Provider of Last Resort (CEMSP of Last Resort).
- It formalizes the fact that there needs to be a CEMSP to which users (PRCM) can always access whenever:
  - It is not possible to find an open market CEMSP
  - It is not desired to find an open market CEMSP
  - The user is in the process of changing its designating CEMSP and in the interim period there is, for whatever reason, a time gap when a temporary CEMSP is required
- It is a regulated activity, provided at regulated tariffs.
- The CEMSP of Last Resort for a certain metering point shall be the network operator for the area where that metering point is located
- Moving to an open market CEMSP is as easy as requesting a change in your designated CEMSP to another accredited one.

Tech. Requirements for Communications and Data Interchange

- The CEMSP AS definition, purpose and characteristics required detail and organization.
- 6.1.1 The CMA communications system and the CEMSP AS system shall integrate a data concentrator (automated system), that is, a computer based systems that receives, processes, stores and distributes data obtained from metering devices.
Tech. Requirements for Communications and Data Interchange

- The whole data concentrator system requirements are defined by the CMA:
  - 6.1.7 The data exchanged between the CEMSP data concentrators and the CMA data concentrator shall comply with the requirements, processes and protocols defined by the CMA. The CMA shall make the required specifications to CEMSPs as required.
- Dedicated communication channels options listed: GSM, GPRS, fiber optics, LTE, DSL, power line carrier, or similar new technologies that replace them. Others valid too if so approved by the CMA.
- The CMA shall keep an updated register (Register of automated systems) of all linked secondary concentrators (CEMSP AS Registry), all directly linked metering devices and the main elements of its own communications system, their location, their protocols, their connectivity and their technical characteristics (hardware and software). The register shall also include the name and contact details of the party responsible for the management, operation and maintenance of the registered element (the related CEMSP or the CMA itself).

Metered Data Collector
Data Collection and Management (i)

- CEMSP shall label data collected according to 4 Qualifiers:
  - Qualifier 1: According with the Metering System installed at the Connection Point (Compliant with the CMC or not)
  - Qualifier 2: According with the type of Meter read (Principal, Redundant or Verification meter)
  - Qualifier 3: According with the way the information is collected (by CEMSP in Automatic, Electronic Local reading or Visual Local reading // or by the Customer)
  - Qualifier 4: According with the initial verification performed by the Metered Data Collector (Complete and Accurate / Incomplete but Accurate / Inaccurate / No Data)
- 7.1.4 These labels shall be informed to the Metered Data Responsible in order it performs the verification and completion process before submitting it to the Metered Data Aggregator.
- 7.1.5 The CMA will develop procedures indicating the way these labels shall be coded when the data is interchanged among stakeholders.
## Metered Data Collector
### Data Collection and Management (ii)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualifier 1: According with the Metering System installed at the Connection Point</td>
<td></td>
</tr>
<tr>
<td>The Metering System complies with all the Code requirements</td>
<td>“Compliant”</td>
</tr>
<tr>
<td>The Metering System does not fully comply</td>
<td>“Non-compliant”</td>
</tr>
<tr>
<td>Qualifier 2: According with the type of Meter read</td>
<td></td>
</tr>
<tr>
<td>Information corresponding to the Principal Meter</td>
<td>“Principal”</td>
</tr>
<tr>
<td>Information corresponding to the Redundant Meter</td>
<td>“Redundant”</td>
</tr>
<tr>
<td>Information corresponding to the Verification Meters</td>
<td>“Verification”</td>
</tr>
<tr>
<td>Qualifier 3: According with the way the information is collected</td>
<td></td>
</tr>
<tr>
<td>Information collected by the CEMSP AS</td>
<td>“Automatic”</td>
</tr>
<tr>
<td>Information collected through Electronic Local Data Reading</td>
<td>“Electronic”</td>
</tr>
<tr>
<td>Information collected by the Customer</td>
<td>“Customer”</td>
</tr>
<tr>
<td>Qualifier 4: According with the initial verification performed by the Metered Data Collector</td>
<td></td>
</tr>
<tr>
<td>The data passes initial checks performed and it is complete</td>
<td>“Complete and Accurate”</td>
</tr>
<tr>
<td>The data passes initial checks but it is incomplete</td>
<td>“Incomplete but Accurate”</td>
</tr>
<tr>
<td>The data does not pass initial checks</td>
<td>“Inaccurate”</td>
</tr>
<tr>
<td>It is not possible to retrieve the data</td>
<td>“No data”</td>
</tr>
</tbody>
</table>

## Metered Data Collector
### Data Collection and Management (iii)

- **Automated Remote Reading:**
  - Type 1, Type 2 and Type 3 metering points shall be remotely read (integrated into the CEMSP AS, and therefore connected directly or indirectly to the CMA concentrator.
  - Added provision to specifically cover Type 4 and Type 5 metering points whenever possible.

- **Decision on the scope of automated remote reading to Type 4 and Type 5 customers made by NARUC:**
  - 7.2.2 NARUC will establish regulations indicating which kind of the Metering Points of Type 4 and 5 shall be mandatory equipped with Automatic Meter Reading, as well as a multi-year calendar for gradual implementation of Automatic Meter Reading of Metering Points of Type 4 and 5.
Metered Data Collector
Data Collection and Management (iv)

- Automated Remote Reading frequency adjusted, to include Type 4 and Type 5:
  - 7.2.3 The CMSP, as per its role of Metered Data Collector, shall perform
    Automatic Meter Reading of the values registered at all the Meters integrated into its
    CEMSP AS:
    - a) Every day, between 00:00:00 and 23:59:59 of the following day (D+1) for all
        Metering Points of Type 1, 2, and 3 for which it is responsible.
    - b) Every month, within the first [15] days of the following month (M+1) for all
        Metering Points of Type 4 and 5 for which it is responsible.

- Information for all type of meters (Principal meter, Redundant meter and
  Verification meter) shall be collected with the same frequency

Metered Data Collector
Data Collection and Management (v)

- Minimum information to be collected by the CEMSP AS listed and clarified:
  - 7.2.5 The information collected by the CEMSP AS for each Meter associated
    with a Connection Point shall be determined by the Metered Data Collector,
    but it shall include at least:
    - a) Hourly readings of active and reactive energy, if it corresponds, with their associated time
        stamps;
    - b) Hourly readings of active and reactive power, if it corresponds, with their associated time
        stamps;
    - c) Accumulated readings of active and reactive energy, if it corresponds, for the previous day;
    - d) Alarms and event logs produced by the Meter;
    - e) Qualifiers of the meter readings (accuracy qualifiers) if the Meter produces such kind
        of information;
    - f) Time and date stamps;

- List above adjusted for Local Meter Reading of Type 4 and Type 5 metering
  points not included in the CEMSP AS
**Metered Data Collector**  
**Data Collection and Management (vi)**

- The previous list was adjusted for Local Meter Reading of Type 4 and Type 5 metering points not included in the CEMSP AS:
  - 7.3.4 The information collected by the CEMSP AS for each Meter associated with a Connection Point shall be determined by the Metered Data Collector, but it shall include at least:
    - a) Hourly readings of active and reactive energy, if it corresponds, with their associated time stamps in all cases the Meter installed at the Connection Points provides for such capability;
    - b) Interval readings of active and reactive energy, if it corresponds, with their associated time stamps in the cases the Meter installed at the Connection Points provides for such capability (and it does not has the capability of producing hourly metering);
    - c) Accumulated readings of active and reactive energy, if it corresponds, for the previous month;
    - d) Alarms and event logs produced by the Meter;
    - e) Qualifiers of the meter readings (accuracy qualifiers) if the Meter produces such kind of information.

**Metered Data Collector**  
**Data Collection and Management (vii)**

- Emphasis put on procedure for local meter read data validation:
  - 7.3.5 In case of successful reading of a Local Meter Reading, the primary data the Metered Data Collector shall, for each Meter at the Metering Point, analyze the completeness and reliability of the data read. In particular:
    - a) Absence of alarm signals from the Meter during billing period;
    - b) Adequacy of time and date stamps, in particular the absolute deviation of time references of the Commercial Meter with the National Time Scale of Ukraine, checking that it is within permissible values;
    - c) Completeness of hourly readings for the Meters which have the capacity of performing such kind of readings, and validation through comparison with the mode of functioning of a specified connection during the billing period and validation through comparison with the mode of functioning of a specified connection during the billing period;
    - d) The contents of the event log of the Meter during the billing period;
    - e) The content of the log for time correction of the Meter during the billing period;
    - f) The adequacy of the parameterization of Commercial Meter.
    - g) The adequacy of the parameterization of Commercial Meter.
Metered Data Collector
Data Collection and Management (viii)

- But added provision to cover the specific case of Electronic Local Meter Reading:
  - 7.5.2 The CEMSP, as per its role as Metered Data Collector, shall perform Electronic Local Meter Reading at any Metering Point for which it is responsible in all cases when, for whichever reason, it is impossible to remotely read the data through its Automatic Meter Reading system. This Local reading shall be performed within the following 5 working days after detecting the problem and shall be done, preferably, through Electronic Local Reading. The Metered Data Collector should inform the Meter Operator about this situation in order the problem that caused the impossibility of Automatic Meter Reading is solved.

Metered Data Responsible
Validation of commercial electricity metering data (i)

- The CEMPS (as Metered Data Responsible) are responsible for validating the data they collect (as Metered Data Collector).
- Before performing some of the validation checks, the metered values (at the Metering Point) shall be referred to values at the Connection Point.
- Calculation of values at the connection point:
  - 9.2.1 In those cases, in which the Metering System is not installed at the Connection Point, the metered results shall be brought to the Connection Point.
  - 9.2.2 The Parties responsible for electricity networks at the Connection Point should agree the procedures of converting the values metered at the Metering Point into the corresponding values at the Connection Point, accordingly to the electricity market regulations in force.
  - 9.2.3 If the parties fail to agree upon the procedures converting values metered at the Metering Point to values at the Connection Points, then any interested party can may resort to the procedure for resolving disputes on this matter in accordance with this Code.
Metered Data Responsible
Validation of commercial electricity metering data (ii)

- After performing these checks, every piece of data shall be classified as:
  - "Valid"; "Invalid" or "No Data"

- If data at a Metering Point is systematically invalidated an Incident Report shall be opened (which will lead to investigation, meter verification and, eventually, replacement)

- The "valid" status is not indefinite, it can change later on due to analysis done by the Metered Data Responsible later on.

- Invalid metered values, together with the reasons for invalidation, shall also be made available to the involved Market Participants

Metered Data Responsible
Validation Checks (i)

- The CEMPS shall carry out certain minimum validation checks before adding metered data to its database:

  a) Meter identification: A metered value (or group of metered values) shall be considered Invalid if the Identification of the Meter, type and identification number (serial number) does not match those registered for this point at the Metering Point Registry;

  b) Date and Time: In order to be considered Valid, a metered value (or group of metered values) shall be obtained from a Meter which:

     i) The Date and time of the Meter internal clock does not differ from the exact date and time in more than [1 minute];

     ii) The Date and time of metered readings are consecutive from the last registered date and time of Valid readings of the Meter.
Metered Data Responsible Validation Checks (ii)

- c) Alarms and event logs. The Metered Data Collector shall analyze alarms and/or events logs, existing at the Meter, in order to judge about their importance and to determine if the metered values shall be considered as Valid or Invalid. The Metered Data Collector shall provide to the Market Participants (stakeholders), the procedures used to perform such validations, if it is requested any kind of clarification. This type of verifications shall be in accordance with the recommendations issued by the Meter manufacturer.

Metered Data Responsible Validation Checks (iii)

- d) Coherence of the metered values: In order to be considered Valid, the difference between the sum of the hourly (or interval) metered values and the total aggregated ones shall be lower than the prescribed limits. The relative deviations shall be calculated by the formula:

\[
\frac{\sum E_i - E_c}{E_c} \times 100\%
\]

<table>
<thead>
<tr>
<th>Periodicity of checks</th>
<th>Permissible deviation range</th>
</tr>
</thead>
<tbody>
<tr>
<td>daily</td>
<td>0.5 %</td>
</tr>
<tr>
<td>weekly</td>
<td>1.1 %</td>
</tr>
<tr>
<td>monthly</td>
<td>0.5 %</td>
</tr>
<tr>
<td>less than monthly</td>
<td>0.1 %</td>
</tr>
</tbody>
</table>
Metered Data Responsible
Validation Checks (iv)

- e) Data from primary and backup meters: In case that Primary and Backup metering are available at the Connection Point, in order to the metered values to be considered Valid, the comparison of aggregated data from primary and backup meters should be within the prescribed limits. The relative differences shall be calculated by the formula:

\[
\frac{E_{\text{основ}} - E_{\text{дубль}}}{E_{\text{дубль}}} \times 100\%
\]

<table>
<thead>
<tr>
<th>Periodicity of checks</th>
<th>Repeatability range</th>
<th>Verification Metering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>± 3 %</td>
<td>± 5 %</td>
</tr>
<tr>
<td>Weekly</td>
<td>± 1 %</td>
<td>± 2 %</td>
</tr>
<tr>
<td>Monthly</td>
<td>± 0.5 %</td>
<td>± 1 %</td>
</tr>
</tbody>
</table>

Metered Data Responsible
Validation Checks (v)

- f) Plausibility of the Metered values: Metered values can be considered as Invalid as a consequence of an analysis which identifies values not plausible. Among them:
  - i) Values which exceed 120% of the allowable value;
  - ii) Values which exceed 200% of the expected consumption based on statistical estimates of past consumptions;
  - iii) Significant differences with respect to historical values;
  - iv) Negative values at consumption points (meter readings shall always increase);
  - v) Zero consumption at Connection Points where positive consumption is expected;
  - vi) Other verifications performed by the Metered Data Responsible.
Metered Data Responsible
Data Processing

- The CMSP, as per its role of Metered Data Responsible, shall process metered data in order to:
  - Estimate and/or substitute metered data at each Connection Point in following cases:
    - When the values resulted from the validation process established in Section 8, have been labelled as “Invalid”;
    - At connection Points equipped with hourly metering devices when the retrieved data has been labelled (as per Section 8) as “Incomplete but accurate”;
    - Determine the Best Value of Metering

Metered Data Responsible
Substitution of Data (Estimation) (i)

- Substitution shall be done according with the Procedures developed by the CMA and approved by NEURC.
- Estimation in case of *Incomplete but Accurate* by procedures proposed by the CEMSP, if:
  - The number of invalid or missing values is lower than 8 over 24-hours;
  - The value of the accumulated energy has been considered as “Valid” by the Metered Data Responsible after performing the validation checks
  - The values retrieved for hourly metering (which are not missing) are consistent with the values of the accumulated energy over 24-hours period:

\[
\sum_{i=1}^{24} \text{Metered value} \times (\text{Estimated values} - \text{hourly kWh values}) = \text{Valid kWh value} - \sum_{i=1}^{24} \text{Metered hourly kWh values}
\]

- The procedure for substituting data shall comply with:

\[
\sum_{i=1}^{24} \text{Metered hourly kWh values} + \sum_{i=1}^{24} \text{hourly values estimated} = \text{Actual kWh value}
\]
Metered Data Responsible
Substitution of Data (Estimation)

- Once the substitution process has been completed, all the data in the CEMSP should be labelled as:
  - Valid
  - Estimated; or
  - No data

  - No data is allowed only in cases in which:
    - It is impossible to estimate such data and/or
    - Substitution of data labelled (as per Section 8) as “Incomplete but accurate” is not allowed. This data will be substituted by the Metered Data Aggregator.

Metered Data Responsible
Determination of the Best Value of Metering

- A Connection Point may have more than one measurements associated with it:
  - Values from the principal and redundant (or verification meters)
  - Values originally retrieved by the AS that do not pass the checks but later on are retrieved locally and are correct,
  - Values from a Principal meter that is compliant with the Code, but redundant or verification meters which are not compliant;
  - Etc.

- Based on all these recorded values, the Metering Data Responsible shall determine the "Best Value of Metering”
  - The Best Value of Metering at a Connection Point is the value (a single value per MTS) which will be used for aggregation and settlement.
Metered Data Responsible
Determination of the Best Value of Metering

- From all the recorded values for a specific Connection Point, the Metered Data Responsible shall determine the BVM using a strict order of priorities (which is indicated in the Code):
  - a) Valid measurements, taken from a “Compliant” Principal Meter using the CEMSP AS. Data shall be labelled as “C AS Valid Principal”;
  - b) Valid measurements, taken from the “Compliant” Redundant Meter (backup) using the CEMSP AS. Data shall be labelled as “C AS Valid Redundant”;
  - c) Valid Measurements, taken from “Compliant” Verification Meters (backup) using the CEMSP AS (after the information has been processed to determine the values at the Connection Point). Data shall be labelled as “C AS Valid Verification”;
  - d) Valid measurements, taken from a “Compliant” Principal Meter using Electronic Local Meter Reading. Data shall be labelled as “C E Valid Principal”;
  - e) …
  - f) Valid measurements, taken from a “Non Compliant” Principal Meter using Electronic Local Meter Reading. Data shall be labelled as “NC E Valid Principal”;
  - g) …
  - h) Valid Measurements taken from “Non Compliant Meters” using Visual Local Meter Reading. Data shall be labelled as NC V Valid;
  - i) Estimated/substituted data, according with Section 9.4 and 9.5. Data shall be labelled as “Estimated”;
  - j) No data. Data shall be labelled as “No data”.

Metered Data Responsible
Transferring data to the Metered Data Aggregator

- The Metered Data Responsible shall send to Metered Data Aggregator (CMA) the BVM data:
  - Data from Connection Points of types 1, 2 and 3 integrated into the CEMSP AS: Daily;
  - Data from Connection Points of types 1, 2 and 3 not integrated into the CEMSP AS: Monthly;
  - Data from Connection Points of types 4 or 5 integrated into the CEMSP AS: Monthly;
  - Data from Connection Points of types 4 or 5 not integrated into the CEMSP AS: Monthly
- Data already transferred could be updated (before the Preliminary Settlement Closing Date) if:
  - An error has been detected
  - BVM is replaced in the database of the CEMSP by another data of higher priority;
  - An Incident Report have been opened and, once it is solved, the Metered Data Responsible judges that the data previously sent is inaccurate.
Metered Data Aggregator
Combining and aggregating BVM data

- Validate the data received by the CEMSPs. Validation involves:
  - Checks on integrity of received data;
  - Checks of consistency (type of connection point, type of metered values, etc.).
  - It does not perform validations on accuracy/appropriateness of the values received. These checks are responsibility of the CEMSPs.
- In case of non validity, inform the involved CEMSP;
- Link with the CP Metering Data Registry (administered by the Metering Point Administrator) to receive the information which associates each CP with a Market Participant:
  - Perform Profiling for all the CP which do not have hourly metering
  - Change/Substitute data in cases it contains zero values (no data)
  - Aggregate metering data
  - Transfer aggregated data to the Settlement Administrator
**Metered Data Aggregator**

**Profiling**
- The CMA, as Metering Code Administrator, shall develop and submit to NEURC for approval a methodology that shall be used for Profiling.
- This methodology should be consulted with all the Market Participants and other involved stakeholders. It shall be uniform across Ukraine.
- The methodology proposed shall make full use of the following data:
  - The zone or area at which the Connection Point which will be profiled belongs;
  - The distribution company which provides distribution services at the Connection point;
  - The commercial metering data stored in the database of the Metered Data Aggregator (in particular the hourly metered data obtained from meters with such capability);
  - The Operational Metering data retrieved from the Transmission and Distribution Companies;
  - The characteristics of the customers or group of customers, either consumers or generators, which will be profiled. (including “ad-hoc” measuring campaigns); and
  - Any other information the CMA considers relevant to accurately perform profiling.
- Until this methodology is approved, the methodology stated in Annex 1 will be utilized.

**Metered Data Aggregator**

**Data Substitution**
- It shall be done only in only two cases:
  - In CP of types 1, 2 or 3: When aggregated data exists (and it has been labelled as valid by the CEMSP) but there are no hourly values (either because the Meter installed does not have this capability and/or because the retrieved values are invalid and the CEMSP is unable to estimate them). In these cases the hourly values will be determined by Profiling.
  - In CP for which “no data” exist (the CEMSP has been unable to estimate it, and/or no CEMSP has been assigned to the connection point). In these cases the substitution values will be:
    - Zero: If the involved Connection Point is a point of injecting generation; or
    - Maximum capacity registered at the Connection Point, if the involved Connection Point is a consumption point.
Metered Data Aggregator
Data Aggregation

- The CMA, as Metered Data Aggregator, shall perform the aggregation of data stored at the database of commercial metering administered by the CMA for:
  - Each Market Participant;
  - The Transmission Company
  - Each Distribution Company

- The CMA shall produce also aggregations discriminated by zones or areas, if this requirement is indicated in the Market Rules and/or requested by the Regulatory Authority (NEURC)

- Aggregated values of active energy for each group shall be performed for each MTS (one hour in the current Electricity Market).

Metered Data Aggregator
Transferring Aggregated Data

- The CMA, as Metered Data Aggregator, shall transfer the aggregated data to the Settlement Administrator at the dates indicated in the Market Rules and/or the regulation that develops them.
Other sections of the CMC

☐ Other sections of the CMC provided to the Consultant do not have significant changes. Among them:
  ☐ Metrological Provisions of Commercial Metering Devices;
  ☐ Verification and inspection of Metering Systems;
  ☐ Sealing of commercial metering system;
  ☐ On site inspection of metering systems;
  ☐ De-energization of metering systems; and
  ☐ Procedures for Resolve Disputes

Transitory Provisions

☐ Utilization of the existing metering system until proper replacement/adaptations will be carried out
  - This provision is totally aligned with the contents of Section 8 “Conditions of exemption from the requirements of the code for commercial metering devices” of the Draft Code submitted to the Consultant;
☐ Until the CMA is equipped with an appropriate IT system, which will permit to execute all the tasks assigned in this Code, the Distribution Companies will be appointed as Metered Data Aggregators and Metering Point Administrators for all connection points of type 4 and 5 of their jurisdictions
☐ At the date of this Code issuing, the Transmission Company and the Distribution Companies are appointed as CEMSP at all connection points at which they are currently performing this activity.
Other aspects to be discussed

- The functions of Metering Point Administrator can be fulfilled by the CMA or by any entity that has received appropriate accreditation at the CMA.
  - Existing in the draft Code provided to the Consultant. Considering eliminating it. MPA role should be fulfilled only by the CMA. Transitory provisions allow for the Distribution Companies plays this role until the appropriate IT system is installed at the CMA.
- Remove provisions that only make sense if the Meter Data Collector and the Metered Data Responsible are different entities. In the CMC they are always the same agent: the CEMSP.
- Consider the introduction of a new section “Indidents Administration” which set the procedures to be followed in case some stakeholder challenges a metered value. These procedures may end up with a “dispute”, but in most of the cases are solved without reaching this point. In any case, the procedures need to be clearly established (“who does what”).

Open Discussion on the Commercial Metering Code
Profiling

- Several different approaches, depending on each country particularities
- Two major approaches
  - Synthetic profiles
  - Area profiles
    - Simple area profiles
    - Adjusted area profiles.

Synthetic Profiles (i)

- Settling consumption by the different customer groups is based on pre-defined typical or “category profiles”.
- Category profiles are based on a typical consumption pattern
  - Estimated for each customer group from statistical analysis of selected consumer samples.
- The final category profiles are determined in advance (before actual delivery).
  - This allows settlement to be undertaken based on meter readings as soon as they are obtained.
- Category profiles may be adjusted to various factors, such as season, type of day, temperature, wind speed, etc.
**Synthetic Profiles (ii)**

- The cumulative load profile of a given Market Participant (supplier) is the sum of all allocated consumption by each of the supplier’s customers.
- This requires the determination of the expected consumption in each customer group by scaling the category profile in accordance to annual (or seasonal) consumption and adding up the individual load profiles of all customer groups.

**Synthetic Profiles (iii)**

The diagram illustrates the process of combining individual synthetic load profiles into a cumulative load profile. Each group's load profile is scaled according to its consumption and then summed to form the overall profile.
Synthetic Profiles (iv)

- As load profiles are estimated, the settlement process will always result in an imbalance error
  - Total energy consumption ≠ Sum of all suppliers assigned load
- Two options:
  - Determine the imbalance and adjust all suppliers’ energy requirements proportionally to remove this imbalance.
  - Assign a residual balance responsible party (BRP), normally the ‘incumbent’ supplier, which supplies the load of all small customers except those supplied by other suppliers (which are settled based on synthetic load profiles)
    - Settlement by differencing

Imbalance settled proportionally

Imbalance assigned to the incumbent
Area Profiles (i)

- Based on the idea of using the ‘Residual load profile’ (RLP) to settle all suppliers of small customers (not hourly metered)
- The adjusted system load profile equals the total area consumption less the metered demand of those customers with interval meters.
  - The estimated system losses are often also deducted.
  - Differences among countries in the way the RLP is actually determined.

Area Profiles (ii)

![Graph showing load profiles and network losses]
Area Profiles (iii)

- Two options for distributing RLP among Market Participants (suppliers)
  - Simple: the RLP is distributed based on each supplier’s share of total annual (or seasonal) consumption of small consumers. → Simple and Straighforward
    - Possible alternative: Use actual accumulated energy metered of each consumer (assigned to each supplier) to determine the shares.
    - More accurate, but it will delay settlements.
  - Profile Adjusted: Each supplier’s share of the adjusted system load profile is determined based on the application of category profiles.
    - Requires category profiles

Area Profiles (iii)

- Profile Adjusted (Adjusted Area Load Profile)

The profiles are used to calculate the share of each consumer category at each particular hour.
Area Profiles (iv)

- Profile Adjusted (Adjusted Area Load Profile)

Taking into consideration the share of each supplier on each type of consumers the distribution of the RLP over all suppliers can be done.

Pros / Cons of each method

- Synthetic Profiles
  - Pros
    - Easy to apply
    - New entrant suppliers are less exposed to balancing risks.
    - Settlement can be done immediately after the hourly measurements are ready
  - Cons
    - Category profiles need to be defined
    - Imbalances can be important, especially if the profiles are not enough accurate
    - Periodic re-settlements may be required if reconciliation (after having available the actual measurements) needs to be carried out
Pros / Cons of each method

- **Synthetic Profiles**

  ![Diagram of Synthetic Profiles]

- **Simple Area Profiles (with constant shares among suppliers)**

  - **Pros**
    - Easy to apply
    - No unbalances (all the metered load is distributed among suppliers)
    - Settlement can be done immediately after the hourly measurements are ready
  
  - **Cons**
    - New entrant suppliers are exposed to balancing risks which can’t hedge.
    - Periodic re-settlements may be required if reconciliation (after having available the actual measurements) needs to be carried out
**Pros / Cons of each method**

- **Adjusted Area Profiles (with constant shares among suppliers)**
  - **Pros**
    - More complex to apply (not a relevant issue)
    - No unbalances (all the metered load is distributed among suppliers)
    - Settlement can be done immediately after the hourly measurements are ready
  - **Cons**
    - Category profiles need to be defined
    - Imbalances can be important, especially if the profiles are not enough accurate
    - New entrant suppliers are exposed to balancing risks which can’t hedge.
    - Periodic re-settlements may be required if reconciliation (after having available the actual measurements) needs to be carried out

- **Area Profiles – With constant supplier shares**

```plaintext
M M+1 M+2 M+3 M+4

Hourly data received by the CMA
CMA conducts checks and profiling
CMA transfer data to Settlement Admin.
Preliminary Settlement
Final Settlement
Hourly data received by the CMA
CMA transfer data to Settlement Admin.
Preliminary Settlement
Final Settlement
```
Pros / Cons of each method

- Adjusted Area Profiles (with actual – metered- suppliers’ shares)
  - **Pros**
    - More complex to apply (not a relevant issue)
    - No unbalances (all the metered load is distributed among suppliers)
    - More accurate. No need for reconciliation
  - **Cons**
    - New entrant suppliers are exposed to balancing risks which can’t hedge.
    - Settlement shall be delayed until all measurements are obtained. This will delay preliminary settlement in about one month (if all consumers are actually metered monthly) or even more.

- Area Profiles – Suppliers’ shares according with actual measurements

Accumulation meters are read once a month; and at different dates. It is needed to wait until all of them are measured.