USAID FROM THE AMERICAN PEOPLE | Regulatory and Energy Assistance

# Preliminary Report

## Metering processes in Retail Market

Technical Assistance to BiH Regulators and Power Utilities through the USAID Regulatory Energy Assistance Project

Bonn, 27 May 2013

***Prepared by:***

Hans Pipke
KEMA Consulting GmbH.

***For the***

Bosnia and Herzegovina (BiH) Regulatory and Energy Assistance Project (REAP)
USAID Contract No. EPP-I-00-03-00004-00, Task Order 5
Implemented by Advanced Engineering Associates International, Inc.

This report is made possible by support from the American People sponsored by the United States Agency for International Development (USAID). The contents are the sole responsibility of the author/s and do not necessarily reflect the views of USAID or the United States Government.

USAID OD AMERIČKOG NARODA | Asistencija regulativi i reformi energetskog sektora

# Preliminary Report

## Metering processes in Retail Market

Technical Assistance to BiH Regulators and Power Utilities through the USAID Regulatory Energy Assistance Project

Preliminary

Bonn, 27 May 2013

**Preliminary Report:**

Metering processes in Retail Market

Bonn, 27/05/2013

Author: Hans Pipke

Preliminary

On behalf of USAID Regulatory Energy Assistance Project (REAP) in Bosnia and Herzegovina

Author : Hans Pipke
53 pages

reviewed :
approved :

KEMA Consulting GmbH Kurt-Schumacher-Straße 8 53113 Bonn Germany T +49 228 44 690 00 F +49 228 44 690 99
bonn@dnvkema.com www.dnvkema.com VAT 205/5729/0465 VAT DE 179 443 724 Registered Bonn HRB 7966
Managing Directors Wolfgang Spahn, Dirk Fenske

# Document History

| Issue | Date | Author | Description |
|---|---|---|---|
| 0.6 | 3 May 2013 | DNVKEMA | Draft, submitted to REAP |
| 2.0 | 12 May 2013 | DNVKEMA | Preliminary Version, submitted to REAP |
| 2.1 | 15 May 2013 | DNVKEMA | Changes regarding Balancing, submitted to REAP |
| 2.2 | 27 May 2013 | DNVKEMA | Additional changes after first workshop in BiH |
| | | | |
| | | | |

Preliminary

# CONTENTS

Page

Management Summary....6

1 Introduction and project objectives....7

2 Metering processes in Retail Market....8
2.1 Overview on common models and understanding of metering responsibilities in the European Union....8
2.1.1 Metering Processes....8
2.1.2 Metering Assets....10
2.1.3 Frequency of Meter Reading....11
2.1.4 Metered customers....11
2.1.5 Meter point identification....11
2.2 Overview on common standards for exchange of information between market operators and customers in the European Union....12
2.2.1 Models for information exchange....12
2.2.2 Standards for information exchange....12
2.2.3 Message formats....13
2.2.4 Message transfer....14
2.3 Requirements from EU-Directive's affecting metering....14
2.4 Definition of metering roles to according to European standards ebIX....14
2.5 Definition of metering processes according to European standards ebIX....17
2.6 Definition of Domains according to European standards ebIX....17

3 Gap analysis of the documents that describes the metering process and actors' roles....19
3.1 Gap Analysis Roles and Responsibilities....19
3.2 Gap Analysis Metering Processes....20
3.3 Gap Analysis Metering Assets....20
3.4 Gap Analysis Frequency of Meter Reading....21
3.5 Gap Analysis Standards for Information Exchange....21
3.6 Gap Analysis Formats for Data Exchange....21
3.7 Gap Analysis Measuring Accuracy....22

4 Draft methodologies, processes and roles to prescribe the metering processes....22
4.1 Business processes....23
4.1.1 Request for Meter Reading....24
4.1.2 Regular Meter Reading....27
4.1.3 Build a new Meter Point....29
4.1.4 Change Meter at Meter Point....31

Preliminary

4.1.5 Metering for Balancing ....34
4.2 Guidelines for Measured Values ....38
4.3 Guidelines on Data ....38
4.3.1 Supplier-ID ....38
4.3.2 DSO-ID ....39
4.3.3 Meter Point ID ....39
4.3.4 Meter Point Register ....40
4.3.5 Meter data ....40
4.4 Data Exchange ....41
4.4.1 Basics for electronic data exchange (EDI) ....42
4.4.1.1 Basic Principles of Organization ....42
4.4.2 Message Data ....42
4.4.3 Channels for Data Echange ....42

5 Conclusions and recommendations for implementation ....43
5.1 Technical aspects in metering ....43
5.2 Frequency of Meter Reading ....44
5.3 Measured Values ....44
5.4 Measured Values for Balancing ....44
5.5 Assets, Roles and Responsibilities ....45
5.6 Data and Data Formats ....45
5.7 Business Processes ....46
5.8 Centralized vs. Decentralized Data Exchange ....46

6 Appendix ....48
6.1 Standards for Identifiers ....48
6.1.1 OBIS ....48
6.1.2 EIC-CODES-OBJECT-TYPES ....49
6.1.3 GLN/ILN/EAN ....50
6.2 Protocols for Data Transfer ....50
6.2.1 AS2 ....50
6.2.2 SMTP ....50
6.3 Abbreviations ....51

Preliminary

# MANAGEMENT SUMMARY

The three Bosnia and Herzegovina (BiH) energy regulators together with the USAID Regulatory Energy Assistance Project (REAP) and the Electric Power Sector stakeholders identified several gaps in the legal and regulatory framework of Bosnia and Herzegovina for the successful functioning of the electricity retail market. This is particularly important as the date of full retail market opening is very close – January 1, 2015. To fill these gaps and to define the metering processes in a retail market USAID REAP together with the three BiH energy regulators has contracted DNV KEMA to provide a Short Term Technical Assistance (STTA) to:

- Analyse the gaps in the documents that describe the roles and procedures in the metering process in BiH
- Develop of draft metering processes and roles based on the international practice
- Define basic communication principles to enable metering information flow between DSO and the Third Party Supplier

Since measured values are crucial in a well-functioning and efficient competitive retail market it is necessary that all market participants have easy access to the data they need for customer switching[1], supply, billing, balancing and settlement.
Within the existing legal and regulatory framework of BiH the processes for the exchange of data are currently not yet defined in a level of detail as required for the development of competitive retail markets. There is also a need for harmonized rules and guidelines covering all aspects of data exchange like protocols, format security and identification of authorized parties in BiH.

Given that the DSO covers most roles in metering, it has proven quite successful throughout Europe to specify the communication regarding metering data between DSO and the supplier and balancing responsible parties in precisely defined processes, with a clear definition of timeframes and data to be exchanged between these parties in national guidelines agreed by the electrical industry and applied by the local regulator.

This report provides the draft proposals for processes and role descriptions as well as drafts for communication requirements like formats of messages or the identification of market parties to ensure fully automated processes at low costs derived from European best practice.

.

[1] Please note that the processes related to switching as well as for balancing and settlement – which are also relevant in this context – are addressed in separate DNV KEMA reports.

Preliminary

# 1 INTRODUCTION AND PROJECT OBJECTIVES

Metering is a crucial behind-the-scenes process for establishing consumption data for billing and balancing purposes. Good quality metering data is required to ensure the functioning of the electricity market. Metering can be performed automatically or manually, and a manual reading can either be performed by the customers through self-reading, or by the company responsible for metering.

Meters, the requirements of the meters, and the metering processes are of the highest interest to the electricity distribution industry today.

Responsibility for metering covers purchasing, owning, installing, and replacing the metering equipment, as well as inspecting and maintaining. The meter reader has to provide consumption information to the relevant market parties in a timely, efficient and non-discriminatory manner, whilst safeguarding consumers' privacy and data confidentiality.

In order to make sure that the market is working the following issues regarding metering will be addressed in this report:

- Legislation regarding metering in BiH
- Roles in the metering processes in relation to European best practice
- Metering processes in relation to European best practice
- Meter data and customer data used in this process

In this report we primarily focus on metering in the retail market, i.e., in the low voltage grid manual meter reading is common. However, we will also have a look at RAM-Customers where AMR-Systems are used. We will identify the gaps in metering processes and roles between the existing laws and regulations in BiH and the requirements on metering in a customer-centralized retail electricity market, with focus on customers connected to the distribution grid. Furthermore, we will draft missing processes and roles according to and illustrated by European best practice.

Preliminary

# 2 METERING PROCESSES IN THE RETAIL MARKET

The purpose of this report is to represent the requirements of metering processes and the transmission of the measured values to the authorized market participants, in particular for billing. The billing process as other processes like customer switching are described in the report "Role of the DSO as Neutral Retail Market Facilitator". However, metering processes are usually triggered by processes used by the DSO and the supplier which are not described here. Especially the development of timelines for metering depends on the given timelines, for example, for customer switching.

## 2.1 Overview on common models and understanding of metering responsibilities in the European Union.

As mentioned before, metering is essential in order to facilitate the emergence of well-functioning and transparent energy markets in a deregulated environment. Therefore, metering processes, data exchange, settlement rules, data ownership and metering responsibility have to be defined. In the following we will look at the common understanding of these requirements in Europe.

### 2.1.1 Metering Processes

Across the member states of the EU there are no EU-wide standards for metering processes. Processes and timescales vary from country to country depending on the respective national legislation. There are some very generic process definitions from the European forum for energy business Information eXchange (ebIX)[2]. Within this set of business processes there are recommendations for Customer Switching "CuS Model documents (customer switching) based on UN/CEFACT's Modelling Methodology 2.0" and measured data "EMD Model documents for Measured Data bases on UN/CEFACT's Modelling Methodology 2.0".

***In Germany*** the processes for metering including the electronically data exchange are described in the WiM the processes for the supply of electricity including the electronically data exchange are described in the GPKE, the balancing processes are described in MaBIS, all developed by EDI@Energy[3] and edited and adopted by the German regulator BNetzA[4]. The approach to estimate and validate meter readings is defined in the VDE~AR-N 4400 (Metering Code), edited by the VDE (the German Association for Electrical, Electronic & Information Technologies[5]).

[2] http://www.ebix.org/content.aspx?ContentId=990&SelectedMenu=3

[3] http://www.edi-energy.de/

[4] http://www.bundesnetzagentur.de/cln_1931/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/unternehmen_institutionen-node.html

[5] http://www.vde.com/de/Seiten/Homepage.aspx

Preliminary

***In the Netherlands*** the Energy Data Services Netherlands (EDSN[6]) was founded (2001) as the Energy Clearing House (ECH) by Essent and Eneco, and the name was changed to Energy Data Services Netherlands (EDSN) in 2007. The objective of the foundation was to standardize and simplify the transfer of information between the various players in the energy market. This was developed in view of the large number of customers expected to switch to another supplier after the liberalization of the energy market.

EDINE Messages are used for the data transfer between the market parties stating their energy production, consumption and trade, as well as measurement data and other information. These messages must meet certain electronic message standards defined on the basis of EDIFACT[7].

Through the system of EDSN the full information required for the transfer switch and relocation processes are handled. In addition, the messages also include the measurement data (e.g., periodic meter readings) and master data communicated to the relevant parties. In total ECH processes more than 100 million messages per year. Messages never go directly between market parties but always through EDSN, which ensures that messages are put through to the appropriate market party.

The approach to estimate and validate meter readings is defined in the Metering Code (Meetcode Elektriciteit).

***In the Nordic Power Market****, the Nordic Interchange Agreement* defines a framework for the exchange of data based on EDIEL Messages[8]. The Nordic Interchange Agreement is a part of Ediel Nordic Forum set of documents, with the intention that it should be used as a common agreement for interchange of Electronic data in the Nordic power market.

**In Norway**, the distribution company is responsible for all meter values from every metering point within its grid area. Even when the handling of meters and metering data are outsourced to a third party, the distribution companies are still responsible for ensuring the quality of all metering data and the handling of the data in the whole value chain. In the "*REG. no. 301 of 11 March 1999: Regulations governing metering, settlement and coordinated action in connection with electricity trading and invoicing of network services*" the Norwegian Ministry of Petroleum and Energy developed the rules for metering, processes and basic requirements on data. Details are fixed in bilateral contracts between supplier and DSO, based on the usage of EDIEL messages. The detailed rules for this are described in the *Norwegian EDIEL Message Exchange Standard*. The rules and guidelines in the EDIEL standard are not regulated directly by law, but are approved by the national regulator NVE. For the identification of the parties (seller, buyer, etc.) in the EDIEL messages, the *EAN*UCC Global Location Number* [9]is recommended.

**In Sweden** the information exchange is regulated in the Electricity Act, in regulations and in the Ediel instructions. In addition to the above-mentioned rules and regulations, the industry has decided upon

[6] http://www.edsn.nl/energie-data-service-nederland-en/

[7] http://www.unece.org/cefact/edifact/welcome.html

[8] http://www.ediel.org/

[9] http://www.gs1.org/barcodes/technical/idkeys/gln

Preliminary

detailed practices regarding, for instance, the EDIEL-message procedure. These detailed practices are documented in instructions called "Elmarknadshandboken[10]".

***Ireland*** has introduced an independent body (market operator), namely the Meter Registration System Operator (MRSO). The MRSO was established for central registration and data management and co-ordinates flows in the switch process. The Irish procedure applies to both domestic and non-domestic customers. The data format is limited to XML and thus does not leave participants the choice of using a deviating format. The processes are described in the following diagram edited by Retail Market Design Services (RMDS[11]):

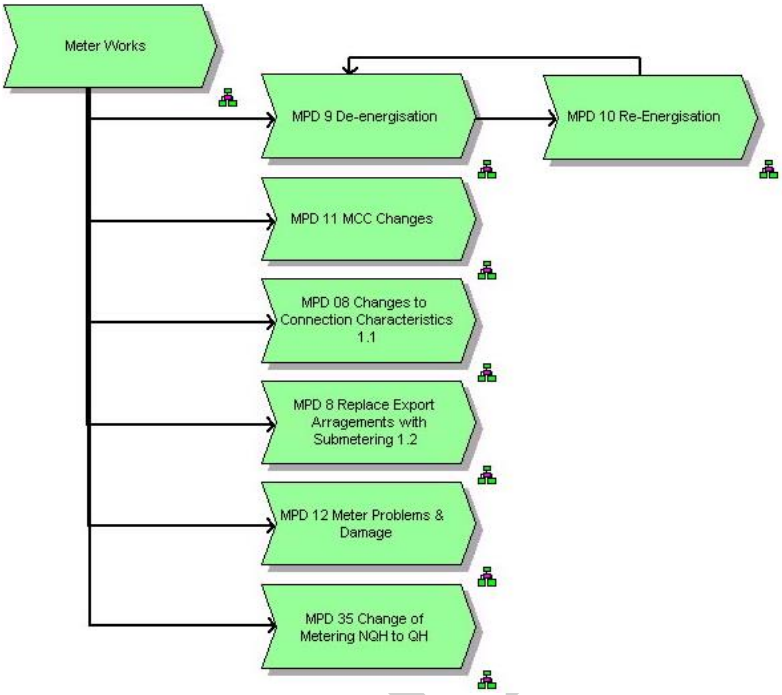


**Figure 1 Retail Market Design Service (RMDS) 2012 – Ireland**

### 2.1.2 Metering Assets

Following the liberalization of electricity supply markets the company responsible for an electricity meter may not be obvious. The meter may be the property of the meter operator, electricity distributor, the retailer or for some large users of electricity the meter may belong to the customer.

In most EU member states, the DSO both owns the metering assets and is responsible for meter reading, for estimation (based on synthetic load profiles) and for validation of metering data. The established consumption data is communicated to the supplier, who is then able to correctly bill the customer (BE, NL, AT, IT, NO, FI, CZ, DE, DK, FR, HU, SE, GR).

[10] http://www.svenskenergi.se/elmarknadshandboken

[11] http://www.rmdservice.com/

Alternative models exist in the UK where suppliers are responsible for the provision, and in Germany where the customers are free to decide to mandate a third party with metering.

### 2.1.3 Frequency of Meter Reading

The frequency of meter reading varies across member states of the EU from yearly to monthly or every second month for small customers in low voltage grids equipped with standard meters, partially depending on their amount of consumption, and daily for larger customers in the low voltage grid or connected to medium or high voltage equipped with Automated Meter Reading (AMR) systems.

### 2.1.4 Metered customers

With regard to metered customers, there are two fundamental customer types: ‘standard load curve’ (SLC) customers, typically households and small businesses, and ‘recording active metering’ (RAM) customers, typically larger businesses and industries. Both types of customers may change suppliers; but contingent on the amount of energy consumed, the switching procedure may work slightly differently. SLC-customers are connected to the distribution system for energy supply while the RAM-customers may be connected either to the distribution or the transmission system.

### 2.1.5 Meter point identification

The unique identification of metering points in the electricity market is crucial for market functioning but there is no uniform European standard for identification. Local standards are used in the different member states.

Today EAN-codes (EAN*UCC Global Service Relation Number) are used for identification of metering points in all Nordic countries except Finland but ENTSO-E (EIC) and DSO assigned numbers are available too. However, few customers know the ID of their meter. In Finland the work to establish a register for identification information is in process and a pilot has recently been launched.

In Germany and Austria a 33-digit metering point id is used. The ID consists of a 2-digit country code (ISO 3166) a 6-digit DSO ID (country specific), a 5-digit postal-code and the 20-digit metering point number.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D | E | 0 | 0 | 0 | 5 | 6 | 2 | 6 | 6 | 8 | 0 | 2 | A | O | 6 | G | 5 | 6 | M | 1 | 1 | S | N | 5 | 1 | G | 2 | 1 | M | 2 | 4 | S |

**Figure 2 Example German Metering Point ID**

In Ireland Meter Point Reference Number (MPRN) is a unique 11 digit number assigned to every single electricity connection and meter in the country. An example of what an MPRN number looks like is: 10009998888.

Preliminary

## 2.2 Overview on common standards for exchange of information between market operators and customers in the European Union.

### 2.2.1 Models for information exchange

Within the EU we can identify three different models through which information and consumption data is exchanged between the metering operator and the supplier.

a. In the first and currently most common market model, information exchange is direct and bilateral: all market parties directly send one another standardised messages (e.g., IT, NO, FI, ES, SE, DE, DN, FR, HU, GR).

b. As an alternative, messages can be sent to a data hub, intended as a kind of 'post box' where messages are subject to a quality check and are then forwarded to the final addressee (e.g. CZ, NL).

c. Data hubs[12] can also be organised as a central database where the exchanged data is not only checked, but also stored. This provides added value in the form of record keeping and data storing (e.g. UK).[13]

### 2.2.2 Standards for information exchange

There are no uniform standards for the (electronic) exchange of information between the market participants in Europe. The requirements on data formats, communication channels, security and privacy vary through the different states in the EU. However, there are some industrial standards and additional efforts towards standardization especially caused by the implementation of smart metering devices. The ENTSO-E proposed a model for the information exchange as shown in the figure below.

Preliminary

[12] A data hub can in general terms be described as a joint database and unit for communications and calculations, handling metering data for all customers (https://www.nordicenergyregulators.org/upload/Reports/Consultancy_report_on_one_or_two_contracts_DRAFT.pdf)

[13] EURELECTRIC Customer-Centric Retail Markets: A Future-Proof Market Design

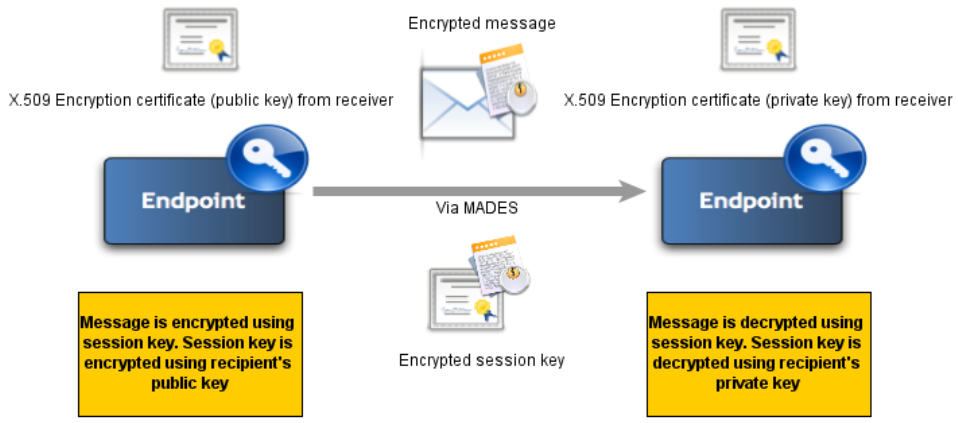


**Figure 3 ENTSO-E-Communication Standard-mades-v1r0**

### 2.2.3 Message formats

In the majority of the European member states (e. g., all Nordic countries, NL, DE) both customer data and meter data are sent by different types of EDIFACT messages. EDIFACT messages in general allow standard communication of business information across companies and borders. Being a standard, there are different implementations of this standard, varying from country to country.

The Ediel Nordic Forum created a common standard for EDI within the Nordic Power Market. Ediel uses the international standard UN/EDIFACT as the basis for message types when describing the information interchanged between participants in the power industry.

Today the PRODAT (Product Data Message) message is used in Norway, Finland and Sweden to send customer data between DSOs and suppliers in a supplier switching process. In Denmark, the UTILMD (Utility Master Data Message) is used. Even though the PRODAT message is standardized, the content of the message is somewhat different in each country.

When it comes to consumption data, the message MSCONS (Meter Service Consumption Report) is with local implementations edited by local authorities used in all countries in combination with OBIS numbers for the identification of metered values. In addition, Norway and Denmark use the UTILTS (Utility Time Series Message).

In Germany, beside others, the most common messages used are UTILMD (for customer Data and supplier switching), INVOIC for billing purposes and MSCONS for metering data. The EDIFACT messages are developed and governed by EDI@Energy a brand of the BDEW[14] in cooperation with the German regulator BnetzA.

[14] http://www.bdew.de/

Preliminary

### 2.2.4 Message transfer

There are different ways for the message transfer in Europe. The most common channel to transfer the messages between market participants is via SMTP-Protocol (Email). In Finland, in contrast to the other Nordic countries, messages are transferred by FTP-protocol.

## 2.3 Requirements from EU-Directive affecting metering.

- Member States shall ensure that: … where a customer, while respecting contractual conditions, wishes to change supplier, the change is effected by the operator(s) concerned **within three weeks**; and customers are entitled to receive **all relevant consumption data** [EU 2009-72-EC, Article 3(5)].
- Customers … have at their disposal their consumption data, and shall be able to, by explicit agreement and free of charge, give any registered supply undertaking access to its metering data. The party responsible for data management shall be obliged to give that data to the undertaking. **Member States shall define a format for the data and a procedure for suppliers and consumers to have access to the data**. No additional costs shall be charged to the consumer for that service [EU 2009-72-EC, ANNEX1 (1) h].
- Customers … are properly informed of **actual electricity consumption** and costs frequently enough to enable them to regulate their own electricity consumption. That information shall be given by using **a sufficient time frame**, which takes account of the capability of customer's metering equipment and the electricity product in question. Due account shall be taken of the cost-efficiency of such measures. No additional costs shall be charged to the consumer for that service [EU 2009-72-EC, ANNEX1 (1) i].
- Customers … receive a final closure account following any change of electricity supplier **no later than six weeks** after the change of supplier has taken place [EU 2009-72-EC, ANNEX1 (1) j].
- Where a Member State imposes measurement of residential use, it shall allow such measurement to be performed by means of **any Class A meter**. For specified purposes the Member State is authorised to require any **Class B meter** [EU 2004- 22-EC, ANNEX MI-003, 7]

## 2.4 Definition of metering roles according to European standards ebIX

A *role* represents the external intended behaviour of a party. Businesses carry out their activities by performing roles, e.g. system operator, trader. Roles describe external business interactions with other parties in relation to the goal of a given business transaction.[15]

[15] ENTSO-E THE HARMONISED ELECTRICITY MARKET ROLE MODEL

Preliminary

| Role | Description | Source[16] |
|---|---|---|
| **DSO** | (Distribution System Operator) A party responsible for knowing the parties linked to the metering points in a grid area and its technical specification. Responsible for creating and terminating metering points. Responsible for the grid usage agreement with the party connected to the grid. The role is called Metering Point Administrator in the ebIX, ETSO and EFET Harmonised role model. (It should be noted that the term 'DSO' is used in the ebIX document for internal consistency and does not infer that this role cannot and/or should not be undertaken by an entity other than a networks assets owner or operator). | ebIX |
| **Electricity Supplier (New/Old)** | A party responsible for fulfilment of its obligations in the contract for supply of electricity to a Metering point. The role is called Balance supplier in the ebIX, ETSO and EFET Harmonized role model. | ebIX |
| **Consumer** | A party that consumes electricity.<br>Additional information: This is a Type of Party Connected to the Grid. | ENTSO-E |
| **Balance Responsible Party** | A party that has a contract proving financial security and identifying balance responsibility with the Imbalance Settlement Responsible of the Market Balance Area entitling the party to operate in the market. This is the only role allowing a party to nominate energy on a wholesale level.<br>Additional information: The meaning of the word "balance" in this context signifies that that the quantity contracted to provide or to consume must be equal to the quantity actually provided or consumed.<br>Equivalent to "Program responsible party" in the Nether- | |

[16] ebIX: = "EURELECTRIC: A Regional Reference Model for the Change-of-Supplier Process"
ENTSO-E:= "THE HARMONISED ELECTRICITY MARKET ROLE MODEL"

| Role | Description | Source[16] |
|---|---|---|
| | lands.<br>Equivalent to “Balance group manager” in Germany.<br>Equivalent to “market agent” in Spain. | |
| **Balance Supplier** | A party that markets the difference between actual metered energy consumption and the energy bought with firm energy contracts by the Party Connected to the Grid. In addition, the Balance Supplier markets any difference with the firm energy contract (of the Party Connected to the Grid) and the metered production.<br>Additional information: There is only one Balance Supplier for each Accounting Point. | ENTSO-E |
| **Meter Administrator** | A party responsible for keeping a database of meters. | ENTSO-E |
| **Meter Operator** | A party responsible for installing, maintaining, testing, certifying and decommissioning physical meters. | ENTSO-E |
| **Metered Data Collector** | A party responsible for meter reading and quality control of the reading. | ENTSO-E |
| **Metered Data Responsible Party** | A party responsible for the establishment and validation of metered data based on the collected data received from the Metered Data Collector. The party is responsible for the history of metered data for a Metering Point. | ENTSO-E |
| **Metered Data Aggregator** | A party responsible for the establishment and qualification of metered data from the Metered Data Responsible Party. This data is aggregated according to a defined set of market rules. | ENTSO-E |
| **Metering Point Administrator** | A party responsible for registering the parties linked to the metering points in a Metering Grid Area. This party is also responsible for maintaining the Metering Point technical specifications, and is responsible for creating and terminat- | ENTSO-E |

| Role | Description | Source[16] |
|---|---|---|
| | ing metering points. | |

## 2.5 Definition of metering processes according to European standards ebIX

The model documents for the ebIX domains describe the exchange of data on a high level in the European Energy Market. The models are specified by business user groups and will be part of an overall ebIX model for the European Energy Market. Regarding metering the following processes are defined:

- ebIX Business Requirements for Measure Collected Data 2.0.D
- ebIX Business Information Model for Measure Collected Data 2011.A
- ebiX Business Requirements for Measure Determine Meter Read 2.0.B
- ebIX Business information Model for Measure Determine Meter Read 2011.A

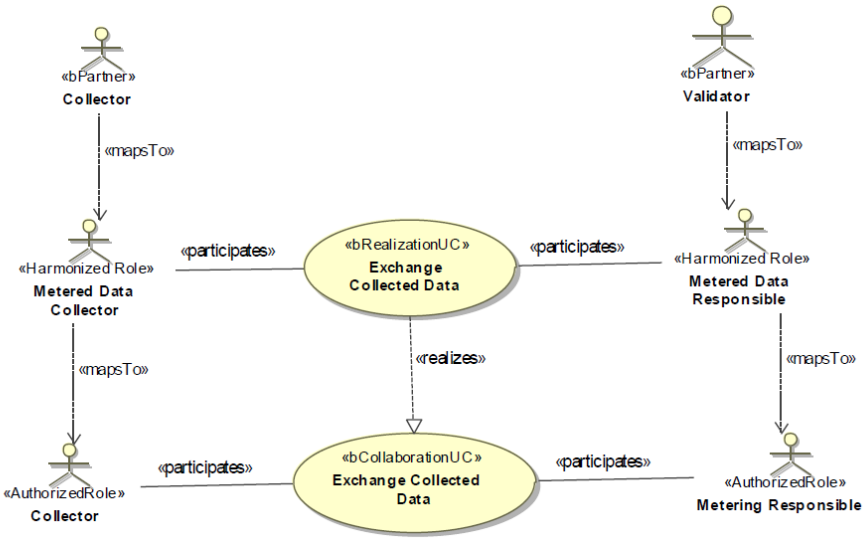


**Figure 4 Example Realization Exchange Collected Data (ebIX)**

As far as we know these documents have not yet been directly adopted by any European member states.

## 2.6 Definition of Domains according to European standards ebIX

A *domain* represents a delimited area that is uniquely identified for a specific purpose and where energy consumption, production or trade may be determined.[17]

[17] ENTSO-E THE HARMONISED ELECTRICITY MARKET ROLE MODEL

| Domain | Description | Source |
|---|---|---|
| **Balance Group** | A collection of Metering Points for imbalance settlement<br>Note: Equivalent to "Balance Group" (Bilanzgruppe) in the Austrian market or (Bilanzkreis) in the German market<br>German definition: It is composed of a various number of metering points within a Market Balance Area.<br>Additional information: This is a type of Functional group. | ENTSO-E |
| **Local Market Area** | A Market Area where there is no transmission capacity restrictions between the Market Balance Areas.<br>Additional information: This is a type of Market Area. | ENTSO-E |
| **Market Area** | An area made up of several Market Balance Areas interconnected through AC or DC links. Trade is allowed between different Market Balance Areas with common market rules for trading across the interconnection. | ENTSO-E |
| **Market Balance Area** | A geographic area consisting of one or more Metering Grid Areas with common market rules for which the settlement responsible party carries out a balance settlement and which has the same price for imbalance. A Market Balance Area may also be defined due to bottlenecks. | ENTSO-E |
| **Meter** | A physical device containing one or more registers. | ENTSO-E |
| **Metering Grid Area** | A Metering Grid Area is a physical area where consumption, production and exchange can be metered. It is delimited by the placement of meters for period measurement for input into and withdrawal from the area. It can be used to establish the sum of consumption and production with no period measurement and network losses. | ENTSO-E |
| **Metering point** | An entity where energy products are measured or computed. | ENTSO-E |
| **Register** | A physical or logical counter measuring energy products. | ENTSO-E |

# 3 GAP ANALYSIS THAT DESCRIBES THE METERING PROCESS AND ACTORS' ROLES

Meter information is crucial for the market. As stated before, there are no uniform rules, processes and data formats for metering in the EU.

In this gap analysis we checked whether existing legal obligations or agreements are defined in BiH covering the following issues in accordance with the European best practice. As a result, we have analysed the documents that prescribe the metering process and metering flow in BiH to identify roles and processes that are missing in order to have metering system established and actors' roles assigned.

(1) Gap Analysis
(2) ISO Market Rules
(3) Network Code
(4) General Conditions of Supply
(5) Rule on Eligible customers
(6) Distribution Code
(7) Metering Code
(8) Load Research Workshop Conclusions

## 3.1 Gap Analysis Roles and Responsibilities

Roles and responsibilities in the table below are defined according to the ENTSO-E Role Model. Roles describe external business interactions in the metering process with other parties in relation to the goal of a given business transaction.

| | FERC | RSERC | SERC | Brcko |
|---|---|---|---|---|
| **Meter Administrator** | DSO | DSO | Transco | DSO |
| **Meter Operator** | DSO | DSO | Transco | DSO |
| **Metered Data Collector** | DSO | DSO & End User | ISO | DSO |
| **Metered Data Responsible Party** | DSO | DSO & End User | ISO | DSO |
| **Metered Data Aggregator** | - | - | ISO | - |
| **Metering Point Administrator** | DSO | DSO | Transco | DSO |

Preliminary

As we can see, according to the laws and regulations in BiH, the DSO [18]owns the responsibility for the majority of functions in the metering process on the retail level. The role of metered data aggregator is only defined on the transmission level.

## 3.2 Gap Analysis Metering Processes

Well-defined processes for meters and meter data management within the binding regulatory framework are of essential importance to obtain well-functioning processes.
Business processes are a collection of related, structured activities or tasks that produce a specific metering service for a party in the market.
Since there is no unique overall process model for the EU member states, we compared the metering best practice processes with emphasis on meter values with the BiH legislation and checked if there are process descriptions (graphical and / or textual) as in Germany or in the Nordic countries.

| | FERC | RSERC | SERC | Brcko |
|---|---|---|---|---|
| **Create Meter Point** | n. a. | n. a. | n. a. | n. a. |
| **Change Meter Point** | n. a. | n. a. | n. a. | n. a. |
| **Terminate Meter Point** | n. a. | n. a. | n. a. | n. a. |
| **Install Meter** | n. a. | n. a. | n. a. | n. a. |
| **Exchange Meter** | n. a. | n. a. | n. a. | n. a. |
| **Regular Meter Read** | n. a. | n. a. | n. a. | n. a. |
| **Request Meter Read** | n. a. | n. a. | n. a. | n. a. |

We found no process descriptions in the documents.

## 3.3 Gap Analysis Metering Assets

The company responsible for reading the meter may not always be the company that owns it; but in BiH we assume that the meter is always owned by the DSO, which is common in the most member states in the EU.

[18] See, Pierce Atwood, Technical Assistance to the USAID Regulatory Energy Assistance Project (REAP), GAP ANALYSIS OF LEGAL AND REGULATORY BARRIERS TO THE SUCCESSFUL FUNCTIONING OF BiH'S ELECTRICITY MARKET AND RECOMMENDED IMPROVEMENTS," December 2012.

## 3.4 Gap Analysis Frequency of Meter Reading

| | FERC | RSERC | SERC | Brcko |
|---|---|---|---|---|
| **Regular meter reading** | Monthly | Monthly | continual | Monthly |
| **Exceptional meter reading** | Price change<br>Switch of sup. | Tariff change<br>Switch of sup. | n. a.<br>*(Gen. cond. of sup. not in English)* | Tariff change<br>Switch of sup. |

As in other EC member states regular meter reading for end customers is performed on a monthly basis and when the supplier or tariff / price changes.

## 3.5 Gap Analysis Standards for Information Exchange

| | FERC | RSERC | SERC | Brcko |
|---|---|---|---|---|
| **Channel** | n. a. | n. a. | n. a. | n. a. |
| **security** | n. a. | n. a. | n. a. | n. a. |
| **privacy** | n. a. | n. a. | n. a. | n. a. |

According to the documents available to us, we found no defined standards for the information exchange between the market participants.

## 3.6 Gap Analysis Formats for Data Exchange

| | FERC | RSERC | SERC | Brcko |
|---|---|---|---|---|
| **Message formats** | n. a. | n. a. | n. a. | n. a. |
| **Data formats** | n. a. | n. a. | n. a. | n. a. |

According to the documents available to us, we found no defined standards the usage of messages or defined data formats for the exchange of metered data between the market participants.

## 3.7 Gap Analysis Measuring Accuracy

| | FERC | RSERC | SERC | Brcko |
|---|---|---|---|---|
| **Accuracy Class (low Voltage)** | Class 1*<br>Class 2* | Class 1**<br>Class 2** | ISO-GRID CODE (2005) | Class 1***<br>Class 2*** |

Since Class 2 (IEC) is equivalent to Class A (MID) and Class 1 (IEC) is equivalent to Class B (MID) these requirements are compliant with the European standard for billing purposes.

* §9, EXCERPTS FROM EP BIH RULE ON END CUSTOMER'S METERING POINT
** §73 RSERC GENERAL CONDITIONS FOR DELIVERY AND SUPPLY OF ELECTRICITY
***§ 73 SERC GENERAL CONDITIONS OF DELIVERY AND SUPPLY OF ELECTRICITY IN BRČKO DISTRICT

# 4 DRAFT METHODOLOGIES, PROCESSES AND ROLES TO PRESCRIBE THE METERING PROCESSES

Although there are no European standards for metering, the informational structure of the electricity market is similar in the different member states. In the following we propose a design for the metering business based on the international practice and giving particular consideration to the relevant European legislation.

Looking at the DSO in terms of roles and regulations we have to distinguish between the "old" vertically integrated DSO, which was responsible for the operation of the network that includes metering as well as for the supply of the end customer, and the new unbundled DSO, which is only responsible for the network and a separate supplier of energy.

The following specifications in this chapter apply to an unbundled DSO in a liberalized energy market whose responsibility is metering and the non-discriminatory supply of information such as metering data to any third party electricity supplier.

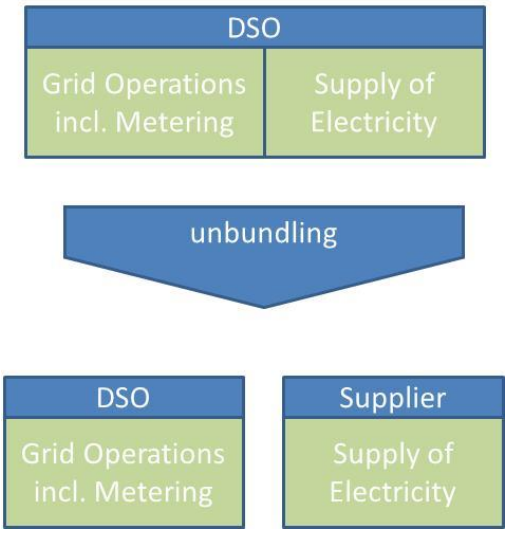


**Figure 5 unbundled DSO**

In order to facilitate an open energy market and activate competition between several energy providers, it is necessary to implement well defined, non-discriminatory and efficient processes in all areas of Bosnia and Herzegovina. In line with this there is the need for the uniform exchange of information between the DSO and the energy supplier.

Preliminary

## 4.1 Metered Data Aggregator

Since the role of the Metered Data Aggregator is new for BiH DSOs, we will explain this role before moving to the processes.

The Metered Data Responsible Party, in Europe usually the DSO in the distribution grid and the TSO in the transportation grid, is in charge of the establishment and qualification of metered data from the Metered Data Responsible Party. This data to be aggregated according to a defined set of market rules include aggregated metered data for profiled metering points as well as metered load profiles for both generation and consumption. The rules usually cover the aggregation of meter data for balancing and settlement. The Metered Data Aggregator then sends the aggregated data as different types of time series to the Balance Responsible Party.

## 4.2 Business processes

The following metering processes are designed to cover all retail related metering activities. To clarify the process, we utilize the roles in the metering process as defined by ENTSO-E in order to demonstrate the different functions and data, being aware that the DSO covers all these roles in BiH.

The following processes are supposed to be processed mainly automatically.

Preliminary

### 4.2.1 Request for Meter Reading

Although this process is mainly defined to be used for reading SLC-Customers, it can be utilized for RAM-Customers as well.

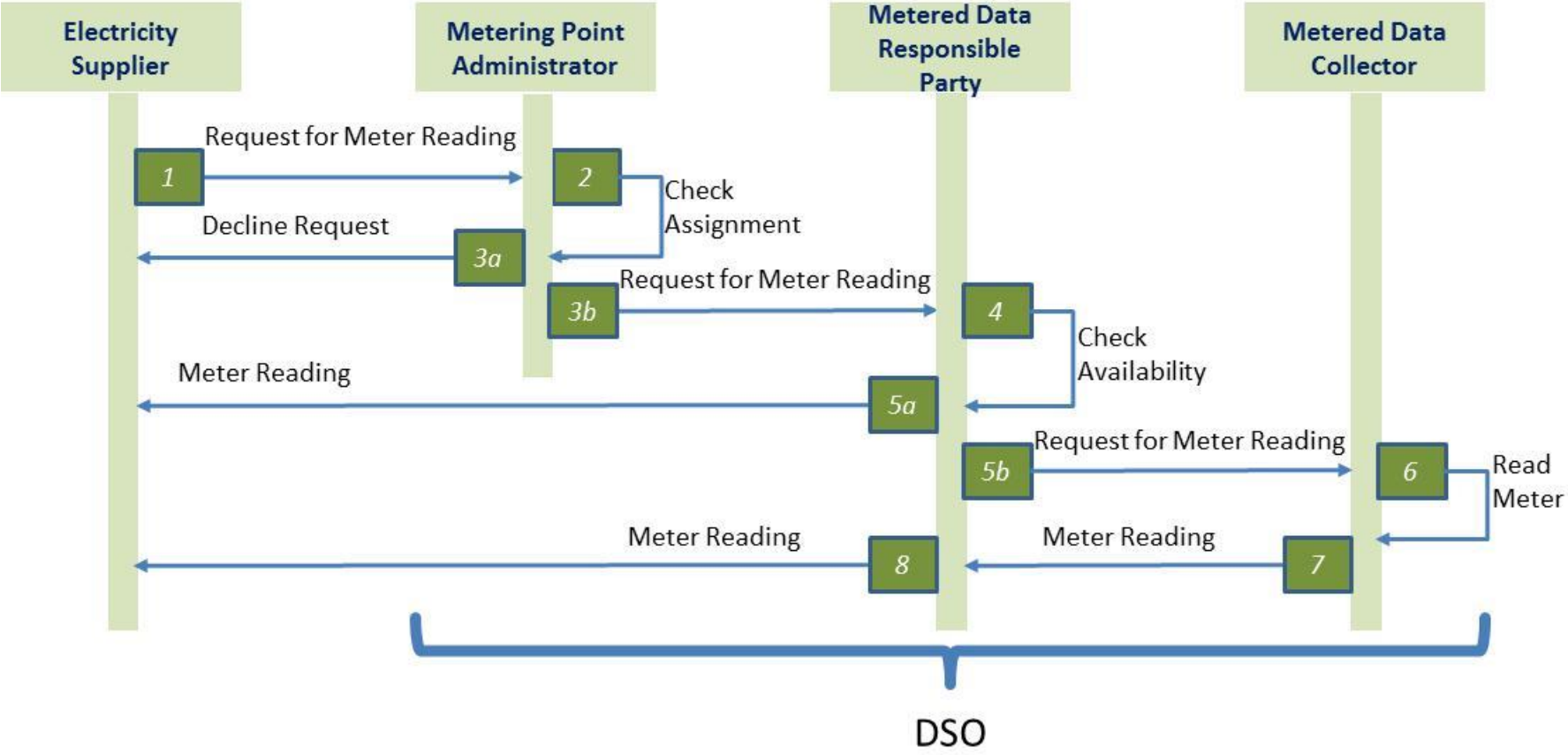


**Figure 6: Request for Meter Reading**

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| 1 | Electricity Supplier | MP Admin | The supplier sends a request for metered data to the Meter Point Administrator (MP Administrator) | | Supplier ID, MP-ID, reason, reading period | Supplier is identified by supplier ID. There may be a reason for the reading request (e.g., end of contract) and a period or an exact date for reading. |
| 2 | | | The MP Administrator checks whether the supplier has an actual contract of supply for the MP or not. | immediately | MP-Register | If a supplier has a valid contract with an end customer at the MP for the requested period it must be registered in the MP Register |
| 3a | MP-Admin | Supplier | In case that the supplier has no valid contract for that MP the request will be declined by the MP-Administrator. | immediately | MP-ID, reason for decline | The message contents only a status “No Valid Contract”. |
| 3b | MP-Admin | Metered Data Resp. | The MP-Administrator forwards the request for metered data to the Metered Data Responsible Party. | immediately | MP-ID, Reason, Period | |
| 4 | | | The Metered Data Responsible Party will check, whether the requested data is available for the reading period or not. | immediately | MP-ID, Meter Data register | Metered Data Responsible Party will store all meter readings for the MP as long as stated in the law. |
| 5a | Metered Data Resp. Party | Electricity Supplier | If metered data already available, it can be sent directly to the requesting supplier. | Immediately | MP-ID, Meter-ID, Register, Reading, Reading-ID | This will be the case when the request refers to passed periods. |

Preliminary

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| 5b | Metered Data Resp. Party | Metered Data Coll. | The Metered Data Responsible Party forwards the request for metered data to the Metered Data collector. | immediately | MP-ID, Reason, Period | |
| 6 | | | The Metered Data collector will read the meter at the meter point. | 3 Work days | | The deadline for meter reading on request has to be established by law. There may be different deadlines, depending on the reason for meter reading. |
| 7 | Metered Data Coll. | Metered Data Resp. Party | The Metered Data collector sends the reading to the Metered Data Responsible Party.<br>He will mark the metered values with a Reading ID. If reading was not possible he will mark this in the Reading-ID | immediately after reading | MP-ID, Meter-ID, Register, Reading, Reading-ID | Reading may be impossible because the Metered Data Collector had no access to the meter. |
| 8 | Metered Data Resp. Party | Electricity Supplier | The Metered Data Responsible Party has to check the plausibility of the meter reading. If there is no reading he has to build a replacement value. He will mark the metered values with a Reading ID and send it to the Electricity Supplier. | immediately | MP-ID, Meter-ID, Register, Reading, Reading-ID | The way how to check the plausibility of a reading and to build a replacement value should to be agreed in a law, a rule or an association agreement between market partners |

Preliminary

### 4.2.2 Regular Meter Reading

This process has no real start event. For SLC-Customers it starts once a month as specified in the particular law. The transmission of data for the daily measured meter values for RAM-Customers should be processed on a daily basis (using AMR-Systems). However, there may be different agreements.

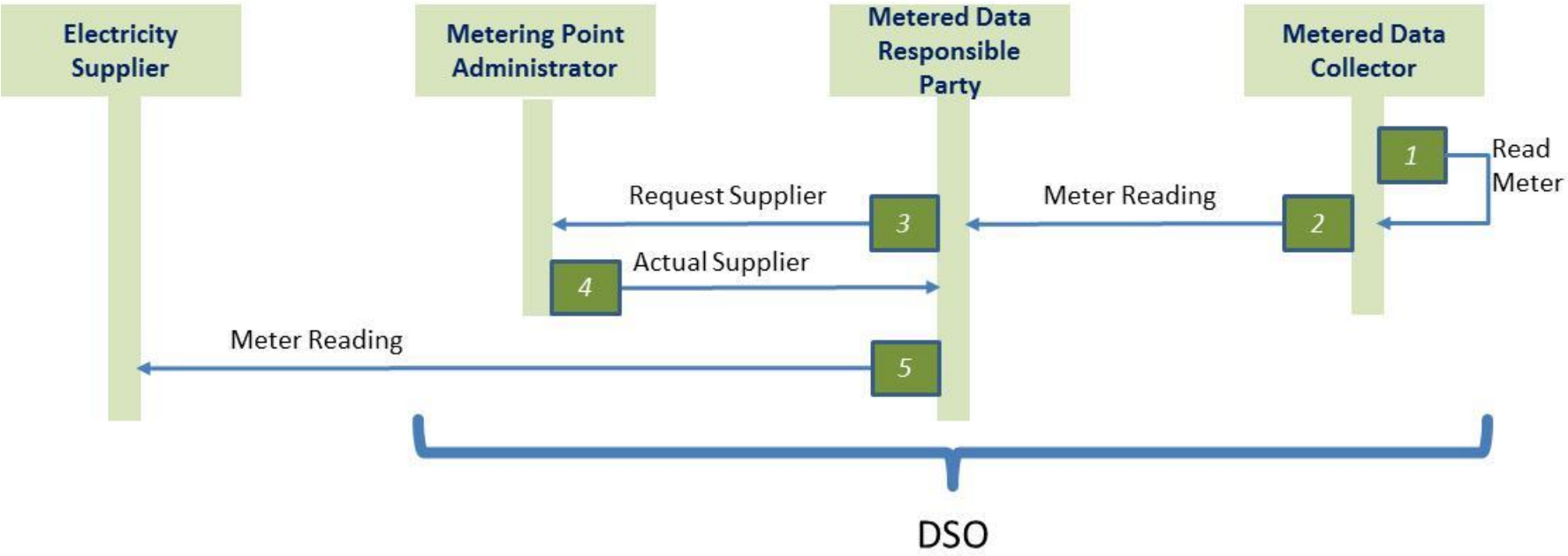


**Figure 7 Regular Meter Reading**

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| 1 | | | The Metered Data Collector will execute meter reading once a month. All meters in | Once a month | List of meters due for reading | DSO usually executes meter reading on the basis of predefined reading |

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| | | | the area covered by the Metered Data Collector have to be read in an agreed cycle. | | | regions / lists. |
| 2 | Metered Data coll. | Metered Data Resp. Party | The Metered Data Collector sends the reading to the Metered Data Responsible Party.<br>He will mark the metered values with a Reading ID. If reading was not possible he will mark this in the Reading-ID | immediately after reading | MP-ID, Meter-ID, Register, Reading, Reading-ID | Reading may be impossible because the Metered Data Collector had no access to the meter. |
| 3 | Metered Data Resp. Party | MP-Admin | The Metered Data Collector requests the actual supplier from the MP-Administrator. | immediately | MP-ID | |
| 4 | MP-Admin | Metered Data Resp. Party | The MP-Administrator sends the actual supplier to the Metered Data Responsible Party. | immediately | MP-ID, Supplier-ID, Supplier-Address | |
| 5 | Metered Data Resp. Party | Electricity Supplier | The Metered Data Responsible Party has to check the plausibility of the meter reading. If there is no reading he has to build a replacement value. He will mark the metered values with a Reading ID and send it to the Electricity Supplier. | immediately | MP-ID, Meter-ID, Register, Reading, Reading-ID | Meter readings shall be sent only to the actual entitled supplier.<br>Where required, the meter reading has to be split between two suppliers. |

Preliminary

### 4.2.3 Build a new Meter Point

This process is to be used after the DSO has built a new meter point (e.g., a new building).

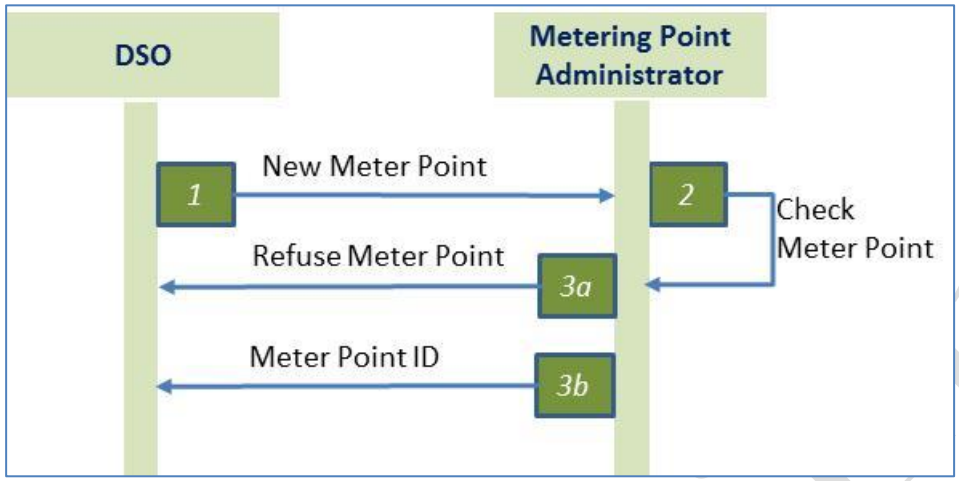


**Figure 8 Build a new Meter Point**

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| 1 | DSO | MP Admin | The DSO sends a new meter point with its characteristics (Address, electrical specification) to the Metering Point Administrator. | immediately after completion | DSO-ID, MP-Characteristics | MP-Characteristics has to be defined in a in a law, a rule or an association agreement between market partners |
| 2 | | | The MP Administrator checks the MP whether the specification is complete | immediately | MP-Characteristics | |

Preliminary

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| 3a | MP-Admin | DSO | In case the specifications are incomplete, the MP Administrator will refuse the registration. | immediately | | |
| 3b | MP-Admin | DSO | The MP Administrator creates a new meter point ID and stores it at the MP-Register and sends the MP-Id to the DSO | immediately | MP-ID, MP-Characteristics | |

Preliminary

### 4.2.4 Change Meter at Meter Point

This process is to be used when the Meter Operator receives an order to change a meter at the meter point.

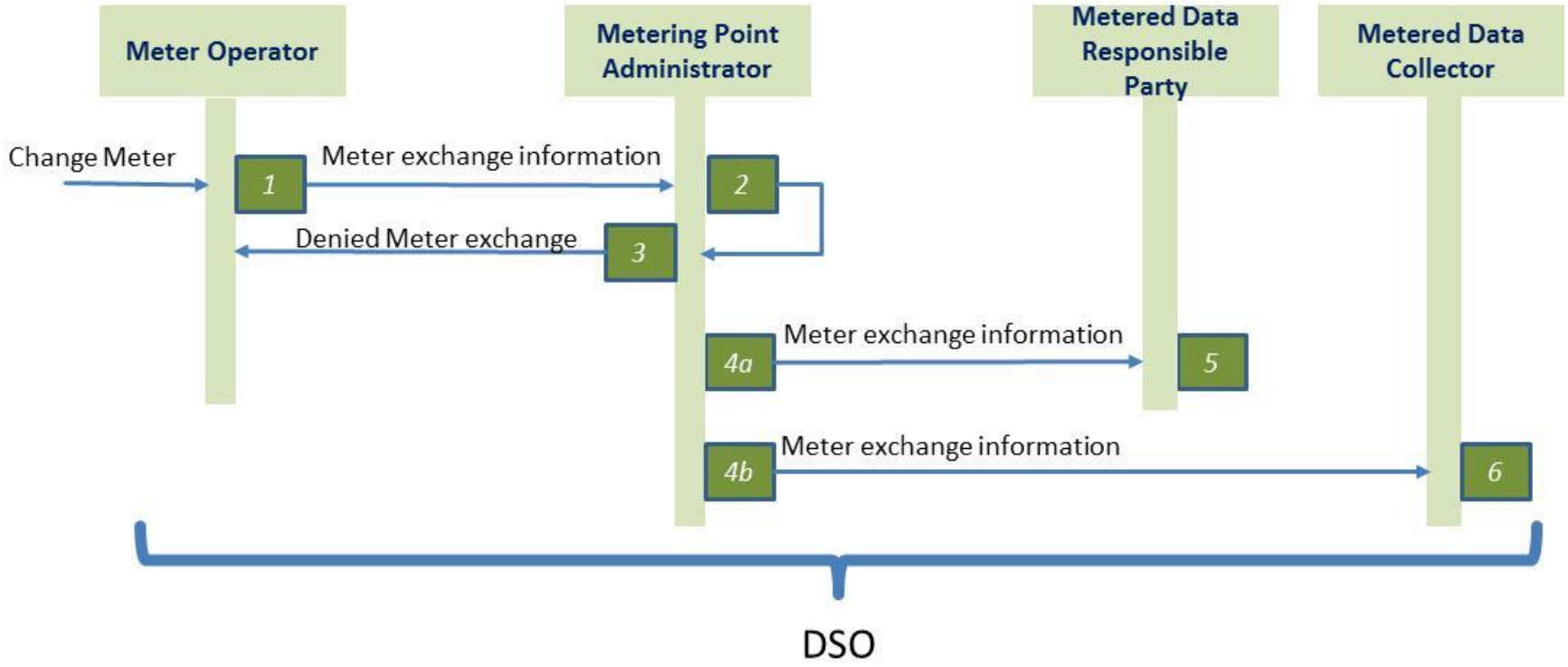


**Figure 9 Change Meter at Meter Point**

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| 1 | | Meter Operator | The Meter Operator receives an order to change a meter at the Meter Point.<br>The Meter Operator exchanges the old meter with the new meter. He reads both meters and sends the Id of old and new meter including meter reading to the MP-Administrator | As per legal req. | Meter Point, old Meter ID, new Meter ID, Meter Reading | Trigger for exchange may also be an timed event (e.g., certification of meter elapsed) |
| 2 | | | The MP Administrator checks whether the new meter fits the MP characteristics. If not, he sends a message of denial | immediately | Meter Point, old Meter ID, new Meter ID, Meter Reading | |
| 3 | MP Administrator | Meter Operator | The MP Administrator sends a message of denial to the Meter Operator | immediately | MP-ID, MP-Characteristics, new Meter ID | After a denial from the MP Admin the process starts from beginning |
| 4a | MP Administrator | Metered Data Responsible | The MP Administrator sends information about the meter exchange to the Metered Data Responsible Party | immediately | Meter Point, old Meter ID, new Meter ID, Meter Reading | |
| 5 | | | Metered Data Responsible Party stores new meter and meter readings in his Meter database and changes the status of the old meter | immediately | old Meter ID, new Meter ID, Meter Reading | |

Preliminary

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| 4b | MP Administrator | Metered Data Collector | The MP Administrator sends information about the meter exchange to the Metered Data Collector | immediately | Meter Point, old Meter ID, new Meter ID, Meter Reading | |
| 6 | | | Metered Data Collector stores new meter and meter readings in his Meter database and changes the status of the old meter | immediately | old Meter ID, new Meter ID, Meter Reading | |

Preliminary

### 4.2.5 Metering for Balancing

This process is intended to demonstrate the flow of metered data and aggregated time series from the Meter Data Aggregator to the Balance Responsible Party for balancing purposes. Content of data and data exchange will vary according to different legal requirements and balancing models.

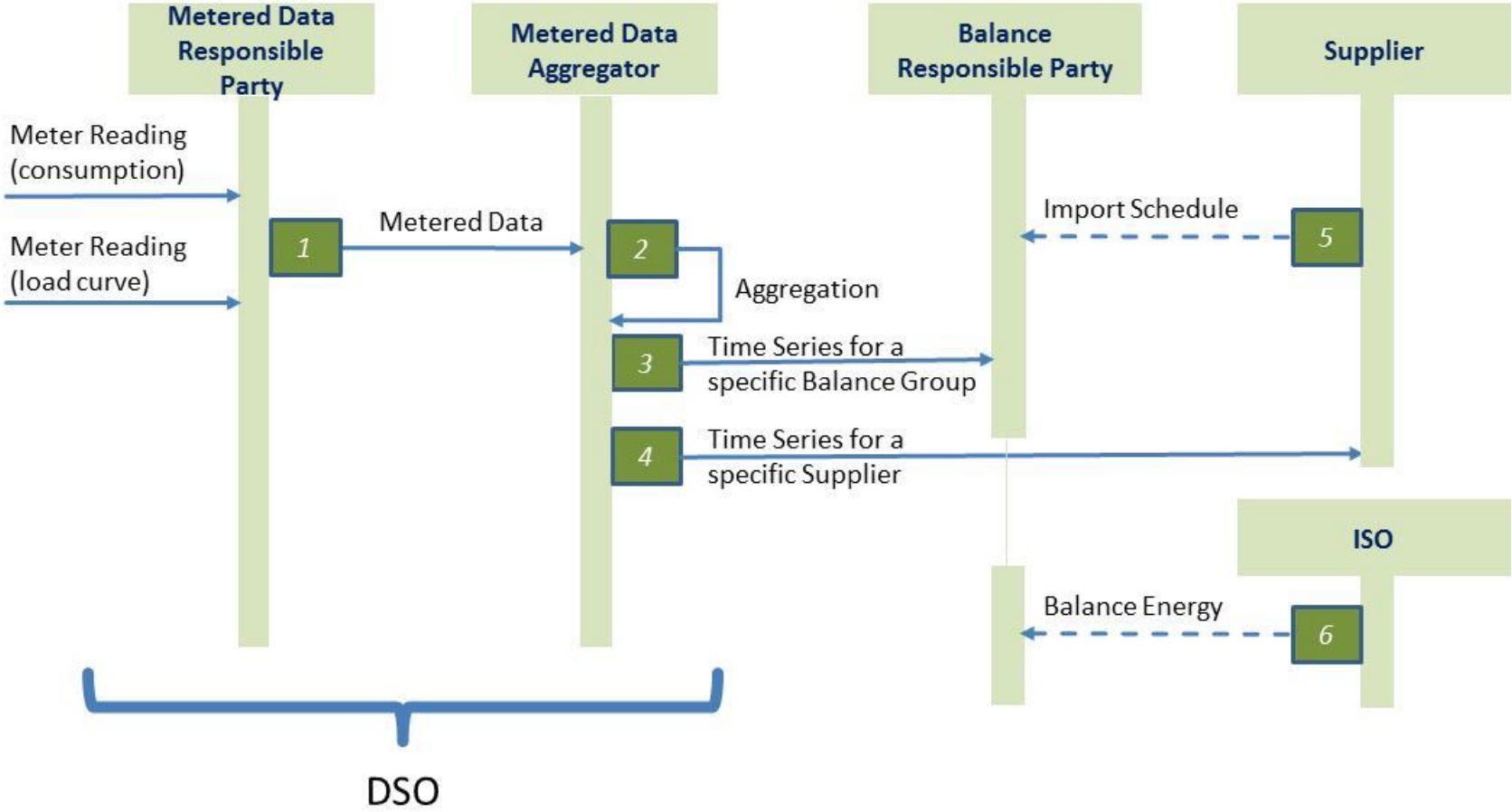

**Figure 10 Metering for Balancing**

The Metered Data Responsible Party receives all meter readings. This includes consumption residential (SLC) customers and load curves as time series from AMR customers as well as generation in the low voltage grid.

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| 1 | Metered Data Responsible Party | Metered Data Aggregator | Metered Data Responsible Party sends validated metered data to Metered Data Aggregator | As per legal req. | MP-ID, Meter ID, Supplier, Metered Data | Consumption as well as load curves for consumption and (small) generation (e.g., Photovoltaics) in the distribution grid. |
| 2 | | | The Metered Data Aggregator will apply measured consumption on the profile class and aggregate the resulting load curve together with measured load curves.<br>He will at least produce the following types of time series for specific Balance Groups:<br>**Import**<br>• *Generation feed-in into the distribution grid (based on applied SLC)*<br>• *Metered load curve generation feed-in into the distribution grid*<br>• *Other import into the distribution grid (metered load curve)* | As per Legal req.<br>Usually on a monthly base | Time Series, Supplier-ID, Balance Group, BRP, | Aggregation includes all consumption (export from the balancing group) as well as all generation (import into the balancing group).<br>There must be different Standard Load Curves for different customer groups (e.g., household, heating, small enterprise).<br>The Meter Data Aggregator has to ensure that all amounts of energy are properly attached to one BPR or supplier.<br>For identification of the produced timelines a virtual MP-ID is com- |

Preliminary

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| | | | **Export**<br>• *Consumption in the distribution grid (customers with metered load curves)*<br>• *Consumption in the distribution grid (customers with applied SLC)*<br>• *All other metered consumption if applicable*<br>• *Grid losses*<br>He will at least produce the following types of time series for entitled suppliers<br>• *Consumption in the distribution grid (customers with metered load curves)*<br>• *Consumption in the distribution grid (customers with applied SLC)* | | | monly used. |
| 3 | Metered Data Aggregator | Balance Responsible Party | Metered Data Aggregator sends the aggregated time series for on the balance area to the Balance Responsible Party | As per Legal req. | Time Series, BPR-ID, Balance Group | |
| 4 | Metered Data Aggregator | Supplier | Metered Data Aggregator sends the aggregated time series to the entitled supplier | As per Legal req. | Time Series, Supplier-ID, Balance Group | The supplier will only receive the data for which he has a valid contract of supply. |

Preliminary

| Nr. | Sender | Receiver | Description | Deadline | Data | Remark |
|---|---|---|---|---|---|---|
| 5 | Supplier | Balance Responsible Party | The supplier sends his Import schedule to the Balance Responsible Party | As per Legal req. | Time Series, Supplier-ID, Balance Group, BPR-ID | Import schedule stands here synonym for the forecast of energy a supplier has to feed into the grid to cover the consumption of his customers. |
| 6 | ISO | Balance Responsible Party | The ISO sends a time series that covers the balancing power used in the Market Area for a given period. | As per Legal req. | Time Series, Market Area | Given period is usually a month |

Preliminary

## 4.3 Guidelines for Measured Values

There should be unique minimal technical requirements on the meter itself. Measured values should have the following status information according to the timelines for meter reading and data exchange:

- True Value
- Replacement Value
- Preliminary Value (can be replaced by a true value after successful reading)
- Faulted Value (should be replaced by replacement value for billing)
- Missing Value (should be replaced by replacement value for billing)

Meter readings have to be stored / archived according an agreed timeline with all versions of the measured values.

***Validation of energy meter readings***
In measuring systems with energy meters the validation is to check whether all mandated readings are processed and properly transferred. The current consumption should be consistent with the consumption of a previous, comparable accounting period.
***Validation of load profile (interval) meter readings***
Before any further examination, the number of readings for each day is to be determined. If there are less or more values, appropriate replacement values have to be formed.
Verify that for each registration period a value was registered. In the case of disabling of supply, the missing registration periods have to be padded with zero as a replacement value.
***Replacement values for energy meter readings***
The consumption for the period since the last good reading is calculated from the average consumption of previous and subsequent period or because of last year's consumption by estimation.
***Replacement values of load profile (interval) meter readings***
Replacement values can be created by using a reference measurement. If a reference measurement is not applicable, replacement values for a profile must be created by using statistical methods for interpolation or extrapolation of profile values. Adequate unique methods for that have to be defined.

## 4.4 Guidelines on Data

### 4.4.1 Supplier-ID

All suppliers in BiH should have a unique Supplier-ID to identify the supplier in all processes of data exchange. This supplier register should be kept at the regulator. The supplier will not perform any action on the market until he is registered. This should be defined in the licensing rules.

The Supplier-ID could be a licensed number according to EIC with EIC-Object Type = X (Party) or GLN or a certain BiH number for usage inside BiH.

Preliminary

For a BiH Supplier-ID a four digit number will be sufficient for all suppliers.
We understand that the ISO has already issued EIC codes to all market participants. In this case, these codes could be used as Supplier-ID for data exchange.

### 4.4.2 DSO-ID

All DSOs in BiH should have a unique DSO-ID to identify the DSO in all processes of data exchange. This DSO register should be kept at the regulator.

The DSO-ID could be a licensed number according to EIC with EIC-Object Type = X (Party) or GLN or a certain BiH number for usage inside BiH. A four digit number will be sufficient for all DSOs.

Remark:
If a certain BiH numbering system is planned, there should be a unique system for supplier and DSO, differing in the role of the party including a check digit according the following example:

| | | | | | | |
|---|---|---|---|---|---|---|
| D | 1 | 2 | 3 | 4 | c | DSO-ID |
| S | 1 | 2 | 3 | 4 | c | Supplier-ID |

We understand that the ISO has already issued EIC codes to all market participants. In this case, these codes could be used as DSO-ID for data exchange.

### 4.4.3 Meter Point ID

A meter point identifies a physical or logical point that is used to identify an object where the measurement of energy takes place.
For a data exchange in an open energy market the meter point must have a unique identification. This ID could be a licensed number according to EIC with EIC-Object Type = Z (Measurement Point) or GLN or a certain BiH number for usage inside BiH. In Europe EIC numbers are already in use for the identification of connection points in the electricity grid.
A BiH internal number should include the DSO-ID and a 10-digit number including a check digit according the following example:

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D | 1 | 2 | 3 | 4 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | c |

If there is a need for defining virtual Meter Points (e.g., for aggregation purposes), the procedure for numbering should be the same as for real Meter Points.

Preliminary

### 4.4.4 Meter Point Register and Customer Data Base

The Meter Point Register is the central hub for all data exchange related to metering data. The meter Point Register has a data structure as shown in the following figure

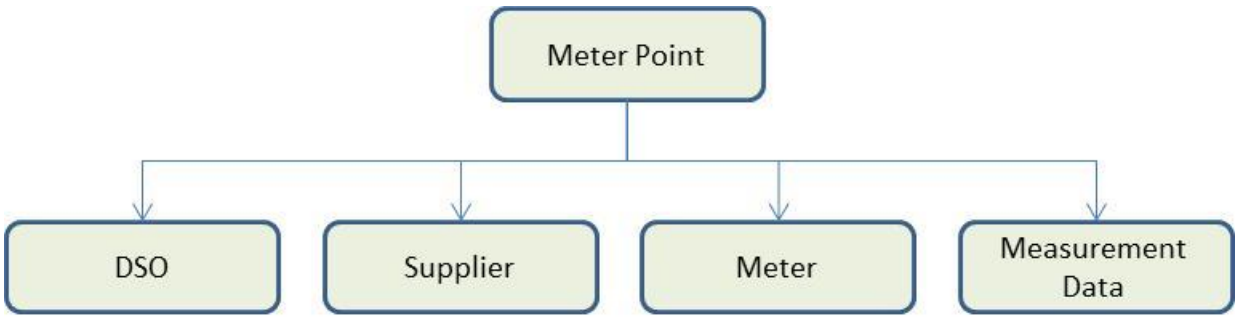


**Figure 11 Meter Point Register**

The relations at the MP are always time based, i.e., request at the MP-Register will always clarify which supplier is supplying the MP for a distinct period of time, which meter is installed for a distinct period of time and the measurement data for a distinct period of time.
In a decentralized model the MP Register is kept at the DSO, in a centralized model there will be a distinct data hub kept at a certain organization.
Nevertheless in a competitive market, rules for the access to the MP Register have to be defined clearly and nondiscriminatory.
The MP Register usually contains the information that customer is connected to which meter point (connection point). This also includes the information that supplier supplies a specific customer at this meter point. Actually the DSO is the only organization that has complete information about all customers at the meter point and the corresponding suppliers over the entire period of the existence of the meter point.
Since in a decentralized model the DSO is the only platform for suppliers and customers he has to ensure that only authorized suppliers have access to the customer and metering data. In this case authorization means that a supplier has only access to customer data **for the period of time covered by a valid contract of supply** with the customer. The DSO settles as well single requests of a supplier regarding a certain meter point (e.g., the type of meter at a meter point) for contractual purpose.

### 4.4.5 Meter data

Regarding meter readings we have to distinguish between the following occurrences of meter readings

a) A single value, usually a consumption in kWh value monthly drawn from a conventional meter, and
b) A load curve that means a time series containing power values measured in a quarterly period in kW.

Both are meter readings in the sense since we have used it in the previous sections.

Preliminary

A complete set of metered data used in the market communication should include at least the data shown in the following table.

| Data | Value |
|---|---|
| MP-ID | Unique ID of meter point |
| Meter-ID | Unique ID of meter |
| Time of meter reading | The time the meter is read e.g., 03012012 |
| Begin period of meter reading | Period for meter reading e.g., 01012012 |
| | |
| End period of meter reading | Period for meter reading e.g., 0228201 |
| Reason | COM (change of meter)<br>IOM (installation of meter)<br>ROM (removal of meter)<br>COS (change of supplier)<br>COB (change of balancing area)<br>PMR (periodic meter reading) |
| Status | SMV (start measure value) e.g., beginning of supply<br>EMV (end measure value) e.g., change of meter<br>MRV (meter reading value) e.g., periodical reading |
| Product Identification | OBIS-Value (include the unit) |
| Quantity Qualifier | True Value (relevant for billing)<br>Estimated Value (relevant for billing)<br>Preliminary Value (not relevant for billing) |
| Quantity | “123460” (with fixed decimal places) |

**Table 1 Metered Data**

For the exchange of load curve values, the quantity field has to be repeated for each value in the load curve. Since the number of values should always cover a full day, there are 96 values for one day (quarterly hour measuring).

## 4.5 Data Exchange

This chapter describes the measures that need to be done to ensure a smooth data exchange between market participants. Only then the enterprise-wide largely automated business processes can be run by all interested market participants.

Preliminary

### 4.5.1 Basics for electronic data exchange (EDI)

#### 4.5.1.1 Basic Principles of Organization

As a prerequisite of all working processes, all main technical, organizational and contractual issues between the parties involved in each business process have to be clarified in their respective market role. This implies in particular that the parties have agreed to the communication parameters in advance. The parties have to ensure the operation and availability of the communications systems and to appoint persons of contact.
All market partners need a unique Identifier for data exchange that has to be published.
In order to achieve maximum automation of data exchange, the market partners must agree before the first data transmission on the communication channel and the data addresses.

### 4.5.2 Message Data

The type and structure of messages and message files has to be agreed in a general rule on data exchange. Aside from an exact definition of the structure of the used messages (e.g., the BiH-specific characteristics and usage of UTILMD for master data and MSCONS for load profiles and meter readings), there is also a need to define the usage of message files, e.g., name conventions, separation of load profiles and meter readings.

### 4.5.3 Channels for Data Exchange

For the transmission of message files, transportation ways like AS2 or E-mail via SMTP are available.

According to the high variety in e-mail usage, automated processes need some rules for the message exchange via e-mail as shown in the following examples:

- The email-addresses are to be used solely for the exchange of these messages. These addresses have to be functional and not personal.
- Encrypting and signing e-mails is permitted exclusively by the S / MIME standard. The use of a qualified signature certificate in S / MIME is technically not possible. It must be an advanced certificate.
- The message is kept in the e-mail attachments. An e-mail must not contain any other attachments, other than signature files.
- The attachment must be Base64 encoded, so that mail server does not insert line breaks during transport.

For the usage of AS2 there are different requirements from best practices such as:

- The AS2 ID must be a market partner ID.
- The AS2 certificate is used for digital signatures and encryption and shall be used solely for AS2 communications.

Preliminary

- As transport protocol HTTP can be used, full qualified name of the domain (URL) must be entered.
- In order to ensure interoperability, no other AS2 parameters other than those specified in the rule shall be used. Header information should be kept to a minimum since the header information is not encrypted with the remaining message when the message is transmitted.

Whether e-mail or AS2 is to be used for the transport of messages between market partners, clear rules need to be defined to ensure minimal efforts for market communication for all market parties.

# 5 CONCLUSIONS AND RECOMMENDATIONS FOR IMPLEMENTATION

As shown in the chapters before, metering is essential in order to facilitate the emergence of well-functioning and transparent energy markets in a deregulated environment. Competitive markets include easy access to meter data for all obliged parties at low metering costs as well. However, metering is only a means to an end – a means to provide metered values for billing, settlement and balancing purposes. To ensure this, metering and metering related laws, rules agreements and processes should be identical and clearly defined in the whole state of BiH for all market participants, and requirements from the EU should be fulfilled.

Conclusions and recommendations are based on the documents available to us and best European practice and will cover all levels of the metering issue.

The recommendations apply to an unbundled DSO in a liberalized energy market whose responsibility is metering and the non-discriminatory supply of information, such as metering data, to any third party electricity supplier.

## 5.1 Technical aspects in metering

As stated in chapter 2.3 there are some minimum requirements from the EU regarding the accuracy of meters deployed in the field and used for billing purposes for residential customers. In the Gap Analysis we found that these issues are covered by law for FERC and RSERC (installing class 1 and Class 2 meters).
Technical parameters for the metering place are given in the *General Conditions of Supply*..
***Recommendation***

Preliminary

We recommend that the accuracy classes for meters in the field should be adopted by Brcko and prescribed by SERC. Also, the rules for testing and certification of meters should be unified for all of BiH.
Unique technical specifications and unique methods for testing and certification of meters should be rolled out for all of BiH.

## 5.2 Frequency of Meter Reading

Although there are no explicit requirements from the EU regarding the execution of metering and the handling of measured values, there are some best practices about these issues.
For BiH regular meter reading is to be executed once a month in accordance with the law which is sufficient for billing purposes. Exceptional meter reading (on change of price or supplier) is covered by law in FERC and RSERC. This is consistent with European best practices.

***Recommendation***
We recommend that the reasons for exceptional meter reading be adopted in the law for Brcko and prescribed by SERC. An indication of the costs for such meter readings should be given. We recommend that this be executed with no additional costs for a single customer or supplier.
For RAM Customers it should also be clarified that metering should be executed at least once a day. Facing the EU requirement that the change of supplier must be effected by the operator concerned within three weeks and customers are entitled to receive all relevant consumption data, a suitable timeline for meter reading should be defined.

## 5.3 Measured Values

There are no explicit EU requirements about the handling of measured values and we could find no rules for the handling missing or implausible measured values for BiH.

***Recommendations***
We recommend that unique agreements regarding the handling of measured values covering the aspects of validation and replacement of measured values from energy meters and load profile (interval) meters be set for BiH as described in chapter 4.3.

## 5.4 Measured Values for Financial Settlement (Balancing)

Although not part of the core meter business, financial settlement balancing needs correct and validated measured values. In the documents available to us, we found no rules or methods to apply consumption data to Standard Load Curves valid for BiH. Also we found no rules describing data transfer between the DSO and the BRP.

Preliminary

Balancing for financial settlement is always based on a time series. There must be different SLC's for different customer groups (e.g., household, heating, small enterprise, PV-Import) to ensure a fair balancing of consumption.

***Recommendation***

We recommend that groups of SLC's have to be defined reflecting the actual course of consumption for the different customer groups. An SLC usually covers the period of one year based on ¼ hour values.

In addition, which method (analytical or Standard Load Profile) a DSO applies to calculate the load curve for a supplier must be described.

## 5.5 Assets, Roles and Responsibilities

Roles and responsibilities are defined in the laws of BiH (see Chapter 3.1). We found that all roles, except the role of the "Metered Data Aggregator" and all responsibilities are covered by the DSO. Therefore, the DSO owns responsibility the majority of functions in the metering process on the retail and transmission level, which is according to European best practice.

We understand that the meter is always owned by the DSO, which is also common in the most member states in the EU.

**Recommendations**

The roles and responsibilities should be outlined in the business processes. The role of the Metered Data Aggregator should be assigned to the DSO.

## 5.6 Data and Data Formats

According to EU requirements, the member states shall define a format for the data and a procedure for suppliers and consumers to have access to the data. In the documents available to us we found no regulations regarding the handling of data and the procedures of data exchange. Although there are no European standards for metering, the informational structure of the electricity market is similar in the different member states.

To define the minimum set of data to be exchanged, two types of information should be taken into account: the minimum set of meter data that has to be exchanged during supply and when starting / ending energy supply. During supply there should be a regular exchange of consumption data between the metering operator (in BiH the DSO), the supplier and the balance responsible party , to enable invoicing, balance and settlement processes. When starting energy supply the metering operator or meter point administrator should provide suppliers with the "relevant meter point data" to allow them to correctly identify the customer, start supplying energy and notify the other market parties.

Preliminary

***Recommendations***

There should be a unique definition of data formats and information exchange in all of BiH. We recommend defining these guidelines in a binding agreement for all market participants in BiH.
These agreements should cover the following aspects of data exchange as described in Chapter 4.5:

- Working processes and main technical, organizational and contractual issues between the parties involved with respect to their market role.
- Unique identification of all market partners with respect to their market role
- Unique data formats (type and structure) to be used in the process of data exchange
- Unique channels for the transport of messages between market partners
- Unique requirements on data security and data privacy

Because the development of such agreements takes lots of time and effort, we strongly recommend to utilize existing formats like the EDIFACT standards UTILMD and MSCONS and to adaopt them to BiH requirements. These are fully developed and proven in daily practice.
Regardless of the tools used for that, the meter point and the market participants need a unique identification, which must be defined.

## 5.7 Business Processes

Although there is no definition of business processes from the EU level, it is crucial to define these processes for BiH. The definition should cover the nondiscriminatory access to meter and meter related data for all eligible market parties. For achieving low costs, business processes are supposed to be processed mainly automatically between the market parties. This requires clear identifications and data formats as described in the chapters above.
In the documents available to us, we found no clear definitions for business processes for metering in BiH.

***Recommendations***

Business processes should be defined in an agreement between the market parties. The definition consists of a diagram of the process and a description of the single tasks, actors, data formats and data (see chapter 4.2).
The definition should not only describe the “normal” process but should cover all exceptions as well.
We strongly recommend utilizing common European practice business process models and adapting them to BiH. These models are proven in practice and utilizing them will save development costs.

## 5.8 Centralized vs. Decentralized Data Exchange

There are three different models in the EU through which information is exchanged between the metering operator (in BiH, the DSO) and the supplier.

Preliminary

- In the first and currently most common market model, information exchange is direct and bilateral. All market parties directly send one another standardised messages.
- As an alternative, messages can be sent to a data hub where messages are subject to a quality check and are then forwarded to the final addressee
- Data hubs can also be organised as a central database where the exchanged data is not only checked, but also stored. This provides added value in the form of record keeping and data storing.

The model to be reflected in the BiH law is the decentralized model.

The fundamental advantage of decentralized models is that messages are sent to, checked by, received from and possibly also stored in just one address. These advantages are independent from the ownership of the central hub.

***Recommendations***

It seems as a trend towards information exchange through data hubs can already be observed within the EU. However, a final recommendation for a centralized or decentralized model should be seen in connection with the role of the DSO and cannot be finalized until after a discussion of this item by the regulators and the industry.

Preliminary

# 6 APPENDIX

## 6.1 Standards for Identifiers

### 6.1.1 OBIS

The OBject Identification System (OBIS) defines the identification codes (ID-codes) for commonly used data items in electricity metering equipment (IEC 62056-61).
This standard applies to all types of electricity metering equipment, such as fully integrated meters, modular meters, tariff attachments, data concentrators, etc. To cover metering equipment measuring energy types other than electricity, combined metering equipment measuring more than one type of energy or metering equipment with several physical measurement channels, the concepts of medium and channels are introduced. This allows meter data originating from different sources to be identified. While this standard fully defines the structure of the identification system for other media, the mapping of non-electrical energy related data items to ID codes needs to be completed separately.

OBIS uses six value groups in a hierarchical structure. Value group A identifies the energy type measured. A=0 identifies abstract codes. Value group A has reserved space for future extensions. Value group B identifies the measuring channels. Value group C identifies the physical quantity measured, while value group D identifies the processing methods and country specific codes. Value group E is used for identifying rates or can be used for further classification. Value group F is used for identifying historical values or can be used for further classification. The Groups B to D have code space for manufacturer specific identifiers.

| | | | Group |
|---|---|---|---|
| **Medium** | 1-digit | Electricity = 1 | **A** |
| Separator 1 | - | ASCII 2D | |
| **Channel** | 1- or 2-digits | not used in elctricity | **B** |
| Separator 2 | : | ASCII 3A | |
| **Measure** | 1- or 2-digits | Real Energy, Reactive Energy, … | **C** |
| Separator 3 | . | ASCII 2E | |
| **Mode** | 1- or 2-digits | Maximum, Actual Value, …. | **D** |
| Separator 4 | . | ASCII 2E | |
| **Tariff** | 1-digit | Total, Tariff1, Tariff2 | **E** |
| Separator 5 | * | ASCII 2A | |
| **Historical values** | 1- or 2-digits | 00...99 | **F** |

**Table 2 OBIS Numbers**

Example:

1-b:1.8.0 real energy import (+) Energy value

1-b:1.29.0 real energy import (+) load curve total

Preliminary

### 6.1.2 EIC-CODES-OBJECT-TYPES

The Energy Identification Coding scheme (EIC), standardized and maintained by ENTSO-E, provides a unique identification of the market participants and other entities active within the Energy Internal European Market (IEM). It is widely used in the Electronic Document Interchange.
EIC codes are supplied and administered either by Local Issuing Offices or by the Central Issuing Office.
Currently the following types of object have been identified in the coding scheme, other types of EIC codes may be added with the agreement of ENTSO-E:

*PARTY (EIC OBJECT TYPE X)*
A party is allowed to have only one EIC code for a given organisation that has a legal standing within the Energy Internal European Market (IEM). Examples: 10X1001A1001A248 for the Danish TSO energinet DK.

*AREA (EIC OBJECT TYPE Y)*
All areas involved in inter System Operator data interchange must be identified on a central basis. In some countries it is possible for a party to have several accounts for its imbalance settlement. These are called balance groups. Such Balance groups are to be identified by an EIC Y-code. Examples: 10YDK-BALANCE-WM for the western balance area in Denmark.

*MEASUREMENT POINT (EIC OBJECT TYPE Z)*
A measurement point identifies a physical or logical point that is used to identify an object where the measurement of energy takes place.

*RESOURCE OBJECT (EIC OBJECT TYPE W)*
Different resource objects, such as production units, consumption plants, etc. need to be defined within the energy market.

*TIE-LINE (EIC OBJECT TYPE T)*
The physical lines that connect together two Market Balance Areas need to be identified to closely follow interconnection capabilities.

*LOCATION (EIC OBJECT TYPE V)*
A location identifies a physical or logical place where a party or an IT system of a party is or could be located. A location has necessarily an EIC Responsible Party associated with it.

Preliminary

### 6.1.3 GLN/ILN/EAN

The Global Location Number (GLN), formerly known as ILN (International Location Number) is part of the GS1 systems of standards. It is used to identify a location and can identify physical locations or legal entities uniquely where required. The key comprises a GS1 Company Prefix, Location Reference, and Check Digit. The GLN is a 13 digit number. The first 3 digits contain the country prefix. Together with the following 4-6 digits they build the GS1-Basic Number followed by 3-5 digits up to digit 12 which build the company individual number . Digit 13 is the check control digit.
The GLN is used in electronic messaging between customers and suppliers, where location advice is important.
For identification purposes in the electrical power market in the Nordic Countries the following numbers are recommended by EDIEL:
For identification of the parties (seller, buyer etc.) in the EDI messages, the EAN*UCC Global Location Number
For identification of the products & services (mostly power) in the EDI messages, the EAN*UCC Global Trade Item Number (formerly known as EAN)
For identification of the metering points in the EDI messages, the EAN*UCC Global Service Relation Number.

## 6.2 Protocols for Data Transfer

### 6.2.1 AS2

Applicability Statement 2 (AS2) is a specification about how to transport data securely and reliably over the Internet. Security is achieved by using digital certificates and encryption.
The AS2 protocol is based on HTTP and S/MIME. Files are encoded as "attachments" in a standardized S/MIME message (an AS2 message). AS2 messages are always sent using the HTTP or HTTPS protocol (Secure Sockets Layer — also known as SSL — is implied by HTTPS) and usually use the "POST" method (use of "GET" is rare). Messages can be signed and encrypted, but do not have to be. Messages may request a Message Disposition Notification [MDN] back if all went well, but do not have to request such a message.

### 6.2.2 SMTP

Simple Mail Transfer Protocol (SMTP) is an Internet standard for electronic mail (e-mail) transmission across Internet Protocol (IP) networks. SMTP defines message transport, not the message content. Thus, it defines the mail envelope and its parameters, such as the envelope sender, but not the header (except trace information) nor the body of the message itself.

Preliminary

## 6.3 Abbreviations

| | |
|---|---|
| AMR | Automated Meter Reading systems |
| AS2 | Applicability Statement 2 |
| BDEW | Bundesverbandes der Energie- und Wasserwirtschaft e.V. |
| BNetzA | BundesNetzAgentur |
| EAN | European Article Number |
| ebIX | European forum for energy Business Information eXchange |
| EDI | Electronic Data Interchange |
| EDIEL | Nordic Ediel Group |
| EDINE | Electronic Data Interchange in the Netherlands Energy Sector |
| EIC | Energy Identification Coding scheme |
| FTP | File Transfer Protocol |
| GLN | Global Location Number |
| GPKE | GeschäftsProzesse zur Kundenbelieferung mit Elektrizität |
| MaBIS | Marktregeln für die Durchführung der Bilanzkreisabrechnung Strom |
| MP | Meter Point |
| OBIS | Object Identification System |
| PKI | public key infrastructure |
| RAM | Recording Active Metering (measuring incremental time series) |
| SLC | Standard Load Curve |
| SMTP | Simple Mail Transfer Protocol |
| UN/EDIFACT | United Nations Electronic Data Interchange For Administration, Commerce and Transport |
| VDE | Verband der Elektrotechnik Elektronik Informationstechnik e.V. |
| VDE~AR-N 4400 | VDE-Anwendungsregel (Metering Code) |
| WiM | Wechselprozesse im Messwesen |
| X.400 | ITU-T Recommendations defining standards for Data Communication Networks |

Preliminary