IMPACT OF THE EU REGULATION 2195/2017 ON THE PASSAGE OF SETTLEMENT TO 15 MINUTES ON THE WHOLESALE MARKET IN ROMANIA AND THE ADAPTING OF THE PROCESSES OF PURCHASE, STORAGE AND EXCHANGE OF DATA BETWEEN PARTICIPANTS

IMPACTUL REGULAMENTULUI UE 2195/2017 PRIVIND TRECEREA DECONTĂRII DE 15 MINUTE ASUPRA PIEŢEI ANGRO DE ENERGIE ELECTRICĂ DIN ROMÂNIA ŞI ADAPTAREA PROCESELOR DE ACHIZIŢIONARE, STOCARE ŞI SCHIMB DE DATE ÎNTRE PARTICIPANŢI

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Abstract: *EU Regulation 2017/2195 on 15-minute settlement changes requires changes to the wholesale electricity market in Romania and the adaptation of the acquisition, storage and data exchange processes between the participants. The paper makes a brief analysis of data sharing among market participants and also of computer systems involved, identifies areas where changes will occur and proposes a plan of measures to be taken by december 2020.*

Keywords: Data acquisition, Data Processing, 15-minute settlement, Metering platform, Wholesale electricity market

Rezumat*: Regulamentul UE 2017/2195 privind trecerea decontării de 15 minute necesită modificări ale pieței angro de energie electrică din România și adaptarea proceselor de achiziție, stocare și schimb de date între participanți. Lucrarea face o scurtă analiză a schimbului de date între participanții la piață și, de asemenea, a sistemelor informatice implicate, identifică domeniile în care vor apărea schimbări și propune un plan de măsuri care urmează să fie luate până în decembrie 2020.*

Cuvinte cheie: Achiziţii de date, procesare de date, decontare 15 minute, platforma de măsurare, piaţa angro de energie electrică

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1. Introduction

In the electricity measuring for electricity balancing market there are a number of factors that may influence the evolution of computing systems architecture. Besides technological factors involving implementation of new technologies a large influence is coming both from requirements of the wholesale electricity market, regional markets and also from the EU and national regulations. The electricity balancing market is an essential component of the national energy system with an important role in harmonizing the trading component with the balancing functions and the technological system services. The electricity balancing market is in a continuous development that stems both from the requirements of EU and national regulations as well as from technological progress.

2. Electricity balancing market today

2.1. Participants in the electricity balancing market and exchanges of data measuring

DM OMEPA as the sole aggregator on the electricity balancing market, receives monthly from other measuring operators (MO), distribution operators (DO), measured values for measuring points from the responsibility of each, the pre-aggregated/aggregated values per holders license based on Aggregation Agreements concluded with Balanced Paying Parties (PRE). Currently, the Wholesale Electricity Market employs 8 distributor dealers, the Transport and System Operator (TSO) for the transport network and 30 zonal distributors.

All measurement operators together with OMEPA, electricity balancing market operator and OPCOM ensure monthly data exchange for all participants in the electricity balancing market. Based on the calculations made on the measured values, unbalances on the electricity balancing market are calculated for participants. In Figure 1 the exchanges between the measuring operators, DM OMEPA, electricity balancing market operator and OPCOM are represented.

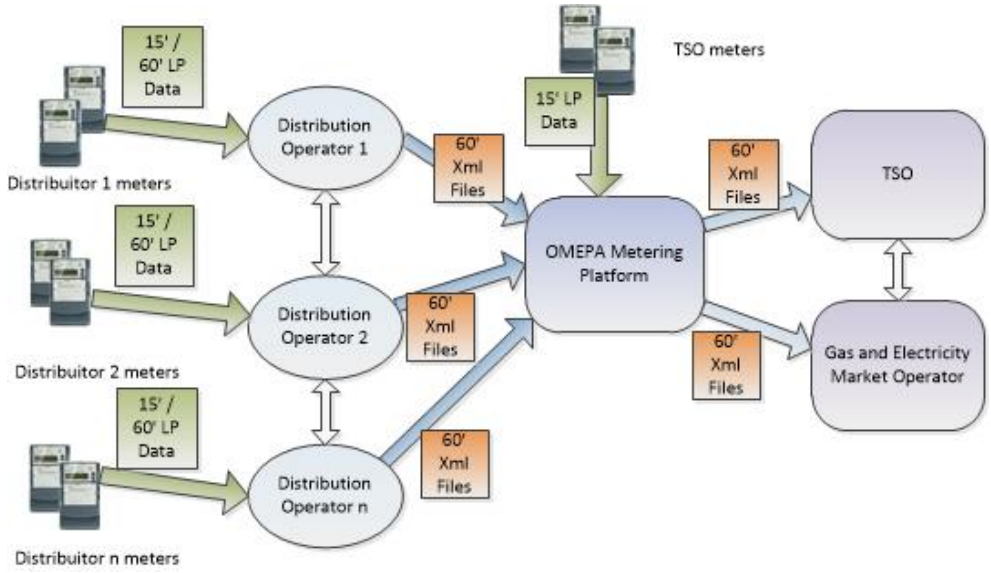

Figure 1. Transmitting of data measuring between wholesale market participants

2.2. Exchange of data measuring between electricity balancing market participants

Each distributor/metering operator, after acquiring the data from its own meters, sends the aggregated/semi-aggregated values for all license holders and Distribution Units (DUs) that are connected to their own distribution network.

Currently, at the distributor level, the measured values are aggregated/semi-aggregated for the previous month, with the 60-minute integration period.

These calculations are transmitted monthly by distribution operators to the DM OMEPA Metering Platform, for the previous month, in xml format, with a 60-minute integration period. All measurement/distribution operators use a unique application that centralizes monthly values on ENTSO-E codes and creates xml files. The values contained in xml files are 60 minutes.

In figure 2 it is represented structure of an xml File transmitted by the distribution operator to the central metering platform.

The xml file contains information about:

- creation date file;
- measuring interval;

- integration period;
- identification code ENTSO-E;
- values in MWh with 3 decimals;
- time stamp;
- status/quality of measuring value.

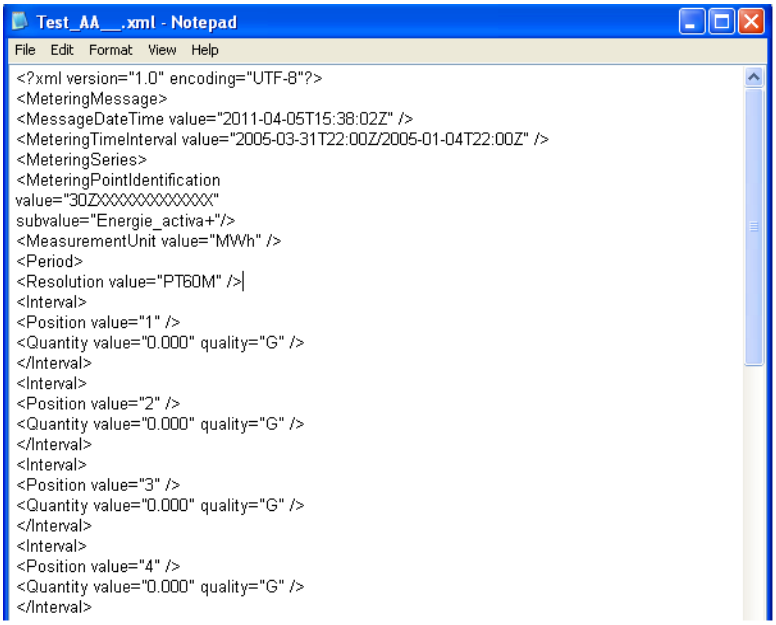

Figure 2. 60 minutes xml file example

The central metering platform aggregates the values received for each license holder at the PRE and UD level, for the previous month, along with the 15 minute integration values from the OTS meters. Once aggregated, the values are transmitted to the Electricity Balancing Market Operator (OPCOM) and the Electricity Balancing Market Operator (BMO) with the 60-minute integration period within the timeframe provided by the regulations in force.

Currently, all data exchanged between participants (Merchants, Distributors, Manufacturers, Suppliers, OPCOM, TSO, BMO) is an xml format with a 60-minute integration period. The data received from the distributors/measurement operators are aggregated in the central metering platform, together with the 15-minute integration period data from the OTS own meters.

In terms of integration intervals for the wholesale energy markets, all of these components markets (Next Day Market, Centralized Bilateral Contracts Market and Intraday Market) have a 60-minute integration period.

2.3. The general architecture of a metering system belonging to a measurement operator

All measurement/distribution operators manage their own data through dedicated IT platforms.

In general, a telemetering platform (Figure 3) is characterized by a number of applications, which, depending on the purpose they have, can be grouped into the following main types of functions:

- data acquisition from meters;
- data aggregation;
- data storage;
- data exchange;
- data publishing.

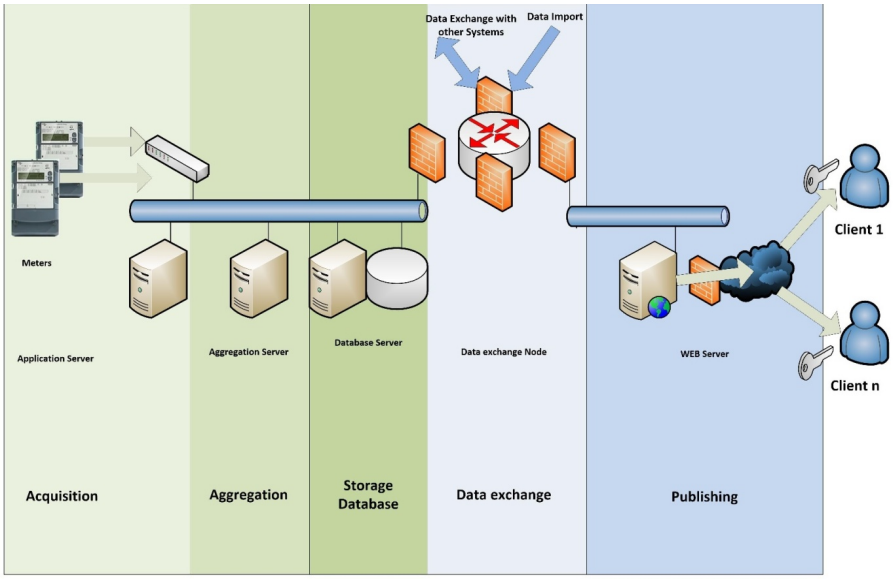

Figure 3. The general architecture of a telemetering system

Some telemetering platforms may have only a few of the basic functions, with some features missing, such as publishing data.

2.4. Data acquisition

Measuring operator telemetering systems acquire data from meters with both integration period of 15 minutes and 60 minutes. At present, only a part of the meters belonging to the measuring operators are parameterized for reading the values with the integration period of 15 minutes, the rest of the meters being parameterized for reading the values with the integration period of 60 minutes.

2.5. Data aggregation

At the distributor level, the data is aggregated by each license holder. These data are transmitted to DM OMEPA in order to aggregate license holders at PRE level. The aggregated data on Measurement/Distribution Operator level is calculated in the 60 minute format.

2.6. Data storage

Data exchange with other computer systems is achieved through applications that generate xml files containing values of 60 minutes. At the same time, some platforms, in addition to measuring data sharing, can send data to specialized financial accounting or asset management information modules.

At present, the acquisition, aggregation, storage, exchange with other information systems and data publishing functions generally have 60-minute entry /exit data.

2.7. Data exchange with another metering platforms

Data exchange with other computer systems is achieved through applications that generate xml files containing values of 60 minutes.

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At present, the acquisition, aggregation, storage, exchange with other information systems and data publishing functions generally have 60-minute entry /exit data.

3. Electricity balancing market in future

Analyzing the ways in which data is exchanged results that the applications that generate the xml files must be modified to generate files with values of 15 minutes. These xml files with 15-minute values must have (Figure 4):

- unique format to be recognized by all IT systems;
- creation date file;
- measuring interval at 15 minutes;
- integration period;
- identification code ENTSO-E;
- values in MWh with 3 decimals;
- time stamp;
- status/quality of measuring value.

Upon switching to 15-minute integration values, the dimensions of xml files exchanged will increase 4 times. This increase can be offset by archiving files with rar or zip archives.

Archiving resulted in compressions of the 10 times smaller than original dimensions, making it possible to transfer these files in conditions similar to the current ones.

This 10 times compression factor assure reserve for transmitting 4 times bigger data files with 15 minute integration values.

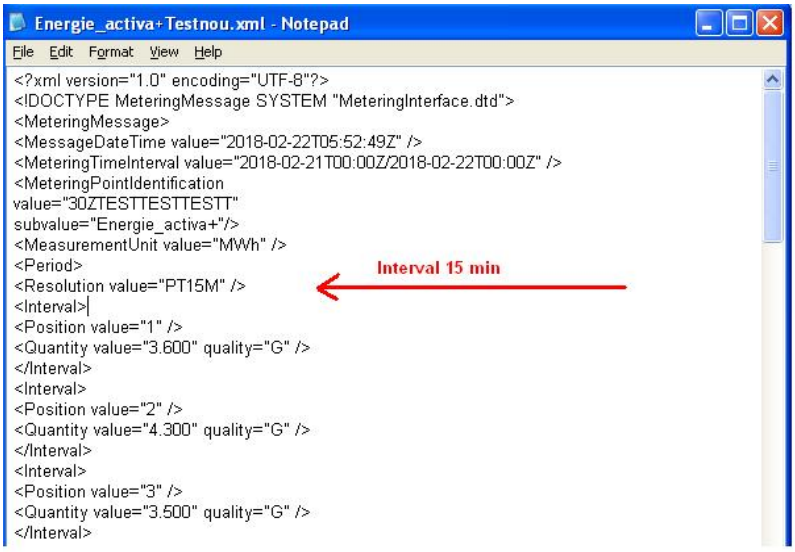

Figure 4. 15 minutes xml file

3.1. Changes occuring in the architecture of a telemetering system to pass the settlement to 15 minutes in future

Attributed to the architecture of a telemetering system, switching to 15 minutes involves changes to the main functions. All the main functions must be set to be applied to the 15 minutes data format.

3.2. Changes in Data Acquisition from Meters

In order to ensure settlement passage at 15 minutes, all counters will need to be parameterized with 15 minute profiles.

Transmitting data to the acquisition/processing servers will involve an increased purchase time depending on the communication protocol used.

The increase in acquisition time can be approximated between 300···400%.

This growth may be covered in principle by the processing servers if they have a reserve of computing power. This reserve can be highlighted by the CPU and memory occupancy in peak traffic times generated by data acquisition with Task Manager programs.

Using data from Task Manager or similar programs, it is possible to make a simulation that will show the need for computing and memory power.

If the acquisition time exceeds a certain acceptable range, it will be necessary to acquisition of the additional processors or servers, as appropriate.

3.3. Changes in Data Aggregation

Aggregation of data is directly influenced by the passage of the settlement to 15 minutes because it requires a 400% calculated calculation time and implicitly a processing power increased by 400%.

Similarly, based on an analysis of the occupancy of processors, memory in the calculation periods through Task Manager programs, it may be determined the need to purchase processors/servers and extra memories.

3.4. Changes in Data Storage

Data storage is directly affected by the settlement switching to 15 minutes, meaning that the amount of stored data will increase by 400%. This can lead to a database reconfiguration by creating new data files tablespaces, but also by allocating new storage capabilities if the storage hardware units do not have sufficient capacity to retrieve the new values to 15 minutes.

According to the regulations in force (ANRE 103/2015 Order of Measuring of Energy Code) the data from the meters maintains a database for a period of 400 days. A database of 10,000 meters with 400-day time stamps occupies an average of 100 GB of memory depending on the applications/databases used. By extrapolation a 100,000 database hour meter counts stored for 400 days occupy 1 TB of memory.

At present, databases are used that store data for 50000 counters. In the near future, it is the issue of acquiring data directly from smart meters at all measuring points. The requirements of the electricity market along with the requirements of EU Regulation 2017/2195 will require the development of telematics systems to database systems that will store values for 2-300000 meters up to 1000000 meters.

The growth of the database in this case will be a significant one, and in some cases investment is needed to meet this new requirement (Figure 5).

3.5. Changes in Data publishing

Data publishing involves both the database and the web publishing servers within the architecture, as well as the bandwidth of the Internet Provider links. However, if the number of clients is limited, switching to 15 minutes will mean a longer wait for data loading without the need for increased web server computing power but only a bandwidth increase of dedicated Internet connections.

In this case, we can also analyze the server load in peak activity times and the occupancy of traffic from the bandwidth of dedicated Internet connections. The analysis will show the steps to be taken in purchasing new processors, memories or servers or increasing bandwidth for Internet connections

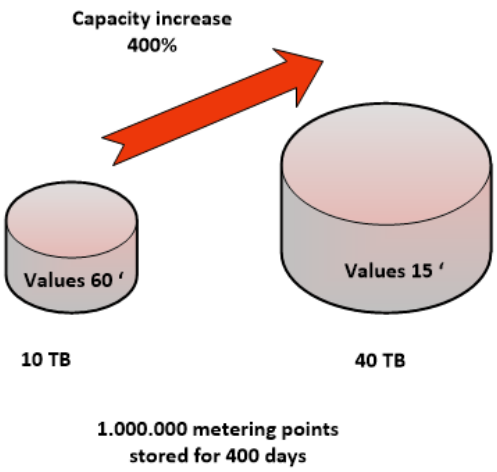

Figure 5. 1000000 metering points increase capacity of database

3.6. Changes in the general architecture of a telemetering system belonging to a measurement operator as a result of switching to 15 minutes

Modifying the main functions of acquisition, aggregation, storage, data exchange and publishing requires, as the case may be, the modification of the metering systems architecture by adding new CPUs, memories or servers and storage units for databases to cover the computing and storage power requirements. The main functions that are influenced in greater proportion are data aggregation and data storage. The aggregation function must be fulfilled within the time limits provided by the legislation in force.

The terms are relatively short as the duration, they require that the aggregations of the values per month be made in a timely manner. Please be aware that these calculations can be repeated several times if data corrections occur. The storage function is obviously affected by resizing storage databases and defining new profiles.

In the schematic representation of the architecture, the allocation of new servers and capacities for data storage was highlighted. Allocation is based on analysis of the capabilities of the telemetering system, resulting in each main function in part the need for additional CPUs, memory, servers and storage units. In figure 6 it is presented the general architecture of a modified telemetering system for 15 minutes data.

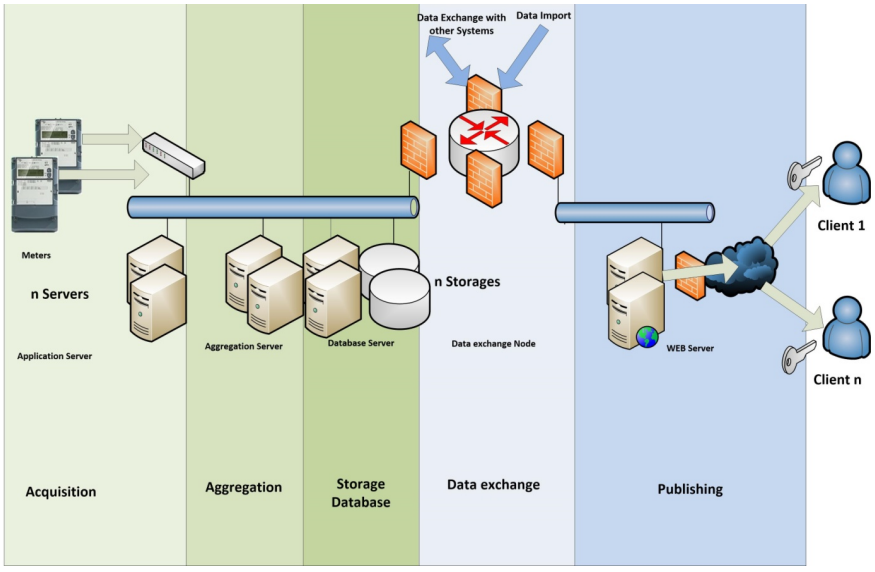

Figure 6. The general architecture of a modified telemetering system for 15 minutes data

The architecture must be scalable from important functions; acquisition, storage, processing, publication.

4. The implementation chart of the measures to be taken to pass to 15 minutes settlement on the wholesale market

Starting from the deadline of 01.12.2020, available for all participants in the electricity balancing market in Romania to switch to the acquisition, aggregation, storage and transmission of the values at 15 minutes and analyzing the changes that are necessary both in the IT systems as well as in the processes of transmitting the values, an indicative plot of implementation of the measures to be taken can be conceived. We can highlight the following orientated suite of actions:

• analyzing the information system and drafting the implementation plan;

• modifying to 15 minutes profiles, parameterizations of meters;

• acquisition, Installation and Configuration Processing Servers and Storage Capacities;

• additional capacity allocation in the database, defining counters at 15 minutes;

• refresh aggregation formulas with counters at 15 minutes;

• acquisition, aggregation, data transmission to MD OMEPA;

• transmission data tests MOs, OMEPA, OPCOM, BMO;

• turn the electricity market to settlement at 15 minutes.

ID	Task Name	Duration	Start	Finish
1	Analiza sistem informatic si intocmire proiect de implementare	30 days	Mon 15.04.19	Fri 24.05.19
2	Modificare profile contoare parametrizari	200 days	Mon 15.04.19	Fri 17.01.20
3	Achizitie Servere Procesare, Capacitati de stocare	120 days	Fri 24.05.19	Thu 07.11.19
4	Alocare de capacitate suplimentara in baza de date, definire contoare 15 minute	120 days	Thu 01.08.19	Wed 15.01.20
5	Refacere formule de agregare cu contoare la 15 minute	100 days	Mon 02.12.19	Fri 17.04.20
6	Teste achizitie,agregare,transmitere date la DM OMEPA	60 days	Wed 22.04.20	Tue 14.07.20
7	Teste trasmitere date OM,OMEPA,OPCOM,OPE	90 days	Wed 15.07.20	Tue 17.11.20
8	Trecere Piata de energie electrica la decontarea la 15 minute	30 days	Wed 21.10.20	Tue 01.12.20

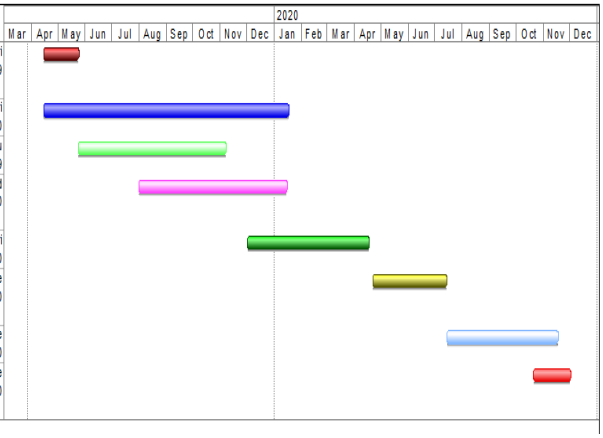

Figure 7. Implementation chart for settlement measures at 15 minutes

5. Conclusions

Following the analysis of both the current situation and the measures to be taken to pass the 15-minute settlement on the wholesale market, the following conclusions were drawn:

It takes time to implement the measures and to invest in metering systems in the switching of the 15-minute settlement on the wholesale electricity market.

Telemetering systems must be scalable, scalability must be mapped to important functions so that any market requirement can be implemented by allocating new processing / storage capacities.

From a scalability point of view, virtual machine architectures have an advantage in that they can allocate for each virtual machine additional extra cores from the unused cores. The allocation of new cores will increase the computing power depending on the new requirements, without the need for further investment in servers.

During the design phase for future telemetering systems, significant storage capacities may be considered given the possibility of future settlement at 5 minutes or even 1 minute.

R E F E R E N C E S

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