ORDER no. 145 of 10 December 2014 (*updated*)
For implementation of smart metering electricity systems
ISSUER: **ROMANIAN** ENERGY REGULATORY AUTHORITY
PUBLISHED IN: OFFICIAL GAZETTE no. 931 of 19 December 2014
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This updated form is valid since 1st March 2016 until the selected date

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*) Note CTCE:
Consolidated form of Order no. 145/2014 published in OFFICIAL GAZETTE no. 931 of 19 December 2014, on 21 November 2016 is made by inclusion of amendments and supplementations brought by: ORDER no. 119 of 29 July 2015; ORDER no. 6 of 26 February 2016.

Whereas the provisions of art. 66 of Electricity and Natural Gas Law no. 123/2012, further amended and supplemented, of art. 5 para. (1) letter c) of Government Emergency Ordinance no. 33/2007 for organization and functioning of the National Energy Regulatory Authority, approved as amended and supplemented by Law no.160/2012, and the provisions of art. 10 para. (2) let. a), b) and para. (3) of Law no. 121/2014 for energy efficiency,
By virtue of art. 9 para. (1) let. h) of Government Emergency Ordinance no. 33/2007, approved as amended and supplemented by Law no. 160/2012,

The President of National Energy Regulatory Authority issues this order.

ART. 1
(1) The smart metering electricity systems are electronic systems which measure the electricity consumption, assure the bidirectional secured transmission of information to the end customer, provide more information than a conventional meter, using electronic forms of communication. The smart metering systems include:
a) measuring subsystems which contain at least the meter, the measuring transformers and equipment for securization of access to meter;
b) subsystems for transmission of information;
c) subsystems for management of information from meters.
(2) Smart metering systems defined by paragraph (1) have compulsory and optional functions.
(3) The projects regarding the implementation of smart metering systems must be feasible from technical point of view, reasonable financially and reflect the money savings proportional to the value of investments in these systems.
ART. 2
(1) The functions of electricity smart metering systems are provided in annex no. 1, which is part of this order.
(2) The functions provided in annex no. 1 can be reallocated between the two categories, respectively mandatory and optional, depending on the requests of beneficiaries for implementation of smart metering systems.
ART. 3
For implementation of electricity smart metering systems, the pace applied by the concessionaire distribution operators is approved by the National Energy Regulatory Authority (ANRE) and has as target until 2020 implementation at 80% of the number of end customers.
ART. 4
(1) In the year 2015, the concessionaire distribution operators implement pilot-projects and evaluate the specific issues of distribution networks, in view of establishing the final conditions for implementation of smart metering systems.
(2) The concessionaire distribution operators will propose the realization of pilot-projects in order to be implemented in the following areas:
a) urban areas with good or recently revamped electric grids which work at nominal technical parameters set out by point 4 of annex no. 2, which is part of this order;
b) rural areas with good or recently revamped electric grids, which work at nominal technical parameters, set out by point 4 of annex no. 2.
(3) Concessionaire distribution operators transmit to ANRE the proposals regarding changes and completions for the realization of pilot-projects for electricity smart metering systems, according to letter A of annex no. 2.
(4) ANRE analyses the pilot-projects regarding the smart metering systems set out by paragraph (1) based on the Approval Criteria set out in annex no. 3, which is part of this order and communicates to concessionaire distribution operators the permits given to them within maximum 30 days from the submission of full documentation to ANRE, but not later than 31 August 2015.

Paragraph (4) of art. 4 was amended by art. I of ORDER no. 119 of 29 July 2015 published in OFFICIAL GAZETTE no. 572 of 30 July 2015.

(5) The concessionaire distribution operators transmit to ANRE the results of pilot-projects implemented in the year 2015, according to letter B of annex no. 2, until 1 November 2015.

ART. 4^1

(1) In the year 2016 the concessionaire distribution operators monitor the pilot-projects regarding the implementation of smart metering systems (SMI) accomplished in the year 2015 and evaluate their costs and benefits.

(2) In the year 2016 the concessionaire distribution operators can propose for approval to ANRE pilot-projects regarding the implementation of smart metering systems in rural and urban areas with not revamped grids, sized so that the information transmission subsystems, the subsystems of management of information from meters and at least 50% of metering subsystems are installed and operational until 31 August 2016, so that they can collect and record results according to the annexes no. 2 and 5.

(3) The pilot-projects set out by paragraph (2) and approved by ANRE finalize until 31 October 2016.

(4) ANRE analyses the proposals of pilot-projects set out by paragraph (2) based on the approval Criteria set out in annex no. 3 and communicate to concessionaire distribution operators the permits given, within 15 days from the submission of full documentation to ANRE.

(5) The deadline for transmission to ANRE of full documentations for the proposals of projects set out by paragraph (2) must not exceed 31 March 2016.

Art. 4^1 was introduced by point 1 of art. I of ORDER no. 6 of 26 February 2016 published in OFFICIAL GAZETTE no. 157 of 1 March 2016.

ART. 4^2

(1) ANRE monitors the results of projects regarding the implementation of SMI made, in accordance with annex no. 5, which is part of this order.

(2) The concessionaire distribution operators send to ANRE annex no. 5 every year until 25 January for the previous year.

(3) By derogation from the provisions of paragraph (2), for the pilot-projects made in the year 2015 and in the year 2016 according to the provisions of art. 4^1 para. (2), concessionaire distribution operators send to ANRE annexes no. 2 and 5, in the following deadlines:

a) On 10 November 2016 – according to the data recorded until 31 October 2016 time 23:59;

b) On 10 January 2017 – according to the data recorded until 31 December 2016 time 23:59.

Art. 4^2 was introduced by point 1 of art. I of Order no. 6 of 26 February 2016 published in OFFICIAL GAZETTE no. 157 of 1 March 2016.

ART. 5

(1) Following the evaluation of results of pilot-projects implementation regarding the smart metering systems obtained, concessionaire distribution operators propose ANRE implementation plans of smart metering systems.

(2) The concessionaire distribution operators send to ANRE the proposals regarding the implementation plans set out by paragraph (1), until 10 January 2017. The possible subsequent changes for which corrections of investment plans are necessary, are made according to the deadlines for updating of investment programmes set out in the Methodology for establishing the fees for the electricity distribution service, approved by Order of president of National Energy Regulatory Authority no. 72/2013, further amended and supplemented.

(3) In the year 2017, the value of investments related to the smart metering systems from the implementation plans set out by paragraph (1) must not exceed 10% of the value of annual investment programme approved according to the provisions of Methodology for establishing the fees for the electricity distribution service, approved by Order of the President of National Energy Regulatory Authority no. 72/2013, further amended and supplemented.

Art. 5 was amended by point 2 of art. I of ORDER no. 6 of 26 February 2016 published in OFFICIAL GAZETTE no. 157 of 1 March 2016.

ART. 5^1

(1) For establishing the national implementation plan of SMI during 2017-2020 in Romania, ANRE performs the cost-benefit analysis regarding the implementation of smart metering systems taking into account the results of pilot-projects made by the concessionaire distribution operators, based on a study elaborated by an independent specialized consultant.

(2) Concessionaire distribution operators send to ANRE all the data and information required for the realization of cost-benefit analysis set out by paragraph (1).

Art. 5^1 was introduced by point 3 of art. I of ORDER no. 6 of 26 February 2016 published in OFFICIAL GAZETTE no. 157 of 1 March 2016.

ART. 5^2

Based on the result of the cost-benefit analysis set out by art. 5^1 para. (1) and proposals of concessionaire distribution operators, ANRE approves until 31 March 2017, by order of president, the national calendar for implementation of smart metering systems, which contains the calendar dates of implementation stages, and the national implementation plan of smart metering systems regarding the investment works for each concessionaire distribution operator, the value of them and financing sources and end customer information measures.

Art. 5^2 was introduced by point 3 of art. I of ORDER no. 6 of 26 February 2016 published in OFFICIAL GAZETTE no. 157 of 1 March 2016.

ART. 6
The concessionaire distribution operators revise and send the proposals of pilot-projects with the amendments and supplementations set out by this order until 31 January 2015.
ART. 7
The concessionaire distribution operators display on their own websites, for informative purposes, the number of smart metering systems implemented, their technical data, compulsory and optional functions, method of communication with the information management subsystems, with the start of pilot-projects.
ART. 8
The concessionaire distribution operators and the suppliers are obliged to inform the end customers, mentioning on the electricity invoice the existence of the smart metering system at the consumption place.
ART. 9
(1) The provisions of this order can apply to distribution operators other than concessionaire, at their request.
(2) The transmission system operator can offer, at request of end customers connected to the electric transmission grids, smart metering systems which fulfil the functions set out in annex no. 1.
ART. 10
Repealed.

Art. 10 was repealed by point 4 of art. I of ORDER no. 6 of 26 February 2016 published in OFFICIAL GAZETTE no. 157 of 1 March 2016.

ART. 11
The concessionaire distribution operators, distribution operators other than concessionaire, the transmission system operator and the electricity suppliers will fulfil the provisions of this order.
The Department for Energy Efficiency and the specialized directorates from ANRE will fulfil the provisions of this order.
ART. 13
This order is published in Official Gazette of Romania, Part I.
ART. 14
On the coming into force of this order we repeal the Order of president of National Energy Regulatory Authority no. 91/2013 for implementation of smart metering electricity systems published in Official Gazette of Romania, Part I, no. 801 of 18 December 2013.

President of National Energy Regulatory Authority,
Niculae Havrileț

Bucharest, 10 December 2014.
No. 145.

ANNEX 1

Functions of smart metering electricity systems (SMI)

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No. crt.	Objective	Function	Description
I.	Compulsory functions		
1.	for end customer	to send the end customer and any third party appointed by him readings from the system , in view of management of consumption	Transmission to end customer or to any third party appointed by him, in due course, of precise readings, easily to understand and use By readings we understand the evolution of consumption

			indices regularly and for a sufficient period of time established by contract
2.	For end customer information to be used in view of realization of energy savings	to update the readings mentioned point 1, with sufficient frequency to allow for the	measuring subsystems/information transmission subsystems will be equipped with the capacity to store data regarding the consumption recorded for a reasonable period of time according to the legal specific provisions in force to allow the consultation and extraction of data regarding the previous consumption. The measuring subsystems/information transmission subsystems must allow the recording of consumption data every 15 minutes and transmission of this data as basic function once a day (in the next day), according to the conditions for payment of electricity in the contracts signed between the Parties.
3.	For concessionaire distribution operator	to allow the remote reading of meters by the concessionaire distribution operator	This function assures the remote reading of meters both for the energy injected in the grid, and for the energy consumed in the distribution grid.
4.	For concessionaire distribution operator	to assure a bidirectional communication between the metering system mounted at consumption place and the information management system	Smart metering systems have to allow for bidirectional communication between the metering system of a consumption place and the information management system to assure at least: - elimination of travel for current operational activities; - secured remote updating of internal software of the meter is permitted in the non-metering part of it; - monitoring of operation of smart metering system and collection of signalling generated by the system - timing of time reference (meters, by internal software and communication infrastructure must have the capacity of timing of data measured with the data received by the central system, sufficiently frequently so that we can obtain the benefits generated by other functions); - updating of types of fees according to the regulations in force and/or the contractual provisions.
5.	For concessionaire distribution operator management of the grid and in	to allow sufficiently frequent readings for the the information to be used in the operational planning of grid development	Smart metering systems have to provide useful data for planning the development of distribution grid. The data recorded by the smart metering systems must be sufficient to allow the optimization of operation of distribution grids and to increase the efficiency of the grid.
6.	For commercial issues of energy supply	to support advanced fee systems	Smart metering systems must contain obligatorily advanced fee structures. The minimum compulsory fee structure must fulfil the following conditions - in case of end non-domestic consumers, with maximum powers approved/contracted of over 30 kW, they allow the application of all fee structures in force on issuing date of the order

			(binomial fees with recording of hourly power at 15 minutes both at peak hours and in remaining hours, with possibility of monthly definition of hourly areas, monomial fees with maximum 3 hourly areas during a day with possibility of seasonable change of hourly intervals) - in case of domestic consumers to allow the application of monomial fees with 3 hourly areas during a day, with possibility of monthly change of hourly intervals. The metering subsystems will also allow for the recording of consumption depending on period and remote control of fees, with assurance of confidentiality of commercial information related to the Parties corresponding to each consumption place. The metering systems can also allow for the recording of consumption depending on period and remote control of fees without being passed through the software system of the distributor. In this case, we will use the recording of load curve at use of advanced fees in view of correct calculation of electricity invoice depending on the fee chosen.
7.	For commercial issues of energy supply. limitation of power.	to allow the remote control of connection/disconnection from the grid or	Smart metering systems must assure protection regarding the use of grid for end customers which allows for limitation or progressive adjustment of absorbed power. The functionality leads to simplification of connection and disconnection processes according to the legal provisions in force. This function automatically assures the management of emergencies of technical nature which can affect the grid and limitation of imbalances on electricity market.
8.	For security and protection of data	to assure secured data communication	The smart metering systems have to allow for implementation of security and data protection protocols including personal data; the data securization protocols must be implemented and in case of messages transmitted by meter to or from any devices or control systems which exist at the domicile of the end customer.
9.	For security and protection of data	to prevent, detect and transmit to the information management system the signalling related to unauthorized access	This function has the purpose to assure the security and safety in case of unauthorized access and expresses the obligation to protect the users of smart metering systems and the measuring operators both at attempt at incompliant use of grid and for software fraud. This function imposes the obligation to equip smart metering systems with mechanisms of detection and signalling of attempts at unauthorized access to data management subsystems.
10.	For decentralized production	to assure the measuring of electricity , separately of absorbed quantity by the customer and the quantity of electricity	This function is mandatory only in the cases when we integrate the local microproduction of electricity produced from renewable sources with consumption from

		injected in the grid by the customer and also to assure the measurement of reactive electricity	distribution grid at the same consumption place. This function must exist only for meters installed in the categories of customers who hold microproduction observing the legal provisions in force.
11.		To allow the automatic identification of deficiencies, reduction of interruption times, improvement of monitoring and control of the main technical parameters regarding the quality of electricity	The smart metering systems must allow for the function of recording the information regarding the voltage drops, their duration and to allow for the recording of information regarding the duration of exceeding the voltage limits accepted (recording of the hour when the excess took place and the hour when it returned to accepted value). The information management subsystems must have the capacity to extract this information and to make it available to customer/supplier in case of complaints / requests for information related to the performance standard for distribution of electricity.
12.		Infrastructure of smart metering systems must allow the integration of at least one meter for balance at each substation (PT), to facilitate the identification of technical and non-technical losses by analysis of energy balances	The data recorded by meters for balance contributes to the management of technical and non-technical losses. This function is compulsory because one of main benefits of introducing smart metering systems is the reduction of technical losses, especially non-technical losses. The meters for balance are necessary components for implementation of this function.
II. Optional functions			
13.		The smart metering system should allow communication with receptors from the home of end customer, including with the meters of other utilities - Home Area Network (HAN)	The smart metering system should make possible the communication with household appliances which allow it, including with other meters. Communication should be based on the standards and protocols used in general, and the meter should offer the possibility of setting the internal software, without intervening in the measuring module and in data storage memory.
14.		The information management subsystem from the meters should store the data metered at least for the relevant period for invoicing, complaints or recovery of possible debts.	This function concerns the data management subsystem and aims at keeping historical data for a definite period by observing the legal provisions in force.
15.		The infrastructure of smart metering systems should allow the mounting of additional meters, without having to replace the existing elements	The infrastructure of smart metering systems has to allow the mounting of a reasonable number of meters without having to replace the other existing elements.
16.		Measuring subsystems/data transmission systems should have the capacity of storing data for a sufficient period of time	The data memorized must be available for a sufficiently long period (maximum 60 days after the expiry of invoicing period), which allows the recovery of data in safe conditions if we cannot access the smart metering system from a distance in view of collection of data (for example, in invoicing period).

			The storage method of data in measuring subsystems / data transmission subsystems must observe the legal provisions in force regarding the security of personal data.

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ANNEX 2

Description of pilot-projects regarding the implementation of
Smart metering electricity systems (SMI)

A. The data set out in this annex is completed for each pilot-project for implementation of smart metering electricity systems.
B. This annex is transmitted to the National Energy Regulatory Authority:
- completed with estimated data for approval of pilot-projects;
- completed with achieved data, after the achievement of pilot-projects.
Name of concessionaire electricity distribution operator: .....
1. Number of pilot-projects proposed to be made in the year...../Number of pilot-projects made in the year.....
2. Total number of customers managed in the project/pilot projects to which point 1 refers: .....
3. Area/areas considered in the pilot project: .....
4. Technical parameters of operation of electric grids (for each pilot-project):
- for electric lines: nominal voltage (+/- 10%), loading degree on each phase, length, section, nominal voltage at ends of grid in each circuit;
- For substations: nominal power, upper nominal voltage (+/- 10%), lower nominal voltage (+/- 10%), loading degree of transformer(s).
5. Details of characteristics of pilot-project which result that each project fulfils the requirements that it must be feasible from technical point of view and reasonable from financial point of view:

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Relevant data - characteristics of pilot-project*)	
Area considered/Town/County	
Total number of customers managed by project, of which:	
Total number of customers managed/project - domestic	
Total number of customers managed/project - non-domestic	
Quantity of electricity distributed every year in the area of pilot-project [MWh/year]	
Number of single-phased meters installed at customers in the project	
Number of three-phased meters installed at customers in project	
Number of meters other than those for end customers, of which:	
Number of meters for balance	
Number of data concentrators administered by SMI	
Number of communication modules and auxiliary devices mounted in the system	
Value of operation costs (readings of meters, replacements of meters	

disconnections/reconnections, complaints and other specific activities)before installation of smart metering systems in the area of pilot-project [lei/customer]	
Value CPT****) in low voltage grid in pilot-project area, before the implementation of SMI, of which:	
Value of technical CPT [lei]	
Value of technical CPT [%]	
Value of commercial CPT [lei]	
Value of commercial CPT [%]	
Investment costs	
Total investment value [lei], of which:	
Value of investment necessary for purchase of meters [lei]**), of which:	
Value of investment necessary for the purchase of single-phased meters [lei]	
Value of investment necessary for the purchase of three-phased meters [lei]	
Value of investment necessary for purchase of meters for balance [lei]	
Value of investment necessary for purchase and installation of data management subsystems and subsystems for transmission of data from meters (data concentrators, modems and communication modules, other than those associated to meter, other auxiliary devices, central system) [lei], of which:	
Value of investment necessary for purchase and installation of subsystem for management of information from meters (server/servers, modems, application database management system, other auxiliary devices) [lei]	
Value of investment necessary for purchase and installation of data transmission subsystem (concentrators, signal repeaters, controllers) [lei]	
Value of investment related to the works for assuring the functioning of SMI, which involves elements from electricity distribution grid (where applicable)***) [lei]	
Unit cost of investment = total value of investment, including works in electricity distribution grid [lei]/Total number of end customers managed by project, of which:	
Unit cost of investment for purchase of single-phased meters = Value of investment with acquisition of single-phased meters [lei]/Number of single-phased meters installed at customers in the project	
Unit cost of investment for purchase of three-phased meters = Value of investment with acquisition of three-phased meters [lei]/Number of three-phased meters installed at customers in the project	

Unit cost of investment for purchase and installation of system (without meters) = Value of investment with acquisition of system [lei]/ Total number of end customers managed by project, of which:	
unit cost of investment for acquisition and installation of subsystems for management of information from meters (server/servers, modems,application database management system, other auxiliary devices) [lei/customer]	
Unit cost of investment for acquisition and installation of data transmission subsystems (concentrators, signal repeaters, controllers) [lei/customer]	
Unit cost of investment for the works which involve elements from electricity distribution grid (without meters) = Value of investment related to the works necessary for assuring the functioning of SMI, which involve elements from the electricity distribution grid [lei]/Total number of end customers managed by the project	
Other costs	
Value of costs necessary for operation and maintenance of SMI [lei/customer]	
Value left undepreciated of meters replaced with SMI [lei]	
Benefits	
Value CPT****) in low voltage grid in pilot-project area, after installation of smart metering systems, of which:	
Value of technical CPT [lei]	
Estimated value of technical CPT [%]	
Value of commercial CPT [lei]	
Estimated value of commercial CPT [%]	
Value of operation costs (readings of meters, replacements of meters, disconnections/reconnections, complaints and other specific activities) after installation of smart metering systems in pilot-project area [lei/customer]	
Total value of estimated benefits [lei]	
Implemented functions	
Functions of system*****)	
Type of communication used from the customer to data concentrator and, respectively from concentrator to the data management system used by the operator (for example, GSM, GPRS, 3G, 4G, PLC, optical fibre, radio, rented telephone line etc.)	
Technical problems and other kind of problems specific to the implemented project	

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*) The required data will be completed for each pilot-project proposed to be made in the year...../made in the year ..... .

**) You will specify separately from annex if the meters include or not modem. If the meters include modem, you will specify its type and you will present in table the acquisition values of these meters (single-phased, three-phased, for balance), depending on the modem included (GSM, PLC, GPRS, other).

***) You will present separately from annex, details of these investments: description and values.

****) The value of CPT before and after implementation is calculated using a reference price determined by taking into account the average price established on the centralized market of bilateral contracts in proportion of 80% and the price established on the next day market in proportion of 20%, for the previous year.

*****) You will complete by taking into account the functions of SMI of electricity from annex no. 1 to order, with the corresponding number of each function technically feasible (for example, if the transmission to the end customer or to any third party appointed by the end customer in due course, of precise readings, easily to understand and to use, in view of managing the consumption, in the table from this annex you will complete the number of function, which means 1).

Annex 2 was replaced by annex 1 of ORDER no. 6 of 26 February 2016 published in OFFICIAL GAZETTE no. 157 of 1 March 2016, according to the change made by point 5 of art. I of the same normative act.

ANNEX 3

Criteria for approval of pilot-projects for implementation of Smart metering electricity systems

The Commission for management of implementation of pilot-projects for smart metering systems, appointed by decision of president, established the following criteria:

1. Repealed.

Point 1 of annex 3 was repealed by point 6 of art. I of ORDER No. 6 of 26 February 2016 published in OFFICIAL GAZETTE no. 157 of 1 March 2016.

2. Correlation of values of investments for pilot-projects with values set out in investment programmes

3. Analysis of total value of investments in implementation of smart metering electricity systems, related to the total value of annual investment programme

- The investments related to pilot-projects must not exceed 10% of total value of annual investment programme.

4. Comparative analysis of unit costs specified in annex no. 2 to order

- We will accept the unit costs in the limit of +/- 20% of average of unit costs transmitted by the 8 distribution operators.

5. Presentation of the following information necessary for cost-benefit analysis, after which we could highlight measurable/quantifiable results according to the data required set out in annex no. 2 to order:

- value of technical and commercial CPT before the implementation of SMI;
- value of controllable OPEX before the implementation of SMI.

6. Compulsory inclusion of meters for balance in the pilot-projects

7. Analysis of investment costs in distribution grid for implementation of SMI: modernizations, replacement of equipment etc.

- You will present details of these investments: description, values, according to annex no. 2 to order.

ANNEX 4

General data of implementation plan of smart metering electricity systems (SMI)

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Complete for the period 2017-2020		
Concessionaire distribution operator responsible for implementation of SMI		
Contact person		
Number of end customers for which we install SMI and percentage they represent of total number of customers served by the concessionaire distribution operator	Number of end customers for whom SMI are installed:	Percentage of total end customers for whom SMI are installed: .....%
Type of end customers involved, percentage of total category of customers and number of end customers involved	Domestic % .... of total domestic Number of end customers....	Non-domestic % .... of total. Number of end customers .....
Data regarding the grid in which we will implement SMI		
Quantity of electricity distributed every year (MWh)		
Number of substations MT/JT		
Total number of transformers MT/JT		
Number of consumption points connected to the low voltage grid		
Number of consumption points connected to the medium voltage grid		
Number of consumption points connected to high voltage grid		
Type and number of meters installed at domestic customers	Single-phased Number of customers	Three-phased Number of customers .....
Type and number of meters installed at non-domestic customers	Single-phased Number of customers	Three-phased Number of customers .....
Number of meters for balance installed		
Number of communication modules and auxiliary devices mounted in the system		
General information of technical solution adopted implemented SMI		
Main characteristics of components of implemented SMI		

1. Description of characteristics of data concentrator:		
a) Number of meters which will be mounted		
b) Place where the concentrator is installed		
c) Communication Interface available in concentrator		
d) How to make the remote timing of the clock		
e) Describe the mechanism of transmission of alarms to the central system		
f) Consumption of concentrator (W)		
2. Describe the communication technologies used for communication between the main components of the system:		
3. Short description of communication protocols used between the main components of the system:		
4. Mechanisms of recovery of data used in the system:		
5. Information of meters for electricity (single-phased and three-phased)		
Average life (years)		
Consumption of meter (W, VA)	Active data communication:	Inactive data communication:
Percentage of time when the data communication is active (annual average)	.....%	
Specify the international standards observed by the meter components		
Are the meters equipped with own protection devices (short-circuit, overload, overvoltage etc.)?		
Are the meters equipped with own connection/ disconnection devices? - type of device (relay, circuit breaker etc.) - Is the device accessible from outside? If not, explain the sheating mechanism.		
- What are the standards observed by the connection/disconnection device? - What is the maximum interrupted current?		
What type of internal supply source do meters have in SMI?		
Description of meter display (is the display alphanumerical?)		
Reading frequency of meters (daily, monthly, twice a month etc.)		

Does the meter record the maximum consumed power?	
What are the instant values measured available in the meter?	
Does the meter measure active bidirectional energy?	
Can the meter record imbalances? (Specify reference period – daily, weekly etc.)	
Is remote timing of the clock/calendar possible?	
Can the meter record the voltage drops and quality of supply?	
Can the meter record events ("event log")? What are the parameters monitored? What historical period is retained by "event log"? How is information accessed?	
Describe the antifraud mechanisms of the meter	
Describe the transmission mechanism of fraud alarm to the central system	
Describe how the meter is recognized by the central system when it is installed in SMI	
Security of smart metering systems	
Is protection of data transmission assured (metering – data concentrator – data management system) against unauthorized users ?	
Can SMI administer the access rights for each of its components?	
Is the protection of data exchange between components of the system assured against attacks such as "replay attack"?	
For which of the system components are the security events recorded?	
Is there security of updating of internal software	
Is encrypting made in the system? In which part of it?	
Confidentiality	

Is the authorization of customer necessary to collect data from the meter ? Who is responsible for the granting of this authorization?	
Financial data	
Total budget of implementation plan (thousand lei)	
Financing sources:	
1. Private investments (%)	
2. Public funds (%)	
3. Source of public funds	
4. Type of public funds (grants, non-refundable loans etc.)	
Investment recovery period (years)	
Internal rate of return (%)	
Net discounted value (NPV) (thousand lei), basic year	
Weighted Average cost of capital - WACC (%)	
Estimated supplementary costs	
Estimated value of works which need to be made in electricity distribution grid (thousand lei)	

Schedule of investment plan regarding the implementation of SMI for the period 2017-2020 (%) and (thousand lei)			
2017	2018	2019	2020

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Annex 4 was replaced by annex 2 of ORDER no. 6 of 26 February 2016 published in OFFICIAL GAZETTE no. 157 of 1 March 2016, according to the change brought by pt. 7 of art. I of the same normative act.

ANNEX 5

Indicators for evaluation of implementation of
Smart metering systems (SMI)

NOTE:
column 6 = Value of basic year
column 7 = Value on .....
column 8 = Value of indicator in basic year

column 9 = Value of indicator on ....
column 10 = target values

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Project no. ...../ year......

No. crt.	Category	name of indicator	Formula	Details of formula terms						
				Symbol of term	Name of term from formula					
0	1	2	3	4	5	6	7	8	9	10
1	Stage of implementation of SMI	Degree of implementation of SMI for domestic consumers included in implementation project of SMI - Gi SMIc	$Gi_{SMIc} = \frac{n_{ccSMI}}{nt_{ccSMI}}$ [%]	n_{ccSMI} nt_{ccSMI}	number of domestic customers to whom SMI were installed total number of domestic customers included in implementation project of SMI					
2		Degree of implementation of SMI for non-domestic customers included in implementation project of SMI Gi SMInc	$Gi_{SMInc} = \frac{n_{cncSMI}}{nt_{cncSMI}}$ [%]	n_{cncSMI} nt_{cncSMI}	number of non-domestic customers to whom SMI were installed total number of non-domestic customers included in implementatio project of SMI					
3		Stage of installation of balance meters set out in implementation of SMI-GI contbalSMI	$Gi_{contbalSMI} = \frac{n_{contbalinstSMI}}{nt_{contbalprevSMI}}$ [%]	$n_{contbalinstSMI}$ $nt_{contbalprevSMI}$	number of balance meters installed in implementation project of SMI total number of balance meters initially provided in implementation project of SMI					
4	Structuc	Number of domestic customers who have the capacity of producers (prosumer) who are integrated in	$Nr_{prosumer}$	$Nr_{prosumer}$						

	t u r a S M I	system with highlight facilities of consumption and own production of electricity			
5		Weight of communications type PLC used in transmission of data from the consumption place in SMI implemented p_{PLC}	$p_{PLC} = \frac{npc_{PLC}}{ntpc_{SMI}} [\%]$	npc_{PLC}	number of consumption points connected by PLC for transfer of information
				$ntpc_{SMI}$	total number of consumption points for which SMI were installed
6		Weight of communications type GSM/GPRS used in transmission of data from consumption place in SMI implemented - $p_{GSM/GPRS}$	$p_{GSM/GPRS} = \frac{npc_{GSM/GPRS}}{ntpc_{SMI}} [\%]$	$npc_{GSM/GPRS}$	number of consumption points connected by GSM/GPRS for transfer of information
				$ntpc_{SMI}$	total number of consumption points for which SMI were installed
7		Weight of communications by optical fibre (FO) used in transmission of data from the consumption place in SMI implemented - p_{FO}	$p_{FO} = \frac{npc_{FO}}{ntpc_{SMI}} [\%]$	npc_{FO}	number of consumption points connected by FO for transfer of information
				$ntpc_{SMI}$	total number of consumption points for which SMI were installed
8		Weight of communications type 3G/4G/LTE used in transmission of data from consumption place in SMI implemented $p_{3G/4G/LTE}$	$P_{P3G/4G/LTE} = \frac{npc_{3G/4G/LTE}}{ntpc_{SMI}} [\%]$	$npc_{3G/4G/LTE}$	number of consumption points connected by 3G/4G/LTE for transfer of information
				$ntpc_{SMI}$	total number of consumption points for which SMI were installed
9		Weight of communications type RF used for transmission of dat from consumption place in SMI implemented -	$p_{RF} = \frac{npc_{RF}}{ntpc_{SMI}} [\%]$	npc_{RF}	number of consumption points connected by RF for transfer of information

		p RF		ntpc SMI	total number of consumption points for which SMI were installed							
10		Weight of consumption places which integrated advanced fee facility and/or prepayment in SMI installed - % LC tarifav	$\%LC_{tarifav} = \frac{LC_{tarifav}}{NrTLC_{SMI}}[\%]$	LC tarifav	number of consumption places which integrated advanced fee and/or prepayment facility included in SMI installed							
				NrTLC SMI	total number of consumption places which have SMI installed							
11		Weight of consumers to whom SMI were installed and who have information facilities on the historical evolution of consumption of electricity on webpage WEB-p cons_WEB	$p_{cons\_WEB} = \frac{nr\_cons_{WEB}}{nrt\_cons_{SMI}}[\%]$	nr_cons WEB	number of consumers who have SMI and benefit from the information on WEBpage							
				nrt_cons SMI	total number of consumers who have SMI installed							
12		Weight of consumers to whom SMI were installed and who have facilities of information on historical evolution of electricity consumption on invoice p cons_fact	$p_{cons\_fact} = \frac{nr\_cons_{fact}}{nrt\_cons_{SMI}}[\%]$	nr_cons fact	number of consumers who have SMI and benefit from information on invoice page							
				nrt_cons SMI	total number of consumers who have SMI installed							
13		Weight of consumers to whom SMI were installed and who benefit from information facilities on historical evolution of electricity consumption on display mounted "in home" - p cons_displlH	$p_{cons\_displlH} = \frac{nr\_cons_{displlH}}{nrt\_cons_{SMI}}[\%]$	nr_cons displlH	number of consumers who have installed SMI which benefit from information on display page "in home"							
				nrt_cons SMI	total number of consumers who have SMI installed							
14		Interval at which we	d [min]	d [min]								

		make the updating of readings for SMI implemented [min]	citire	citire	
15	Economic effects	Reduction of costs with reading of meters by customer RC cc	$RC_{cc} = \frac{C_{ccinit} - C_{ccSMI}}{C_{ccinit}}$ [%]	C ccSMI	cost with reading of meters after the installation of SMI [lei/customer]
				C ccinit	Cost with reading of meters before installation of SMI [lei/customer]
16		Reduction of costs with interventions at consumption places - RC intlc	$RC_{intlc} = \frac{C_{intlcinit} - C_{intlcSMI}}{C_{intlcinit}}$ [%]	C intlcSMI	Cost with interventions at consumption place after the installation of SMI [lei/customer]
				C intlcinit	Cost with interventions at consumption place before the installation of SMI [lei/customer]
17		Cost of investments with implementation of SMI - C spSMI	$C_{spSMI} = \frac{V_{inv\_SMI}}{E_{cons\_an\_SMI}}$ [lei/kWh/an]	V inv_SMI	Value of investments with implementation ofSMI [lei]
				E cons_an_SMI	annual average consumption of all consumers to whom SMI are installed according to the investment plan [kWh/year]
18		Reduction of commercial CPT - RCPT com	$RCPT_{com} = \frac{CPT_{cominit} - CPT_{comSMI}}{CPT_{cominit}}$ [%]	CPT comSMI	value of commercial CPT after implementation of SMI [%]
				CPT cominit	value of commercial CPT before implem. of SMI [%]
19		Reduction of technical CPT RCPT th	$RCPT_{th} = \frac{CPT_{thinit} - CPT_{thSMI}}{CPT_{thinit}}$ [%]	CPT thSMI	value of tech. CPT after implementation of SMI [%]
				CPT thinit	value of technical CPT before the

					implementation of SMI [%]
20	Indicatori de performanță calitativi	Reduction of time of interruptions in supply of electricity (at consumer) Red d_nealim	$Red_{d\_nealim} = \frac{SAIDI_{init} - SAIDI_{SMI}}{SAIDI_{init}}$ [%]	SAIDI _SMI	Index of average time of interruption in grid (system) after implementation of SMI [min/year]
				SAIDI _init	Index of average time of interruption in grid (system) before implementation of SMI [min/year]
21		Reduction of number of complaints as to measuring errors - Red_recl er_mas	$Red_{recl\ er\ mas} = \frac{nr_{recl\ er\ mas\ init} - nr_{recl\ er\ mas\ SMI}}{nr_{recl\ er\ mas\ init}}$ [%]	nr_recl er_mas_ SMI	annual average number of complaints regarding measuring errors recorded after the installation of SMI
				nr_recl er_mas_init	annual average number of complaints regarding measuring errors recorded before the installation of SMI
22		Number of identifications of power excess recorded by the system after the installation SMI - Nr_dep Pcontr	Nr_dep Pcontr	Nr_dep Pcontr	
23		Number of identifications of voltage variation outside the accepted limits - Nr.id var_Un	Nr.id var_Un	Nr.id var_Un	Number of identifications of voltage variation outside accepted limits according to performance standard for the service of distribution of electricity
24		Variatian of monthly average consumption of electricity for		E medlnccSMI	Monthly average consumption of electricity made by

		domestic consumers included in the implementation project of SMI - DeltaE $_{medlncc}$			domestic consumers included in implementation project of SMI,after the installation of SMI [kWh/month]
			$DeltaE_{medlncc} = - \frac{E_{medlnccinit} - E_{medlnccSMI}}{E_{medlnccinit}}$ [%]	$E_{medlnccinit}$	Monthly average consumption of electricity made by domestic consumers included in implementation project of SMI, before the installation of SMI [kWh/month]
25		Variation of monthly average consumption of electricity for non-domestic consumers included in implementation project of SMI - DeltaE $_{medlncnc}$	$DeltaE_{medlncnc} = - \frac{E_{medlncncinit} - E_{medlncncSMI}}{E_{medlncncinit}}$ [%]	$E_{medlncncSMI}$	Monthly average consumption of electricity made by non-domestic consumers included in the implementation project of SMI after the installation of SMI [MWh/month]
				$E_{medlncncinit}$	Monthly average consumption of electricity made by non-domestic consumers included in implementation project of SMI, before the installation of SMI [MWh/month]
26		Variation of consumption in peak hours for domestic consumers to whom SMI were installed - DeltaE $_{varfcc}$	$DeltaE_{varfcc} = - \frac{E_{varfccinit} - E_{varfccSMI}}{E_{varfccinit}}$ [%]	$E_{varfccinit}$	consumption in peak hours for interval of time analysed before the introduction of SMI on the segment of domestic consumers (ex. a quarter, a semester, a year) [MWh]
				$E_{varfccSMI}$	consumption in peak hours for interval of time analysed after the

					introduction of SMI on the segment of domestic consumers (ex. a quarter, a semester, a year) [MWh]
27		Variation of consumption in peak hours for non-domestic consumers to whom SMI were installed SMI - $DeltaE_{varfcnc}$	$DeltaE_{varfcnc} = -\frac{E_{varfcncinit} - E_{varfcncSMI}}{E_{varfcncinit}}$ [%]	$E_{varfcncinit}$	consumption in peak hours for interval of time analysed before the introduction of SMI on the segment of non-domestic consumers (ex. a quarter, a semester a year) [MWh]
				$E_{varfcncSMI}$	consumption in peak hours for interval of time analysed after the introduction of SMI on the segment of non-domestic consumers (ex. a quarter, a semester, a year) [MWh]
28	Secu-rita-te	Degree of security of transfer of data on the whole consumer chain – consumer - concentrator - concentrator - central system of acquisition and management of data, in nodes and in communication paths (by encryptation coding, wrapping, fragmentation etc.) - $G_{asigSec}$	$GasigSec = \frac{N_{pct\_mas\_sec}}{Nt_{pct\_mas}}$ [%]	$N_{pct\_mas\_sec}$	number of measuring points for which security is assured for the transfer of data on whole chain consumer - concentrator - central system of acquisition and management of data
				Nt_{pct_mas}	total number of measuring points for which SMI were installed
29		Security degree against the unauthorized access to elements of measuring point (connections of meter change of internal	$GasigSecAn_{pm} = \frac{N_{pct\_mas\_sec\_Anpm}}{Nt_{pct\_mas}}$ [%]	$N_{pct\_mas\_sec\_Anpm}$	number of measuring points secured from point of view of unauthorized access to measuring point

		software, access of measuring block etc.) G asigSecAnpm		Nt pct_mas	Total number of measuring points for which SMI were installed							

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Synthesis of indicators for evaluation of implementation of SMI
Concessionaire distribution operator:
Year:

NOTE:
column 6 = Value of basic year
column 7 = Value on .....
column 8 = Value of indicator in basic year
column 9 = Value of indicator on ....
column 10 = Target values

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No. crt.	Category	Name of indicator	Formula	Details of terms of formula						
				Symbol of term	Name of term from formula					
0	1	2	3	4	5	6	7	8	9	10
1	Stage of implementation at level of license area	Implementation degree of SMI for domestic consumers at the level of concession area of OD - GiSMIc	$Gi_{SMIc} = \frac{n_{ccSMI}}{nt_{ccOD}} [\%]$	n ccSMI	number of domestic consumers to whom SMI were installed					
				nt ccOD	total number of domestic consumers who are in concession area of OD					
		Implementation degree of SMI for non-domestic consumers in the concession area of OD -GiSMInc	$Gi_{SMIncPP} = \frac{n_{cncSMI}}{nt_{cncOD}} [\%]$	n cncSMI	number of non-domestic customers to whom SMI were installed					
				nt cncOD	total number of nondomestic consumers from concession area of OD					
3		Stage of installation of balance meters - Gi contbal	$Gi_{contbal} = \frac{n_{contbalinst}}{nt_{contbalprev}} [\%]$	n contbalinst	number of balance meters installed in implementation programme of SMI					
				nt	total number of					

						contbalprev	balance meters provided in the SMI implementation programme					

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Annex 5 was introduced by point 8 of art. I of ORDER no. 6 of 26 February 2016 published in OFFICIAL GAZETTE No. 157 of 1 March 2016 and has the content of annex 3 of the same normative act.
