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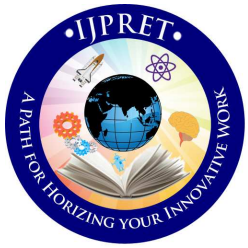

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REPLACEMENT OF ELECTROMECHANICAL METERS AND IMPACT TO LOSSES MINIMIZATION

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Abstract

The need for significant rehabilitation of the measuring point, extension, adoption and application of standards in assets of KEK Distribution System is very clear. Due to field conditions that are evident, the need for development projects selected as high priority projects is very clear, and it is included in the Development Plan 2013-2017 Distribution System Operator. To ensure coordination with other players plans and to utilize synergy cases and once-only possibilities that may exist during the re-engineering design, studies will be needed to develop the Master Plan for the distribution of electricity. This plan should recommend undertaking projects and present the road map for further development of KEK distribution facilities, from the point where the amount of energy delivered to the network to the point where consumers are involved, serve and measured.

INTRODUCTION

The main challenges facing the Distribution System in the fields of electricity Measuring and Calculation of Customers Energy are listed below.

- Age of meters
- Locations without meters
- Non closure of the equipment where meters are installed
- New connections
- Accuracy, maintenance and meter calibration
- Difficulty to access customer sites
- Meter Tampering
- Lack of systems to facilitate the detailed calculation of the feeder energy 10 (20) kV and SS 10 (20) / 0.4 kV.

Consumer Consumption Profile (including industrial customers) in 2011 is shown in Table 1. This table shows the number of customers at the average monthly consumption above certain values. Table 2 presents data on the age of the meters installed at customer locations. The data in these tables are used in the development of a measurement strategy that will help to focus investment in effective and results-oriented approach to reduce commercial losses, improve energy calculation and to assist in the regulation of consumer.

CALCULATION OF ENERGY AND ENERGY MEASUREMENT OF CONSUMER

As discussed earlier, there are several challenges in the field of measurement of electricity to consumers and energy calculation. Calculating energy strategy from the top down will help KEK in focusing efforts to reduce commercial losses. It will also provide the opportunity to measure the technical losses at higher voltage levels where commercial losses are limited and assist in directing the activities of KEK to reduce technical losses. In the field of energy measurement to the customer, installation of metering points with distance reading opportunities is important, especially in locations with high consumption and hard to access locations.

Meters for power calculations are important for the calculation of power right within the various substations 10 (20) / 0.4 kV across the service area. This approach will provide information to improve the assessment of technical losses and easily

identify areas where commercial losses are high. Meter primary functions include energy calculations - four squares, load profile, resistant to tampering, evidence of tampering, optical port, remote communication (reading and configuration) through GSM / GPRS, etc.. Currently KEK meters for energy calculations have been installed / exist in all substations of 110 kV and 35 kV, including 35 kV and 10(20) kV feeders. The next step was conducted during 2011 and early 2012 which are installed with meters distance communication opportunities to all substations 10 (20) / 0.4 kV. In addition, based on commercial performance, at the end of 2011 meters are installed remotely reading multifunctional GSM / GPRS to individual consumers connected at 0.4 kV with high consumption of electricity. KEK has also purchased the software for automatic reading and meter data management that can effectively integrate with reading meters remotely from different manufacturers and provide reports to assist operations on a regular basis.

In order to improve measurement in households with a reasonable cost, KEK strategy is to replace 60,000 old meters annually with simple electronic meter. Simple electronic meter primary functions are: measuring small loads versus old electromechanical meters will have a significant amount of income from the measurement of small loads. Electronic meters are resistant to tampering / interference from outside. Tariff clock is integrated within the meter. It means there will be no external tariff hours as in the case of electromechanical meters where access is easy tariff hours interference.

In 2011, KEK has signed a contract for the purchase of 100,000 simple electronic meters. Only during the period January-September 2012 are replaced / installed about 37,000 meters based on need and priority. Primary strategy is focused and will focus on replacement of meters that are older than 40 years. Moreover, the new meters will be used for all new connections and will replace defective meters. Any existing meter that can be repaired to be used again in lower risk areas. Electro Mechanical Meter T3 Electronic Meter MT 171.

Financial Analysis after meter replacement

Based on detailed data and analysis of financial losses caused by irregularities with tariff relay programming and recommendation resulting from this report for the installation of digital meters, we get data from Distribution Division on the number of meters replaced with purpose of comparing the technical and financial impact on the consumption of the consumers to whom they have replaced electromechanical meters.

Districts Installations from 01.01.2012 - 31.09.2012,

Consumption analyzes (kWh) and billing (EURO):

For each group of Meter changed have analyzed the costs in the form: Meters installed in January - Consumption / Billing (February - October 2012) Meters installed in February - Consumption / Billing (March - October 2012) Meters installed in March - Consumption / Billing (April - October 2012) Meters installed in September - Consumption / Billing October 2012.

The same data for all is extracted from the previous period last year 2011. The summarized districts data's are given in the Table 4:

The analyzes of differences (kWh and EURO) are originated from this table and are as follows From Table 5 we see that:

1. There's an increase of 12.14% (or 9,890,542 kWh) of energy recorded after the installation of digital meters and

2. An increase of 30.42% (or EUR 1,409,567) in Billing.

Another interesting analysis and that has changed a lot in comparison with field inspections carried during the previous year is the ratio between A1 and A2 in comparison with A1 + A2 (2011 and 2012), given in the following table

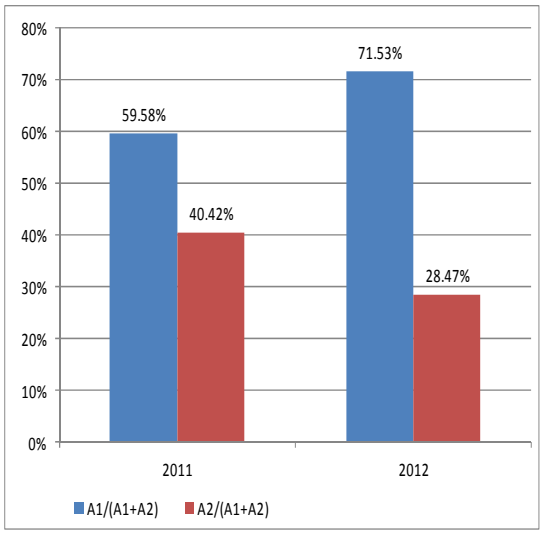
Table 6 shows that:

- A1 tariff ratio (high) and A2 (lower) in 2011 was **59.58%** to **40.42%**
- A1 tariff ratio (high) and A2 (lower) in 2012 has changed **71.53%** to **28.47%.**

The ratio against A1 and A2 compared to the total (A1 + A2) in 2012 now complies with the real load (expense) recorded in our network during normal official tariff time.
Said differently:

•Recording high Tariff A1 **increased** by 16,816,327 kWh (or **34.63%)**
• Recording Low Tariff A2 is **reduced** to 6,925,785 kWh (or **21%)**

Graphically:



CONCLUSIONS

The above analysis shows that:

1. Process of Meter changing from electromechanical to digital gives visible and positive results and is creating additional income for our corporation, as the main reasons is the inability of the customer programming tariffs, options which have significantly been maltreated in the past (this is backed up by the report of DMDV based on inspections performed).

2. Performance and dynamics of changing meters across Districts varies and is not proportional to the number of customers and the number of staff

3. Replacement of meters directly affects relieving (improving) the graph of load because consumers do not have access to

tariff regulation (uncontrolled spending or increased during low tariff periods). Therefore consumers unable to tariff regulation will be referenced to consuming electricity during periods when digital meters recording with a low tariff (i.e. EE savings) and thereby preserving our assets from overloading, especially in peak times.

4. When analyzing meter replaced consumption is noticed that a number of customers (2-3% of the total changed meters) had no consumption for a long period of time.

5. The process of changing meters from electromechanical to digital should continue with increased intensity as seen very positive effects on the growth of consumption and revenue billing and consequently Corporation incomes.

6. Should increase the meter changing dynamics in districts where large commercial losses are observed and poorer performance is noted.

Table 1

Costumer Consumption Profile in year 2011 (kWh/month)

District	Total	>5000kWh		>2000kWh		>1500kWh		>1000kWh		>700kWh		>500kWh		≤500kWh	
		Number	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Gjakove	45,683	155	0.3 %	348	0.8 %	389	0.9 %	1,856	4.1 %	2,712	5.9 %	10,287	22.5 %	29,936	65.5 %
Ferizaj	63,636	252	0.4 %	544	0.9 %	474	0.7 %	2,152	3.4 %	3,357	5.3 %	14,685	23.1 %	42,172	66.3 %
Gjilan	51,968	157	0.3 %	368	0.7 %	393	0.8 %	1,933	3.7 %	3,221	6.2 %	13,543	26.1 %	32,353	62.3 %
Mitrovica	43,596	110	0.3 %	285	0.7 %	312	0.7 %	1,218	2.8 %	1,747	4.0 %	8,002	18.4 %	31,922	73.2 %
Peja	54,390	162	0.3 %	436	0.8 %	487	0.9 %	2,017	3.7 %	2,704	5.0 %	11,321	20.8 %	37,263	68.5 %
Prishtina	123,053	741	0.6 %	1,745	1.4 %	1,755	1.4 %	7,197	5.8 %	8,463	6.9 %	28,160	22.9 %	74,992	60.9 %
Prizren	66,641	233	0.3 %	588	0.9 %	793	1.2 %	3,459	5.2 %	3,965	5.9 %	13,973	21.0 %	43,630	65.5 %
Totali	**448,967**	**1,810**	**0.4 %**	**4,314**	**1.0 %**	**4,603**	**1.0 %**	**19,832**	**4.4 %**	**26,169**	**5.8 %**	**99,971**	**22.3 %**	**292,268**	**65.1 %**

Table 2

Presenting Districts Meters per their age

District	Total	Less than 10 years		10 up to 20 years		20 up to 30 years		30 up to 40 years		Above 40 years		Production with year exluded	
		Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Ferizaj	63,599	26,224	41.2%	13,093	20.6%	7,110	11.2%	5,386	8.5%	4,466	7.0%	7,320	11.5%
Prizreni	67,714	16,448	24.3%	14,168	20.9%	12,524	18.5%	12,247	18.1%	7,886	11.6 %	4,441	6.6%
Prishtina	128,149	51,269	40.0%	19,688	15.4%	12,255	9.6%	15,428	12.0%	4,657	3.6%	24,852	19.4%
Peja	55,532	25,240	45.5%	14,023	25.3%	3,830	6.9%	4,127	7.4%	1,683	3.0%	6,629	11.9%
Mitrovica	43,705	21,380	48.9%	8,822	20.2%	3,006	6.9%	4,089	9.4%	2,229	5.1%	4,179	9.6%
Gjilani	51,879	23,058	44.4%	10,186	19.6%	6,687	12.9%	6,068	11.7%	2,142	4.1%	3,738	7.2%
Gjakova	47,066	16,088	34.2%	11,958	25.4%	7,953	16.9%	6,178	13.1%	2,791	5.9%	2,098	4.5%
Totali	457,644	179,707	39.27 %	91,938	20.09 %	53,365	11.66 %	53,523	11.70 %	25,854	5.65 %	53,257	11.64 %

Table 3

District	Numbers of Meters
Prishtina	5943
Prizreni	7885
Peja	5439
Ferizaji	7118
Gjilani	4054
Mitrovica	4512
Gjakova	4791
TOTALL	39742

Table 4

Dist	Consumption	A1 2011	A2 2011	A1+A2 2011	Fat 2011	A1 2012	A2 2012	A1+A2 2012	Fat 2012
DPR	Feb.-Oct.	8,291,344	5,432,262	13,723,606	824,204	11,825,911	4,473,646	16,299,557	1,124,107
DPZ	Feb.-Oct	8,393,235	7,559,447	15,952,682	898,632	12,071,370	4,918,668	16,990,038	1,150,893
DPE	Feb.-Oct	6,456,363	4,473,665	10,930,028	626,322	9,111,582	3,736,808	12,848,390	839,014
DFE	Feb.-Oct	9,233,246	4,954,612	14,187,857	798,161	11,476,557	4,523,571	16,000,128	1,044,984
DGL	Feb.-Oct	4,957,894	3,512,079	8,469,973	475,302	6,493,472	2,534,760	9,028,232	589,688
DMI	Feb.-Oct	6,127,627	2,755,987	8,883,614	511,598	7,094,984	2,823,898	9,918,882	633,432
DGJ	Feb.-Oct .	5,087,707	4,253,236	9,340,943	499,428	7,289,867	3,004,151	10,294,018	661,095
TOT:		48,547,416	32,941,288	81,488,704	4,633,648	65,363,743	26,015,503	91,379,246	6,043,214

Table 5

2012-2011 (kWh)	Growth (%)	2012-2011 (EUR)	Growth (%)
2,575,951	18.77%	299,903	36.39%
1,037,356	6.50%	252,261	28.07%
1,918,362	17.55%	212,692	33.96%
1,812,270	12.77%	246,823	30.92%
558,259	6.59%	114,386	24.07%
1,035,268	11.65%	121,835	23.81%
953,075	10.20%	161,667	32.37%
9,890,542	**12.14%**	**1,409,567**	**30.42%**

Table 6

A1/(A1+A2) 2011	A2/(A1+A2) 2011	A1/(A1+A2) 2012	A2/(A1+A2) 2012
60.42%	39.58%	72.55%	27.45%
52.61%	47.39%	71.05%	28.95%
59.07%	40.93%	70.92%	29.08%
65.08%	34.92%	71.73%	28.27%
58.53%	41.47%	71.92%	28.08%
68.98%	31.02%	71.53%	28.47%
54.47%	45.53%	70.82%	29.18%

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