BALKANS JOINT CONFERENCE AND EXHIBITION

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GOLEM, ALBANIA

Towards Safe, Reliable and Sustainable Services

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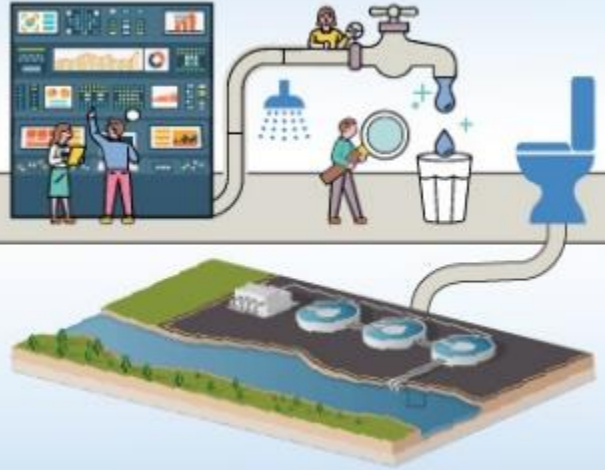

Methodology of assessment of commercial losses

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Content

- Definition/sources of losses;
- Why;
- Statistic and analysis team;
- Purpose, task, study;
- Developing of Methodology;
- Categories/Components;
- Results;
- Benefits.

Definition

Consumed water which not generate revenues.

Sources

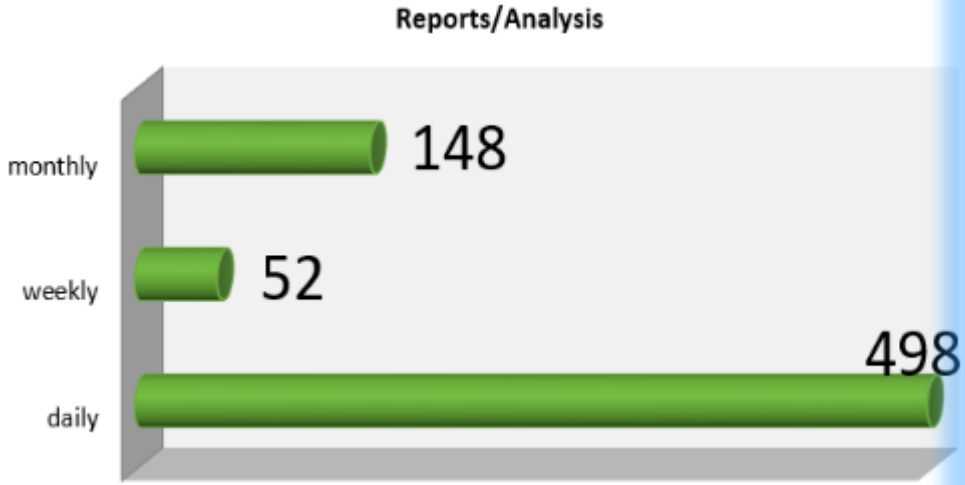
The main causes of commercial losses can be divided into 4 main groups:

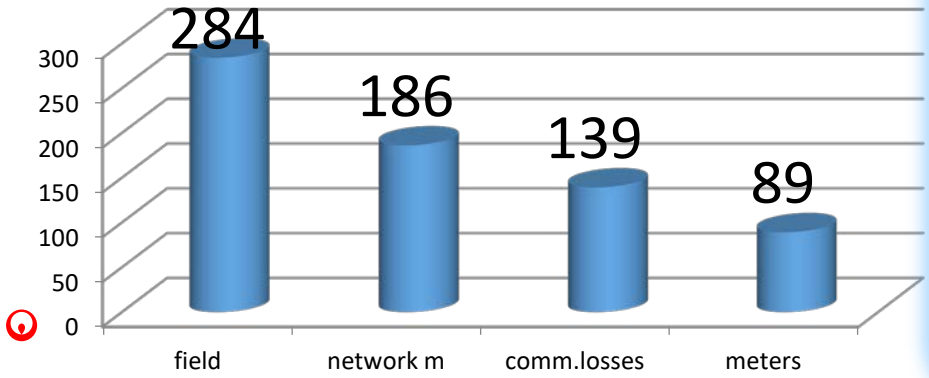
- illegal consumption;
- unmetered consumption;
- non-covered consumption;
- not invoiced/billed consumption.

Why

- More than 10 years our priorities are to fight against commercial losses (near 10 000 000 m3 are found and billed);
- Every year starting new processes and projects related to covering reasons for commercial losses (25 processes and projects to 2022);
- Created database of all activities related to it;
- Needs to be prepared methodology for estimation / assessment of commercial losses in order:
  - to get total picture of commercial losses (measured/unmeasured, billed and not billed);
  - correct prioritization of the activities in order of increasing efficiency related to decreasing of commercial losses.

Statistic and analysis team





Purpose, task, study

The purpose of the research is to study and analyse in detail the components forming the commercial losses, through numerous statistical indicators and determinants, through which their size can be predicted.

The tasks through which the purpose is realized are the following:

- selection of indicators that best measure the dependencies between and within the components;
- selection of factors that affect commercial losses;
- study of the relationships between the indicators;
- making predictions based on micro-level relationships and dependencies.

Type of study – representative statistical study of samples from the aggregated data and study of the general aggregation itself.

Developing of Methodology

Trying to cover most of known (for us)components of commercial losses:

- past and current activities – taking results, divided to all components (DN of meters, type of customers, -/+ measured etc.) and extrapolating it on the whole plurality of every component;
- available information from Veolia – global level;
- information from social and media space (ghettos)

For every criteria there is information for:

- reason to be in methodology and short definition;
- way of estimation;
- % reliability of the statistical sample;
- level of reliability of the criteria;
- sources.

category	№	component	category	№	component
meters on connections	1	aging of meters	measured/not billed	14	reading on closed services
	2	installed meter not sent for reading		15	readings on meters with expired metrology
	3	not correct sizing of meters		16	corrections of common needs
	4	blocked meters		17	not billed real readings
lack of meters on connections	5	basis		18	not billed with meter replacement
	6	lack of meters on new connections		19	not billed common needs
	7	lack of meters of blocks of flats	unauthorized consumption	20	cut connection
	8	site networks		21	negative initial data
	9	villas zones		22	already penalized customers
meter reading	10	not read meters		23	w/o contract for connection
	11	closed services		24	illegal consumption
condominiums	12	closed services	specific areas	25	ghettos
	13	negative common needs			

Criteria / Components - visualization

Компонент

Корекция на разпределени ОН	Адреси с издаден ПД без ДП
Блокирали водомери	Вилни зони
Изградени СВО с водопровод ,...	Измерени, нефактурирани реа...
Измерени, нефактурирани реа	Имоти със закрити услуги

Калкулиран месец

1/2022	10/2022
11/2022	12/2021
12/2022	2/2022
3/2022	4/2022

Диаметър

15	20	25
30	32	40
50	63	65
80	100	125

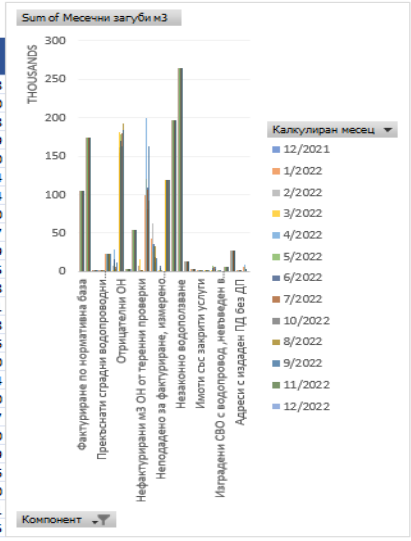
Тип клиент

no info	no info
Битови	Търговски

Финална визуализация на месечните търговски загуби

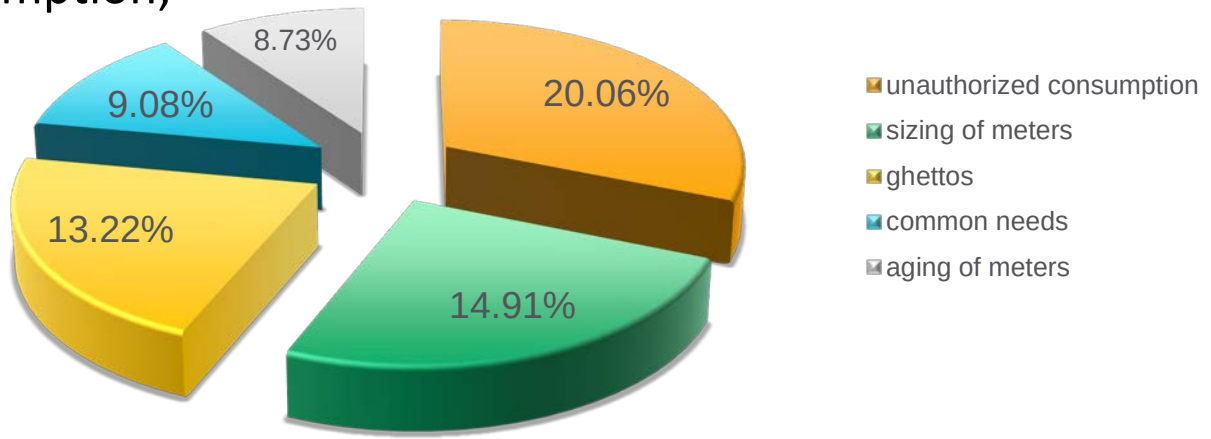
Sum of Месечни загуби м3 Калкулиран месец

Компонент	12/2021	1/2022	2/2022	3/2022	4/2022	5/2022	6/2022	7/2022	10/2022	8/2022	9/2022	11/2022	12/2022	Grand Total
Фактуриране по нормативна база		105521	105521	105521	105521	105521	105521	105521	105521	105521	105521			1055208
Територии, населени от малцинства		174246	174246	174246	174246	174246	174246	174246	174246	174246	174246			1742460
Скупени, манипули	156	156	156	156	156	156	156	156	156	156	156	156	156	2028
Прекъснати сградни водопроводни отклонк		1761	1761	1761	1761	1761	1761	1761	1761	1761	1761	1761	1761	21129
Площадки-не завършени		23141	23141	23141	23141	23141	23141	23141	23141	23141	23141			231410
Площадки-завършени		-2692	7334	2197	28726	9660	15957	6277		3021	11274			81754
Отрицателни ОН		154563	161383	181327	169316	178039	169691	179055	162322	192372	184347			1732414
Отрицателни изходни данни		3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	45120
Остаряване на водомерите		54181	54181	54181	54181	54181	54181	54181	54181	54181	54181			541807
Нефактурирани м3 ОН от терени проверки		7780	7192	15642	505	229	1131	28	94	208				32809
Нефактурирани м3 ОН		99343	99863	120817	199950	80698	108727	105638		92351	162258			1069645
Нефактуриране на измерени м3 по устройс		42552	61884	26244	36288	33318	36342	19224	12042	33264	17550			318708
Неподадено за фактуриране, измерено потребление от терени прове				33		5286	7574			408				13301
Неотчетени водомери на СВО		119680	119680	119680	119680	119680	119680	119680	119680	119680	119680			1196798
Некоректно оразмерени в-ри		196478	196478	196478	196478	196478	196478	196478	196478	196478	196478			1964776
Незаконно водоползване		264375	264375	264375	264375	264375	264375	264375	264375	264375	264375			2643750
Липса на водомери в сгради с режим ЕС		13880	13880	13880	13880	13880	13880	13880	13880	13880	13880			138804
Комбинирани водомери		2778	2778	2778	2778	2778	2778	2778	2778	2778	2778			27780
Имоти със закрити услуги		864	859	856	854	850	847	835		830	813			7607
Измерени, нефактурирани реални отчети –		402	637	839	1020	358	739	458	275	987	395			6110
Измерени, нефактурирани реални отчети – изтрити/променени				1353	1300	7429	4822	6775		2961	5969			30609
Изградени СВО с водопровод ,невъведен в е		585	390	897	663	1209	1092							4836
Вилни зони		6000	6000	6000	6000	6000	6000	6000	6000	6000	6000			60000
Блокирали водомери		27481	27793	27637	27637	27637	27637	27637	27637	27637	27637			276371
Адреси с издаден ПД без ДП		729	729	729	729	729	729	729	729	729	729			7285
Корекция на разпределени ОН		5896	5568	6016	8398	3168	3483							32529
	156	1303458	1339587	1350542	1441341	1314566	1344726	1312612	1169054	1320723	1376929	5677	5677	13285048



TOP 5 (66% of all losses)

- 20.06%- unauthorized consumption;
- 14.91% - sizing of meters;
- 13.22% - ghettos;
- 9.08% - common needs;
- 8.73% - aging of meters.



Unauthorized consumption

- **Reason to be in methodology and short definition;**

There are mainly two types of unauthorized water consumption that generate commercial losses:

- Illegal connected properties - connected to the network without the required documents under legislation.
- unauthorized water consumption in properties which are customers – different practices, including , connection from the water service connection before the revenue meter, additional unauthorized water supply of the site from the water network without revenue meters, manipulation of the meter and various other practices.

- **Way of estimation;**

On the territory of the concession area nearly 120,000 landed properties are present, over 95% of them are regulated (RLP).

- Based on the 5 consecutive years - the ratio of visited properties and the established cases of unauthorized water consumption is 9%.
- This percentage refers to the total number of landed properties and the calculated number of 11,250 properties with possible unauthorized water consumption is multiplied by 282 m^3 (it is calculated against double average annual measured consumption for 2016 of newly created customers from the activity of Illegal Connections Team).

- **% reliability of the statistical sample – 78%**;
- **Level of reliability of the criteria – medium;**
- **Used statistic method - mean values; forecasting**
- **Sources – GIS, operative system,**

Meter sizing

- **Reason to be in methodology and short definition;**

This criterion is one of the main ones containing the authorized commercial losses. The inaccurate sizing of the meters as compared to the real water volumes leads to a bigger error in the upper sensitivity threshold (Q_4/max), related to the reduction of the service life of the water meter, or in the lower sensitivity threshold (Q_1/min), related to lack of measurement of the water volumes. Especially problematic are the cases where the service connection is sized for domestic consumption and water for fire safety needs. The second element leads to considerable increase of the diameter of the connection and the water meter as compared to the water consumption under usual conditions.

- **Way of estimation;**

The available analysis of results from statistical survey of the consumption per minute of various types of consumers shows:

- meters for customers of the type “population” – on average 13% of the consumed water volumes are under the minimum sensitivity threshold of the meter (Q1/min), for which registration of the consumption within the legally set errors of measurement is not guaranteed -/+5%;
- meters of “commercial/industrial” customers – on average 35 % of the consumed water volumes are under the minimum sensitivity threshold of the meter (Q1/min), for which registration of the consumption within the legally set errors of measurement is not guaranteed -/+5%;

The results of conducted tests and analyses of the behavior of water meters in a minimum flow below (Q1/min) show that on the average 20% of the flowing water volumes are not registered by the meters.

For the calculation of that component, the measured volumes of all meters are used divided by type of customers and diameters.

- **% reliability of the statistical sample – 64%**;
- **Level of reliability of the criteria – high;**
- **Used statistic method – grouping, correlation, coefficients of correlation**
- **Sources – DBRM, operative system,**

Ghettos

- **Reason to be in methodology and short definition;**

Unauthorized water consumption by compact Roma residential quarters – illegal constructions built, which expand gradually until entire ghettos are created.
They squatted on municipal property or on uninhabited private land. Houses, shacks, tents were erected without authorization or wagons were placed.

Nearly all similar ghettos are with unauthorized consumption of water from the water network, but they use nearly the entire capacity of the constructed water connections.
Unofficially, on the territory of the concession area there are between 30 and 40 ghettos, which are different by size, from 50 to 700-800 people live there (with the exception of Filipovtsi with approximately 5,500 residents. Moreover, there are smaller ghettos with fewer than 10 families, whose number cannot be specified.

- **Way of estimation;**

The biggest ghetto on the territory of the concession area is Filipovtsi quarter (5,500 people), whose water consumption is covered by meter. For one year, the measured water volumes are 1,000,000 m3 on the average.

2016 is used as a base year with measured consumption of 1 000 019 m3, which is 182 m3 on average per person/per year.

For the needs of the survey (apart from the actually measured losses in Filipovtsi residential quarter), it is accepted that the ghettos supplied with water are 30 with 200 residents on average, on the basis of which we apply the annual consumption per person/year from Filipovtsi r.q., which as losses is 1,091,148 m3.

Or the total annual losses are calculated to 2,090,949 m3

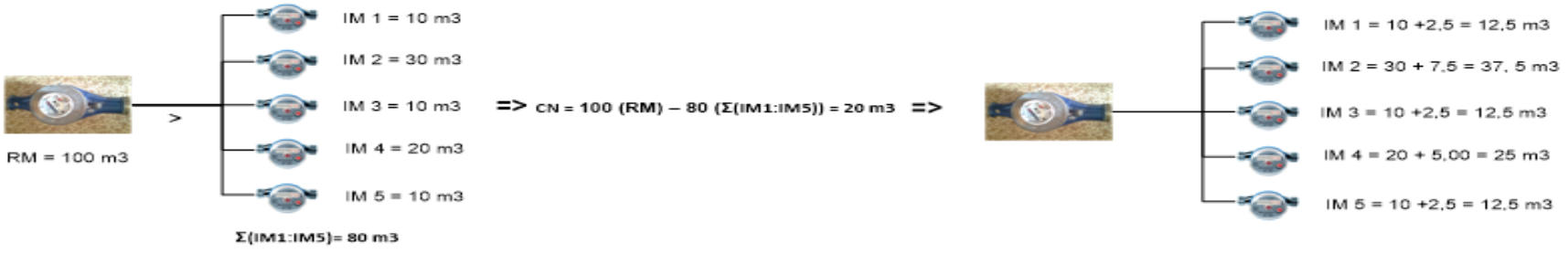
- **% reliability of the statistical sample – 34%**;
- **Level of reliability of the criteria – low;**
- **Used statistic method - forecasting**
- **Sources – Scada, official and unofficial surveys,**

Condominiums common needs (CN)

- **Reason to be in methodology and short definition;**
- For 7 predefined reasons (except for the lack of a real reading of a water meter) CN are not billed, regardless of the presence of a real reading. Commercial losses are generated from measured, but unbilled water volumes.
- **Way of estimation;**

The number of cases and m3 are extracted on an annual/monthly basis, where CN are not billed per reasons.

- **% reliability of the statistical sample – 98%**;
- **Level of reliability of the criteria – high;**
- **Used statistic method - standart deviation; mean values**
- **Sources – operative system,**



Meter aging

- **Reason to be in methodology and short definition;**

- The aging of the meters is related to the breaking and failure of the mechanism and the components in the water meter's body, which are directly related to the accuracy of the measurement of the water volumes. As the years pass, the sensitivity of the water meters reduces, especially when measuring minimum water volumes. Experience and tests show that the % of error in the measurement could range between 0.2%-0.5%/year, and for the low-quality water meters that percentage could reach, even exceed 1%.

- **Way of estimation;**

By RM database is extracted:

- the number of years of use of the water meters by diameters,
- the average annual measured consumption by diameters;

The measured consumption from the year following the year of installation of the device for each previous year before the base year is decreased as follows:

- meters installed over the period to 2012, including with 0.5 % - high-quality devices - Sensus, Itron, EWT, Zenner, NGO (analysis of tested water meters before and after the expiry of the period between the checks);
- water meters installed after 2013 1% - low-quality water meters – Maddalena, B Meters (analysis of tested water meters before and after the expiration of the period between the checks);

- **% reliability of the statistical sample – 97%**;
- **Level of reliability of the criteria –high;**
- **Used statistic method - mean; relative values;hypothesis; t-test**
- **Sources – DBRM, operative system,**

Results

12% of inlet measured water quantities

29% of total losses

13.11% are not field losses

Benefits

- information about approx. real ratio between physical losses and CL;
- exact sources for losses;
- prediction of losses and sources;
- planning of proactive activities:
  - ✓ generated revenues;
  - ✓ leads to water conservation;
- focus and optimize our sources and activities;
- updating of criteria and entire methodology.

THANK YOU FOR YOUR ATTENTION!