



*Georgian National Energy and Water Supply
Regulatory Commission*

**Principles of Control and Regulation of
Energy Losses in the Distribution Company
Network**

**Nugzar Beridze
Ilia Nakashidze
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Legal Basis of the Control and Regulation of the Energy Losses in the Energy Distribution Company Network

Georgia Laws:

- **Concerning Power Engineering and Gas**
- **Concerning License and Permission**

Commission Regulations:

- **Commission Resolution #23 of September 23:
"Concerning Adoption of the Control and Licensing Procedures in Power Engineering, Gas and Water Supply Sectors"**



Georgian National Energy Regulatory Commission Resolution #3 of July 1, 1998:

„Concerning Adoption of Rules and Procedures of Determination of Power Supply Tariffs Methodology ~

- **Transmission and distribution losses in the network are fully reflected in the energy and power costs.**
- **Standard losses allowable at each voltage level in transmission and distribution are reflected in the tariffs..**
- **Retail tariffs calculations are based on combination of costs of energy purchased by distribution company, power cost and distribution tariff. The result is calculated taking into account allowable losses.**

- Commission Resolution #17 of May 11, 2006:

“Concerning Adoption of Standard Losses in Electric Network of the Energy System”

Following Commission Resolution is being elaborated:

“Concerning Adoption of Standard Losses Determination Procedure”

- **All distribution licensees operating in the electric energy sector are obliged to submit to the Commission Commission-approved form of a report concerning compliance with conditions of operation and services in the period from April 1 to May 1.**
- **Appropriate structural unit of the Commission (Department of Electric Energy) is obliged to study reports submitted by the Companies prior to June 1 each year and provide the Commission with appropriate lists of licensees that have timely submitted full-fledged reports, those that failed to submit their reports at all and/or those that submitted incomplete reports.**



Standard Losses Determination Procedure establishes standard electric energy losses values' calculation principles

The following is taken into account:

- **Technical losses in transmission and distribution networks;**
 - Technical losses of energy are unavoidable expenses of energy conditioned by physical processes accompanying transportation of energy through conductors and devices of the network



- **Energy used by substations for their own needs**
 - Energy used by substations to power their own operation constitutes the volume (quantity) of energy necessarily required to ensure uninterrupted operation of the substation and provide working conditions for exploitation personnel.
- **Losses due to inaccuracy of measurement tools**
 - Energy losses conditioned by standard inaccuracy of measurement tools constitute part of energy not accounted for that is not registered in the recordings of the meters in the facilities because of impact measurement tools standard technical specification has on measurement results (negative systemic indicator of the measurement system inaccuracy). Within error margins, standard instrumental inaccuracy of measurement tools is dependent on load of the electric circuit.



- **Factual losses of energy – disparity between energy received by the network and transmitted to the end user as defined by comparison of the measurement system data on volumes of received energy and energy delivered for use.**
- **Commercial losses – losses caused by various reasons, including theft of energy determined by disparity between control meter indicated value of energy costs paid for and amount of energy delivered for use.**



Transmission losses of Energy

- **Transmission losses should be deducted from Company's total losses of energy.**
- **Transmission losses in the network of the licensee are not to be reflected in the tariff.**

Definition of Standard Losses of Electric Energy

- Standard losses of electric energy within electric network constitute technological expense of energy necessary for its transportation and includes technical losses, energy used by substations for their operation and losses conditioned by instrumental inaccuracy of measurement tools.



Organization of Calculation of Standard Losses

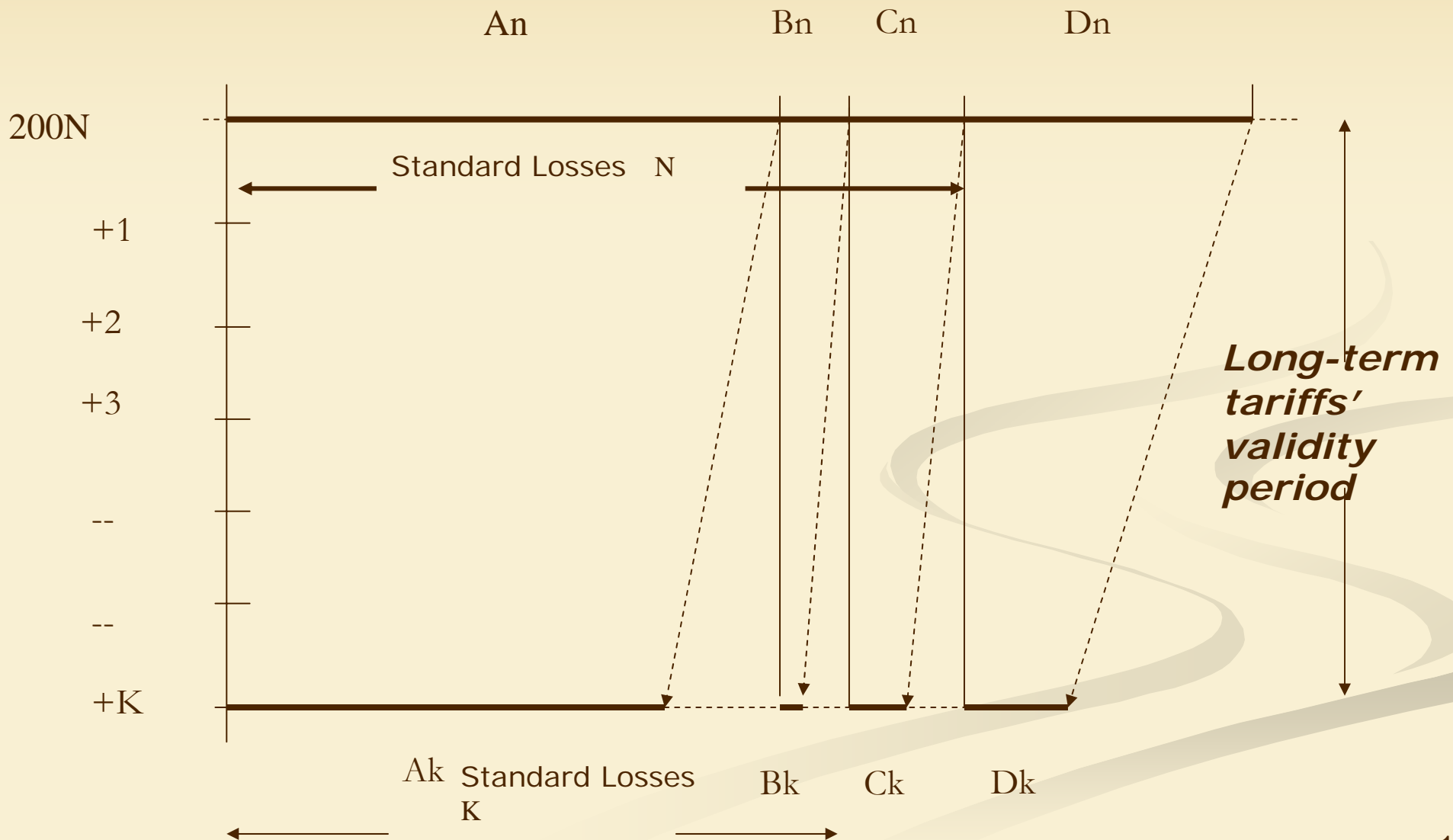
- **As per legislation, losses should be calculated by the owner of electric networks or, by their order, by appropriately competent party.**
- **Technical losses should be calculated by means of certified software.**
- **Values asserted through calculation of technical losses should be submitted to the Commission for ratification of standard losses**
- **Commission should be presented with the plan of reducing network losses for the next production year.**



Ratification of Standard Losses

- **Correctness of submitted losses calculation is being examined and checked by the Commission. If need be, calculations may be passed over to be reviewed by independent expert.**
- **By the end of each year licensee is obliged to submit to the Commission values of factual losses along with their structural analysis.**
- **In case of valid claim by the licensee, correction of losses is acceptable**

Structure of Energy Losses Regulation



Commentary to the Slide 7

200N – Year standard losses have been determined in

K – Validity of the standard

An Ak - Technical losses

Bn → Bk – Use for own needs

Cn → Ck - Measurement losses

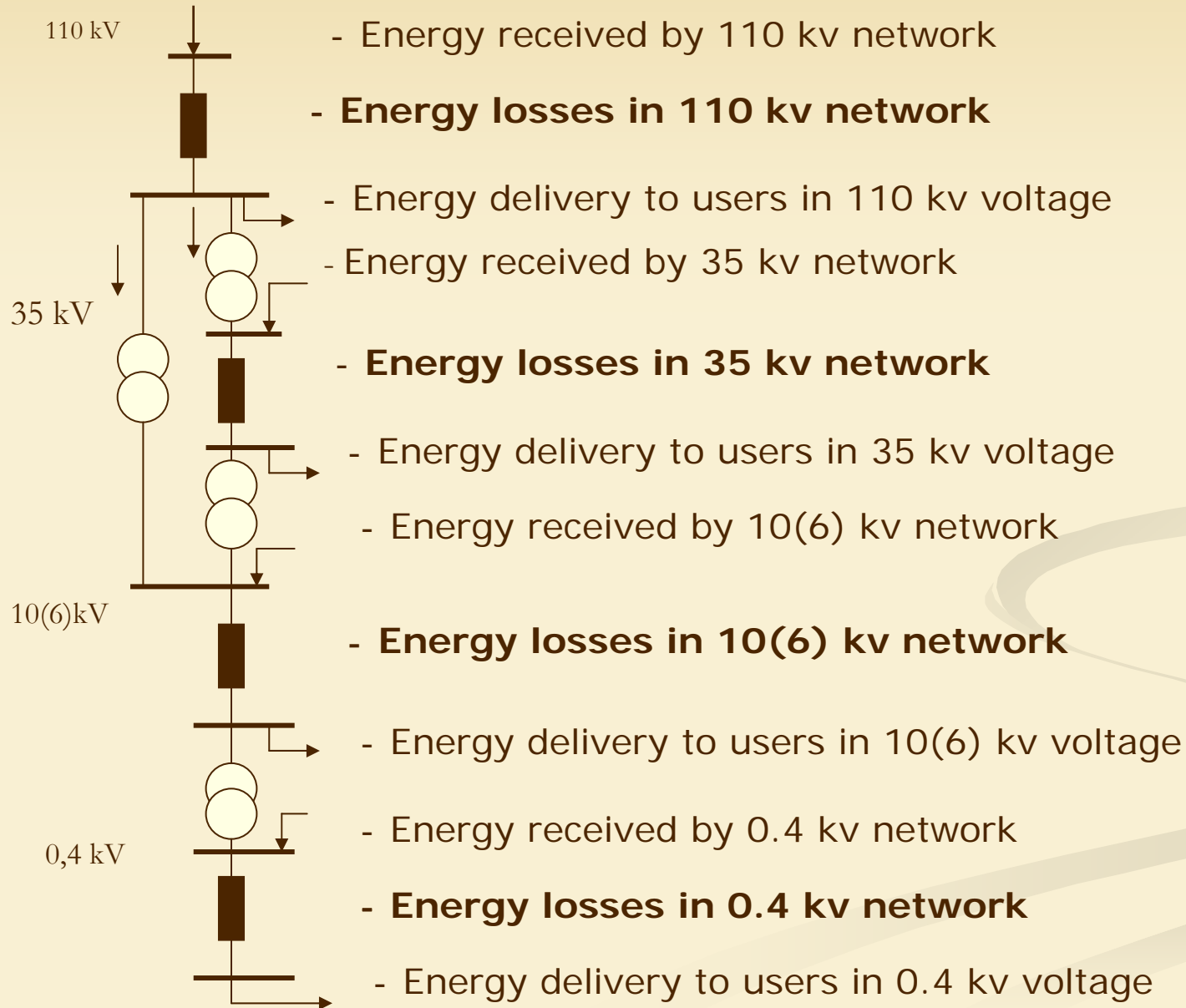
Dn Ck - Commercial losses



Distributing company is obliged to submit to the Commission yearly:

- **Factual and technological losses' volumes per voltage levels using submission form approved by the Commission**
- **Plan for reduction of losses and information on factual reduction of losses once the plan is implemented – in the form of explanatory note.**

Structure of Energy Losses Control



Basic Characteristics of the Factual Losses Submission Form

- Separate data for energy losses on 110-35-10(6)-0.4(0.22) kv voltage levels
 - Factual losses, including:
 - Technological losses
 1. Technical losses
 2. Energy used for own needs
 3. Energy losses through standard instrumental inaccuracy of measurement tools
 - Commercial losses
- Average coefficient of installed capacities' use

Average Coefficient of Installed Capacities' Use

- For a given level of voltage ratio of amount of energy received by the network (kilowatt-hour) to transformer capacity installed for the level of voltage (kilovolt) multiplied by 8760 hours expressed in percentage.



Dynamics of Standard Losses Determination in Standard Acts issued by the Commission

As per Resolution #2/2 of January 21, 2000:

- For transmission network (500-35 kilovolt) – 10.56%;
- For distribution networks (110-35-10(6)-0.4 kilovolt):
- For distribution network - 13.0%

As per Resolution #63 of July 12, 2002

- For transmission network: 500-35 kilovolt – 9.96%
- For distribution network: 13.0%



2006 **By virtue of Resolution #17 of May 11,**

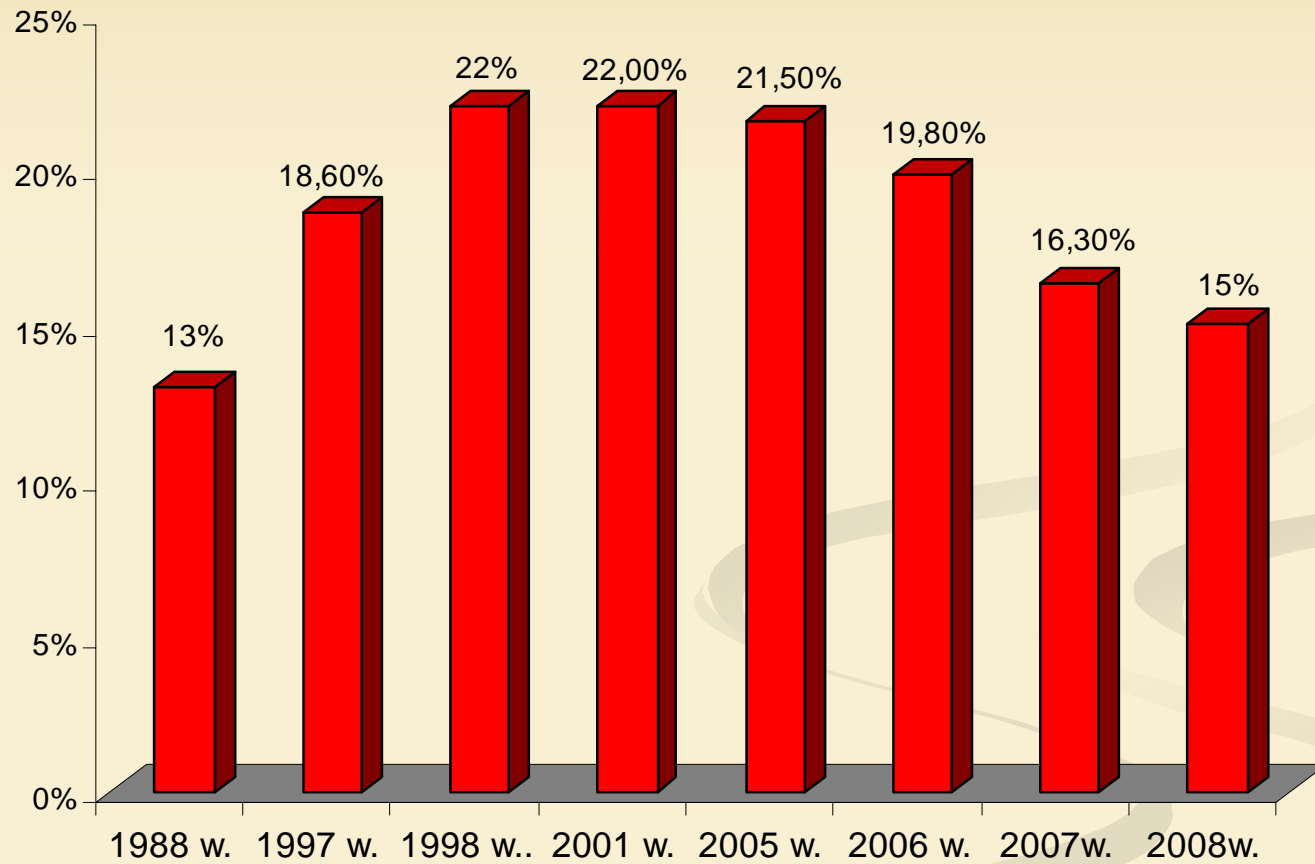
Standard losses of energy in transmission and distribution from generated and imported energy in the network:

Total losses – 13.2%

- **For transmission – 4.41% (200-220-110-35 kilovolt)**
- **For distribution – 110-35 kilovolt – 2.8% - 10(6)-0.4 kilovolt – 5.99%**



Factual Losses of Energy for 500-0,4 kilowatt Networks (percentage)





Losses of Energy in Distribution Companies' Networks

JSC Telasi

- Standard Losses – 12.4%

Including:

- For 110 **kilovolt** voltage level – 1,17%
- For 35 **kilovolt** voltage level - – 0,5%
- For 10 (6) **kilovolt** voltage level - 5,28%
- For 0,4 **kilovolt** voltage level – 5,45%

- Factual losses in 2008 - 19,9%.

JSC Energo-Pro Georgia

- Standard Losses – 14.61%

Including:

- For 110 **kilovolt** voltage level – **2.6%**
- For 35 **kilovolt** voltage level - – **0.91%**
- For 10 (6) **kilovolt** voltage level – **5.0%**
- For 0,4 **kilovolt** voltage level – **6.1%**

- Factual losses - 20%.



JSC Kakhetis Energodistributsia

- Standard Losses – 10.5%

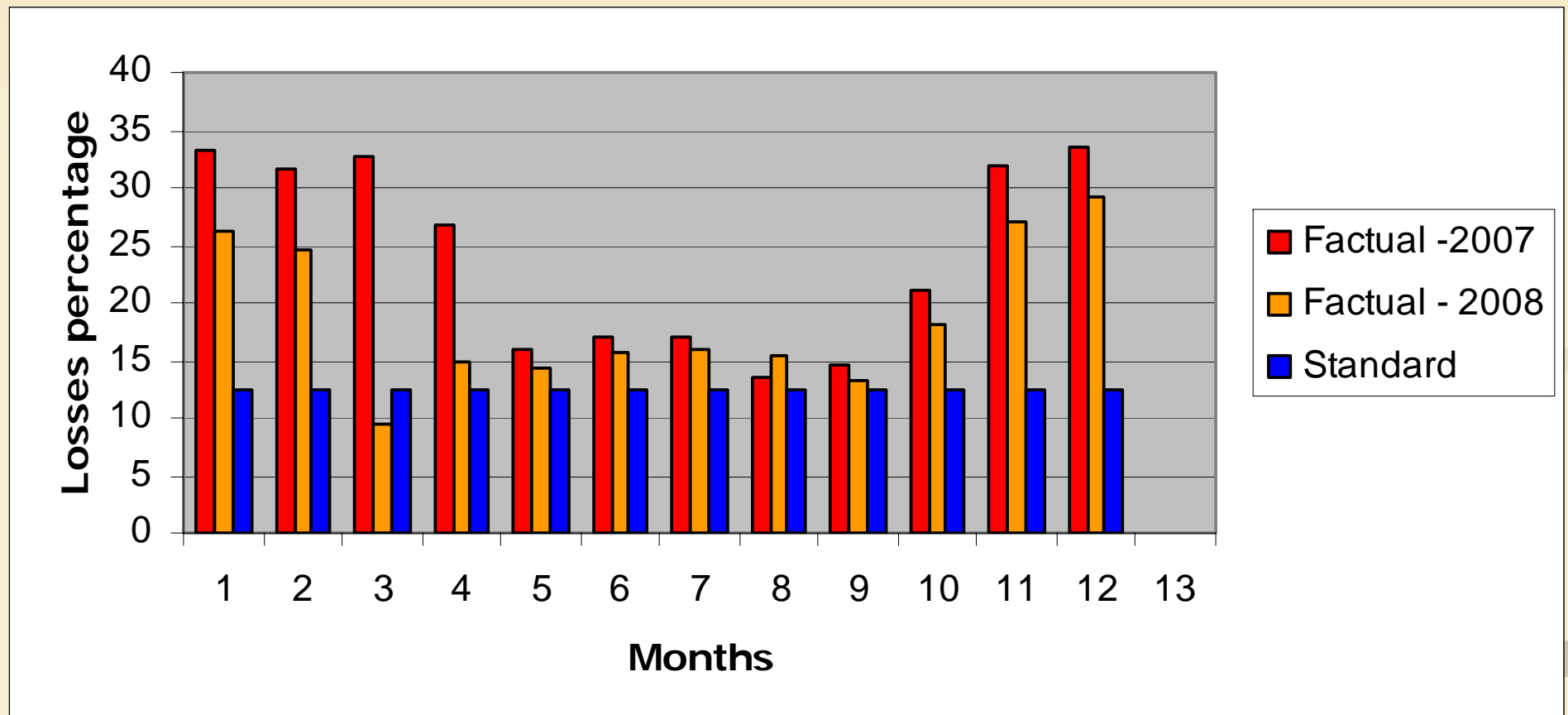
Including:

- For 10 (6) kilovolt voltage level – 4.5%
- For 0,4 kilovolt voltage level – 6.0%

- Factual losses – 17.2

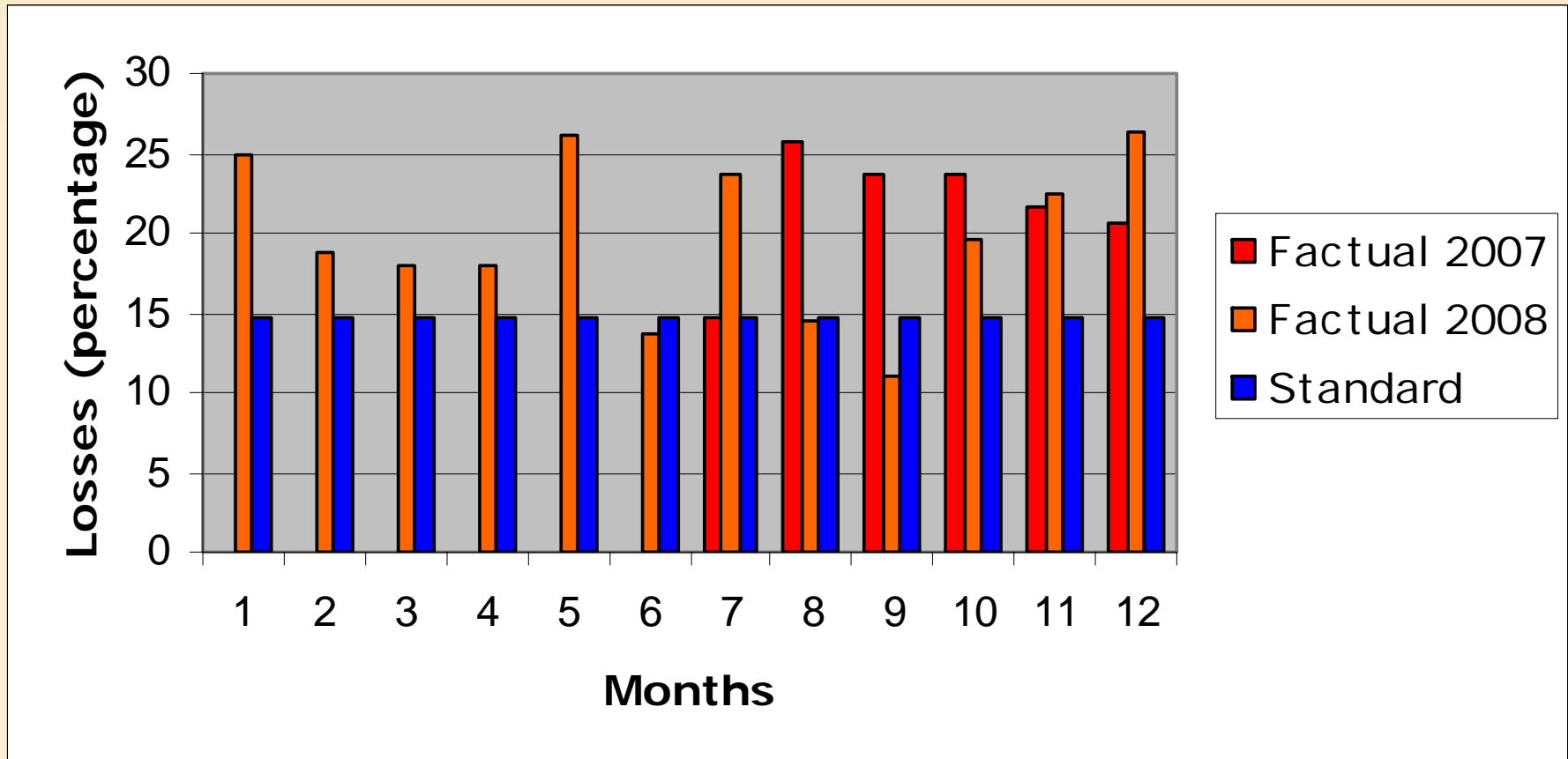


Losses in JSC Telasi Networks (percentages) in 2007 and 2008



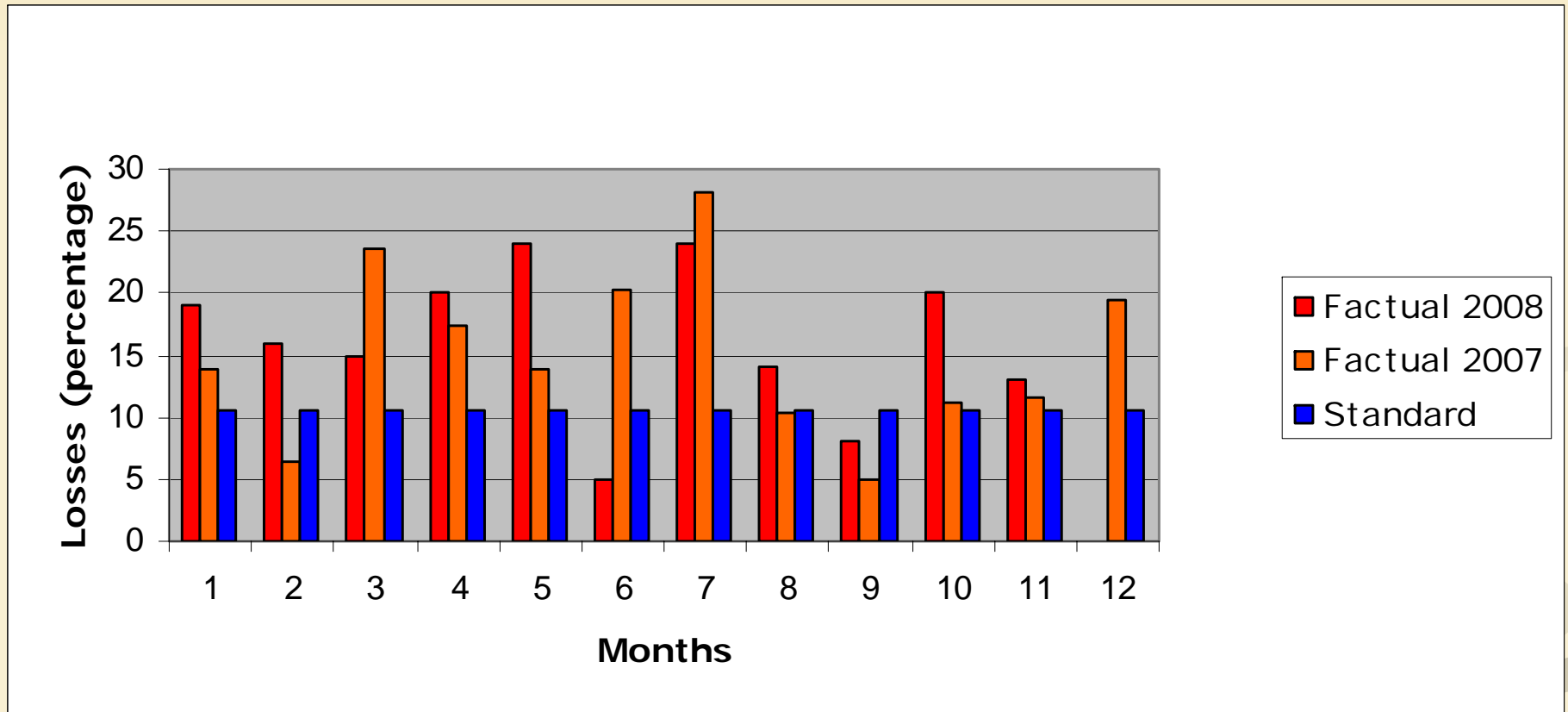


Losses in JSC Energo-Pro Georgia Networks (percentages) in 2007 and 2008

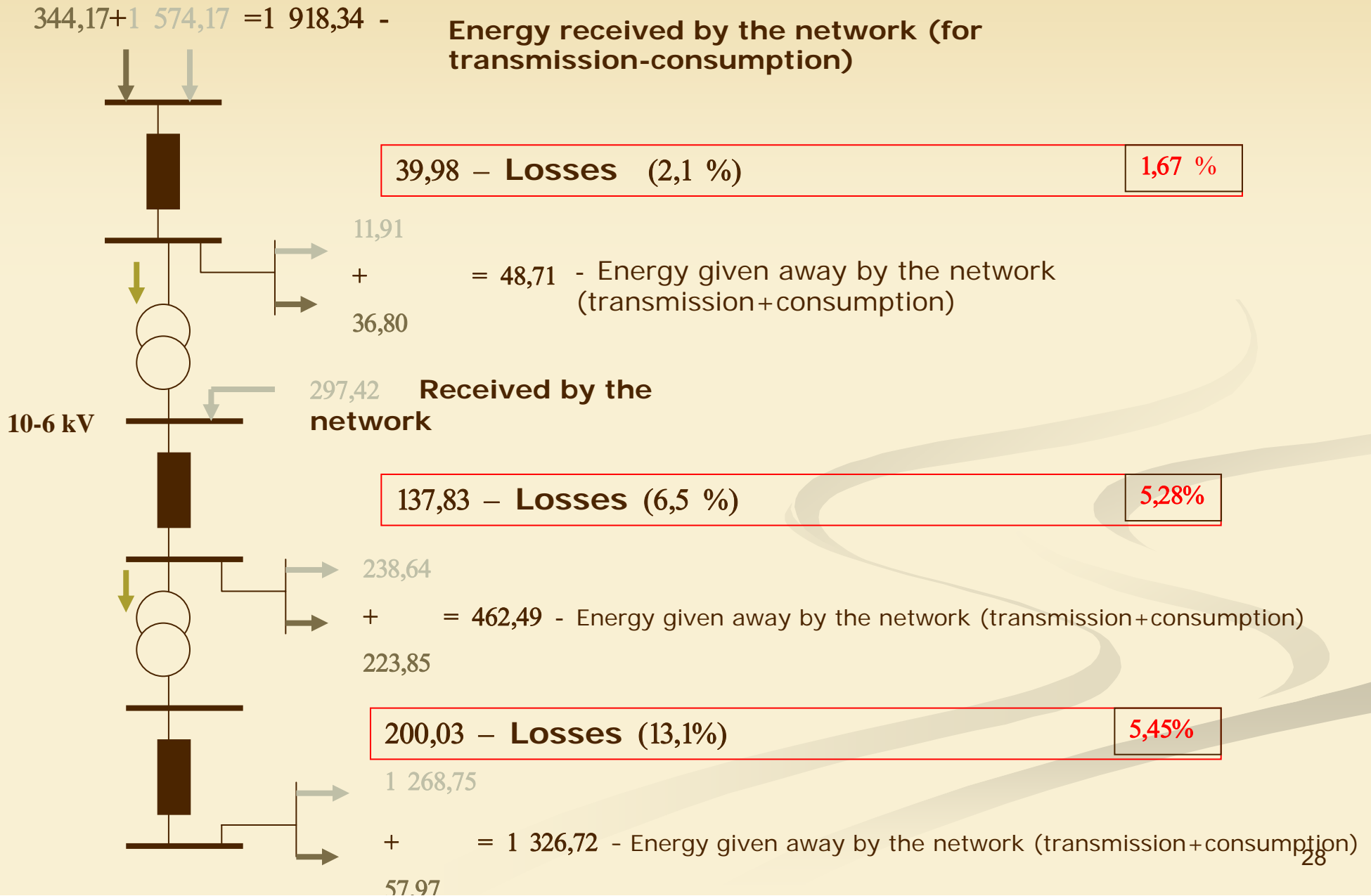




Losses in JSC Kakheti Energodistributsia Networks (percentages) in 2007 and 2008



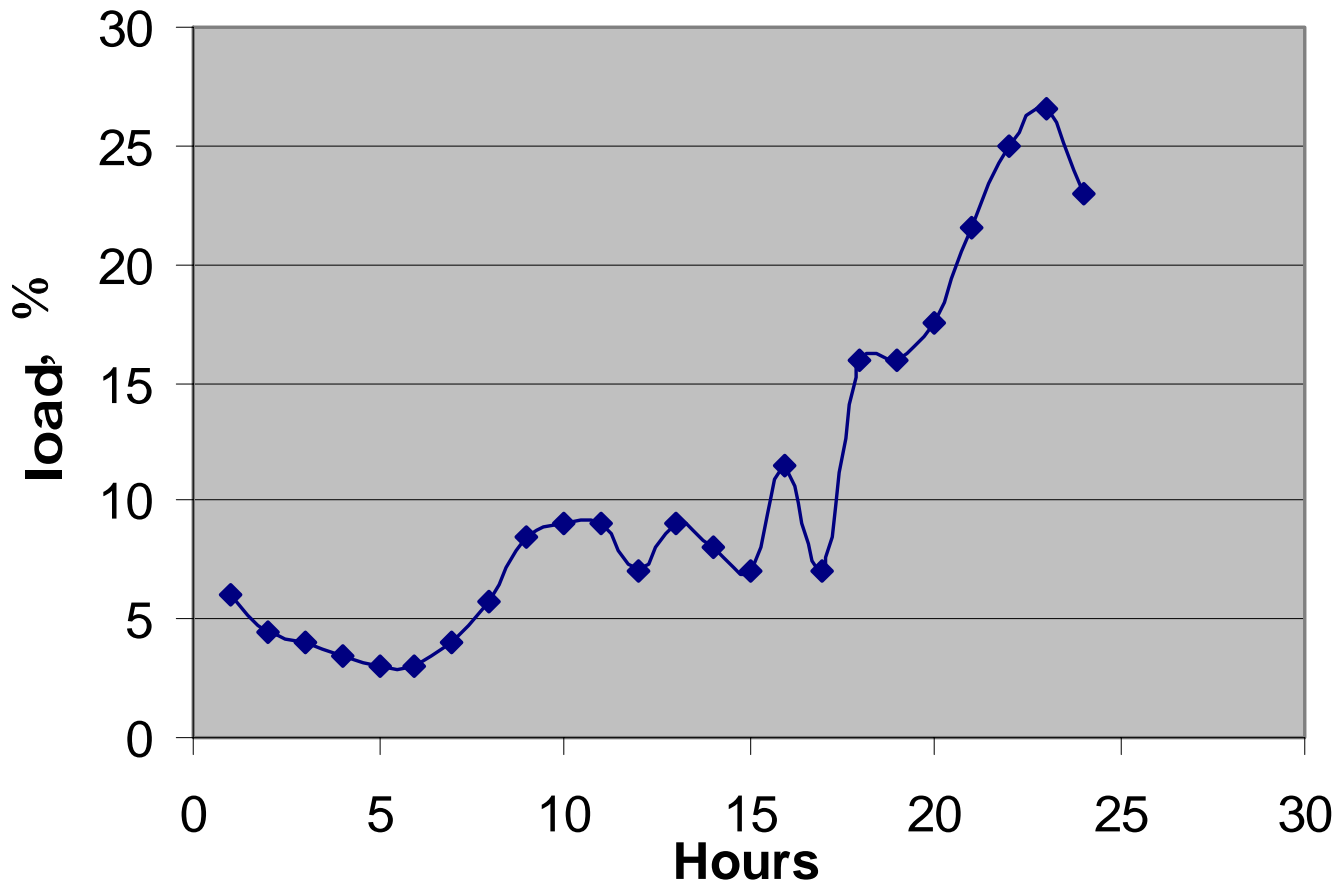
Structural Analysis of Losses in JSC Telasi Network (million kilowatt-hour)



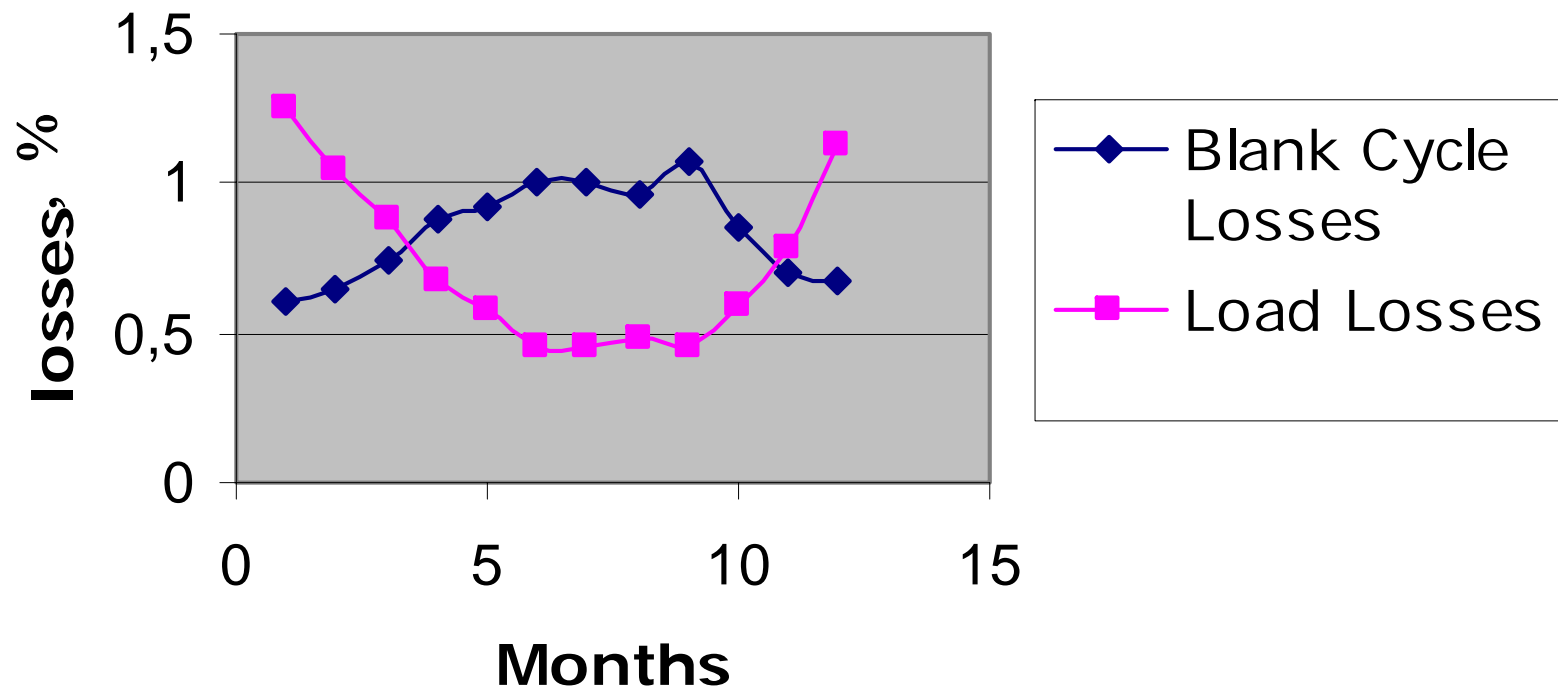
Total Balance of the Company

- Energy received by the network – 2,215.76 million kilowatt-hour
Including: distribution – 1,8771.59 million kilowatt-hour
transmission – 344.17 million kilowatt-hour
- Energy given out – 1,837.92 million kilowatt-hour
Including: distribution – 1,519.3 million kilowatt-hour
transmission – 318.62 million kilowatt-hour
- Losses – 377.84 million kilowatt-hour - 17,1%
Including: distribution – 352.3 million kilowatt-hour - 15,9 %
transmission – 25.6 million kilowatt-hour - 1,2%

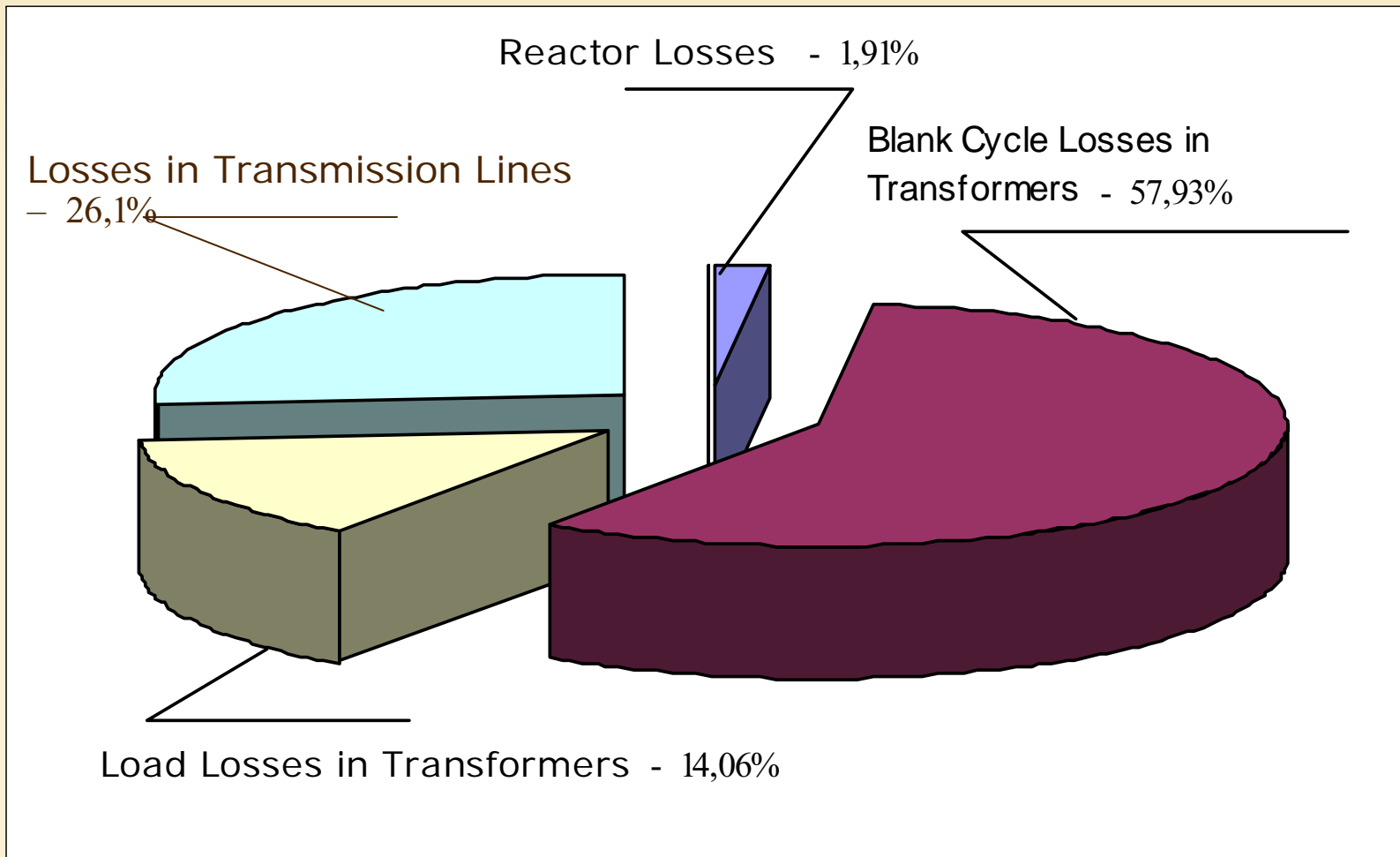
Typical load of JSC Telasi 110 kilowatt substation



Dynamics of losses in JSC Telasi network during the year, %



Yearly Structure of JSC Telasi 35-110 kilovolt Network Technical Losses



Factors Conditioning High Level of Factual Losses in Company Networks and Commission Recommendations towards their Reduction

- 1. Asynchronous readings of measurement tools (especially in the case of 0.4 kilovolt voltage). Companies are not simultaneously reading their meters on retail consumers' side, therefore it is hard to adequately balance out energy received and given out by the network; situation may be improved through installment of automated reading systems, smart-meters and other modern technical measurement equipment;**

2. Theft of energy through meddling with measurement units and by circumventing measurement units. In order to suppress the practice, companies need to be more active with regards to scheduled and sudden inspections of standard meters and actively use control and balance meters. The commission has established appropriate legal basis through adoption of regulations of energy supply and consumption, incorporating provisions on efficient suppression of energy theft;

3. Installment of measurement tools on consumer-owned low voltage transformers results in inaccurate reading of energy losses in said transformers due to frequent high level of losses when transformer operates in the low load and blank cycle modes. Said problem is easily solved through installment of measurement tools in balance division point (tariff mode point) that constitutes imperative of energy delivery and consumption regulations.

4. **High level of blank cycle losses in power transformers**, since their load in the energy system rarely exceeds 20-30% following reduction of number of power-intensive industrial enterprises. Also, **significant share of low voltage distribution networks**, especially in the outlying regions increases losses and impair quality and reliability rate of energy. Said may be redressed through optimization of networks by means of assessment of existing loads and replacement of unloaded units, employment of **DEEP INJECTORS** and so forth.

5. .

5. Significant problem is constituted by **measurement system units**, there is high level of losses in **current and voltage transformers** due to non-compliance of measurement transformers' class and unsteadiness of their measurement over periods of time. To date, companies are not paying to this issue due attention and do not hold appropriate equipment.



Thank You for your attention!