

**Georgian National Energy and Water
Supply Regulatory Commission**

Natural Gas Department

**Problems of Metering Natural Gas
used by Population**

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- **Definition provided under law of Georgia *Concerning Power Engineering and Gas*:**
- ***Distribution Network*: means of natural gas distribution connecting delivery points with consumers**
- **Distribution networks constitute 1.2 – 0.6 – 0.005 MPA pressure gas pipelines**

- **Problem I: is the individual gas meter indivisible part of the distribution network and who is to purchase it – distribution licensee or the end consumer?**
- **Problem II: in colder parts of Georgia, problem of measurement of gas consumption by population by means of individual meters is persistent. Natural gas distribution licensee are purchasing gas in normal condition, yet because of lower temperatures, for the time it is sold it is more compressed (i.e., abnormal conditions)**

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- Article 2 Clause F of the law of Georgia *Concerning Power Engineering and Gas*: “Natural Gas” or “Gas” is a carbhydrate that at the pressure equal to 1.2 MPA and temperature of 200C is gaseous and has thermal composition is no less than 31.8 megajoule/m³ (7,600 kcal/m³). Therefore, mentioned condition of the natural gas corresponds to normal (standard) conditions
- GNERC tariff is set for the natural gas in normal (standard) conditions
- How to solve the problem with regards to distribution?

➤ **Monthly and Yearly Average Air Temperature for those basic Regions where there is Gas Distribution**

No	Town	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
1	Bakuriani	-7,3	6.4	-2.3	3.6	8.8	12.0	14.8	15.0	10.6	5.9	0.8	-4.5	4.3
2	Stepantsminda	-5.2	-4.7	-1.5	4.0	9.0	11.8	14.4	14.4	10.6	6.6	1.5	-2.6	4.9
3	Akhalkalaki	-7.2	-5.4	-2.0	4.7	10.2	13.2	16.0	16.4	12.4	7.4	1.6	-4.0	5.3
4	Tsalka	-4.8	-3.8	-0.3	4.9	10.1	13.2	16.1	15.*9	12.4	7.7	1.8	-2.4	7.5
5	Tianeti	-4.7	-3.1	1.3	7.0	12.4	15.7	18.6	18.5	12.1	9.2	3.3	-2.4	7.8
6	Pasanauri	-4.1	-2.6	1.9	7.4	12.4	15.6	18.5	18.5	14.4	9.4	3.7	-1.6	9.1
7	Tetri Tskaro	-2.1	-0.8	3.0	8.4	13.6	16.8	19.8	20.1	15.8	10.2	4.5	0.0	9.7
8	Dusheti	-1.4	-0.5	3.5	8.9	13.9	17.2	20.2	20.4	16.3	11.2	5.5	0.8	9.7
9	Khashuri	-1.9	-0.8	3.5	9.0	14.3	17.6	20.5	20.7	16.7	11.3	5.2	0.3	9.7
10	Tbilisi	0.9	2.6	6.6	11.9	17.3	21.1	24.4	24.4	19.6	13.8	7.6	2.8	12.7
11	Kutaisi	5.8	8.4	12.9	17.9	21.0	23.2	23.6	20.5	16.4	11.5	7.5	14.5	5.2

- **Actual volume of gas passed through meter is equal to**

- $$V_n = \frac{293,16V_g}{273,16 + t_g}$$

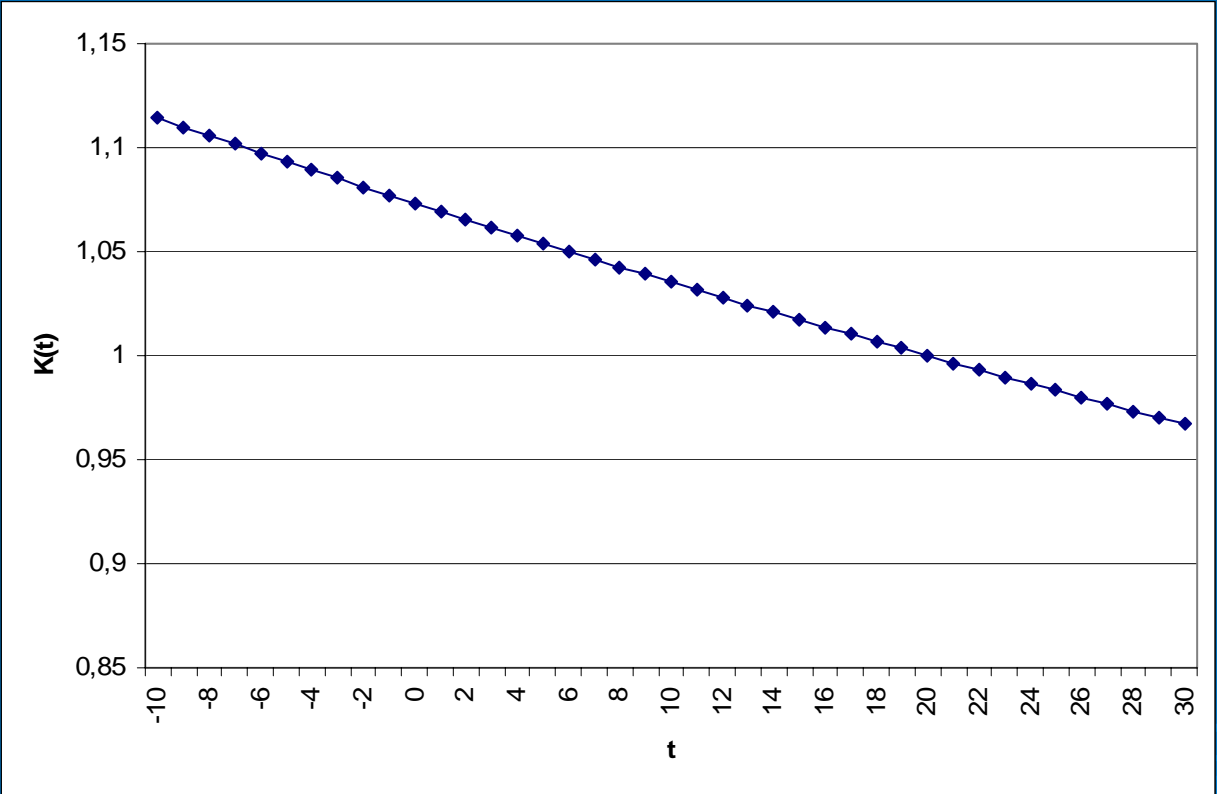
- **Where V_g - is volume of gas measured by the meter**
- **V_n - is actual volume of gas that has passed through the meter (calculated down to normal conditions)**

- Correctness of above given formula is beyond doubt
- Correcting coefficient is equal to

$$K = \frac{V_n}{V_g} = \frac{293,16}{273,16 + t_g}$$

- For temperatures above 20°C $K < 1$ and for lower temperatures $K > 1$

- Domestic meters belong to the class of measurement instruments, therefore the question of correcting their measurement is the prerogative of the National Agency of Standards, Technical Regulations and Metrology of Georgia
- According to specifications of domestic meters, if natural gas temperature varies from $+17^{\circ}\text{C}$ to $+25^{\circ}\text{C}$, then correcting coefficient should be considered to be equal to 1, since inaccuracy caused by temperature change is within limits of the allowed inaccuracy of the meter itself.



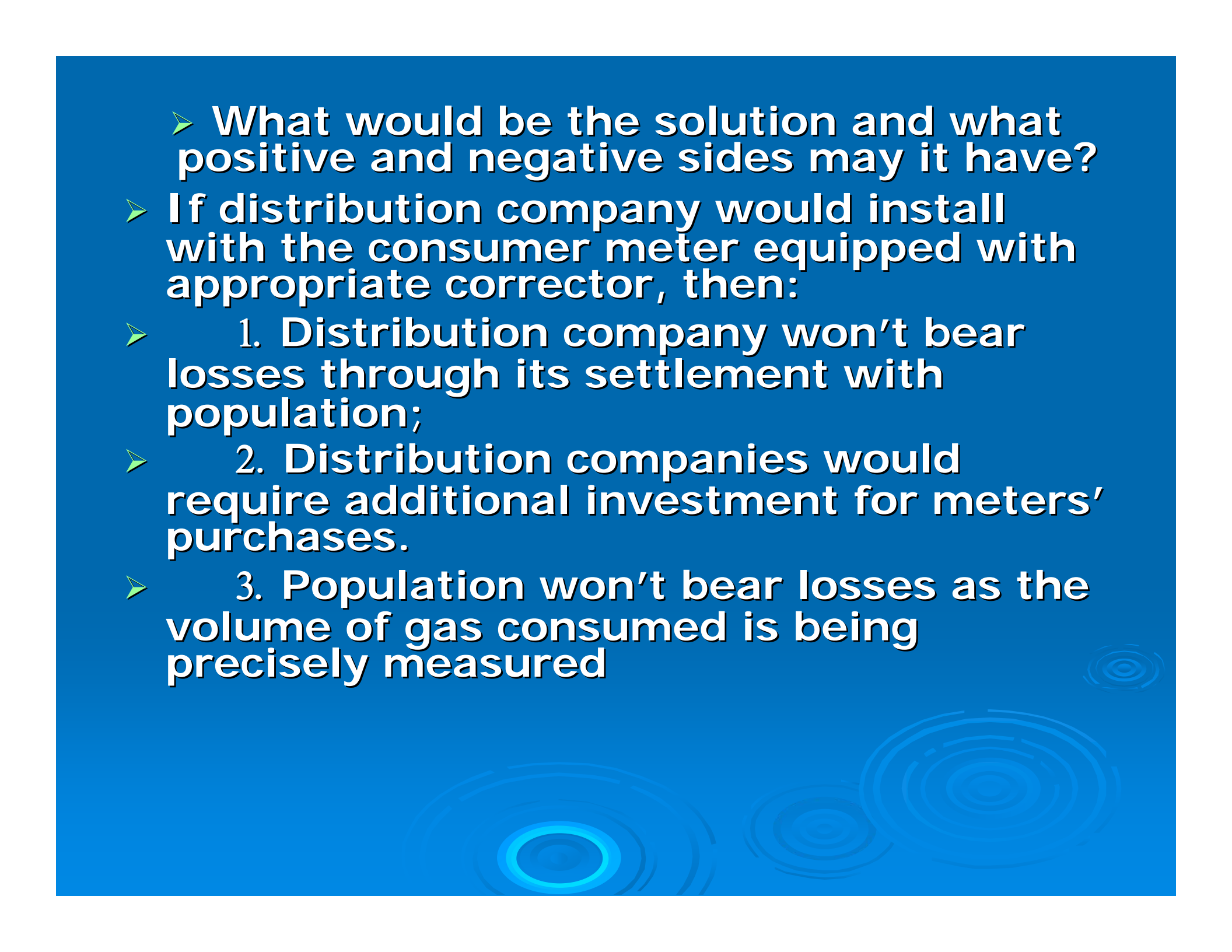
➤ Temperature Coefficient t ratio to Temperature

t **k**

➤	-10	1,113999
➤	-8	1,105597
➤	-6	1,09732
➤	-4	1,089166
➤	-2	1,081133
➤	0	1,073217
➤	2	1,065416
➤	4	1,057728
➤	6	1,05015
➤	8	1,04268
➤	10	1,035316
➤	12	1,028054
➤	14	1,020894
➤	16	1,013833
➤	18	1,006869
➤	20	1
➤	22	0,993224
➤	24	0,986539
➤	26	0,979944
➤	28	0,973436
➤	30	0,967014

- **Table of Temperature Coefficient ratio to Temperature**
- **To date, distribution companies in their mutual settlement with population are using temperature correction coefficient**

- Distribution companies are measuring gas temperature either through main collective meters or in gas-regulating stations where automated thermometers are installed
 - Neither approach is acceptable!!!
- It is also incorrect to average the temperature out per day or month, since gas consumption varies during twenty-four hours and during the month alike.
- Consequently, the practice is profitable for distribution companies and puts the consumers at a disadvantage

- What would be the solution and what positive and negative sides may it have?
 - If distribution company would install with the consumer meter equipped with appropriate corrector, then:
 - 1. Distribution company won't bear losses through its settlement with population;
 - 2. Distribution companies would require additional investment for meters' purchases.
 - 3. Population won't bear losses as the volume of gas consumed is being precisely measured
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➤ If distribution company in its settlement with population would use temperature correction coefficient, then:

➤ 1. Distribution company won't bear losses in its settlement with population if it would use temperature correction coefficient during 12 months.

➤ 2. Population would bear losses because of employment of temperature correction coefficient by the distribution company only in winter season;

➤ 3. Population would bear losses through settlement if the distribution company commits an error in their temperature measurement formula.

➤ 4. There are no control tools on regulatory authorities' side to monitor correctness of temperature measurements

➤ 5. There are no control tools on populations' side to monitor correctness of temperature measurements

➤ 6. When accruing correcting coefficient seasonal and other individual and varying factors should be taken into account, such as network of gas pipelines, it's built up, distance to end consumers, temperature of gas pipeline surfaces and other individual and varying factors.

- **Is there any universally applicable formula or methodology that would link temperature with environment?**
- **As National Agency of Metrology, Technical Regulations and Standards of Georgia has explained to GNERC – there is no such universally applicable formula or methodology**



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Thank you for your attention

