

# Determination of Tariff Limits for Energy and Material Resources Using National Accounts Data

**Vitaly Postolati**

Institute of Power Engineering, Chiisinau, Republic of Moldova

**Email address:**

[vpostolati@rambler.ru](mailto:vpostolati@rambler.ru)

**To cite this article:**

Vitaly Postolati. Determination of Tariff Limits for Energy and Material Resources Using National Accounts Data. *American Journal of Management Science and Engineering*. Vol. 4, No. 1, 2019, pp. 8-16. doi: 10.11648/j.ajmse.20190401.12

**Received:** March 16, 2019; **Accepted:** April 26, 2019; **Published:** May 15, 2019

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**Abstract:** The structure and interconnection of the main macroeconomic indicators reflected in the National Accounts of the Republic of Moldova: "Release" (R), "Intermediate Consumption" (IC), "Gross Value Added" (GVA), "Gross Domestic Product" (GDP). The place of tariffs in the general structure of economic indicators has been determined. It is shown that the tariffs for energy and other types of material resources and the costs accompanying the production cycle are in the "Intermediate Consumption" (IC) sector. It is shown that an increase in tariffs leads to a decrease (GVA) and, accordingly, a decrease in volume (GDP). It is established in a quantitative form as far as the growth of tariffs overtakes the growth of real GDP. A new methodology for setting tariff limits is given, taking into account the dynamics of real GDP growth, indicators of planned GDP growth, as well as the average annual consumer price index. On the basis of calculations and substantiations, it is concluded that tariffs should be reduced by 5.6% for natural gas, by 17.7% for electricity, and by 32% for thermal energy of the central heating system, compared to their current values. The proposed methodology and approach will contribute to the sustainable development of the economy as a whole, including the energy sector, and also take into account the tasks of further improving the state of the social sphere.

**Keywords:** Indicators, National Accounts, Gross Value Added, Tariffs

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## 1. Introduction

One of the main indicators of the development of the country's economy is the annual gross domestic product (GDP) produced. This indicator is used in world practice when comparing the levels of economic development of various countries. In the Republic of Moldova. The National Bureau of Statistics systematically and regularly processes and publishes data on macroeconomic indicators [1, 2], including data on GDP.

Studies [4, 5] clearly showed the quantitative relationship of tariffs with macroeconomic indicators, in particular, with the gross domestic product (GDP).

The main factors determining the volume of GDP are the volume of "Release" (R), and the volume of "Gross Value Added" (GVA).

The volume of "Gross Value Added" (GVA) is directly dependent on the "Intermediate Consumption" (IC) in the sphere of material production.

According to the accepted definitions, the volume of

"Gross Value Added" (GVA) is defined as the difference between the volume of "Release" (R) and the volume of "Intermediate Consumption" (IC), i. e.

$$GVA = R - IC \quad (1)$$

The gross value added (GVA) is the main component of the gross domestic product (GDP), which is the main economic indicator of the level of the economy and social security of the society and the state as a whole.

GDP is calculated as a sum:

$$GDP = GVA + Tax - S, \quad (2)$$

where Tax - taxes on manufactured products and imports; S - subsidies.

Expression (2) in view of (1) takes the form:

$$GDP = R - IS + Tax - SC \quad (3)$$

As follows from expression (3), the volume of GDP is the greater, the larger the volume of "Release" (R), and the

smaller the value of “Intermediate Consumption” (IC), and

d the smaller the return of “Subsidy” (S). As for taxes, their value is regulated by the relevant government agencies, depending on the type of product (value added tax - VAT, import tax, etc.). A detailed analysis of the values of the individual components of intermediate consumption in the sphere of production is possible on the basis of intersectoral balances [3, 8, 9], as well as detailed tables of national accounts [2]. They show which and to what extent each of the sectors of the economy used the services of other branches, and in what volumes the branches themselves gave to other branches, both in physical and monetary terms.

This methodology was effectively used in the previous period, until 2014 [2]. After 2014, the National Bureau of Statistics of Moldova switched to the methodology for compiling aggregated indicators [1], which, however, made it difficult to carry out a detailed analysis. At the macroeconomic level, such opportunities have been preserved.

The purpose of this article is to present a new approach to determining the maximum allowable levels of tariffs for energy and material resources using data from economic indicators of national accounts, to bring the results of studies of changes in the levels of tariffs for natural gas, electric and thermal energy and to compare with the dynamics of changes in real GDP in the last decade in the Republic of Moldova.

Comparison of tariff growth rates with the rates of increase in real GDP makes it possible to carry out an appropriate analysis and draw conclusions as to how coordinated they are and whether they meet the requirements and conditions for ensuring sustainable development of the economy and solving social problems. First of all, it is necessary to perform an analysis of the dynamics of changes in real GDP.

## 2. Data Analysis of Changes in GDP

According to the materials of the Central Statistical Bureau, such macroeconomic indicators as GDP are expressed in current prices, in comparative prices and prices, adjusted to the base year. In the latter case, the volume of GDP is expressed in the prices of the base year, most suitable for a comparative analysis of real indicators of the economy.

The real volume of GDP for each year is determined taking into account the coefficient of deflation. When choosing one of the previous years as the base year, the GDP volume of each subsequent year is defined as private, obtained by division the cost pressure of GDP at current prices for the year in question to the total deflation coefficient relative to the base year. In this paper, 2009 was adopted as the base year for comparisons.

The main initial statistical data characterizing the change in GDP are given in Table 1 [1].

**Table 1.** Changes in macroeconomic indicators of the economy of the Republic of Moldova for the period 2009-2017.

Years	GDP at current prices, thousand lei	Index deflator, %	Medium annual consumer price index, %	GDP in comparable prices, taking into account the deflator index, thousand lei (2/3)	Total deflator index, rel. units	Real GDP in prices of 2009, thousand lei (2/6)	Total index of change in real GDP by 2009, rel. units
1	2	3	4	5	6	7	8
2009	72524580	102,2*	100,0*	70963385	1,022	70963385	1,0
2010	86275377	111,1	107,4	77655604	1,1354	75983958	1,071
2011	98772814	108,2	107,6	91287258	1,229	80397997	1,133
2012	105480184	107,4	104,6	98212461	1,319	79941885	1,127
2013	119532871	103,9	104,6	115046074	1,371	87191732	1,229
2014	133481634	106,4	105,1	125452663	1,459	91509850	1,210
2015	145753642	109,6	109,7	132986900	1,599	91170679	1,285
2016	160814564	105,7	106,4	152142445	1,690	95166953	1,341
2017	178880890	106,3	106,6	168279294	1,796	99584436	1,403
2018 prognosis							

\* According to [2].

The cited data for the period 2009-2017 shows that the volume of GDP at current prices in the Republic of Moldova increased from 72.5 billion lei to 178.8 billion lei. The value of the deflator index per year was 102-111%, or 1.02-1.11 rel. units. The change in the volume of GDP in comparable prices (taking into account the annual deflator index) occurred in the range of 70.9 billion lei (in 2009) to 168.2 billion lei (in 2017).

To determine the change in the volume of real GDP, it was necessary to perform the calculation of the resulting deflator index relative to the base year, which was adopted as 2009. The calculation was performed by multiplying the deflator index value in the current year by its net value for previous years. Table 1 shows the values of the total deflator index

obtained in this way.

During the period under review, its value increased from 1.022 (in 2009) to 1,796 relative units (in 2017). Having the value of the total deflator index, it became possible to determine the volume of real GDP for each year. For each year, real GDP was calculated as the ratio of GDP in current prices to the value of the total deflator index of that year by 2009. The real GDP calculated in this way amounted to 70.9 billion lei in 2009, and by 2017 it increased to 99.5 billion lei.

Taking the ratio of the volume of real GDP each year to its value in 2009, the change in GDP for the corresponding period is defined in relative units. Dynamics of changes in real GDP for the period 2009-2017 in relative units is shown in Figure 1.

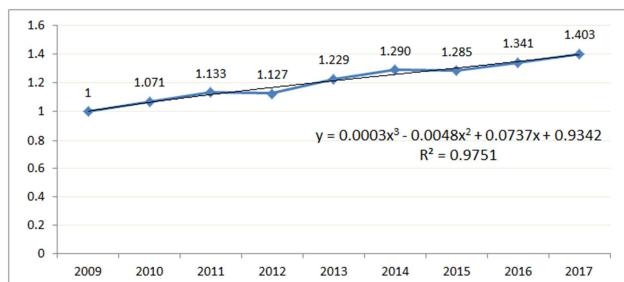


Figure 1. Growth of real GDP, relative units.

The change in real GDP ranged from 1.00 (in 2009) to 1.403 rel. units (in 2017)

The graph (Figure 1) shows an analytical expression — an equation of the line-trend of GDP change, which has the following form:

$$Y = 0,0003 \cdot X^3 - 0,0048 \cdot X^2 + 0,0737 \cdot X + 0,9342, \quad (4)$$

where Y is the real GDP value for each year (X), in relative units relative to 2009; X is a variable (years).

When carrying out calculations, the following values of variable (X) are accepted:

X=1 – 2009; X=2 – 2010; X=3 – 2011; X=4 – 2012; X=5 – 2013; X=6 – 2014; X=7 – 2015; X=8 – 2016; X=9 – 2017.

The above analytical expression (4) describes the line - the trend of real GDP change. At the same time, it makes it possible to predict the value of the expected volume of real GDP in 2018 and subsequent years. In addition, recording the expression of the first derivative  $Y'(X)$  allows you to determine the rate of change in real GDP at any given time (X).

The expression of the first derivative of function (4) can be written in the form

$$Y' = 0,0003 \cdot 3X^2 - 0,0048 \cdot 2X + 0,0737, \quad (5)$$

where  $Y'$  is the rate of change in the value of real GDP (Y) at any time (X), over years, or at any other time interval.

It should be noted that if the variable (X) is measured in

years, then the derivative ( $Y'$ ) is nothing but indices of changes in GDP over the years in relative units. If we take the second derivative from expression (4), then the resulting new expression  $Y''(X)$  will determine the acceleration of changes in real GDP. In the calculations below, only the first derivative ( $Y'(X)$ ) is accepted.

Further calculations use another important indicator characterizing the social security of the population. We are talking about the average annual consumer price index (inflation index).

Based on national accounts data [1, 2], this indicator varied from 1 to 1.09 in different years. The nature of its changes over the period 2009-2017 shown in table 1 and in figure 2. The trend line is described by the equation:

$$Y = 1,0259 \cdot X^{0,0213}, \quad (6)$$

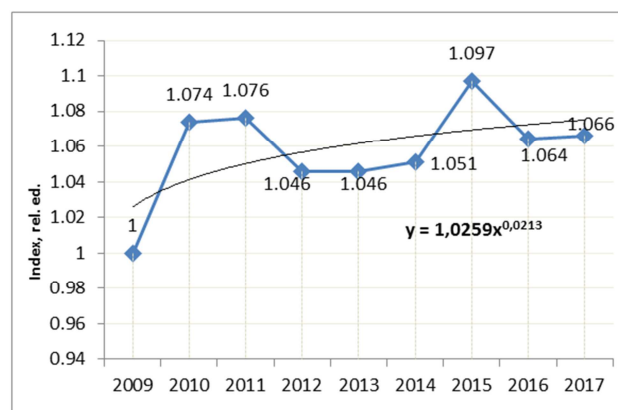


Figure 2. Change in average consumer price index, rel. units.

It was noted above that the main component of GDP is gross value added (GVA). Its value is determined according to expression (1), as the difference in the volume of "Release" (R) and volume pent "Intermediate consumption" (IC).

Volumes of "Release" and "Intermediate Consumption" according to [1, 2] for the period 2009-2017 re shown in table 2.

Table 2. Data "Release" and "Intermediate Consumption" in the economy Of the Republic of Moldova for the period 2009-2017 at current prices, thousand lei.

Years	Release (R), thousand lei	Intermediate consumption (IC), thousand lei	The ratio of IC / R, %	The ratio of IC/ R, rel. units
1	2	3	4	5
2009	127666362	76857170	60,2	0,602
2010	149858660	89937970	60,0	0,6
2011	168167347	99777789	59,3	0,593
2012	175646560	101960465	58,04	0,58
2013	196559525	112840049	57,46	0,574
2014	221504229	127000670	57,33	0,573
2015	242862568	138989939	57,22	0,572
2016	263410750	147941249	56,16	0,561
2017	286216970	131402391	45,91	0,459

In compiling Table 2, data [1, 2] was used, as well as data from National Accounts for 2009–2014. As can be seen from the data given in table 2, the value of the volume of "Intermediate consumption" (IC) in different years in the period 2009-2016 was steady amounted to  $60.2 \div 57.22\%$  of the value of the "Release". Over these years there has been a

tendency to reduce the share of the volume of "Intermediate Consumption" (IC) in relation to the value of the Volume of "Release" (R) at current prices.

In 2017, the share of "Intermediate Consumption" (IC) amounted to 45.9% of the volume of "Release" (R), which is significantly lower than in previous years.

It should be assumed that the reasons for such a significant decrease in the share of “Intermediate consumption” (IC) from the volume of “Release” (R) are a further structural adjustment of the economy of the Republic of Moldova or / and a change in the methodology for preparing and processing statistical data characterizing the main indicators of the economy of the Republic of Moldova.

The comparison of the relative indicators of 2015 and 2017 given in Table 2 is very illustrative. In 2015, with the Volume of “Release” of 242.8 billion lei, the volume of “Intermediate Consumption” amounted to 132.9 billion lei. In 2017, these values mounted to: the volume of “Release” increased to 286.2 billion lei, while the volume of “Intermediate consumption” decreased to 131.4 billion lei.

### 3. Analysis of Changes in Tariffs for Major Energy Resources

As the main energy resources are considered:

- natural gas;
- electric energy;
- thermal (heat) energy.

The analysis of legislative acts and decisions taken by the National Energy Regulatory Agency (NARE) allowed us to determine the weighted average annual values of tariffs for these types of energy resources. The data characterizing their change for the period 2009-2017 are given in figure 3-6.

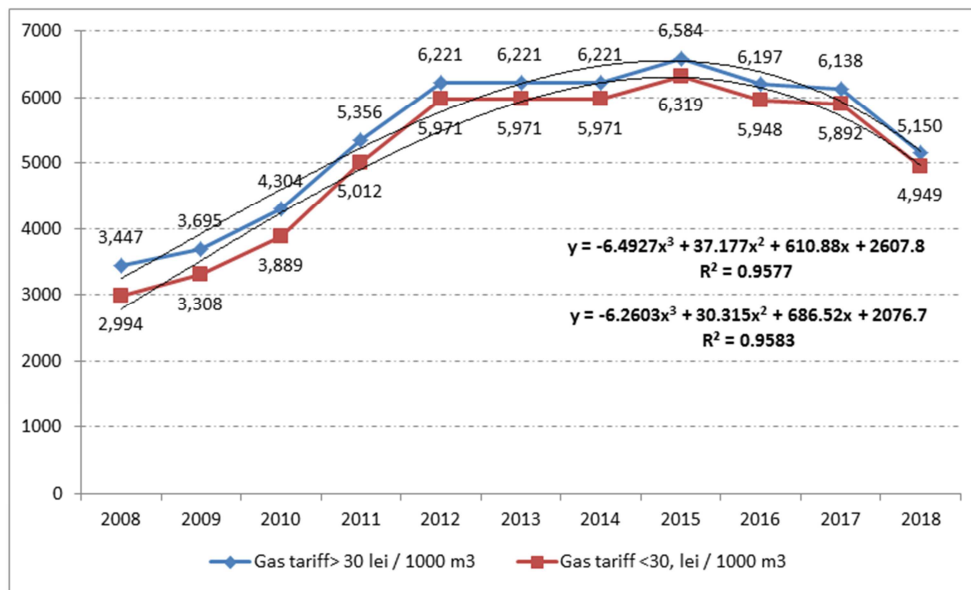


Figure 3. Natural gas Weighted Average Tariff, lei/1000 m3.

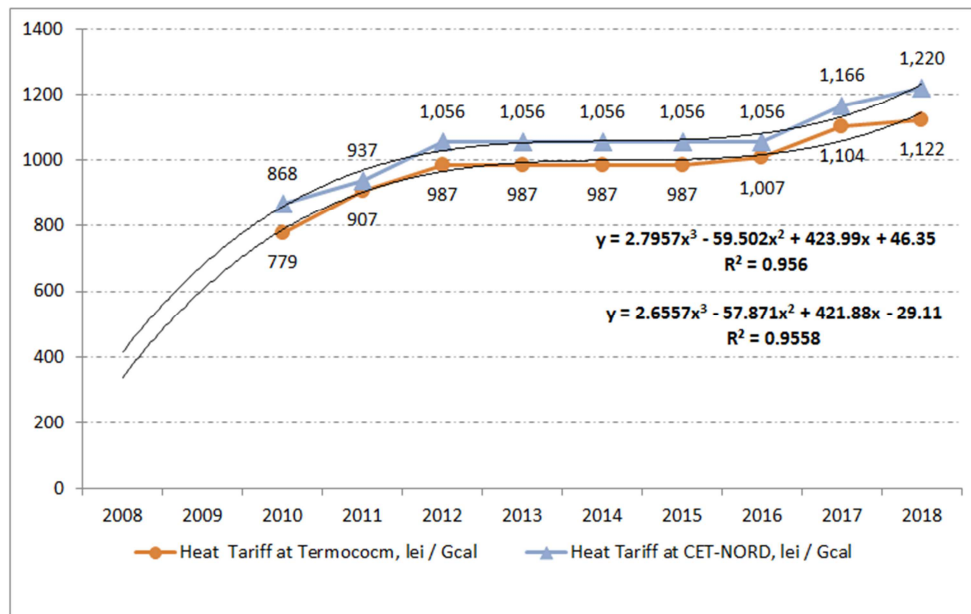


Figure 4. Heat Weighted Average Tariff, lei/Gcal.

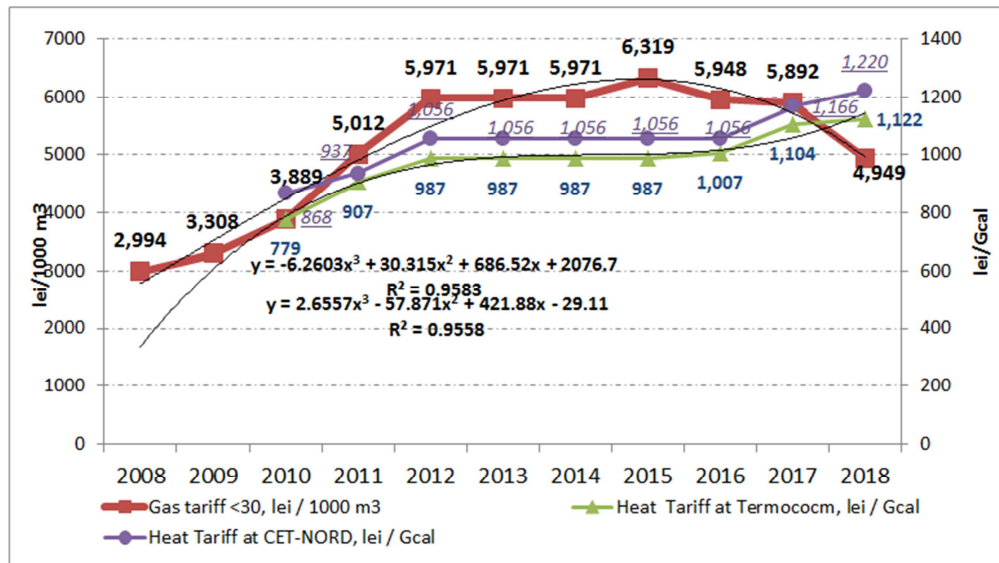


Figure 5. Natural gas Weighted Average Tariff, lei/1000 m³; Heat Weighted Average Tariff, lei/Gcal.

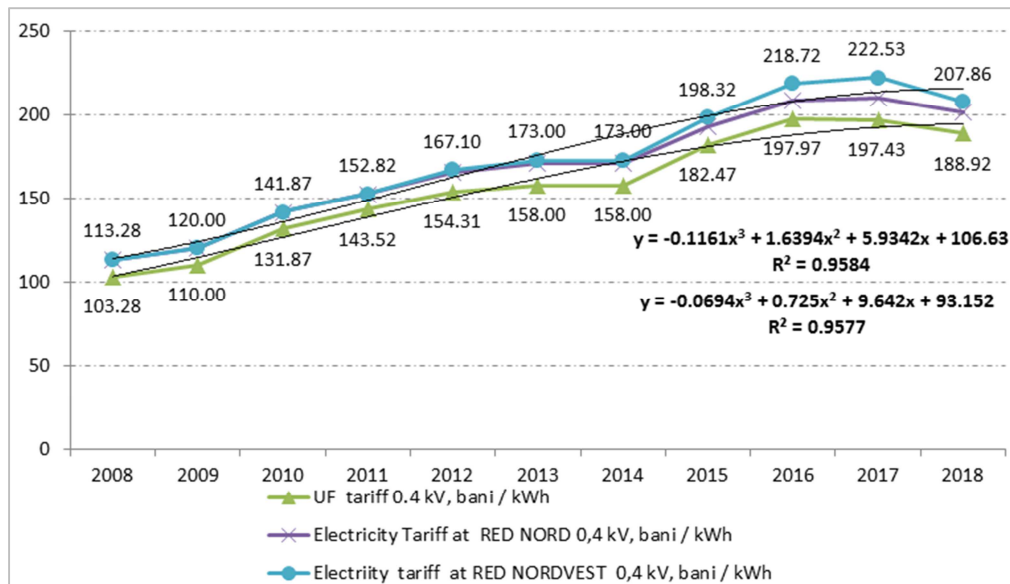


Figure 6. Electricity Weighted Average Tariff, bani/kWh.

The tariffs for natural gas increased from 2009 to 2015 from a value of 3.3 thousand lei / 1000 m³ (in 2009) to 6.3 thousand lei / 1000 m³ in 2015 (Figure 3). In subsequent years (2016-2018), gas tariffs decreased. In 2018, the gas tariff for consumers consuming more than 30 m³ - per month, 4.94 thousand lei / 1000 m³.

Tariffs for thermal energy in the centralized heat supply system during 2009-2017 constantly increased (Figure 4), from 540.8 lei / Gcal (in 2009 [6]) to 1122 lei / Gcal (in 2017) [10-11]. In 2018, the tariff for heat energy did not change. In figure 5, a comparison was made of the dynamics of changes in natural gas tariffs and heat energy tariffs.

In the district heating system, the main fuel for generating heat energy is natural gas. In the cost of thermal energy produced, natural gas accounts for about 80% of the total costs. Analysis of the graphs shown in Figure 5, indicates that the tariff for thermal energy in the period 2016-2018 years.

not coordinated with natural gas tariff. The tariff for natural gas is reduced, and the tariff for heat energy is growing. This already has its negative consequences, both for the central heating system itself (due to the disconnection of a number of consumers and the transition to autonomous heat supply), as well as for the economy and the social sphere in general.

Tariffs for electricity for the period 2009-2017 constantly increased: from 110 ÷ 120 bani / kW · h (in 2009) to 197 ÷ 222 bani / kW · h (in 2017). In 2018, the electricity tariff was reduced to the level of 188.9 ÷ 207.8 bani / kWh.

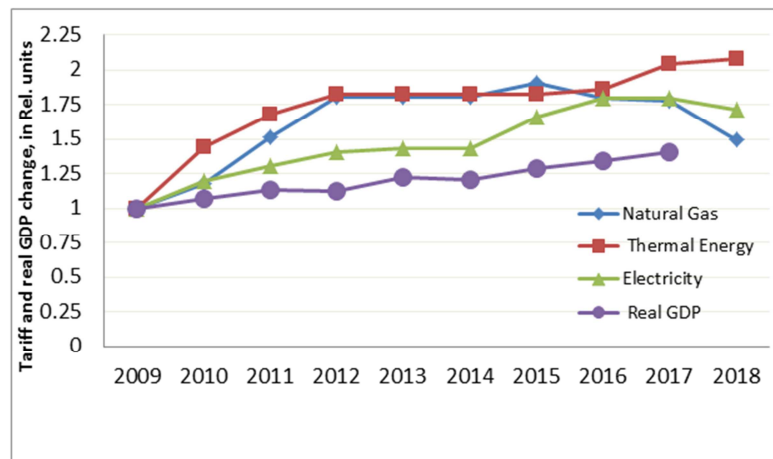
For an objective and visual assessment of the rate of change in tariffs and comparison with the growth rate of real GDP, it is necessary to change the tariffs in relative units for the same period as GDP, i. e. since 2009.

Estimated data of changes in tariffs for the considered resources in relative units are presented in table 3, as well as in figure 7.



**Table 3.** Indicators of changes in weighted average real tariffs for gas, heat and electricity for the period 2009-2018, in relative units in relation to 2009.

Years	Natural gas		Thermal energy		Electricity	
	lei / 1000 m3	rel. units	Lei / Gcal	rel. units	bani / kWh	rel. units
1	2	3	4	5	6	7
2009	3307	1	540	1	110	1
2010	3888	1,175	779,1	1,442	131,8	1,198
2011	5012	1,515	906,6	1,678	143,5	1,304
2012	5571	1,805	987,0	1,827	154,3	1,402
2013	5971	1,805	987,0	1,827	158,0	1,436
2014	5971	1,805	987,0	1,827	158,0	1,436
2015	6319	1,91	987,0	1,827	182,4	1,658
2016	5948	1,798	1007,1	1,865	197,9	1,799
2017	5892	1,781	1104,2	2,044	197,4	1,794
2018	4948	1,496	1122,0	2,077	189,9	1,717

**Figure 7.** Changes in energy tariffs and real GDP growth for the period 2009-2018, in rel. units, in relation to 2009.

In figure 7 comparison of data on changes in energy tariffs and changes in real GDP for the period 2009-2018 in relative units. This whole period is characterized by more accelerated the rate of growth of tariffs for energy compared to the dynamics of growth in real GDP.

Tariffs for the types of energy resources in question increased particularly intensively in the period 2009-2016. With real GDP growth 1.34 times compared to 2009, the increase in tariffs at current prices was compared to 2009:

- for natural gas - 1.79 times;
- for thermal energy - 1.86 times;
- for electricity - 1.79 times.

After 2016, the situation has changed a bit, due to a decrease in the purchase price for natural gas. At the same time, the tariffs for natural gas decreased in 2018 to the level of 4948 lei / 1000 m3 and for electricity up to 188.9 bani / kWh. However, as follows from Figure 7, relative tariff growth data remained higher than real GDP growth. As for heat energy, the tariff for it remained the highest, unchanged.

The analysis shows that the existing methodology for setting tariffs for energy resources does not take into account real processes in the economy and the social sphere. The fact that tariff growth rates are ahead of the dynamics of real GDP growth is a constraining factor on the path of successful economic growth and improvement of social benefits in society.

Below in the article, a method is proposed for calculating permissible levels of tariffs, based on an analysis of the dynamics of changes in real GDP, and taking into account the planned plans for economic development and improvement of the social situation.

#### 4. The Essence of the New Approach to Determining the Permissible Levels of Tariffs

The main idea of the new approach is to ensure that the following conditions are met when determining the maximum allowable tariff levels: tariff growth rates ( $\Delta T$ ) should not be higher than real GDP growth rates ( $\Delta GDP$ ), the adopted GDP growth targets are taken into account and taken into account the average annual consumer price index.

If we designate the current value of the tariff - ( $T_c$ ), then the new admissible value of the tariff ( $T_N$ ) will be determined by the expression:

$$T_N = \frac{T_c}{K} \cdot \Delta T \quad (6)$$

where:  $T_c$  is the current tariff in current prices at the considered moment of time ( $X$ );  $K$  - a coefficient characterizing how much the ratio of the current tariff in

current prices to the base year (for example, 2009) exceeded the growth of real GDP over the same time. In other words, the coefficient (K) characterizes to what extent the "deviation" of the tariff growth at current prices from the real GDP growth has occurred:

$$K = \frac{\Delta T_c}{\Delta GDP} \quad (7)$$

Here:  $\Delta T_c$  is the change in the value of the current tariff in relation to the value of the tariff in the base year, in relative units;  $\Delta GDP$  - change in real GDP relative to the base year, in relative units.

In [6], the ratio ( $T_c / K$ ) is called the calculated (base) tariff, those:

$$T_b = \frac{T_c}{K} \quad (8)$$

Formula (6) in view of (8) will take the following form:

$$T_N = T_b \cdot \Delta T \quad (9)$$

In formula (9), the value ( $\Delta T$ ) is the maximum allowable (allowable from the point of view of sustainable development of the economy) level of tariff increase, determined in relative units at the considered time (X) - (year or month) in relation to the estimated value of the tariff ( $T_b$ ).

The value ( $\Delta T$ ) in case of growth (GDP) will be positive, and in the case of decrease (GDP) - negative.

In the case of growth (GDP) value ( $\Delta T$ ) can be determined by the expression, which will have the following form:

$$\Delta T = \Delta GDP' \cdot \alpha \cdot \frac{1}{I_{pc}} \quad (10)$$

where:  $\Delta GDP'$  is a quantity characterizing the rate of change real (GDP) at the considered time point (X), (year or month), i. e., the index of change in GDP, in relative units.

In the absence of data ( $\Delta BBI$ ) at the considered time (X), its value should be determined by the forecast based on the data of change (GDP) in the previous confidence period of time.

Practice shows that official data of the Bureau of Statistics publishes 1–1.5 years behind. If the decision to change the tariff needs to be taken at the current time, then ( $\Delta GDP'$ ) must be predicted.

For this purpose, it is convenient to use the derivative of the main function of real (GDP) change over years for a certain number of years (for example, over the last  $n = 10$  years, since 2009  $GDP = Y(X_i)$ ,  $i = 1 \div n$  and take for a given time (year or month  $X_i$ ) the first derivative ( $Y'$ ) of this function. This will be the change ( $\Delta GDP'$ ) at a given point in time ( $X_i$ ), that is, the index of change in GDP.

The expression of the function reflecting the trend of real GDP change is shown in Figure 1 as an example. It has the following form for the accepted source data:

$$Y = 0,0003 \cdot X^3 - 0,0048 \cdot X^2 + 0,0737 \cdot X + 0,9342 \quad (11)$$

The first derivative of function (11) will have the form:

$$\Delta GDP'(X) =$$

$$Y' = 0,0003 \cdot 3 \cdot X^2 - 0,0048 \cdot 2 \cdot X + 0,0737 \quad (12)$$

The above formula (10) includes the coefficient (a). It reflects the planned directive of economic development in the form of a planned level of GDP growth.

The coefficient (a) in our case is conveniently expressed as:

$$\alpha = \frac{1}{A} \quad (13)$$

where A is the coefficient of GDP growth ahead of schedule, planned, for example, in the Republic of Moldova until 2020 and established by the Law of the Republic of Moldova No. 166 dated 07/07/2012 "On approval of the National Development Strategy Moldova 2020" [7]. In the baseline scenario, an average annual growth rate of GDP until 2020 is estimated at 4.7%, i. e. in relative units  $A = 1.047$ .

In formula (10), the average annual consumer price index ( $I_{pc}$ ) is also taken into account, which is called the Inflation Rate. Its values are given above in table 1 and in figure 2. This ratio varies in the range of 104 ÷ 109% or 1.04 ÷ 1.09 in rel. units

Expression (9), reflecting the new value of the tariff (maximum allowable, allowable), taking into account (7-10) will take the following form:

$$T_N = \frac{T_c \cdot \Delta GDP'}{K \cdot A \cdot I_{pc}} \quad (14)$$

Where

$T_c$  - the current value of the tariff in monetary units;  $\Delta GDP'$  is the growth index ("increments") of real GDP, in relative units at the considered time point; K - coefficient of "deviation" of the tariff, expressed by the formula (7); A - planned GDP growth rate, in rel. unit;  $I_{pc}$  - the average annual consumer price index, in rel. units

Using this methodology, as well as the above data, further calculations were made of the marginal levels of increase in tariffs for major energy resources.

## 5. The Results of the Calculation of the Maximum Levels of Tariff Increases Using National Accounts Data

The calculation of permissible (allowable) levels of increase in tariffs for the types of energy under consideration was made using the formula (14) for the period of the end of 2018 - the beginning of 2019. The calculation of the maximum levels of the tariff for thermal energy was performed in [6].

For the wholeness of consistency, the results of these calculations are partially recalculated.

According to the above methodology, the calculation of the maximum allowable tariffs for the energy resources under consideration was made in tabular form (Table 4).

**Table 4.** Calculation of the maximum permissible values of tariffs for natural gas, electric and thermal energy, at the beginning of 2019.

№	Estimated values	Units	Natural gas	Electricity	Thermal energy
1	2	3	4	5	6
1.	Current Tariff (Tc):				
	Natural Gas	lei/1000 m <sup>3</sup>	4949	-	-
	Electricity	bani / kWh	-	189,9	-
	Thermal energy	lei / Gcal	-	-	1122
2.	The real GDP growth index (equation (12)): $\Delta BB\Pi'(X) = Y'(X) = 0.0003 \cdot 3 \cdot X^2 - 0.0048 \cdot 2 \cdot X + 0.0737$ at X = 10 (since 2009)	%	6,77	6,77	6,77
		rel. units	1,0677	1,0677	1,0677
3.	Tariff growth in relation to the base (2009) year (tab. 3)	rel. units	1,496	1,717	2,077
4.	Real GDP growth relative to the base (2009), forecast for the beginning of 2019 according to equation (11): $\Delta GDP(X) = Y(X) = 0.0003 \cdot X^3 - 0.0048 \cdot X^2 + 0.0737 \cdot X + 0.9342$ (at X = 10)	rel. units	1,4913	1,4913	1,4913
5.	The coefficient of "deviation" of tariff growth from the growth of real GDP, (K) (P3 / P4)	rel. units	1,066	1,2238	1,48
6.	Planned GDP growth rate, (A)	rel. units	1,047	1,047	1,047
7.	The average annual consumer price index (Ipc), according to the equation in Figure 2 (forecast)	rel. units	1,0772	1,0772	1,0772
	The new value of the maximum allowable tariff (TN) according to the formula (14):				
8.	- natural gas	lei/1000 m <sup>3</sup>	4671,6		
	- electricity	bani/ kWh		156,13	
	- thermal energy	lei/ Gcal			762,85
9.	The necessary reduction in the value of the tariff in relation to the current value (at the beginning of 2019)	%	5,6	17,78	32,0

## 6. Results Analysis

The results show that the current tariffs for energy resources are too high compared to the maximum allowable rates, which are determined based on the analysis of the dynamics of real GDP growth. The growth of tariffs substantially outpaces the growth of real GDP. Such a situation can hardly be considered normal. Similarly to the faster growth of tariffs for energy resources, there is an uncoordinated increase in tariffs for materials and services in the sphere of production, due to other sectors of the economy.

All this is a destabilizing factor constraining the growth of indicators of the economy, in general. This is primarily reflected in the volume of GDP, since tariffs increase the volume of Intermediate Consumption (IC), which is accompanied by a decrease in Gross Value Added (GVA) and, accordingly, GDP. The data in table 4 show that to meet the conditions coordinating the growth of tariffs with the growth of real GDP, tariffs should be lowered at the beginning of 2019:

- for natural gas - by 5.6%;
- for electricity - by 17.7%;
- for heat energy - by 32%.

In the future, in the case of steady growth in real GDP, energy tariffs can be increased accordingly.

Their new level can be calculated by the method described in this article, as well as in [4-6].

## 7. Conclusion

It has been established that tariffs for energy resources, as well as for other types of material resources and services in

the production sector, constitute the bulk of the volume of Intermediate Consumption (IC). It is shown that the higher the volume of Intermediate Consumption (IC), the smaller the volume of Gross Value Added (GVA) and, accordingly, the smaller the volume of Gross Domestic Product (GDP). On the example of indicators of the economy of the Republic of Moldova, using the National Accounts Data, calculations were made of changes in real GDP over the past ten years, from 2009, taken as the base year, to 2018, as well as the forecast for 2019. It was established that the volume of real GDP by 2017 compared with 2009 increased by 1.403 times. For the period of the beginning of 2019, real GDP growth is expected according to the forecast by 1.49 times compared to 2009.

Based on the available data, an analysis of changes in tariffs for the main types of energy resources was performed:

- for natural gas, for electricity and for thermal energy over the last ten years, since 2009.

The calculations used the current weighted average tariffs at current prices. The increase in tariffs by the beginning of 2019 compared to their values in 2009 was:

- to natural gas 1,496 times;
- for electricity - 1.717 times;
- for thermal energy - 2.077 times

In order to equalize the growth rate of tariffs for the type of energy resources under consideration with the growth rate of real GDP, and also to take into account the planned GDP growth rate and the average consumer price index, the following reductions in effective tariffs are necessary:

- for natural gas - by 5.6%;
- for electricity - by 17.7%;
- for heat energy - by 32%.

The proposed method of setting the maximum permissible



tariff levels can be recommended, as universal, in relation not only to energy resources, but also to tariffs for various types of materials and services in the production sector of the country's economy. The method allows to take into account the planned indicators of GDP growth, as well as the average annual consumer price index. In addition, the methodology can be used to coordinate the development of industries of the country or individual regions.

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## Biography



**Vitaly Postolati**, Doctor-habilitat of Technical Sciences, Academician of the Academy of Sciences of Moldova, Head of the Laboratory of Controlled Transmission of the Institute of Power Engineering of the Republic of Moldova. Research interests: large energy systems, system research, controlled flexible compact power transmissions, modern means of regulation, environmental and Energy security, energy economics, electric power, heat and power, renewable energy sources.