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SOCIAL CONFLICT CAUSED BY A GOVERNMENT DECREE – HEATING ENERGY DISTRIBUTION IN BLOCKS OF FLATS

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Abstract: From 2005 to the last years, there was a large-scale call for tender for energy saving in Hungary. This was called "Panel Program". This tender offers the opportunity to the owners of flats in the big cities of our country to modernize the residential buildings, to improve their energy rating. We would like to summarize the method of heating cost sharing and the experiences of the past period in this article.

Keywords*: cost-sharing devices, heating fee, radiator, thermostatic valve*

1. INTRODUCTION

From 2005 to the last years, there was a large-scale call for tender for energy saving in Hungary. This was called "Panel Program". This tender offers the opportunity to the owners of flats in the big cities of our country to modernize the residential buildings, to improve their energy rating, from state and local government non-refundable grants, and by using their own contribution. This tender includes insulation of exterior walls, replacement of windows and modernization of the complete heating system or parts of it. This intervention greatly reduced the heating demand of buildings during the winter. Before the "Panel Program", the heating fee was distributed depending on the volume of each flats, regardless of the geographical orientation of the apartment and its location within the building. There was no other way to control the temperature of the rooms of the flats than opening the windows. The water temperature of the radiators was usually determined so that even in the coldest flats it was still acceptable. In the better-positioned, warmer parts of the building, there has been considerable energy waste for decades because of the frequently open windows.

Modern heating systems have enabled the installation of so-called thermostatic valves on radiators. By using these, the temperature of the radiators and the apartment became controllable, and so-called heating costs-sharing devices were installed on the radiators. These structures – according to the distributor company – will show a dimensionless unit, that is proportional to the heating energy consumed. The numerical values (unit of consumption) represent a proportional distribution to dissipate all the heat charges of the building to every single flat. The gov-

ernment believed that with the introduction of a fair and legally regulated system, all residents would pay as much energy as they consumed. Thus, environmental awareness and energy saving are realized simultaneously.

2. REGULATORY LAWS

The first regulatory government decree did not take into account the fact that the heat demand of each apartment is different due to its location within the building. The law does not take into account that the walls between each apartment are thin and do not contain thermal insulation. For example, in other homes around an empty flat without heating, much more heating is required. The first government decree [157/2005. (VIII. 15.) Government Decree] was published without investigating the adverse financial consequences of the introduction of the Act for certain apartments. Typically, the ground floor apartments had to pay hundreds of thousands of forints at the end of the heating season. People living on the higher floors – who had almost no need to open the thermostatic valve to get the right temperature – got back tens of thousands of forints. A few years later, the number of (legitimate) outbursts has increased to such an extent that 104/2011. (VI. 29.) Government Decree had to make a fairer accounting system. One manifestation of this was the correction table introduced on the basis of the location of each apartment *(Figure 1)*.

The other most important change was that the maximum heat charge for an apartment should in no case exceed 2.5 times the heat charge calculated on the size of the apartment. This solution ensured that, after the settlement period, maximum 80–90 thousand forints should be paid for a flat. However, the Government Decree did not specify how the remaining part should be distributed to the other flats. Distribution is necessary because the heat supplier expects the full heat charge from the block of flats. The latter change was, in our opinion, a very big step towards a fairer distribution, but the differences between the individual homes are still too large. The relationship between the owners who had lived in relatively peaceful has deteriorated, everybody wants to get information about the heating bill of the others, and the envy of the residents has increased.

With over 10 years of experience, we can say that the losers of this current settlement system are really:

- people living in a ground floor apartment
- elderly, sick people, possibly with vascular lesion
- parents with small children who want to have higher temperature in their home.

Based on the aggregate statistics of the past few years, it can be stated that a minority group of flat-owners pays a disproportionately high price for a little extra warmth. In contrast, the majority of owners live comfortably in their warm flats with locked thermostatic valves and get a refund from the heating costs.

Category	Correction in %
1. Correction in ground floor:	
1.1. Ground floor if there is no room below	**–15**
1.2. Ground floor if there is a room below without heating	**–10**
2. Correction of the top floor:	
2.1. building with flat roof, directly under the roof	**–20**
2.2. under not built-in, unheated attic	**–15**
2.3. under built-in, unheated attic	**–10**
3. Correction of corner rooms:	
3.1. any room with at least two outer boundary surfaces (cooling wall surfaces)	**–10**
4. Correction according to direction:	
4.1. north side	**–5**
5. Other corrections:	
5.1. room above unheated corridor and above doorway	**–15**
5.2. room above unheated ground floor	**–10**
5.3. room near unheated staircase or corridor	**–5**

Figure 1. 104/2011. (VI. 29.) Government Decree – correction table

3. CURRENT FORM OF ACCOUNTING

In this chapter we would like to briefly describe how the settlement is done in a block of flats which was renewed with "Panel Program". To do this we have investigated a 10-storey detached house with 55 flats in the Miskolc Avas area. The data described below has been aggregated and included in charts on the basis of our own collection work. The amount of heat consumed by an apartment, and so the heating fee to be paid, consists of two parts *(Figure 2)*. One part comes from the air volume of the apartment, and the other is from the cost-sharing device mounted on the radiator.

According to the Government Decree, the percentage after the airspace may be 30, 40 or 50%. The amount of heat calculated from the value shown by the cost-sharing devices is the remaining 70, 60 or 50%. The government decree entrusted the decision to the owners with which accounting ratio the heat fee would be distributed. The decision was made at the condominium assembly. It is interesting to note that when the settlement system was introduced and the owners had to vote about the percentage distribution system, nobody had any experience about the

consequences of the vote. Since then, it has turned out that for the majority, the 30–70% allocation is favorable for purely financial reasons, while it causes heavy financial burden for the minority. This ratio can be changed at any time by the vote of the condominium assembly, but the minority can hardly enforce its interests against the majority.

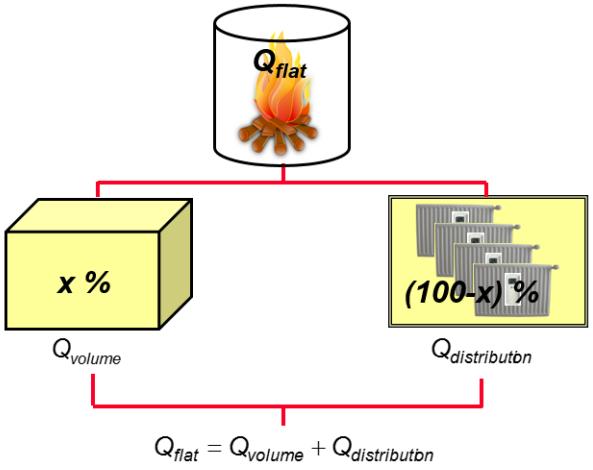

Figure 2. Determining the amount of heat consumed by an apartment

The next step in the calculation is to sum up the values shown by all cost-sharing devices. As a result, we get the total heating unit in the "E_{sum}" *(Figure 3)*.

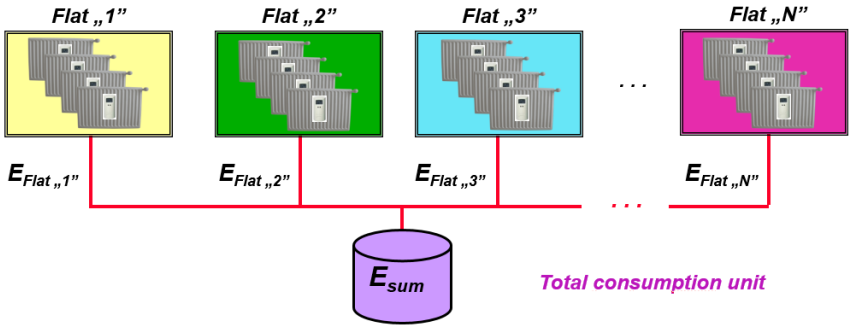

Figure 3. Determining of total consumption unit

At the end of each heating period, the heat supplier company provides information on the total heat consumption of the given block of flats, so it is easy to calculate how many GJ heat energy does one unit represent. From this we can calculate the total calculated theoretical heat consumption of the apartment *(Figure 4)*.

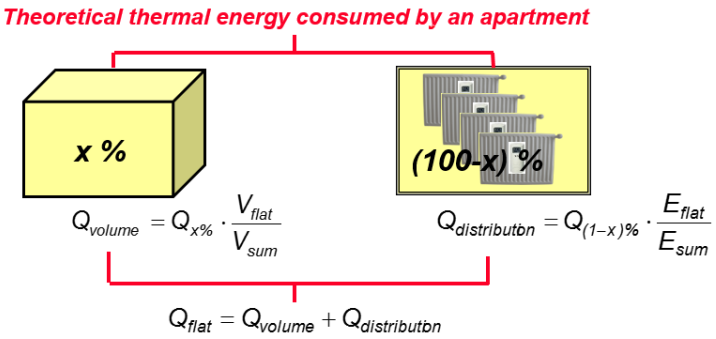

Figure 4. Total calculated theoretical heat consumption of an apartment

The heat supplier company calculates the amount of heat consumed in the so-called "Q_{flat}" expressed in GJ and invoices it to the owners.

4. STATISTICS OF A CONDOMINIUM EQUIPPED WITH COST-SHARING DEVICES

As already mentioned, we have been monitoring the heating data of a ten-storey, 55-apartment condominium located in the Avas area of Miskolc from the beginning to the present. If you look at the figure below *(Figure 5)*, you can make some interesting discoveries.

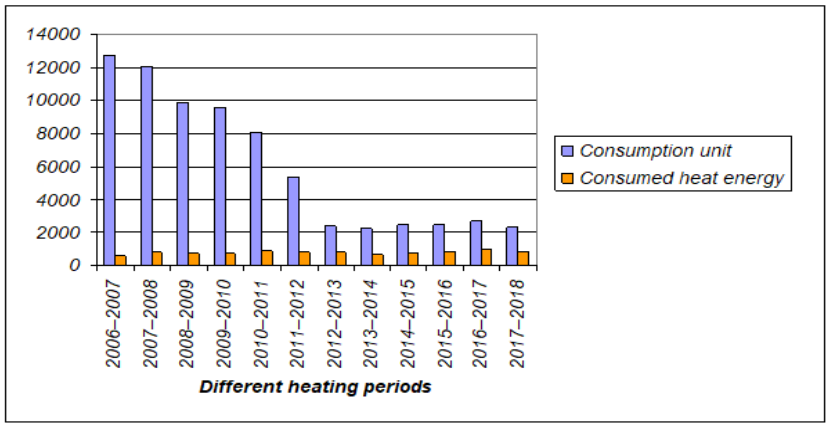

Figure 5. The evolution of the consumption unit and the amount of heat consumed

In the first year of installing the cost-sharing devices and in the following years it can be seen that the residents of the flats heated regularly several times, with the total consumption unit varying between 8–12 thousand. The reason for this is that the radiators were not controllable before, so it took years for the residents to get used to it. The downward trend shows this. For the 2012–2013 heating period, the residential community achieved the environmental awareness that was probably

motivated by the significantly lower heat fee and not by energy savings. In the last 6 heating periods, all consumption units are stagnant, almost constant. We believe that the chart's trend could have been predictable. It is interesting, however, if we represent the total amount of heat consumed for the entire heating period in the same diagram. We would expect that larger consumption unit and the amount of heat consumed would show a similar trend. However, the chart shows that the total amount of heat consumed by the condominium during the 12 years of the study is approximately constant. The relatively small differences can be attributed to different winter temperatures.

However, if the amount of heat consumed and the amount of units visible on the cost-sharing devices do not correlate as it was expected, we can question the whole process of the accounting which is based on the values shown by the cost-sharing devices. According to the diagram, there is no linear relationship between the two quantities.

On the basis of the available data, we will examine how the price of one heating unit has developed in each heating period *(Figure 6)*.

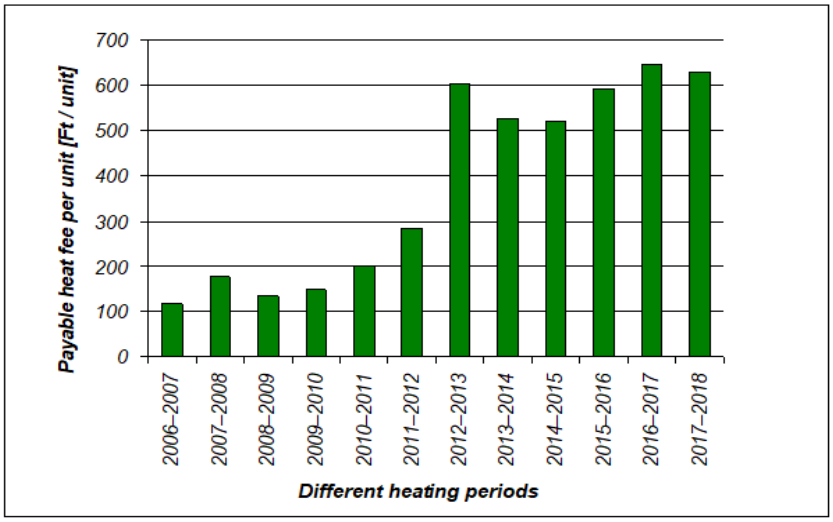

Figure 6. Annual change of the price of one heating unit

The figure shows that while in the first years of installing the cost-share devices one unit had a relatively low cost (120–180 HUF), currently it costs over 600 HUF. Experience has shown that during the winter months, one heating unit is produced in 4–8 heating hours, depending on the radiator temperature. However, the residents living at the higher floors do not need to open the thermostatic valves at all to reach the comfort of 22–23 ºC (heat dissipation of building heating pipes ensures the appropriate temperature). Therefore, the above-mentioned 600 HUF/unit heat charge only affects the owners of less-favored homes, where the temperature of the heating pipe is significantly lower.

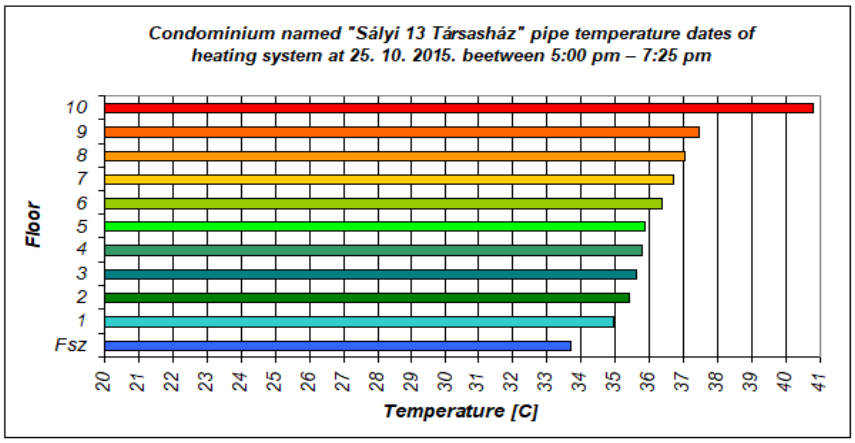

Figure 7. Heating pipe temperature in the investigated condominium

The reduction in pipe temperature from the upper level to the ground floor can be determined by measurement *(Figure 7)*. As shown in the figure, the pipe temperature on the 10th floor was 40.8 ºC at the time of the test, and on the ground floor the pipe temperature was only 33.7 ºC. In addition, the upstairs apartments have a return heating pipeline under the ceiling, which also has a significant heat transfer function. The test was carried out with a suitable non-contact temperature measuring device, because in some of the apartments the pipe was not directly accessible due to the furniture.

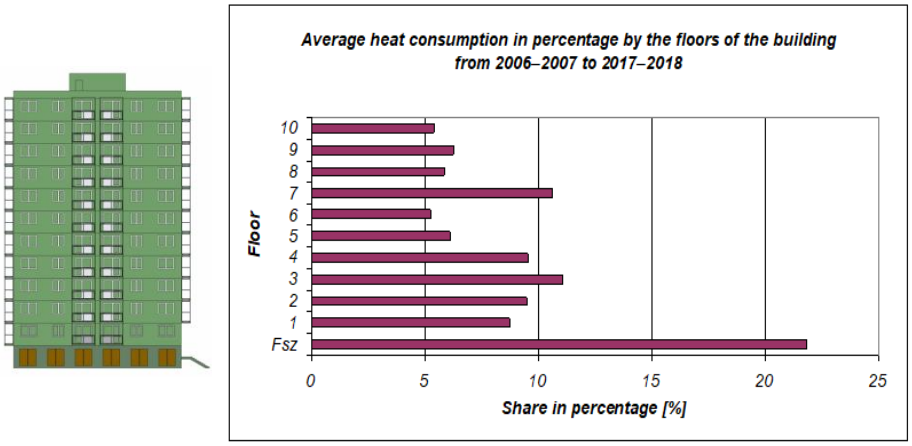

Figure 8. Average heat consumption in percentage by the floors of the building

We have also performed an analysis to show how much the average consumption in percentage has been on each floor over the past 12 years. *Figure 8* clearly demonstrates what we have already established, namely that the current account system is not fair. It can be clearly seen that the average heat demand on the

ground floor is almost four times higher than on the top floor, but it also has more than double heat demand than any other floors. In contrast to this fact, the 104/2011. (VI. 29.) Government Decree provides only a 10% reduction for these owners. This is probably due to the fact that no such summary analysis was made at governmental or national level. We have also investigated other residential buildings with similar results.

5. SUMMARY

In this article, we gave a brief overview of the calculation algorithm of the heating cost-sharing system that is prescribed by the Government Decree for block of flats renewed through "Panel Program". Special attention has been paid to the experience of the past 12 years, showing the serious failures of the system and the unfair accounting, which affects the minority of the residents continuously, even nowadays. Although government decrees have changed, and all of them have improved the situation, but an acceptable state is still not developed.

It would be very necessary to create a commission with expert engineers, which would produce a proven accounting system based on numbers, facts and data. This system would share the heating fee between the owners based on the comfort of the flat rather than the temperature of the radiator.

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REFERENCES

[1] 157/2005. (VIII. 15.) Government Decree on implementing the law XVIII of 2005 (in Hungarian).

[2] 104/2011. (VI. 29.) Government Decree on modifying 157/2005. (VIII. 15.) Government Decree (in Hungarian).

[3] 559/2013. (XII. 31.) Government Decree modifying the Government Decrees related to mining and district heating (in Hungarian).