

Lis Piotr

ENERGY USE FOR HEATING AS A HOUSING SELECTION CRITERION

For the last several years, a rapid decrease in the number of housing units commissioned in Poland may be observed. The main reason behind this situation is shortage of financial resources and available housing credits. Modest incomes of the majority of Polish families result in increasing numbers of families possessing housing units, yet not making payments for costs of maintenance thereof, in which heating costs constitute about 70%. It is due to these facts that a buyer of a product, which housing units have now become, more and more often tends to take into account, while making a decision, also the rate of housing units maintenance payments to be made over the period of dozens of years.

ENERGY CONSUMPTION USED TO HEAT HOUSING UNITS IN THE MUNICIPAL HOUSEHOLD SECTOR

When analyzing the above issue, one should distinguish between two qualitatively different cases, i.e. buildings erected prior to year 1991, when building thermal isolation requirements were introduced by force of Polish Standard PN-91/B-02020 on one hand, and buildings erected in conformity to requirements as mentioned in the said Standard, on the other. Unfortunately, the latter group, as results from an analysis of GUS (Chief Office of Statistics) data, comprises merely about 2.5% of all Polish housing resources. The remaining 97.5% of housing units are located in buildings exhibiting an increased heating level demand, influenced, inter alia, by: heat losses and excessive water losses in heating networks, as well as inappropriate operation of central heating installations. All these factors contribute to increased energy consumption levels in the municipal households sector, and high costs of housing heating. As early as in mid-eighties, the municipal households sector's share in the national primary energy consumption was about 40%, which was equal to 53.1 mln MT of theoretical standard fuel (t. s. f.). Out of this quantity of energy consumed, as much as 71% was absorbed by heating and ventilation of housing units (60%), and public-utility buildings (11%), which is depicted in Table 1:

Table 1 – Municipal household sector's energy consumption structure [4,5]

Consumption	Municipal household sector's energy consumption structure in the eighties.	
	mln MT of theoretical standard fuel (t. s. f.)	% of total consumption
Total consumption	53,1	100
Heating and ventilation	37,7	71
Preparation of hot usable water	6,9	13
Preparation of meals	4,8	9
Lights and electrical facilities	3,7	7

The above facts find their reflection also in values of heat demand factor E, which for most Polish housing units are within the range of 235-310 kWh / (m²a) (Table 2). For the sake of comparison, the value of E factor is lower by about 25% in France, and by about 46% in Denmark (Table 2), taking into account different weather conditions. In Poland, only the users of housing units erected in conformance to the 1991 heat standard requirements, and "Building Technical Requirements" of 1995, or users of buildings that were subjected to thorough thermal renovation, would have a chance to reach similar heat / energy parameters of their housing units. What should be pointed out now is that in Poland, within the group of potential buyers of housing units, quite restricted for financial / crediting reasons, over the half decides to purchase apartments in several or several dozen years old buildings, rather than in new ones.

Over the last several years, a rapid increase in housing heating costs may be observed. The main reason behind this growing tendency is an increase in prices of heat-carrying agents, which, as per GUS (Chief Office of Statistics) data, within the years 1996 - 2002, rose in real terms by: electricity about 2 times, natural gas about 2 times. Price changes of the basic heat-carrying agents are illustrated in Table 3.

The said price increase has been brought about by two main factors. The first one is inflation, and relative of it periodical updating of prices to bring them to more realistic levels, as well as the state's gradual

withdrawal from subsidizing coal-mining industry and municipal households management, which absorbed about 20% and 30% respectively of the total state budget allocated subsidies. The other reason behind this significant rise in heat-carrying agents prices is a change in their mutual price relations, as well as relations towards other products, as for many years they used to be inappropriate. Attention should be also drawn to the fact that along with price rise of heat-carrying agents, these prices relation to average monthly salary level kept changing as well.

Table 2 – Energy consumption for heating of buildings in Poland and others countries

[Our own data based on [1,4,5]]

Years of building	Index of energy consumption for heating, kWh/(m ² a)
until 1966 in Poland	240 – 350
1967 – 1985 in Poland	240 – 280
1986 – 1992 in Poland	160 – 200
1993 – 1997 in Poland	120 – 160
since 1998 in Poland	90 - 120
average in Poland	280
average in France	212
average in Germany	180
average in Switherland	170
average in Denmark	150
current standards in Germany	40 – 80
current standards in Sweden	30 - 60

Table 3 – Price increase of basic heat-carrying agents in 2002 compared to 1996

[Our own data based on [2,3]]

Heat-carrying agent	Price of 1996, zł/GJ	Price of 2002, zł/GJ	Price relation of 2002 & 1996, (zł/GJ)/(zł/GJ)
Hard coal (fine coal)	17,44	20,25	1,16
Domestic coke	21,00	25,20	1,20
Fuel oil, light	36,11	45,24	1,25
Natural gas	19,44	33,17	1,71
Network heat (fuel: hard coal)	27,78	30,74	1,11
Electrical energy (night tariff)	25,83	55,56	2,15
Electrical energy (days tariff)	53,61	99,82	1,86

According to GUS data, 1985 average monthly salary was equal in amount to payment for about 5,460 m³ of natural gas, or for central heating of about 3,470 m² of housing area (when accounted for in m²). The following years proportions for gas and central heating respectively were as follows: 1989 - 5,090 m³ and 2,909 m², 2004 - 1724 m³ and 816 m². An overall analysis of the above values allows to assert that price increase of these two heat-carrying agents was higher than rise of average monthly salary for the same period. Similar phenomenon occurred with varied intensity in case of other basic heat-carrying agents.

This is the direct reason for an increase of the share of housing expenses in family budgets, for which rising costs of heating are chiefly responsible. This assertion is fully justifiable, as heating costs constitute about 70% of the whole housing rent at the moment. These expenses have today reached the rate of 20 - 30% of income for about one third of families in Poland, and one should expect their further increase brought about by an attempt to gradually reach the level of housing expenses in EEC countries, where they constitute about 30% of family income. Poland should achieve or achieved the "world" level of heat-carrying agents prices. This signifies the further increase of heating costs of housing units and public utility buildings. This thesis finds confirmation in the comparison of basic heat-carrying agents prices in Poland and EEC countries, as depicted in Table 4. Bearing in mind a significant share of heating costs in housing rents, one can point out that living in a well heat-isolated apartment equipped with a state-of-the-art heating system with gauging allows its user to achieve substantial savings. Such a housing unit is also more available in terms of its maintenance cost for a wider circle of potential buyers, though its price might be higher due to the use of

energy-saving material and construction solutions. This price difference should be retrieved within several years of the housing unit's usage.

Thus, the level of demand for housing heating, and arising from it in connection with heat consumption gauging, cost of heating should shortly become maybe the decisive criterion of selection and purchase of a housing unit. A clear indication of such information may be the value of E factor expressed in kWh per one square metre of heated area, which, together with data upon the manner of heating costs accounting, allows to evaluate heating costs and confront them with our financial possibilities.

Table 4 – Prices of heat-carrying agents used to heat housing areas in EEC, as mean weighted prices in the following countries: France, Italy, Belgium, the Netherlands, United Kingdom, Germany, and prices in Poland as of 2002 [Our own data based on [2,3]]

Heat-carrying agent	Price in Poland, \$/MJ	Mean-weighted of price if six countries of Western Europe, \$/MJ	Price relation: Price in Poland / Mean-weighted of price of six countries of Western Europe, \$/MJ/\$/MJ
Hard coal (fine coal)	5,33	11,11	0,48
Fuel oil, light	11,90	12,11	0,98
Natural gas	8,73	10,57	0,83
Electrical energy	26,27	37,08	0,71

With ever more often arising, at purchase of a housing unit, necessity to answer the question if we can afford to incur costs connected with its maintenance, it seems natural for a growing circle of people to search for a potential to reduce rent levels, including those connected with heating, which constitute as much as about 70% of the total housing maintenance cost. This aim may be most easily achieved by purchasing housing units situated in new buildings, or those in existing ones, provided certain most fundamental data upon heating systems and heat loss levels of the latter are known. In this case, having a simple tool of a building's heat-energy evaluation, it is possible to make a proper selection of a housing unit equipped with energy-saving external partitions and energy-saving heating system with heat consumption gauging. Certainly the building's or apartment's E factor mentioned above may be such a tool. By widespreading knowledge upon low heat demand building and, from this viewpoint, the desired E factor value among the public, housing units buyers are provided with a simple decision criterion. Of course, in order to facilitate the applicability of the said criterion it is also necessary to promote the manner of E factor calculation for buildings being designed and existing, through introduction of appropriate formal, legal and standard requirements. Bringing about the situation whereby every house would have its E factor calculated may also influence the process of real estate market shaping, due to differentiation of houses and housing units prices. This will be made possible by a group of potential buyers tending to spend more money to purchase e.g. an apartment in a warmed-up house equipped with state-of-the-art, gauged heat supply system, which will directly influence the rate of heating costs to be incurred later on. One of intermediary stages on the way to achieve the above objective may be amalgamation, by real estate agents, of data against which it would be possible to make an indirect evaluation of a building's heat-energy parameters, i.e.: thermal isolation of external partitions (including windows), heating system's effectiveness, existing heat consumption gauging, and connected with it financial burdens on its future users.

Unfortunately, as follows from the analysis of such data availability carried out for nine out of eleven real estate agencies to be found in Czestochowa, only about 40% of real estate agents could offer this type of information. Based on Table 5, one may assert that possibilities of potential housing units buyers to acquire information directly or indirectly connected with real estate maintenance are to a large extent limited.

It was further discovered that the price of one square metre of housing usable area was significantly influenced only by its finishing quality, and location in particular quarters of the city, i.e. features that exert no impact on e.g. housing heat demand. Among the nine agencies analyzed, all of them offered information upon the estates finishing quality, whereas only two possessed comprehensive information on whether the buildings had appropriate thermal isolation or heat consumption gauging systems, which could significantly influence the rates of heating expenses, and bring substantial savings over the period of a housing unit's maintenance. One should hope, however, that along with increase in heating expenses, to which we are doomed as per the explanations above, the said features of buildings will be taken into account by its future users to a greater degree than so far; and that advantages of general information on the housing heat-energy condition incorporated in the E factor will be duly acknowledged by all participants in the real estate market.

Table 5 – Availability of the selected data on houses and apartments offered by real estate agencies, taking into specific account issues connected with housing heating and heat losses

Type of data on house (apartment)	Did real estate agency offer particular data on house (apartment)? (yes 1, no 0)										
	Real estate agencies in Czestochowa									Agencies offering part. data	
	I	II	III	IV	V	VI	VII	VIII	IX	Yes (1)	No (0)
1. No. of floors	1	1	1	1	1	1	1	1	1	9	0
2. Maintenance period	1	1	1	1	0	0	0	0	0	4	5
3. Building materials used	1	0	1	1	0	1	1	0	0	5	4
4. Orientation of windows	1	0	1	1	0	1	0	0	0	4	5
5. Type of windows	1	0	1	1	0	0	0	0	0	3	6
6. Replacement of windows	1	0	1	1	0	1	1	0	1	6	3
7. Building's heat isolation	1	0	0	1	0	0	0	0	0	2	7
8. Heating system	1	0	1	1	0	1	1	0	1	6	3
9. Heating system's rehab	0	1	0	1	0	0	1	0	0	3	6
10. Heat gauges	1	1	0	1	0	0	1	0	0	4	5
11. Cost dividers	1	1	0	1	0	0	1	0	0	4	5
12. Source of usable hot water	1	1	0	1	0	0	1	0	0	4	5
13. Water consumpt gauges	0	1	1	1	0	1	0	0	0	4	5
14. Maintenance fees, rents	0	1	0	1	0	1	0	0	0	3	6
15. Utility standard	1	1	1	1	1	1	1	1	1	9	0
TOTAL (-)	3	6	6	0	13	7	6	13	11	—	—
TOTAL (+)	12	9	9	15	2	8	9	2	4	—	—
TOTAL										70	65
TOTAL (without items 1 and 15)										52	65

SUMMARY

Increasing costs of housing heating, and the state's withdrawal from subsidizing heat-carrying agents and municipal household management, result in increasing expenses connected with maintenance of a housing unit. This, coupled with low income of an average Polish family, will cause increasing numbers of persons capable of significant financial efforts associated with purchasing a housing unit to face the problem to confront their income with maintenance costs of such a housing unit. By choosing an apartment in a low heat demand building, and equipped with a heat consumption gauging system, an average Pole will be able to largely reduce costs incurred on account of its heating. Introduction of the E value to information packages on houses and apartments offered by real estate agencies, and appropriate promotion of knowledge in this respect, would supply potential buyers with an important decision-making criterion as to predominating influence upon the subsequent maintenance costs of a housing unit purchased, which may be decisive in the selection itself.

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