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WHITE CERTIFICATES – LEGAL, TECHNICAL AND ECONOMIC ASPECTS

BIAŁE CERTYFIKATY – UWARUNKOWANIA PRAWNE, TECHNICZNE I EKONOMICZNE

A b s t r a c t

The present article describes the basic legal, technical, and economic aspects of the functioning of the White Certificate Scheme in Poland. A method of performing the energy audit process (a basic element of the tender procedure) in a simplified way is presented. Essential conditions which guarantee participating in tender procedures as a necessary condition for getting bonuses for the implementation of investments resulting in reducing the primary energy consumption are also listed in this paper.

Keywords: *White Certificates*, *energy audit*, *invitations to tender*

S t r e s z c z e n i e

W artykule zamieszczono podstawowe uwarunkowania prawne, techniczne i ekonomiczne funkcjonowania BC w Polsce. Przedstawiono sposób sporządzenia audytu efektywności energetycznej (podstawowego elementu w procedurze przetargowej), wykonanego w sposób „uproszczony". Zwrócono również uwagę na istotne warunki gwarantujące przystąpienie do przetargu jako niezbędnego działania do uzyskania premii za realizację inwestycji generujących efekt w postaci zmniejszenia zużycia energii pierwotnej.

Słowa kluczowe: *Białe certyfikaty*, *audyt efektywności energetycznej*, *przetargi*

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1. Introduction

The Directive of the European Parliament and of the Council 2012/27/EU of 25 October 2012 on energy efficiency (amending Directives 2009/125/EC and 2010/30/EU and repealing Directives of 2004/8/EC and 2006/32/EC) obliges the European Union Member States to develop National Energy Efficiency Action Plans every three years [1]. In order to meet these requirements, Poland created its first National Energy Efficiency Action Plan (1st NEEAP). The purpose of the first NEEAP was to save final energy in an amount which is equivalent to **no less than 9%** of the annual average amount of the final energy consumption from the period 2001–2005 (i.e. 53 452 GWh) by the year 2016. The subsequent second National Energy Efficiency Action Plan (2nd NEEAP) was adopted by the Polish government in April 2012. In the 2nd NEEAP, the effectualness of applying the energy efficiency means suggested in the 1st NEEAP, i.e. in the period 2008–2009, and of the forecast energy savings by the year 2016, was analysed.

As the results of these analyses and computations conducted by experts showed, the energy savings in the years 2008-2009, mainly resulting from a 'motivating' increase in energy prices, proved to be unsatisfactory (the energy prices in Poland have increased threefold during the last few years and they are currently among the highest prices in Europe, but this fact has not caused any noticeable reduction in energy consumption). This situation leads to the conclusion that it would not be very possible to achieve an increase in energy efficiency exceeding **1%** per year (according to the EU recommendations) in subsequent years. To meet these requirements, it was assumed in the 2nd Polish National Energy Efficiency Action Plan that the amount of energy saved in Poland in 2016 should be equal to 4.5 Mtoe (million tonnes of oil equivalent).

To that end, the following 4 main mechanisms of action were suggested:

- projects concerning energy efficiency, financed by the National Fund of Environmental Protection and Water Management (NFEP&WM) (0.7 Mtoe),
- the Thermomodernisation and Repairs Fund (0.7 Mtoe),
- information campaigns and the so-called 'soft' actions (0.9 Mtoe),
- White Certificates (2.2 Mtoe).

It has to be emphasised that almost a half of the planned 4.5 Mtoe of energy savings, i.e. 2.2 Mtoe, should come from the White Certificate Scheme.

2. White Certificate Scheme in Poland

White Certificates are documents certifying energy efficiency, which can be obtained for implementing measures aiming at increasing the energy efficiency of buildings. The White Certificate Scheme (WCS) has been functioning in the European Union for over 10 years now, e.g. since 2001 in Italy, since 2002 in Great Britain, and since 2006 in France.

In Poland, the WCS was implemented pursuant to the Act on energy efficiency of 15.04.2011. The Act imposes an obligation to obtain White Certificates and submit them for redemption to the President of the Energy Regulatory Office (ERO) on the following groups of entities:

– energy sector companies which sell energy to final users,
– final users connected to the power grid within the territory of the Republic of Poland, who are trading members as provided for in Art. 2 (5) of the Act of 26.10.2000 on commodity exchanges,
– commodity brokerage houses which enter into transactions commissioned by final users connected to the power grid within the territory of the Republic of Poland.

The introduced White Certificate Scheme assumes generating measurable energy savings in three areas:
– by final users,
– in own equipment,
– reducing power, heat, and natural gas loss during their transmission and distribution.

Invitations to tender for White Certificates are issued by the ERO President in the above three areas (categories) of undertakings aiming at improving energy efficiency. The tender procedures adopted for the White Certificate Scheme are aimed at stimulating energy-efficient behaviour in the form of selecting projects including the most effective solutions, i.e. solutions **which ensure the highest energy savings at the lowest level of direct support**. The ERO President is authorised to issue and redeem the Certificates. Property rights resulting from White Certificates are transferable and constitute goods traded on the power exchange.

The first invitation to tender for WCs in Poland was issued on 31.12.2012, and the winning tender was selected as late as on 13.09.2013. Approximately 100 tenderers submitted 212 tenders (it was possible for one bidder to submit more than 1 certificate). Unfortunately, as many as 107 out of the 212 certificates submitted for the tender were rejected because they contained mistakes. The basis for rejecting all these 107 offers was Section 10 (3) (1) of the Regulation on tender offers, which says, 'the offer does not include an appropriately filled in tender declaration or energy audit form'.

The second invitation to tender was announced on 27.12.2013, with one month for potential contractors to submit their proposals, i.e. until 27.01.2014. Certain amounts of energy efficiency certificate values were allocated to each of the 3 categories of undertakings, and acceptance percentages (ts) were established. For the 1st invitation to tender, this percentage amounted to $t = 0.5$, and for the 2nd invitation to tender $t = 0.4$. It needs to be emphasised that the acceptance percentages adopted in both of these invitations to tender were very low (0.5 and 0.4, respectively). The Certificate values for the particular categories, as determined by the ERO President, are listed in Table 3 in Section 3 of this article.

The certification process was previously applied in Poland in the fields of renewable energy (the so-called green certificates) and of generating combined heat and power (the so-called red certificates).

2.1. Conditions and procedures

It is possible to obtain a White Certificate for a pro-efficiency project which has already been implemented (but which was not completed prior to 1 January 2011) or for a project which is planned to be implemented, provided that the amount of energy saved as a result of such project is not less than **10 tonnes** of oil equivalent (toe) per year. A White Certificate can also be issued collectively for multiple projects of the same kind, for which the total

amount of energy saved exceeds 10 toe (10 tonnes of oil equivalent correspond to the energy produced by the combustion of e.g. 15.6 tonnes of hard coal or 11800 litres of fuel oil).

Conditions for obtaining a **White Certificate**:

a) an energy efficiency audit including the suggested technical solutions must be carried out for a selected pro-efficiency project,
b) the optimal solution in terms of technical and economic aspects must be selected,
c) an offer must be submitted as a response to an invitation to tender,
d) after an energy performance certificate is received, the pro-efficiency project has to be implemented according to the guidelines from the preliminary audit. After the modernisation works have been completed, an energy efficiency audit confirming the declared energy savings (the confirming audit is performed for the declared energy savings exceeding 100 toe as the annual average value) must be conducted,
e) after the confirming audit is conducted (or, if it is not required, after the modernisation is finished), the entity which received the certificate must notify the ERO President within the statutory period of completing the undertaking. This constitutes the grounds for conferring the property rights arising from the certificate.

These rights constitute goods traded on the power exchange and are transferable. In practice, it means obtaining funds which will improve the economic indicators of the implemented pro-efficiency project. Pursuant to the Act on energy efficiency, entities which are obliged to receive White Certificates and which do not receive them and do not submit them for redemption, shall pay a substitution or penalty fee whose amount is determined by the said Act (PLN 1000/toe, 1 toe = 11.63 MWh) [2, 4].

2.2. Probability of obtaining White Certificates

In order for an offer to win an invitation to tender, the value of the energy performance coefficient must be between ω_{av} and ω_{max}. Certificates are issued to entities which successfully undergo tender procedures, that is, are classified within the following range:

$$t \cdot \omega_{av} \quad \text{and} \quad \omega_{\max} \tag{1}$$

where:

t – the acceptance percentage announced by the ERO President,
ω_{av} – the average energy performance value – the average value of all the undertakings aiming at improving the energy efficiency, declared in a given tender
ω_{max} – the highest value of energy performance declared in a given tender.

The energy performance is the relationship between the amount of energy saved on average per year as a result of the implementation of an energy efficiency improvement project (or energy efficiency improvement projects) and the value of the energy savings certificate. The ω_{av} and ω_{max} values are determined by the market [8].

While selecting the winning tender, the tender committee chooses tenders in which the declared energy performance is within the range of between $t \cdot \omega_{av}$ and ω_{max} for each category of undertakings. Table 1 presents an example of the results of a small invitation to tender and the criteria (values) which were taken into consideration when accepting and rejecting tenders.

It is assumed that 10 entities applying for certificates whose values ranged from several to a dozen tonnes of oil equivalent took part in the invitation to tender. The maximum value declared by one of the tenderers amounted to $\omega_{max} = 3.5$, the weighed average was $\omega_{av} = 2.68$, the total amount of toe to be awarded was 160, and the acceptance percentage for the tenders was 0.9.

Table 1

Results of invitation to tender

Tenderer	Energy performance value (ω)	$t \cdot \omega_{av}$	selected offers [condition]	Entities receiving WCs	Aspects
1	3.50	2.41	within the range of between $t \cdot \omega_{av}$ and ω_{max} $0.9 \cdot 2.68 = 2.41$; $\omega_{max} = 3.5$	1	Total of 160 toe
2	3.40	2.41		2	
3	3.12	2.41		3	
4	3.00	2.41		4	
5	2.95	2.41		5	
6*	2.8	2.41		6	There were not enough WCs allocated by the ERO
7*	2.47	2.41		7	
8	2.1	2.41	Not qualified for the invitation to tender	8	Not in the range of 2.41–3.50
9	1.9	2.41		9	
10	1.6	2.41		10	

* There were 'not enough' White Certificates allocated for the given tender for the tenderers No. 6 and 7, despite the fact that their declared energy performance was within the range required by the applicable law. If this happens, these entities can offer the same undertakings in other invitations for tender, and they are not (as for now) obliged to implement the undertaking described in their tenders.

3. Energy audit

The most important part of a tender declaration in an invitation to tender for WCs is an energy audit including an energy consumption profile, information on the technical condition of a structure (or of a device or system), and a list of undertakings aimed at the improvement of its energy efficiency. Evaluating the economic feasibility and the possible energy savings is also important here.

Any pro-efficiency project implemented under any energy efficiency obligation scheme must be **appropriately documented** (in the form of an energy audit).

A detailed description of the procedure for preparing energy audits is provided in the Regulation of the Minister of Economy of the Republic of Poland of 10.08.2012 [3]. Pursuant to the Regulation, audits can be carried out using one of the following two methods:

– the balance method,
– the simplified method.

Simplified audits are conducted for **small projects**, while **balance audits** (calculations taking into account engineering estimates and the scale of the project under concern) are performed for more complex projects.

A list of undertakings aimed at energy efficiency improvement, for which simplified audits can be carried out, is provided in Appendix 1 to the Regulation [6]. These undertakings mainly concern adding thermal insulation to building envelopes, woodwork and joinery, modernisation of light fixtures or light sources, and replacement of household appliances (washing machines, refrigerators, etc.).

Energy audits with the use of the balance method include performing a full energy balance of the building (or technical device or system) under the given project. The scope of a balance audit is very much wider. In this type of audit, data and different methods concerning determining the amount of energy saved are used. This requires applying the documented method of engineering calculations, often described in other documents.

Apart from in-depth engineering analyses, balance audits of this type require measurements to be performed, and the results of the measurements need to be analysed with the use of specialist equipment as well as measuring and research methods in most cases [6, 8].

3.1. Determining amount of final energy saved as a result of introducing means aiming at energy efficiency improvement – simplified audit of energy efficiency

Determining the amount of final energy saved as a result of introducing means aiming at the energy efficiency improvement is the main purpose of the performed audit of final energy, thus checking whether the scope of the thermomodernization works is sufficient for applying for White Certificates. An example of calculating how much final energy was saved for heating purposes (as a result of thermomodernization works aimed at the energy efficiency improvement) in the case of a residential building, using the simplified method, is presented below.

3.1.1. General details concerning the building under study

The building under study is a 3-storey multi-family residential building located in the Podlaskie Voivodship, with the basement built with the use of the traditional method, with a total usable area of 1728 m^2, and a volume of 5184 m^3. The exterior walls of the building are made from cellular brick of 38 cm thickness, U = = 1.28 $W/(m^2 \cdot K)$, the roof is a full flat roof, U = 1.64 $W/(m^2 \cdot K)$. For the ceiling above the unheated basement (Ackerman), U = 2.45 $W/(m^2 \cdot K)$ and for the double-glazed window frames U = 2.6 $W/(m^2 \cdot K)$.

In the building described above, the following thermomodernization works were conducted: the exterior walls; the flat roof; the ceiling above the unheated basement was thermally insulated; the windows were replaced with new ones. The total area of the insulated exterior walls was 980 m^2, the area of the insulated flat roof was 576 m^2, and the total surface of the replaced windows amounted to 190 m^2. The average temperature of heated rooms was 19°C (including the staircase). The heating system of the building obtains hot water from a heat transfer station of a municipal heat distribution network.

The results of the calculations are listed in Table 2.

3.1.2. Calculations

The savings resulting from insulating the exterior walls and the flat roof were calculated from the following formula (2)

$$\Delta Q_o = \frac{0.3356 \cdot k_1 \cdot k_2 \cdot k_3 \cdot A_p \left(U_o - \dfrac{1}{\dfrac{1}{U_o} + \dfrac{d}{\lambda}} \right)}{\eta_i} \tag{2}$$

where:

- ΔQ_o – amount of final energy saved [GJ/year],
- k_1 – climate zone coefficient,
- k_2 – correction factor depending on the average value of the temperature in the heated room,
- k_3 – reducing factor due to the correction of the actual climatic conditions $k_3 = 0.90$,
- A_p – area of the insulated wall [m^2],
- U_o – heat transfer coefficient for the barrier [W/(m^2·K)],
- d – thickness of the insulation layer [m],
- λ – thermal conductivity of the insulating material [W/(m·K)],
- η_i – total efficiency of the heating system.

It is also possible to use the formula (2) to compute the savings resulting from insulating the basement ceiling; however, the value of 0.3356 has to be replaced with 0.1426 [3].

Savings on account of the window replacement were set from the formula (3)

$$\Delta Q_o = \frac{0.3356 \cdot k_1 \cdot k_2 \cdot k_3 \cdot A_{ok} [0.336(U_{0ok} - U_{1ok}) + 0.57]}{\eta_i} \tag{3}$$

where:

- A_{ok} – surface of the replaced windows [m^2],
- U_{0ok} – heat transfer coefficient for the windows before the exchange [W/(m^2·K)],
- U_{1ok} – heat transfer coefficient for the windows after the exchange [W/(m^2·K)].

The other symbols are the same as in the formula (2).

The calculation results.

The energy savings brought about by insulating the exterior walls with a 15 cm thick layer of extruded polystyrene foam:

ΔQ_o = [0.3356 · 1.124 · 0.942 · 0.9 · 890 · (1.28 – 1/(0.78 + 3.75))] : 0.9 = 333.18 GJ/year

The energy savings caused by insulating the flat roof with a 20 cm thick layer of extruded polyurethane foam:

ΔQ_o = [0.3356 · 1.124 · 0.942 · 0.9 · 576 · (1.64 – 1/(0.61 + 5.555))] : 0.9 = 336.12 GJ/year

The energy savings as a result of replacing the windows with windows for which U = 1.5 W/(m^2 · K):

$$\Delta Q_o = [0.3356 \cdot 1.124 \cdot 0.942 \cdot 0.9 \cdot 190 \cdot (0.336\,(2.6 - 1.5) + 0.57)]: 0.9 = 189.67 \text{ GJ/year}$$

The energy savings resulting from insulating the basement ceiling with an 8 cm thick layer of extruded polystyrene foam:

$$\Delta Q_o = [0.1426 \cdot 1.124 \cdot 0.942 \cdot 0.9 \cdot 576 \cdot (2.45 - 1/(0.408 + 2.0))] : 0.9 = 177.41 \text{ GJ/year}$$

Table 2

Amounts of energy saved as a result of conducted thermomodernization works

Thermomodernization works	Area [m²]	U coefficient [W/(m² · K)]		Demand reduction (ΔQ_o)	
		before thermo-modernization	after thermo-modernization	GJ/year	toe
Wall insulation	890	1.28	0.220	333.18	7.958
Flat roof insulation	576	1.64	0.162	336.12	8.028
Insulation of ceiling above unheated basement	576	2.45	0.415	177.41	4.230
Window replacement	190	2.60	1.5	189.67	4.530
Total				1036.38	23.746*

* They constitute a group of works of the same kind, for which the total savings resulting from the implementation of thermomodernization works exceeded the amount of 10 toe, and are therefore the basis for applying for White Certificates.

4. Recommended undertakings aiming at energy efficiency improvement

In Art. 17 of the act on energy efficiency [2], and then in the Announcement of the Minister of Economy of the Republic of Poland [6], a detailed list of undertakings aiming at improving energy efficiency, was published. The undertakings were divided into 8 groups. In the 2 announced invitations to tender, these undertakings were classified into 3 categories; 1 – final recipients, 2 – own devices, 3 – power, heat, or natural gas loss in transmission or distribution. Some specified amounts of energy efficiency certificate values were allocated to each of these three categories. The recommended groups of undertakings as well as the certificate values allotted to them in the 1st and 2nd invitations to tender, provided for in the Announcement of the Minister of Economy, are listed in Table 3.

An analysis of the values of the energy efficiency certificates planned to be issued under the 1st and 2nd invitation to tender, presented in Table 3, shows that the vast majority of the certificate values (80%) was allocated to projects aiming at improving the energy efficiency through energy savings classified under the first category, that is, by final recipients.

Table 3

List of recommended undertakings improving energy efficiency and amounts of energy efficiency certificate values granted in 1st and 2nd invitations to tender

Project group	Scope	Cate-gory	% of amount granted ([toe])	
			1st invitation to tender	2nd invitation to tender
1	Insulation of industrial systems	1	80% (440 000)	80% (1094638.8)
2	Alteration or modernization of buildings	1		
4	Devices and systems used in industrial processes	1		
3	Modernization or replacement of own devices	2	10% (55 000)	10% (136 829.6)
6	Heat recovery in industrial processes	2		
5	Local heat distribution networks and local sources of heat	3	10% (55 000)	10% (136 829.6)
7	Reducing loss (including transmission loss)	3		
8	Replacing low-effective local and individual sources of heat with sources of higher efficiency	3		
Total [toe]			550 000	1 368 296

5. Conclusions

Pursuant to the Act on energy efficiency [2], the obligation of obtaining and cancelling WCs was imposed in Poland with the effect from the beginning of 2013, and it will continue until the first quarter of 2016. So far, 2 invitations to tender have been announced, the first one on 31.12.2012, for the total value of the certificates of 550 000 toe, and the other was published on 31.12.2013 with the total certificate value of 1 368 296 toe, which, added together, is 1 918 296 toe. Assuming that 100% of the certificate values are used, only 282 000 toe will be left for the last year, i.e. 2015 (the amount estimated in the 2nd NEEAP is 2.2 Mtoe).

By 30 October 2013, the ERO had issued only 7 energy efficiency certificates for the total amount of 1 901.00 toe. The total amount of the final energy savings declared in these certificates in the period of generating energy saving is 24 666.40 toe (which is as little as 1.12% of the established target). The total amount of the reduction in CO_2 emission, resulting from the implementation of improvements, is estimated at 212 482.100 tonnes [7]. The number of certificates issued increased to 24 in mid-November 2013.

Enterprises which received the certificates are mainly heating companies and Polskie Sieci Elektroenergetyczne S.A. Very few entities which have submitted their offers so far represented housing cooperatives, public utilities owned by local public administrative bodies (possible thermomodernization works), energy-intensive companies, or other enterprises.

Entities which fail to comply with the obligation imposed on them (of obtaining WCs) (will) have to pay a substitution or penalty fee proportional to the amount of savings below the level needed by these entities to fulfil the obligation (usually determined in Euros per unit of energy), up to the amount which does not exceed 10% of their gross revenue. In cases where an enterprise has not implemented the undertakings described in their tender declaration, or in cases where the savings generated by any enterprise prove to be lower than in the declaration, the amount of such a penalty fee might even be as much as 2 m Euros, and additionally, such an entity is excluded from procedures of awarding contracts for a period of 5 years. The proceeds from the penalty fee collection go to the NFEP&WM.

Any property rights resulting from the energy efficiency certificates are listed from the moment they are marketed until they are blocked with the intention of cancelling the energy efficiency certificate which they result from. Any certificate cancelled on or before 31 March each year is taken into account in calculating the amounts resulting from the duty of cancelling the certificates for the previous calendar year. According to the Art. of 27 (7) of the act on energy efficiency, **any property rights which are not cancelled on or before 31 March 2016, expire by virtue of law on 1 April 2016** [2].

If the experience gained during the functioning of the WC Scheme in Poland (2013––2015) proves to be effective in obtaining the planned result of increasing energy savings, and the costs of the suggested mechanism of financial support are optimal (and the energy efficiency improvement proves to be economically profitable), they can be used as valuable instructions for supporting the energy efficiency policy in Poland in the years of 2016–2020.

References

[1] Dyrektywy 2012/27/UE z 25.10.2012 dot. efektywności energetycznej.

[2] Ustawa z 15.04.2011 o efektywności energetycznej (Dz.U. 94, poz. 551).

[3] Rozporządzenia Ministra Gospodarki z 10.08.2012 w sprawie szczegółowego zakresu i sposobu sporządzenia audytu efektywności energetycznej, wzoru karty audytu efektywności energetycznej oraz metod obliczania oszczędności energii (Dz.U. poz. 962).

[4] Rozporządzenia Ministra Gospodarki z 4.09.2012 (Dz.U. poz. 1039) w sprawie sposobu obliczania ilości energii pierwotnej odpowiadającej wartości świadectwa efektywności energetycznej oraz wysokości jednostkowej opłaty zastępczej.

[5] Rozporządzenia Ministra Gospodarki z 23.10.2012 (Dz.U. poz. 1227) w sprawie przetargu na wybór przedsięwzięć służących poprawie efektywności energetycznej.

[6] Obwieszczenie Ministra Gospodarki z 21.12.2012 w sprawie szczegółowego wykazu przedsięwzięć służących poprawie efektywności energetycznej.

[7] Rozporządzenie Ministra Środowiska z dnia 12 września 2008 r. w sprawie sposobu monitorowania wielkości emisji substancji objętych wspólnotowym systemem handlu uprawnieniami do emisji (szacowaniu wielkości redukcji emisji CO_2).

[8] KAPE – System Białych certyfikatów w Polsce, MG, Warszawa 2012.