

Technical Sciences

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**DYNAMICS OF CHANGES IN THE STRUCTURE AND VOLUMES OF  
FORMATION OF SECONDARY ENERGY RESOURCES IN THE  
ENERGY OF UKRAINE**

**ДИНАМИКА ИЗМЕНЕНИЙ СТРУКТУРЫ И ОБЪЕМОВ  
ОБРАЗОВАНИЯ ВТОРИЧНЫХ ЭНЕРГОРЕСУРСОВ В  
ЭНЕРГЕТИКЕ УКРАИНЫ**

***Summary.** The paper presents the dynamics of changes in volumes of secondary energy resources (SER) in the energy sector of Ukraine by type of energy. The data on changes in the structure and volumes of secondary energy resources for the last period are presented.*

***Key words:** secondary energy resources, combustible secondary energy resources, high-potential heat SER.*

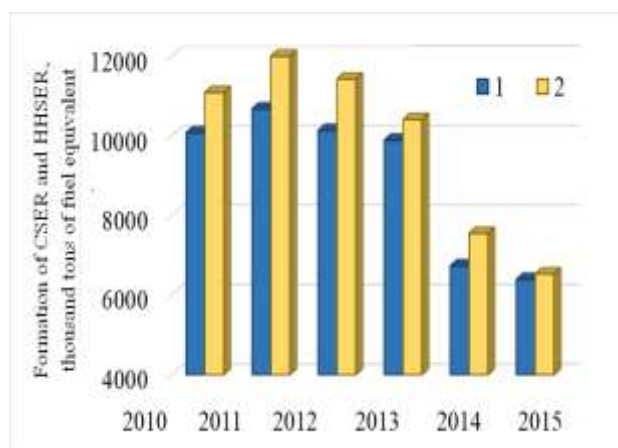
***Аннотация.** В работе представлена динамика изменения объемов образования вторичных энергоресурсов (ВЭР) в энергетическом хозяйстве*

Украины по видам энергии. Приведены данные об изменении структуры и объемов ВЭР за последний период.

**Ключевые слова:** вторичные энергетические ресурсы, горючие вторичные энергоресурсы, высокопотенциальные тепловые ВЭР.

The widespread use of "energy waste" - the so-called secondary energy resources (SER), is one of the important areas of energy conservation in the energy sector of Ukraine. The relevance of the use of SER is also due to the fact that it can significantly reduce the impact of energy facilities on the environment [1; 2].

Data on the volumes of formation of combustible secondary energy resources (CSER) and high-potential heat SER (HHSER) are shown in Fig. 1. The data presented cover the period from 2010 to 2015. There is no official information for subsequent years, since according to the order of the State Statistics Committee of Ukraine No. 162 dated 31.08.2016, the development of this information from 2016 is not provided for by the forms of state statistical observations.

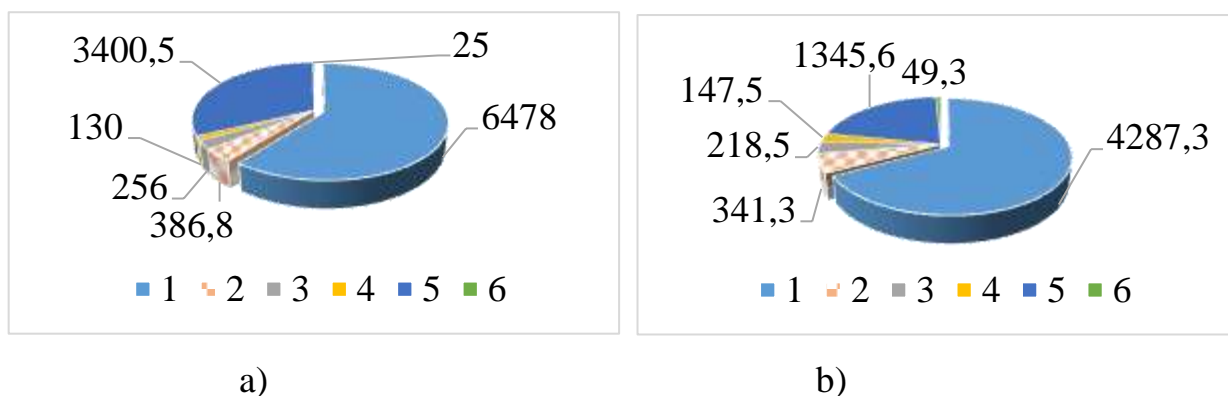


**Fig. 1. Volumes of formation of CSER and HHSER in Ukraine for the period from 2010 to 2015: 1 - CSER; 2 – HHSER**

As seen from Fig. 1, in the period from 2010 to 2015 the dynamics of production of CSER and HHSER is of a similar nature. Namely, there is a slight increase in the formation of the indicated SER from 2010 to 2011 and further its decline until 2015.

The production of CSER in 2015 compared to 2011 decreased by about 1,7 times, and HHSER - by 2 times. Attention is also drawn to the fact that a sharp drop in the formation of both CSER and HHSER occurred in 2014.

Let's consider the volume of CSER formation in various types. Thus, from 2011 to 2015, there has been a rather sharp decline in the production of blast furnace gas (by about 1,5 times), a slight drop in the production of converter and ferroalloy gas (by 13,3% and 17,2%, respectively). There is also a fairly significant decrease in the so-called "other types" of CSER (by 2,5 times), see Fig. 2. At the same time, during the mentioned period, the volume of logging waste has almost doubled, and woodworking by 13,5%.



**Fig. 2. Volumes of formation of various types of CSER (thousand tons of fuel equivalent): 1 - blast furnace gas; 2 - converter gas; 3 - ferroalloy gas; 4 - woodworking waste; 5 - other types; 6 - logging waste; a) 2011.; b) 2015**

Table 1 shows data on the creation and actual production of high-potential heat SER by types of heat recovery units.

Table 1

**Formation and actual production of high-potential heat SER by types of utilization units, thousand Gcal**

Type of heat-recovery facilities	2011		2015	
	Annual formation	Actual manufacture	Annual formation	Actual manufacture
Power engineering facilities	826,354	527,487	364,562	211,882
Boilers-utilizers	10905,0	8099,812	6505,944	4025,755
Dry coke quenching boilers	1403,896	1213,345	533,153	459,83
Converter gas cooling boilers	888,660	825,191	597,679	561,024
Evaporative cooling systems	2402,599	1815,776	1221,256	791,023
Contact heat exchangers	63,719	38,881	339,571	244,058
Other plants	399,226	351,478	197,397	178,322
Total	16889,46	12871,97	9840,532	6529,648

As can be seen from Table 1, over a five-year period, for almost all types of heat recovery units, both the annual generation of these SER and their actual production have significantly decreased. For example, the annual formation of HHSER decreased by 2.3 times for power engineering installations, 1.7 times for waste heat boilers, 2.6 times for coke extinguishing boilers, and 1.5 times for coke extinguishing boilers, and for evaporative cooling systems - 2 times. The exception is contact heat exchangers, for which the annual formation of heat SER increased by 5.3 times.

In conclusion, we will give some examples of elaborations on the use of heat SER [3-10].

**Conclusions.** In Ukraine, secondary energy resources are an important factor in increasing the efficiency of its energy economy. The volume of the total annual formation of combustible SER in the country amounted to 6.39 million thousand tons of fuel equivalent in 2015, and high-potential heat SER –

6.53 million Gcal. The problem of increasing the level of use of SER is one of the urgent tasks of the development of energetics in Ukraine.

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