

Energy supply under conditions of energy deficiency - use of the security electric LED lamps

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Abstract. The problem of energy saving resources is now very urgent. Reducing the lighting electricity consumption through the introduction of advanced technologies is one of the most effective ways. The main method - the replacement of incandescent lamps with LED lamps, since the light output of the latter is 5-8 times higher. However, LED bulbs are only becoming widespread, as most products entering the Ukrainian market are of low quality and of high cost. Also, the frequent phenomenon is the submission by producers of false information about the characteristics of the lamps. There fore, we decided to experiment with the light bulbs available in the market of the western Ukraine.

Many people think about changing the traditional incandescent lamp-lamp to some thing more perfect, since the prices for electricity are constantly growing, because their efficiency is very low and is only 5%. Among alternative way so flighting, halogen lamps are one of the options.

Key words: LED lamps, light output, lighting.

INTRODUCTION

The problem of energy saving resources is now very urgent. Reducing the lighting electricity consumption through the introduction of advanced technologies is one of the most effective ways. The main method - the replacement of incandescent lamps with LED lamps, since the light output of the latter is 5-8 times higher. However, LED bulbs are only becoming widespread, as most products entering the Ukrainian market are of low quality and of high cost. Also, the frequent phenomenon is the submission by producers of false information about the characteristics of the lamps. Therefore, we decided to experiment with the light bulbs available in the market of the western Ukraine.

THE ANALYSIS OF RECENT RESEARCHES AND PUBLICATIONS

Over the last decade, the development of physics in the field of semiconductors has created the prerequisites for intensive research and the widespread introduction of LEDs as a substitute for other types of lamps. Analyzing forecasts of the development of LED technology, in the coming years is expected to produce industrial LED with a light output of 100-150ml / W and significantly lower cost. Today, LED lamps on the market can be found at significantly lower prices than even a year ago. Therefore, in the near future, one should expect a revision of the strategy of programs for the development of energy-saving light engineering.

However, in the Ukrainian market quite often you can find LED lamps, the characteristics of which are submitted by the manufacturers do not correspond to the actual ones. Therefore, the main consumer benefits of LEDs - high luminous efficiency, significantly higher reliability and burning time compared to traditional light sources today - can not always compensate for their shortcomings.

From this it can be concluded that the problem of quality, reliability and safety of new light sources is very relevant.

OBJECTIVES

The task of the study is to investigate the real characteristics of LED lamps that enter the Ukrainian market and evaluate their compliance with the declared data.

MAIN RESULTS OF THE RESEARCH

We studied LED lamps of Euro lamps, Electrum and Extra on the conformity of the declared lighting and electrical parameters.

Manufacturers provided the characteristics of the light sources, which are listed below.

Continuation of Table 2

1	2	3	4	5	6	7	8	9	10	11	12	13
«Electrum», 10 Watt, 820 Lm	I, A	-	-	-	-	-	-	-	-	-	-	0,072
	E, Lux	-	-	-	-	-	-	-	-	-	-	1595
	S, Watt	-	-	-	-	-	-	-	-	-	-	15,84
	F, Lm/Watt	-	-	-	-	-	-	-	-	-	-	100,96
«Electrum», 6 Watt, 480 Lm	I, A	-	-	-	-	-	-	-	-	-	-	0,041
	E, Lux	-	-	-	-	-	-	-	-	-	-	938
	S, Watt	-	-	-	-	-	-	-	-	-	-	9,02
	F, Lm/Watt	-	-	-	-	-	-	-	-	-	-	100,96
«Electrum», 6 Watt, Свічка 450 Lm	I, A	-	-	-	-	-	-	-	-	-	-	0,041
	E, Lux	-	-	-	-	-	-	-	-	-	-	510
	S, Watt	-	-	-	-	-	-	-	-	-	-	9,24
	F, Lm/Watt	-	-	-	-	-	-	-	-	-	-	55,19
«Electrum», 5 Watt, Свічка 380 Lm	I, A	-	-	-	-	-	-	-	-	-	-	0,036
	E, Lux	-	-	-	-	-	-	-	-	-	-	1164
	S, Watt	-	-	-	-	-	-	-	-	-	-	7,92
	F, Lm/Watt	-	-	-	-	-	-	-	-	-	-	146,97
«Electrum», 4 Watt, Гриб 380 Lm	I, A	-	-	-	-	-	-	-	-	-	-	0,025
	E, Lux	-	-	-	-	-	-	-	-	-	-	815
	S, Watt	-	-	-	-	-	-	-	-	-	-	5,5
	F, Lm/Watt	-	-	-	-	-	-	-	-	-	-	148,18
«Electrum», 2,5 Watt, Свічка 180 Lm	I, A	0,015	0,018	0,021	0,024	0,024	0,025	0,025	0,025	0,027	0,03	0,03
	E, Lux	215	233	244	251	264	282	292	300	306	318	348
	S, Watt	1,8	2,34	2,94	3,585	3,872	4,182	4,46	4,75	5,4	6,3	6,6
	F, Lm/Watt	119,44	99,57	82,99	70,01	68,18	67,43	65,41	63,16	56,67	50,48	52,73
«Extra», t= 22°C 9 Watt, 630 Lm	I, A	0,041	0,046	0,05	0,055	0,061	0,065	0,068	0,073	0,075	0,08	0,09
	E, Lux	215	230	245	260	275	290	300	310	325	335	350
	S, Watt	4,92	5,98	7	8,25	9,76	11,05	12,15	13,78	15	16,8	19,8
	F, Lm/Watt	43,699	38,46	35	31,52	28,18	26,24	24,69	22,5	21,67	19,94	17,68
«Extra», t= 9°C 9 Watt, 630 Lm	I, A	0,041	0,046	0,05	0,055	0,061	0,065	0,068	0,073	0,075	0,08	0,09
	E, Lux	202	217	233	251	266	283	301	315	330	350	366
	S, Watt	4,8	5,85	7	8,25	9,2	11,05	12,6	13,78	15,5	17,33	18,7
	F, Lm/Watt	42,083	37,09	33,29	30,42	28,91	25,61	23,89	22,87	21,29	20,2	19,57

A schematic diagram for the study of electric light sources is given below.

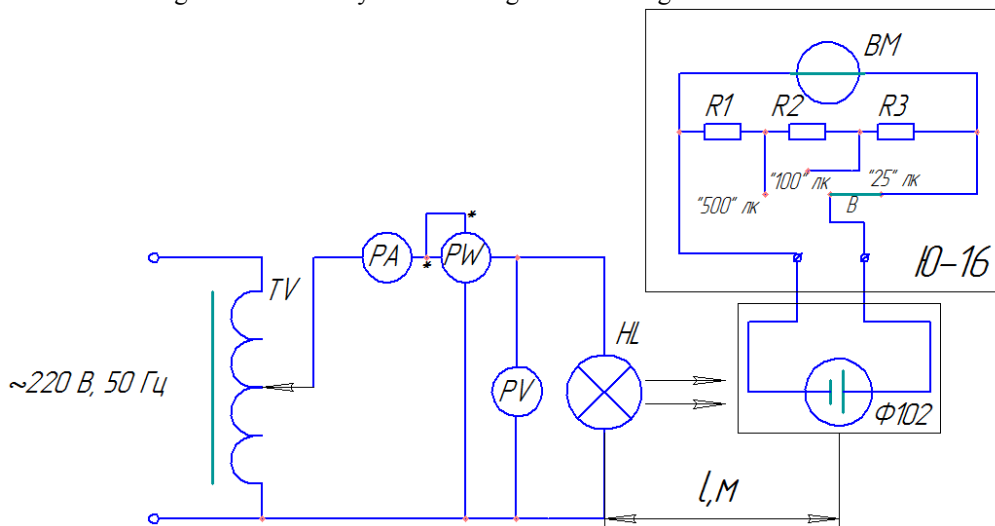


Fig. 1. The study scheme of light sources electric and lighting parameters: TV – autotransformer; HL – study lamp; PA, PV, PW – ammeter, voltmeter and wattmeter respectively; VM – measuring mechanism; B – switch; F102 – photocell; Y-16 is a lux meter

After carrying out experiments, we obtained active power performance for work at a nominal voltage of 220 V, which are shown below.

The resulted results of the research testify that among

the investigated batches of lamps the average value of active power on all presented manufacturers does not correspond to the declared capacity on the package.

Table 3. Comparison of the specified and total power received after the calculations

Producer	The given power, Watt	Estimated power, Watt	The difference between actual and declared values, %
<i>Euro lamp</i>	15	22	+31,82
<i>Euro lamp</i>	13	18,7	+30,48
<i>Euro lamp</i>	11	17,16	+35,89
<i>Euro lamp</i>	10	16,5	+39,39
<i>Euro lamp</i>	6	18,7	+67,91

These data indicate that none of the lamps of the "Euro lamp" is not in line with the declared power, moreover, at times exceeds the power consumption.

Table 4. Comparison of the specified and total power received after the calculations

Producer	The given power, watt	Estimated power, watt	The difference between actual and declared power, %
<i>Electrum</i>	15	23,54	+36,28
<i>Electrum</i>	12	17,6	+31,82
<i>Electrum</i>	10	15,84	+36,87
<i>Electrum</i>	6	9,02	+33,49
<i>Electrum</i>	6	9,24	+35,07
<i>Electrum</i>	5	7,92	+36,87
<i>Electrum</i>	4	5,5	+27,27
<i>Electrum</i>	2,5	6,6	+62,12

These data indicate that none of the "Electrum" lamps corresponds to the claimed power, moreover, exceeds the power consumption at times.

Table 5. Comparison of the specified and total power received after calculations at different temperatures

Producer	The given power, Watt	Estimated power, Watt	The ambient temperature., °C	The difference between actual and declared power, %
Extra (China)	9	19,8	22	+54,55
Extra (China)	9	18,7	9	+51,88

These data indicate that the lamp of a Chinese manufacturer does not correspond to the declared power, moreover, at times exceeds the power consumption.

Among the LED lamps can be distinguished by lamps that have a constant illumination (light flux) when changing the power of the network, and those that are not constant. This is due to different built-in drivers. Lights that change the illumination (light flux) can be used with dimmers. Prices for such lamps are higher.

Below are the graphs of the dependencies of light (light flux) on the voltage of the brand "Eurolamp", "Electrum", and "Extra" (China), which demonstrate it.

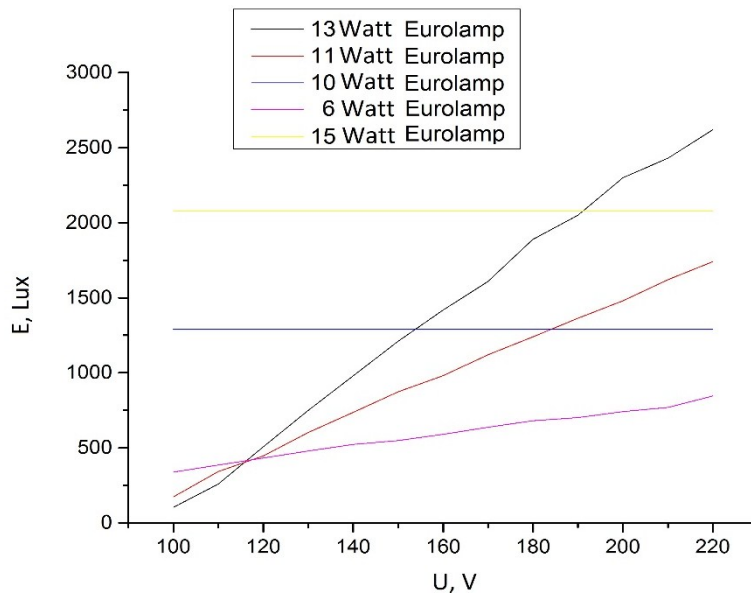


Fig. 2. Graphical dependencies of "Eurolamp" lamps of different capacities

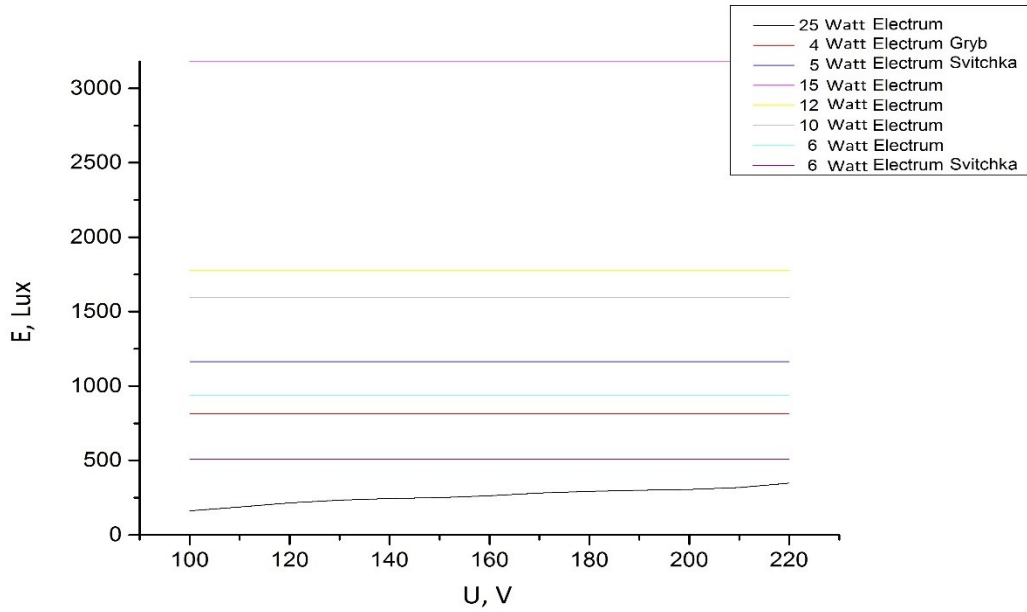


Fig. 3. Graphical dependencies of "Electrum" lamps of different capacities

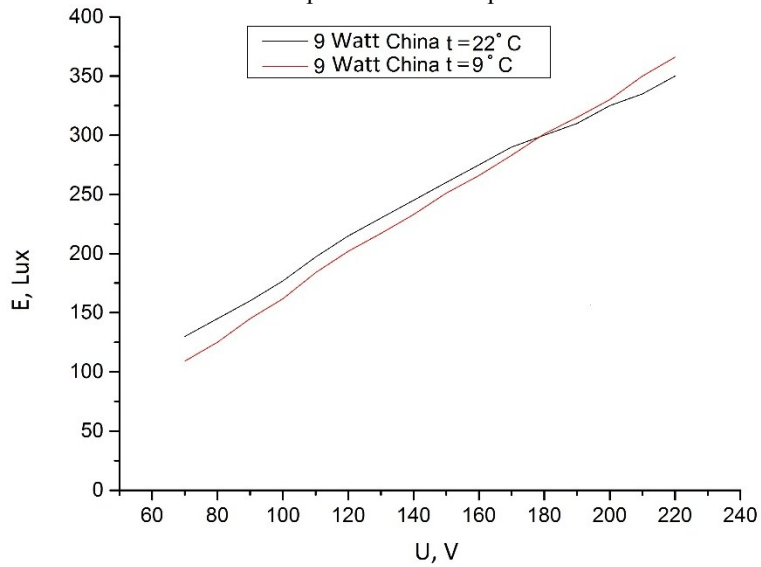


Fig. 4. Graphical dependencies of the "Extra" lamp at different temperatures

From the graphs presented above, it can be concluded that LED lamps at nominal capacities have higher illumination (light flux) at lower ambient temperatures.

However, under reduced voltage illumination (light flux) is higher on the contrary - at higher temperatures.

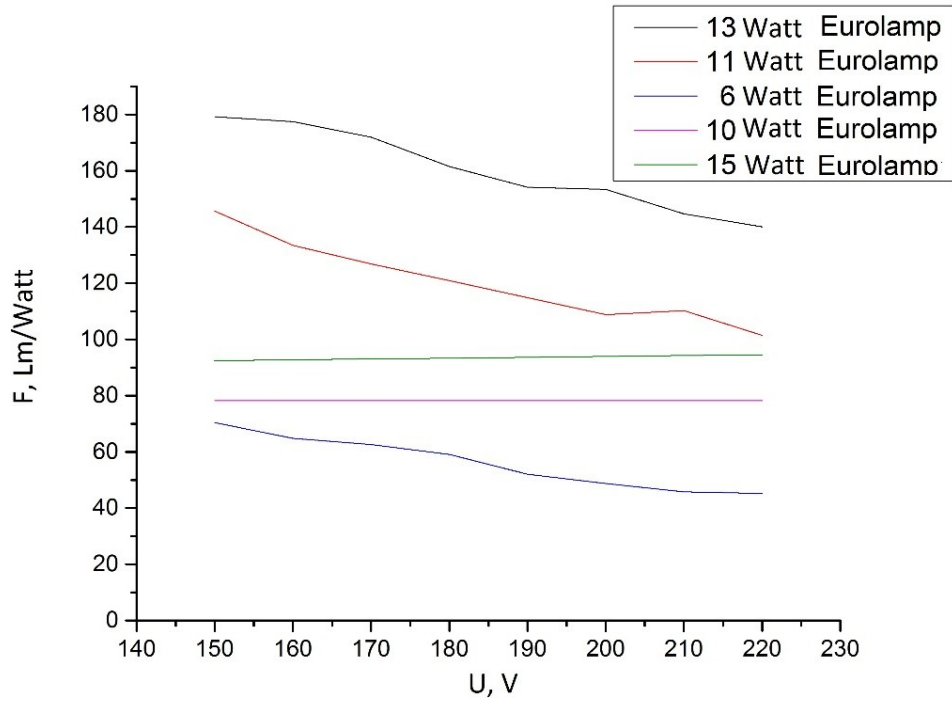


Fig. 5. Graphical dependencies of "Eurolamp" lamps of different capacities

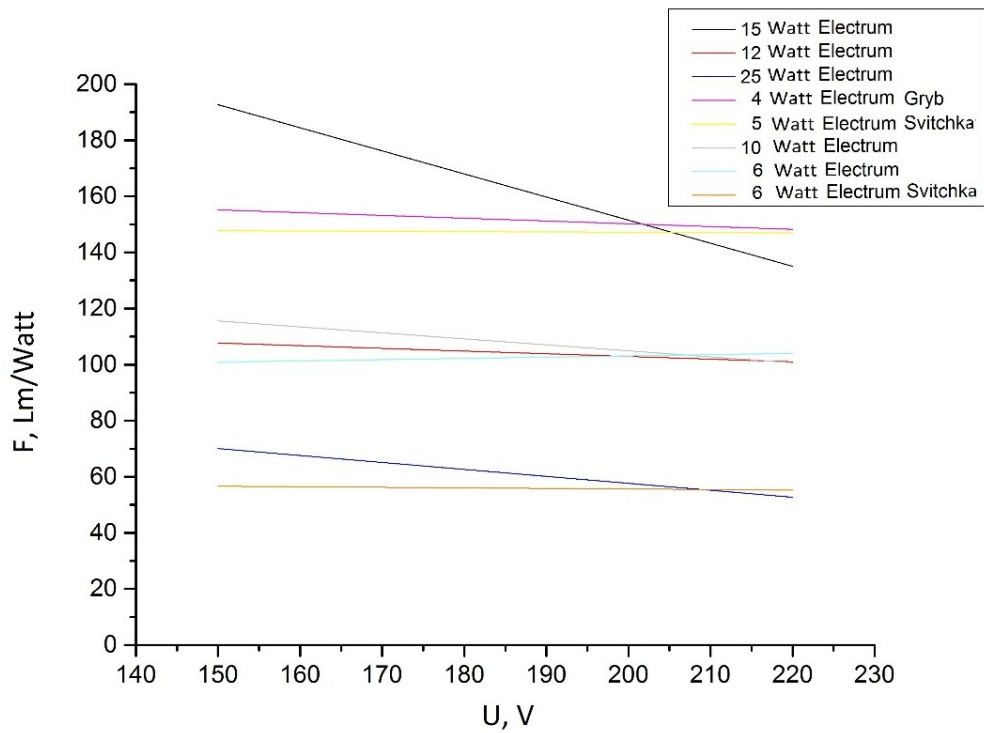


Fig. 6. Graphical dependencies of "Electrum" lamps of different capacities

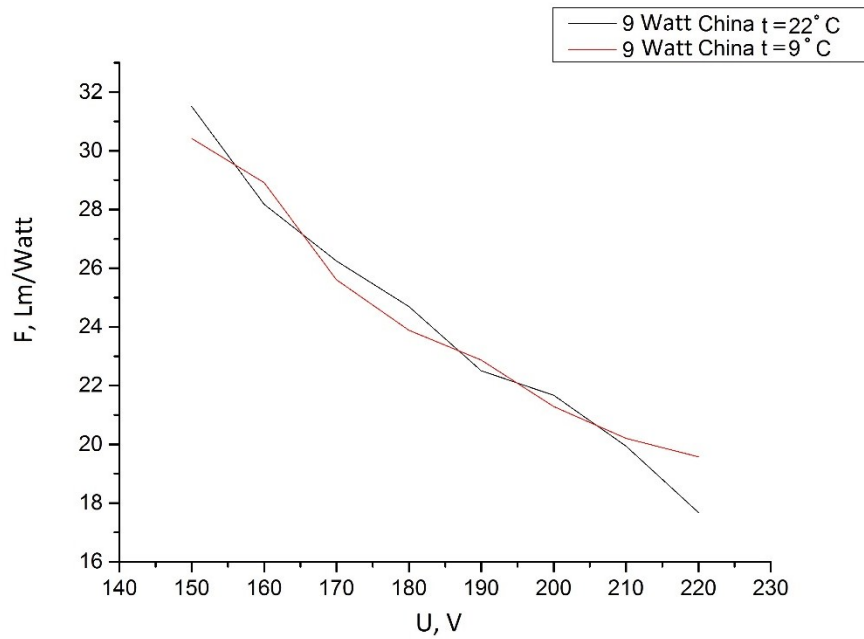


Fig. 7. Graphical dependencies of the "Extra" lamp at different temperatures

Also, for comparison, we chose the Lamps of three manufacturers with similar capacities, stated by the manufacturer, namely 10 Watt "Electrum" and

"Eurolamp" and 9 Watt "Extra". Below are comparative graphs.

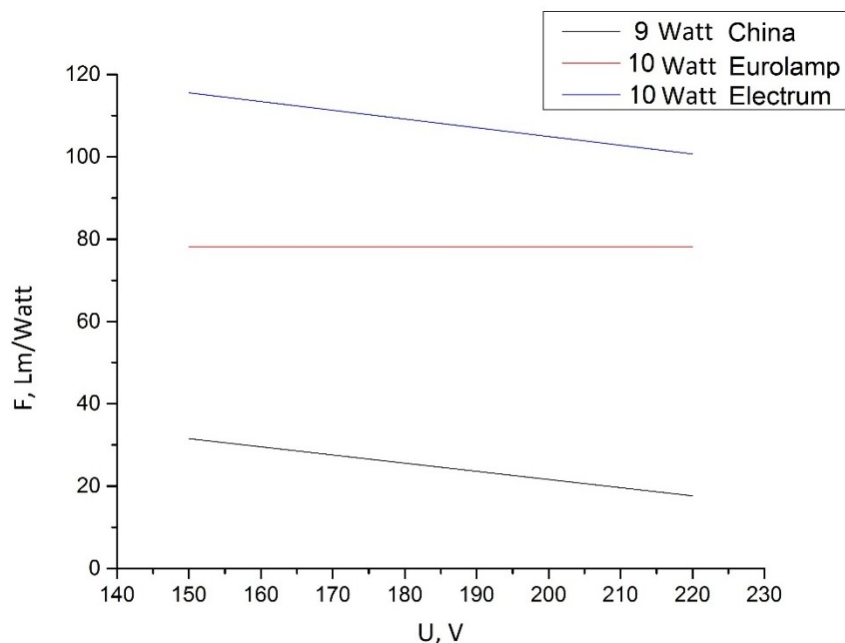


Fig. 8. Graphical dependencies of different types of LED lamps

CONCLUSIONS

LED lamps are the most promising sources of light for both special and general lighting, but a significant part of the lamps that enter the Ukrainian market do not meet the declared electrical parameters.

The most effective was the "Electrum" lamp. The light output of this lamp was higher than its analogue

"Eurolamp". The LED bulb of the Chinese manufacturer "Extra" was several times weaker than the previous two.

However, the power consumption of LED lamps far exceeds the manufacturer's stated demand. Thus, the Eurolamp lamp 10 Watt exceeds the power by 39.39%,

the Electrum brand exceeds 36.87% by 10 Watt and the

As we see from the study, the "Eurolamp" LED lamps of the capacity of 6-15 Watt, which is claimed by the manufacturer, are actually practically the same power. That is, at lowering the power of the lamp, we see an increase in total power.

Also during the research it was found that LED lamps have a higher light output at a voltage of 150 V. That is, from the point of view of saving electricity consumption, it would be more appropriate to use these types of lamps with reduced voltage of the power grid.

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