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ГАЛАХИМ

CAREL

IMPROVING THE EFFICIENCY OF DISTRICT POWER SUPPLY WITH THE TRANSMISSION OF PEAK LOADS OF DISTRIBUTED GENERATION

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Research Objective: Reducing the capacity of electricity losses on transit and reducing the harmful effects of power plants.

Project objective:

- Analysis of power loss components in power transmission lines;
- Simulation of operating modes of distribution networks;
- Justification for the inclusion of local generation in thedistrict networks;
- Electrical calculation of the power lines of the microdistrict;
- Calculation of the reduction of carbon dioxide emissions into the atmosphere.

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District power supply system:

- The installed capacity of the receivers is 11 MW, the estimated capacity is 5 MW in summer, 6 MW in winter;
- The microdistrict is powered by six 10/0. 4 kV TP, with an installed capacity of 2000 kVA;
- The power supply center is a 110/10 kV TP;
- Transit through the district is carried out by a 10 kV cable line according to the ring scheme.

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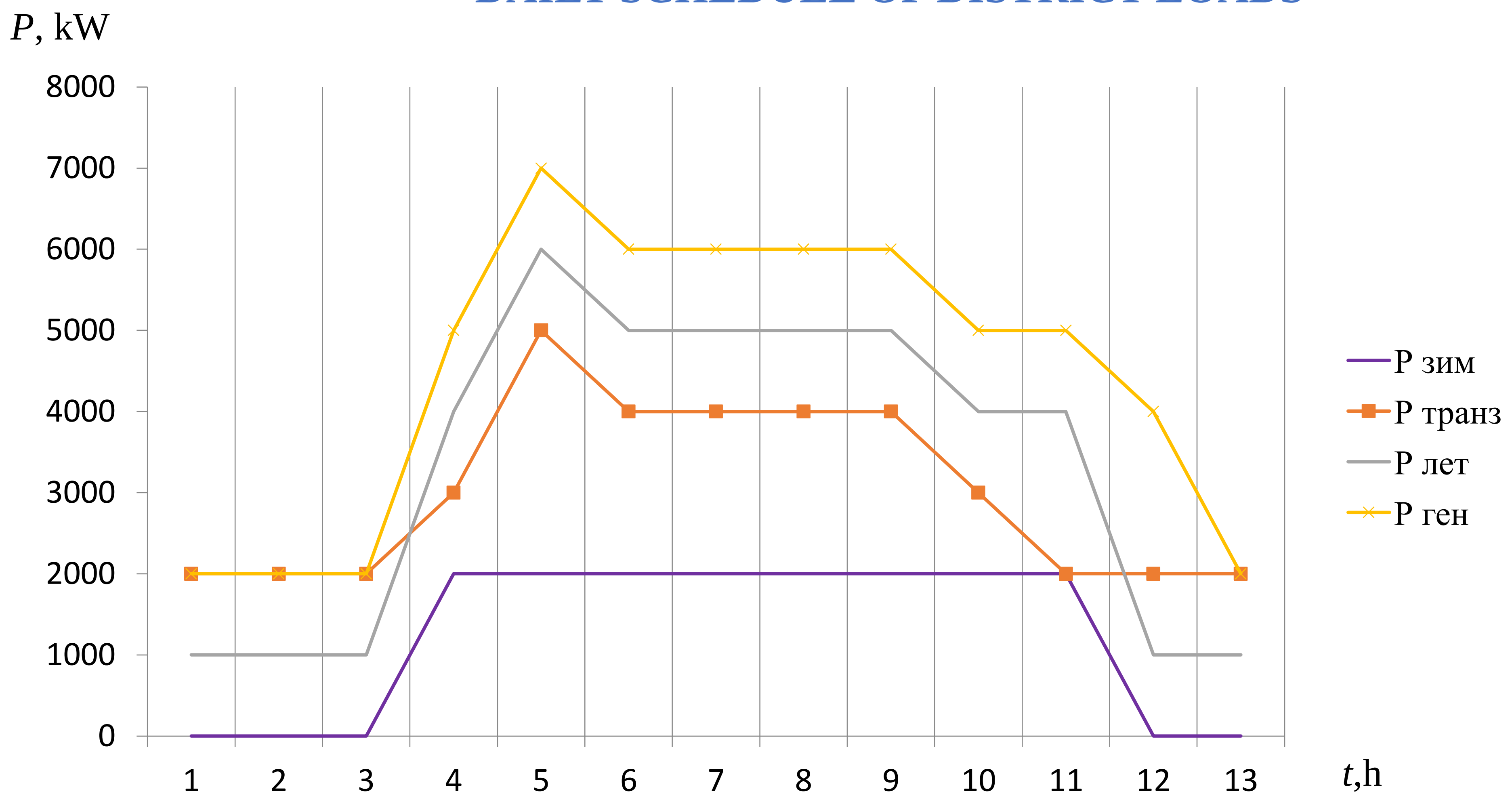
DAILY SCHEDULE OF DISTRICT LOADS



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t	*P* load	*I* line	*P* con	*W* con	*P*gen	*P* tran	*I* line	*P* con	*W*con	*dW*con
hour	kW	A	kW	kWh	kW	kW	A	kW	kWh	kWh
0	1000	58	3	7	0	1000	58	3	7	0
2	1000	58	3	7	0	1000	58	3	7	0
4	1000	58	3	7	0	1000	58	3	7	0
6	4000	231	53	107	2000	2000	116	13	27	80
8	6000	347	120	241	2000	4000	231	53	107	134
10	5000	289	84	167	2000	3000	173	30	60	107
12	5000	289	84	167	2000	3000	173	30	60	107
14	5000	289	84	167	2000	3000	173	30	60	107
16	5000	289	84	167	2000	3000	173	30	60	107
18	4000	231	53	107	2000	2000	116	13	27	80
20	4000	231	53	107	2000	2000	116	13	27	80
22	1000	58	3	7	0	1000	58	3	7	0
24	1000	58	3	7	0	1000	58	3	7	0
total	43000			1263					461	802

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t	*P* load	*I* line	*P* con	*W* con	*P*gen	*P* tran	*I* line	*P* con	*W*con	*dW*con
hour	kW	A	kW	kWh	kW	kW	A	kW	kWh	kWh
0	2000	116	13	27	0	2000	116	13	27	0
2	2000	116	13	27	0	2000	116	13	27	0
4	2000	116	13	27	0	2000	116	13	27	0
6	5000	289	84	167	2000	3000	173	30	60	107
8	7000	405	164	327	2000	5000	289	84	167	160
10	6000	347	120	241	2000	4000	231	53	107	134
12	6000	347	120	241	2000	4000	231	53	107	134
14	6000	347	120	241	2000	4000	231	53	107	134
16	6000	347	120	241	2000	4000	231	53	107	134
18	5000	289	84	167	2000	3000	173	30	60	107
20	5000	231	53	107	2000	2000	116	13	27	80
22	4000	289	84	167	0	5000	289	84	167	0
24	2000	116	13	27	0	2000	116	13	27	0
total	58000			2005					1016	989
%	116000			1,73					0,88	0,85

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t	*P* load	*I* line	*U* line	*U* load	*I* line	*U* line	*U* load
hour	kW	A	kV	kV	A	kV	kV
0	1000	58	0,232	10,768	58	0,232	10,768
2	1000	58	0,232	10,768	58	0,232	10,768
4	1000	58	0,232	10,768	58	0,232	10,768
6	4000	231	0,924	10,076	116	0,464	10,536
8	6000	347	1,388	9,612	231	0,924	10,076
10	5000	289	1,156	9,844	173	0,692	10,308
12	5000	289	1,156	9,844	173	0,692	10,308
14	5000	289	1,156	9,844	173	0,692	10,308
16	5000	289	1,156	9,844	173	0,692	10,308
18	4000	231	0,924	10,076	116	0,464	10,536
20	4000	231	0,924	10,076	116	0,464	10,536
22	1000	58	0,232	10,768	58	0,232	10,768
24	1000	58	0,232	10,768	58	0,232	10,768

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t	*I* line	*U* TP1	*U* TP2	*U* TP3	*I* line	*U* TP1	*U* TP2	*U* TP3
hour	A	kV	kV	kV	A	kV	kV	kV
0	58	10,81	10,77	10,70	58	11,31	10,98	10,77
2	58	10,81	10,77	10,70	58	11,31	10,98	10,77
4	58	10,81	10,77	10,70	58	11,31	10,98	10,77
6	231	10,12	10,08	10,02	116	11,06	10,75	10,54
8	347	9,65	9,61	9,55	231	10,58	10,28	10,08
10	289	9,88	9,84	9,78	173	10,82	10,51	10,31
12	289	9,88	9,84	9,78	173	10,82	10,51	10,31
14	289	9,88	9,84	9,78	173	10,82	10,51	10,31
16	289	9,88	9,84	9,78	173	10,82	10,51	10,31
18	231	10,12	10,08	10,02	116	11,06	10,75	10,54
20	231	10,12	10,08	10,02	116	11,06	10,75	10,54
22	58	10,81	10,77	10,70	58	11,31	10,98	10,77
24	58	10,81	10,77	10,70	58	11,31	10,98	10,77

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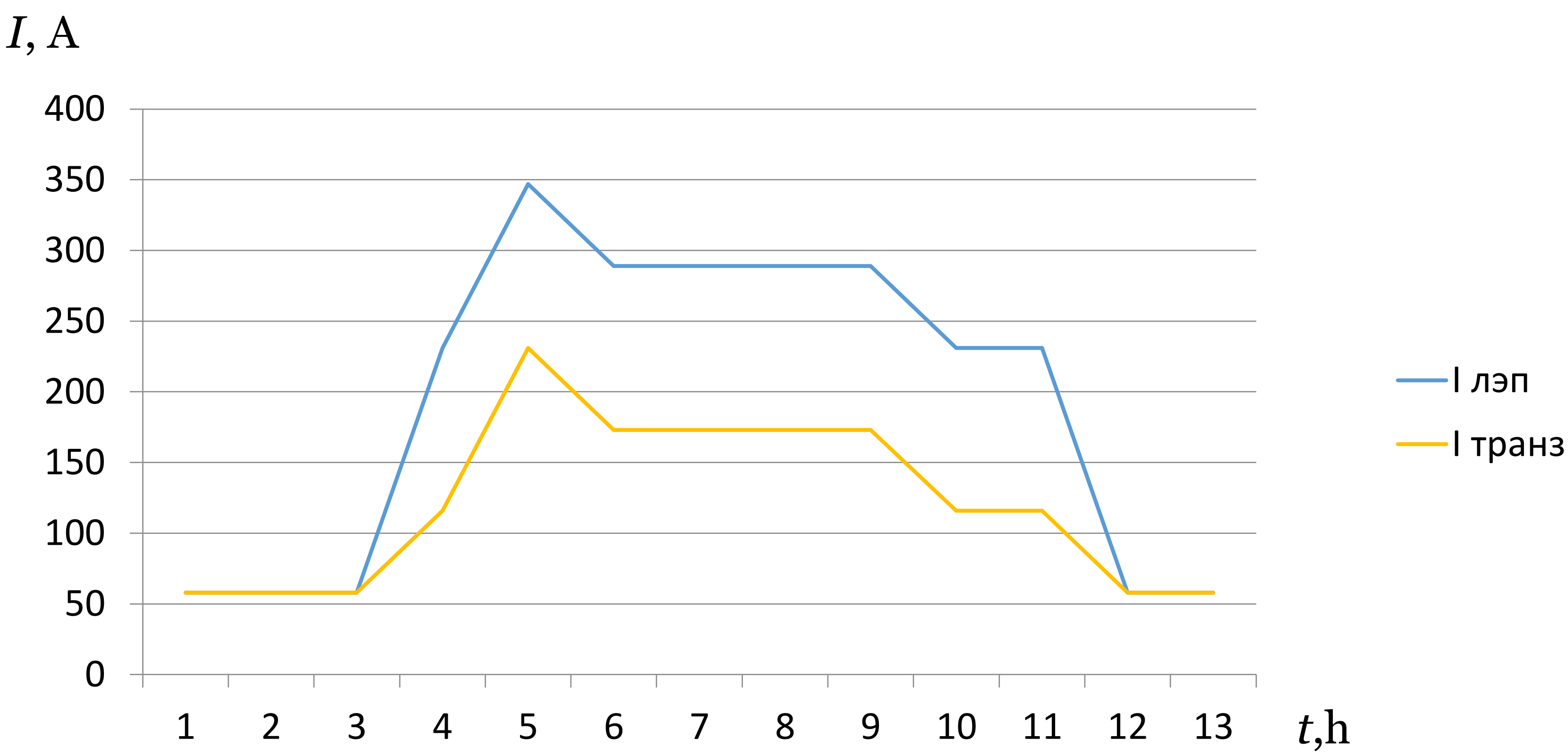

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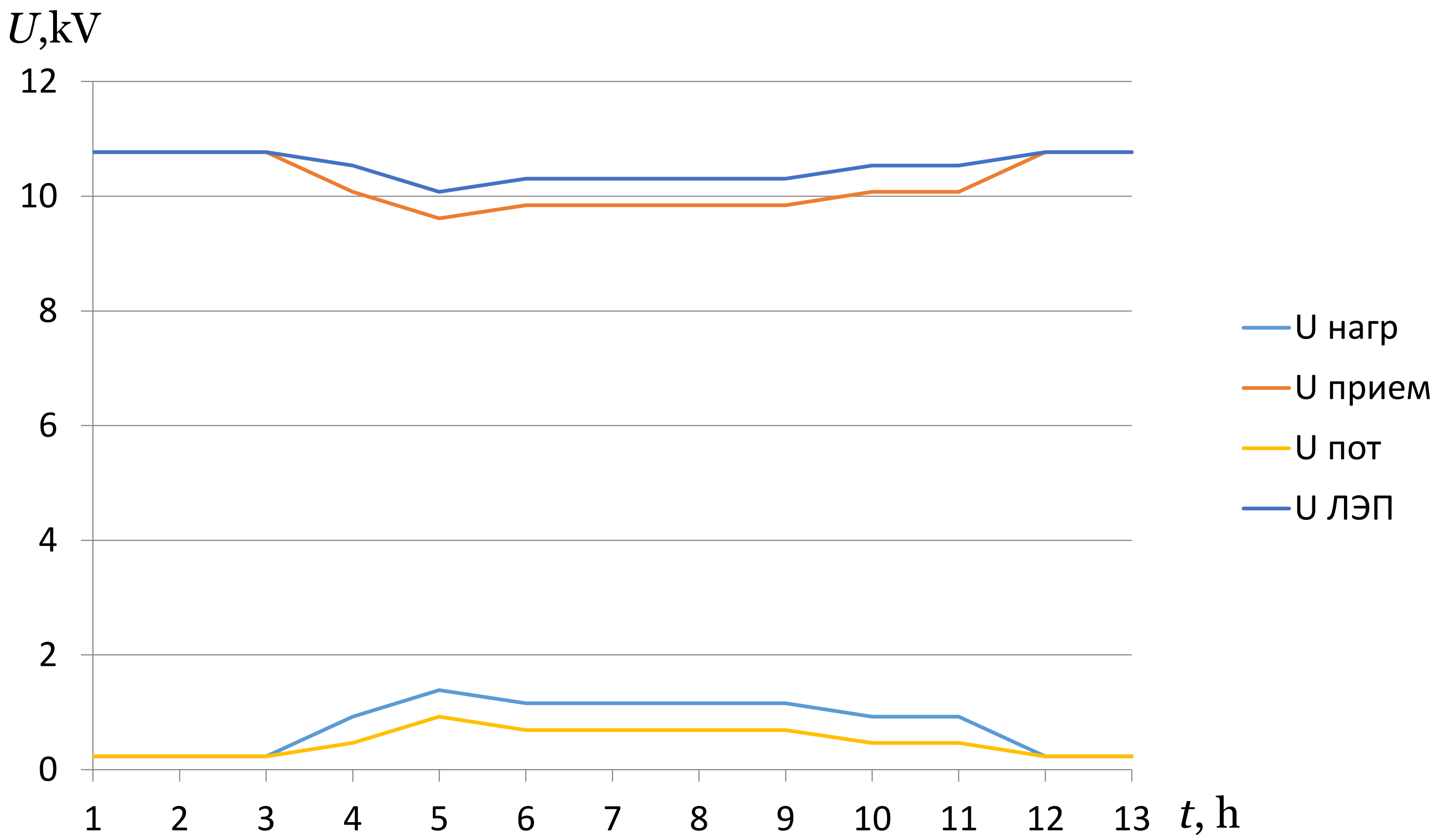

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Peak power exceeds the daily maximum by an average of 20%, but lasts no more than 2 hours.

Transit electricity losses during the peak period account for 20% of daily losses in summer and 16% in winter.

Table 1-Estimation of the change in the power loss of power transmission lines (kW) when using local generation

	Summer		Winter	
	Peak load	Daily maximum	Peak load	Daily maximum
Before	126	83	164	120
after	53	30	84	53

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CONCLUSIONS

- The inclusion of local generation reduces the losses on the transit of electricity by almost 2 times.

- Reducing the transit power allows you to reduce the currents in the lines and reduce the voltage drop at the full resistance of the power line.

- The inclusion of local generation gives a tangible environmental effect. Reducing the power generation of the CHP by the amount of reducing transit losses for Penza will reduce greenhouse gas emissions by 2,700 tons when working on fuel oil and by 10 thousand tons per year when working on coal.

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