



III International Scientific Conference “**Sustainable and efficient use of energy, water and natural resources – SEWAN-2021**”

ГАЛАХИМ



Design of the district power supply system with the integration of hydrogen energy facilities.

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Development prospects renewable energy sources:

- 1. Increasing share of agricultural processing;*
- 2. Availability of generating and network equipment on the market;*
- 3. Cheap labor resources;*
- 4. Availability of vacant land;*
- 5. Low rent, tax benefits;*
- 6. The trend of distributed generation;*
- 7. Use of secondary energy resources;*
- 8. Attracting large investors.*



Design of the district power supply system with the integration of hydrogen energy facilities.

Characteristics of the loads of the district center

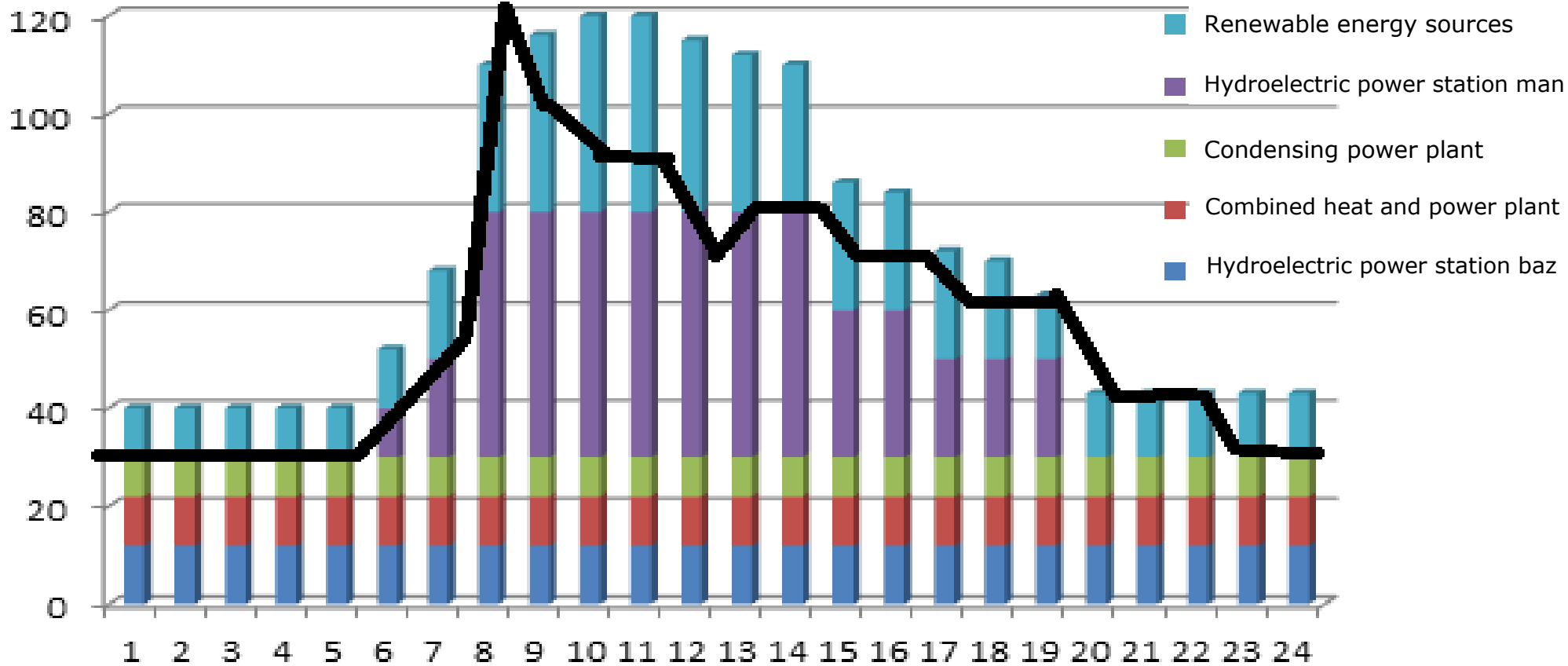
Name	Quantity	Р_{уст}, kWh	W_{см}, thousand kWh-hour	Р_{см}, kWh	W_{сут}, kWh-hour	Р_{сут}, kWh
Industrial plant	1	400	3000	250	5640	235
Industry	16	860	6750	562	9090	378
Total:	17	1260	9750	812	14730	613
Residential sector:						
1 district	2x100 кварт	400	2400	200	4520	188
2 district	30x8 кварт	500	3000	250	5650	235
3 district	120	240	1440	120	2712	113
4 district	180	360	2160	180	4068	169
5 district	200	400	2400	200	4520	188
Total housing and utilities:		1900	11400	950	21470	893
IN TOTAL:		7890	52000	4338	87900	3700

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Generation capacity in the power system-maximum of renewable enerav sources



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An electrolyzer is a special device that is designed to separate the components of a compound or solution using an electric current. An electrolyzer is a special device that is designed to separate the components of a compound or solution using an electric current.



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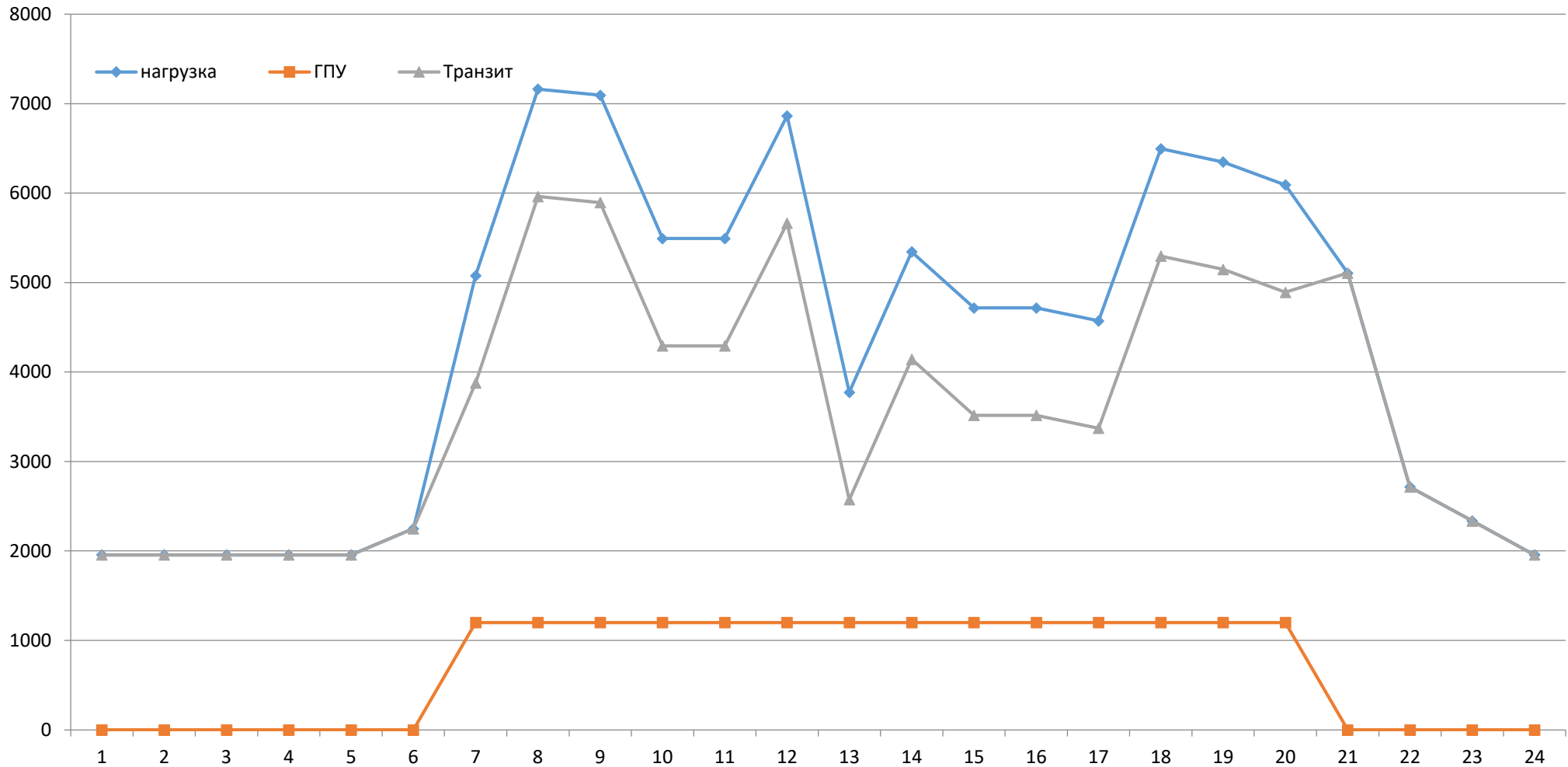
DISTRICT power supply system

- The power center is a 110/35/10 kV transformer substation;
- Transit is conducted by a high-voltage line of 35 kV, in the district center of the power line of 10 kV;
- The installed capacity is 7.64 MW
average per day – 3.68 MW,
average per working shift – 4.3 MW.
- The industrial plant operates a gas-piston power plant with a capacity of 1.2 MW;
- The installed capacity of the solar power plant is 4 MW;
- The installed capacity of the two wind farms is 6 MW.



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Daily load schedule of the area with a gas-piston power plant

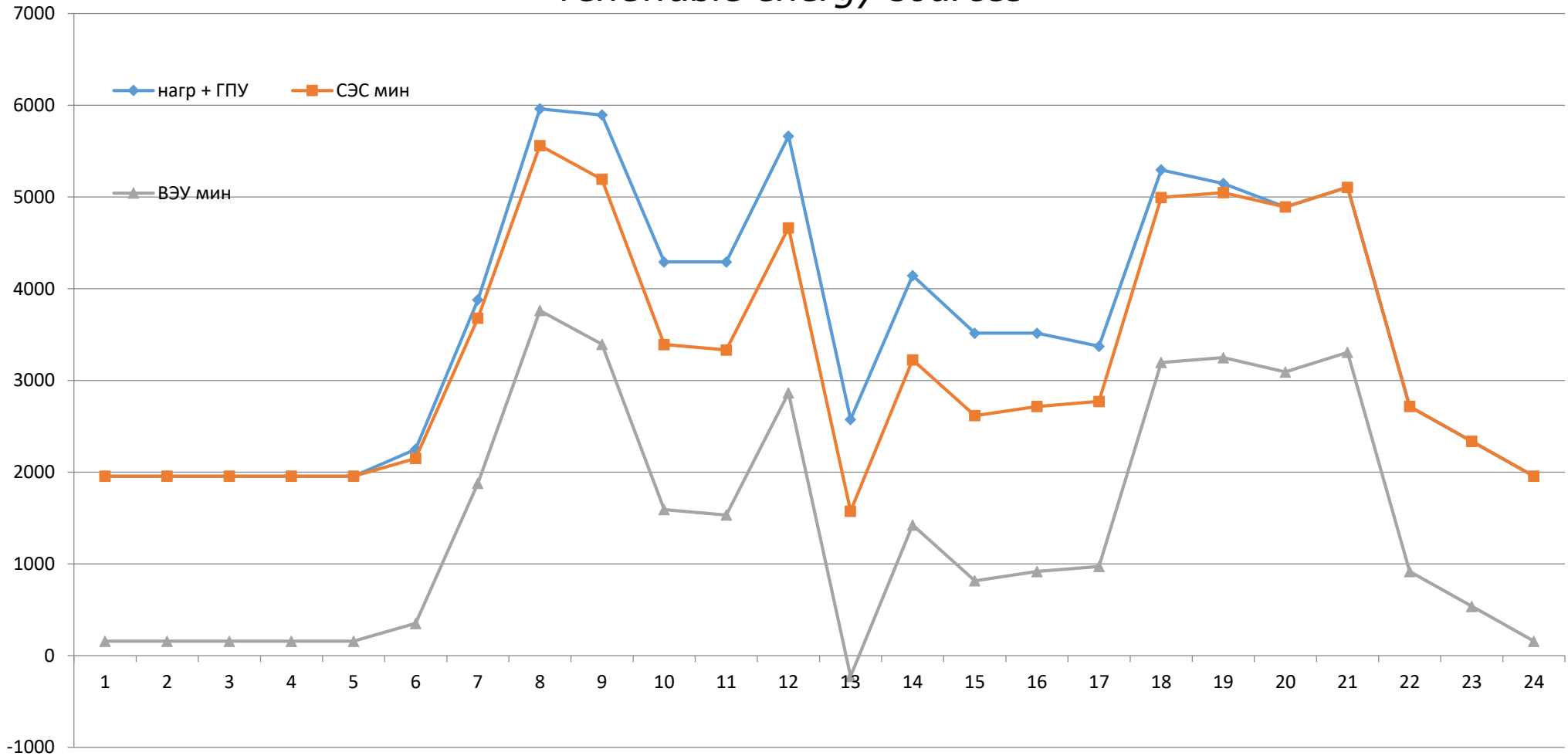


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Daily load schedule of an area with a gas-fired power plant and a minimum capacity of renewable energy sources

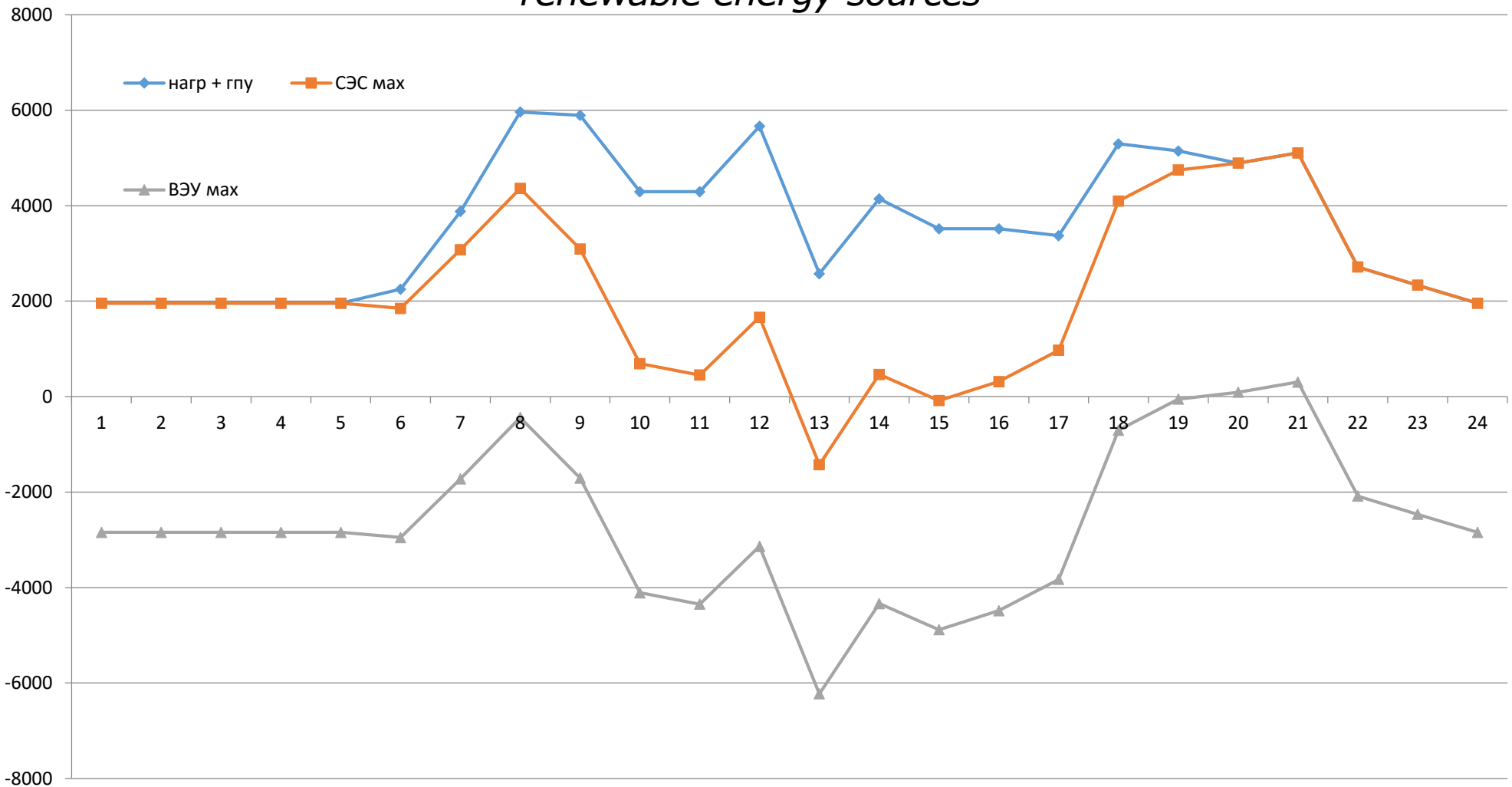


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Daily load schedule of the area with a gas-fired power plant and the maximum capacity of renewable energy sources

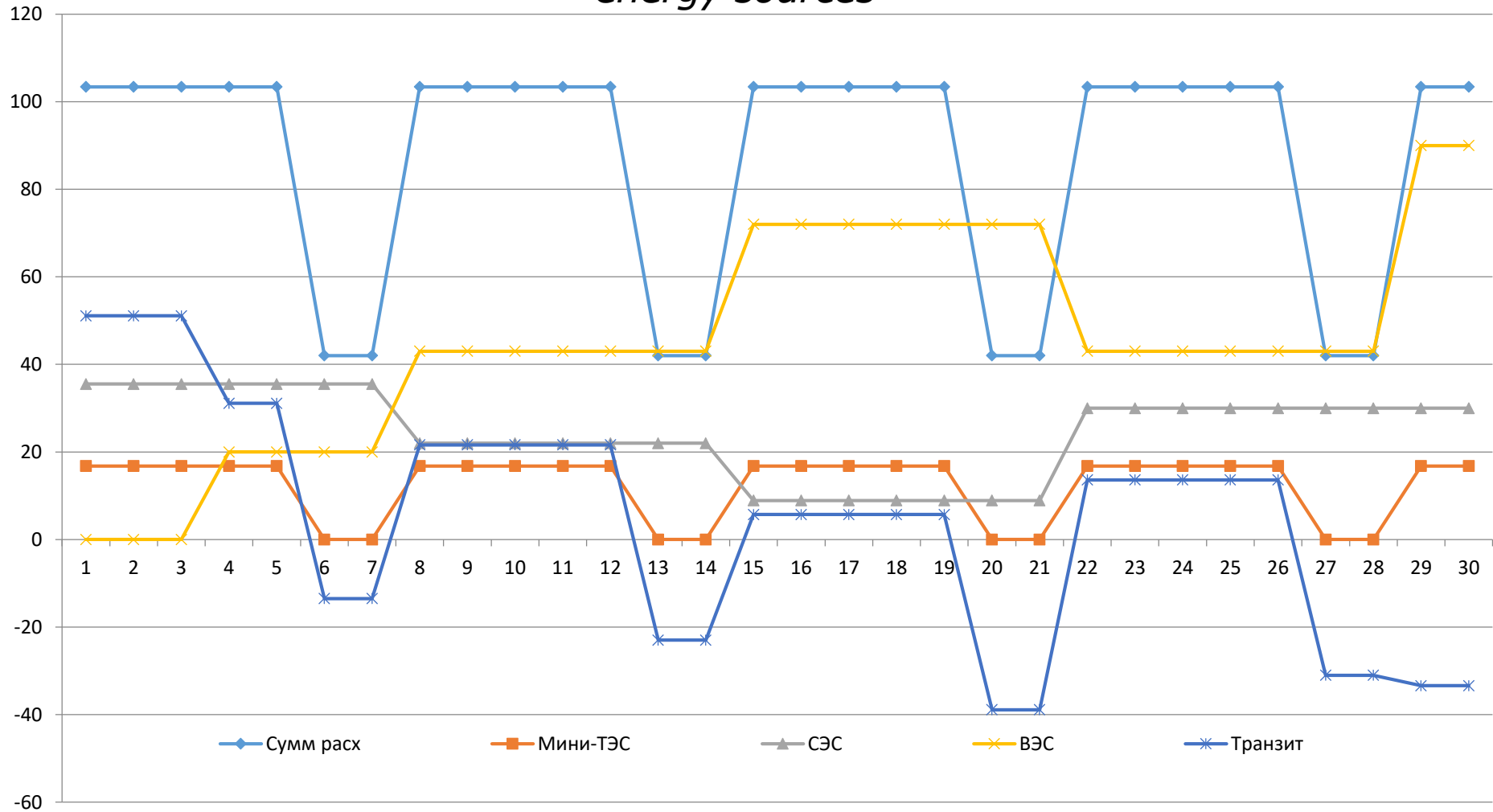


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Monthly schedule of gas-fired power plant loads and average capacity of renewable energy sources

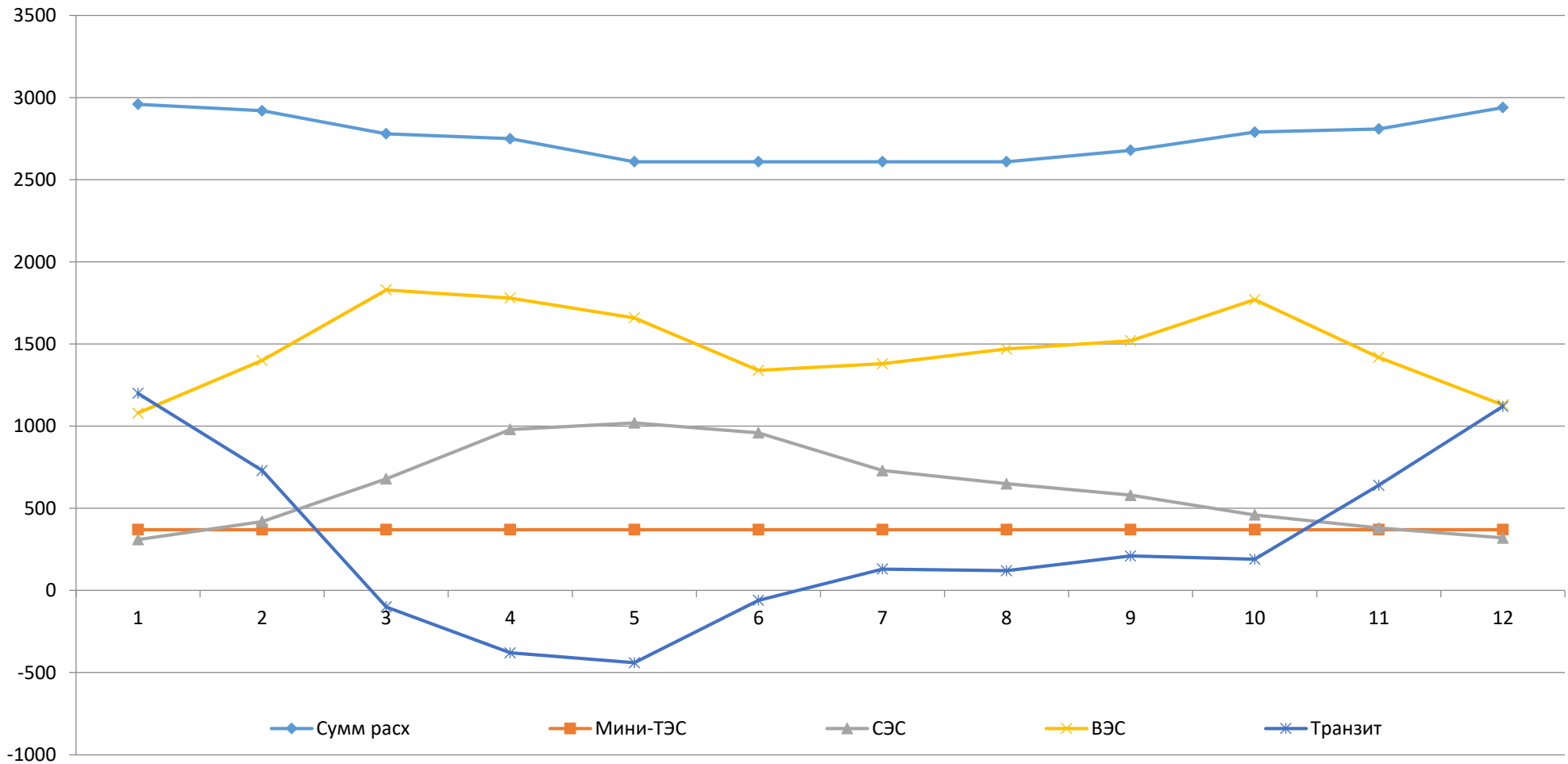


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Annual electricity consumption and generation by the district



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high heat transfer coefficient;



low viscosity index;



safe for the environment;



easy storage.

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Prospects for hydrogen fuel



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The main sources of carbon dioxide emissions into the atmosphere

Electricity generation from renewable energy sources in the district per month 2880 MWh. The consumption of natural gas for generating such a volume is 600 thousand cubic meters. The mass of pure carbon is 450 tons, the mass of carbon dioxide in the flue gases of a thermal power plant is 1650 tons per month. The use of renewable energy sources for one area reduces CO₂ emissions into the atmosphere by 1,650 tons.



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CONCLUSION:

- It is impossible to create an autonomous power supply system for remote areas of the Russian Federation only on the basis of renewable energy sources without thermal power plants and boiler houses.
- In case of unfavorable weather conditions, the capacity of transit through regional power lines will decrease by 2 times, For the Volga region it is 82 days a year.
- For the best conditions, the renewable energy facilities fully meet the needs of the district and can supply the grid with a capacity of 3 MWh per day and 5 MWh at night-56 days a year.
- For average weather conditions, renewable energy facilities meet the needs of the district almost completely, the transit of main power lines is 0,? duration: 227 days.
- The installed capacity of renewable energy sources and a gas-fired power plant is 4 times higher than the estimated capacity.
- In the absence of power output to the main power lines, the electrolyzers are able to produce up to 200 tons of hydrogen per month under favorable weather conditions.
- Reducing the amount of electricity generated by burning natural gas helps to reduce carbon dioxide emissions into the atmosphere.

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Thank you for your attention!

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