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REVIEW OF COGENERATION TECHNOLOGIES FOR THERMAL

ОГЛЯД ТЕХНОЛОГІЙ КОГЕНЕРАЦІЇ ДЛЯ СИСТЕМ ТЕПЛОПОСТАЧАННЯ

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The ongoing conflict in Ukraine has severely impacted the country's thermal infrastructure, with extensive damage to heat sources such as boiler plants and combined heat and power (CHP) plants. This destruction has made it more difficult to provide heating services and significantly increased recovery costs. As of early 2023, the damage to thermal infrastructure was valued at $ 1.2 billion, with the most severe destruction occurring in regions such as Kharkiv, Kyiv, and Sumy due to bombings and occupation. By mid-2024, nearly 90% of Ukraine's thermal generation capacity was destroyed, including all of the thermal power stations owned by the company "Centenergo" [17].

Despite these challenges, centralized heating remains one of the most energy-efficient and cost-effective ways to provide heat, with a high potential for modernization, low-carbon technology adoption, and flexible fuel use. As part of the recovery efforts, Ukraine has increasingly focused on implementing cogeneration plants, which allow for both heat and electricity production. These plants are seen as an essential component of reducing carbon emissions and ensuring a stable energy supply. They also meet Ukraine's climate obligations as part of its integration into the European Union [1–3].

Table 1 provides an overview of various gas piston power plant manufacturers, highlighting their engine types, fuel options, power output ranges, advantages, and disadvantages [4–7].

Table 1

Gas Piston Plant Manufacturer Comparison

Company	Engine Type	Fuel	Power (kW)	Advantages	Disadvantages
Elteco (Slovakia)	Gas piston power plants based on PERKINS, GUASKOR, MAN, DEUTZ engines	Natural gas	3.8–3916	High efficiency, costeffectiveness, eco-friendliness, autonomy, capability to operate in parallel with other energy sources.	Long manufacturing, delivery, and equipment installation times (from 6 months).
FG Wilson (United Kingdom)	Gas piston power plants based on Perkins, Scania, Isuzu, Ford, General Motors engines	Natural and liquefied gas	11–276 (low power), 380–1000 (medium power)	Wide model range, ease of connection to gas supply, high reliability.	Long delivery times (10–14 weeks), high likelihood of low-quality supplies from unreliable vendors, high cost for standard equipment.
Guascor (Spain)	Gas piston power plants based on Guascor engines that operate on various types of gas	Natural gas, associated gas, biogas, sewage gas	142.8–1204	High reliability, electronic control systems, versatility, ability to run on various types of gas, low energy production costs, convenient maintenance.	Limited power range compared to other brands, less stringent gas composition requirements but not suitable for all conditions.
Caterpillar (USA)	Gas piston power plants based on Caterpillar engines	Natural gas, associated gas, biogas, sewage gas	10–3860	High efficiency and fuel economy, cogeneration systems with up to 40% fuel savings, excellent operational and transient performance.	High installation cost, custom-order deliveries.

Conclusions. The analysis of gas piston power plants from various manufacturers demonstrates that each company offers distinct advantages and limitations, making them suitable for specific applications and conditions [1, 2, 8].

In conclusion, the selection of a gas piston power plant should be guided by a comprehensive assessment of technical specifications, operational needs, and economic constraints. Future research and technological advancements may further enhance the performance and accessibility of these systems.

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