



**ADVANCED
POWER GENERATION
TECHNOLOGIES**



REMOTE POWER UNIT EVOGRESS BASED ON FREE-PISTON STIRLING ENGINES FOR PERMANENT POWER SUPPLY OF PRODUCTION FACILITIES

EVOGRESS.COM

NAUKA – POWER TECHNOLOGY LLC

Major activity:

Development and production of sources of remote power supply intended for permanent generation as well as production of basic functional blocks for sources produced under the trademark EVOGRESS.

- ▶ Subsidiary company of NPO NAUKA
- ▶ Resident of Skolkovo Innovation Centre
- ▶ Member of Russian Technology Platform «Environmentally friendly high-performance thermal power»
- ▶ In-house design bureau and production facilities
- ▶ The company's products are certified in the INTERGASCERT system and approved for use at the facilities of Gazprom



ENGINE-GENERATOR TECHNOLOGY

FREE PISTON ENGINE

Fully sealed heat machine, whose operation is based on external heat supply to the heating zone and heat removal from the cooling zone.

The work of the generator is performed in cyclic linear motion piston from high pressure area to low pressure area.

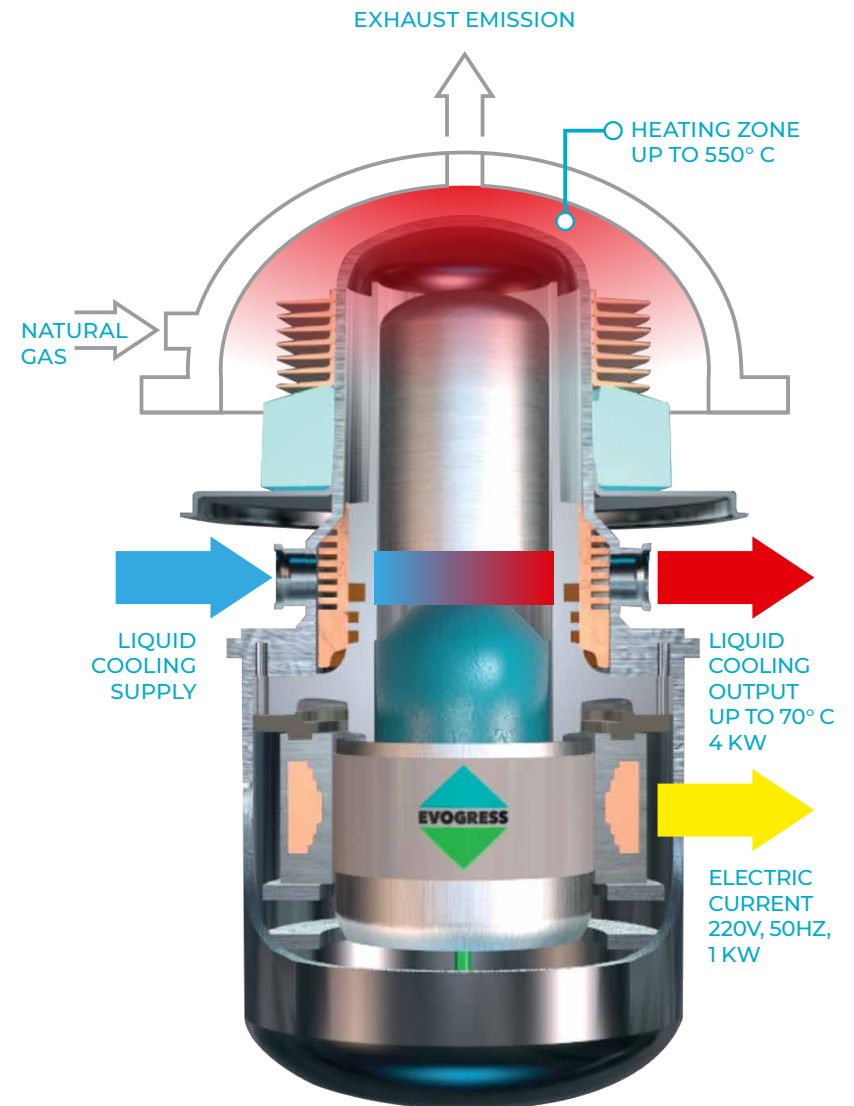
The cyclicity of the piston movements is set due to its coaxial displacer, which periodically moves the working fluid (helium) from the heating zone to the cooling zone and back.

The free piston engine is completely maintenance free device during the entire service life, in which, due to the presence of gas-dynamic supports, there is no mechanical friction of moving parts, which in turn eliminates the need for the use of the system lubrications. Heat is supplied to the engine from an external burner powered by low-pressure natural gas.

Resource indicators of the engine do not depend on the degree of its load and the number of cycles «start-stop»

ADVANTAGES

1. Quiet operation
2. Ability to work on a variety of fuels (natural gas, LNG)
3. Service life 100 thousand hours and no need in periodic maintenance



PARAMETER	VALUE
Seriality of the product	18,500 pieces
Total operating time	More than 250 million hours
Power electric unit	1 kW
The heat	4 kW
Voltage	230V (1 phase) 50Hz
Control range	From 10% to 100 %
Efficiency electric not less	16 %
Efficiency cogeneration	85 %
Natural gas fuel consumption	0.6 Nm ³ per hour
Fuel gas pressure	The 2.5 – 3 kPa.
Assigned resource	100, 000 h
Maintenance interval	Service not required
The loss of the working fluid (helium)	No
Possible fuels	Gas, liquid, solid

UNIVERSAL GENERATING MODULE EVOGRESS

EVOGRESS has a modular design. As a power the installation uses a Universal generating module (UGM) based on a free piston engine. Increasing the capacity of the plant is due to increasing the number of UGM's



KEY ADVANTAGE

- ▶ Level of automation-4 (work in automatic mode without the presence of personnel)
- ▶ Long service interval-8760 hours
- ▶ Low fuel gas consumption-0.6 m³ per 1 kW of installed capacity
- ▶ Efficiency electric, not less-16 %
- ▶ Full efficiency-up to 85 %
- ▶ Low cost maintenance

ELECTRO POWER	UGM
HEAT POWER	1 kW
U out	4 kW
	230V (50 Hz)

SOURCES OF REMOTE POWER SUPPLY EVOGRESS

Remote power unit in all-weather vandal-proof- in the design for the main power and heat supply of facilities with constant power consumption from 1 to 10 kW (short-term re-load capacity from 3 to 30 kW). In a standard complete set real-the possibility of connection and operation of WSE in priority mode has been realized, and there is also an inverter-storage system for guarantee to provide short-term peak power supply

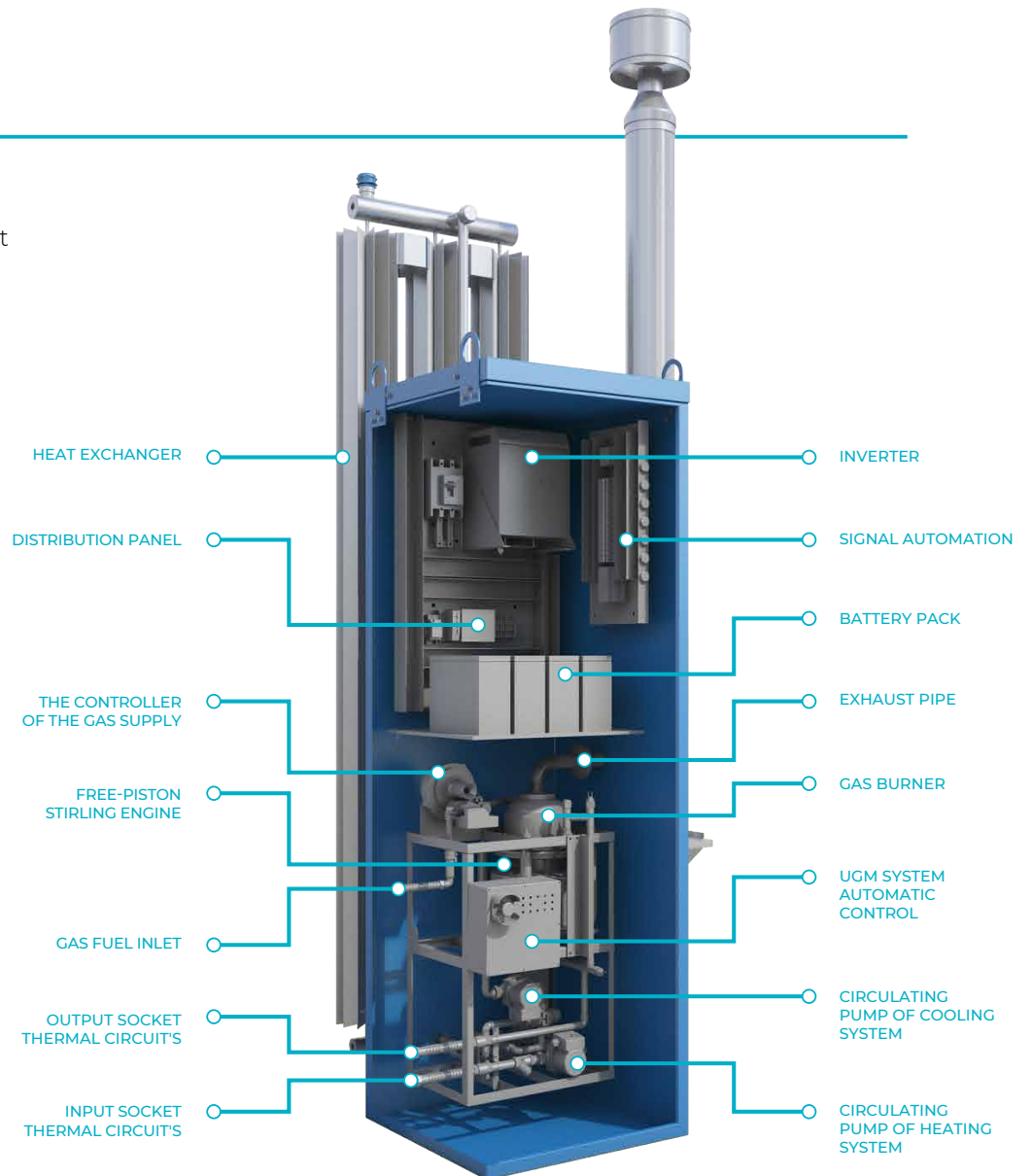
In the standard configuration a separate heat supply circuit is implemented to the consumer from the cooling circuit of engines. In order to achieve the optimization algorithm is implemented for greater efficiency of the system engine operation depending on the required constant power (load regulation depth from 10 to 100%).

PURPOSE

Generation of heat and electricity at production facilities, transportation, distribution and processing of hydrocarbons enterprises fuel and energy complex with energy consumption up to 30 kW.

APPLICATION OPTION:

- ▶ Gas wells
- ▶ Automated gas production systems
- ▶ Mechanized gas production systems (concentric lift columns)
- ▶ Crane units
- ▶ Radio relay communication stations
- ▶ Telemechanics facilities
- ▶ Monitoring and diagnostics systems of gas transportation systems
- ▶ Cathodic protection stations
- ▶ Nodes of preliminary preparation of gas
- ▶ Autonomous gas distribution stations
- ▶ And other gas facilities with constant power consumption-up to 10 kW



REMOTE POWER UNIT EVOGRESS WITH ELECTRIC POWER 100-500 W

Similar to thermoelectric generators Global Thermoelectric power. up to 550W

<u>P el. const</u>	<u>100-500 Wt</u>
<u>P el. peak</u>	<u>1 600 Wt</u>
<u>U output AC</u>	<u>230 V, 50 Hz</u>
<u>U output DC</u>	<u>12 V / 24 V</u>



SINGLE-MODULE REMOTE POWER UNIT EVOGRESS

Similar TO ENERGY SHELTER BASED ON thermoelectric generators up to 750 watts

P el. const	750 Wt
P el. peak	5 000 Wt
P heat	3 500 Wt
U output AC	230 V, 50 Hz
U output DC	12 V / 24 V / 48 V



MULTI-MODULE REMOTE POWER UNIT EVOGRESS

Similar to ORMAT

P el. const	2-5 kWt
P el. peak	5-8 kWt
U heat	9-18 kWt
U output AC	230 V, 50 Hz
U output DC	12 V / 24 V / 48 V



MULTI-MODULE REMOTE POWER UNIT EVOGRESS



<u>P el. const</u>	<u>6-9 kWt</u>
<u>P el. peak</u>	<u>5-30 kWt</u>
<u>U heat</u>	<u>21-30 kWt</u>
<u>U output AC</u>	<u>230 V, 50 Hz</u>
<u>U output DC</u>	<u>12 V / 24 V / 48 V</u>

COMPLEX TECHNOLOGICAL EQUIPMENTS EVOGRESS-BKU

<u>P el. const</u>	<u>0,6-10 kWt</u>
<u>P el. peak</u>	<u>3-30 kWt</u>
<u>U heat</u>	<u>3-30 kWt</u>
<u>U output AC</u>	<u>230 V, 50 Hz</u>
<u>U output DC</u>	<u>12 V / 24 V / 48 V</u>



PILOT PROJECT EVOGRESS-OIL 1.0

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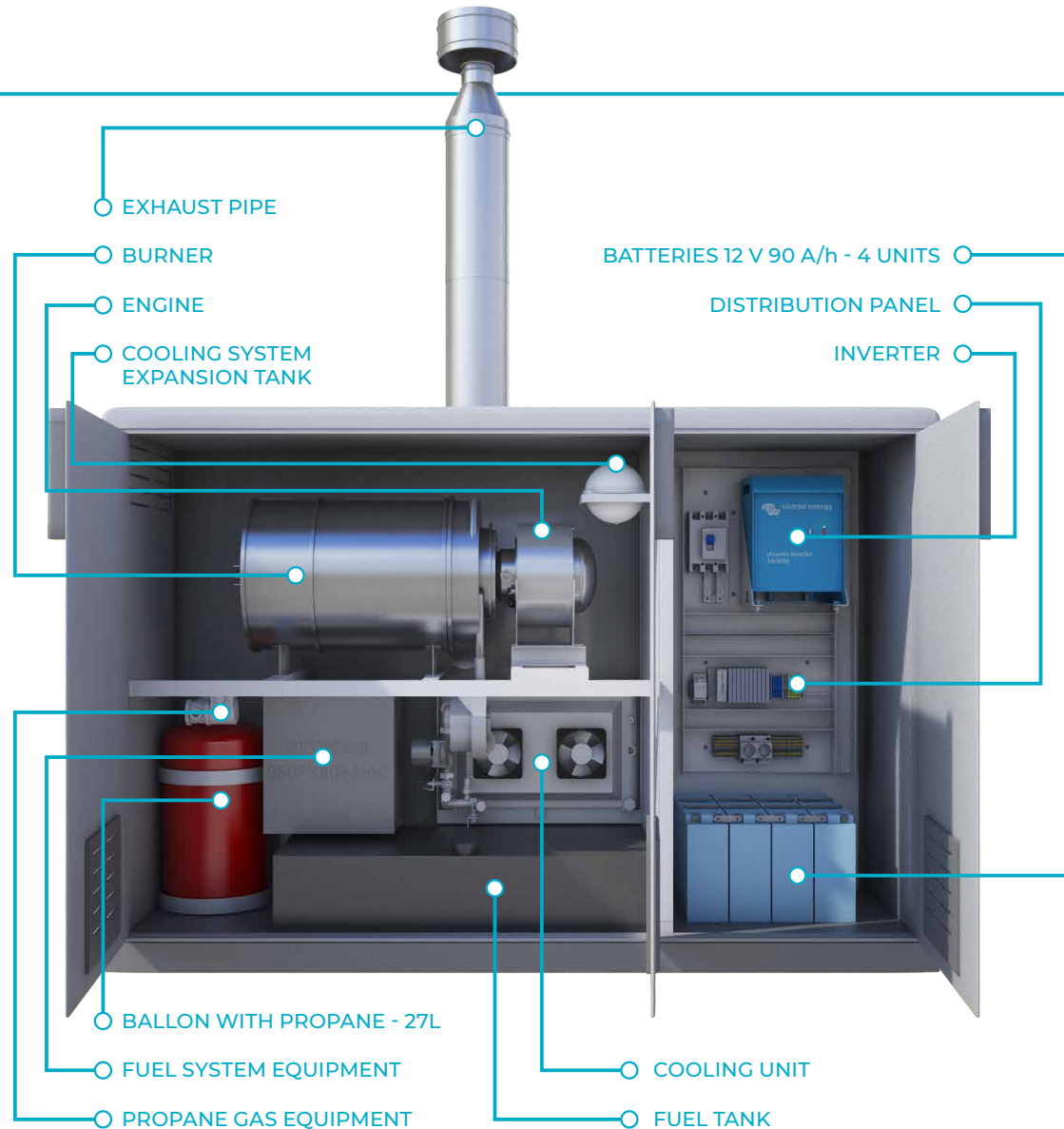
Full factory readiness for use both independently and as part of the block-complete technology-systems.

The source is equipped with a gas heating system-thermal heating of complex liquid species fuel (gas heating only works when the source is initially turned on). In the process, heating fuel comes from a vortex burner.

Power unit equipped with inverter storage unit, designed to increase the short rated electrical power source up to 5-8 kW.

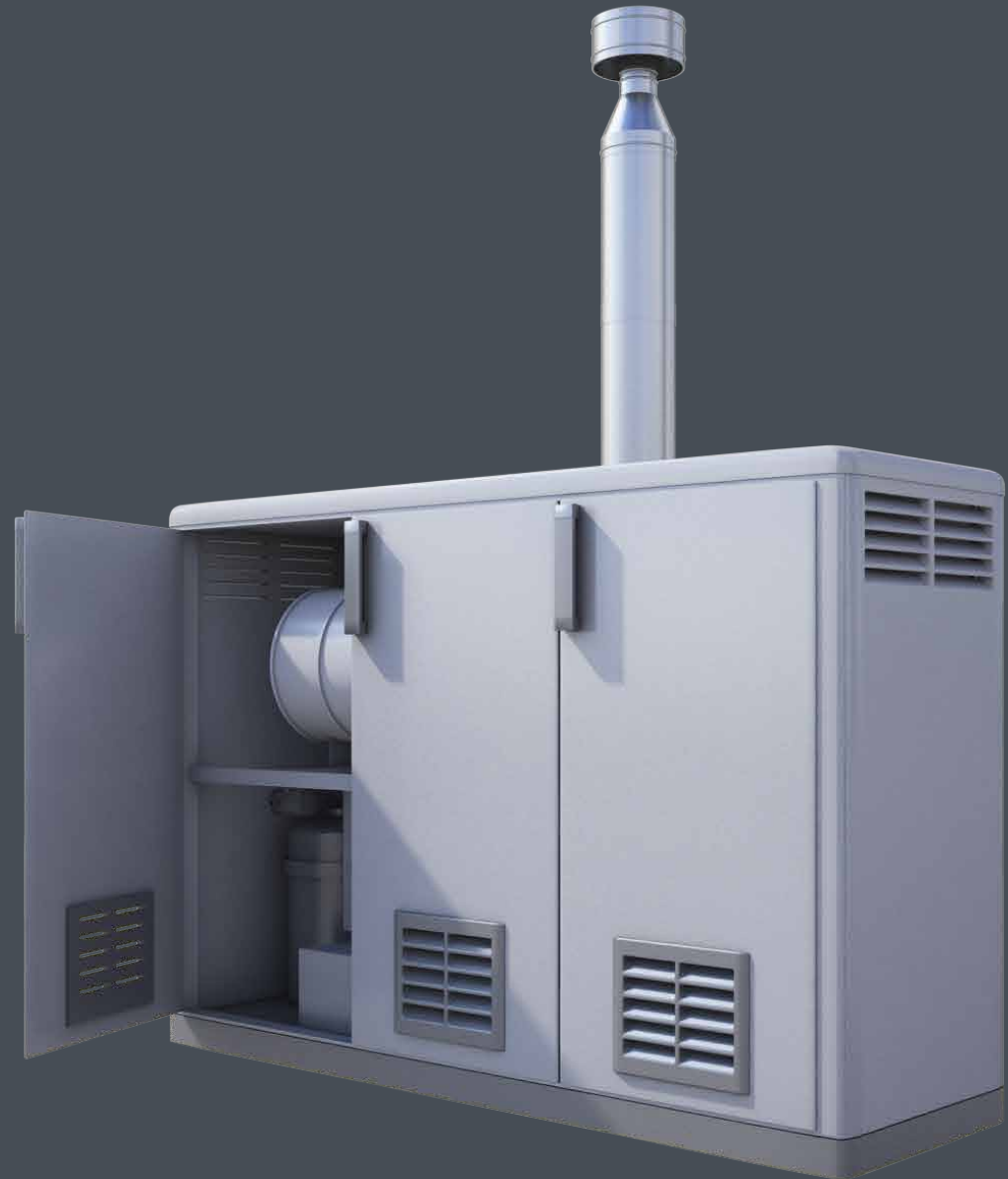
The liquid cooling system is equipped with independent heating circuit, designed for-heat transfer equipment consumer. The power unit includes a fuel tank with volume of 70 liters.

At the same time it is possible use of independent fuel tank to increase the frequency of refueling fuel. In the basic configuration of the power unit, the algorithm of connection of Wind/Solar working in priority mode.



REMOTE POWER UNIT ON LIQUID TYPES OF FUELS

<u>P el. const</u>	<u>750 Wt</u>
<u>P el. peak</u>	<u>5 000 Wt</u>
<u>U heat</u>	<u>3 500 Wt</u>
<u>U output AC</u>	<u>230 V, 50 Hz</u>
<u>U output DC</u>	<u>12 V / 24 V / 48 V</u>



COMPLEX OF TECHNOLOGICAL EQUIPMENT FOR OIL INDUSTRY

PURPOSE

Complex of technological equipment with integrated power supply EVOGRESS-OIL is designed for mining infrastructure services and transportation of liquid hydrocarbons in places with lack of centralized power supply and depending on the composition of the technological equipment serve to provide communication, pipelines cathodic protection, telemetry transmission, remote control shut-off valve.

Power range of remote power units on liquid fuels similar to the power range of remote power units, working on natural gas

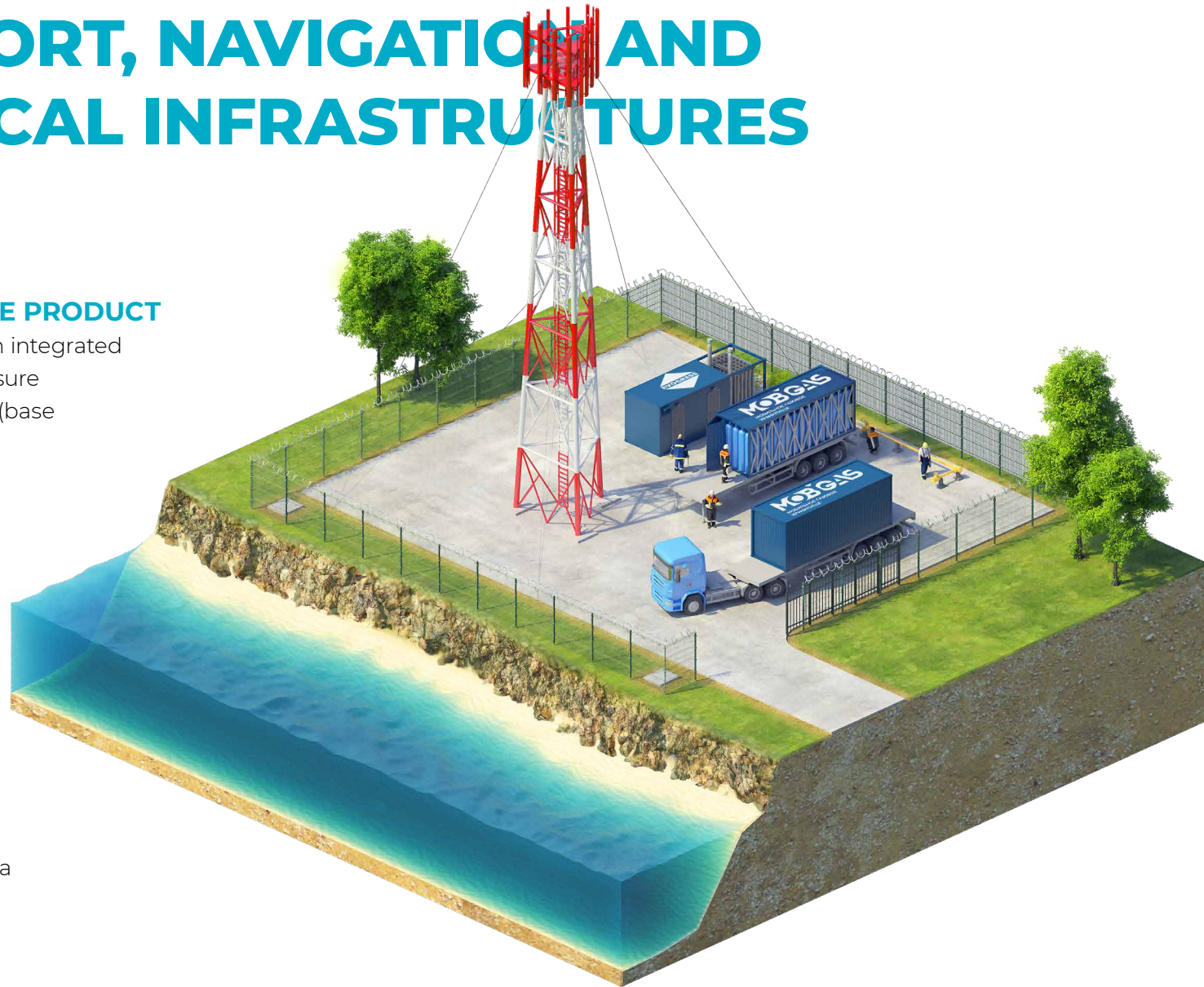


COMPLEX FOR APPLICATION THE OBJECTS OF THE TELECOMMUNICATIONS, ROAD TRANSPORT, NAVIGATION AND METEOROLOGICAL INFRASTRUCTURES

THE APPOINTMENT OF A PERSPECTIVE PRODUCT

The complex of technological equipment with an integrated remote power unit EVOGRESS is designed to ensure uninterrupted operation of telecommunications (base stations), road transport (Autonomous posts of communication and heating, lighting of road facilities on Federal highways, etc.), navigation (aviation and marine navigation systems), meteorological (weather stations and emergency early warning stations) infrastructure, as well as other infrastructure facilities that require continuous offline operation.

The complex of technological equipment with integrated remoter power unit EVOGRESS is able to work on available local fuels (compressed natural gas, liquefied petroleum fuel, diesel fuel, etc.), having a long interval between refueling.



CONTACT INFORMATION



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