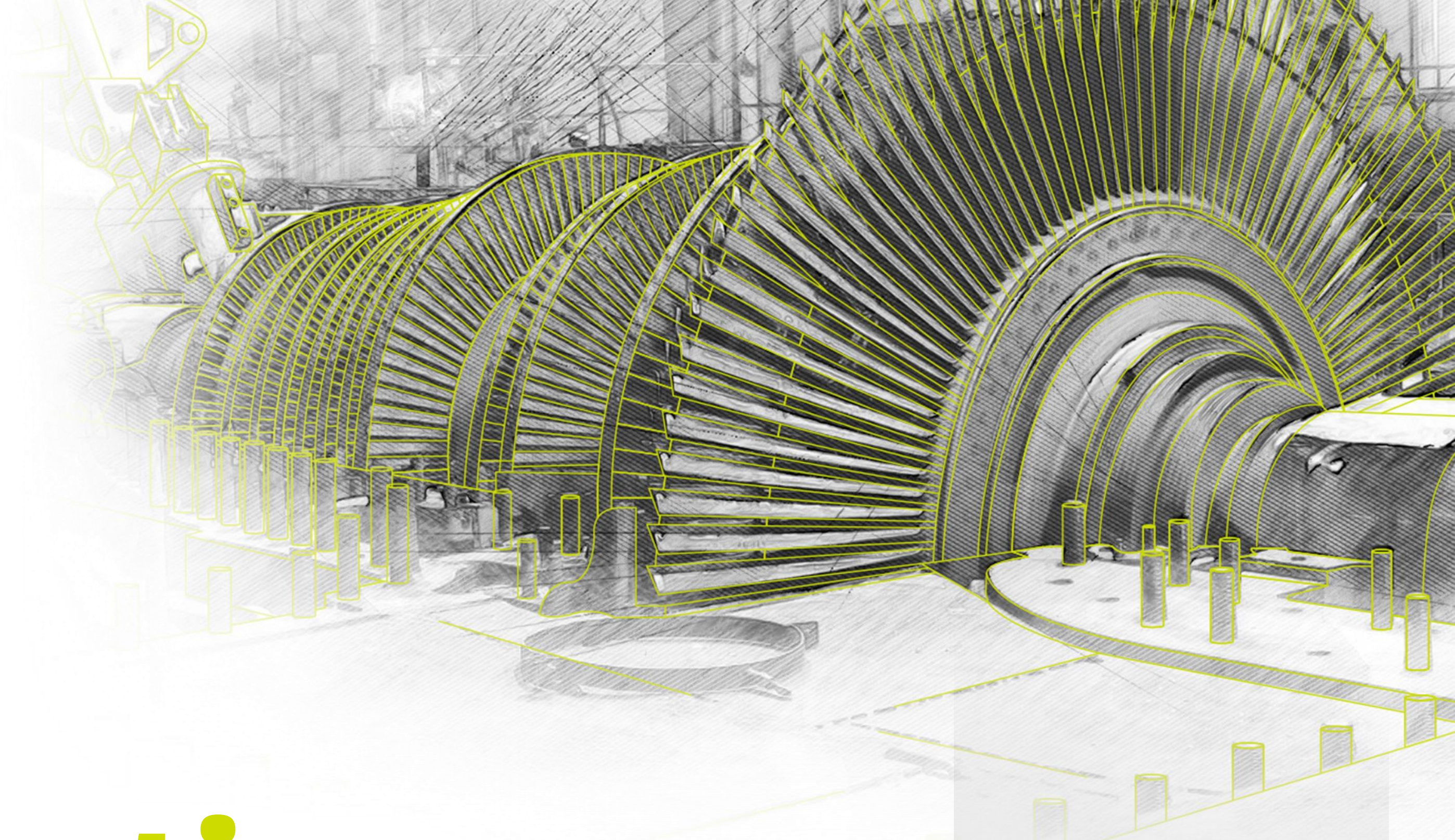




DB ENERGY

Zero-emission industry



Cogeneration

Wrocław, 2024

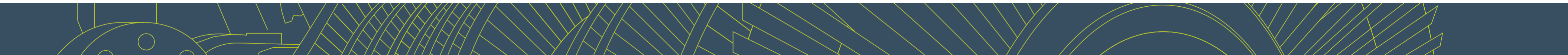
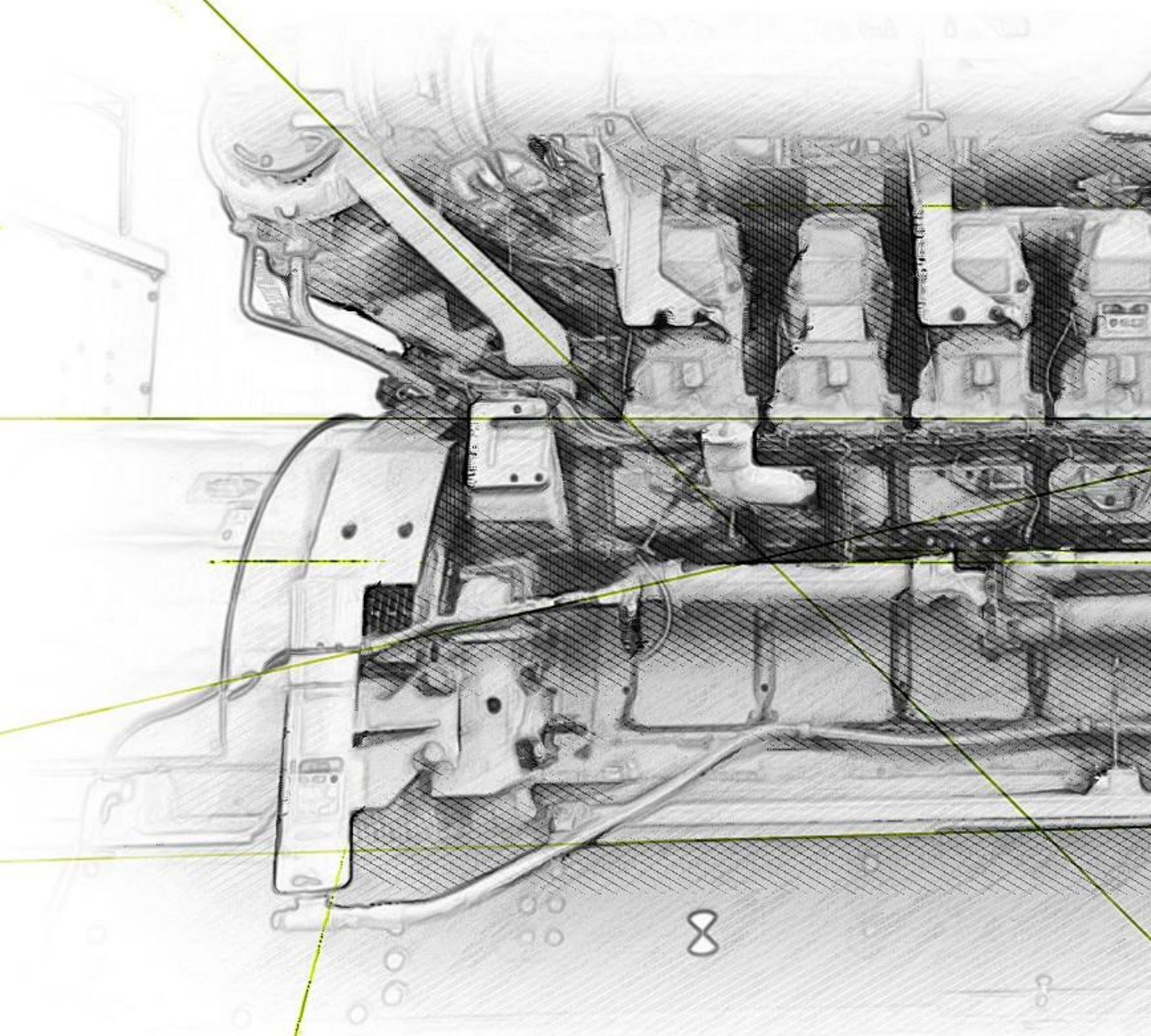
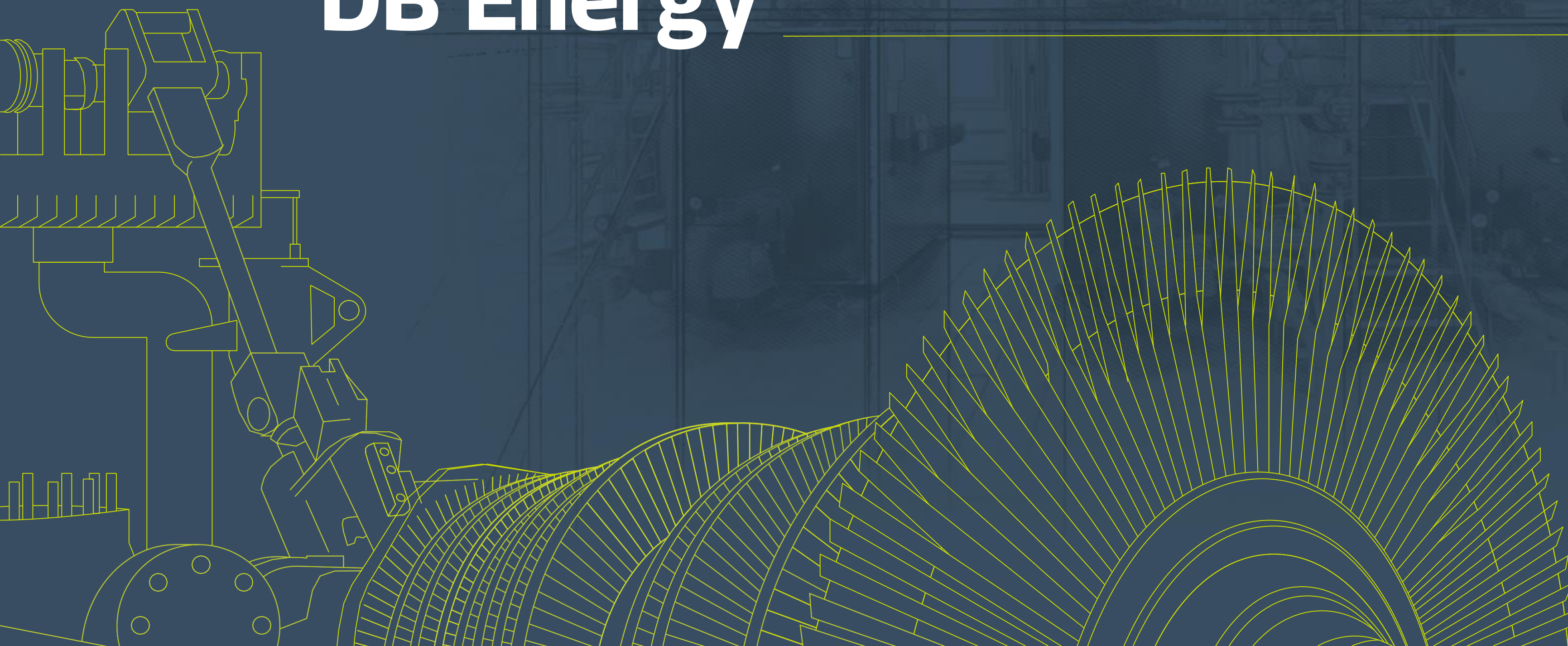


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DB Energy



What do WE DO?

DB Energy was founded in 2010 in Wrocław. We have been developing zero emission strategies and improving energy efficiency in the industry for more than 10 years.



Consultancy

Walk Through Audit

Company Energy Audit

Energy Efficiency Audit

Zero emission strategies

White Certificates



Investments

development of energy saving investments

financing and project implementation in the ESCO model or as the General Contractor

investor supervision



Diagnostics

control of installations efficiency and their energy consumption

continuous attempts to identify potential for further energy efficiency improvements

measurements

Comprehensive CONSULTING

Complex support for our client while developing energy-saving investments.



Audit Walk Through

we identify the potential for energy-saving investments



Company Audit

an obligatory audit for large companies, we develop a long-term energy efficiency improvement plan



Energy Efficiency Audit

we provide a complete concept of an energy-saving investment



Zero emission strategies

plant's zero emissions due to reducing CO₂ emission



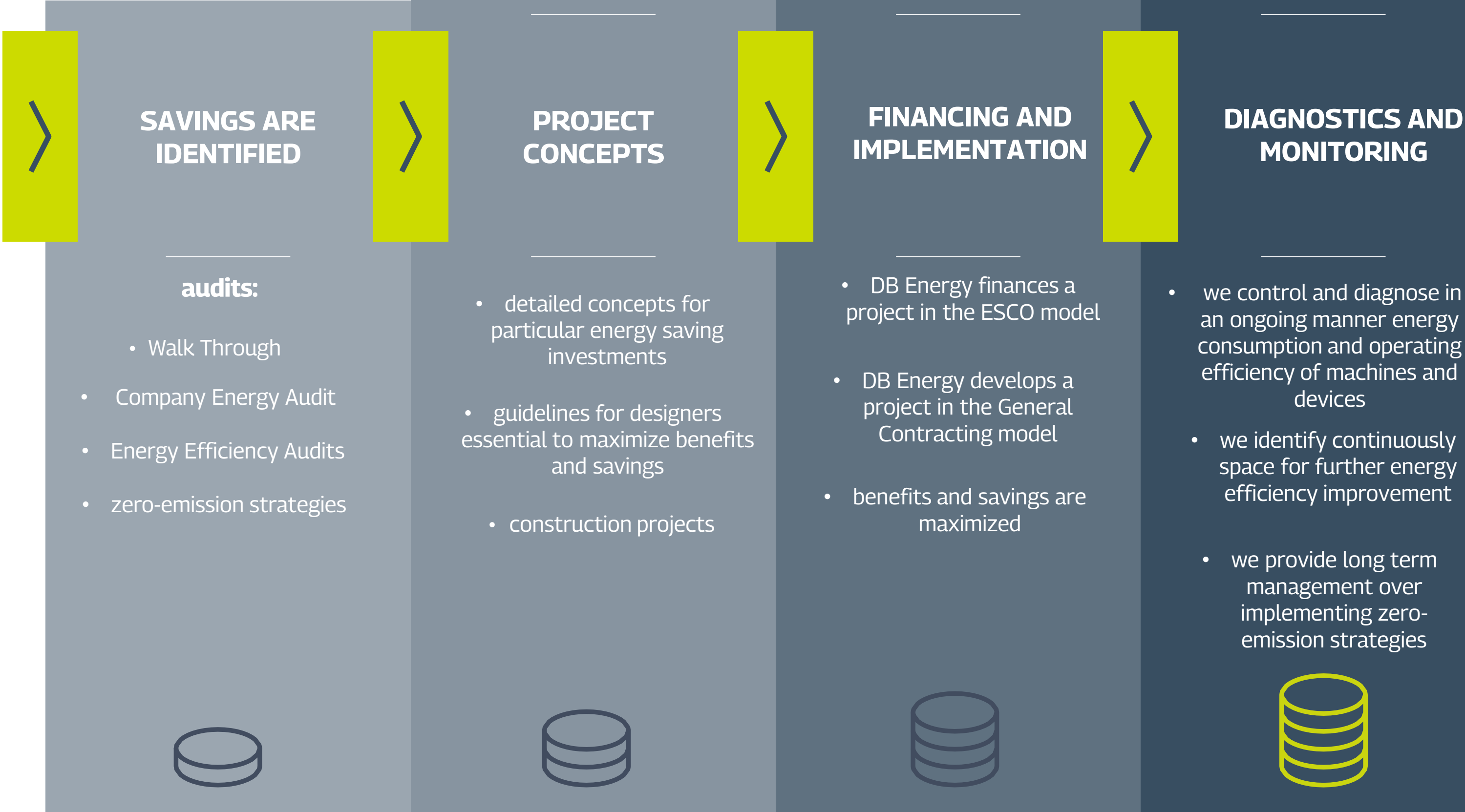
Concepts and projects

feasibility studies, technical implementation concepts and construction projects for energy-saving investments

Comprehensive support for the process to improve **ENERGY EFFICIENCY**

we manage extensively the entire process to improve energy efficiency

benefits and savings are maximized for a client



Cogeneration



How does **COGENERATION WORK?**

COGENERATION (CHP - Combined Heat and Power)

is a simultaneous generation of electrical energy along with thermal and cooling energy.

Natural gas

High nitrogen natural gas

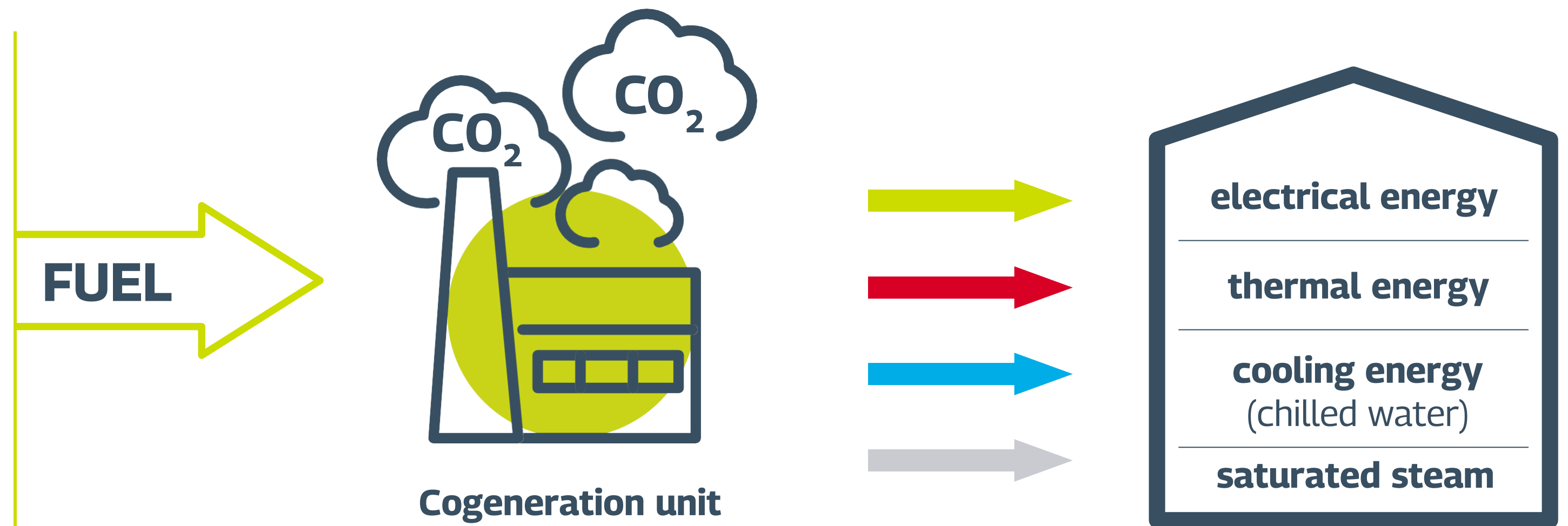
Biogas

Mine gas

Synthesis gas

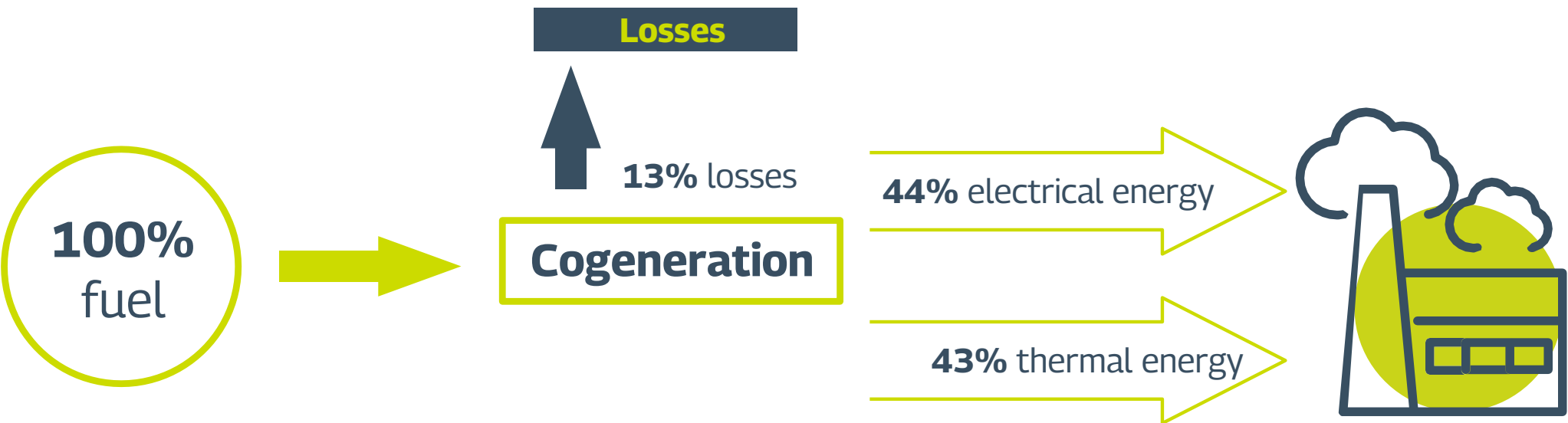
Cok oven gas

Coal

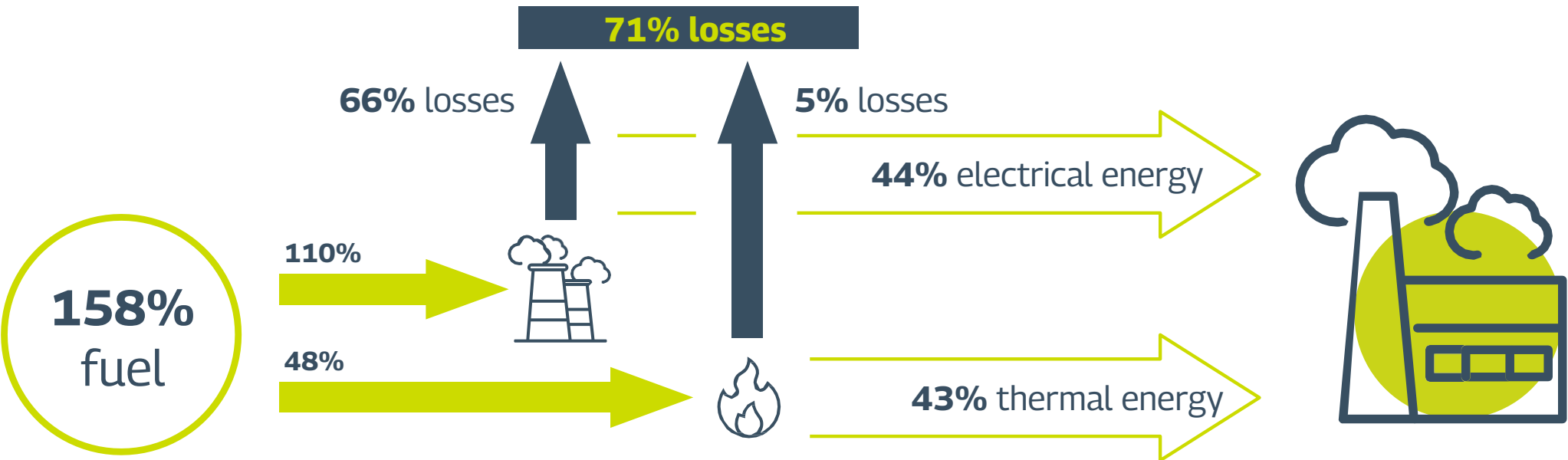


How does COGENERATION WORK?

Cogeneration



Separate energy production



Why is cogeneration financially viable?

it allows energy losses to be prevented while simultaneously generating electrical energy, thermal and cooling energy.

it allows energy transfer losses to be prevented while generating energy on site - in a client's industrial plant.

How does GAS COGENERATION WORK?

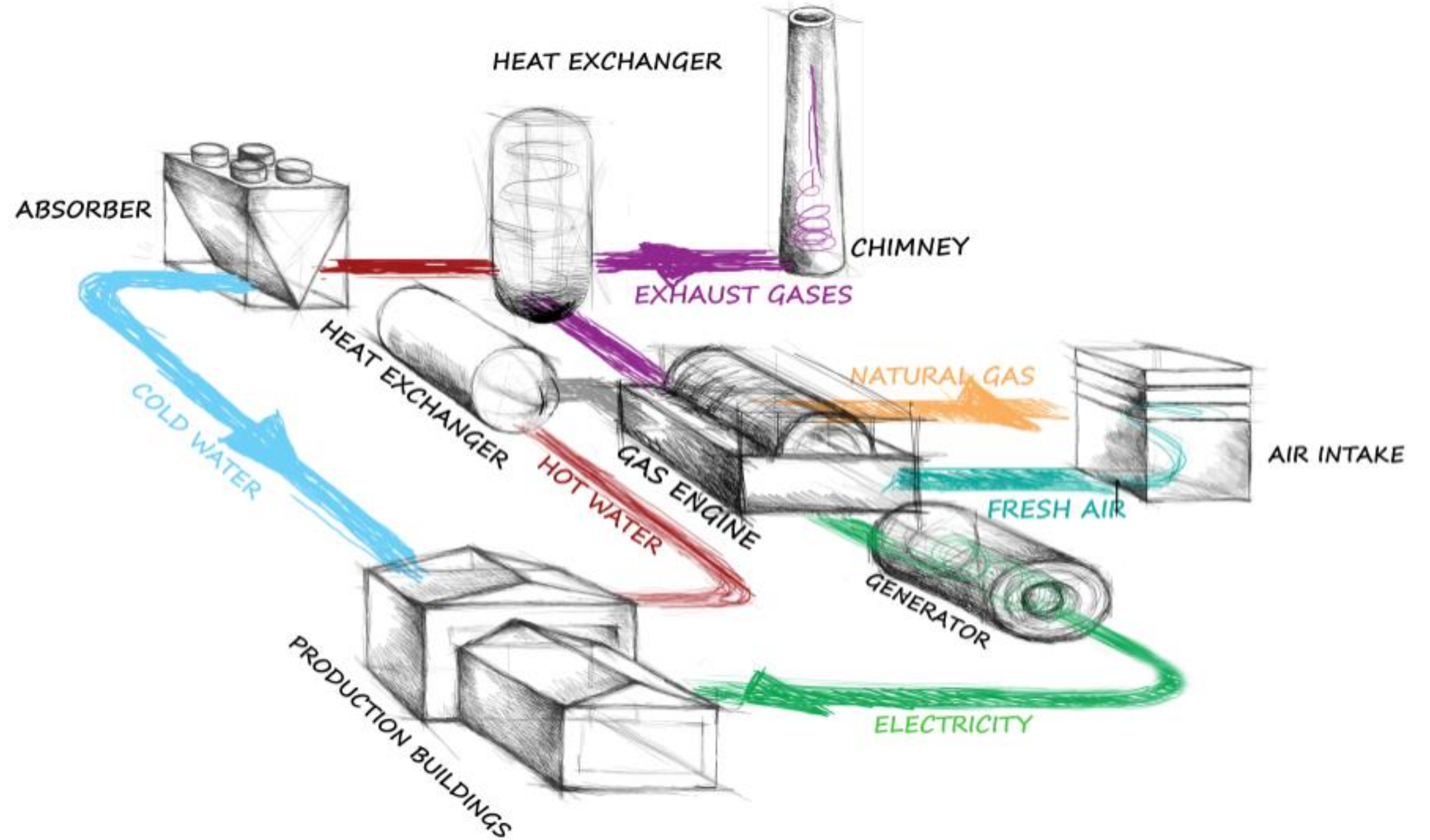
cogeneration is usually driven by a standard internal combustion engine

an engine drive shaft powers a synchronous generator through a drive gear and, therefore, energy is generated

while combusting fuel, generated thermal energy is transferred into cooling oil which is stored in an engine jacket and through a flue gas exchanger it is then transferred to hot water which cools flue gases

the unit might be equipped with an aggregate to produce chilled water

the unit is additionally equipped with a cooling installation in order to enhance its performance



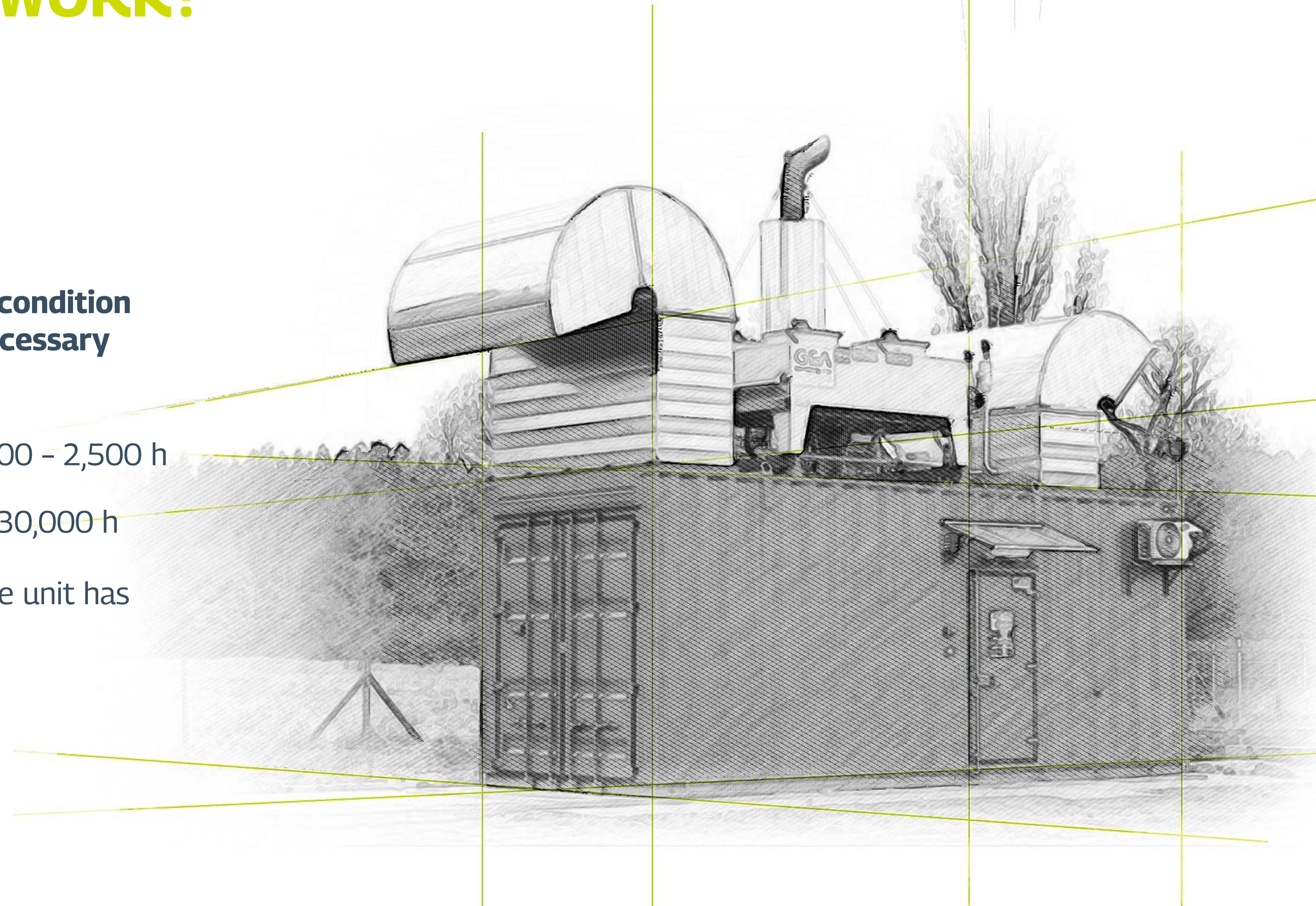
How does GAS COGENERATION WORK?

In order to maintain the unit in a good condition and to keep the warranty valid, it is necessary to:

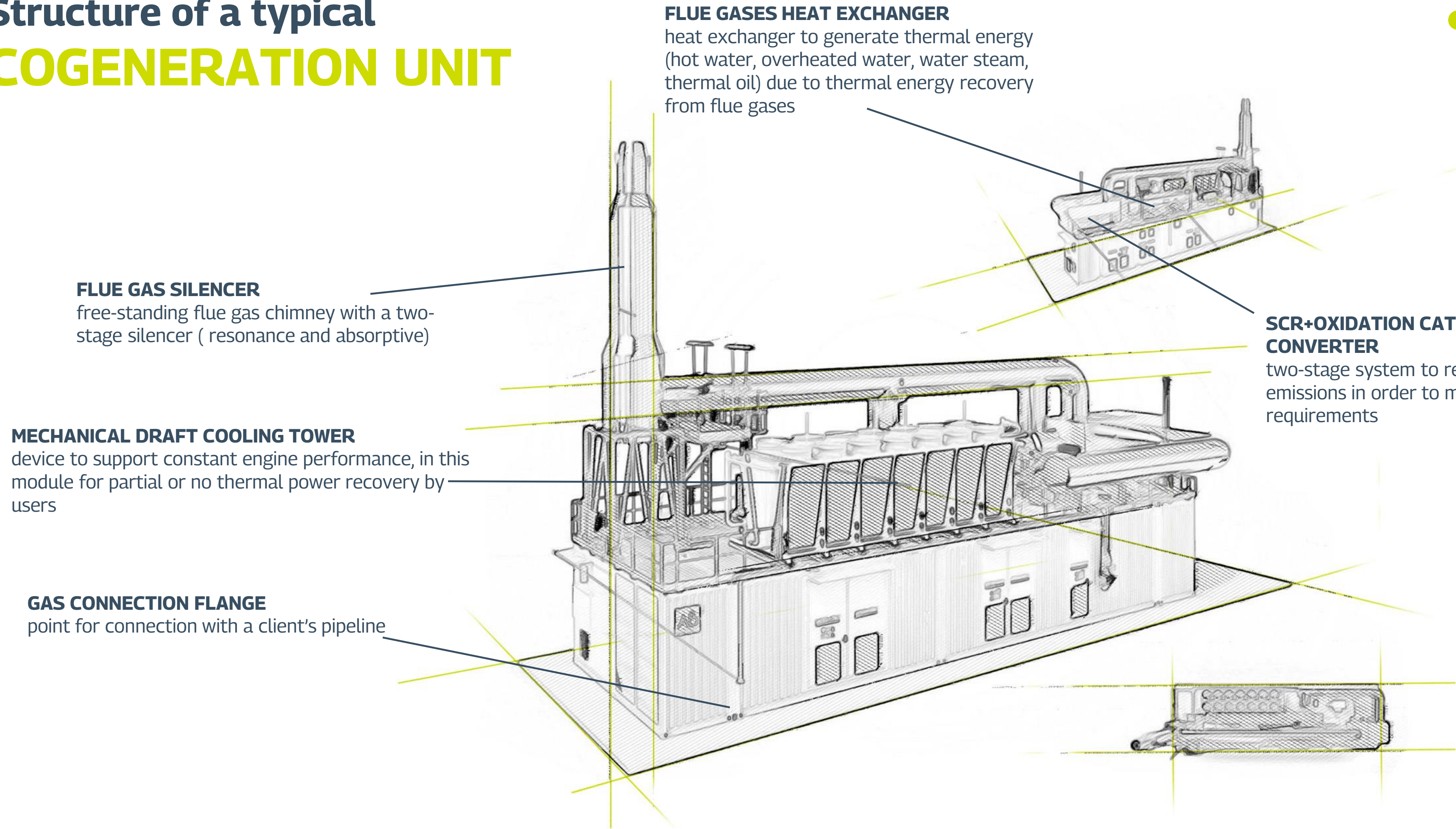
perform a regular maintenance every 1,500 - 2,500 h

perform a refurbishment every 25,000 - 30,000 h

perform a general refurbishment after the unit has been operating for 72,000-80,000 h



Structure of a typical **COGENERATION UNIT**



FLUE GASES HEAT EXCHANGER

heat exchanger to generate thermal energy (hot water, overheated water, water steam, thermal oil) due to thermal energy recovery from flue gases

FLUE GAS SILENCER

free-standing flue gas chimney with a two-stage silencer (resonance and absorptive)

SCR+OXIDATION CATALYTIC CONVERTER

two-stage system to reduce NO_x and CO₂ emissions in order to meet the local requirements

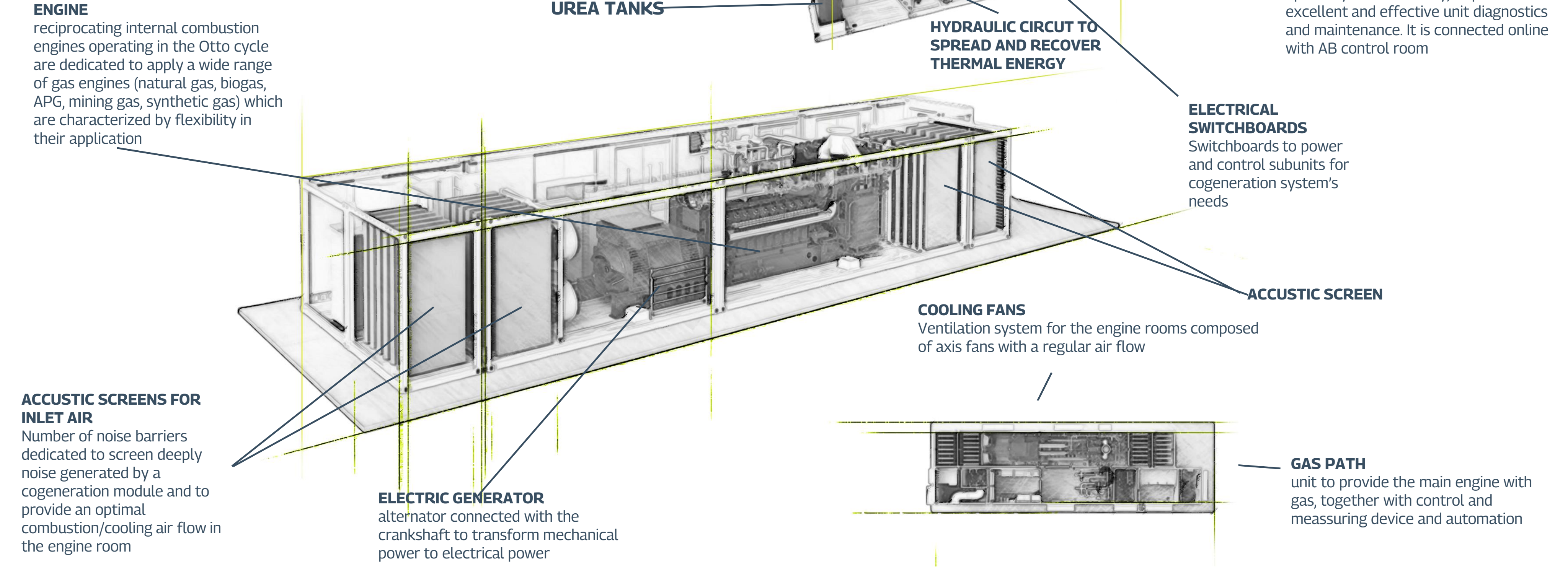
MECHANICAL DRAFT COOLING TOWER

device to support constant engine performance, in this module for partial or no thermal power recovery by users

GAS CONNECTION FLANGE

point for connection with a client's pipeline

Structure of a typical COGENERATION UNIT



ENGINE
reciprocating internal combustion engines operating in the Otto cycle are dedicated to apply a wide range of gas engines (natural gas, biogas, APG, mining gas, synthetic gas) which are characterized by flexibility in their application

ELECTRICAL SWITCHBOARDS
switchboards to connect an alternator to the energy grid

OIL TANKS
2 tanks to store lubricating oil (fresh and wasted) equipped with water-tight tubs

ARRESTER
A panel in an alternator preventing from voltage surge

SCADA SYSTEM
Supervision and control system of every ECOMAX® subsystems, developed by AB in order to manage cogeneration unit optimally and efficiently, to provide excellent and effective unit diagnostics and maintenance. It is connected online with AB control room

UREA TANKS

HYDRAULIC CIRCUIT TO SPREAD AND RECOVER THERMAL ENERGY

ELECTRICAL SWITCHBOARDS
Switchboards to power and control subunits for cogeneration system's needs

ACCUSTIC SCREEN

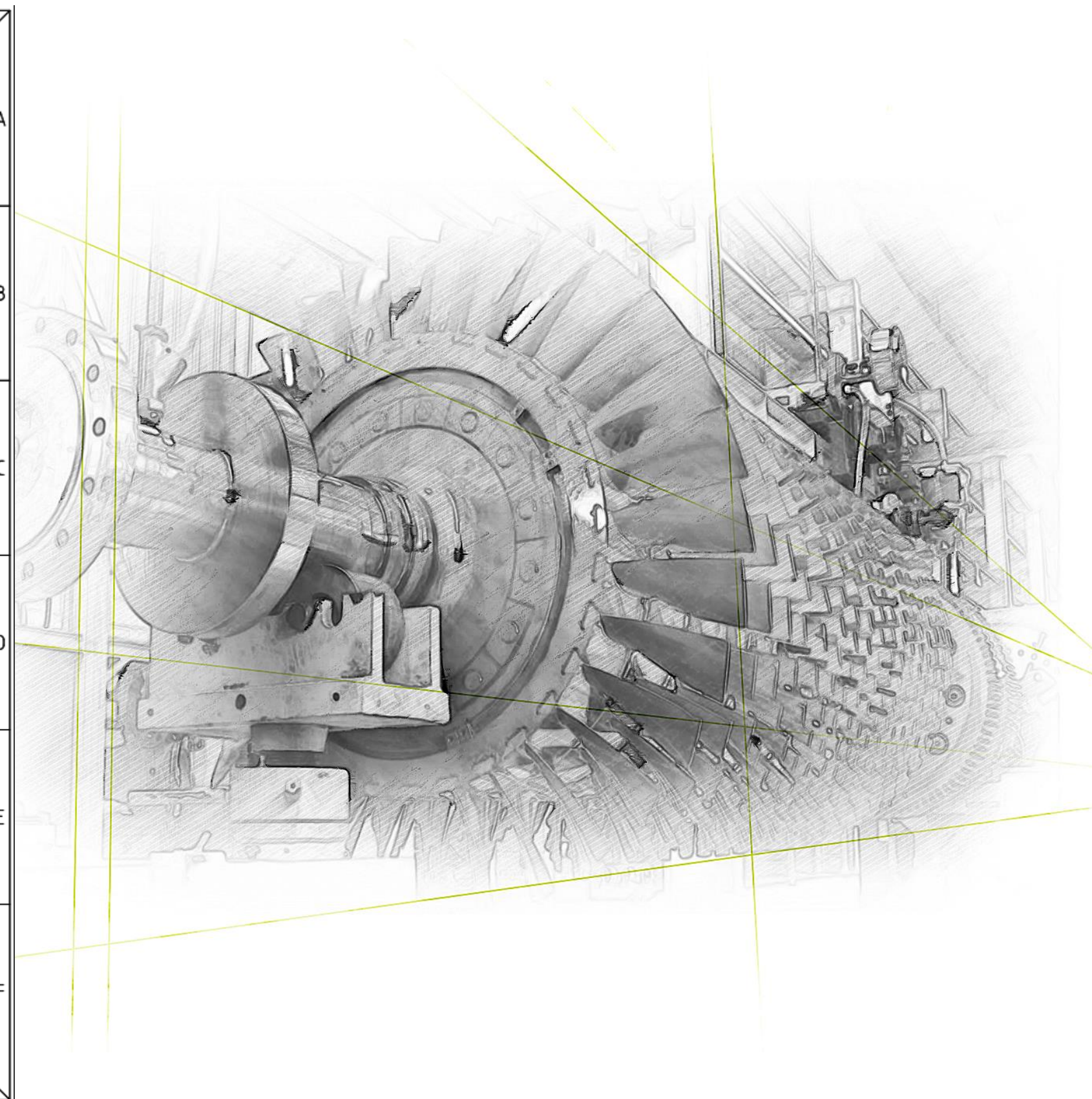
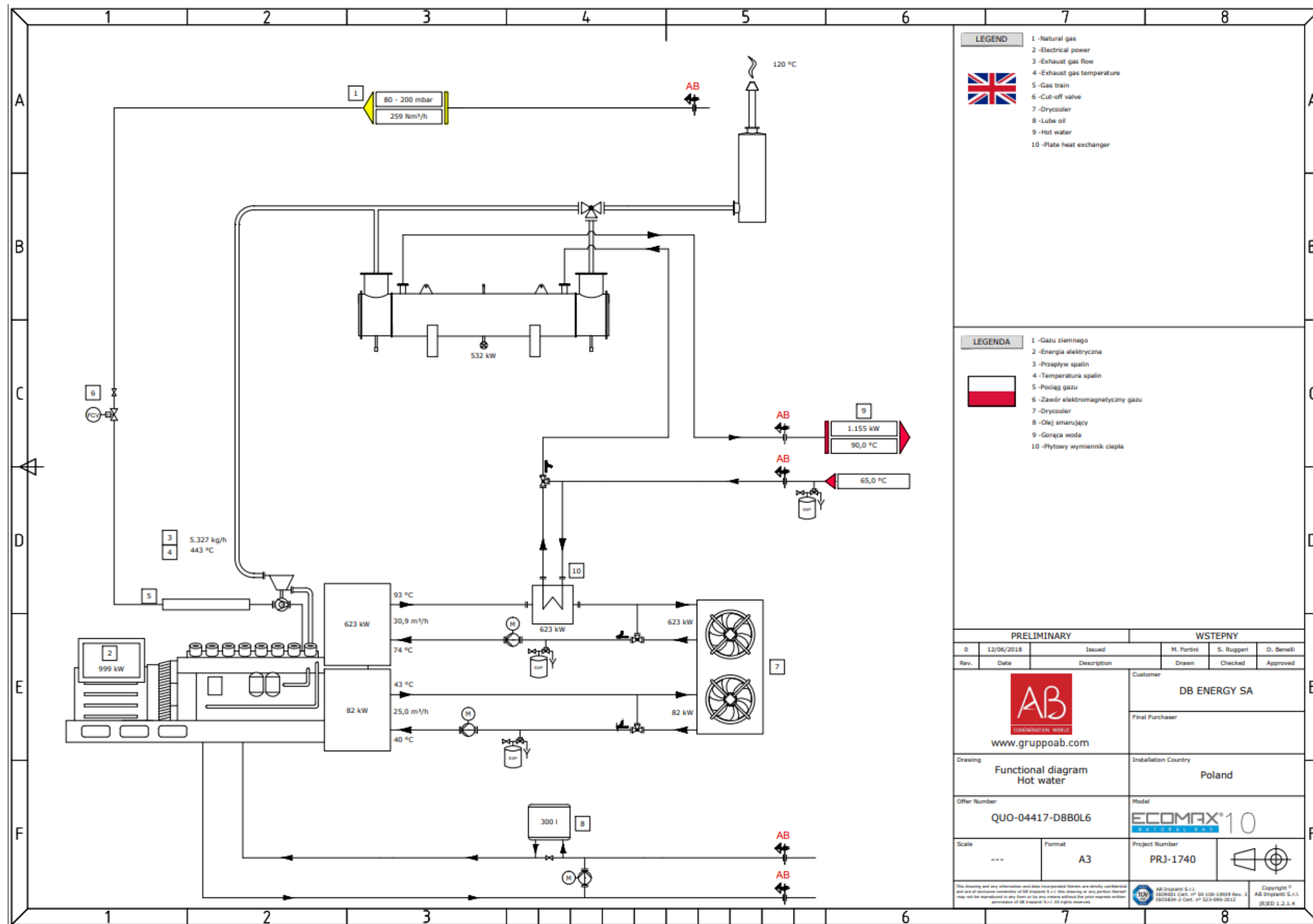
COOLING FANS
Ventilation system for the engine rooms composed of axis fans with a regular air flow

ACCUSTIC SCREENS FOR INLET AIR
Number of noise barriers dedicated to screen deeply noise generated by a cogeneration module and to provide an optimal combustion/cooling air flow in the engine room

ELECTRIC GENERATOR
alternator connected with the crankshaft to transform mechanical power to electrical power

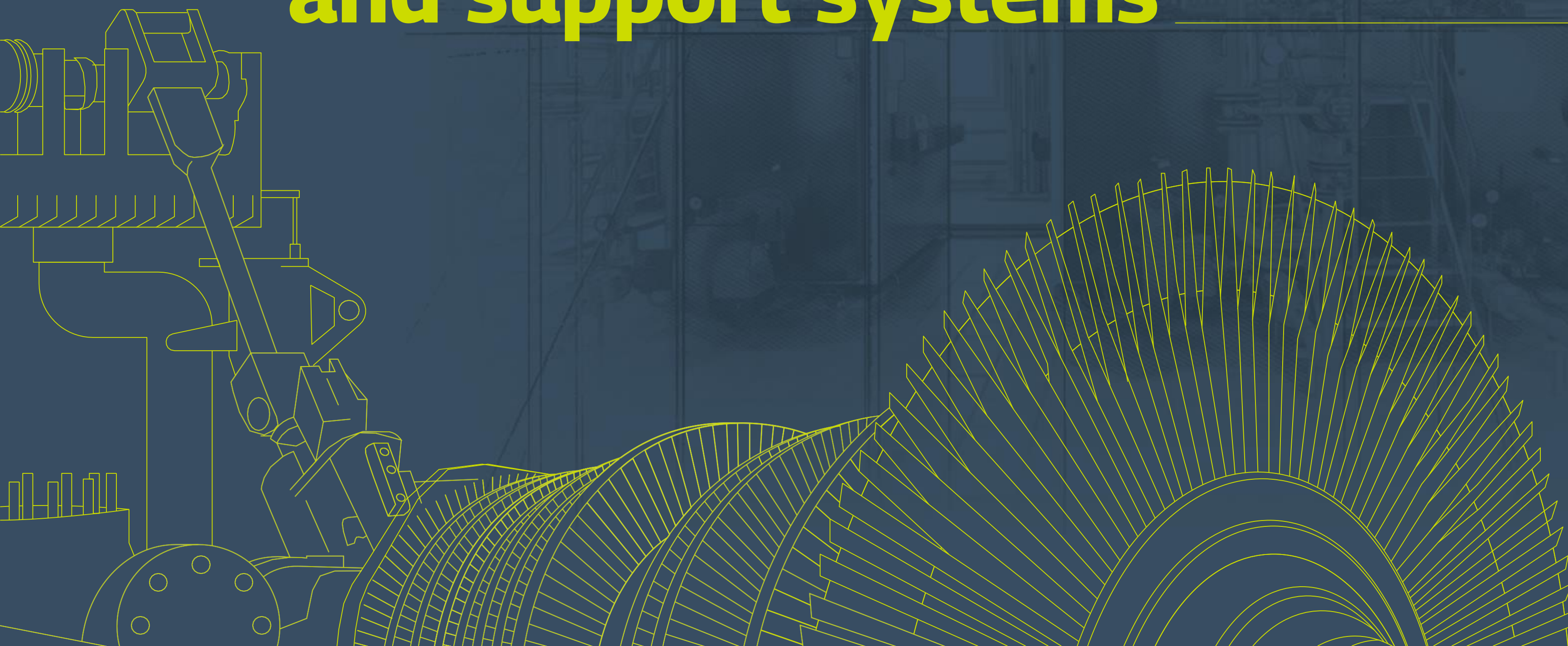
GAS PATH
unit to provide the main engine with gas, together with control and measuring device and automation

SCHEME OF AN EXAMPLATORY INSTALLATION



PRELIMINARY		WSTĘPNY	
Rev.	Date	Description	Customer
0	12/06/2018	Issued	M. Fortini S. Ruggieri D. Benelli
		Drawn	Checked
		Approved	
 www.gruppoab.com		DB ENERGY SA Final Purchaser	
Drawing: Functional diagram Hot water		Installation Country: Poland	
Offer Number: QUO-04417-D8B0L6		Model: ECOMAX¹⁰	
Scale: ---	Format: A3	Project Number: PRJ-1740	
<small>This drawing and any information and data incorporated therein are strictly confidential and are of exclusive property of AB Ingersoll Rand S.p.A. Any drawing or any portion thereof may not be reproduced in any form or by any means without the prior express written permission of AB Ingersoll Rand S.p.A. All rights reserved.</small>		 AB Ingersoll S.p.A. 3603804 - C.A. di SpA - 100 - 10038 Roma, I 00188/9 - 2 - Cont. 07 523 980 2012	Copyright © AB Ingersoll S.p.A. (0/20) 1.2.1.4

Benefits and support systems



DB Energy

COGENERATION

Benefits

savings – from EUR 450 thousand annually
lowered costs for electrical, thermal and cooling energy purchase

low emission energy source – reduced CO₂ emission by 40%
environmental and PR advantage

increased energy generation equals 40% more efficient consumption of fuel compared with traditional methods

30% lower cost for electrical energy generated by a cogeneration unit compared with energy purchased withing an electricity grid

substantially – even by 80% – decreased variable distribution costs, among which a capacity fee is to be found

reliability, independence and safety of the power supply
partial independence from energy being supplied by a grid, reduction of unplanned downtime

investment with no financial outlays
financing and project implementation by DB Energy in the ESCO model

off-balance investment depending on agreement provisions

financial support systems, incl. guaranteed bonus

possible settlement with a licence granted to DB Energy

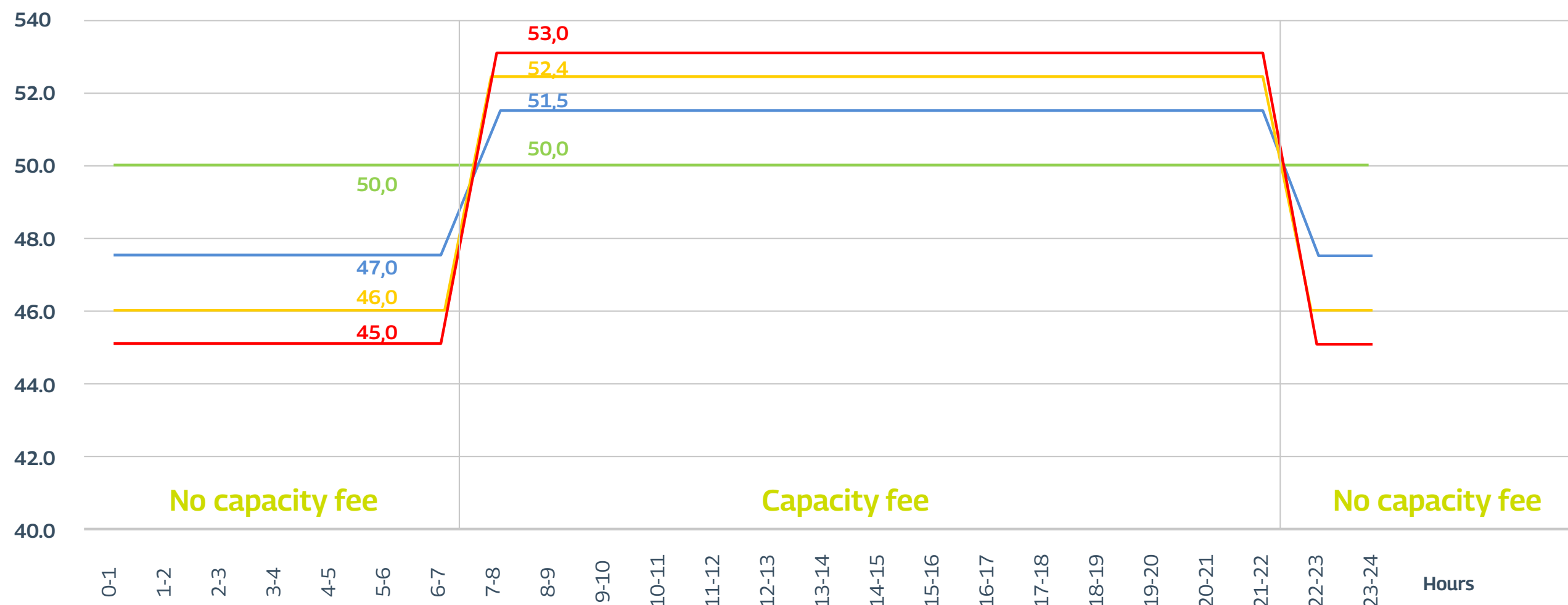
Benefits due to your own energy source

CAPACITY FEE REDUCTION

An average electrical energy intake from an external grid during working days

Your own energy source allows your profile of electrical energy supplied by the grid to be flat-lined, this, in consequence, results in **even 83%** lower capacity fee!

Electrical energy consumption [MWh]



Statutory end users division

- K-4 - difference of >15%
- K-3 - difference of <10%;15%>
- K-2 - difference of <5%;10%>
- K-1 - difference of <5

- Group K1
- Group K2
- Group K3
- Group K4

Data for the explanatory year of 2021	Annual total energy consumption	Energy consumption in peak hours - 7 a.m. - 10 p.m. in working days	Energy consumption in off-peak hours in working days	Average energy consumption in peak hours	Average energy consumption in off-peak hours	Capacity fee with no discount	Discount	Capacity fee with discount	Percentage inclination
		ZSn	ZPSm	ZSn	ZPSn	ZSn x 76,20 zł/MWh		Wom=A x Zk x SoM	
Group K-4	438,000 MWh	201,930 MWh	102,870 MWh	53.0 MW	45.0 MW	PLN 15,387,066	PLN 0	PLN 15,387,066	18%
Group K-3	438,000 MWh	199,644 MWh	105,156 MWh	52.4 MW	46.0 MW	PLN 15,212,873	PLN 2,586,188	PLN 12,626,684	14%
Group K-2	438,000 MWh	196,215 MWh	108,585 MWh	51.5 MW	47.5 MW	PLN 14,951,583	PLN 7,457,792	PLN 7,475,792	8%
Group K-1	438,000 MWh	190,500 MWh	114,300 MWh	50.0 MW	50.0 MW	PLN 14,516,100	PLN 12,048,363	PLN 2,467,737	0%

There is a possibility to be granted financial support for new cogeneration units. Depending on the device electrical power, the following bonus schemes are provided:

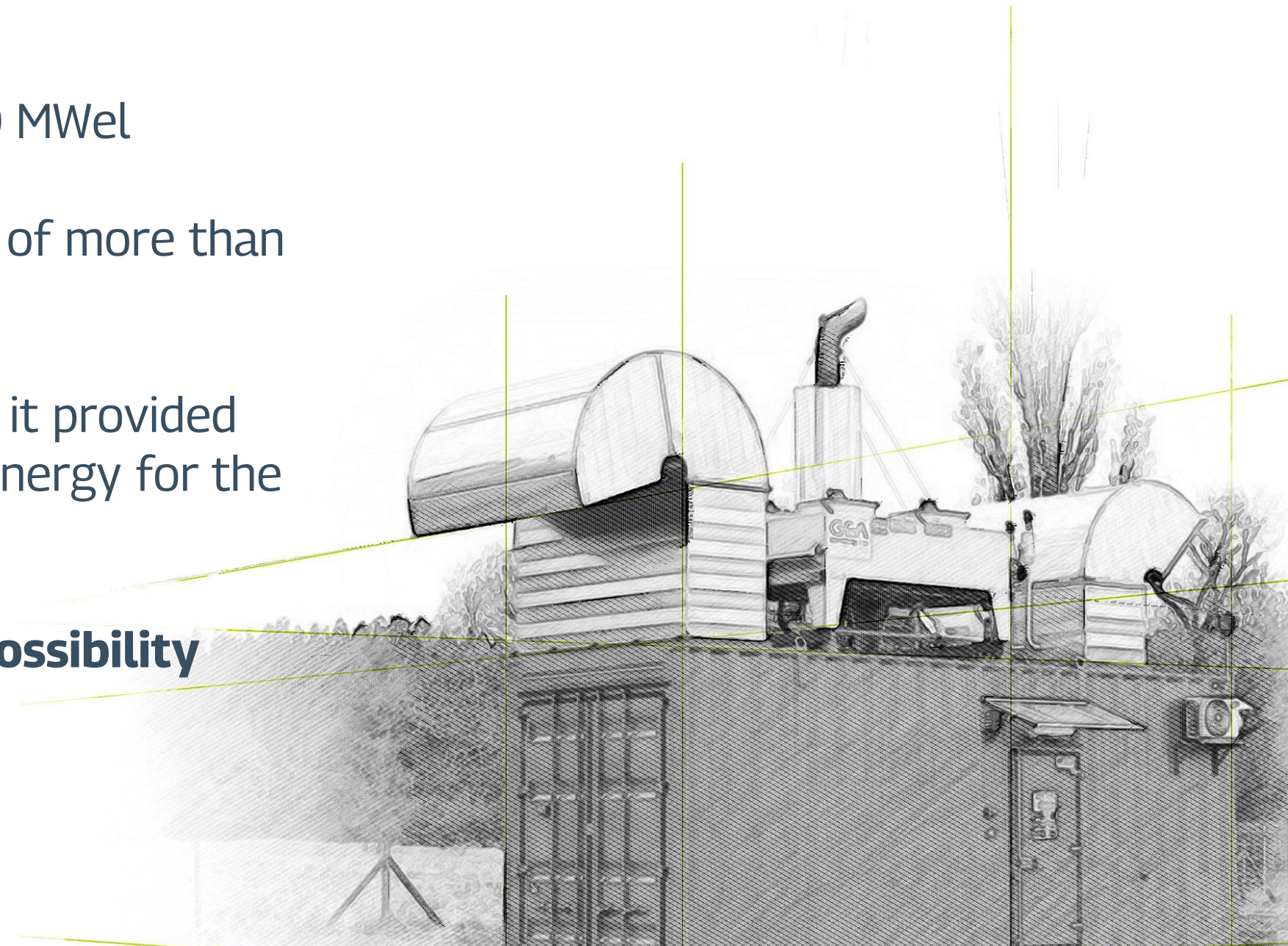
guaranteed bonus – for units with installed power of 1 MWel

cogeneration bonus (CHP auctions) – for units with installed power of 1 – 50 MWel

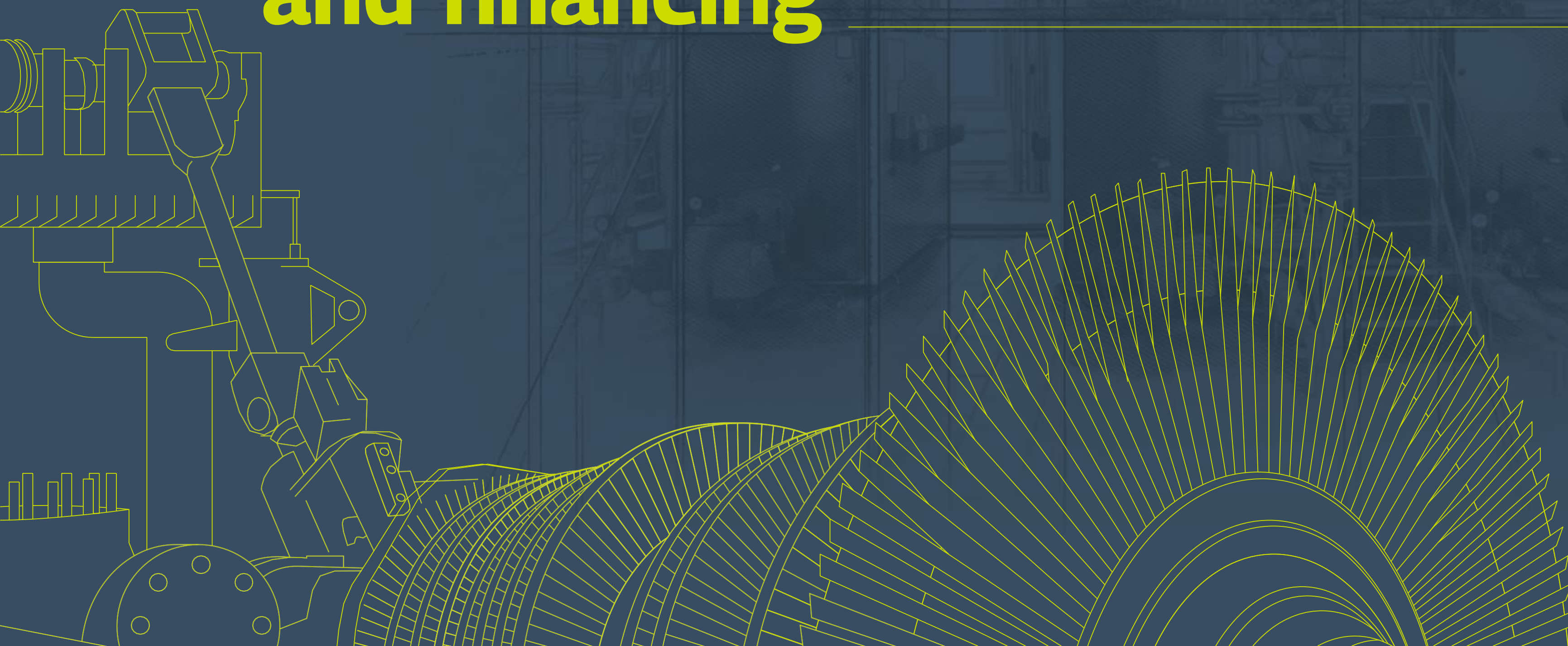
individual cogeneration bonus (applications)– for units with installed power of more than 50 MWel

The guaranteed bonus is the most reliable form of financial support. Currently, it provided a possibility to be granted PLN 148.49 for each generation MWh of electrical energy for the next 15 years (up to PLN 1.1 million annually).

The remaining bonus schemes for larger units do not provide for 100% possibility of being financially granted.



Implementation and financing



Cogeneration

PROJECT PREPARATION

DB Energy provides comprehensive management of a project while investing in cogeneration

General Contracting by DB Energy means that benefits and savings are maximized for a client



General frame of CHP DESIGN CONCEPT



Energy analyses and CHP power selection

Analysis of electrical, thermal and cooling energy to select optimal power for a CHP unit

Concept to implement a CHP unit in a plant

Land development plan with description and drawings of CHP connection to a plant's infrastructure and (natural gas, electrical and thermal energy) supply grids



General frame of CHP DESIGN CONCEPT



Concept on how to manage generated energy

Analysis of possibilities and ways how to utilize electrical, thermal and cooling energy

Investment financial analysis

Calculation of financial flows for an optimal technical solution, analysis of possible scenarios with changeable energy prices. Analysis of possible financial support.



DB Energy

COGENERATION

Data crucial for
cogeneration
profitability analysis

electrical power demand for min. one year (hourly or 15-minute data)

projected investments which result in increased installed power – predictable increase in electrical/thermal energy consumption

thermal power of applied boilers – number, type, power, operating parameters (temperature, power supply/ return), efficiency, etc.

annual thermal energy demand for each carrier (steam, hot water, chilled water – hourly or 15-minute data)

price EUR/MWh and annual cost of natural gas (incl. fixed fees) with an average gas calorific value)

price EUR/MWh and annual cost of electrical energy purchase (incl. transmission fee)

cost of thermal energy generation/purchase (EUR/MW of GJ for hot water)

process steam parameters and information on condensate (pressure, temperature, volume of returning condensate, etc.)

information on chilled water (power, temperature, its cyclicity)

schemes and maps – technological scheme of a boiler room, technological and electrical scheme of a plant, a plant map (.dwg)

General frame of CHP DESIGN CONCEPT

ACTIVITIES [MONTHS]	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. PROJECT CONCEPT	●	●																
2. SPECIFICATION OF ENVIRONMENTAL CONDITIONS, CONNECTION TO THE GAS AND ELECTRICAL GRID		●	●	●	●	●												
3. ORDER AND DELIVERY OF A CHP UNIT*			●	●	●	●	●	●	●	●	●	●						
4. RETROFIT DESIGN, INCL. PROJECTS SUCH AS A CONSTRUCTION, AUTOMATION AND MONITORING SYSTEM PROJECT; AN INVESTMENT PROGRESS AND PAYMENT SCHEDULE TOGETHER WITH A SCHEDULE ON DEVICES DELIVERY; PREPARING LICENCE APPLICATIONS FOR AN INVESTMENT							●	●	●									
5. SUBMISSION AND GRANTING BUILDING PERMIT										●	●	●						
6. CONSTRUCTION WORKS (FOUNDATIONS, CONNECTIONS, OTHERS)													●	●	●	●		
7. CHP UNIT IMPLEMENTATION, ITS CONNECTION WITH THE GRID, LAUNCH AND ITS SYNCHRONIZATION)																	●	●

*once a design concept has been approved, it is only possible to purchase a CHP unit unless the client bears the risk of not meeting the requirements specified in stage 2.

HOW IS IT FINANCED?

We prepare a design concept to implement cogeneration units, we finance and implement the project in the following schemes:



**GENERAL
CONTRACTING**



DEBT FINANCING



**DB ENERGY
FINANCING IN THE
ESCO MODEL**
(80/20 savings division,
investment period of 7-8 years)



**ENERGY SUPPLY
CONTRACTS**



general contracting

design

project implementation

client's own financing

fixed assets are owned by a client



debt financing

design

project implementation

support to acquire debt financing (BOŚ Bank, Santander, HP, ING)

client's own financing or client's debt

investment is financially secured by a client's fixed assets



DB Energy financing in the ESCO model

design

project implementation

DB Energy financing in the ESCO model (off-balance investment for a client)

savings division between a client (20%) and DB Energy (80%)

contract duration 7-8 years

fixed assets are owned by DB Energy while the contract duration, when it ends, they become the client's property



energy supply contract

design

project implementation

DB Energy financing within an energy supply contract (off-balance investment for a client)

under the contract the generated energy is sold to the client by DB Energy

fixed assets are owned by DB Energy - with possibility to take them over by a client

TECHNOLOGY SELECTION

Significant issues to assess a supplier

references – portfolio of implemented projects with a possible on-site visit

recommended procedure to achieve min. 75% efficiency

automation offer

CE certificate for the entire cogeneration unit, not for a particular device

SCADA for the entire unit

maintenance scope

Popular suppliers

Gruppo AB

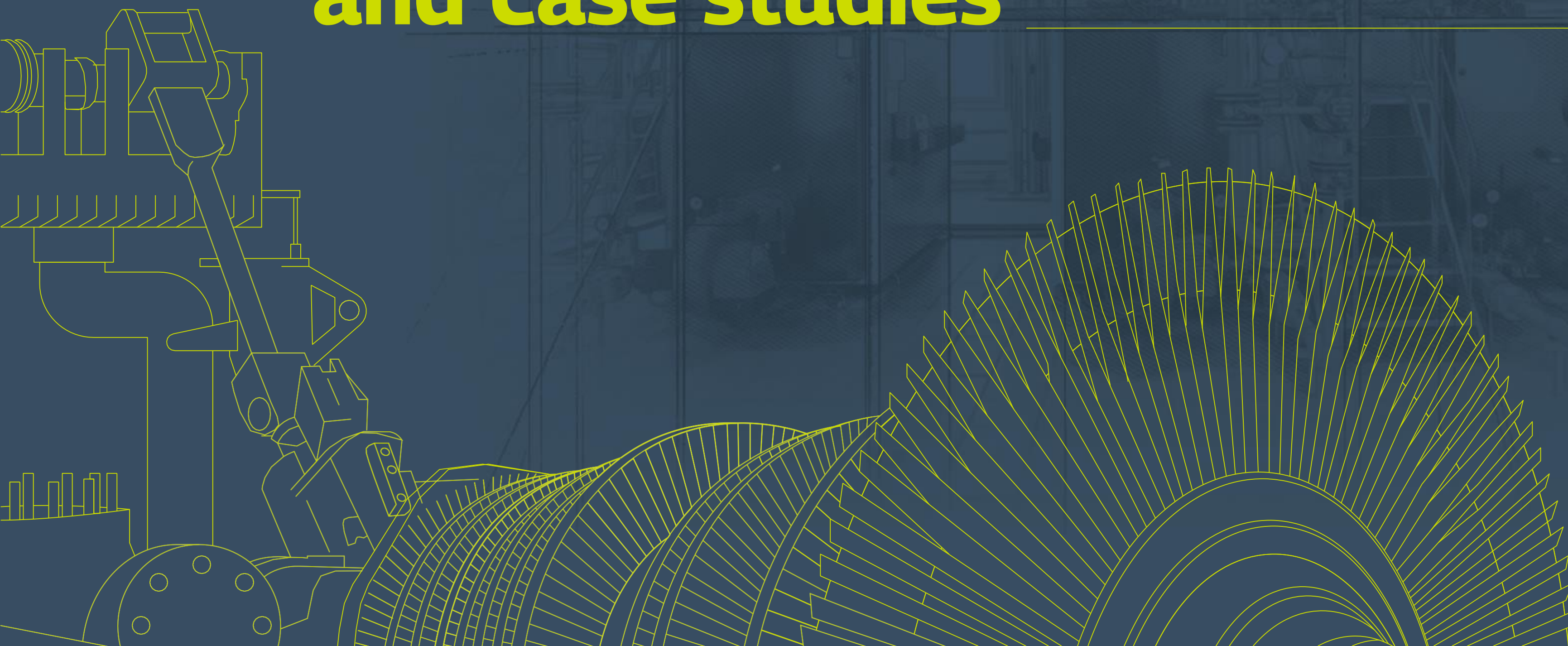
Jenbacher

Eneria

Caterpillar

Tedom MWM

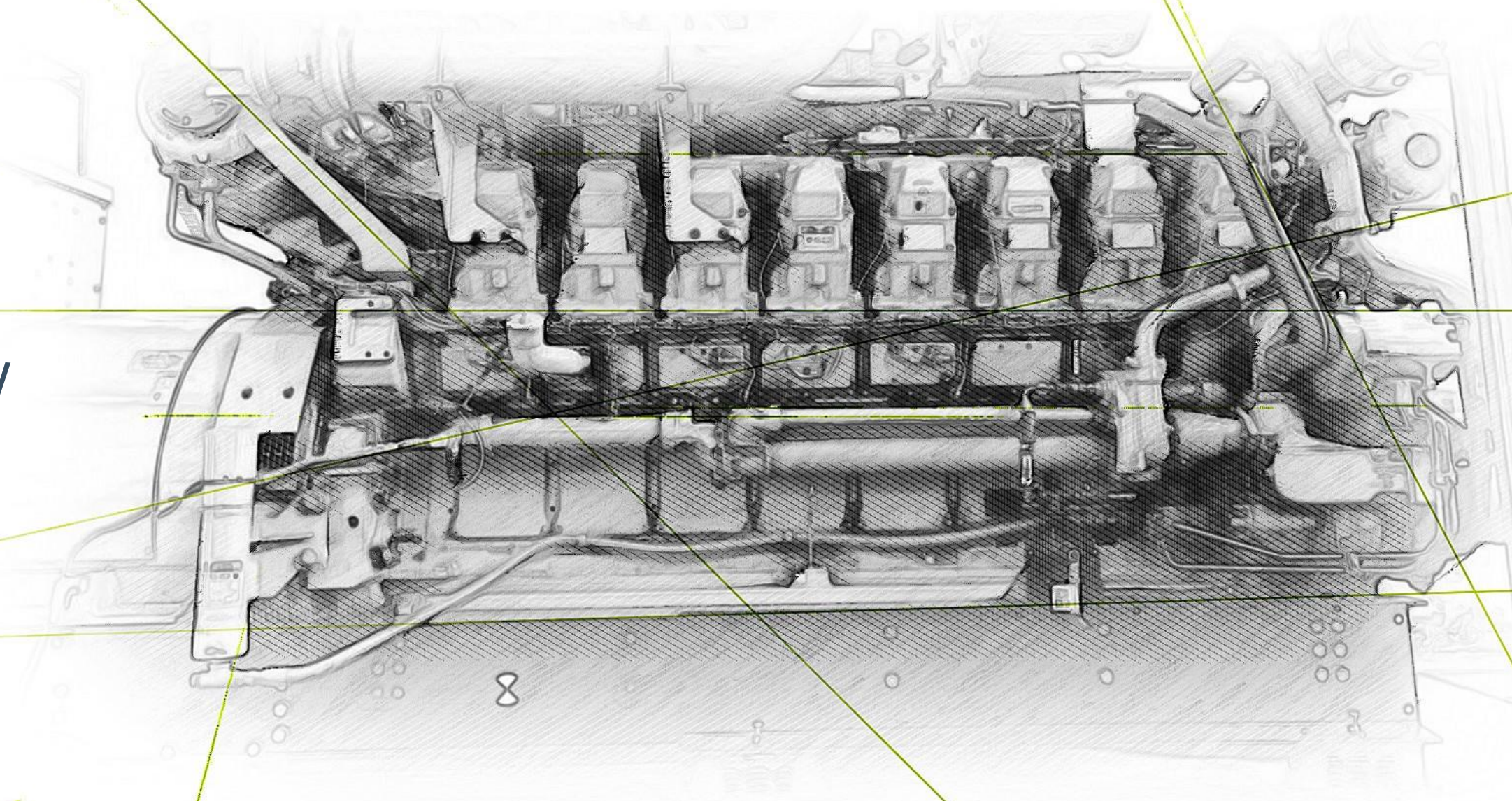
Experience and case studies



Our EXPERIENCE

€ 110 million is the total value of cogeneration projects designed by DB Energy.

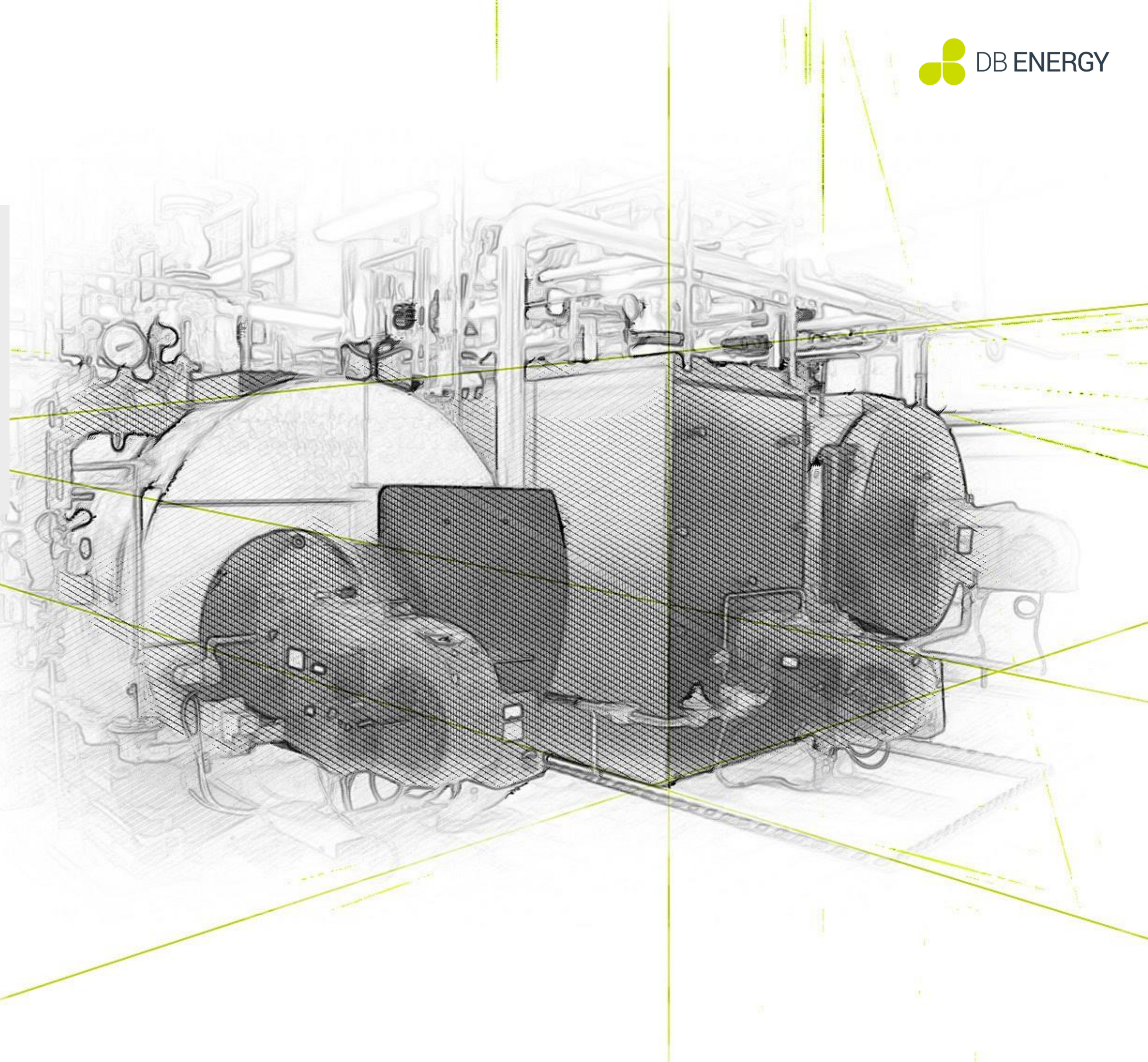
€ 26.5 million is the total value of average annual savings which may be achieved due to cogeneration units designed by DB Energy.



SŁODOWNIA SOUFFLET POLSKA

world leader in malt production

The power supply system
improvement with an application of
waste heat and a cogeneration unit,
developed in the ESCO model



SŁODOWNIA SOUFFLET POLSKA

world leader in malt production

investment value of **€ 6.4 million**
fully covered by DB Energy

Projects key elements

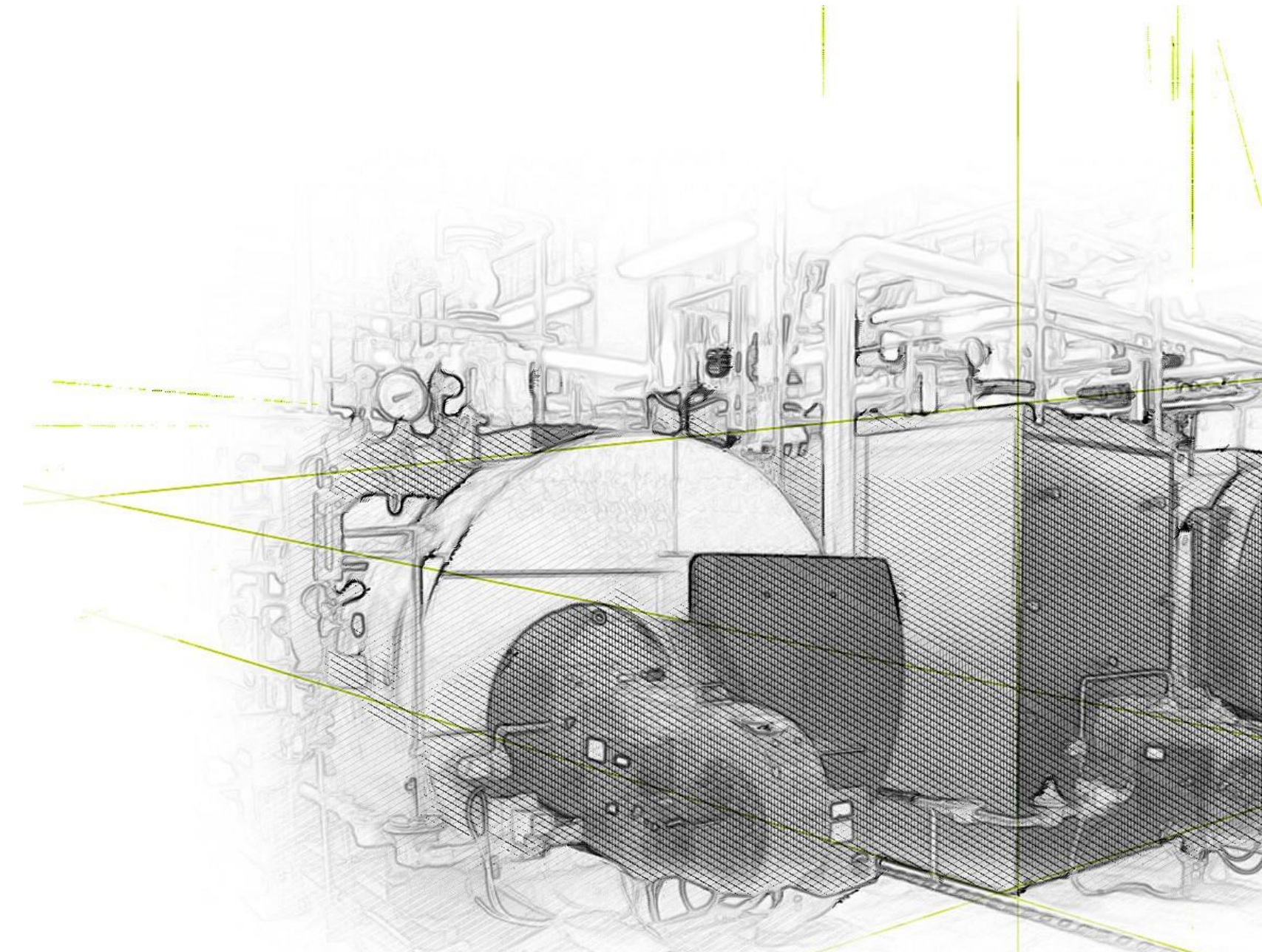
thermal energy recovery

new refrigeration system

new cogeneration system to generate electricity and thermal energy

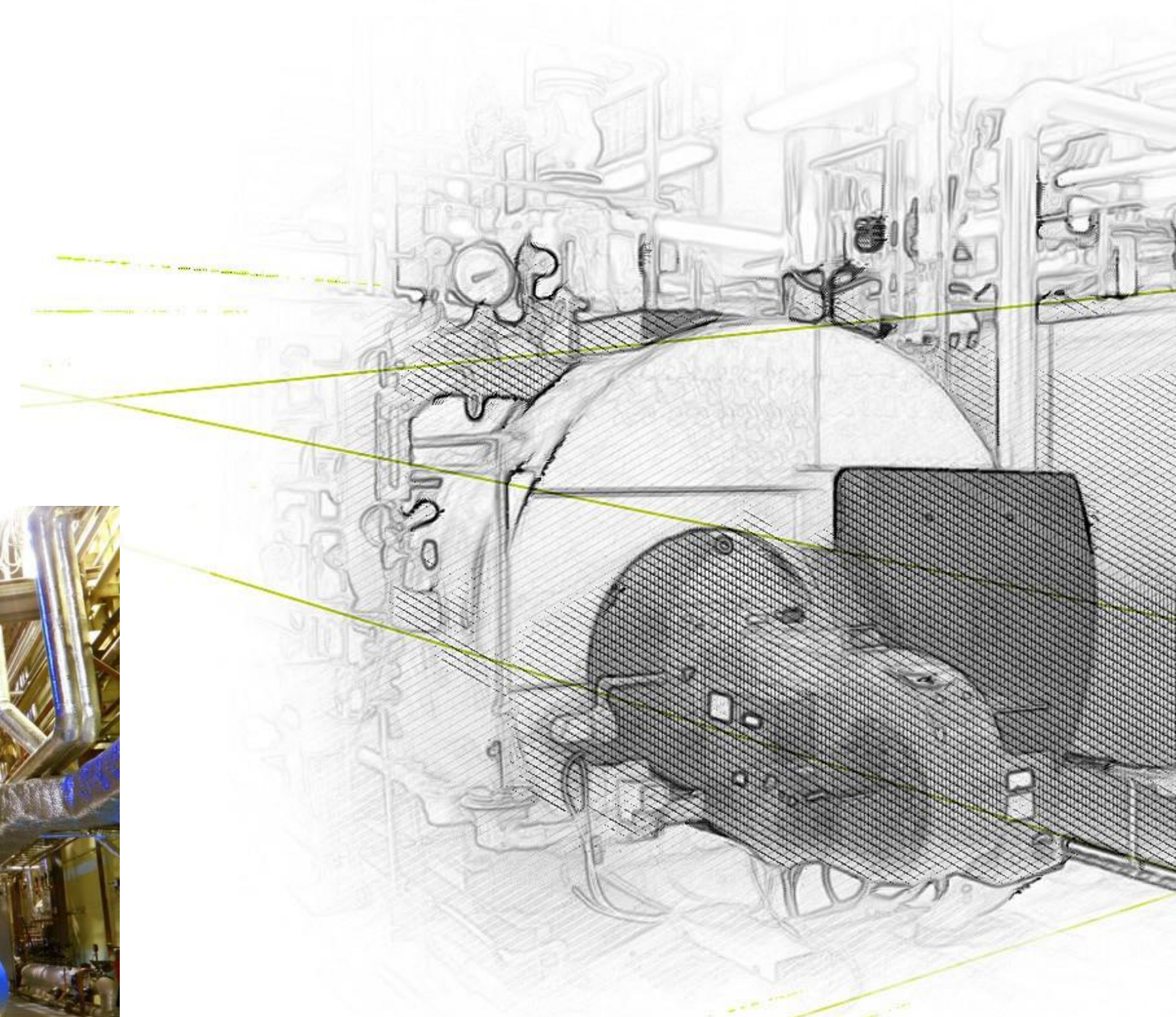
ESCO contractual period – **10 years**

emission reduction – **9 543 tCO₂** annually



SOUFFLET POLSKA

world leader in malt production

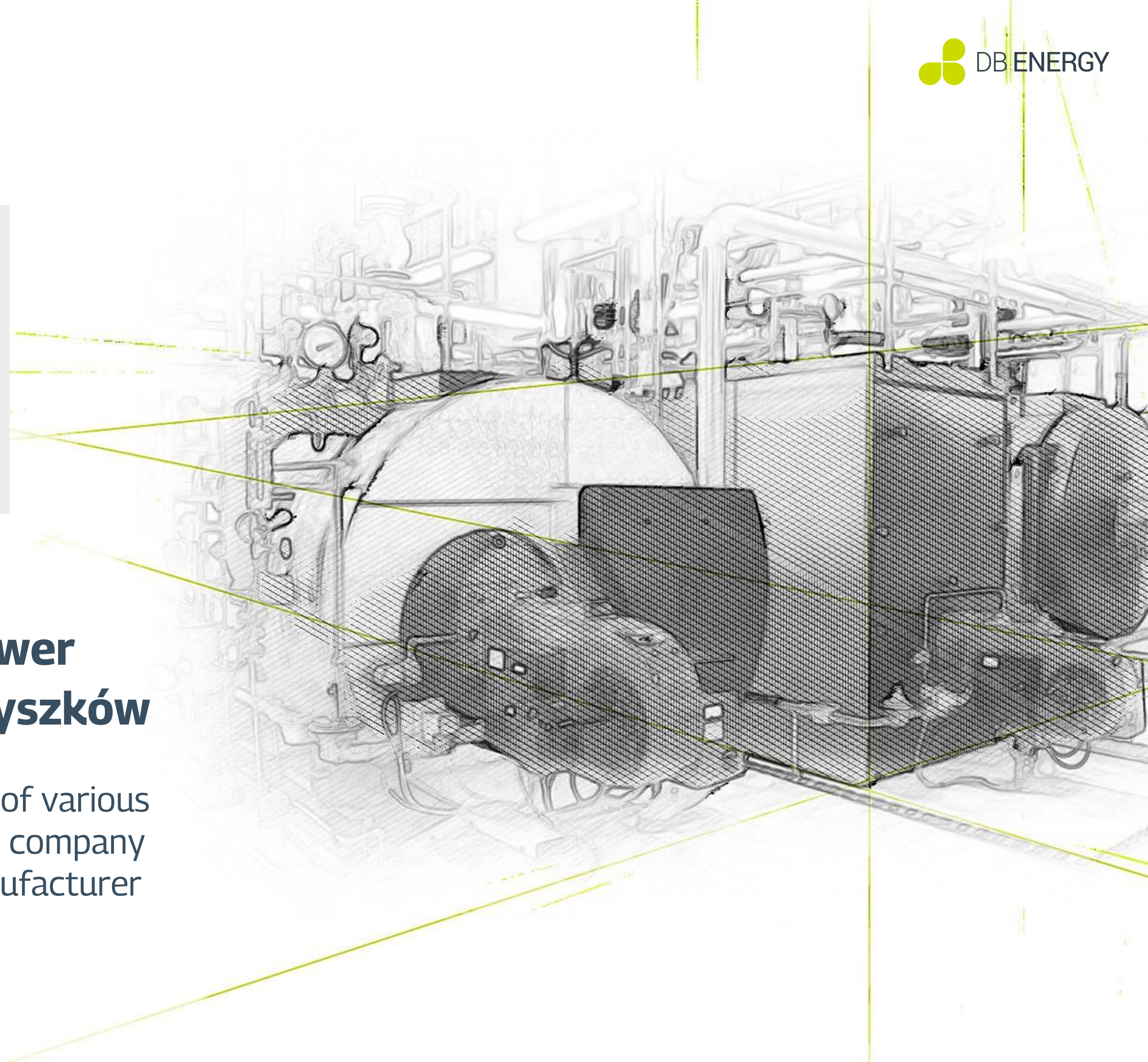


SCHUMACHER PACKAGING

Heat and power plant improvement

**Annual savings of EUR 4.4 million -
DB Energy improves the heat and power
plant of Schumacher Packaging in Myszków**

Schumacher Packaging is a worldwide manufacturer of various types of paper packaging. Having 29 subsidiaries, the company is one of the biggest solid and corrugated board manufacturer in Europe.



SCHUMACHER PACKAGING

Heat and power plant improvement

The boiler improvements effects - real profits for Schumacher Packaging

total investment value - € 7.8 million

boiler efficiency increase by 20% (from 65% to 85%) - combustion process improvement

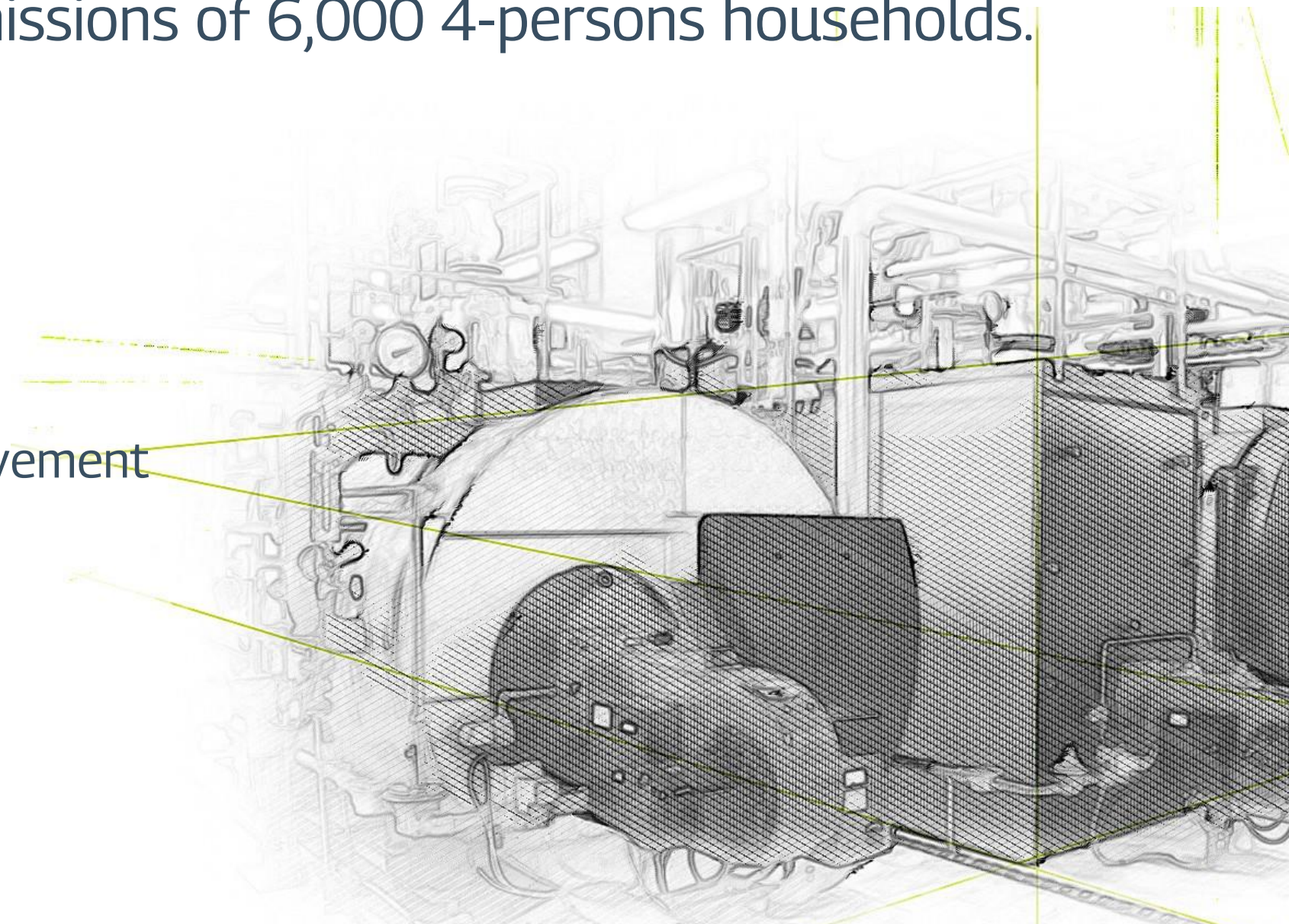
annual savings due to improvement of both boilers - approx. € 4.5 million

final energy savings of more than 6,200 toe - the possibility to be granted White Certificates of € 2.6 million

18 months - payback period

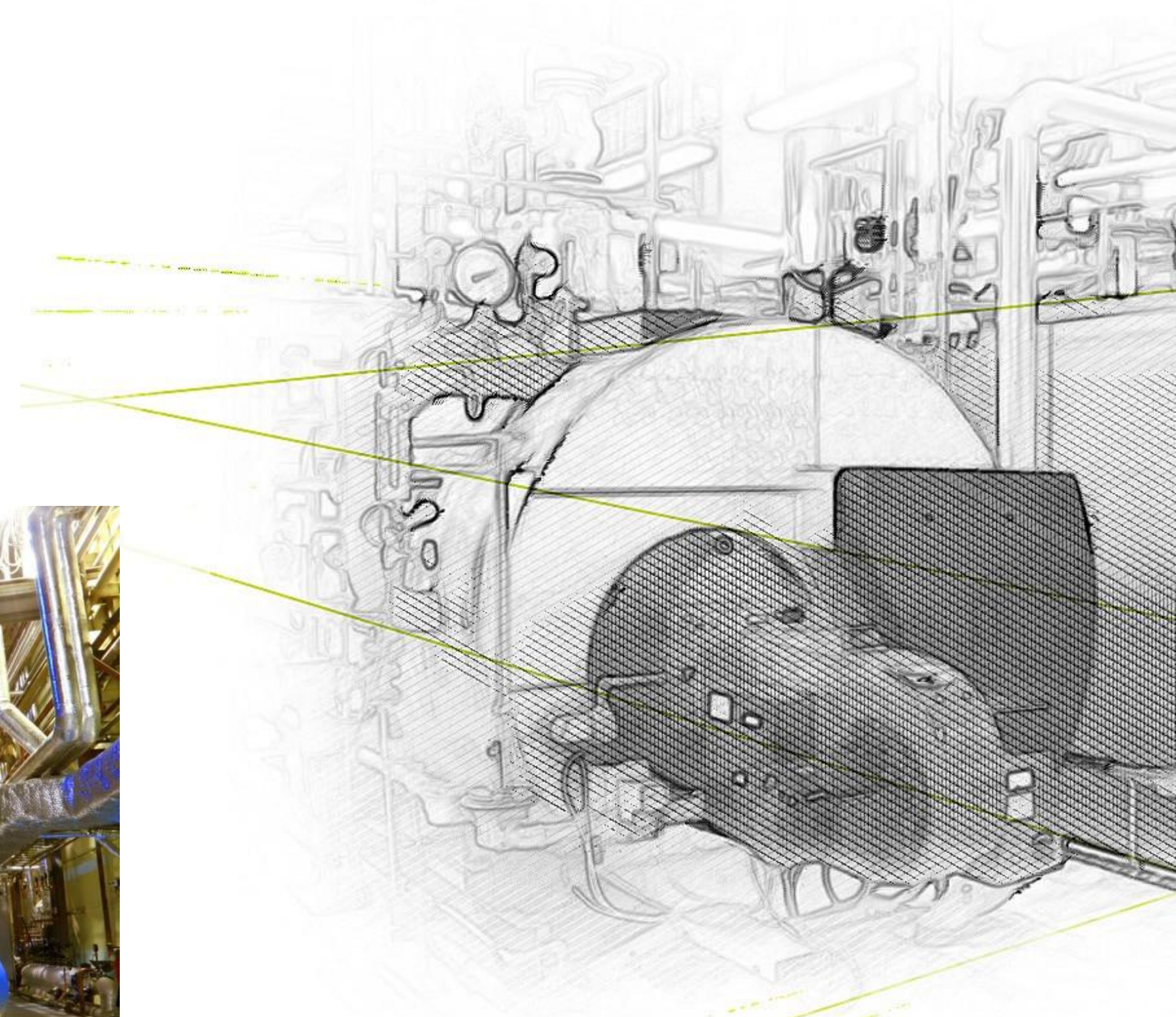
Due to the improvements the CO₂ emissions will be reduced from approx. **134,000 tons** to approx. **110,000 tons** annually.

The difference of **24,000 tons** refers to the average annual CO₂ emissions of 6,000 4-persons households.



SCHUMACHER PACKAGING

Heat and power plant improvement



DB Energy market leader



YEARS **15**
OF EXPERIENCE
IN THE INDUSTRY

1,300

EUR 1.3 bn

EUR 480 ml

9.3 TWh

EUR 150 ml

_____ industrial audits

_____ value of energy-saving investments

_____ annual savings generated by the designed investments

_____ annual energy savings thanks to designed investments

_____ value of the requested White Certificates

We reduce annual energy consumption **IN ALL INDUSTRIES**



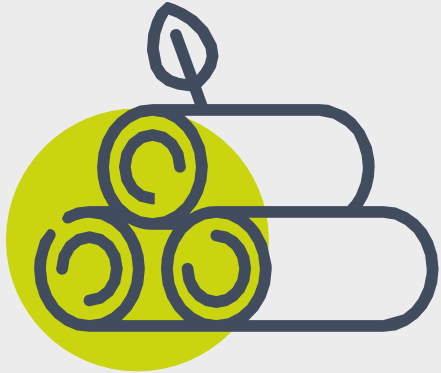
Mining
industry

28%



Food
industry

20%



Wood, paper
and chemical
industry

26%



Building
industry and
infrastructure

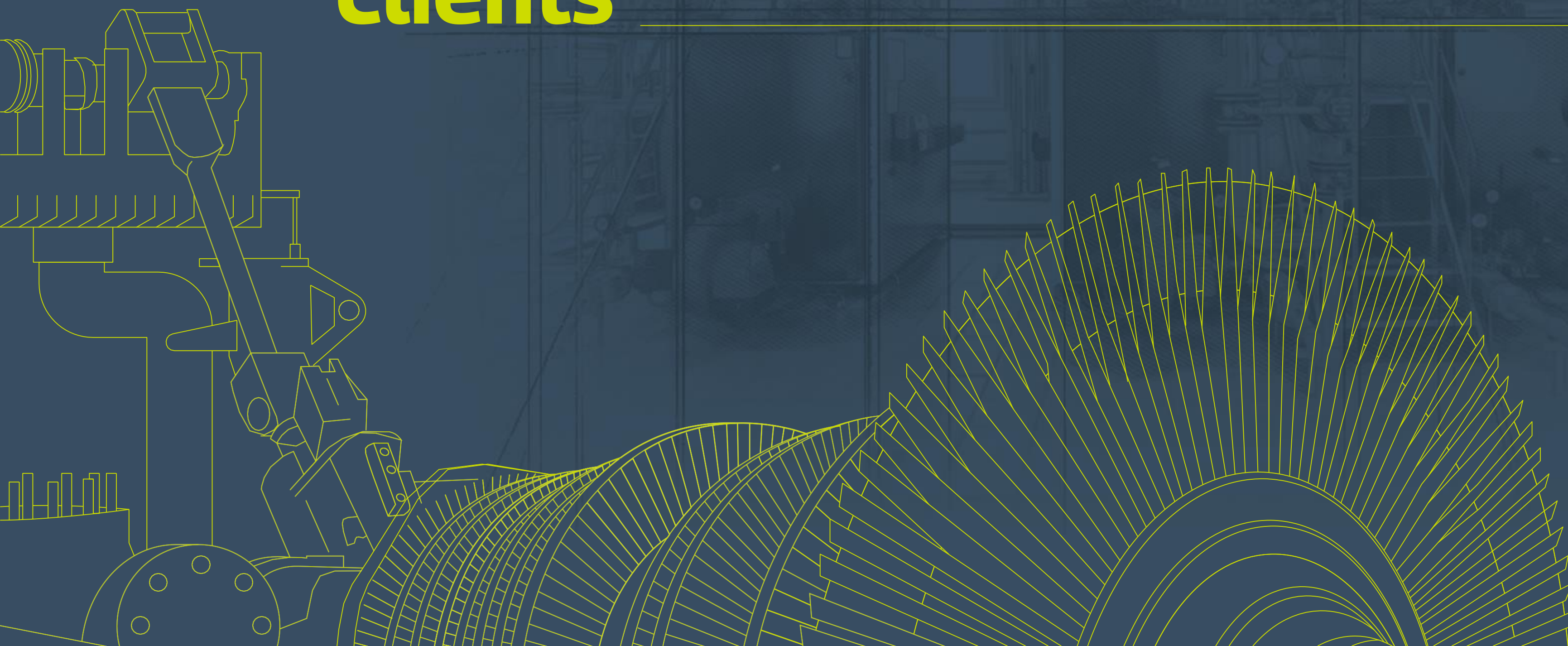
24%



Metal
industry

22%

Selected clients



Selected CLIENTS



Alicja Walkowiak

SALES

M: [+48 500 520 689](tel:+48500520689)

E: alicja.walkowiak@dbenergy.pl

www.dbenergy.pl



VI Commercial Division of District Court Wrocław-Fabryczna,
under KRS number 0000685455, NIP 8942995375, REGON 02124914
Share capital of PLN 306,146



European Union
European Regional
Development Fund



DB Energy conducts the R&D project titled „Development of an innovative drive diagnostics system (DiagSys) based on electrical signal measurements characteristic of mechanical damage to rotating machine components, together with a specialized analyser of machine operating status and efficiency (APPS 3)”. The project is financed under the Intelligent Development Operational Programme 2014-2020, under sub-measure 1.1.1. „Industrial research and development work carried out by enterprises”. No. of the competition: 1/1.1.1/2015. Value of the project PLN 5,974,021.85. Value of co-financing PLN 3,727,676.11.