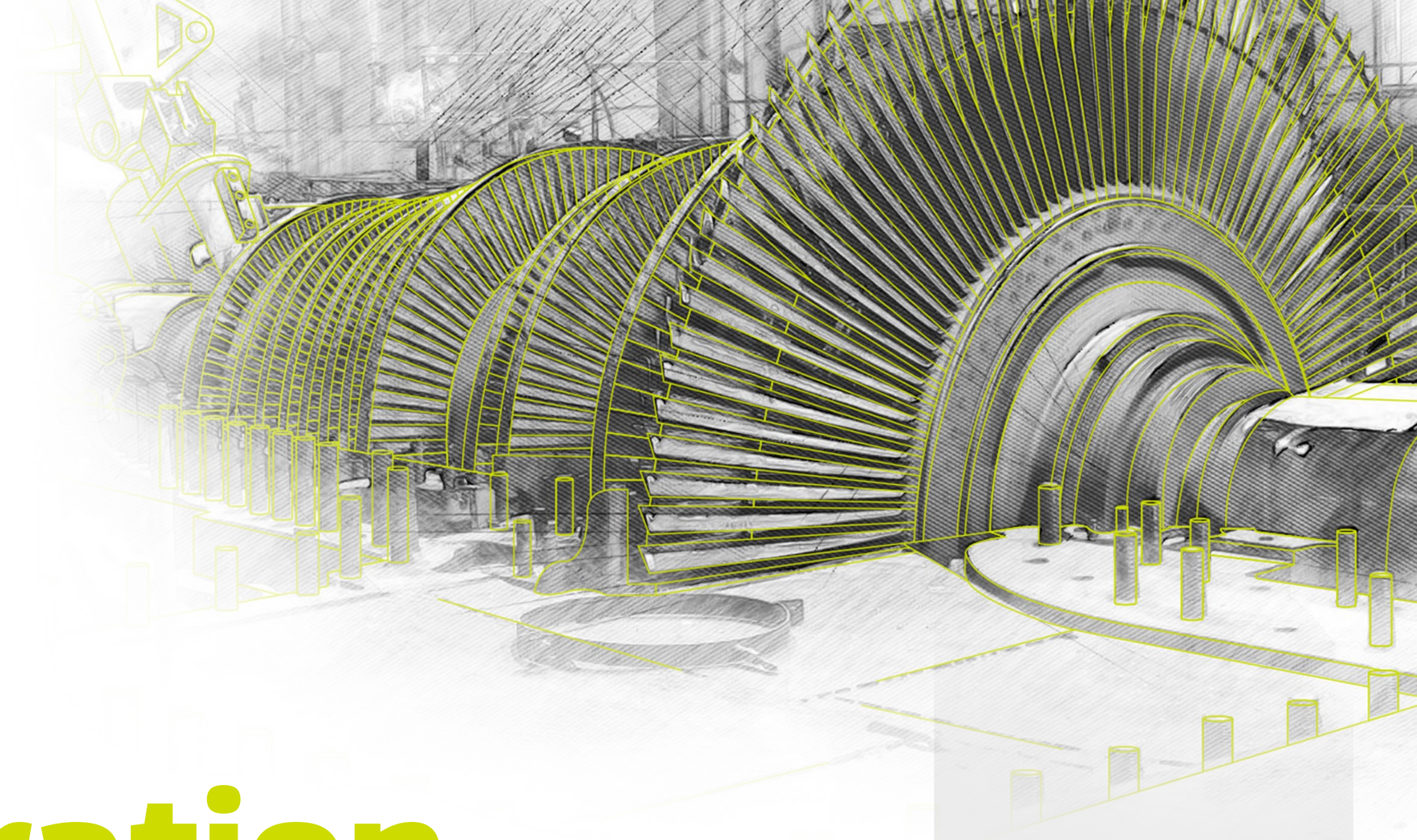
DB ENERGY

Zero-emission industry



Cogeneration

Wrocław, 2022

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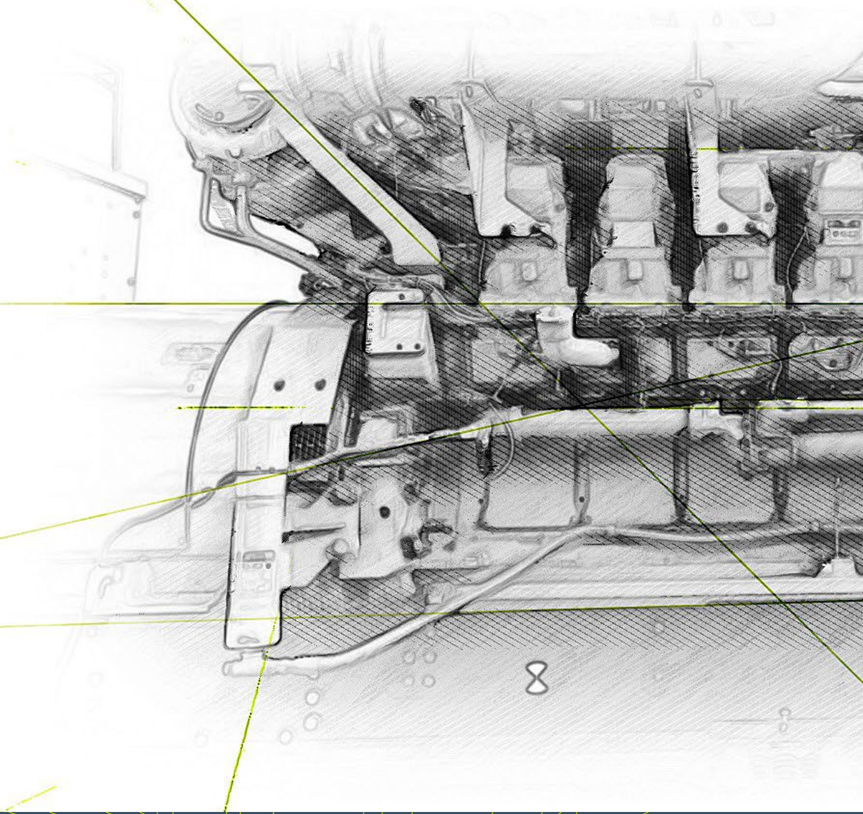
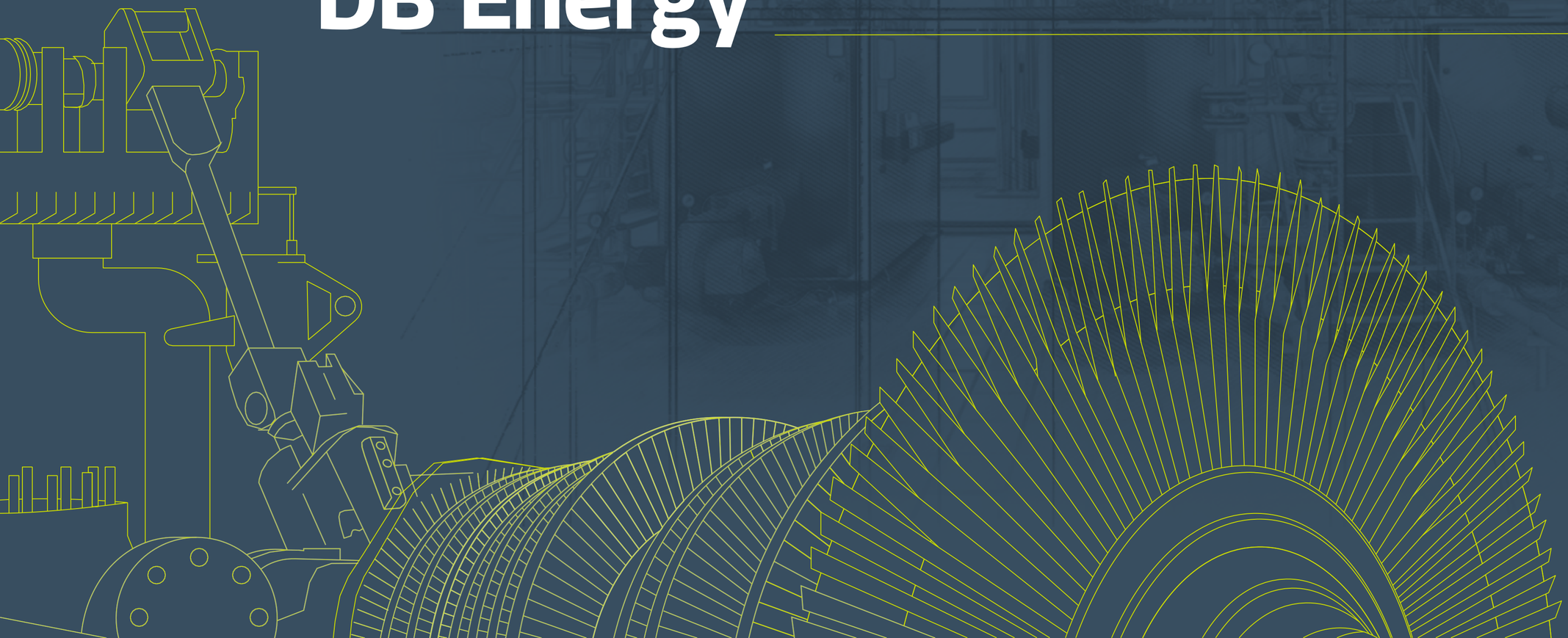


DB ENERGY

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.

DB ENERGY

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

DB ENERGY

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 CO_2 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

SAVINGS ARE IDENTIFIED

audits:

- Walk Through
- Company Energy Audit
- Energy Efficiency Audits
- zero-emission strategies

PROJECT CONCEPTS

- detailed concepts for particular energy saving investments
- guidelines for designers essential to maximize benefits and savings
- construction projects

FINANCING AND IMPLEMENTATION

- DB Energy finances a project in the ESCO model
- DB Energy develops a project in the General Contracting model
- benefits and savings are maximized

DIAGNOSTICS AND MONITORING

- we control and diagnose in an ongoing manner energy consumption and operating efficiency of machines and devices
- we identify continuously space for further energy efficiency improvement
- we provide long term management over implementing zero-emission strategies

DB ENERGY

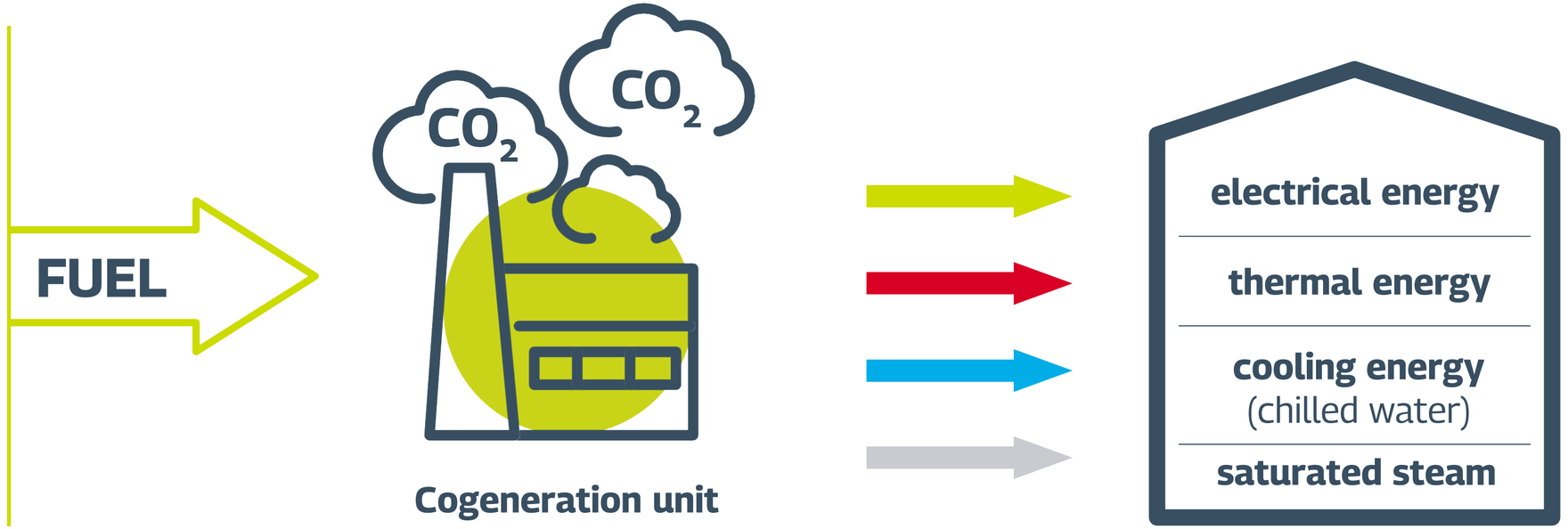
Cogeneration

How does
COGENERATION WORK?

DB ENERGY

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?

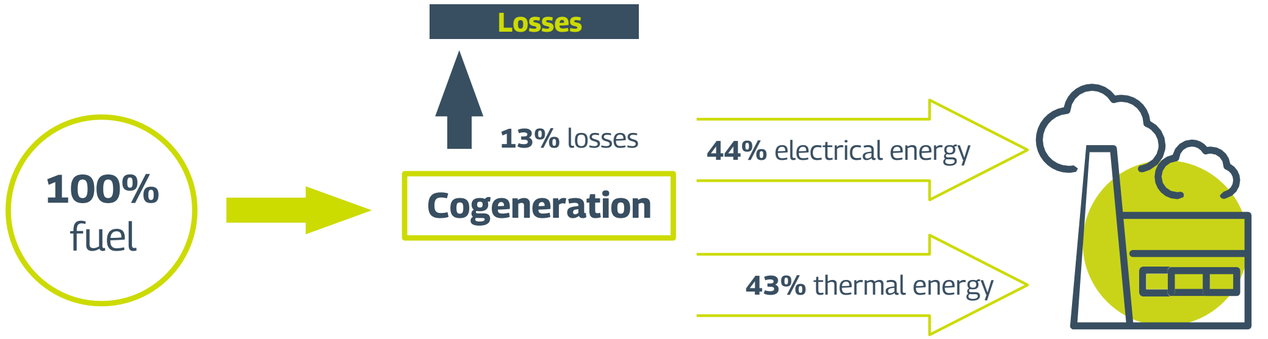
DB ENERGY

Why is cogeneration financially viable?

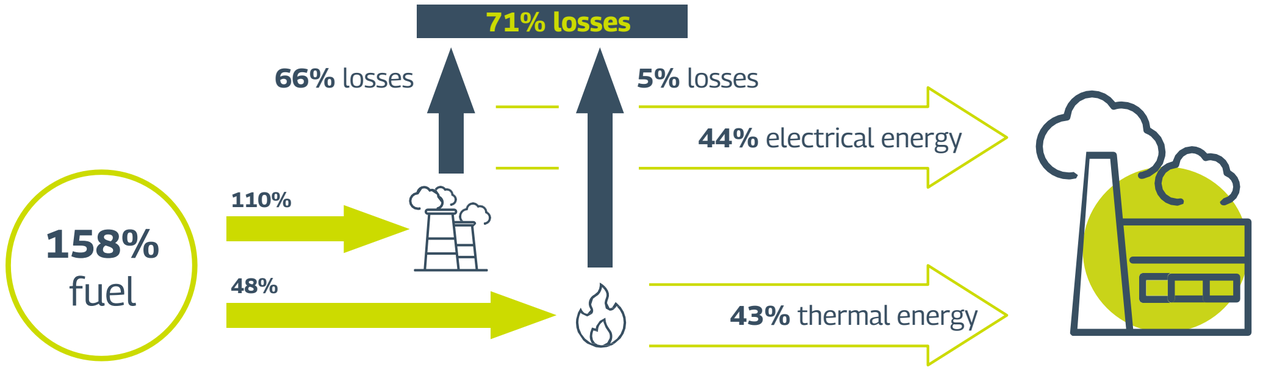
it allows energy losses to be prevented while simultaneously generating electrical energy, thermal and cooling energy.

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

Cogeneration



Separate energy production



How does
GAS COGENERATION WORK?

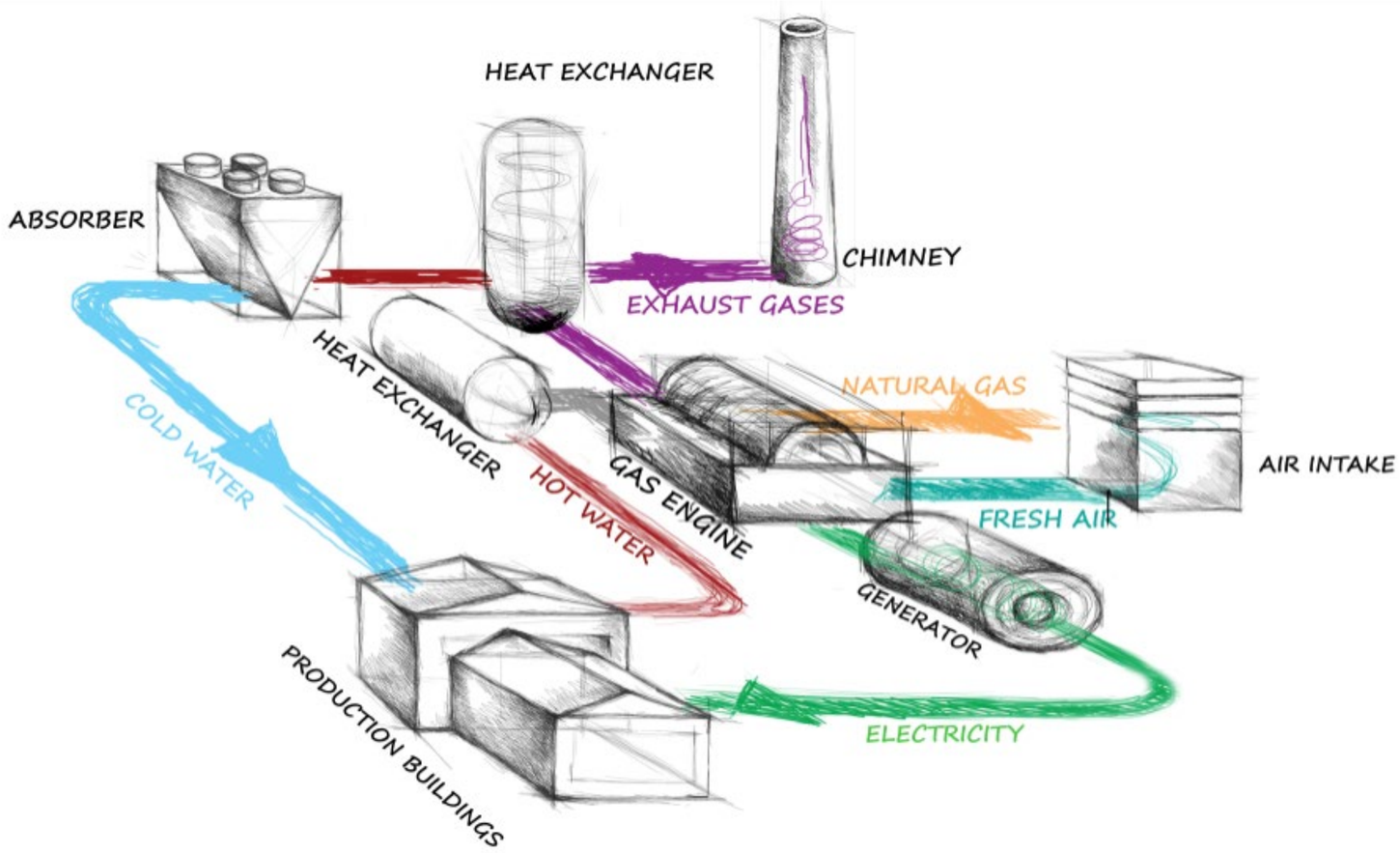
cogeneration is usually driven by a standard internal combustion engine

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



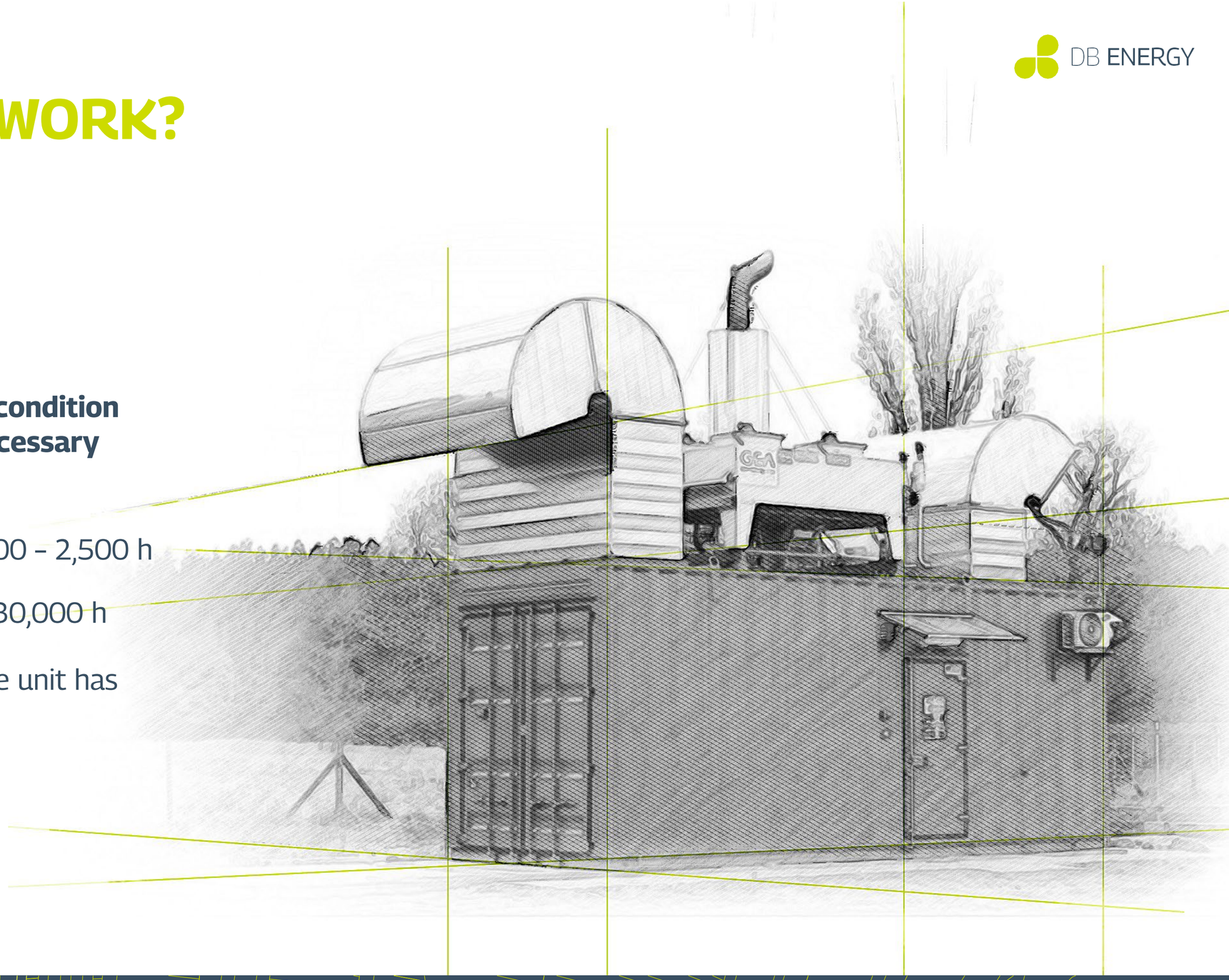
How does
GAS COGENERATION WORK?

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

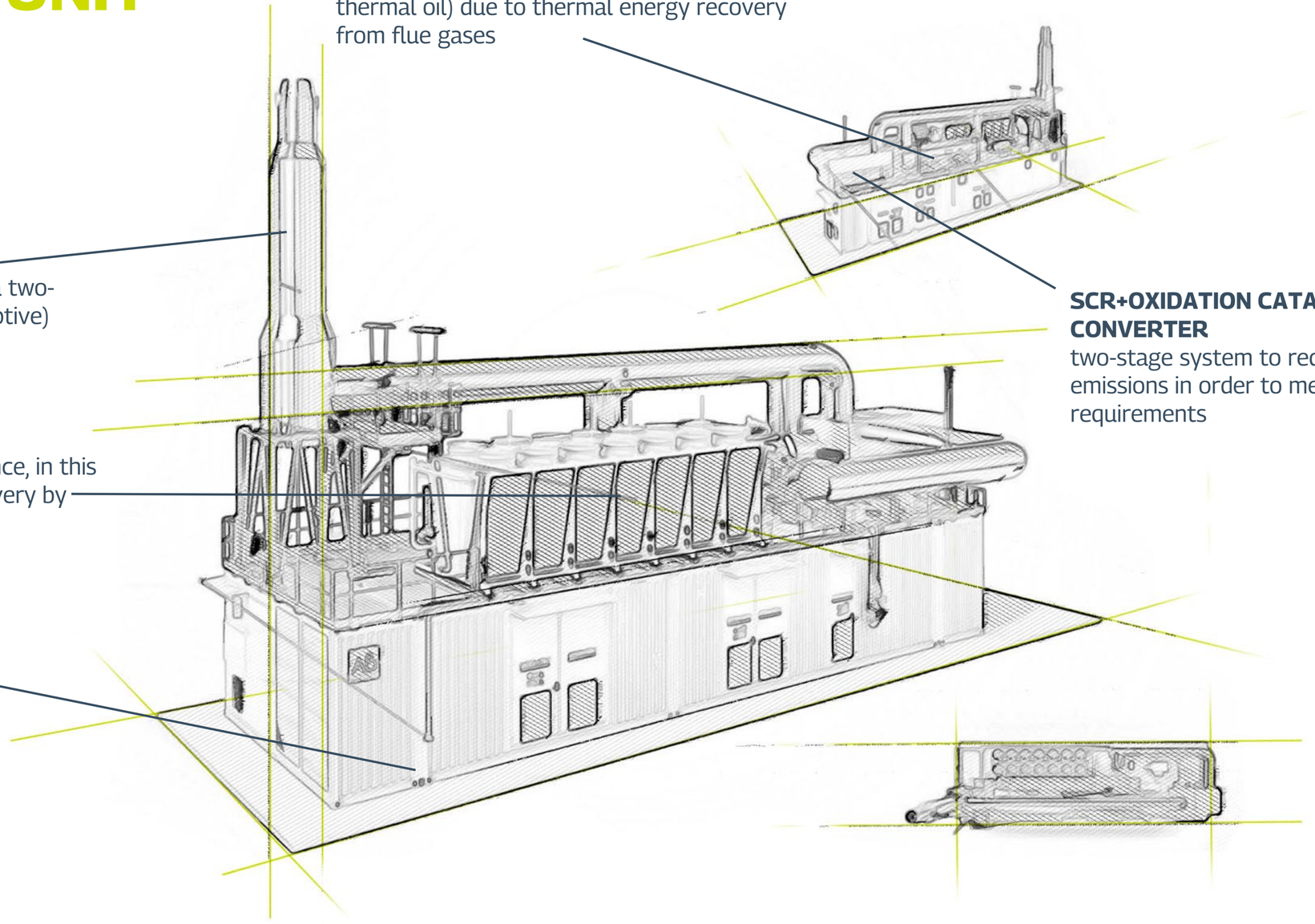
FLUE GASES HEAT EXCHANGER
heat exchanger to generate thermal energy (hot water, overheated water, water steam, thermal oil) due to thermal energy recovery from flue gases

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 CO_2 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

DB ENERGY

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

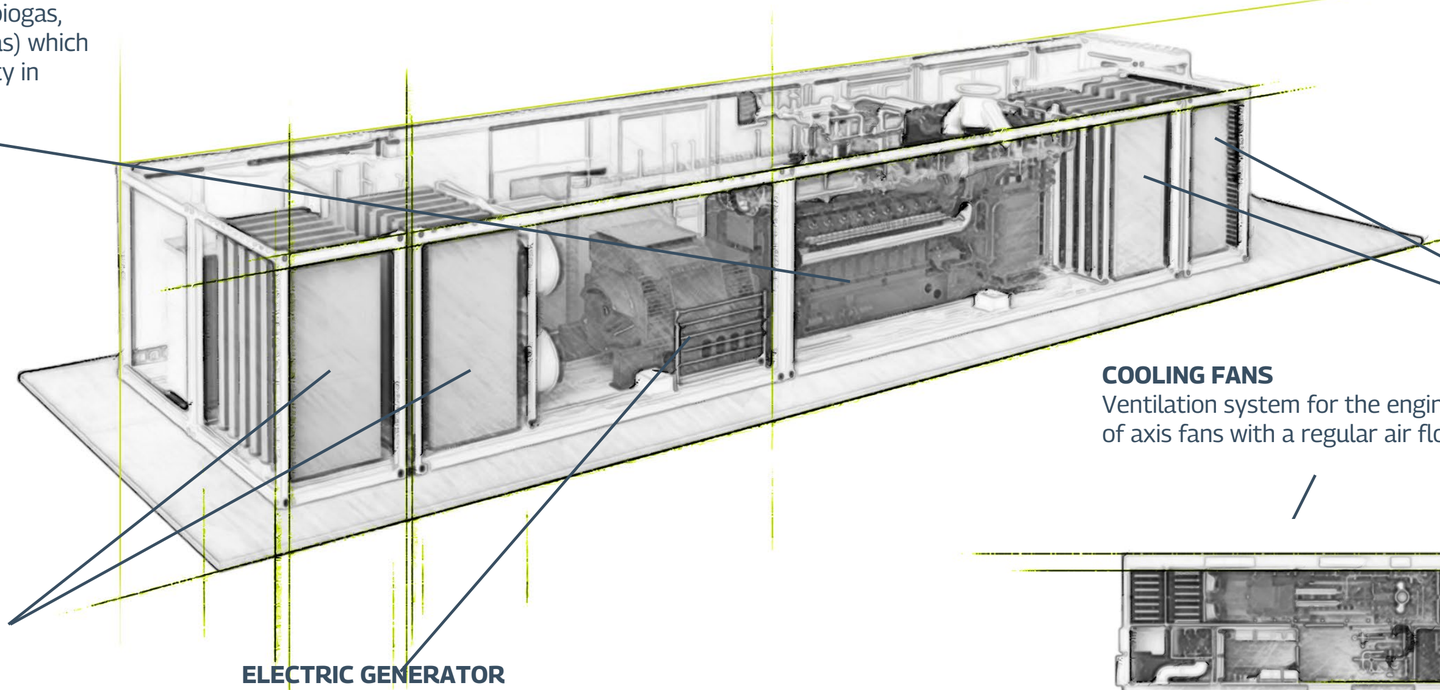
ARRESTER
A panel in an alternator preventing from voltage surge

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 CIRCUT TO SPREAD AND RECOVER THERMAL ENERGY

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 power and control subunits for cogeneration system's needs

ACCUSTIC SCREEN

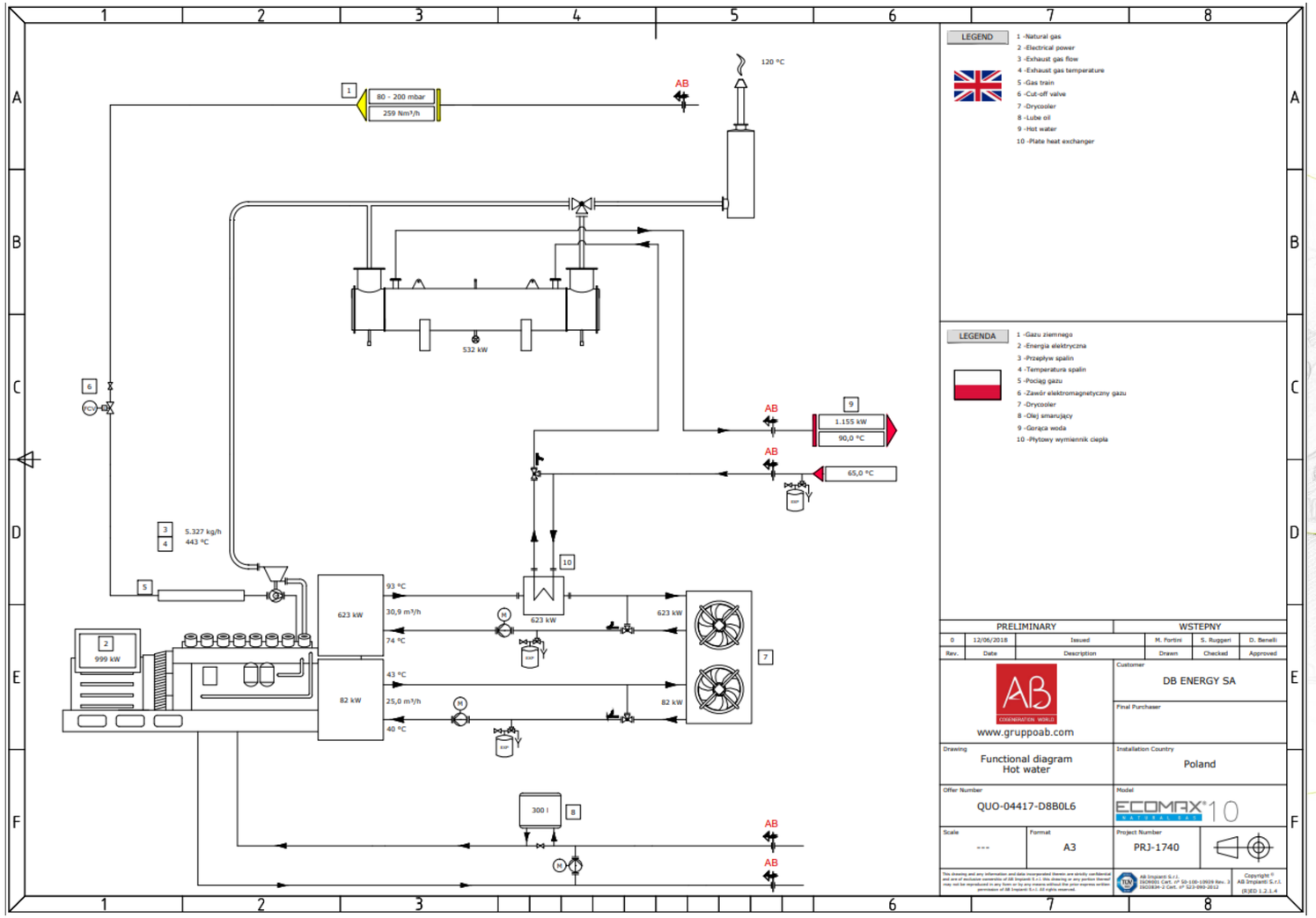
COOLING FANS
Ventilation system for the engine rooms composed of axis fans with a regular air flow

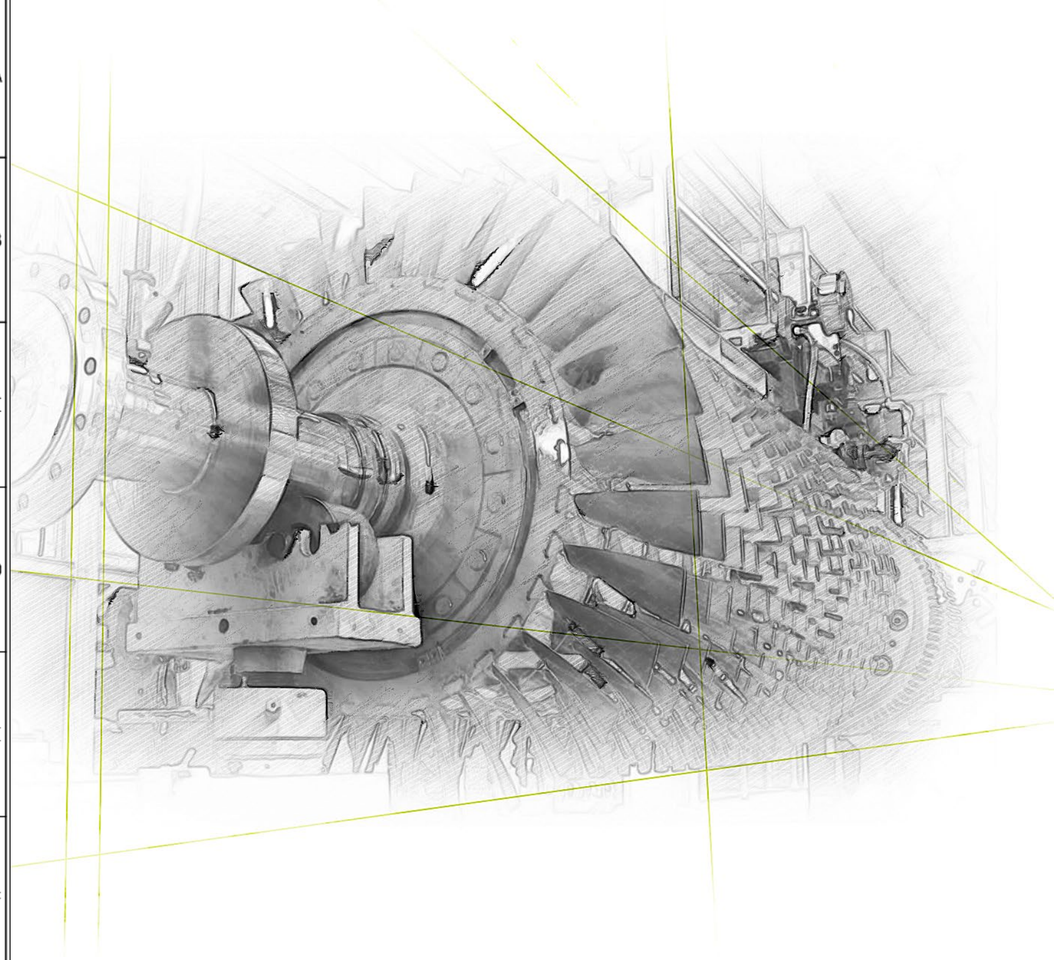
GAS PATH
unit to provide the main engine with gas, together with control and meassuring device and automation

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

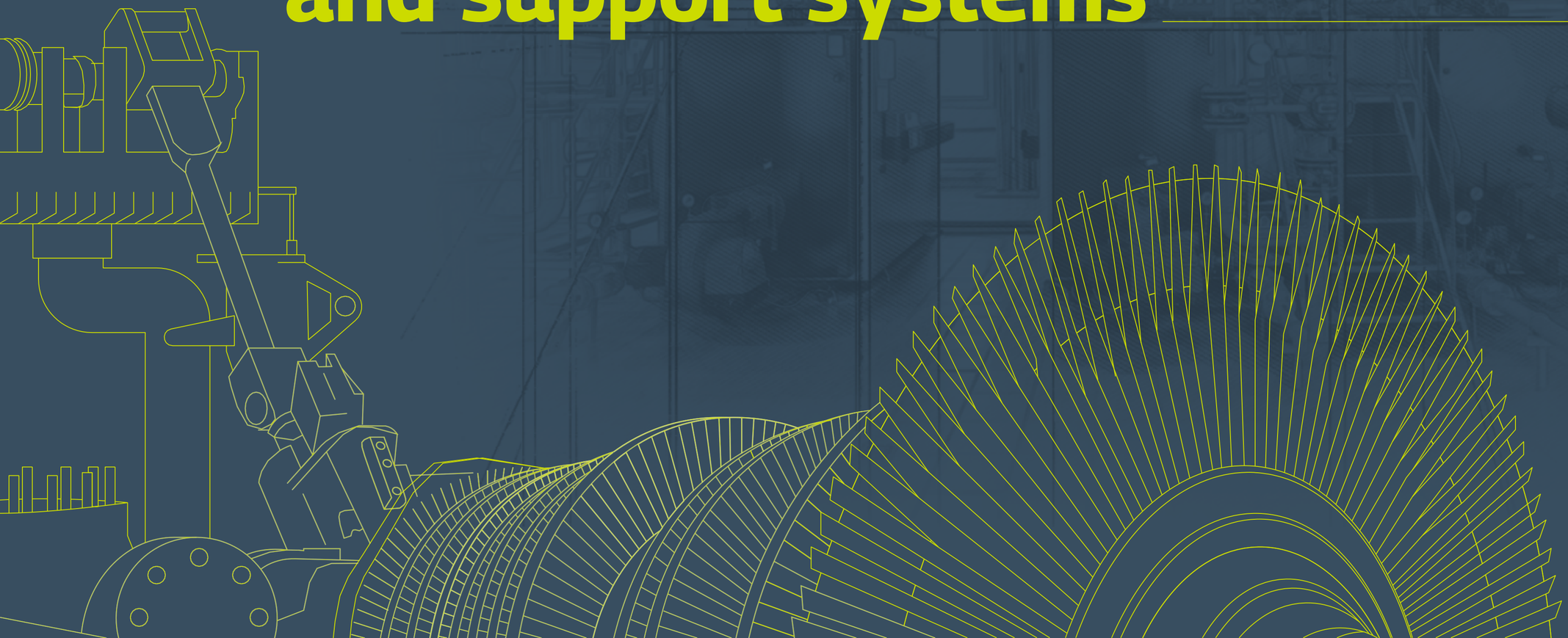
SCHEME OF AN EXAMPLATORY INSTALLATION





DB ENERGY

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 CO_2 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

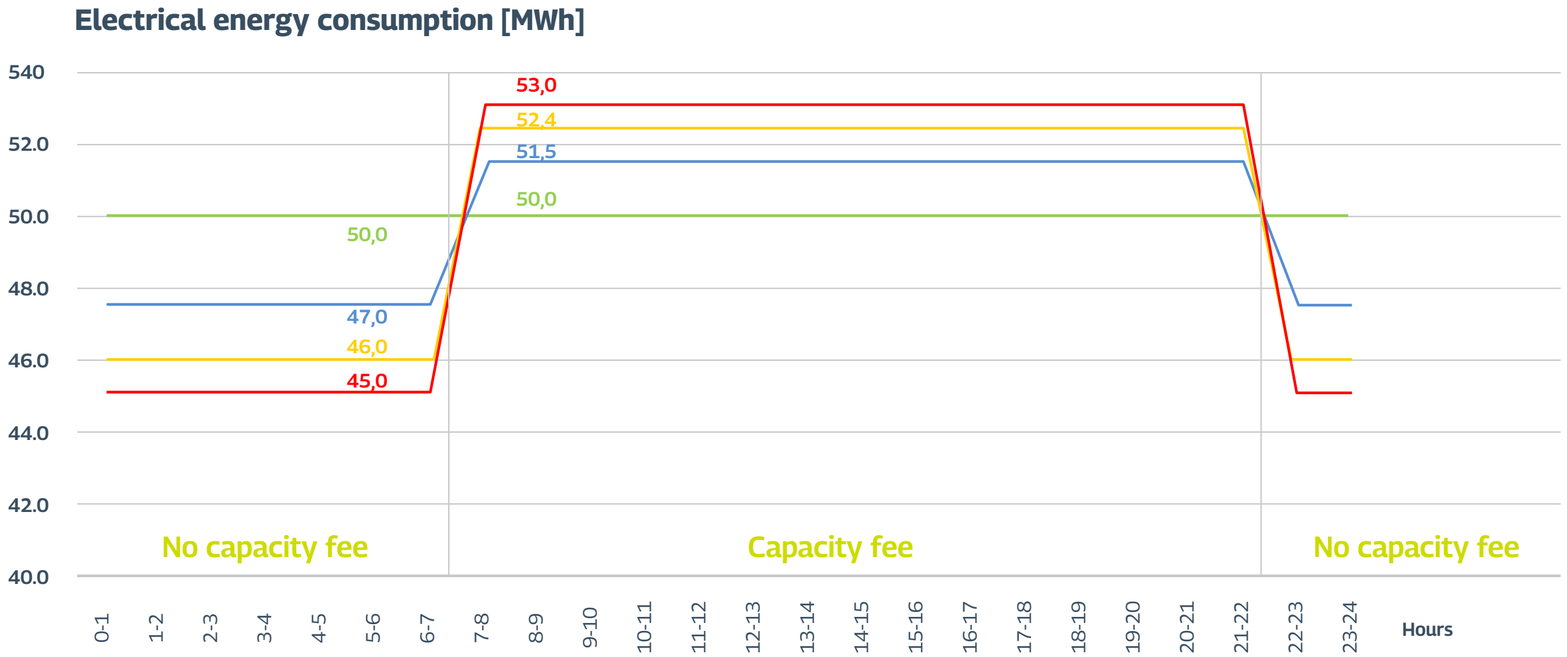
possible settlement with a licence granted to DB Energy

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!



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**

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%

FINANCIAL SUPPORT

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:

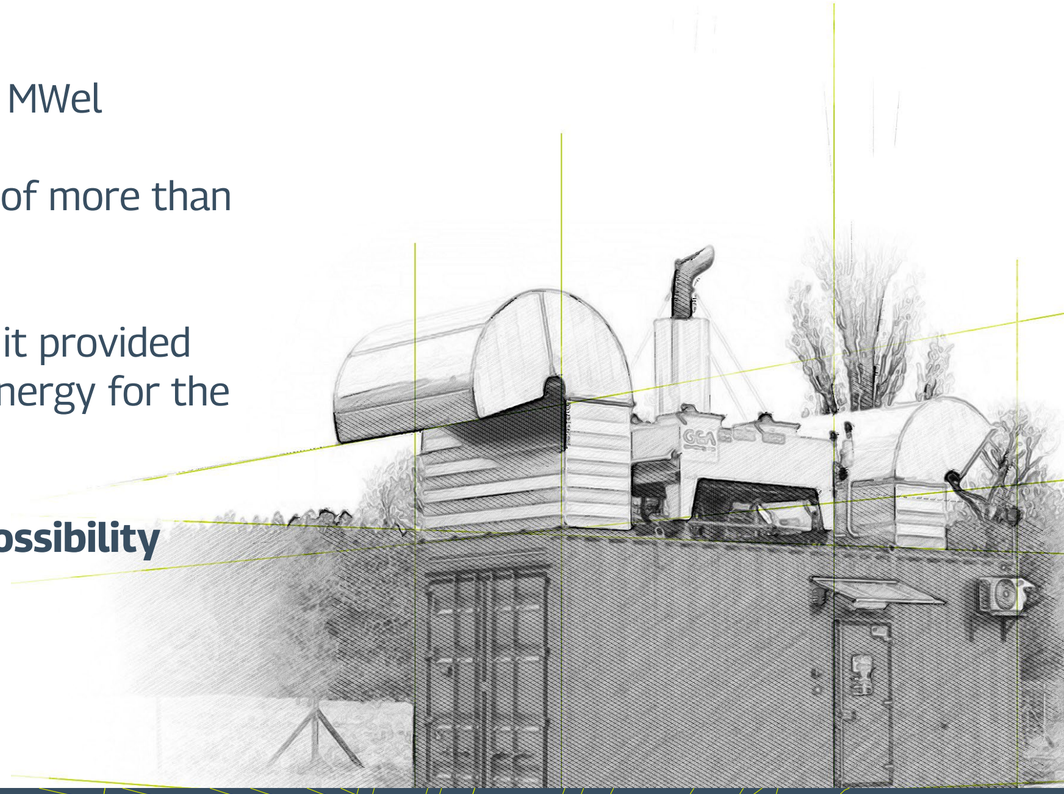
guaranteed bonus – for units with installed power of 1 MWel

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.



DB ENERGY

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

ANALYSIS OF ENERGY BALANCE

- a curve for electrical energy consumption is assessed
- a cogeneration unit is selected

ON-SITE VISITS

- investment feasibility is analysed
- technical and economic potential is analysed

TECHNICAL CONCEPT

- project concept is drawn
- guidelines for Terms of Reference
- guidelines for designers

PROJECT

- optimal technology is selected
- designing works
- financing and implementation in the General Contracting or ESCO model

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 cyclicality)

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

General frame of
CHP DESGIN 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 ENVIRONEMNTAL 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 PROJECCT; 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.

Estimated costs of implementing a cogeneration unit of 1MW POWER (EXCLUDING PROJECT COSTS)

DB ENERGY

Electrical energy +thermal energy (cogeneration)

- cogeneration aggregate of 0.99 Mwel
- foundation for an aggregate
- gas installation
- heat service connection
- automation

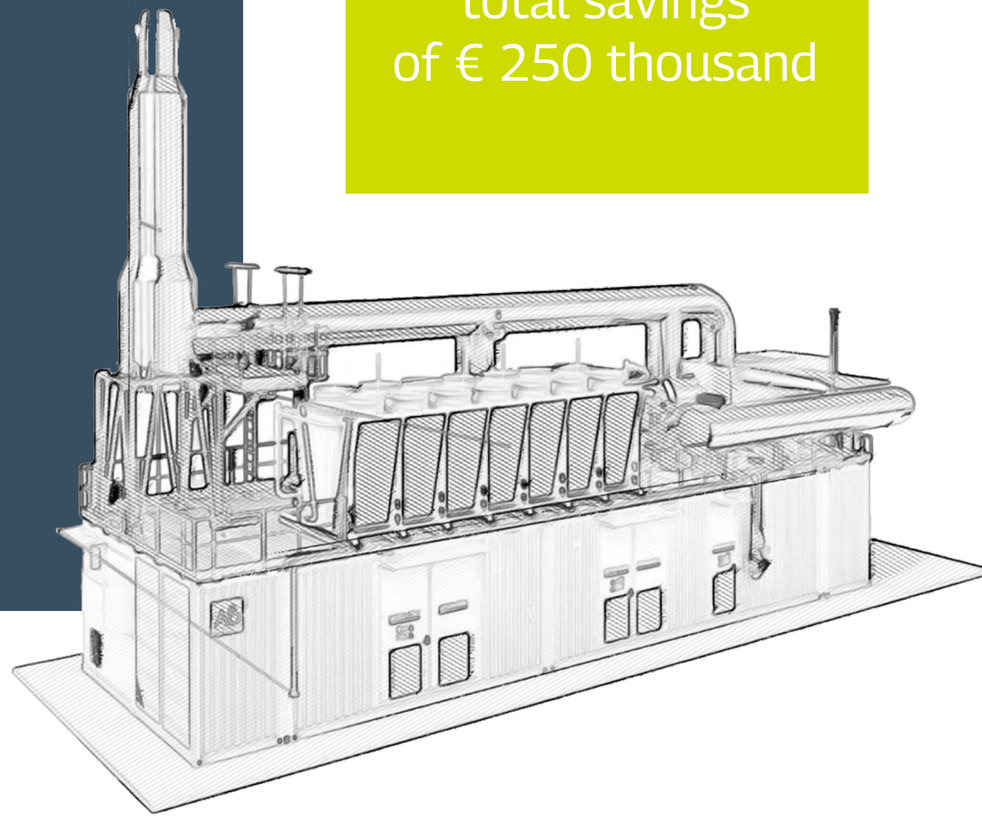
CAPEX approx. **EUR 1 mln**

Additional bonus – possibility to generate cooling energy (trigeneration)

- absorption unit of 870 kW (15/8)
- cooling tower
- water connection with an absorber
- automation

CAPEX of **€ 270 thousand**

Estimated annual total savings of € 250 thousand



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

HOW IS IT FINANCED?

DB ENERGY

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

DB ENERGY

Significant issues to assess a supplier

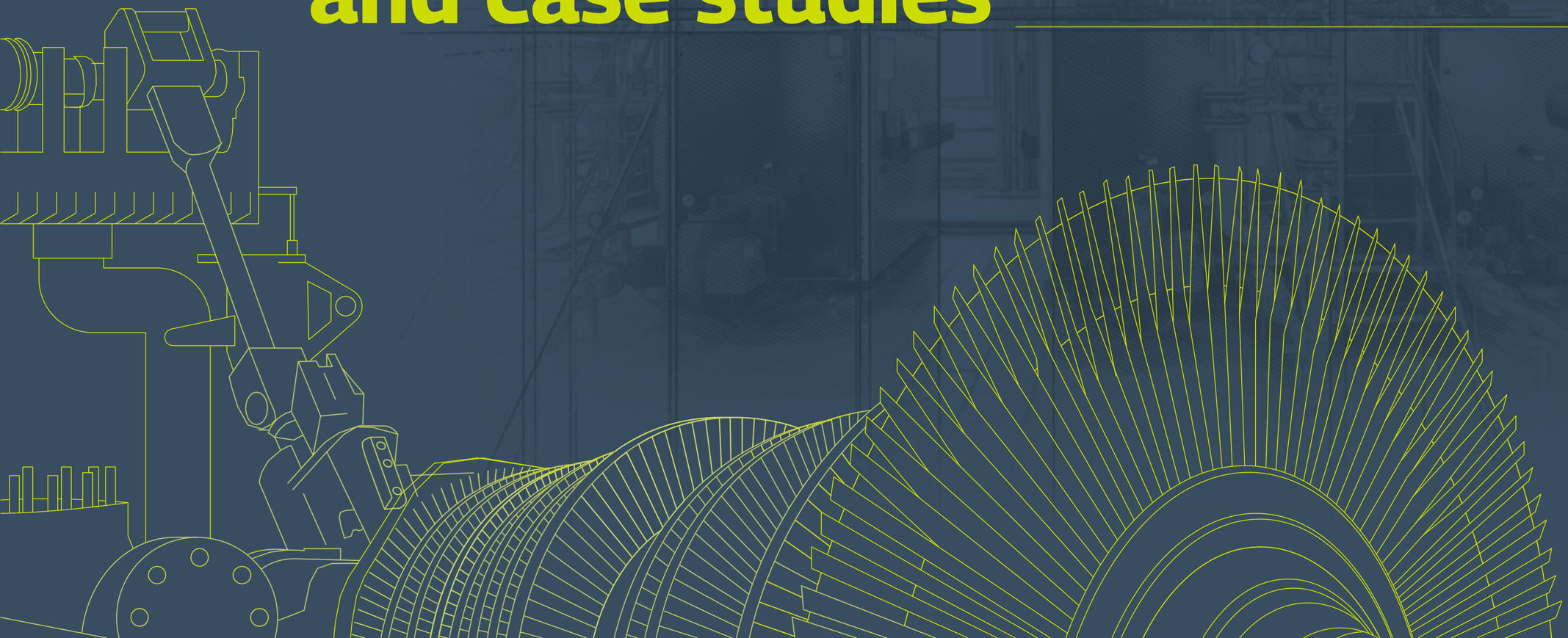
- references – portfolio of implemented projects with a possible on-site visit
- recommended procedure to achieve min. 75% efficiency
- automation offer
- CE certificate for the entire cogeneration unit, not for a particular device
- SCADA for the entire unit
- maintenance scope

Popular suppliers

- Gruppo AB
- Jenbacher
- Eneria
- Caterpillar
- Tedom MWM

DB ENERGY

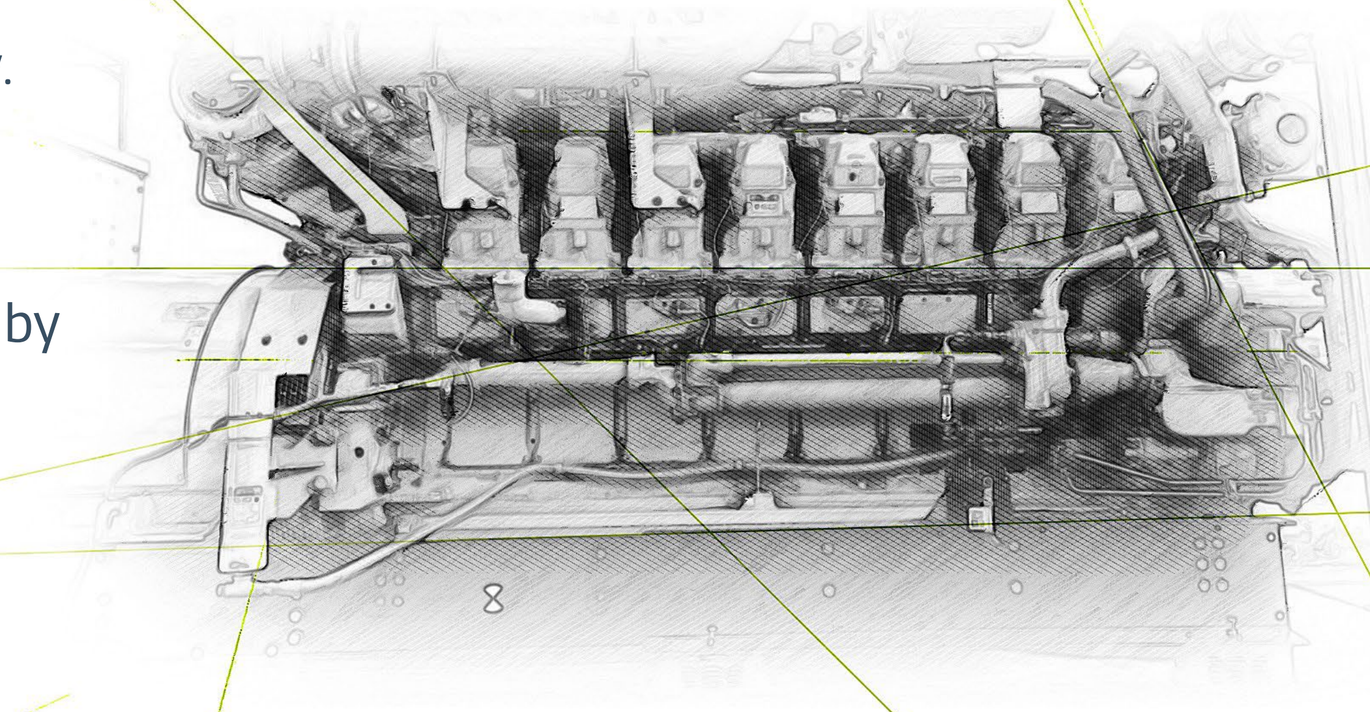
Experience
and case studies



Our
EXPERIENCE

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

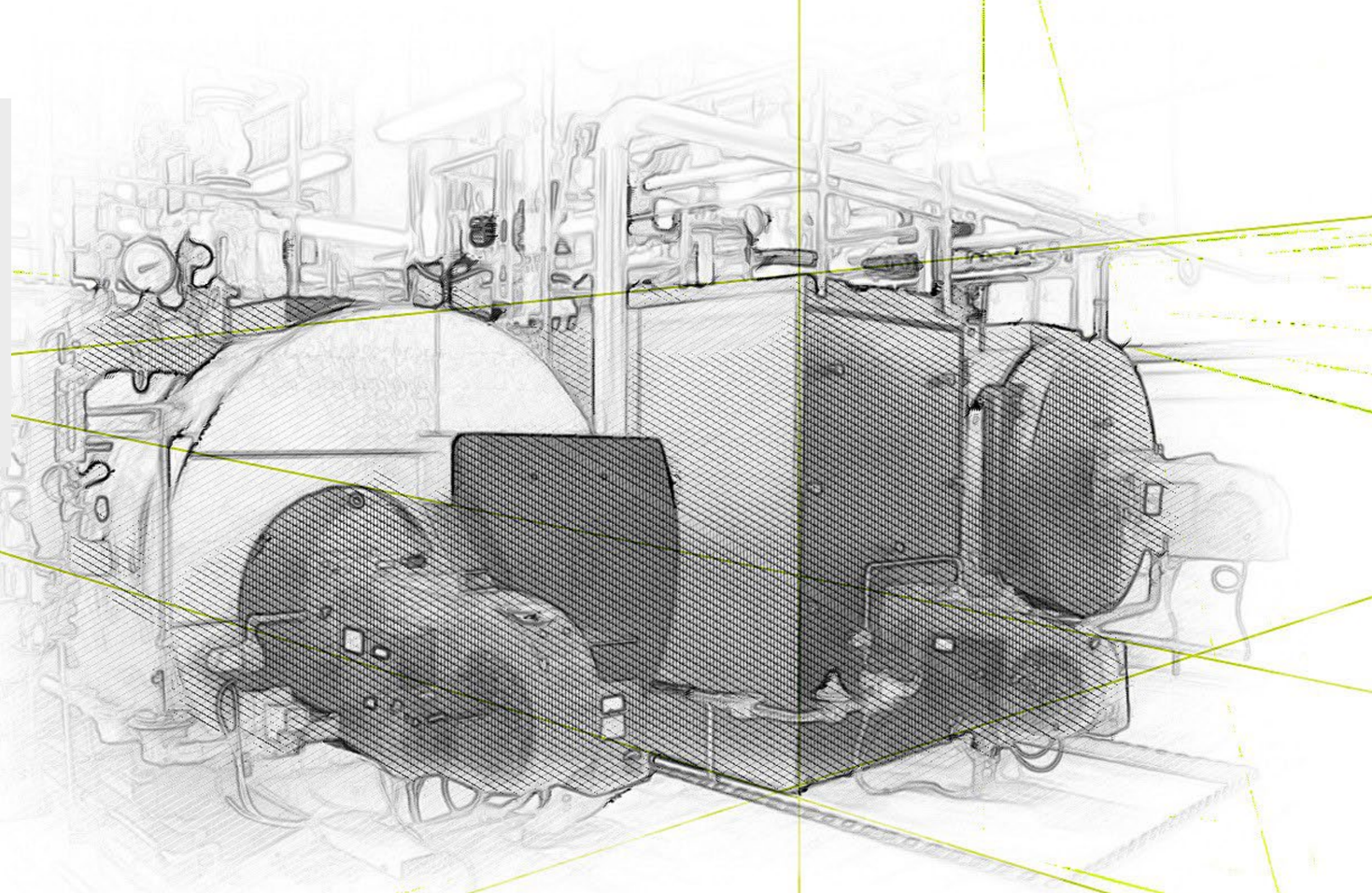
€ 26.5 million is the total value
of average annual savings which may
be achieved due to cogeneration units designed by
DB Energy.



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

DB ENERGY

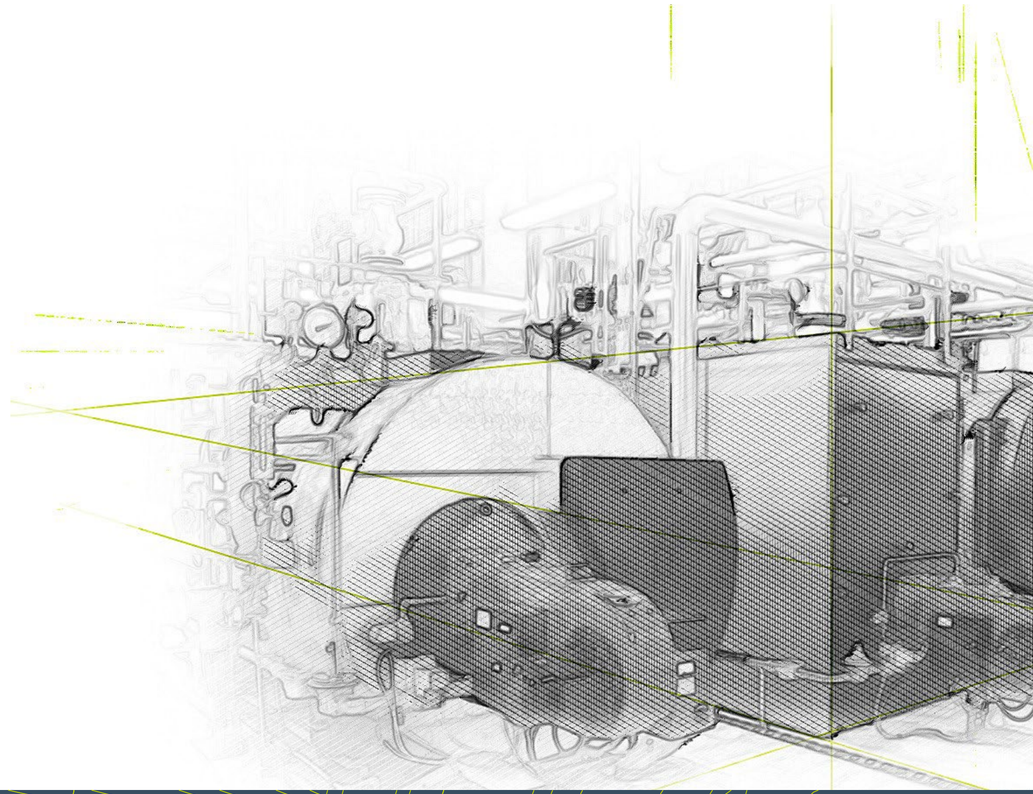
SŁODOWNIA SOUFFLET POLSKA

world leader in malt production

investment value of € 6.4 million
fully covered by DB Energy

Projects key elements

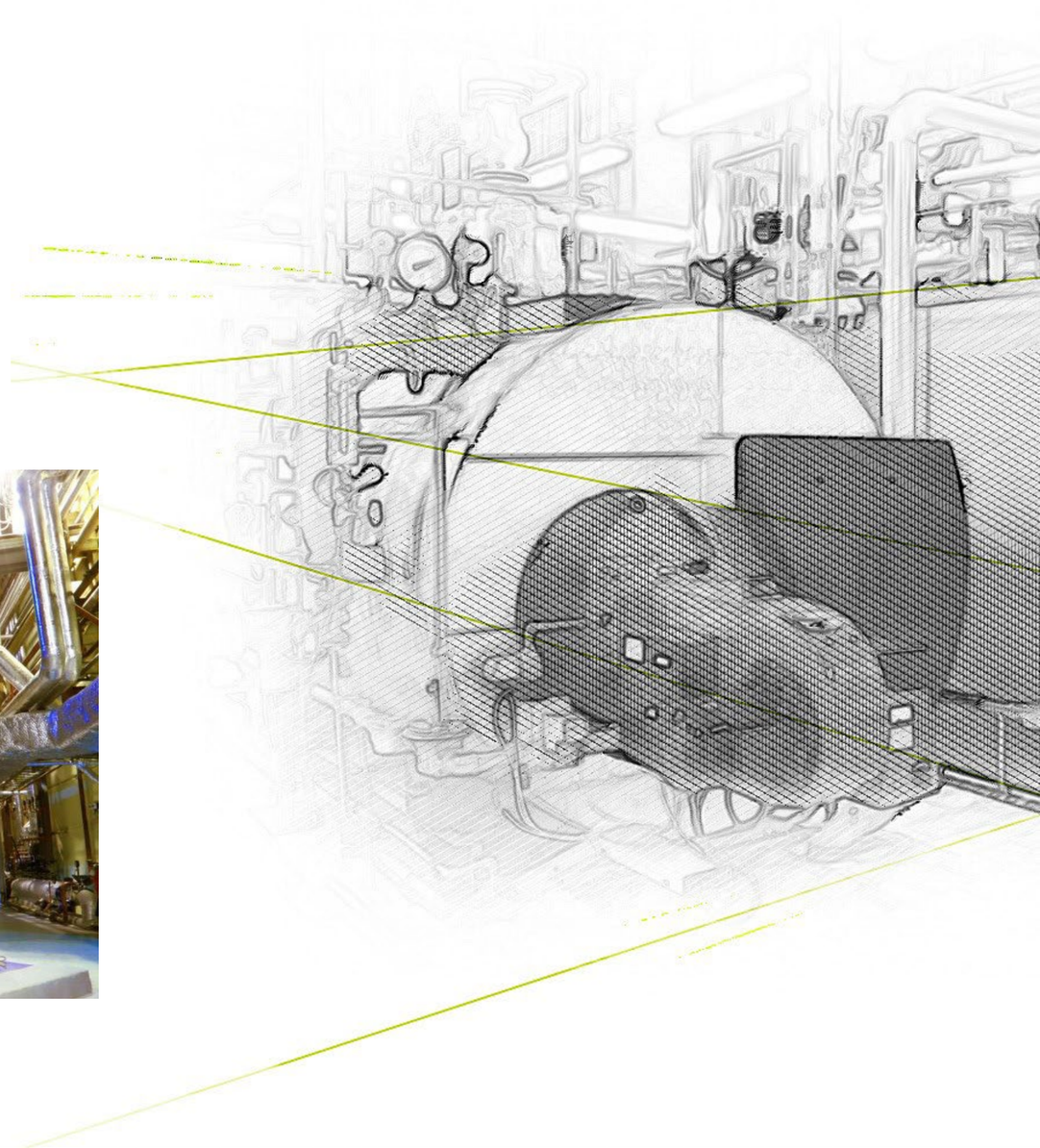
- thermal energy recovery
- new refrigeration system
- new cogeneration system to generate electricity and thermal energy
- ESCO contractual period – **10 years**
- emission reduction – **9 543 tCO_2** annually



DB ENERGY

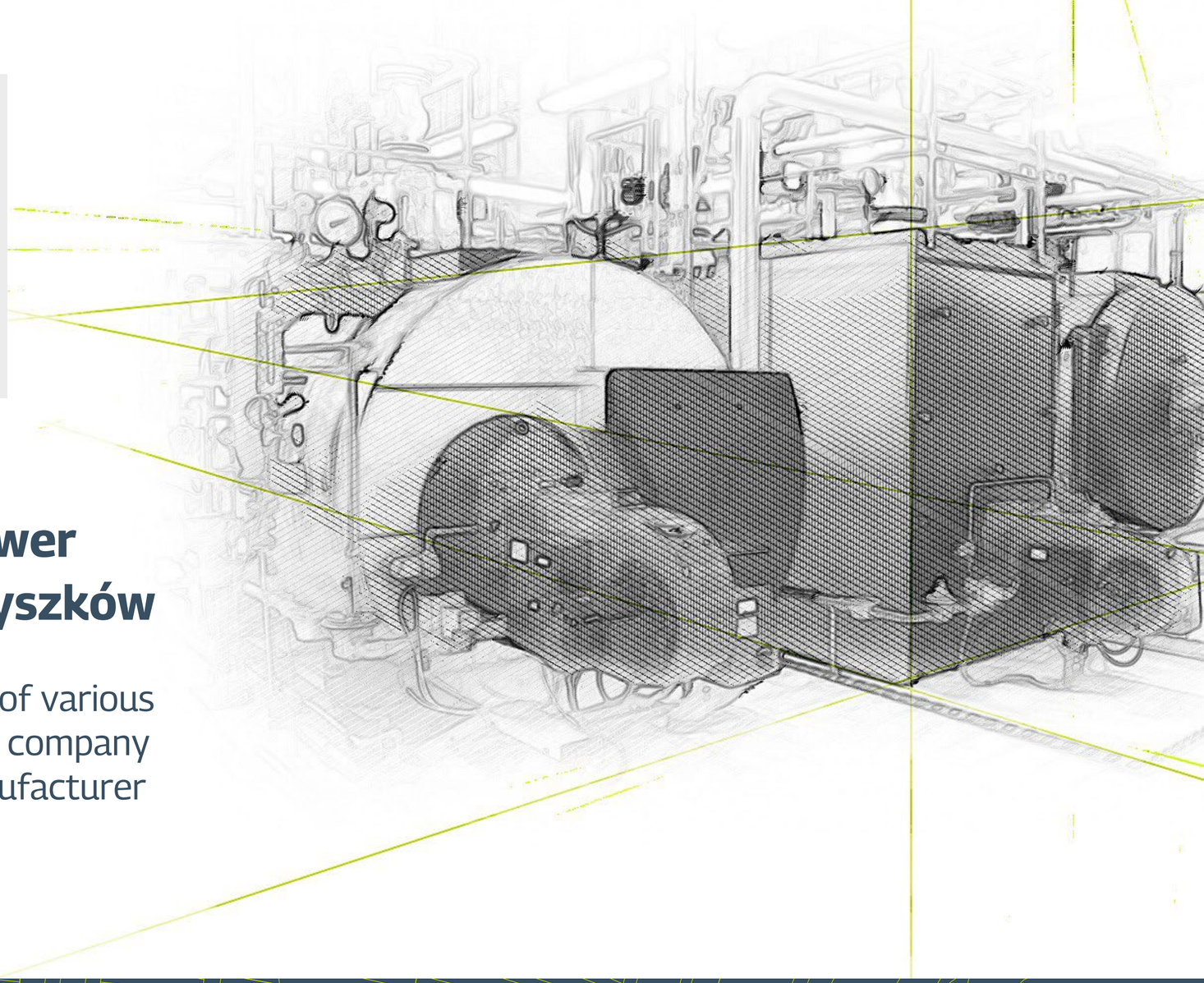
SOUFFLET POLSKA

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.

DB ENERGY

SCHUMACHER PACKAGING

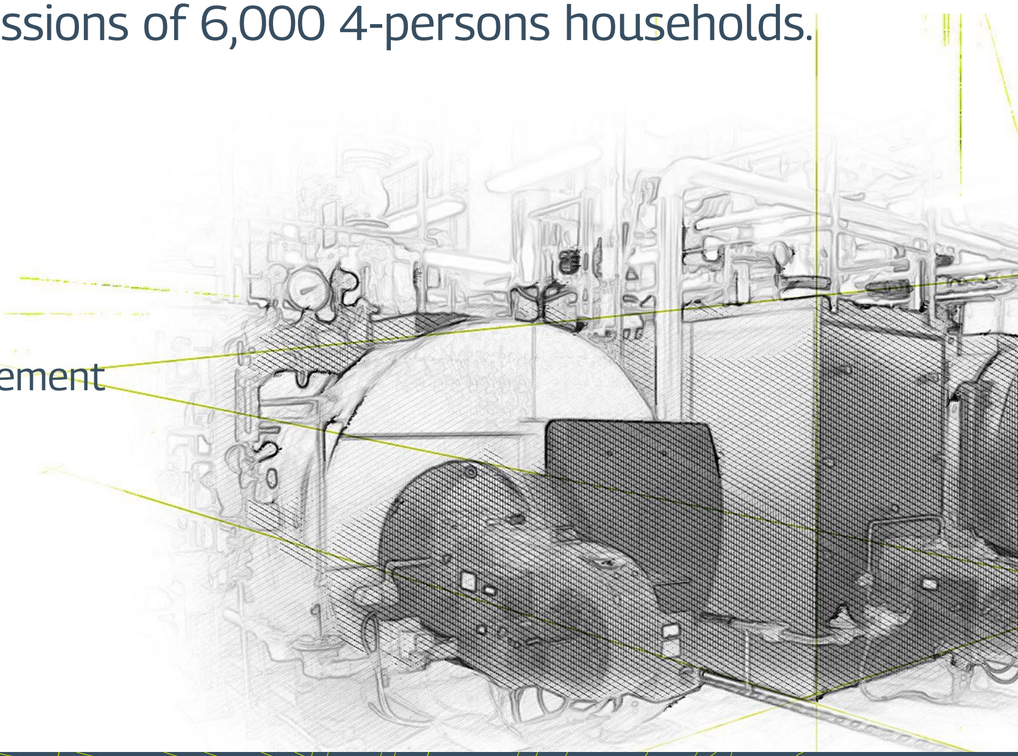
Heat and power plant improvement

Due to the improvements the CO_2 emissions will be reduced from approx. **134,000 tons** to approx. **110,000 tons** annually.

The difference od **24,000 tons** refers to the average annual CO_2 emissions of 6,000 4-persons households.

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



DB ENERGY

SCHUMACHER PACKAGING

Heat and power plant improvement

DB ENERGY

DB Energy
market leader

13 YEARS OF EXPERIENCE IN THE INDUSTRY

1,200	industrial audits
€ 1.1 bn	value of energy-saving investments
€ 380 ml	annual savings generated by the designed investments
8.3 TWh	annual energy savings thanks to designed investments
€ 133 ml	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

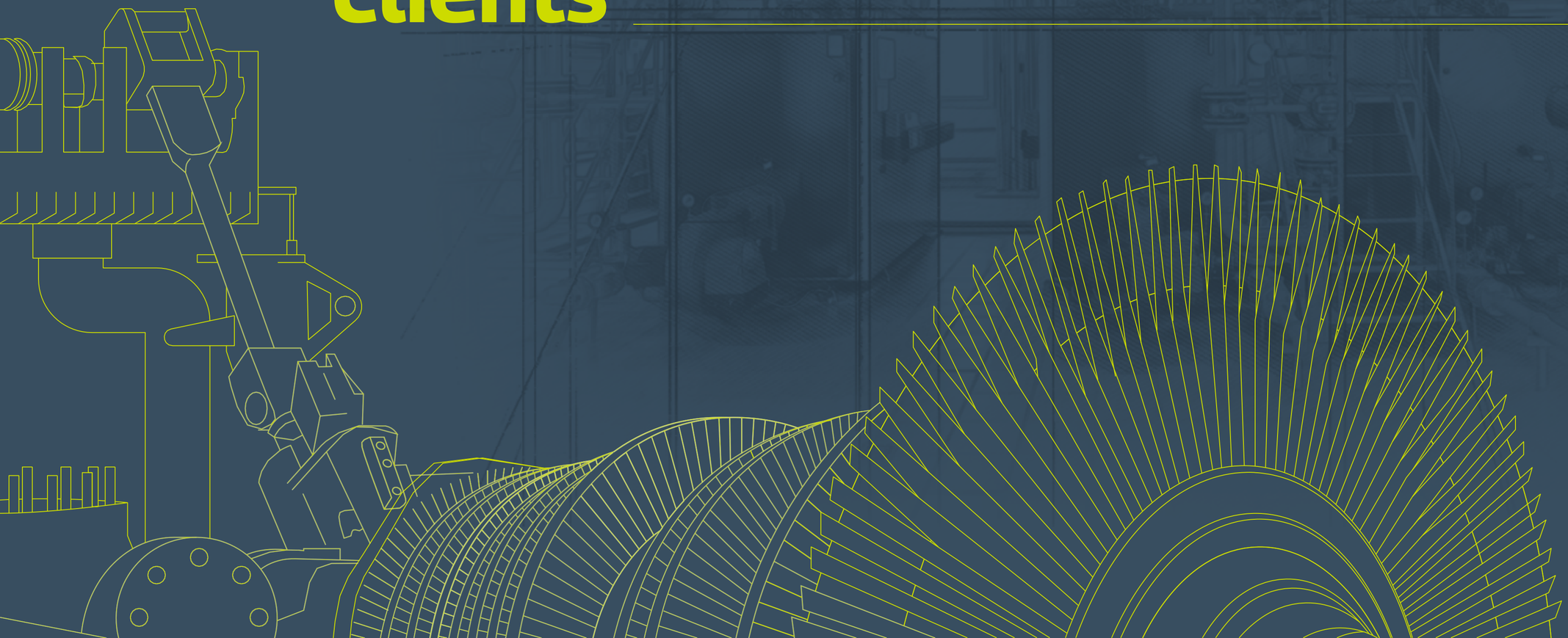
24%

Metal industry

22%

DB ENERGY

Selected clients



Selected
CLIENTS

Contact for CLIENTS

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DB ENERGY WILLBEE ENERGY APPS

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

European Funds Smart Growth

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.