
Софийска вода
Renewable energy production -
the case study of
Kubratovo WWTP in Sofia.
29 Juni 2022
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VEOLIA

Central and Eastern Europe Zone
Activities

38 500 employees

14 countries

ACCESS TO WATER & SANITATION

1,063
WTP/WWTP plants

71,644 km
water/sewage networks

10,9 M
people served in drinking water services

585 M m3
drinking water – sales

11,2 M
people served in wastewater services

LOCAL LOOPS OF ENERGY

2,565
thermal plants

41,1 th. MWh
cold sales

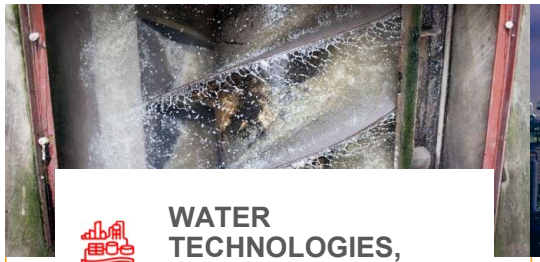
19,2 M MWh
heat sales

6,238 km
DH networks

8,5 M MWh
electricity sales

SOLID WASTE MANAGEMENT

3,413,000 tons
waste - municipal solid waste, commercial waste, secondary raw material, fly ashes



WATER TECHNOLOGIES, TREATMENT PLANTS & NETWORKS

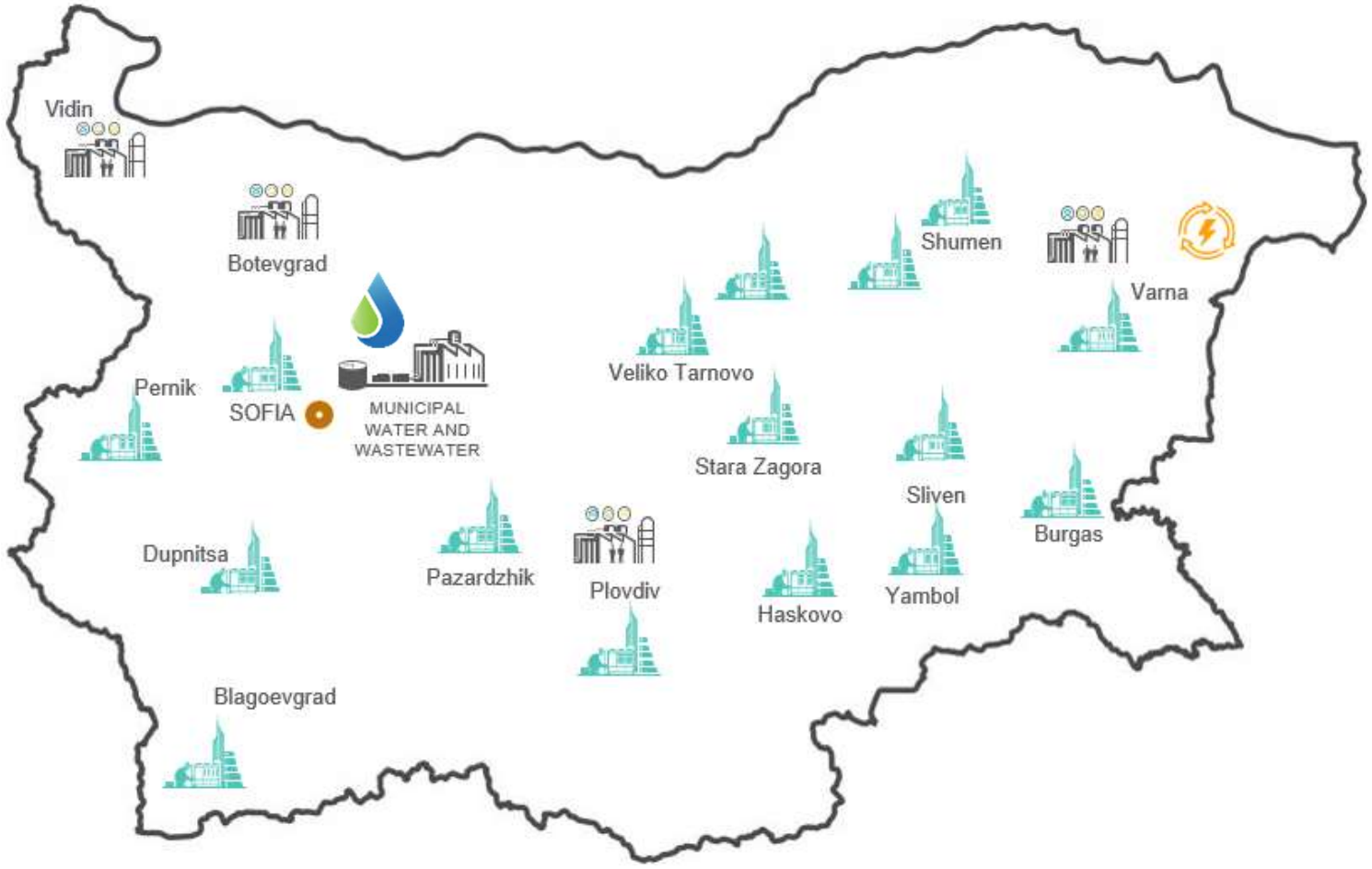
5
COUNTRIES

ON-SITE SERVICES TO INDUSTRIAL CLIENTS

More than 1,000
Industrial sites

Our presence in Bulgaria

3 companies for a national footprint



Industrial Utilities – Water & Energy

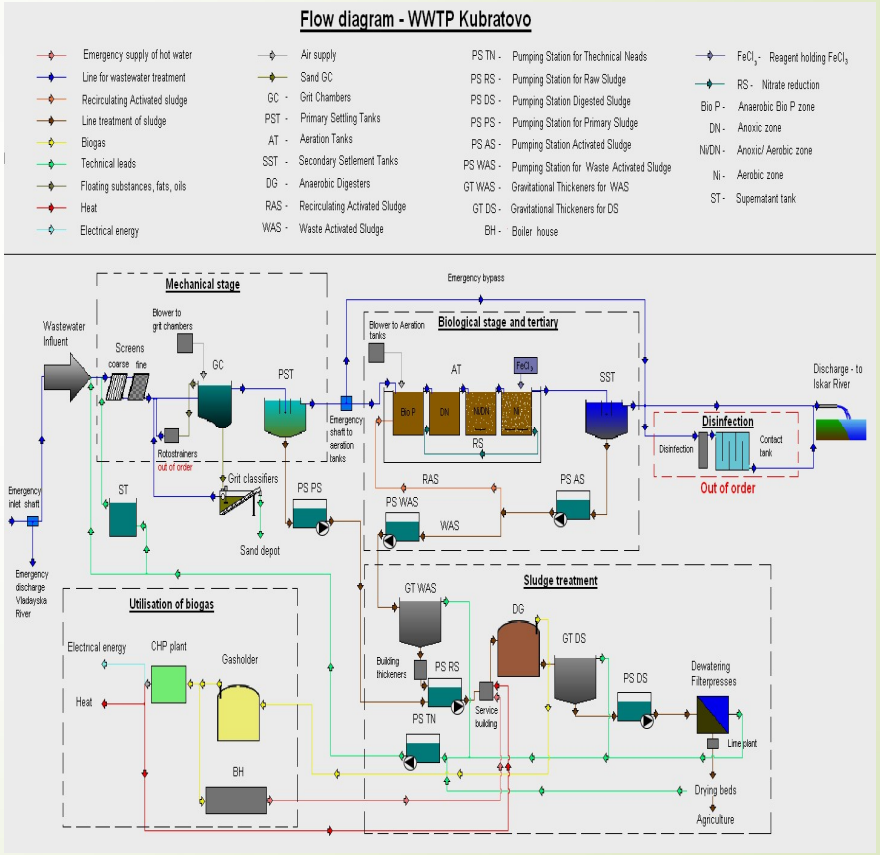
Technical Services

Water and Wastewater services

District heating network - Varna

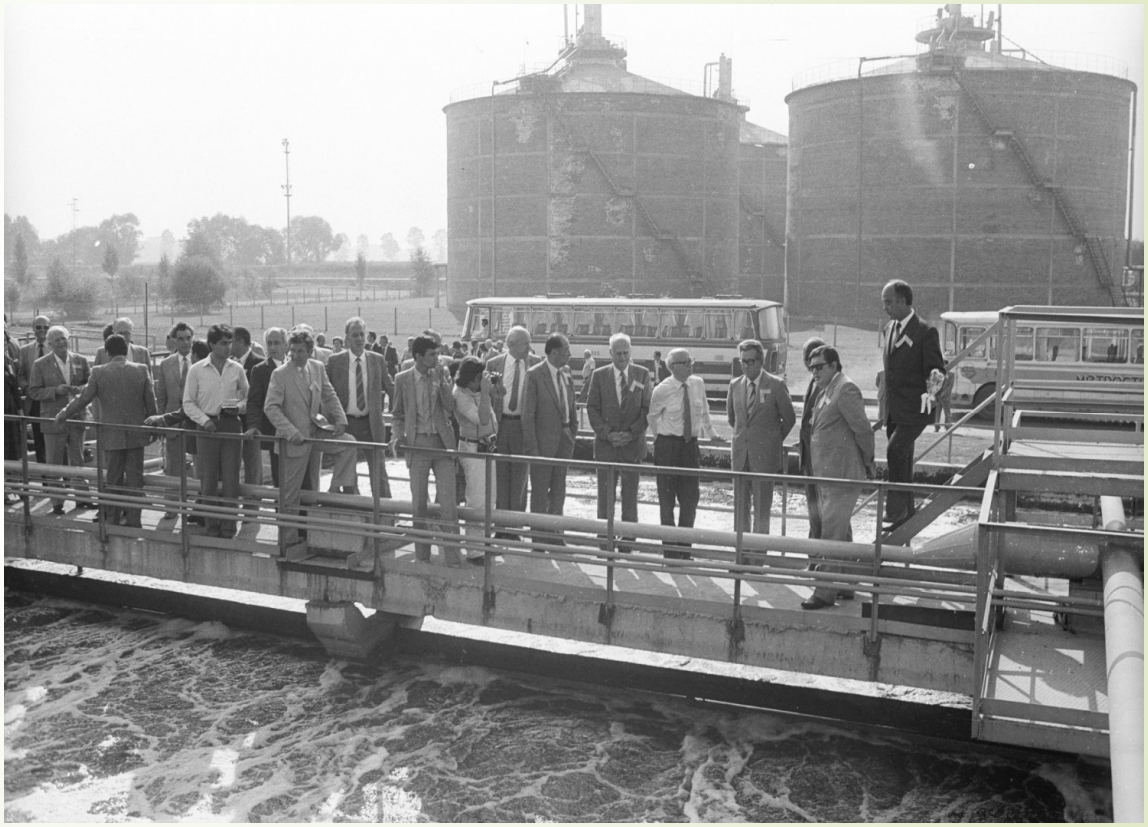
170+ engineers & technical experts based in the main cities

WWTP - Kubratovo



Overview of Sofia WWTP

- The plant was designed during the 1970s
- Until recently the biggest on the Balkan Peninsula with an area of 60 ha
- Treatment capacity 480,000 m^3/day
- Located in the lowest part of Sofia valley
- Commissioned on September 4 1984



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Sofia Wastewater Treatment Plant – Basic Parameters:

- **Flows:**

- Designed Wastewater flow – 480 000 m^3/day;
- Flow to full treatment – 550 000 m^3/day;
- Maximum flow – 680 000 m^3/day;

- **Loads:**

- Influent BOD_5 – 164 mg/l, or 78 720 kg/day;
- Influent SS – 173 mg/l, or 83 040 kg/day;
- Influent TN – 40 mg/l, or 19 200 kg/day;
- Influent TP – 5,8 mg/l, or 2 784 kg/day;

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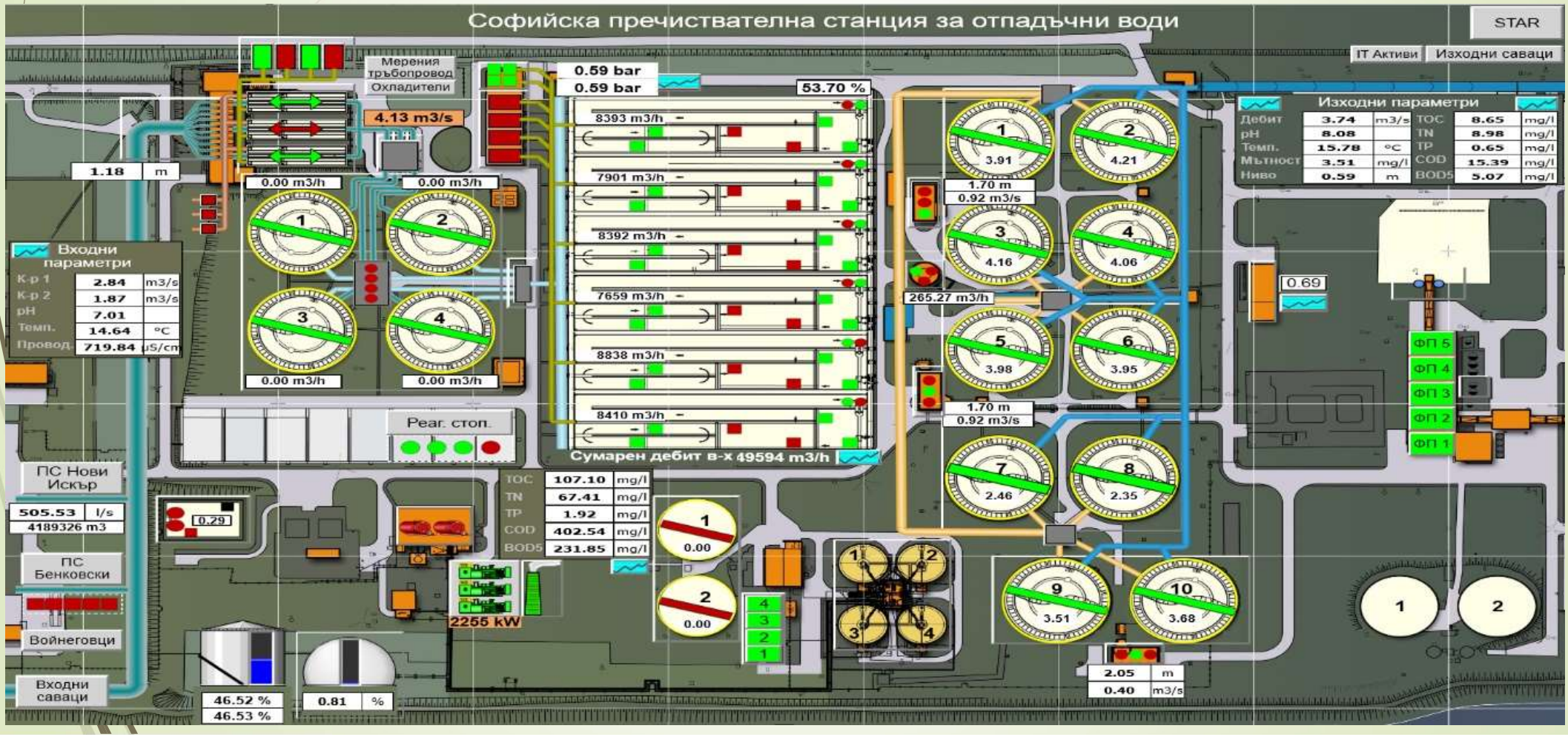
Sofia WWTP – Main reconstructions

1996 - 1999	2002 - 2004	2006	2009	2010 – 2011	2019 - 2020
• Project for reconstruction of the Sludge treatment facilities	• Project for reconstruction of the water treatment line	• Finishing the reconstruction of the Sludge treatment facilities and starting operation of Digesters	• Installing of CHP - plant	• Reconstruction of biological line and implementation of technology for nitrogen and phosphorus removal	• Building of new fifth Digester

Sofia WWTP – SCADA system



Sofia WWTP – mechanical treatment

Screens

10 ps. core screens
10 ps. fine screens

Sofia WWTP – mechanical treatment

Sand and grease removal

3 ps.

Sofia WWTP – mechanical treatment

Primary settling tanks 4 ps.

Diameter - 54 meter

Volume – 12 000 m^3

Sofia WWTP – biological treatment

Aeration tanks

6 ps.

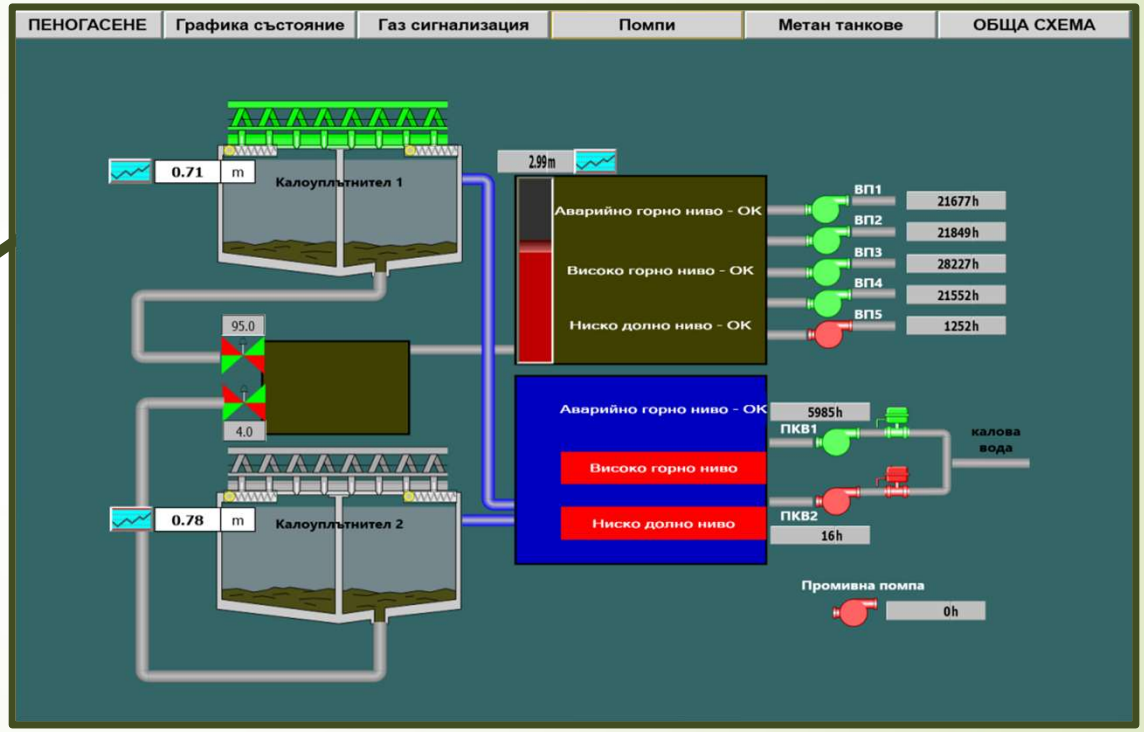
Biological treatment with active sludge

Sofia WWTP – biological treatment

Secondary settling tanks

10 ps.

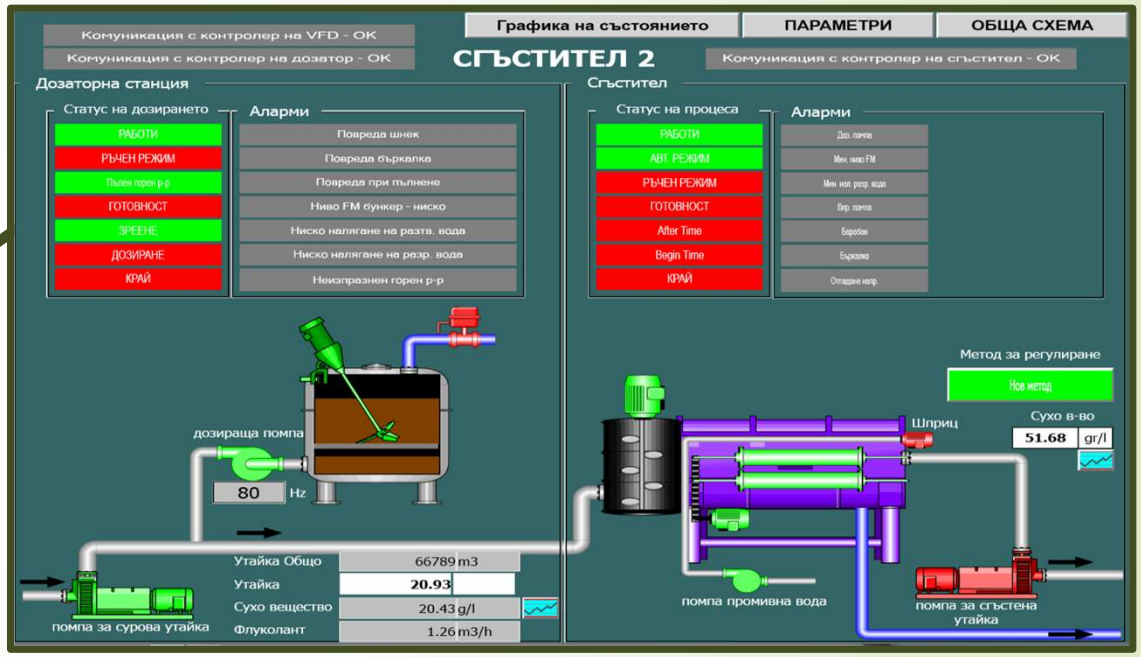
Sofia WWTP – sludge treatment



Gravity thickeners

2 ps.

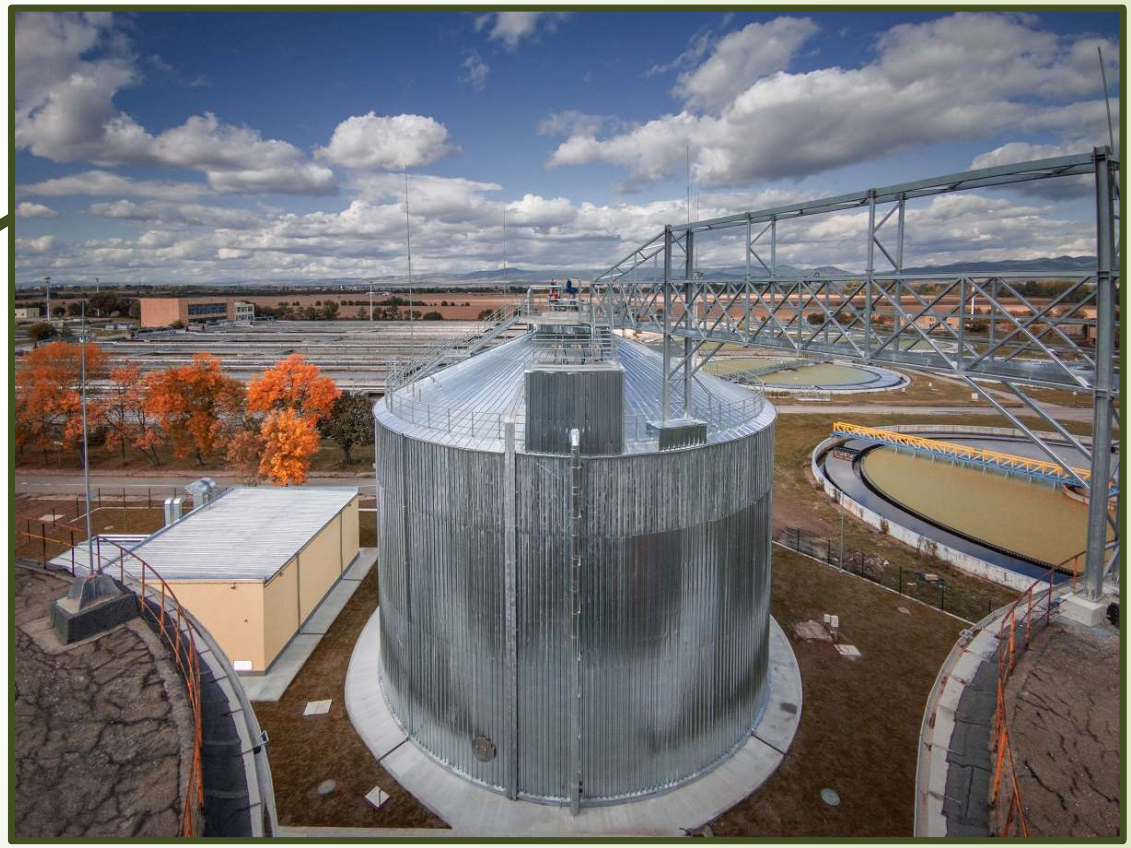
Sofia WWTP – sludge treatment



Mechanical thickeners

4 ps.

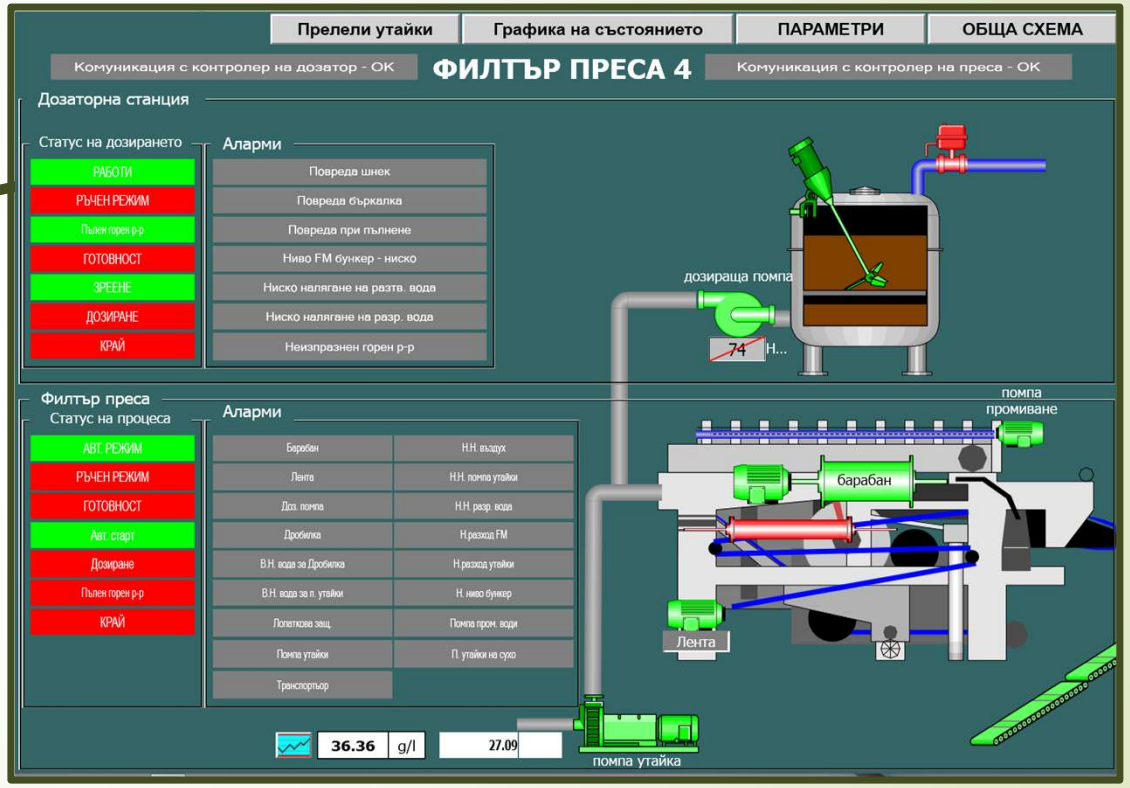
Sofia WWTP – sludge treatment



Digesters

5 ps.

Sofia WWTP – sludge treatment



Belt presses

5 ps.

Sofia WWTP – CHP plant

Before

After

Focus on WWTP energy efficiency

- New Double Membrane Gasholder - 2016

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Focus on WWTP energy efficiency

- New Double Membrane Gasholder
  - Main goal:
    - Additional (extra) methane gas storage capacity;
    - More reliable and flexible operation of gas processing facilities: no need to interrupt sludge digestion process, while overhaul is required for the existing gasholder;
  - Main operational data:

Double Membrane Gasholder, type GS 217	
Useful volume	970 m^3
Diameter of reservoir	12,99 m
Height of reservoir	9,74 m
Operational pressure of the gas	35 mbar
Max consumption of gas	2000 m^3/h
Max gas flow	2000 m^3/h
Min required inside pressure	35 mbar

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Focus on WWTP energy efficiency

- New Heat Recovery System from CHP exhaust gases - 2017

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Focus on WWTP energy efficiency

- New Heat Recovery System from CHP exhaust gases
  - Main goal:
    - Additional heat production;
    - More heat for technological purposes and on-site building heating;
    - Substitute of boiler capacity in winter season;
  - Main operational data:

Heat Output of Utilization System:	
Gas flow	12 600 Nm^3/h
Temperature of inlet gases	250 ^0C
Specific heat capacity	1109,5 kJ/kg.K
Temperature of outlet gases	90 ^0C
Density of chimney gases	0,95 kg/m^3
Heat output	590,73 kWh

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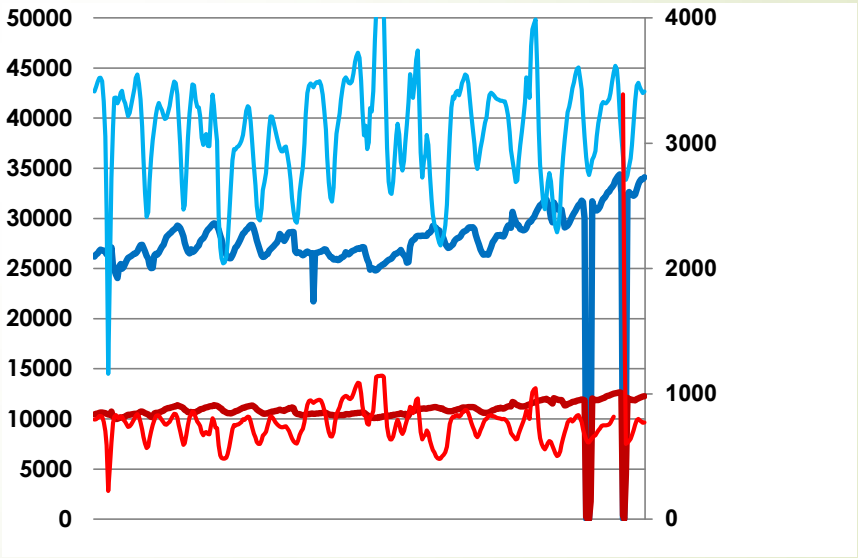
Focus on WWTP energy efficiency

- NEW BLOWERS - 2017: Investments in state-of-the-art aeration technology

11 per cent reduction in process energy consumption



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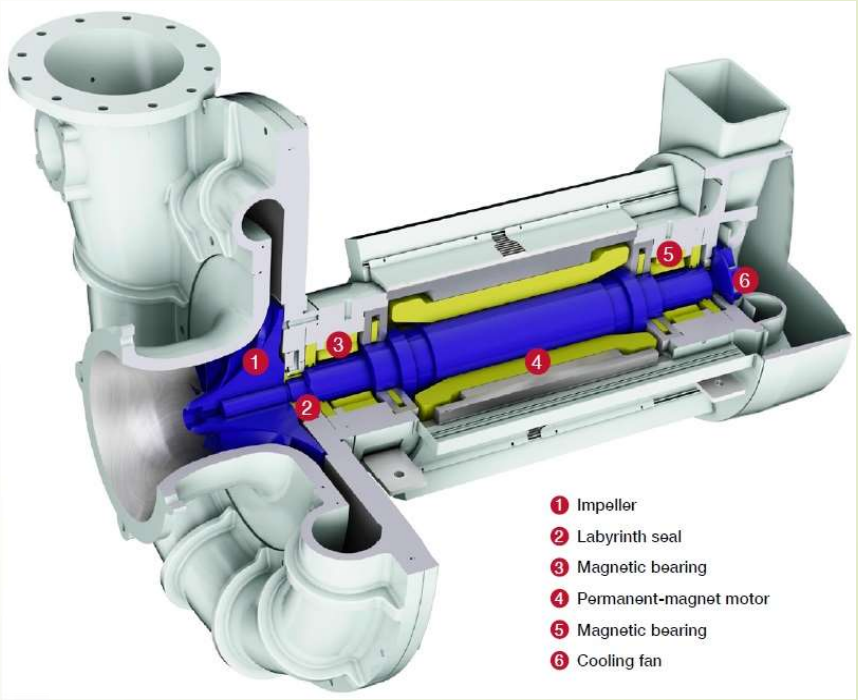
Focus on WWTP energy efficiency

- NEW BLOWERS: Investments in state-of-the-art aeration technology
- Advantages
  - Magnetic bearings with active regulation
  - No friction and vibrations
  - Low maintenance and operation costs
  - High energy efficiency
  - Automatic regulation based on pressure set point
  - No need for additional cooling
  - Automatic group control of blowers in parallel in optimal mode



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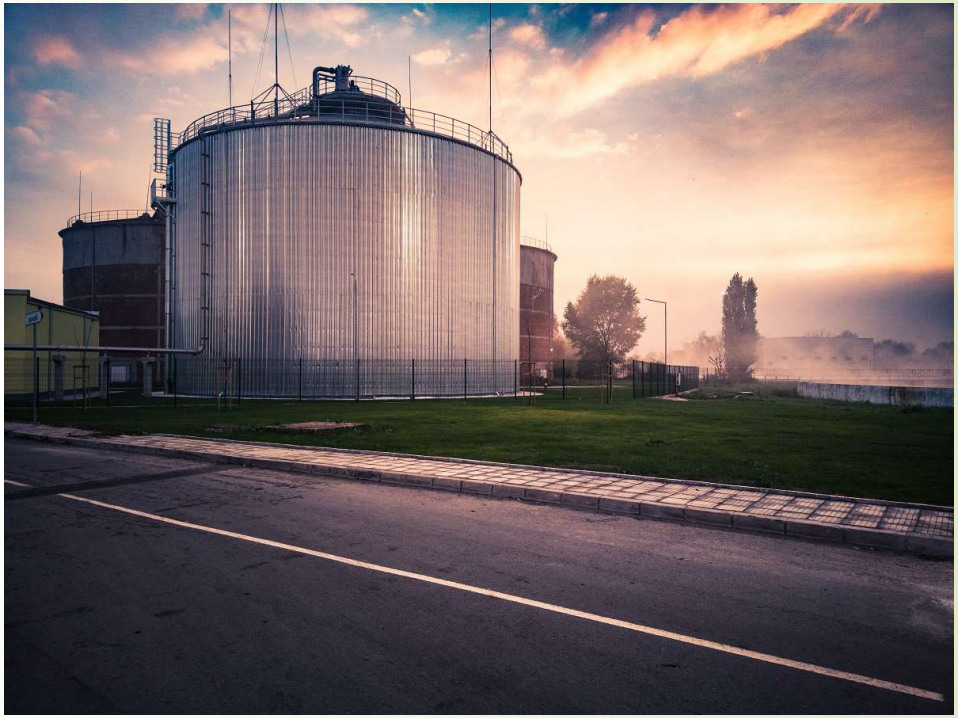
Focus on WWTP energy efficiency

- New Digester – 2020 - parameters
  - Volume – 7 000 m3
  - Mechanical mixing
  - Mesophilic operation – temperature 35 – 38°C
  - Biogas production ≈ 6 000 – 8 000 m3/d



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Focus on WWTP energy efficiency

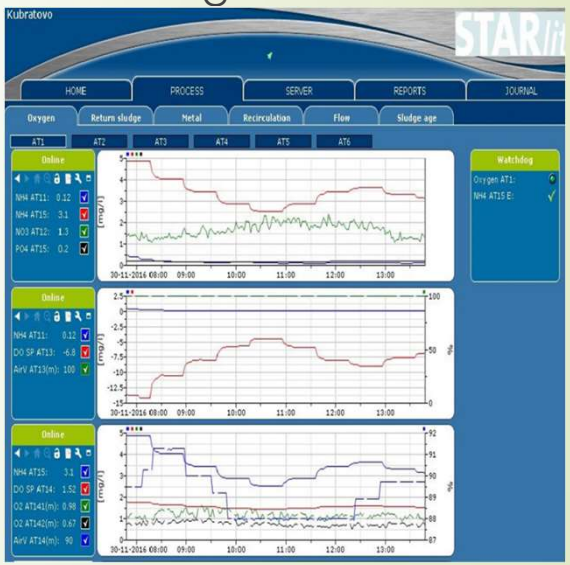
- HubgradeTM Performance Plant (AQUAVISTA, STAR) from Krüger

- In 2013 was implemented the STAR Lite in WWTP Kubratovo to optimize the management of nitrogen and phosphorus removal processes
  - reduction in the cost of phosphorus removal reagent
  - improvement in nitrogen removal
- In 2019 was implemented the N/DN Phase control
  - The phase control monitors all the online measurements

  in the aeration tanks and takes decision whether to aerate

  or not a certain zone, so the denitrification

  capacity can be expanded
  - reducing the TN in the effluent by 5%



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Focus on WWTP energy efficiency

- HubgradeTM Performance Plant (AQUAVISTA, STAR) from Krüger
- 2021 - Hubgrade™ Performance Plant from Krüger
  - The online control system Hubgrade ™ Performance Plant replaces the existing STAR Utility Solutions and includes improved features for optimization of Nitrogen removal, savings on energy and chemical consumptions, improved hydraulic optimization by integration of information from sewer system
- The implementation In WWTP Kubratovo includes:
  - Upgrade of existing modules:
    - DO & Nitrogen Removal and prepared for N2O sensor/optimization
    - P-Precipitation
    - NO3-recirculation incl. SMART Bio-P
    - Return Activated Sludge
    - Solids Retention Time
    - Flow Distribution – Biological lines

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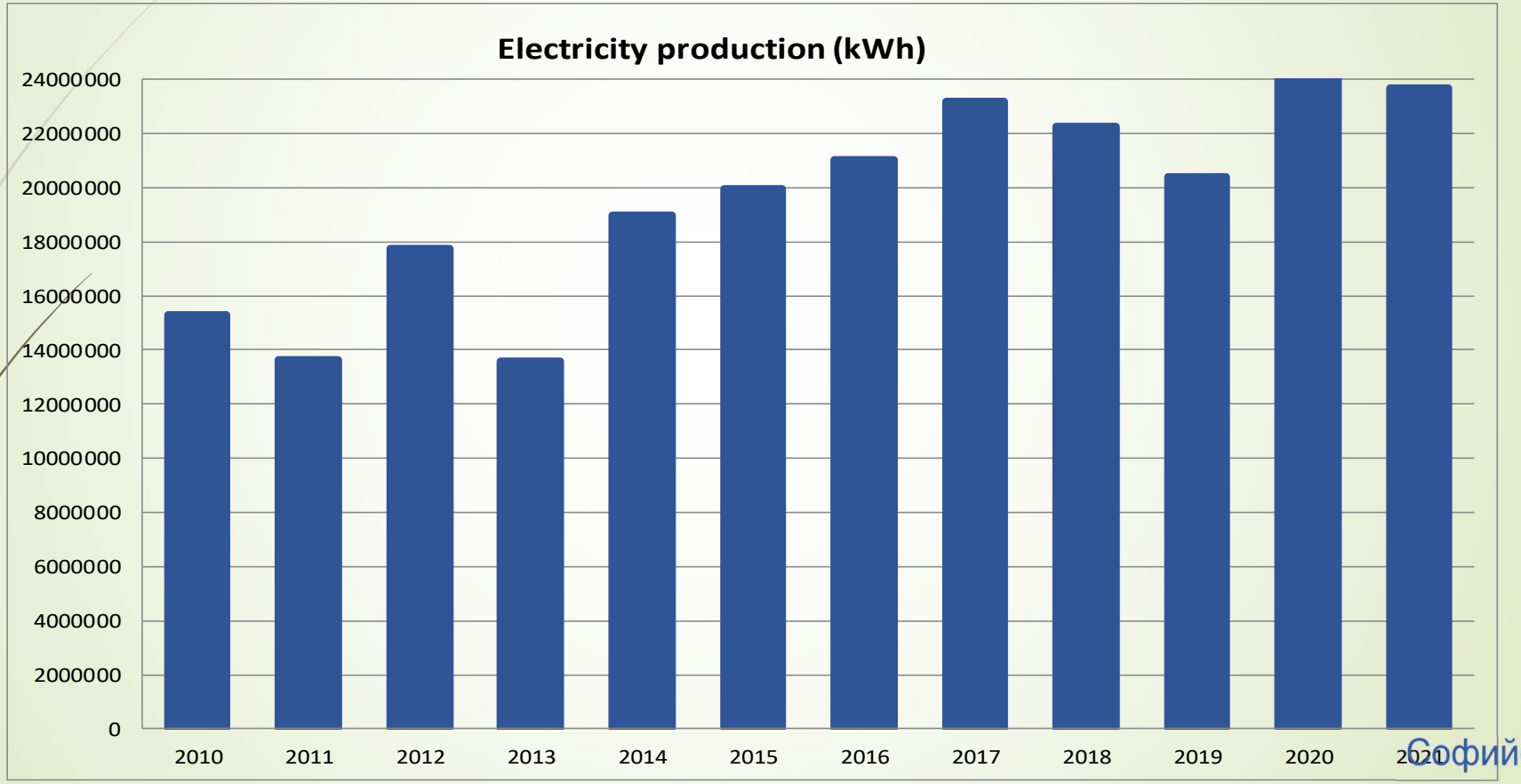
Energy achievements 2021



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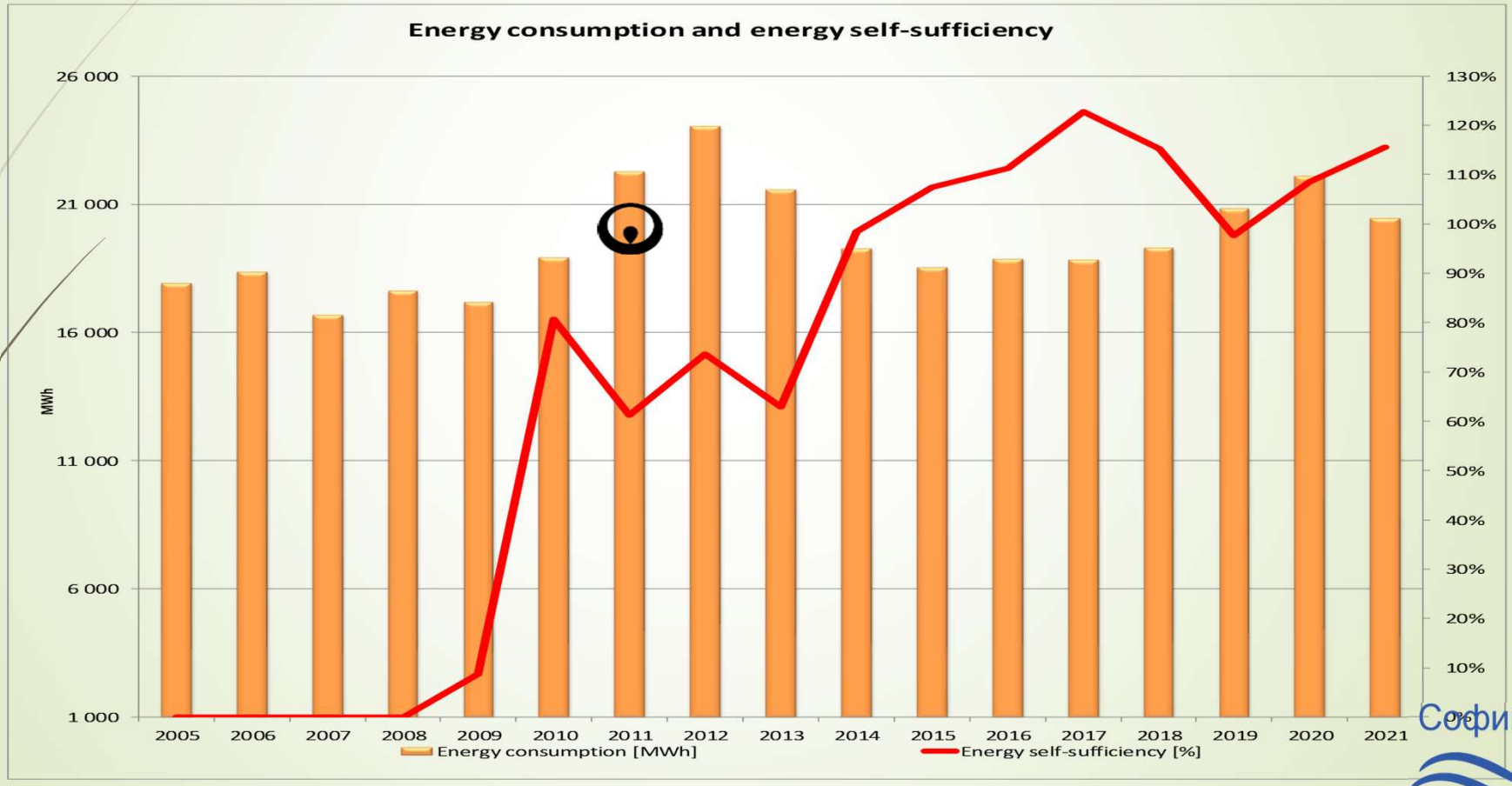
Energy achievements 2021



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Focus on GLOBAL energy efficiency

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Focus on GLOBAL energy efficiency

- How can we best valorize these results?

To have energy independent wastewater plants is no longer a dream

To have energy positive water cycles is possible

So:

Can we make these well known?

Can we make these a norm within the Veolia group?

Can we link Veolia to the image of energy independent operations?

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THANK YOU FOR YOUR ATTENTION!

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