

Balkans Joint Conference and Exhibition,
“Water and Climate Change”, November 6th 2020



Sewage Disposal Southwest Kosovo IV (Peja WWTP)

Reduction of Greenhouse Gas Emissions by Energetic Use of Biogas from Sludge Digestion

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KFW



Schweizerische Eidgenossenschaft
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DHE PARRALEL F.B.A.



Project Location Map

Population connected to Sewerage

	Population		Population		Population	
	connected to sewerage		connected to sewerage		connected to sewerage	
	Stage I	Stage II		Stage I		Stage II
Year	2026	2036		2026		2036
Growth Rate per annum	1.005 0,50%	1.005 0,50%	Connection Rate		Connection Rate	
	[cap.]	[cap.]	[%]		[%]	
Peja Municipality	103.943	109.258		59.178		70.783
connection to sewerage				57%		65%
Peja City Area	52.766	55.464	95	50.127	100	55.464
Vitomirice	5.829	6.127	85	4.955	95	5.821
Rausic	2.436	2.560				
Trebovic	2.101	2.209			95	2.099
Naberoje	1.975	2.076				
Novi	1.958	2.058				
Brestovik	1.851	1.946	85	1.574	95	1.849
Qyshk	1.596	1.678	85	1.357	95	1.594
Radac	1.457	1.532				
Beliopoje	1.371	1.441	85	1.165	95	1.369
Zahaci	1.207	1.269			95	1.205
Krysmec	1.087	1.143				
Berzhenik	771	810			95	769
Gorazhdec	614	646			95	613
Other villages	26.923	28.299				

**Forecast
Population
connected to
sewerage**

**Stage I 59,200
residents**

**Stage II 70,800
residents**

Deficiencies in the Field of Wastewater Systems

- **Direct discharges of untreated wastewater into Lumbardhi Pejës River**
 - **No wastewater treatment plant in Peja City available**
- ### **Specific Project Objectives**
- **Improve the collection and treatment of wastewater in the city area of Peja**
 - **Contribute to protect surface and groundwater resources in the project area**
 - **Assist the city of Peja in view of**

Available Project Funds

Item	Project Financing	Funds
	International Funds	
1.1.	KFW Grant	EUR 9,000,000
1.2.	SECO Grant	EUR 7,600,000
	Local Funds	
2.1.	Peja Municipality	EUR 3,000,000
2.2.	Republic of Kosovo	EUR 3,800,000
	Total Financing	
	Total Funds	EUR 23,400,000

Sewage Disposal Southwest Kosovo IV Peja - Time Schedule

Start Design Phase 01/2018

**Tender Publication
 Submission Date
 12/2018**

*Construction Period 31
 months*

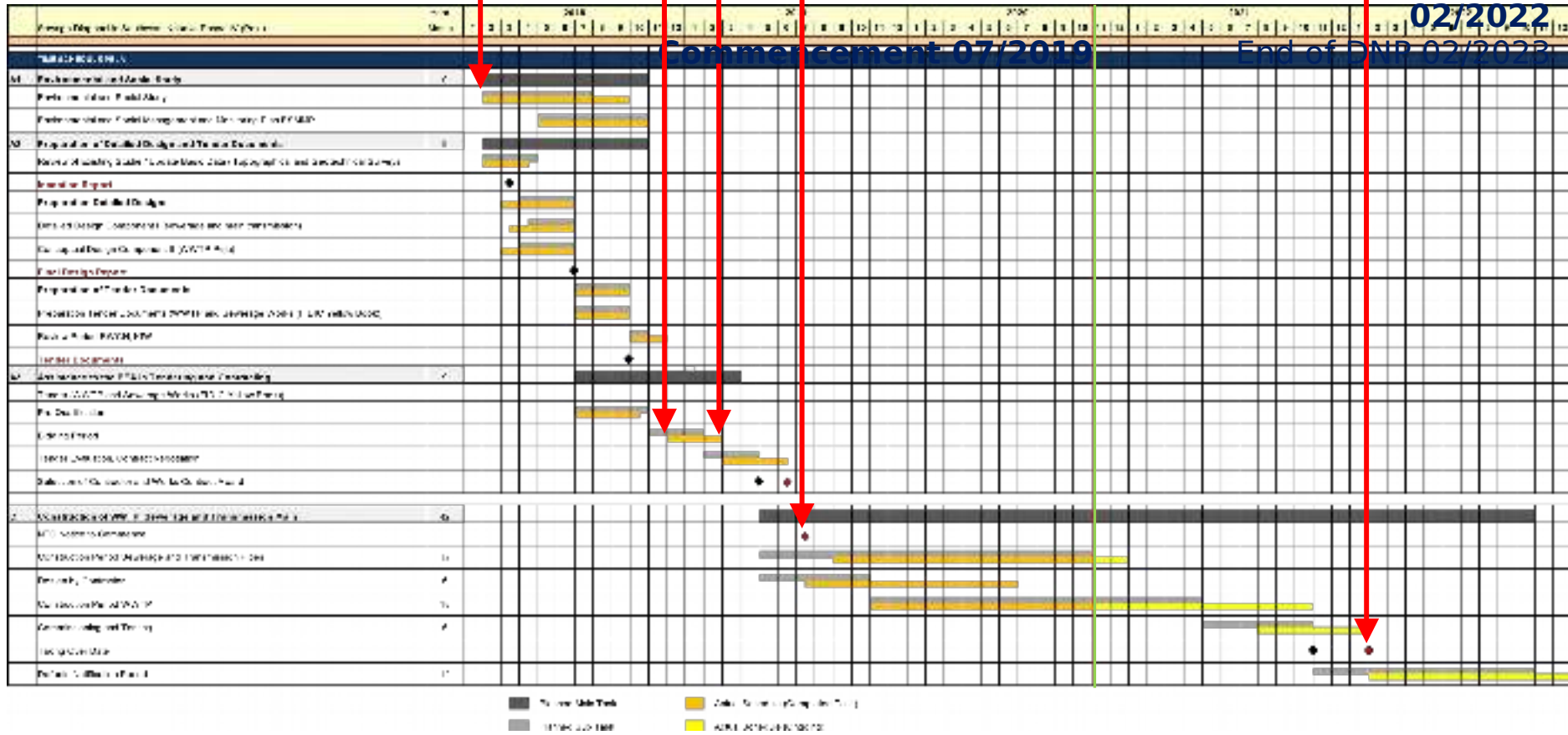
02/2019

Taking Over Date

02/2022

Commencement 07/2019

End of DNP 02/2022



Organic Pollution Loads

Basic Design Data				Stage 1		Stage 2	
Year		2018	2021	2025	2031	2036	
	Unit						
Waste Water Characteristics and Loads							
Specific Pollution Loads							
CCD ₅₀	g/PE ^{ind} /d	105	105	105	105	105	
BOD ₅₀	g/PE ^{ind} /d	54	54	54	54	54	
SS ₅₀	g/PE ^{ind} /d	65	65	65	65	65	
TKN ₅₀	g/PE ^{ind} /d	11	11	11	11	11	
PO ₄ ^P _{eq}	g/PE ^{ind} /d	1,6	1,6	1,6	1,6	1,6	
Total Daily Pollution Loads (from municipal + industrial)							
COD	kg/d	5.354	6.275	6.280	6.701	7.400	
BOD	kg/d	4.108	4.235	4.380	4.770	5.158	
SS	kg/d	4.400	4.031	4.072	5.003	5.443	
TKN	kg/d	676	689	702	773	804	
P	kg/d	131	138	141	150	150	
Average Pollution Concentrations (municipal + industrial)							
COD	mg/l	683	694	728	783	845	
BOD	mg/l	336	343	359	395	419	
SS	mg/l	390	367	394	409	439	
TKN	mg/l	53	54	55	62	65	
P	mg/l	11	11	12	12	13	
Population Equivalent							
Population Equivalent COD ₁₀₀	PE COD ₁₀₀	77.348	79.382	82.041	89.828	97.039	
Population Equivalent BOD ₁₀₀	PE BOD ₁₀₀	76.009	76.439	80.085	86.486	93.317	
Population Equivalent SS	PE SS	87.685	89.710	91.871	97.894	103.791	
Population Equivalent TKN	PE TKN	68.631	69.640	70.774	76.261	79.761	
Population Equivalent P	PE P	72.032	75.355	79.263	85.393	89.315	

Pollution Load Stage I

4.369 kg BOD5/d
81,000 PE

Pollution Load Stage II

5.158 kg BOD5/d
96,000 PE

Transmission Mains and Special Structures

Lot I Sewerage Rehabilitation / Transmission Mains

(photo:

STRABAG August 2020)



Peja Wastewater Treatment Plant

Classification Receiving Water Body

- **River Lumbardhi Pejës is regarded as less sensitive area (MoESP)**
- **Organic carbon removal is required to a far extent, but no nutrient removal**
- **European Urban Wastewater Directive 91/271/EEC**
- **Requirements for discharge of treated effluent from communal WWTPs according to Administrative Instruction MoESD No. 30/2014, Annex II, Tables 1 and 2**

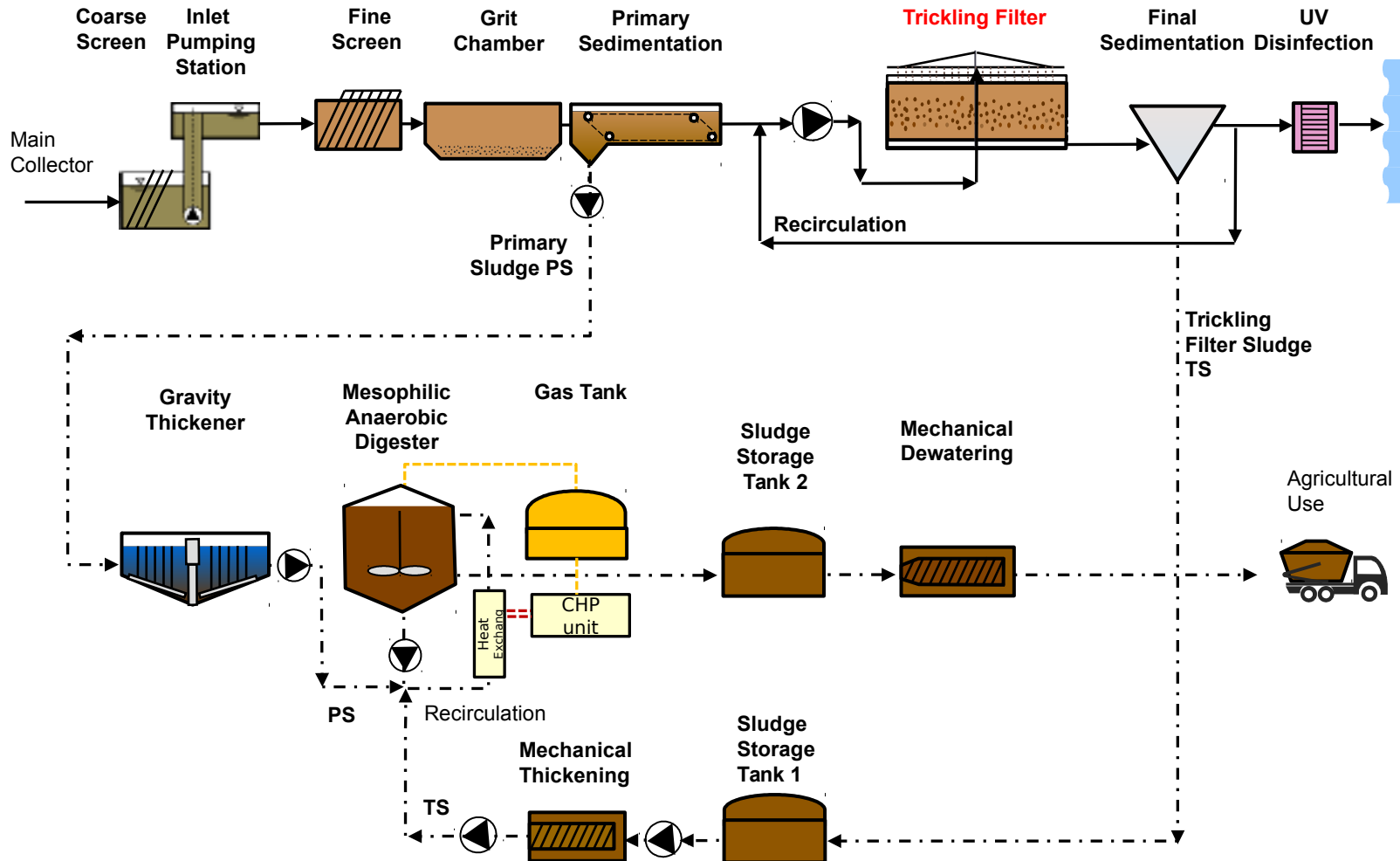
Parameter		Unit	Stage I	Stage II
Suspended Solids	TSS	mg/l	35	35
Biological Oxygen Demand	BOD5	mg/l	25	25
Chemical Oxygen Demand	COD	mg/l	125	125
Total Nitrogen	Ntot	mg/l		15
Ammonia	NH4	mg/l		2
Phosphorus	P	mg/l		2
Escherichia Coli Bacteria		MPN/100 ml	1,000	1,000

Scope of Project Measures

Peja Wastewater Treatment Plant

- **Wastewater Treatment Plant for 81.000 PE (Stage 1)**
- With mechanical and biological treatment for organic carbon removal
- Trickling Filters or Activated Sludge Tanks
- UV Disinfection
- Anaerobic Mesophilic Digestion

Peja WWTP Process Flow Chart - Tender Outline Design



Peja WWTP - Tender Outline Design Bird Eye View



Peja WWTP - Works Contract Conditions

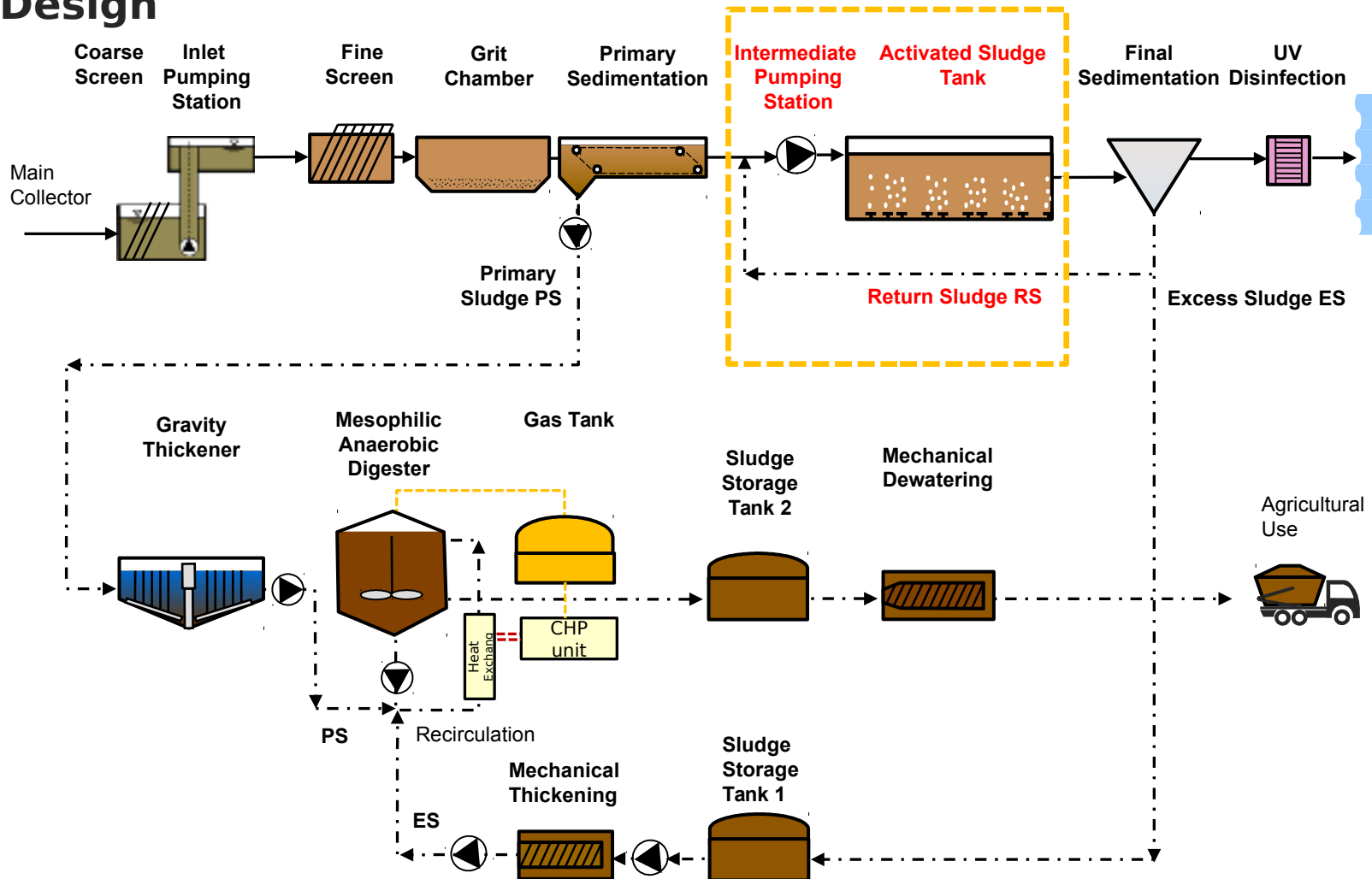
Conditions of Contract for **Plant and Design-Build**

**For Electrical and Mechanical Plant, and for
Building and Engineering Works, Designed by the
Contractor**

FIDIC 1999



Peja WWTP Process Flow Chart - Alternative Design



Peja WWTP - Alternative Design Bird Eye View

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Lot II Wastewater Treatment Plant Peja

Drone Flight View
Construction Site 08/2020

(Source STRABAG AG Environmental
Technology)



Sludge Production and Digestion

Parameter	Unit	Stage 1 (2026)	Stage 2 (2036)	Reference Values
Total Raw Sludge	[kg ds/d]	5,576	6,828	
	[m ³ /d]	101	119	
	[kg ods/d]	4,111	4,965	
Retention Time	[d]	25.3	20.7	>15-20
Digester Volume	[m ³]	2,470	2,470	
Specific Volume	[m ³ /PE]	30	26	20-40
Organic Load	[kg ds/m ³]	1.66	2.00	2-3
Gas Production	[m ³ /kg ods]	0.434	0.419	
Biogas	[m ³ /d]	1,785	2,083	
Gas Production	[m ³ /PE/d]	22.1	21.8	14.5-22

Biogas Use

Parameter	Unit	Stage 1 (2026)	Stage 2 (2036)	Reference Values
Gas Production	[m ³ /d]	1,785	2,083	
Calorific Value	[kWh _{cv} /d]	11,426	13,331	
Calorific Value mean	[kWh _{cv} /d]	10,020	11,691	
Capacity CHP units	[kW _{cv}]	550	550	
	[kW _{el}]	2 x 100	3 x 100	
Electrical Efficiency	[%]	38	38	25-40
Electrical Power	[kWh _{el} /a]	1,389,774	1,621,542	
	[kWh _{el} /d]	3,808	4,443	
Thermal Efficiency	[%]	49	49	45-60
	[kWh _{th} /a]	1,792,077	2,090,935	
	[kWh _{th} /d]	4,910	5,729	

Electrical Power Balance

Parameter	Unit	Stage 1 (2026)
Power Production	[kWh _{el} /a]	1,389,774
	[kWh _{el} /d]	3,808
Power Consumption	[kWh _{el} /a]	1,774,581
	[kWh _{el} /d]	4,862
Electrical Balance	[kWh _{el} /a]	-384,807
	[kWh _{el} /d]	1,054
Percentage of Demand	[%]	22

Annual Electrical Power required from external public supply 385 MWh/a

Reduction Emission of “Greenhouse Gas”

Parameter	Unit	
Power Production	[kWh _{el} /a]	1,389,774
Specific Emission		
Coal	[kg CO ₂ /kWh]	1,175
Diesel	[kg CO ₂ /kWh]	0,750
Hydropower	[kg CO ₂ /kWh]	0
Kosovo Energy Mix	[kg CO ₂ /kWh]	1,039
Reduction GHG	[to CO ₂ /a]	1.444

Energy Mix for Kosovo consists of around 96% fossil energy (75% coal, 21% diesel/gasoline) and 4% renewable energy results in 1.039 gCO₂/kWh for electrical power consumption

Contribution Climate Protection

Reduction of greenhouse gas emissions by energetic use of biogas from the sludge

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