

# SRF in a CHP-plant in Germany:

**Part 1:** SRF-production (BPG® and SBS®) by  
REMONDIS Rheinland GmbH

**Part 2:** Use of SBS® in CHP-plant “Berrenrath“

**Part 1:**

**Production of BPG<sup>®</sup> and SBS<sup>®</sup>**

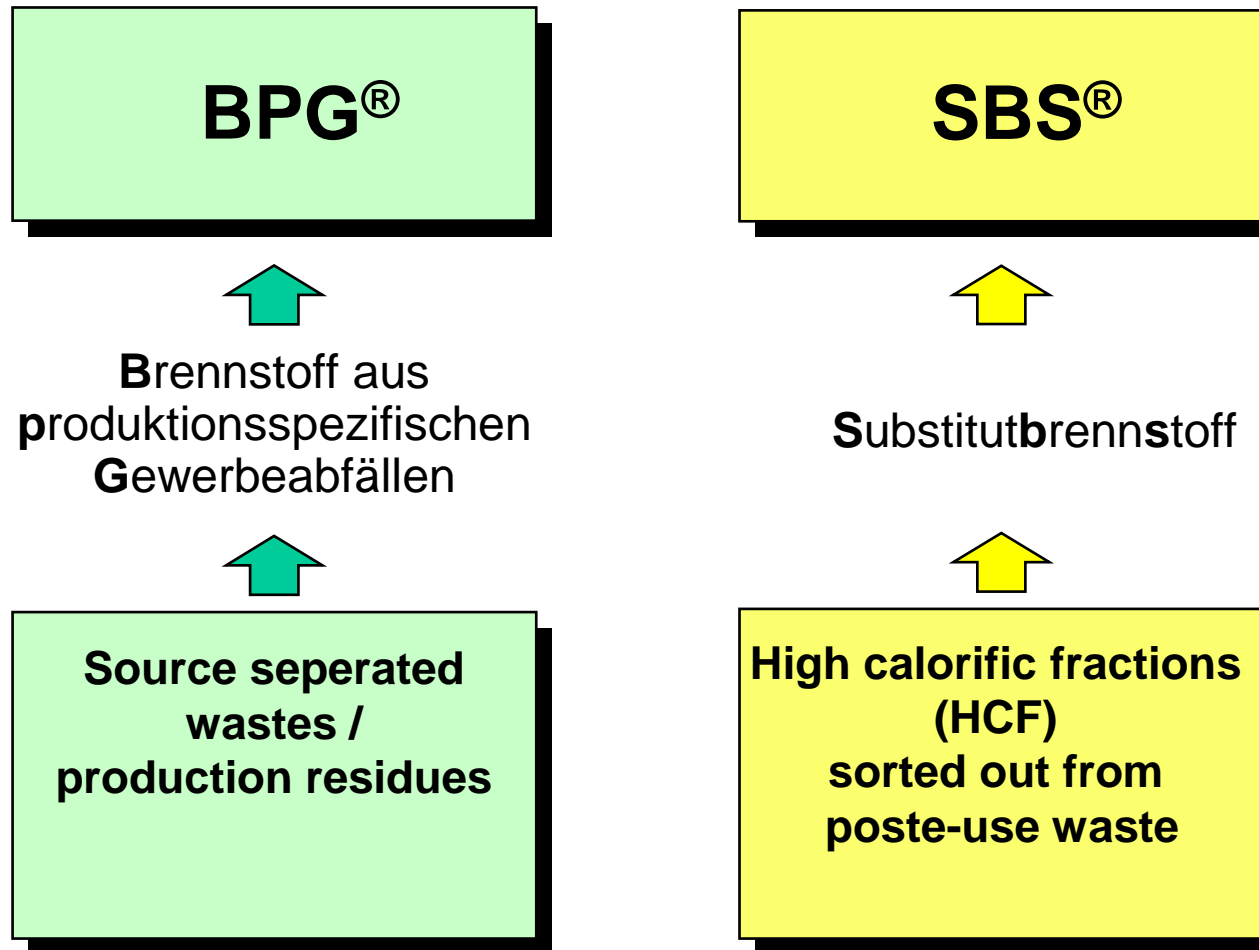
**by REMONDIS Rheinland GmbH**

# Two quality groups, two trade marks

since 1995/1998

**REMONDIS®**

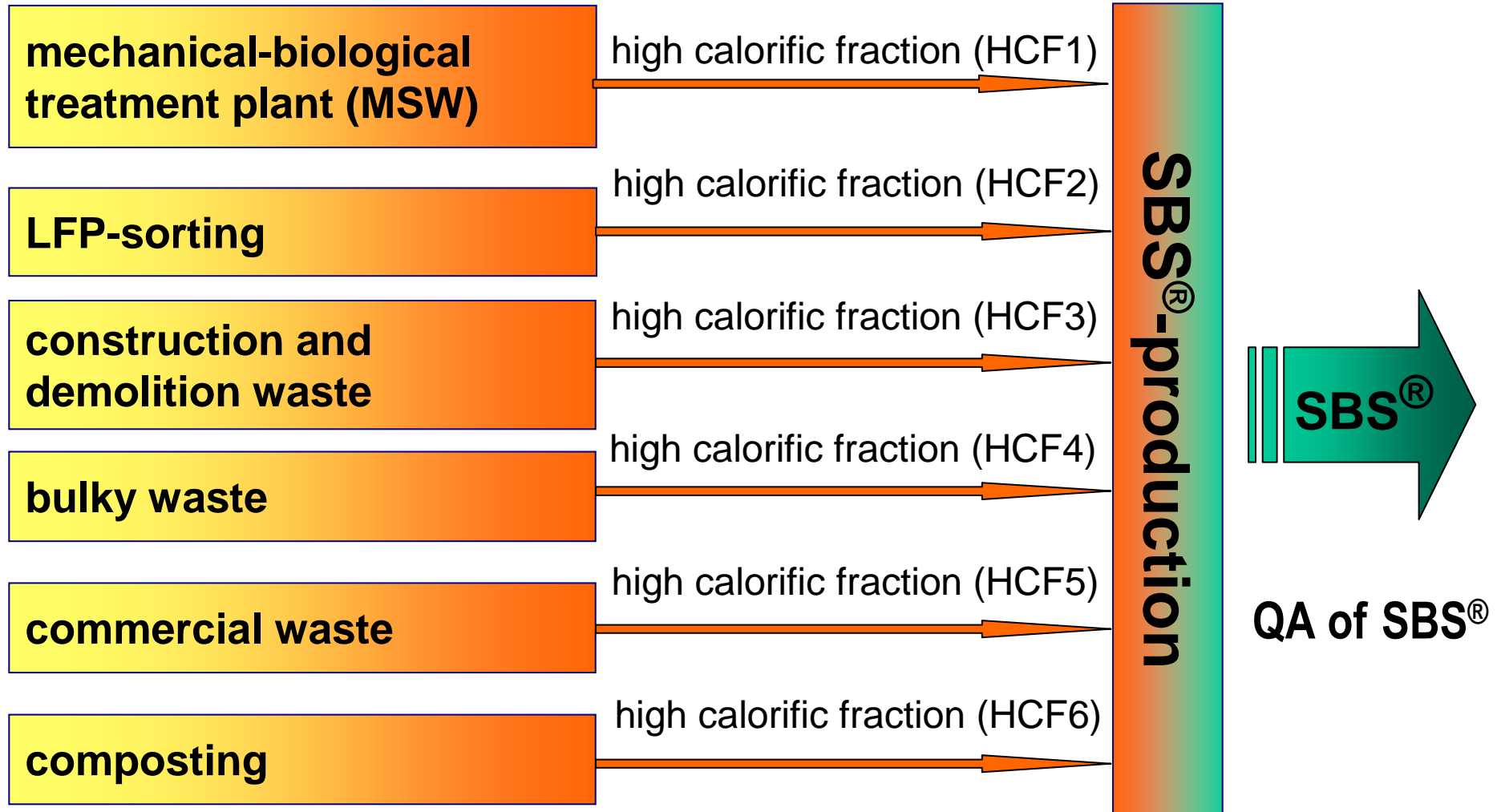
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# Input materials for SBS®

**REMONDIS®**

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**Quality Assurance of HCF`s**

# Specifications

for BPG<sup>®</sup> and SBS<sup>®</sup>



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Parameter	Unit	BPG 1 power plants	BPG 2 cement kilns	BPG 3 lime kilns	SBS 1 power plants (BC)	SBS 2 cement kilns/ power plants (HC)
NCV	MJ/kg	16 - 20	20 - 24	23 - 27	13 - 18	18 - 23
Cl	%	< 1,0	< 1,0	< 1,0	< 0,7	< 1,0
F	%	< 0,05	< 0,05	< 0,05	< 0,05	< 0,05
H <sub>2</sub> O	%	< 35	< 20	< 12,5	< 35	< 20
S	%	< 0,2	< 0,3	< 0,3	< 0,5	< 0,8
Ash	%	< 20	< 15	< 9	< 20	< 15
As	mg/kg ds	< 10	< 10	< 10	< 10	< 10
Be	mg/kg ds	< 1	< 1	< 1	< 1	< 1
Cd	mg/kg ds	< 9	< 9	< 9	< 9	< 9
Co	mg/kg ds	< 12	< 12	< 12	< 12	< 12
Cr	mg/kg ds	< 120	< 120	< 120	< 250	< 250
Cu	mg/kg ds	< 400	< 400	< 400	< 1.000	< 1.000
Hg	mg/kg ds	< 0,5	< 0,5	< 0,5	< 1,0	< 1,0
Mn	mg/kg ds	< 100	< 100	< 100	< 400	< 400
Ni	mg/kg ds	< 50	< 50	< 50	< 160	< 160
Pb	mg/kg ds	< 100	< 100	< 100	< 400	< 400
Sb	mg/kg ds	< 120	< 120	< 120	< 120	< 120
Se	mg/kg ds	< 4	< 4	< 4	< 5	< 5
Sn	mg/kg ds	< 70	< 70	< 70	< 70	< 70
Te	mg/kg ds	< 4	< 4	< 4	< 5	< 5
Tl	mg/kg ds	< 1	< 1	< 1	< 1	< 1
V	mg/kg ds	< 15	< 15	< 15	< 25	< 25

(\*): values for digestion with aqua regia in a closed microwave system

REMONDIS GmbH	ThermWert	Dr. Glorius	Spezifikation.xls, Stand: 01.01.2007
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# HCF-Sorting with NIR-systems

key technology for low-chlorine SRF

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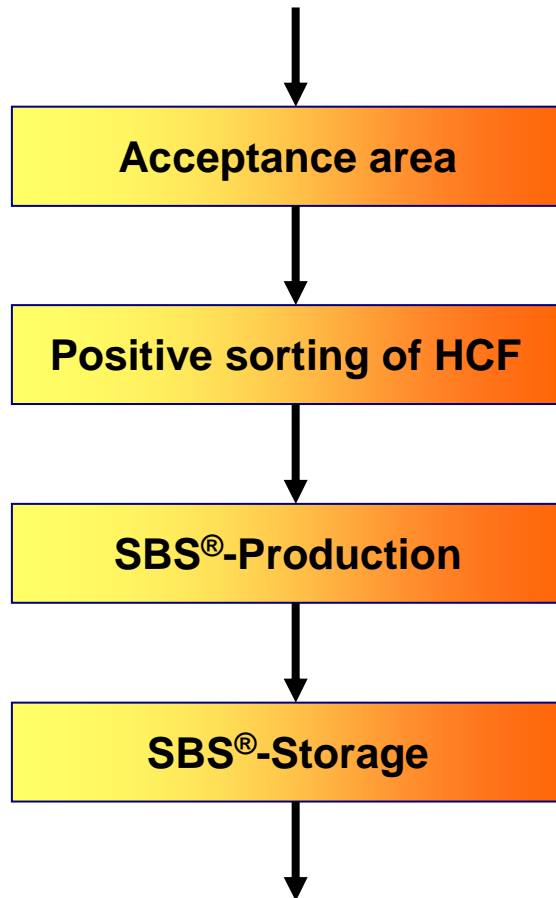
# QMS

for the production of SBS<sup>®</sup> in Erftstadt

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## Process-chain



## QA-chain



ISO 9001



EFB



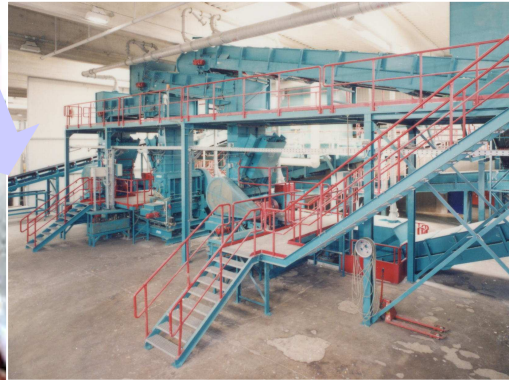
**RAL-GZ 724**



CEN TC 343



# Quality/product control according RAL-GZ 724 and prEN 15442



Sampling behind last step of size reduction



Regular sampling during production  
Analysis of H<sub>2</sub>O in the plant



Single samples are combined to 500-Mg-mixed-samples,...

Delivery to the customer

Every 1.500 Mg additional parameters are analysed:

... and are analysed by an external laboratory :



**UCL**

Analysis report – Number ...

**1.500-Mg-analysis**

for BPG® and SBS®

Parameter:

ds, H<sub>2</sub>O, Cl, Ash, NCV, F, ...

HM Group I-III:

As, Be, Cd, Co, Cu, Hg, Mn, Mo,

Ni, Pb, Sb, Se, Sn, Te, Tl, V, Zn

Ash:

Al<sub>2</sub>O<sub>3</sub>, CaO, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO,

Na<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SiO<sub>2</sub>, SO<sub>3</sub>, TiO<sub>2</sub>, ZnO

**UCL**

Analysis report – Number ...

**500-Mg-analysis**

for BPG® and SBS®

Parameter:

ds, H<sub>2</sub>O, Cl, Ash, NCV

+ 2 HM (changing monthly)



# Development of SBS<sup>®</sup>1<sub>Erftstadt</sub>-quality



## Short analysis and elementary analysis

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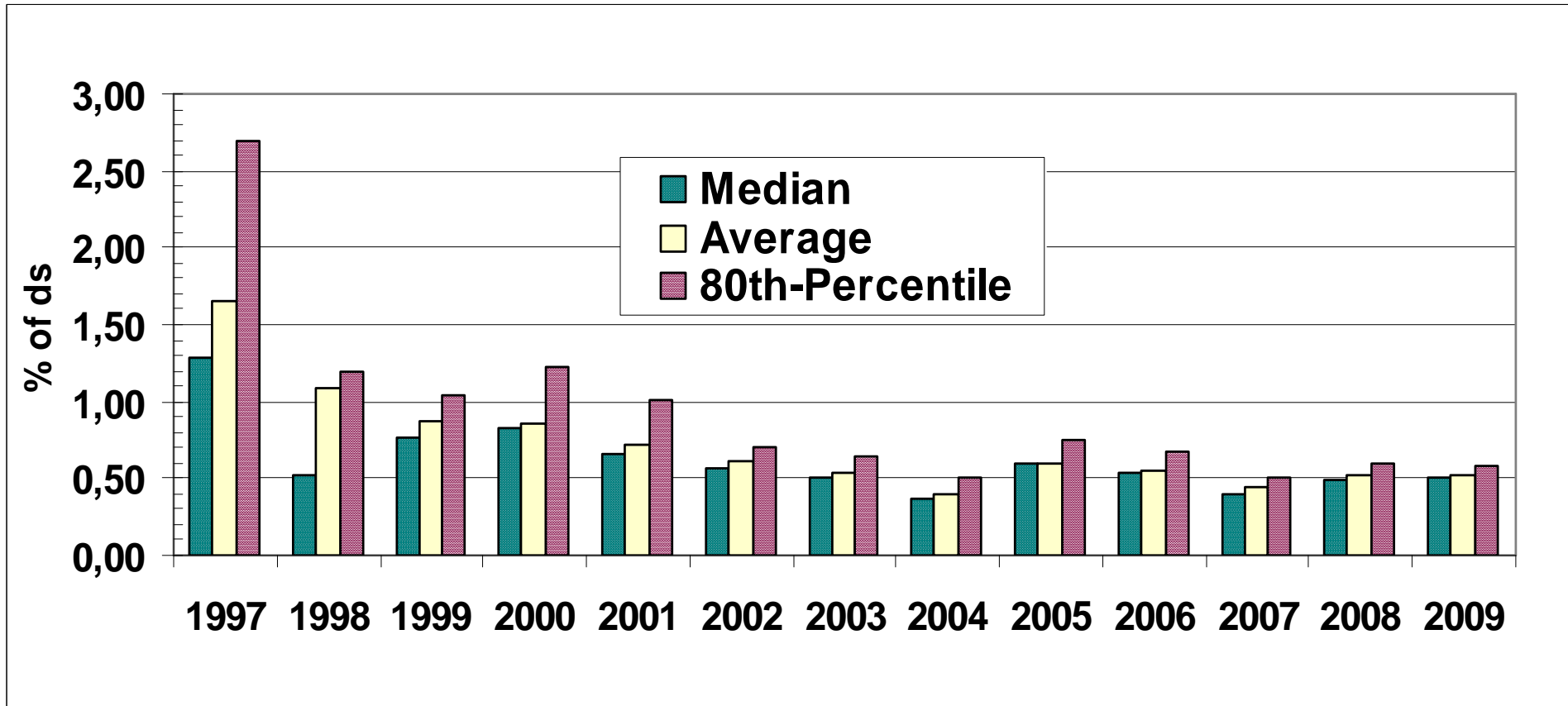
	Unit	Lignite from the Rhine (Inden), Mean	SBS 1 Mean 2004 - 2005	SBS 1 Mean 2006 - 2007	SBS 1 Mean 2008
<b>Short analysis</b>					
Net. Calorific Value	MJ/kg o.s.	8,15	14,1	13,8	14
H <sub>2</sub> O	% o.s.	58,8	29	22,6	24
Ash	% o.s.	3,0	10,3	9,5	9,8
Chlorine	% o.s.	0,02	0,34	0,38	0,40
Volatile	% o.s.	53,8	55	52	n.a.
<b>Elementary analysis</b>					
C <sub>org</sub>	% o.s.	24,8	33,5	34,6	34,7
H	% o.s.	2,2	5,5	4,9	n.a.
O	% o.s.	10,6	20,3	26,4	n.a.
N	% o.s.	0,4	0,5	1,5	n.a.
S	% o.s.	0,2	0,1	0,2	0,2

**Classification code according prEN 15359 since 2004: NCV: 4; Cl: 2; Hg: 1**

# Development of CI-values of SBS®

since 1997 (n = 1253)

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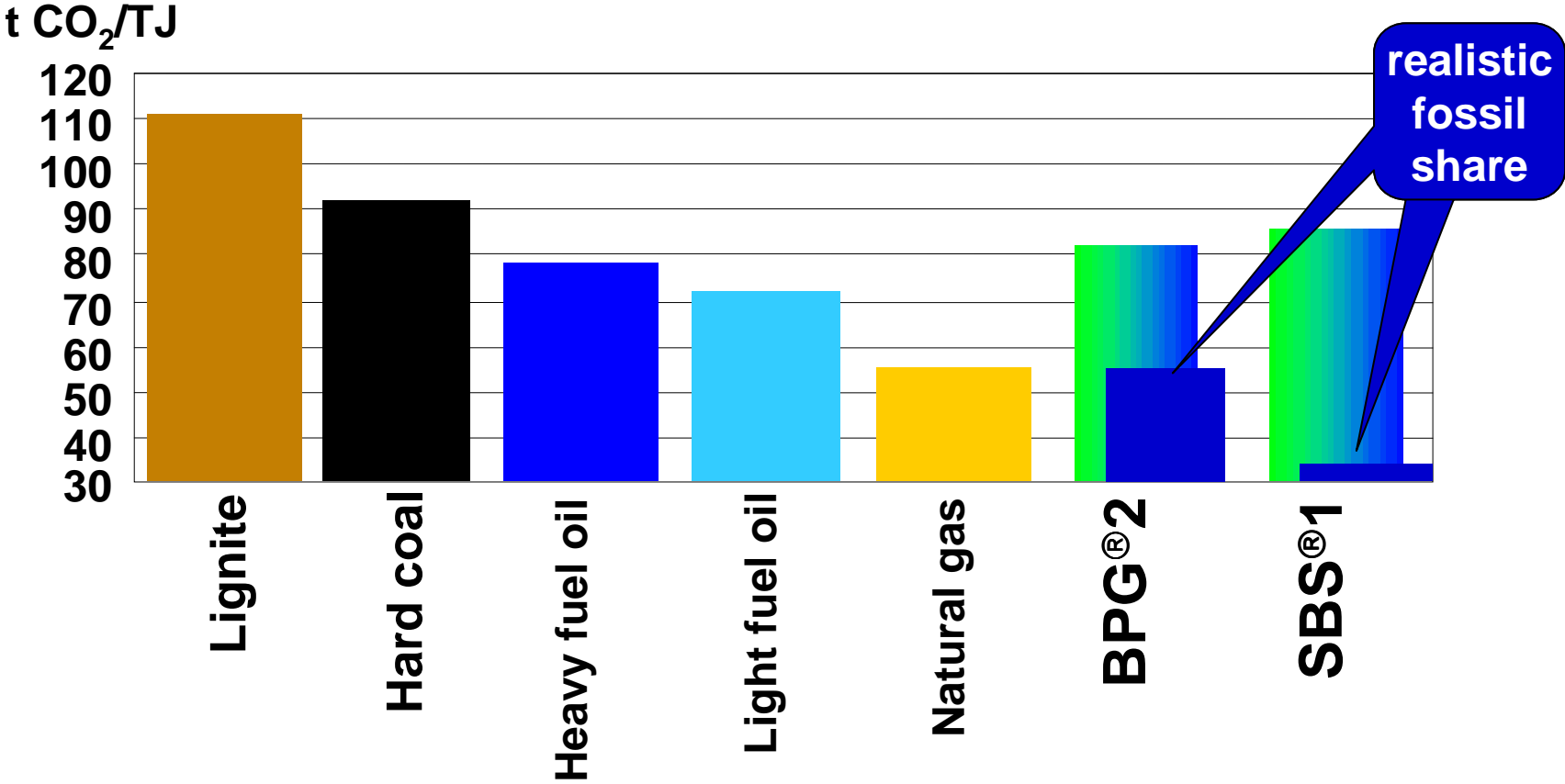
↑  
**First trials with NIR**

↑  
**Effect of German  
landfill-directive**

# Energy specific CO<sub>2</sub>-emissions

of different fuels

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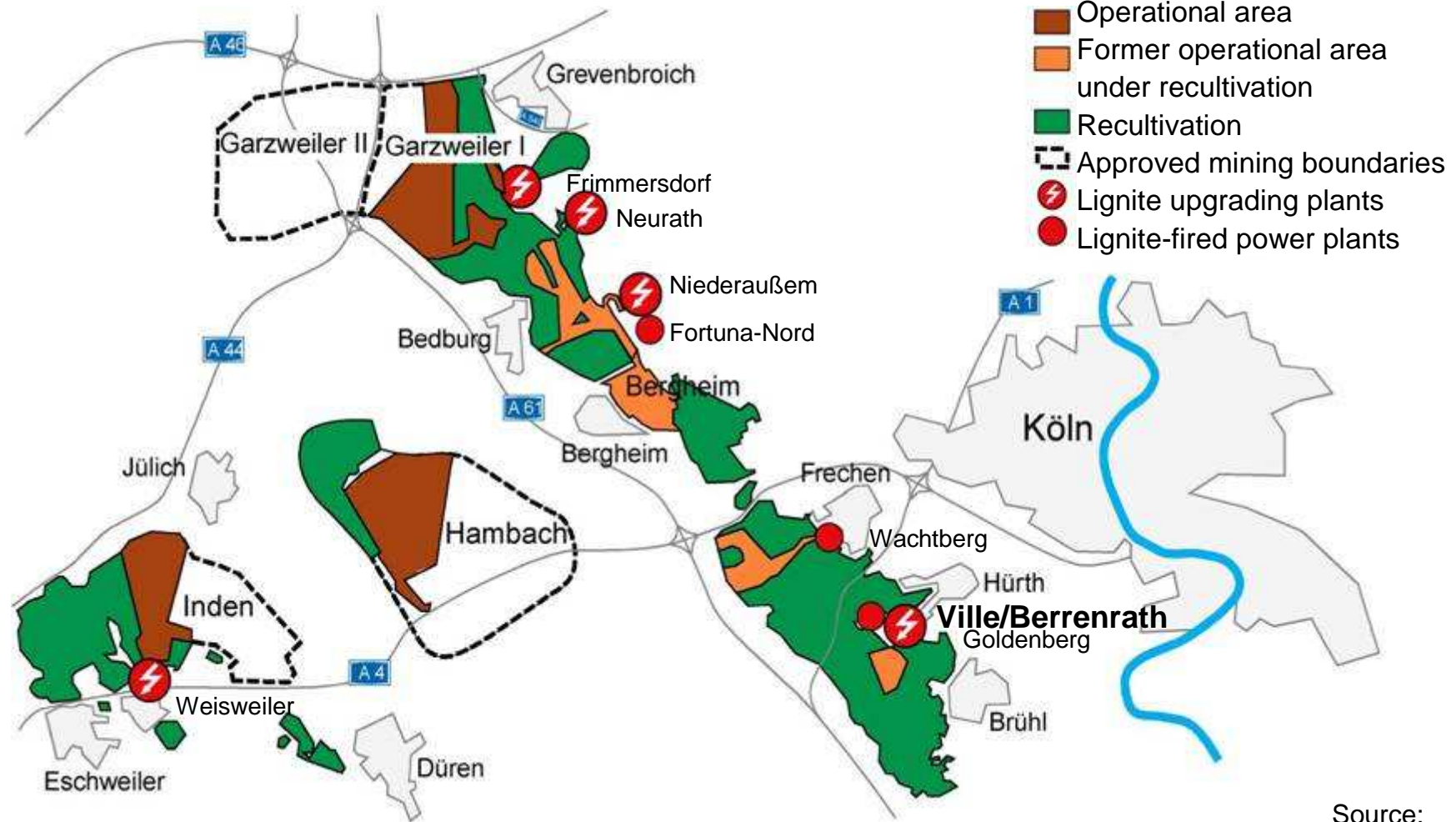
**CO<sub>2</sub>-reduction:**  
**0,75<sub>(HC)</sub> - 1<sub>(BC)</sub> t CO<sub>2</sub>/SBS1® (with 50% biogenic content)**

## **Part 2:**

# **Use of SBS® of REMONDIS Rheinland in the CHP-plant “Berrenrath“**

# Location of Berrenrath

## in the Rhenish Lignite Mining Area



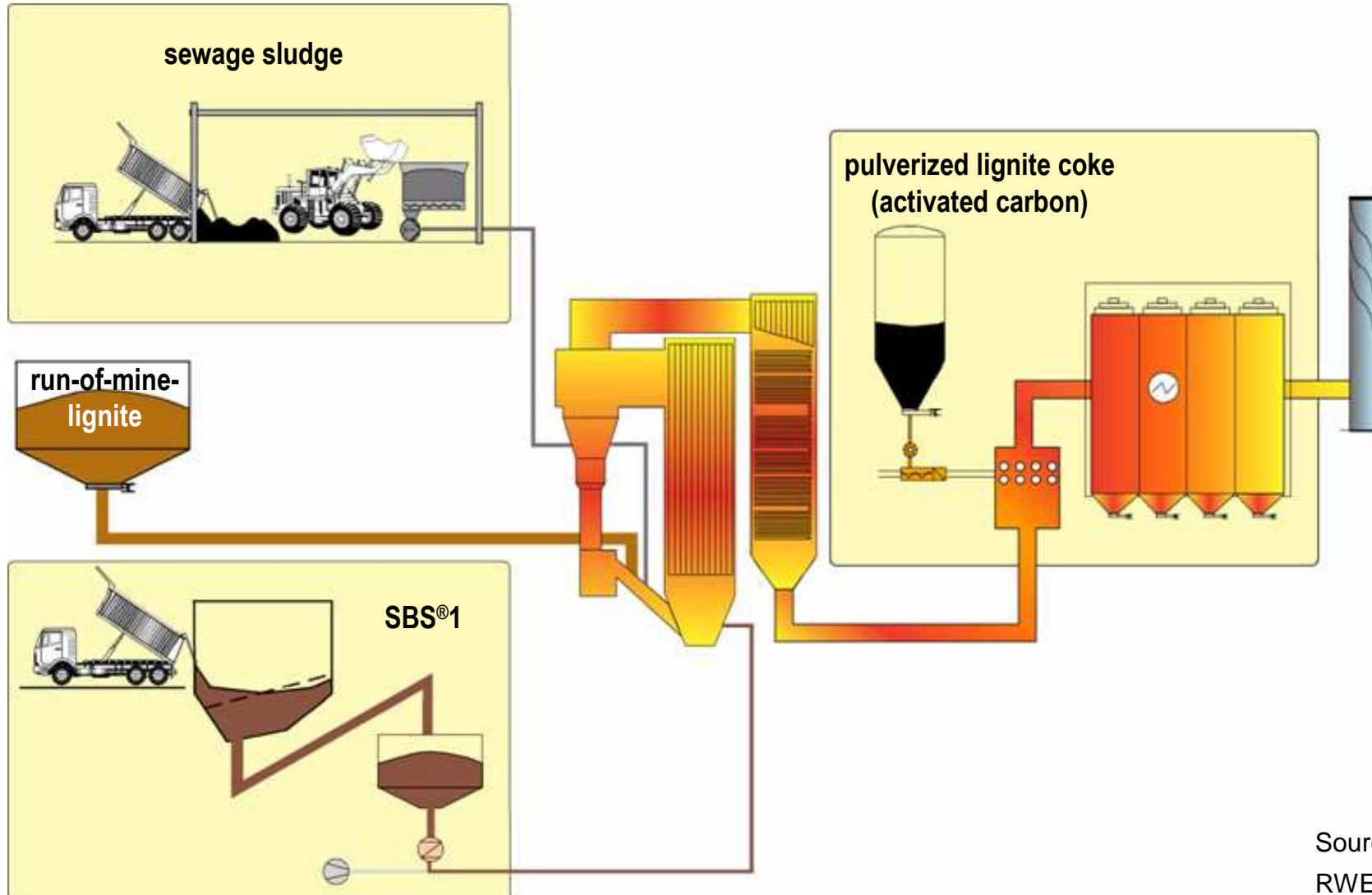
Source:  
RWE Power



# Co-combustion installations of the Berrenrath Power Plant

**REMONDIS®**

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Source:  
RWE Power

# Technical data

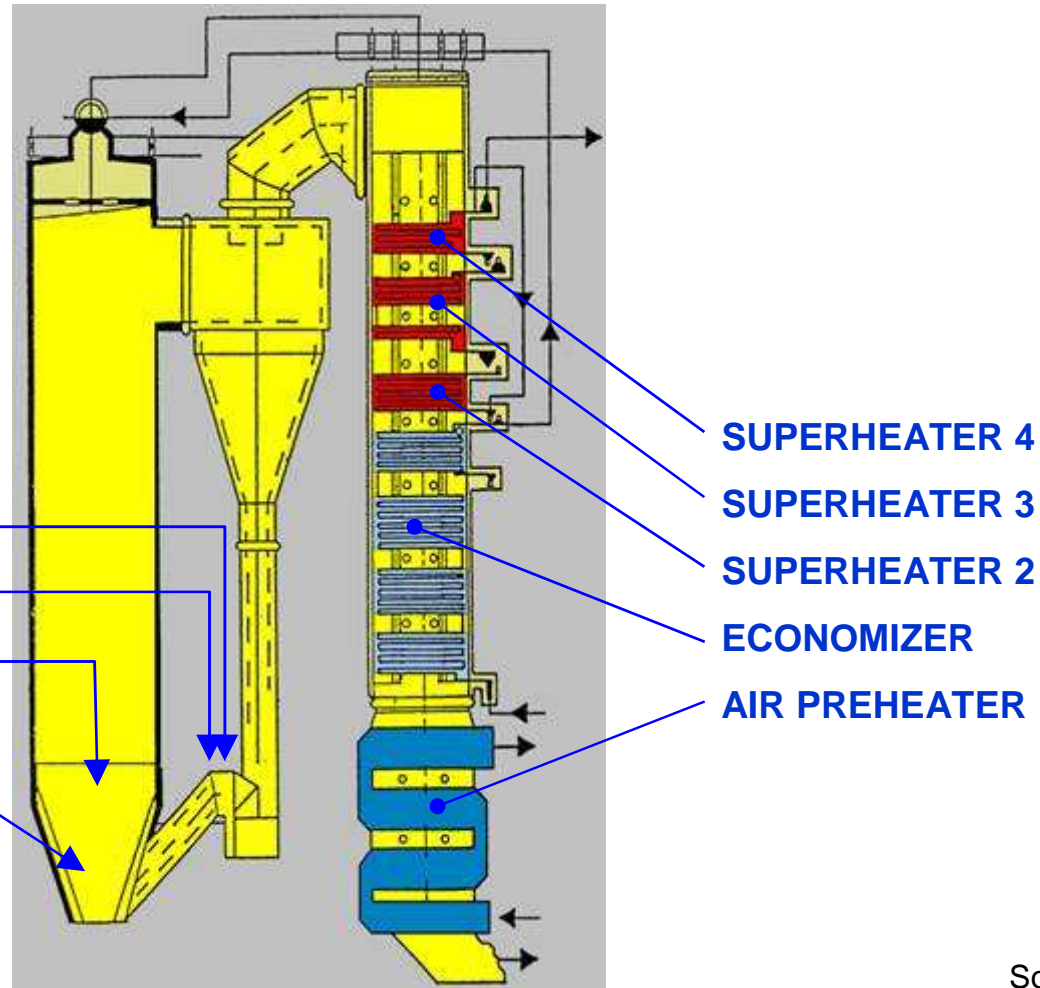
of Berrenrath CFB

## Steam data :

- 77.8 kg/s
- 510 °C
- 90 bar

## Fuels :

- Lignite
- Sewage sludge
- Lignite sludge
- Used wood / SRF

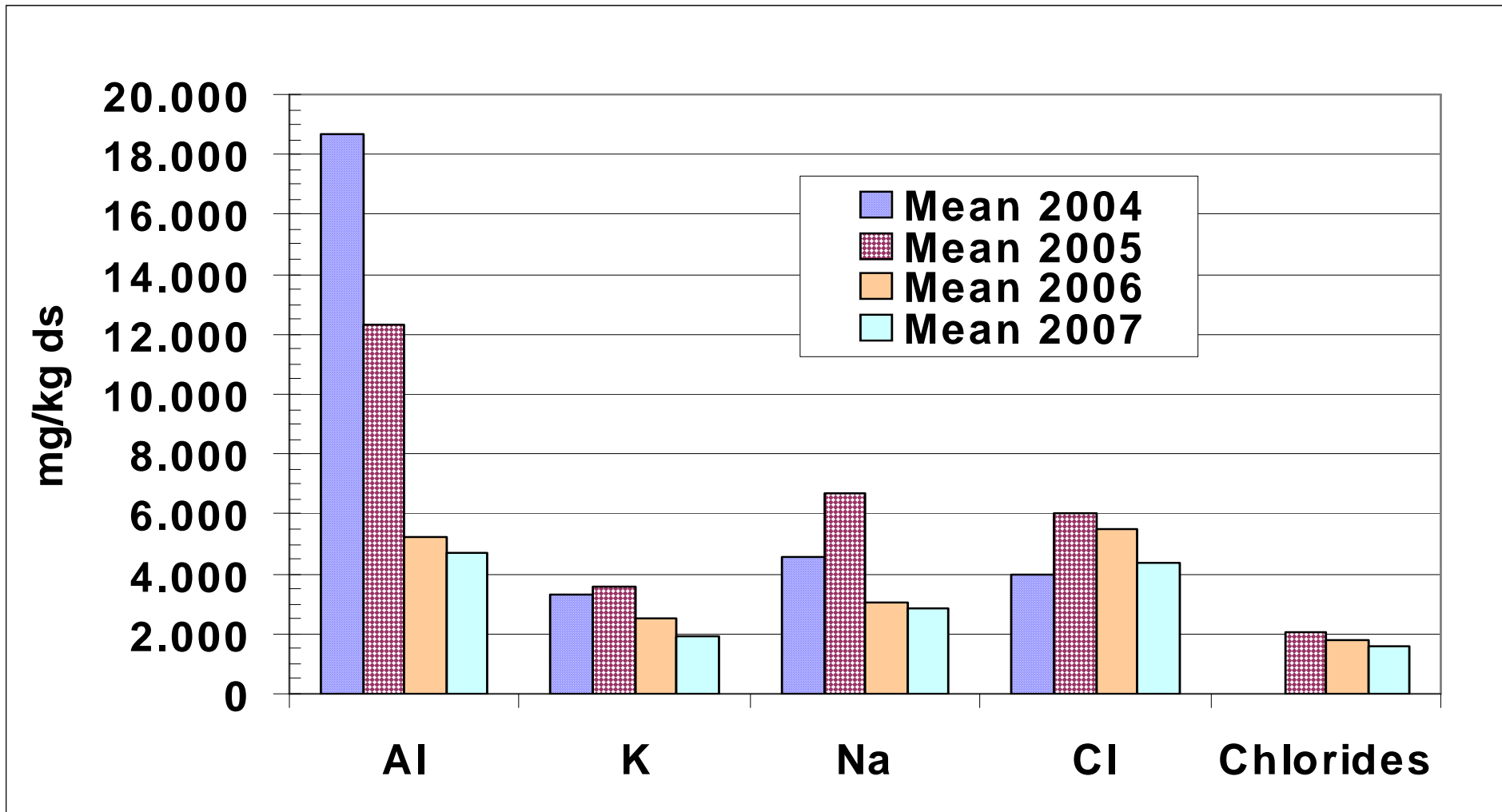


Source:  
RWE Power



# Development of parameters

with fouling- or corrosion-potential for SBS<sup>®</sup>1



# Existing (old) feeding system in the Berrenrath Power Plant



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**Buffer Silo**



**Pneumatic Feeding System,  
Rotary sluice**

Source:  
RWE Power



- **SRF-production (example Erftstadt)**
  - Use of high-tech sorting devices (NIR-technology)
  - QMS according RAL-GZ 724/CEN TC 343 can improve the reliability of fuel properties
  - Improved SBS<sup>®</sup>1-qualities since 2006 (Al, K, Na, Chloride and Cl) as a result of improvements within the sorting process
  - Increased share of SBS<sup>®</sup>1 (36% in 2007 → 45% in 2008)
- **SRF-use (example Berrenrath)**
  - Increased use of SBS<sup>®</sup>1: 1.050 → 1.350t/week (2007 → 2008)
  - Continuous use of SRF (> 60.000t SRF/a, > 100.000t lignite/a substituted)
  - High CO<sub>2</sub>-reduction effect: > 1t CO<sub>2</sub>/t SBS<sup>®</sup>1 (lignite substitution)
- **SRF-production and use are a sustainable solution**