

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[®] and SBS[®]

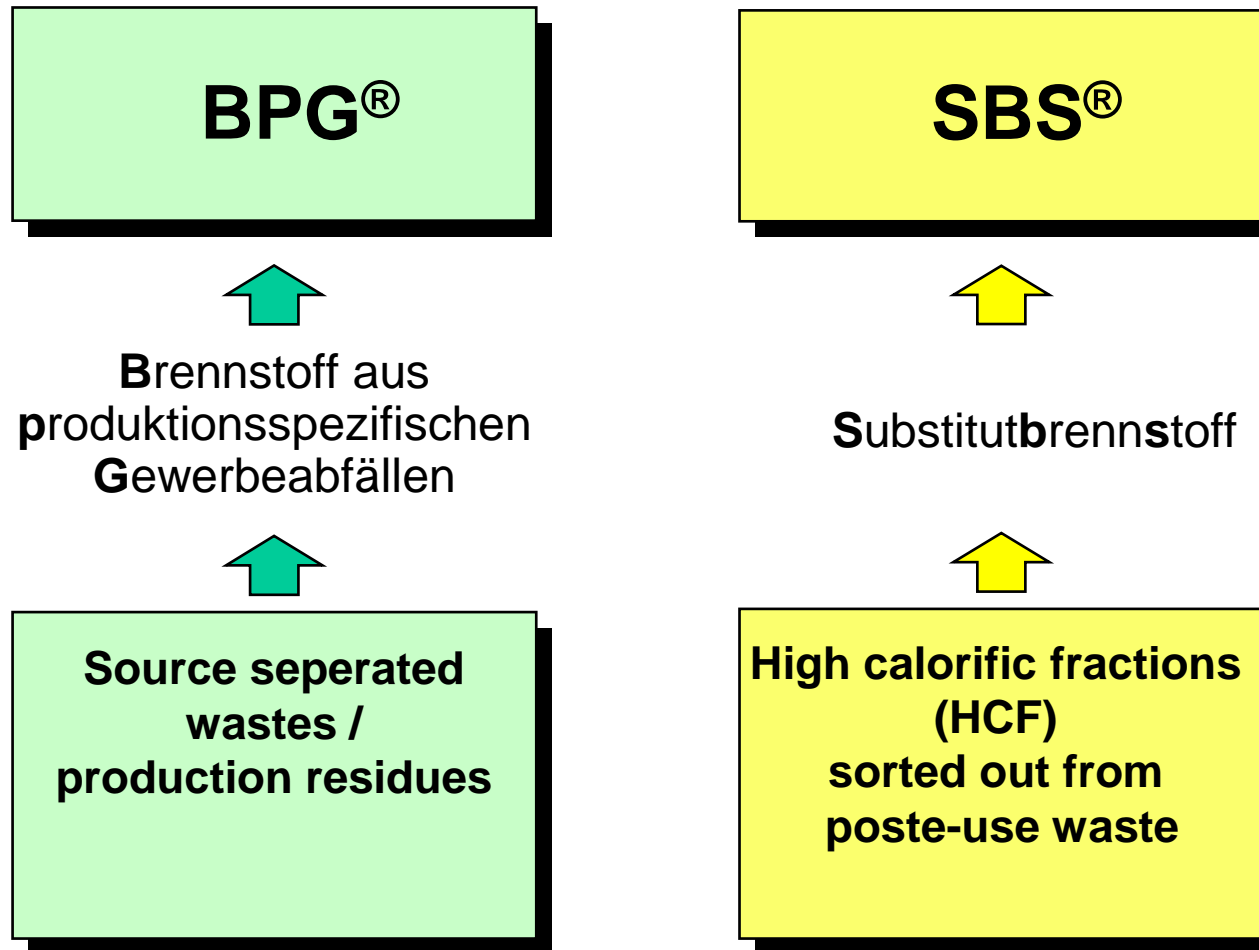
by REMONDIS Rheinland GmbH

Two quality groups, two trade marks

since 1995/1998

REMONDIS®

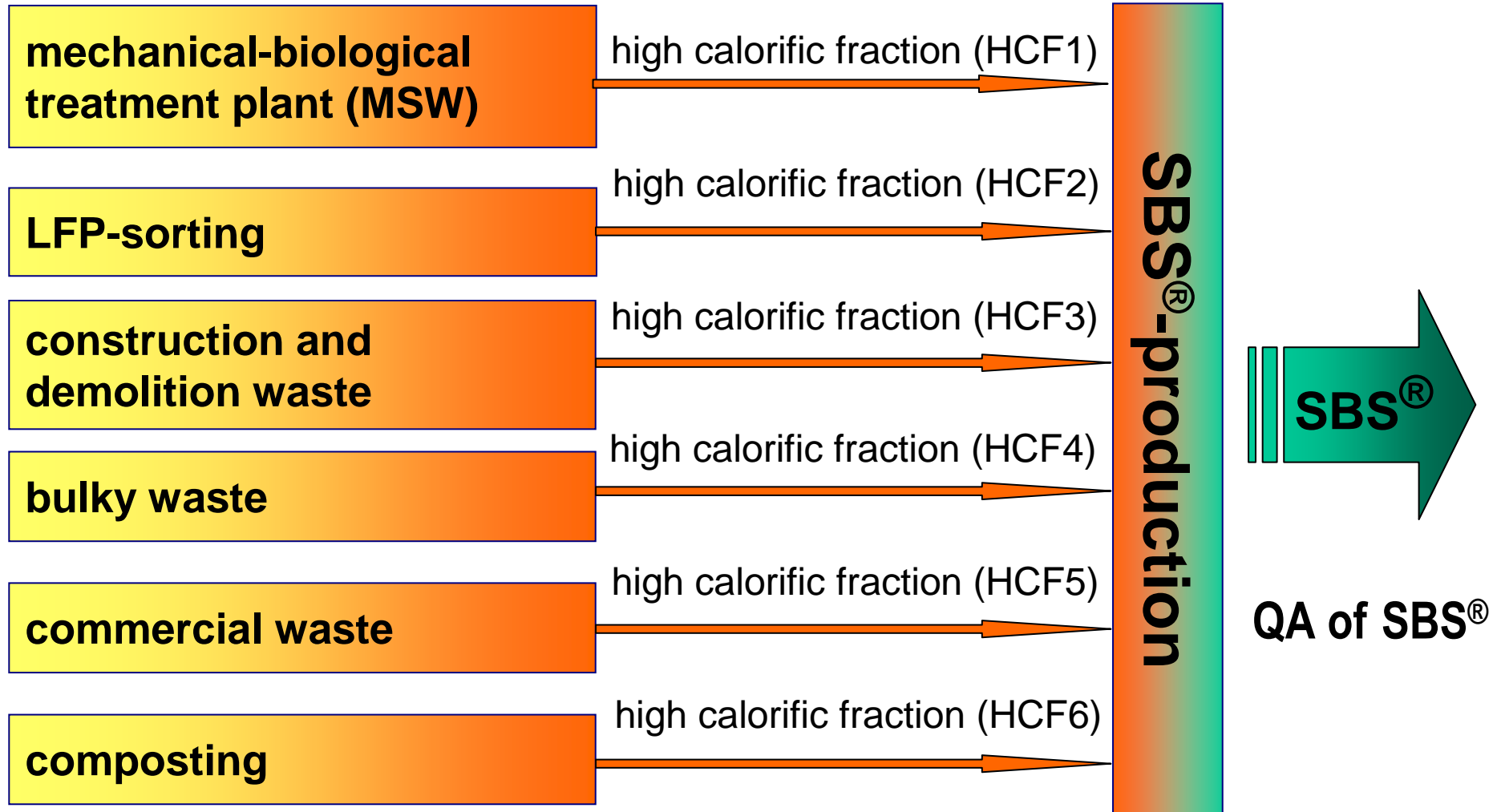
REMONDIS Rheinland GmbH



Input materials for SBS®

REMONDIS®

REMONDIS Rheinland GmbH



Quality Assurance of HCF`s

Specifications

for BPG[®] and SBS[®]



REMONDIS Rheinland GmbH

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 ₂ 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
---------------	-----------	-------------	--------------------------------------

HCF-Sorting with NIR-systems

key technology for low-chlorine SRF

REMONDIS®

REMONDIS Rheinland GmbH



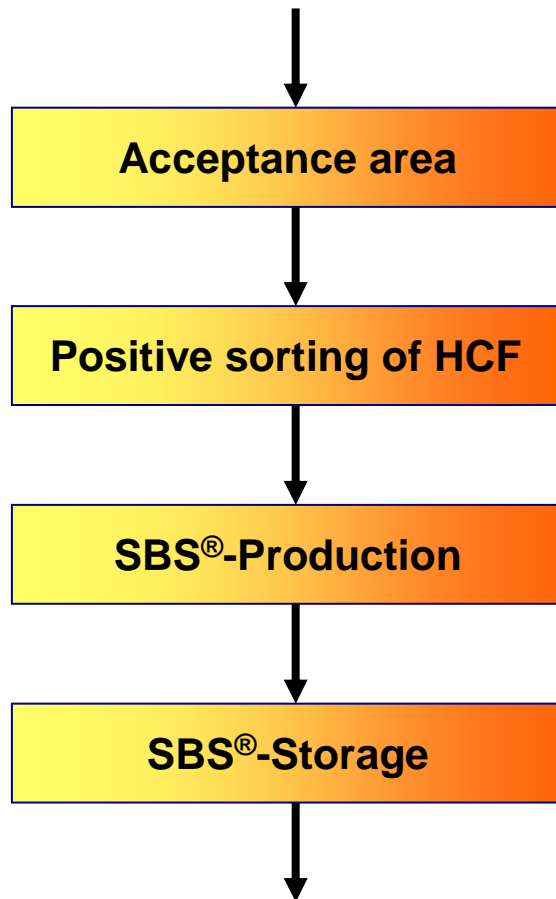
QMS

for the production of SBS[®] in Erftstadt

REMONDIS[®]

REMONDIS Rheinland GmbH

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 H₂O 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, H₂O, 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:

Al₂O₃, CaO, Fe₂O₃, K₂O, MgO, Na₂O, P₂O₅, SiO₂, SO₃, TiO₂, ZnO

UCL

Analysis report – Number ...
500-Mg-analysis

for BPG® and SBS®

Parameter:

ds, H₂O, Cl, Ash, NCV

+ 2 HM (changing monthly)

Development of SBS[®]1_{Erftstadt}-quality



Short analysis and elementary analysis

REMONDIS Rheinland GmbH

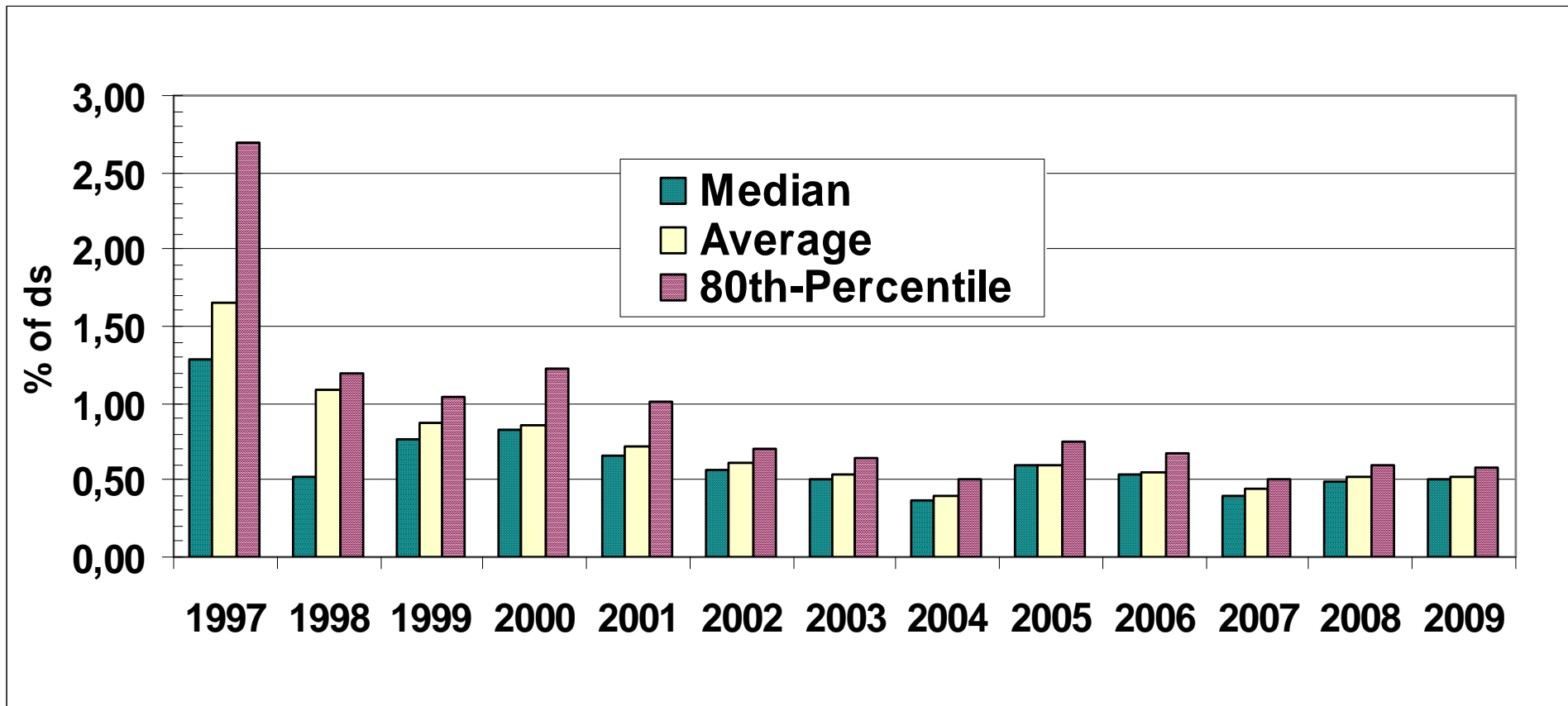
	Unit	Lignite from the Rhine (Inden), Mean	SBS 1 Mean 2004 - 2005	SBS 1 Mean 2006 - 2007	SBS 1 Mean 2008
Short analysis					
Net. Calorific Value	MJ/kg o.s.	8,15	14,1	13,8	14
H ₂ O	% o.s.	58,8	29	22,6	24
Ash	% o.s.	3,0	10,3	9,5	9,8
Chlorine	% o.s.	0,02	0,34	0,38	0,40
Volatile	% o.s.	53,8	55	52	n.a.
Elementary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

REMONDIS Rheinland GmbH



↑
First trials with NIR

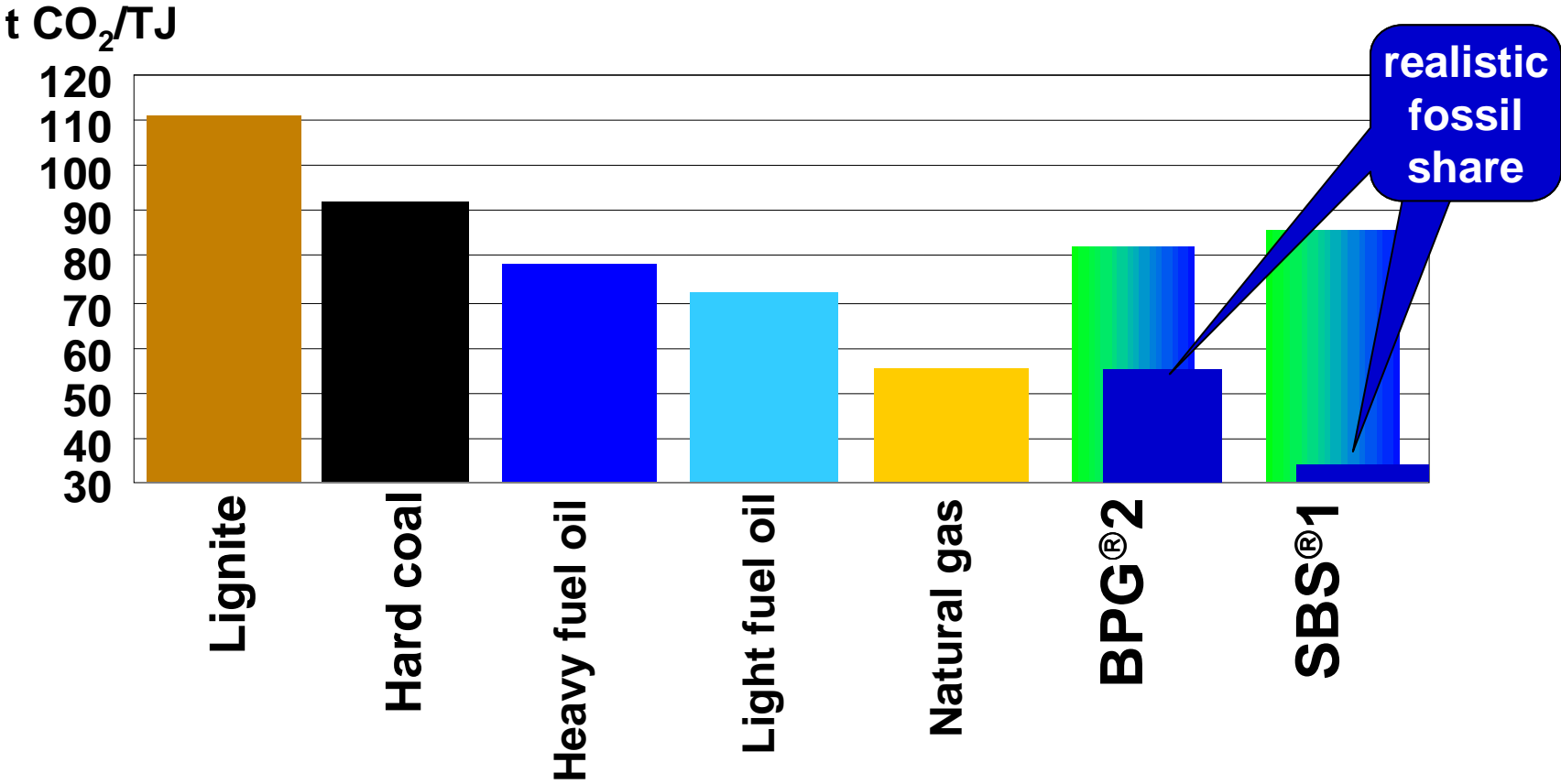
↑
**Effect of German
landfill-directive**

Energy specific CO₂-emissions

of different fuels



REMONDIS Rheinland GmbH



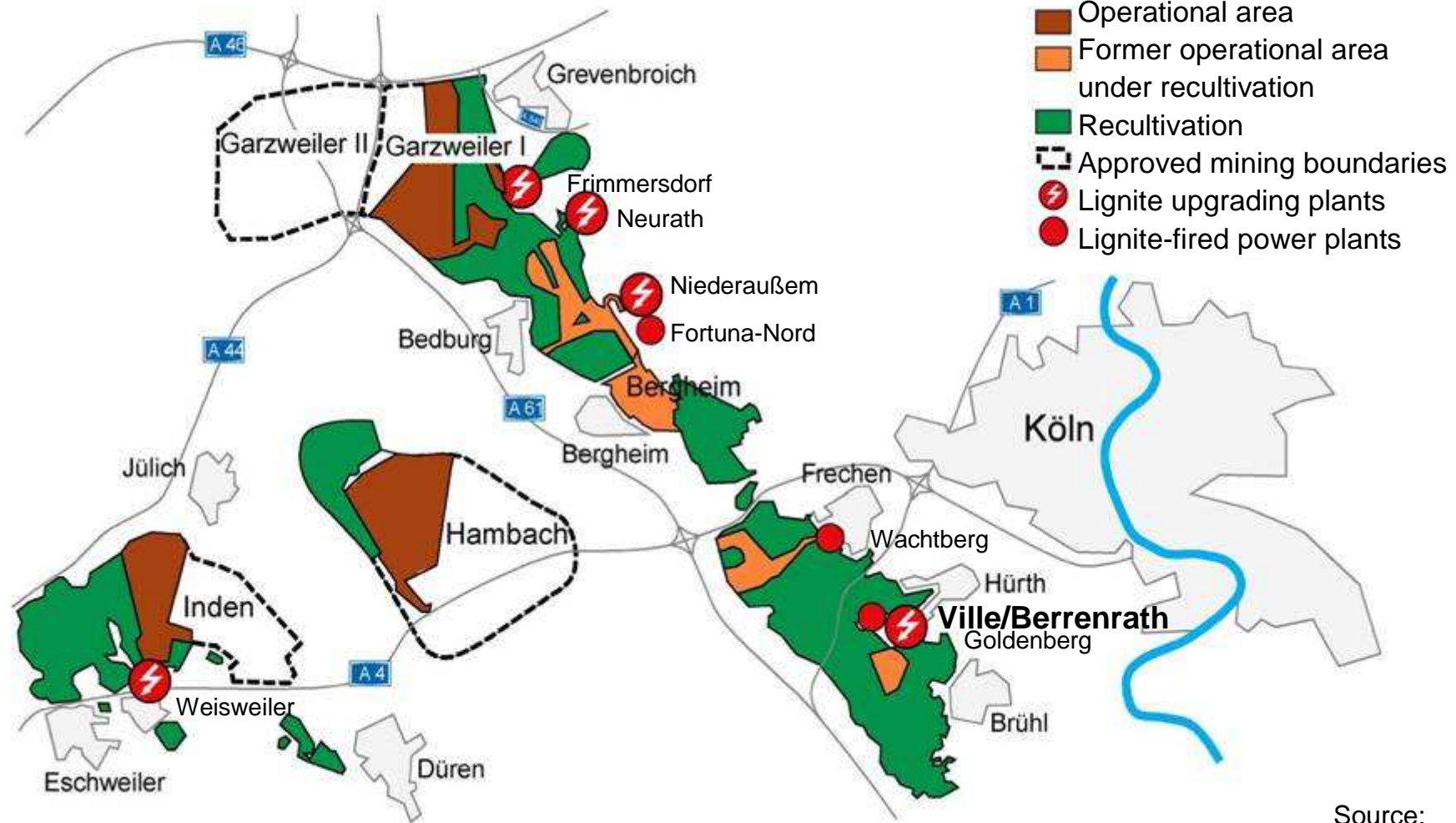
CO₂-reduction:
0,75_(HC) - 1_(BC) t CO₂/SBS1[®] (with 50% biogenic content)

Part 2:

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

Location of Berrenrath

in the Rhenish Lignite Mining Area

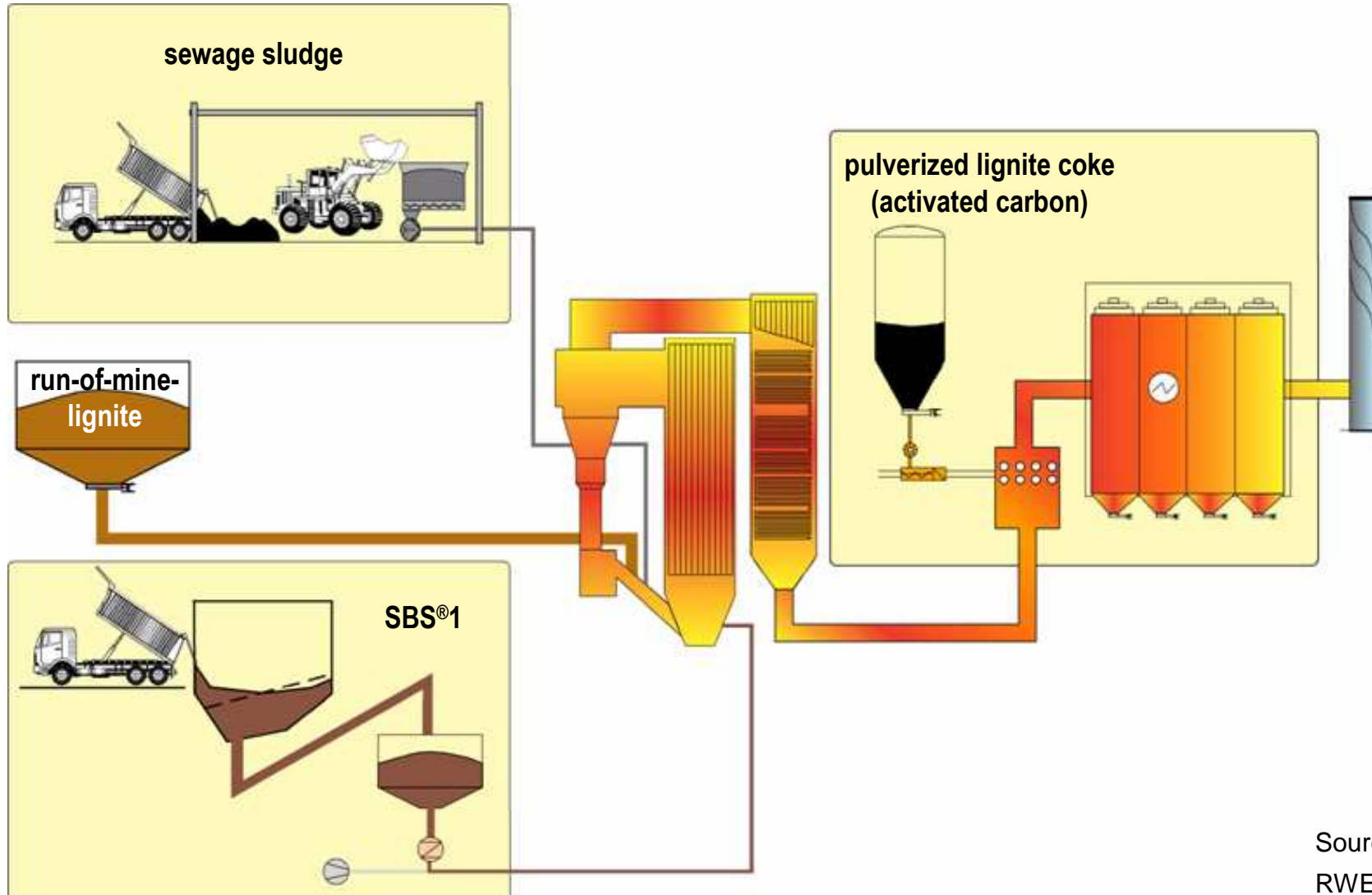


Source:
RWE Power

Co-combustion installations of the Berrenrath Power Plant

REMONDIS®

REMONDIS Rheinland GmbH



Source:
RWE Power

Technical data

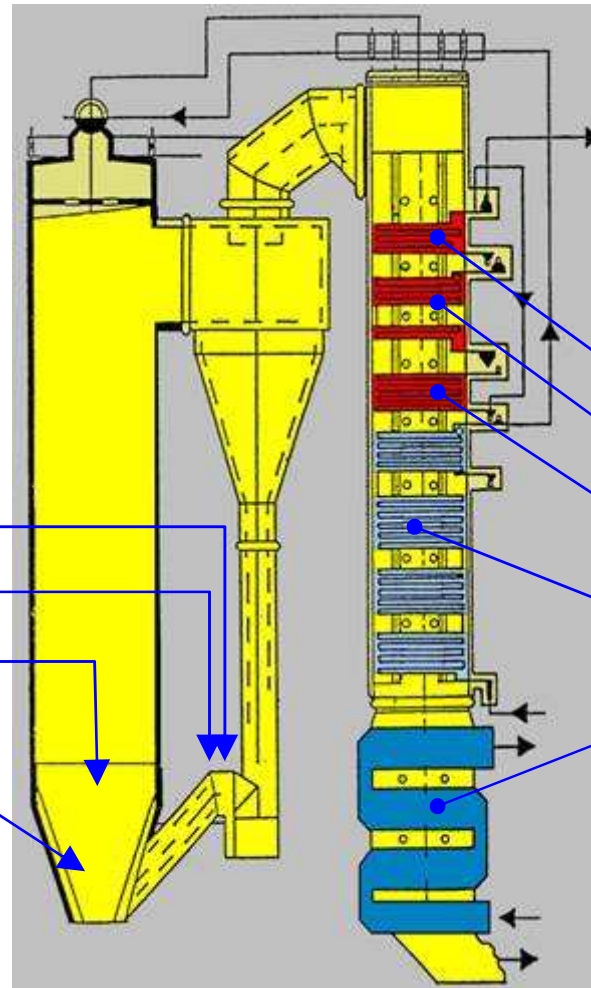
of Berrenrath CFB

Steam data :

- 77.8 kg/s
- 510 °C
- 90 bar

Fuels :

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

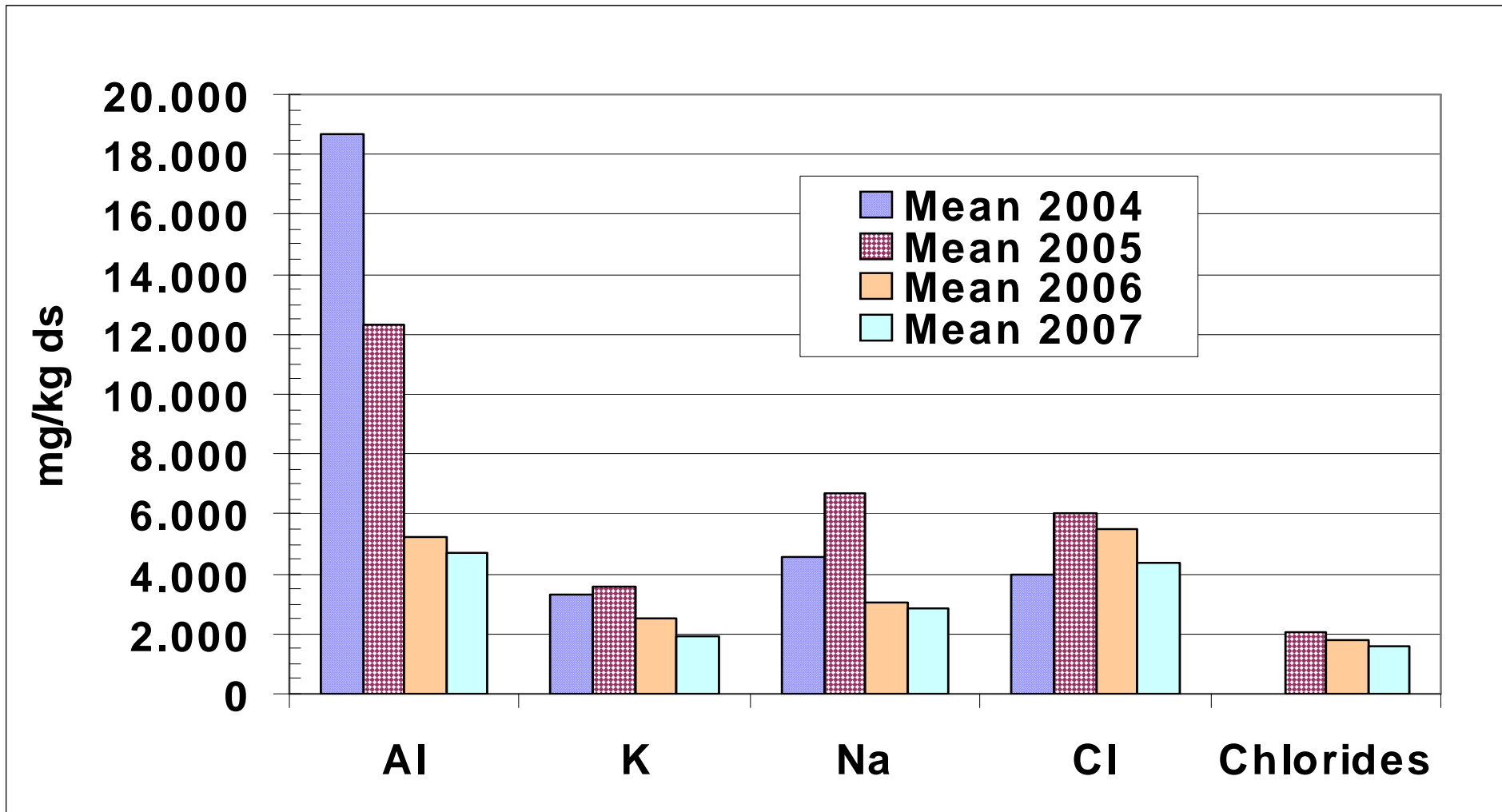


- SUPERHEATER 4
- SUPERHEATER 3
- SUPERHEATER 2
- ECONOMIZER
- AIR PREHEATER

Source:
RWE Power

Development of parameters

with fouling- or corrosion-potential for SBS[®]1



Existing (old) feeding system in the Berrenrath Power Plant



REMONDIS Rheinland GmbH



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[®]1-qualities since 2006 (Al, K, Na, Chloride and Cl) as a result of improvements within the sorting process
 - Increased share of SBS[®]1 (36% in 2007 → 45% in 2008)
- **SRF-use (example Berrenrath)**
 - Increased use of SBS[®]1: 1.050 → 1.350t/week (2007 → 2008)
 - Continuous use of SRF (> 60.000t SRF/a, > 100.000t lignite/a substituted)
 - High CO₂-reduction effect: > 1t CO₂/t SBS[®]1 (lignite substitution)
- **SRF-production and use are a sustainable solution**