# Clean Coal Combustion & Non-Regular/Recovered Fuels Addition

## Workshop - Contribution

## 43rd International Energy Agency - Fluidized Bed Conversion

## IEA - FBC MEETING, Lisbon

## November 22 - 24, 2001

**Dr. Ralf L. Lindbauer, BBP- AE GRAZ/Austria**

# FUTURE MIX of THERMAL ENERGY-

## Drivers and Constraints till 2010

**Liberalization of Energy Markets**

**Transport, Logistics & Free Market**

**Political Acceptance & Hesitations**

**Political Dependence & Infrastructure, SECURITY of SUPPLY**

**Kyoto+ & Environmental Considerations**

**Availability & Cost, Demand or Supply Side Controlled**

**Technology and Innovation Potential**

**EU Politics Development: Fair Rules or Wishful Thinking**

**Steady Development or Drastic Change…..**

***WHICH FUELS / FUEL MIX FOR NEW BOILER PLANTS ?***

***……&...SUSTAINABLE DEVELOPMENT……..***

# FUTURE MIX of THERMAL ENERGY-

## *L i b e r a l i z a t i o n aims for:*

***Cost-effective production - - - demand side production***

***new European energy production & distribution structures (EU 15 rather than 15 nationals)***

***gets rid of behavioral encrustations : less state more private***

***Q U E S T I O N S ? ? ?***

***Only energy trade & soft-ware, no „local“ production, no new plants?***

***How cheap (price NOW vs. in 20 years), how monopolistic (competition vs. erosion of participants), how regional („how big a player, how close“), how sustainable (instant „market regulation“ vs. „generation provision“)?***

**AND: minus 40000 MW of thermal plants/ minus 250000 jobs in Europe: *stranded costs, end-of-life-cycle use of plants with non-regular fuels (corrosion plus unforeseen pollution?)***

# FUTURE MIX of THERMAL ENERGY-
## EU Politics: Rules *or* Wishful Thinking

***Security of primary energy supply***

***Technology and Innovation Potential driven***

***ORGANIZATION: central or regional ?***

***RULINGS: harmonized or local ? (flexible level playing field ??)***

***Social Costs & Environmental Costs : how to be internalized in a Global Market ? Liberal or sustainable ? What's sustainable ?***

**Sustainable Development**

***is more than fulfilling environmental objectives,***

***much more than renewable energy use***

# C O A L : now & in 2010

- **Where are we now….**
- **Rel. abundant energy source for Europe:14,5% of primary energy, 25% of electricity production**
- **Social aspects not negligible (repercussions from pit closures: F, A to some extent UK, E, D? )**
- **Fall in world prices for coal vs. increasing social costs demand political decisions on state aid vs. regional infrastructure**

- **And in 10(+) years ?**
- **Accession states (CEEC, esp. PL) will probably need coal mining as revenue, increasing social costs**
- **environmental problems with coal will cause higher costs for pollution abatement compared to other fuels**
- **clean coal tech on two-way trip: higher temperature/ pressures/ efficiencies in bigger plants yet AND co-combustion of „non-regular fuels“, also in industrial units**

# CLEAN COAL (CC) TECHNOLOGY

- **D R I V E R S .....**

- Kyoto CO2 reduction with efficiency increase from ~35 to beyond 50%
- Fluid Bed Tech: less NOx, less SO2 (Ca fix)
- Relative EU15 import *in*dependence
- Enlargement increases EU coal interest (PL)
- world-wide interest (US); if financing is secured also elsewhere (Asia)
- JI (Kyoto) attractive in CEEC
- CDM (Kyoto driver in Asian, South American countries)

- **C O N S T R A I N T S .....**

- Coal is most carbon-rich fuel (2 x gas), more SO2 and ash in coal than other fossils
- Import of coal (EU15/1999): 60 %; 20% of primary energy
- Singular interest of D (F, E?, UK??)
- Mining and state aid ?? New rules In EU15 ?
- CC Technology costs 3 x gas Combined Cycle
- „Kyoto in haze“ & politics / financing ? JI leads to fight between share CEEC and EU15 / CDM‘s success depends on int‘l finance

# Co-COMBUSTION *vs.* CLEAN COAL Assessment

- **Clean Coal/<u>Co-Combustion</u> +++/---**
- **Kyoto goals to be met by co-firing „recovered & renewable“ fuels with coal [wood, biomass to peat, waste, RDF-SRF, …]]**
- **<u>attractive for numerous CFB circulating fluidized bed</u> plants (new plants that can handle co-incineration and emissions, erosion/ corrosion/ mechanical handling of non-regular/ recov‘d fuels) in the range 10 to >100 MW; attractive for CHP**
- **attractive for alliances between different business sectors (agriculture, industry, utilities, wastes)**
- **-- „attractive“ for end-of-life-cycle use of redundant power plants („stranded costs“)**
- **- gasification argument often applied in lieu for „non-incineration“, but useful as add-on with existing power plant**

- **<u>*„Clean*</u> Coal <u>only</u>“ +++**
- **Kyoto goals to be met by eff. upgrade (high temperature, high pressure, highest efficiency boilers)**
- **attractive for research and technical demonstration into PFBC , IGCC**
- **<u>attractive to building of new, very large FB plants</u> (> 300 MW, large enough to ease burden of high investment costs by lowering specific costs by „economics of scale“**

# *Non-regular / Recovered Fuels for ENERGY RECOVERY : how much ?*

## COMBUSTIBLE WASTES :

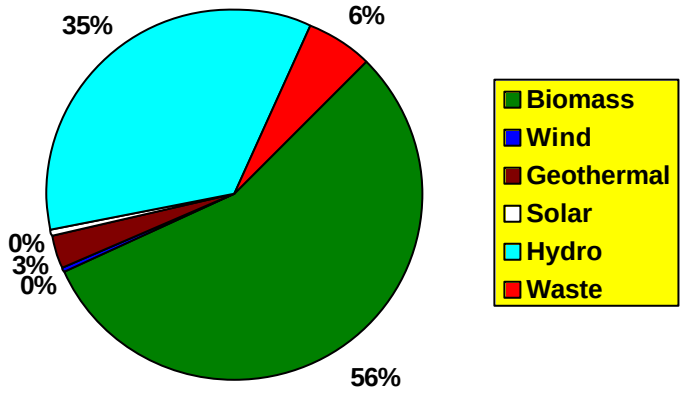
## MIX of POLITICS & TECHNICALITIES

- *„combustible wastes“ being non-regular/recovered waste/fuels from private and industrial use amount to about 4 times the tonnage (and energy content) of the „original household wastes“ (before source recovery)*
- *they amount - in energy - to about 10%+ of a country‘s primary (fuel) energy, they are a plentiful , locally available source of energy*
- *non-regular/recovered fuels may contain substantial hazardous ingredients (heavy metals, organic toxics), compared to regular fuels*

# Non-regular / Recovered Fuels for ENERGY RECOVERY : how much ?

European Commission, DG TREN

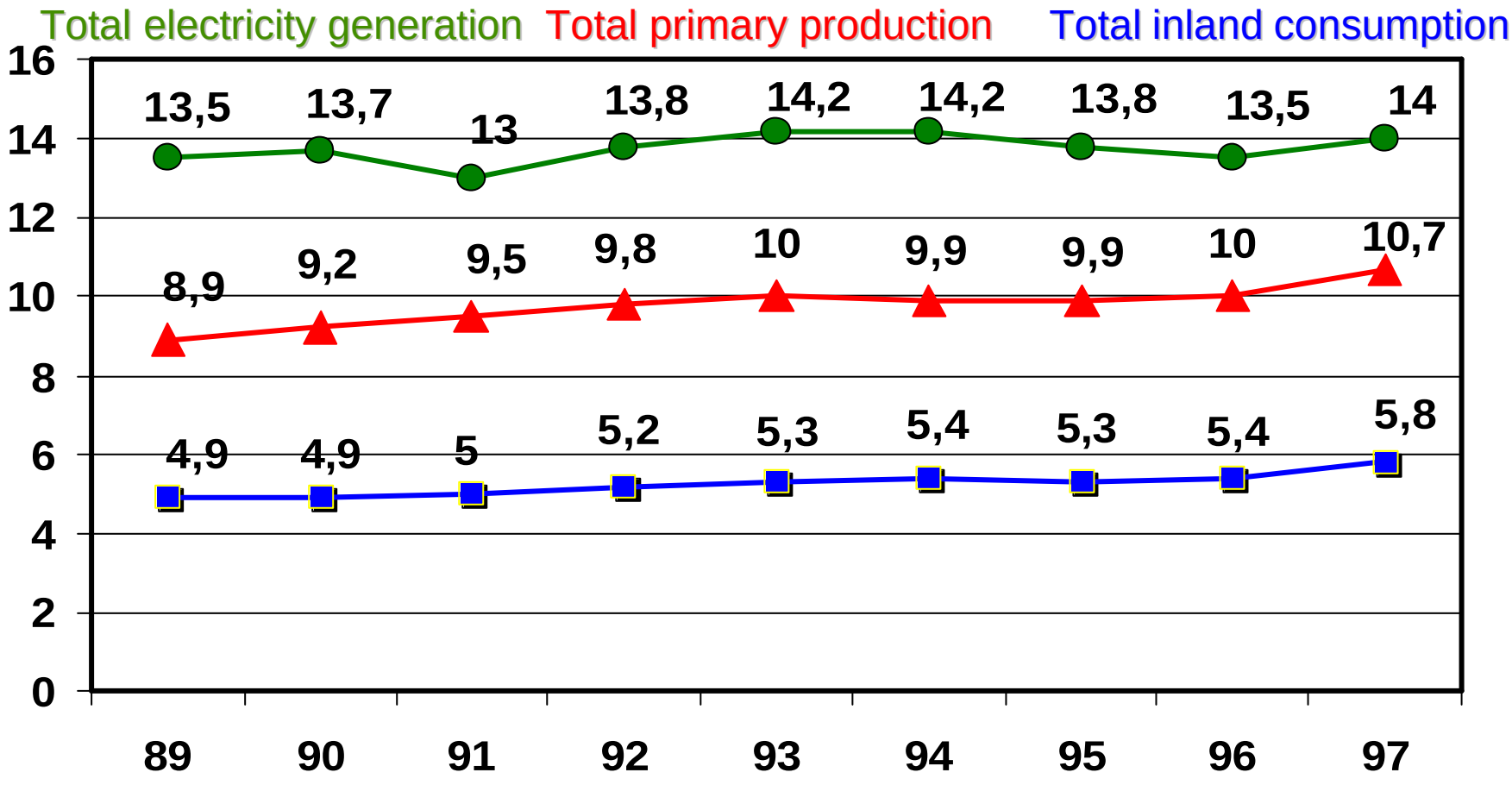
**Contribution of Waste to RES Energy Share (Eurostat 1997)/Hanreich 5-2001**




**Waste's contribution has been achieved thanks to the development of reliable & environmentally friendly technologies.**

# Contribution of RES in EU

**DG TREN/Millich May 2001**



# *Non-regular / Recovered Fuels for ENERGY RECOVERY : what are they?*

## COMBUSTIBLE WASTES : MIX of POLTICS & TECHNICALITIES

- *Waste, Household Wastes, Commercial Waste, Refuse Derived Fuel, Recovered Fuels, Secondary Fuels, Waste Fuels, Substitute Fuel, Industrial Waste Fuels, Solid Recoverd Fuels, Waste for Recovery (R1), Waste for Disposal (D10), dry stabilized waste, recycling/shredder wastes, in-company wastes..*
- *Renewables, biomass, biofuels, wood residues, impregnated wood residues, saw dust, bark, waste wood, wood wastes...*
- *Agricultural wastes, new biomass fuels (cynara thistle, fast growing biomass, olive pits, shells)….*
- *„Green fossils“ : peat, landfill gas….*

# FUTURE MIX of THERMAL ENERGY -

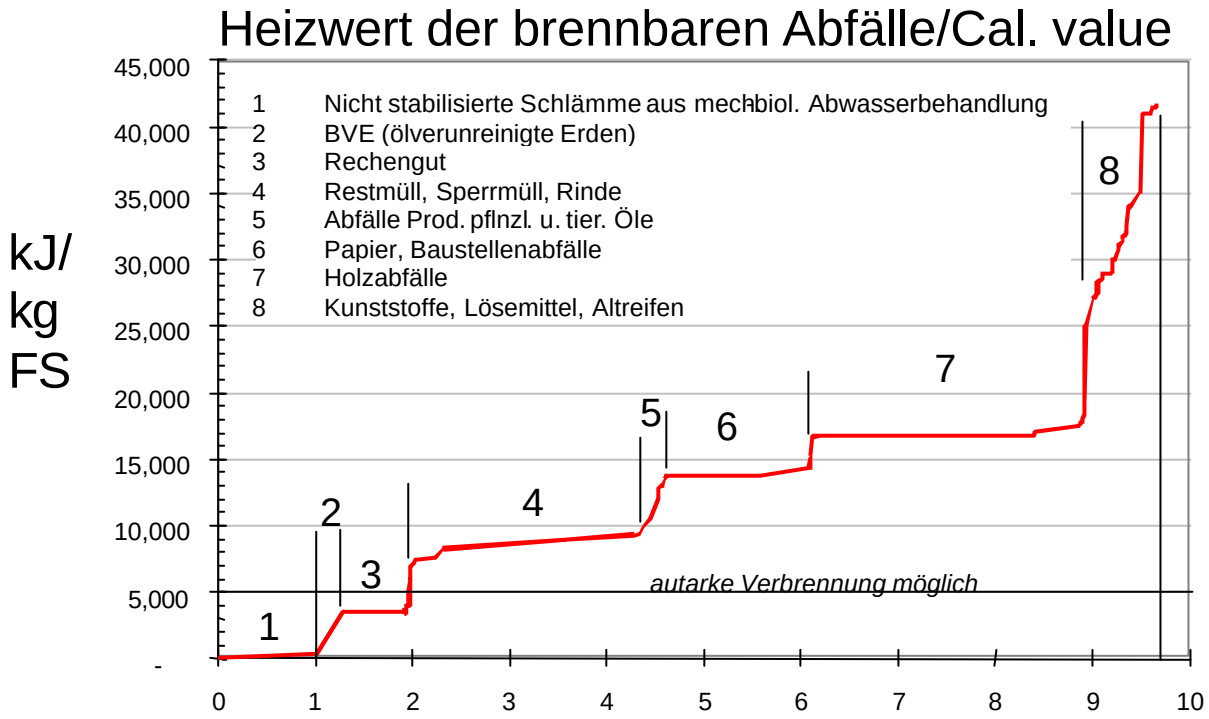
## D: Annual Waste-to-Energy is 101 million tpy / 1,2 tpy & capita !

**Abfallstatistiken 1996 und 1998/9 für Deutschland/Reimann**

| Übersicht | | Mio. Mg/a | Mio. Mg/a |
|---|---|---|---|
| **Aufkommen von Primärabfällen (1996)** | | **335,954** | |
| | verteilt auf: | | |
| "primary wastes" | Bauabfälle, Abbruch, Bodenaushub | | 176,582 |
| | unbehandelte Bergmaterialien aus dem Bergbau | | 67,814 |
| | **Abfälle aus dem produz. Gewerbe/Industrie/ "comm. waste"** | | **56,948** |
| | Siedlungsabfälle/ "household wastes" | | ~34,000 |
| **Siedlungsabfälle (1998/9)** | "household wastes" | **44,008** | |
| einschl. ~10 Mio Mg/a hausmüllähnlicher Gewerbeabfall, Sperrmüll, Kehricht/comm.waste" | davon: | | |
| | Abfallbeseitigung | D10-"wastes for disposal" | 24,678 |
| | Abfallverwertung | R1 – "wastes for recovery" | 19,330 |
| **Siedlungsabfall (1998/9)** | "householdwastes | | |
| **in öffentlicher Verantwortung** | davon: | **24,678** | |
| (andienungspflichtig) | zur Verbrennung | "MSWI incineration" | 11,000 |
| | zur Deponierung | "landfilling" | 13,678 |

# FUTURE MIX of THERMAL ENERGY -

## A: Annual Waste-to-Energy could be 9,7 million tpy/1,2 tpy & capita !




9.7 Mio t/a brennbarer Abfälle/combust. wastes

Quelle: ASTRA, PRIZMA

# FUTURE MIX of THERMAL ENERGY -

## Austria: but the 9,7 mio tpy contain environmentally relevant „ingredients“!

| Calorific Value | Mass of Comb. Wastes to Recovery | Cl | Cd | Hg | Pb | Zn |
|---|---|---|---|---|---|---|
| | | to Recovery | | | | |
| MJ/kg | % | % | % | % | % | % |
| > 5 | 80 | 100 | 98 | 82 | 97 | 95 |
| > 8 | 77 | 97 | 95 | 74 | 92 | 89 |
| > 11 | 54 | 59 | 51 | 23 | 38 | 55 |
| > 14 | 42 | 48 | 48 | 22 | 36 | 49 |
| > 17 | 13 | 40 | 38 | 8 | 11 | 30 |
| > 21 | 8 | 16 | 19 | 5 | 7 | 29 |

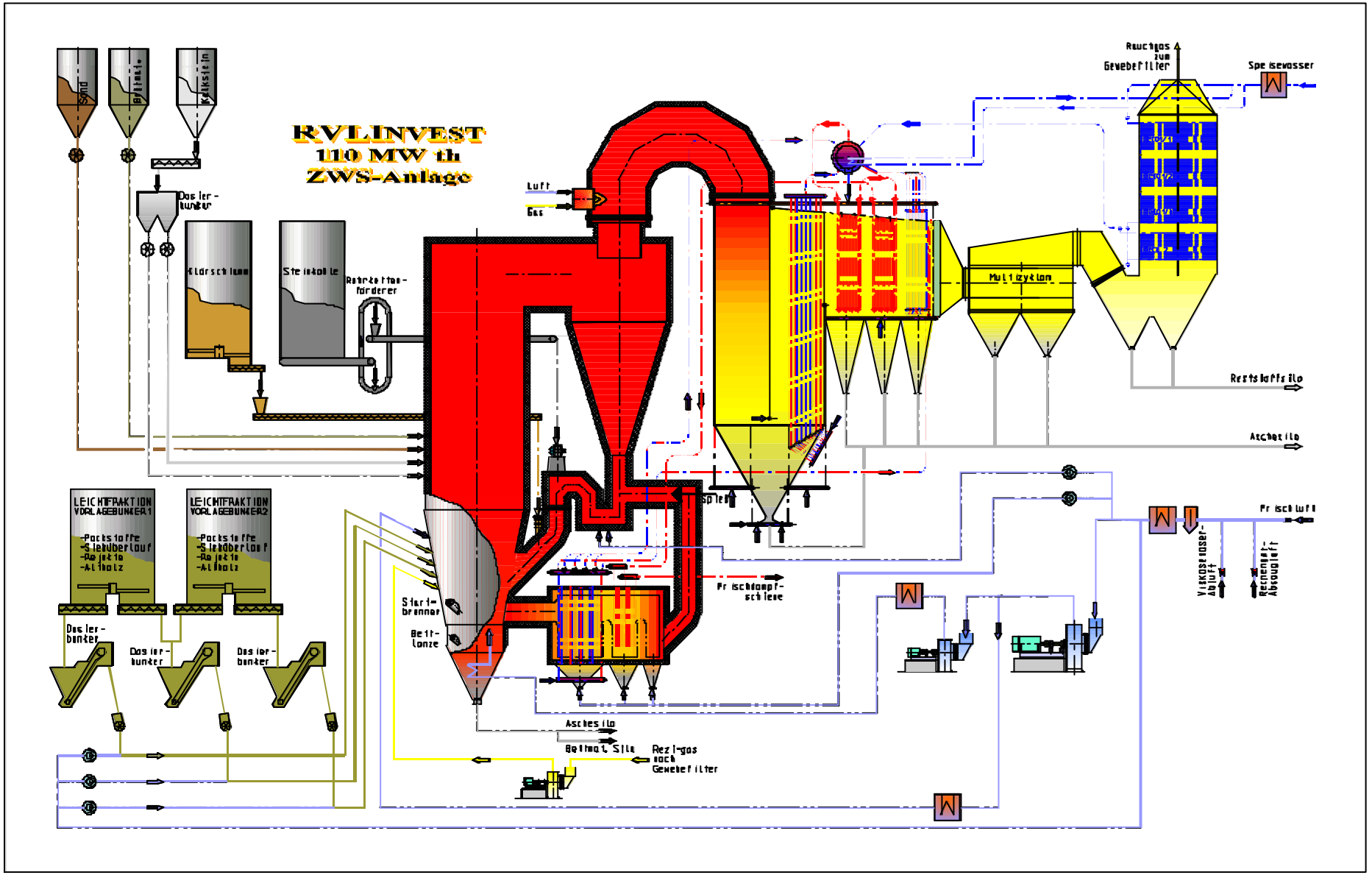
# Flue Gas Emissions RV-Lenzing

(mg/Nm³, related to 11% $O_2$, dry)

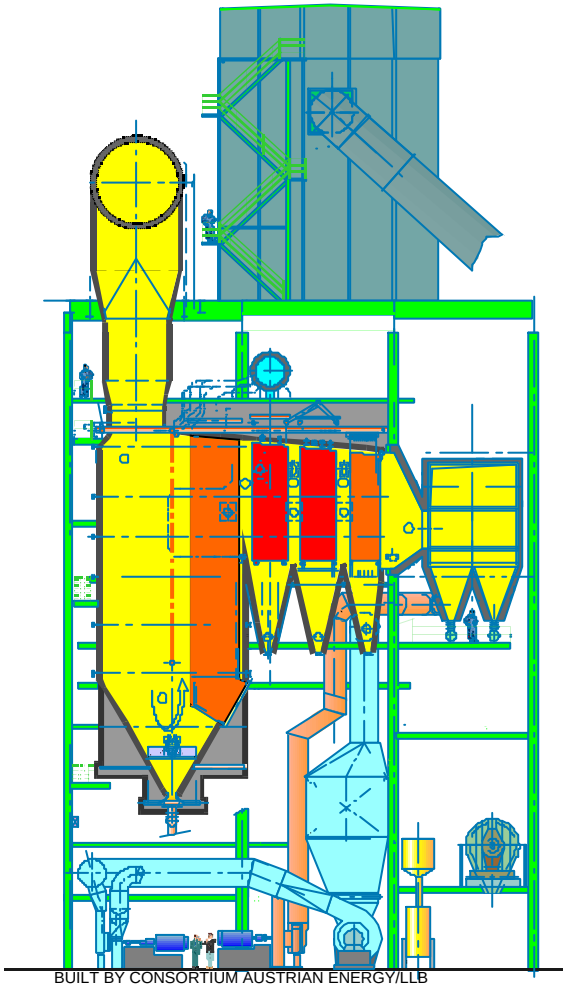
| Maximum 0.5 h mean value at all load cases | | limit boiler exit | act. emission boiler exit | limit total plant | act. emission total plant |
|---|---|---|---|---|---|
| Dust (rel. to 11% $O_2$, dry) | mg/Nm³ | 3000 | < 3000 | 8 | < 1 |
| NOx (rel. to 11% $O_2$, dry) | mg/Nm³ | 300 | 70 - 150 | 70 | < 40 |
| CO (rel. to 11% $O_2$, dry) | mg/Nm³ | 45 | < 1 - 10 | 50 | < 1 - 10 |
| $C_{org}$ (rel. to 11% $O_2$, dry) | mg/Nm³ | 5 | 0.5 | 8 | 0.5 |
| $SO_2$ (rel. to 11% $O_2$, dry) | mg/Nm³ | 2000 | 0 - 200 | 50 | < 5 |
| $SO_3$ (rel. to 11% $O_2$, dry) | mg/Nm³ | 40 | 5 | - | - |
| HCl (rel. to 11% $O_2$, dry) | mg/Nm³ | - | 700 - 1600 | 7 | 1 |
| PCDD / PCDF (rel. to 11% $O_2$, dry) 2h mean value | ng/Nm³ | 10 | < 10 | 0.1 | < 0.1 |

# Fuels RV-Lenzing

| | LHV | Capacity | Bulk density | Flow by volume (design) |
|---|---|---|---|---|
| | MJ/kg | t/h | kg/m³ | m³/h |
| Packing mat. / Screen overflow | 9 - 28 | 2 - 36 | 80 - 150 | 450 |
| Waste wood | 13 | 6 - 30 | 150 | 200 |
| Sewage sludge | 1.5 - 2 | 4 - 18 | 900 - 1000 | 20 |
| Bituminous coal | 31 | 1 - 15 | 800 | 19 |


RVL INVEST
110 MW th
ZWS-Anlage
Sand
Kalkstein
Dosier-bunker
Klärschlamm
Steinkohle
Rohrkettenförderer
Luft
Gas
Rauchgas zum Gewebefilter
Speisewasser
Multizyklon
Reststoffsilo
Aschesilo
LEICHTFRAKTION VORLAGEBUNKER 1
LEICHTFRAKTION VORLAGEBUNKER 2
-Packstoffe
-Siebüberlauf
-Rejekte
-Altholz
Dosier-bunker
Dosier-bunker
Dosier-bunker
Stütz-brenner
Bett-lanze
Frischdampf-schleife
Frischluft
Viskosewasser-Abluft
Rezi-gas nach Gewebefilter

# CFB-Plant Reststoffverwertung Lenzing Invest GmbH., Austria



BUILT BY CONSORTIUM AUSTRIAN ENERGY/LLB

**Steam parameters:** 129 t/h; 80 bar, 500 °C
**Main fuels:** packing materials, RDF, wood waste, rejects, sewage sludge
**Additional fuels:** screenings, bituminous coal, heavy fuel oil, natural gas
**Combustion air:** $H_2S$ and $CS_2$ polluted combustion air

Guaranteed-performance figures

| | |
|---|---|
| Max. continuous rating with waste materials: | 110 $MW_{th}$ |
| Max. continuous rating with coal: | 110 $MW_{th}$ |
| Min. continuous rating with waste materials: | 50 % |
| Availability: | 92 % |
| Range of lower heating values: | 6,5 -31 MJ/kg |
| Emissions: rel. to 11% $O_2$ in flue gas, dry | |
| CO: | 45 mg/Nm³ |
| Corg: | 5 mg/Nm³ |
| $SO_2$:*) | 50 mg/Nm³ |
| $NO_x$:*) | 70 mg/Nm³ |
| HCl:*) | 7 mg/Nm³ |
| PCDD: (TE after ITEF) *) | 0,1 ng/Nm³ |

*) after flue gas cleaning

# Fouling of Heating Surfaces RV-Lenzing


Optimization Cleaning Equipment:

- 1st radiation duct:
  Water lance blowers
- 2nd radiation duct with wing walls:
  Steam blowers
- Tail end pass:
  Optimisation of mechanical rapping system, additional steam blowers
- Economiser:
  Steel shot cleaning system

# Selected BBP Fluidised Bed Reference Plants

**SICET : 80 t/h, wood, bark**

**WESTFIELD: 47 t/h, chicken litter**

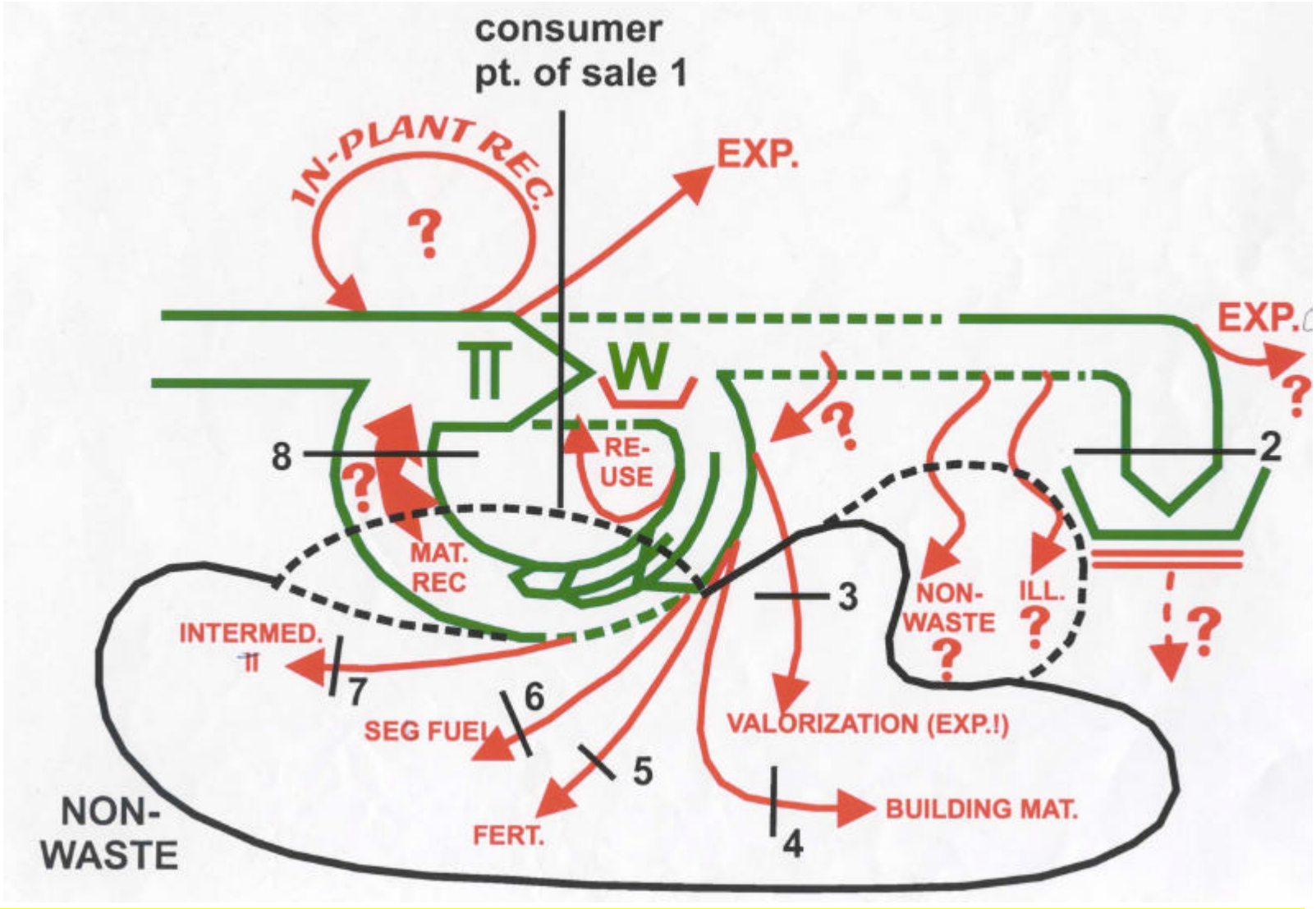
**FUNDER: 39 t/h, residuals, used wood, etc.**

# Selected BBP Fluidised Bed Reference Plants

**VERA : 3 x 11,2 t/h, sewage sludge**

**HAINDL : 80 t/h, residuals, waste wood, etc.**

**RENI : 18 t/h, sewage sludge, waste wood, etc.**




# INTEGRIERTE ABFALLWIRTSCHAFTSKREISLÄUFE ?

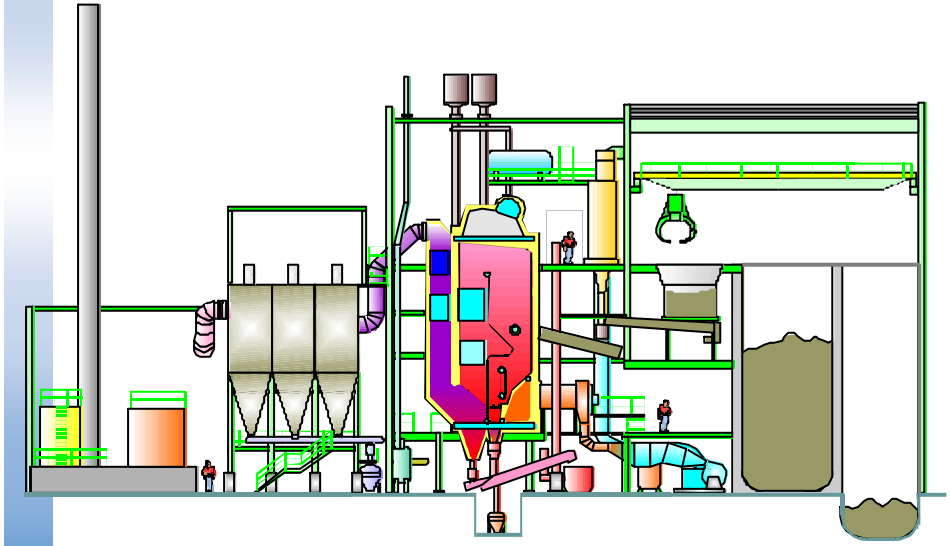
# Stoffkonzentrationen in den brennbaren Abfällen

| | C | N | S | Cl | Pb | Zn | Cd | Hg |
|---|---|---|---|---|---|---|---|---|
| | [g/kg TS] | | | | | | [mg/kg TS] | |
| **Durchschnitt der Abfälle** | 450 | 9,1 | 2,3 | 4,3 | 0,23 | 0,52 | 5,7 | 0,8 |
| **min. Konz.** | 100 | 0,2 | 0,06 | 0,01 | <0,001 | 0,001 | 0,01 | 0,001 |
| **max. Konz.** | 900 | 670 | 17 | 480 | 4 | 16 | 500 | 10 |
| **Restmüll** | 240 | 7 | 4 | 8,7 | 0,81 | 1,1 | 11 | 2 |

**Data source : ASTRA/ISWA**

# TURBO WS-Anlage RENI AG, Schweiz

| | |
|---|---|
| **Dampfdaten:** | 18,3 t/h; 15 bar; 230 °C |
| **Hauptbrennstoffe:** | Spuckstoffe aus der Papierindustrie, Sedimatschlamm, kommunaler Klärschlamm, Rechengut, Abfallholz, Geschwemmsel |
| **Zusatzbrennstoff:** | Leichtöl |



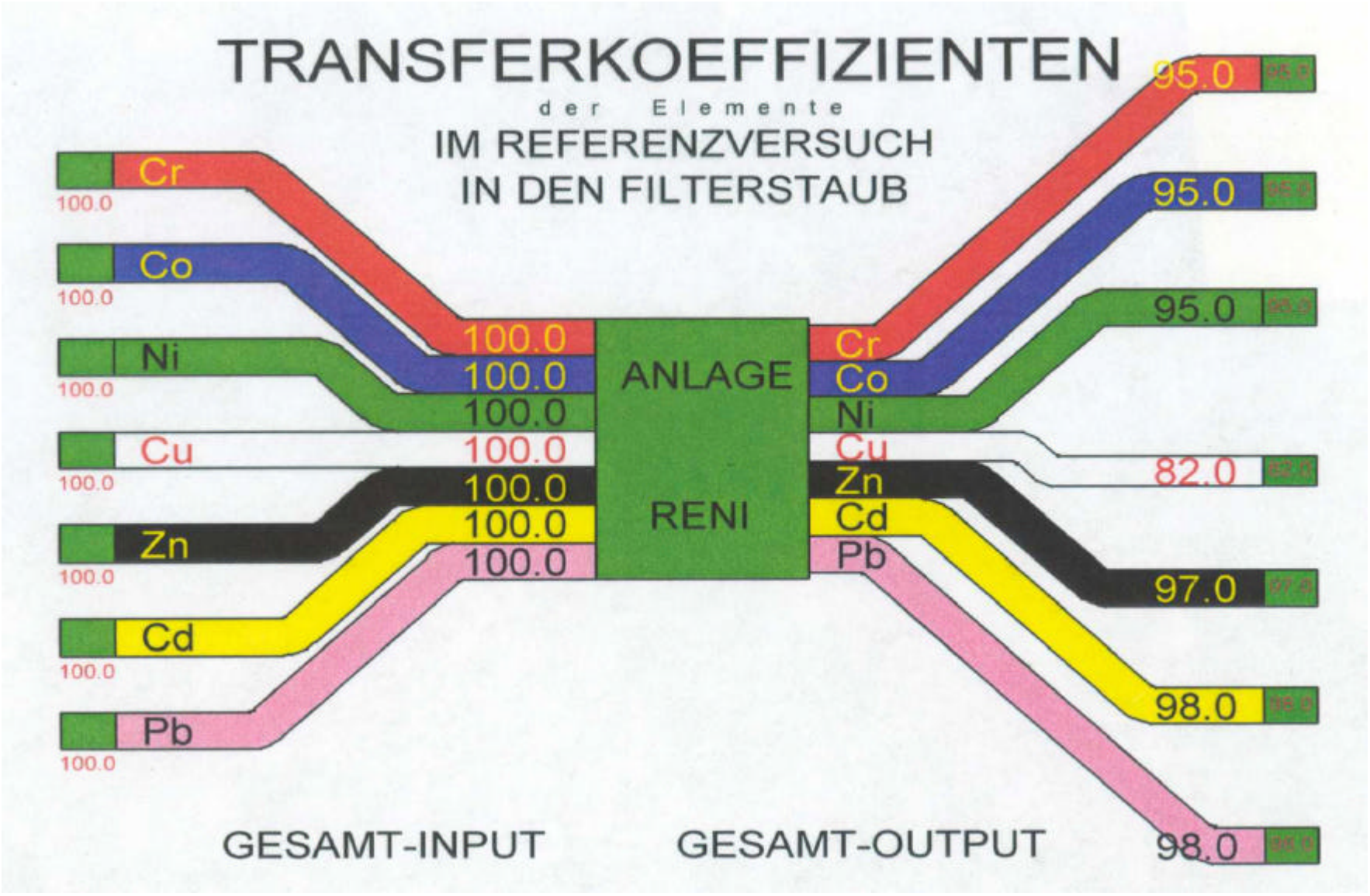
| | Garantiewerte | Betriebswerte | | |
|---|---|---|---|---|
| Max. Dauerlast: | 15,2 | 18,3 | t/h | (nach Leistungs-erhöhung) |
| Min. Dauerlast: | 9,2 | 9,2 | t/h | |
| Gesamtbetriebsdauer bis Juli 2000: | | 15.000 | h | |
| Laständerungsgeschwindigkeit (bez. auf Momentanlast): | - | 8 | %/min | |
| Wirkungsgrad: | 85,5 | 85,5 | % | |
| Emissionen: bez. auf 11 % $O_2$ im Rg. tr. | | | | |
| CO: | 50 | 16,3 | mg/Nm³ | |
| $SO_2$: | 50 | < 1,8 | mg/Nm³ | |
| $NO_x$: | 70 | 45,2 | mg/Nm³ | |

# Stoffstromanalyse - Wirbelschicht RENI

AUSTRIAN ENERGY & ENVIRONMENT SGP/WAAGNER-BIRO

## TEAM: RENI + IWAS + ENAGES + AE

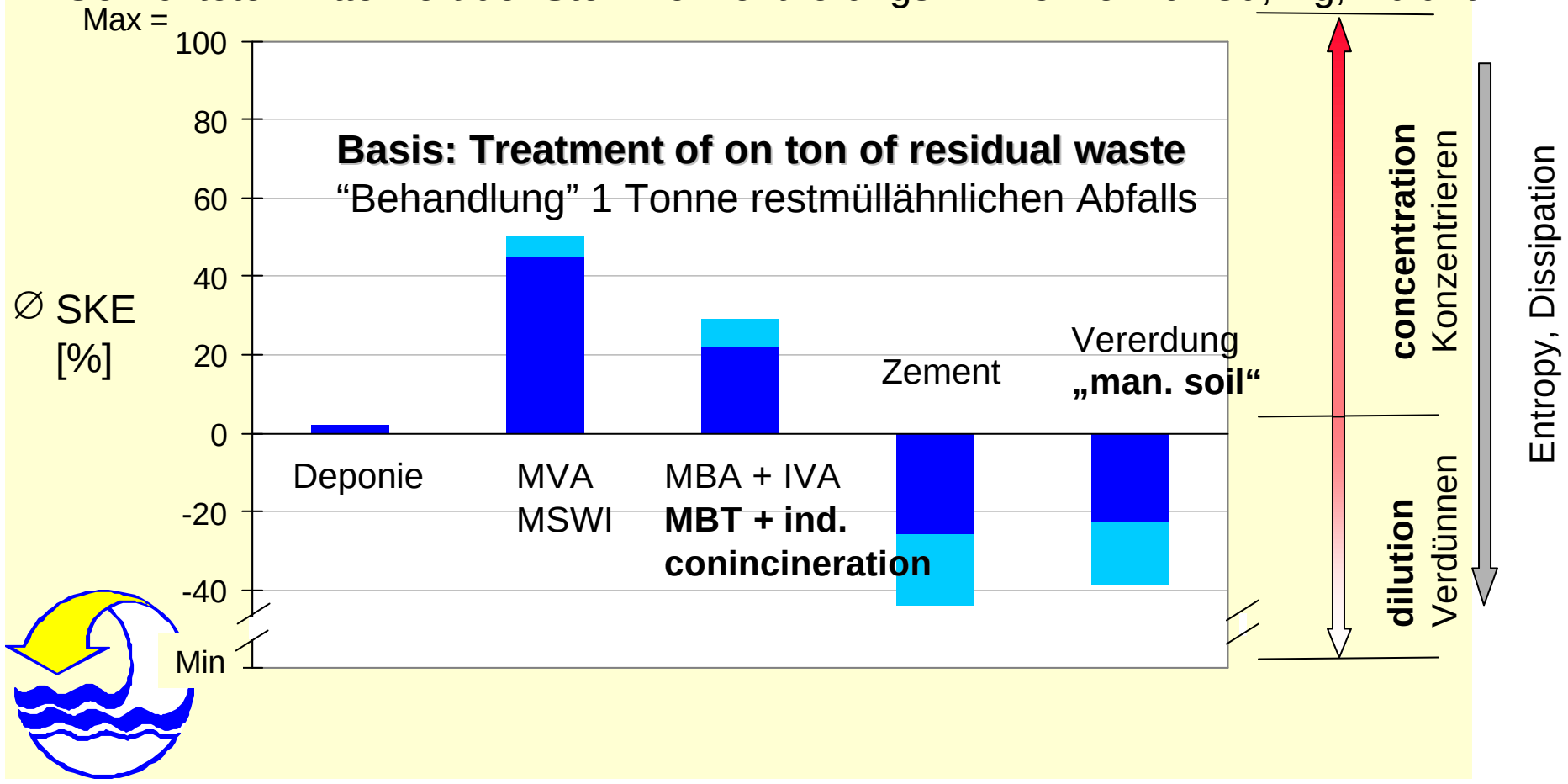
RENI: ADAM, BAUMELER, ERNST
IWAS: BRUNNER, MORF, SCHACHERMAYER
ENAGES: NEGER, SPIEGEL
AE: FERCHER, PREM, WÖRTL, SCHEURER, KAUBE, HUBER, LINDBAUER


TRANSFERKOEFFIZIENTEN
der Elemente
IM REFERENZVERSUCH
IN DEN FILTERSTAUB
Cr
100.0
Co
100.0
Ni
100.0
Cu
100.0
Zn
100.0
Cd
100.0
Pb
100.0
100.0
100.0
100.0
100.0
100.0
100.0
ANLAGE
RENI
Cr
Co
Ni
Cu
Zn
Cd
Pb
95.0
95.0
95.0
82.0
97.0
98.0
98.0
GESAMT-INPUT
GESAMT-OUTPUT

# Quo vadis -Waste Management or Material Flow Management?

**Substance Concentration Efficiencies SKE: Dilution or CONCENTRATION?**

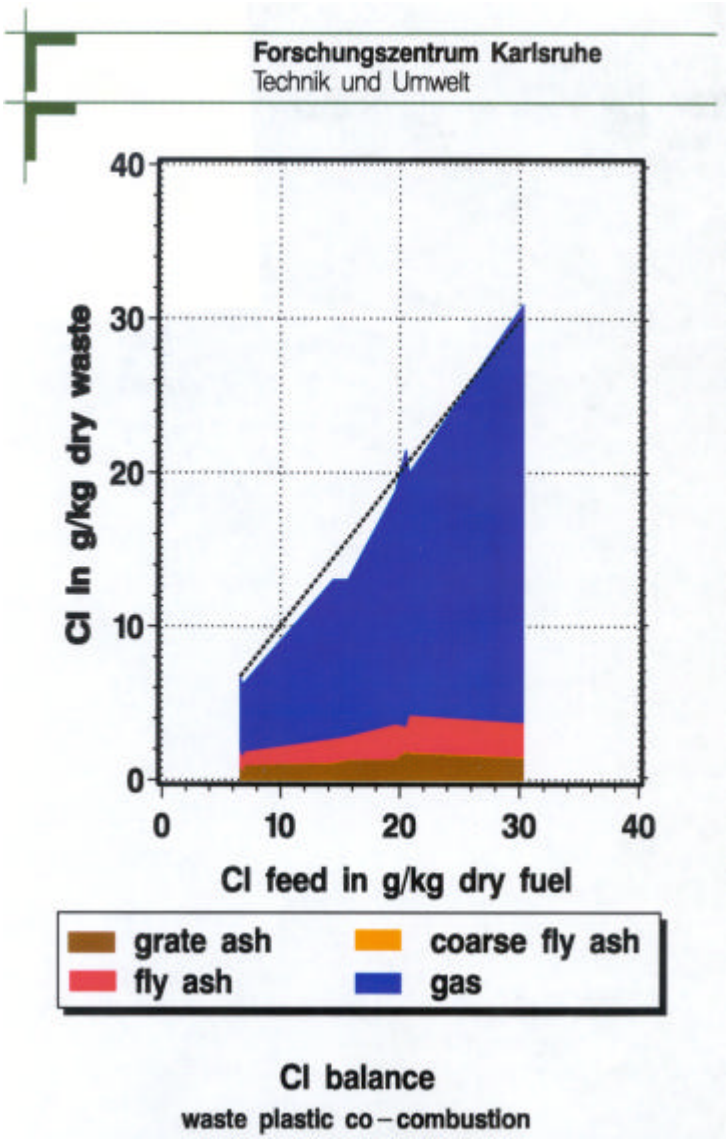
Gewichteter Mittelwert der **S**toff **K**onzentrierungs **E**ffizienzen für Cd, Hg, Pb und Zn



# Environm'l Leadership from Cradle to Grave

| | Figures in mg/kg fuel | | | | | |
|---|---|---|---|---|---|---|
| | S | Cl | ? Me | Cr | Cd | Hg |
| Referenzwert [R] | 250 | 100 | 5 | 100 | 0,2 | 0,2 |
| A [< 0,4*R] | < 100 | < 40 | < 2 | < 40 | < 0,08 | < 0,08 |
| B [< 2*R] | < 500 | < 200 | < 10 | < 200 | < 0,4 | < 0,4 |
| C [< 10*R] | < 2.500 | < 1.000 | < 50 | < 1.000 | < 2 | < 2 |
| D [< 50*R] | < 12.500 | < 5.000 | < 250 | < 5.000 | < 10 | < 10 |
| E [< 250*R] | < 62.500 | < 25.000 | < 1.250 | < 25.000 | < 50 | < 50 |
| F [> 250*R] | > 62.500 | > 25.000 | > 1.250 | > 25.000 | > 50 | > 50 |

**Data base:**
**Austrian standards working group 11-2001**

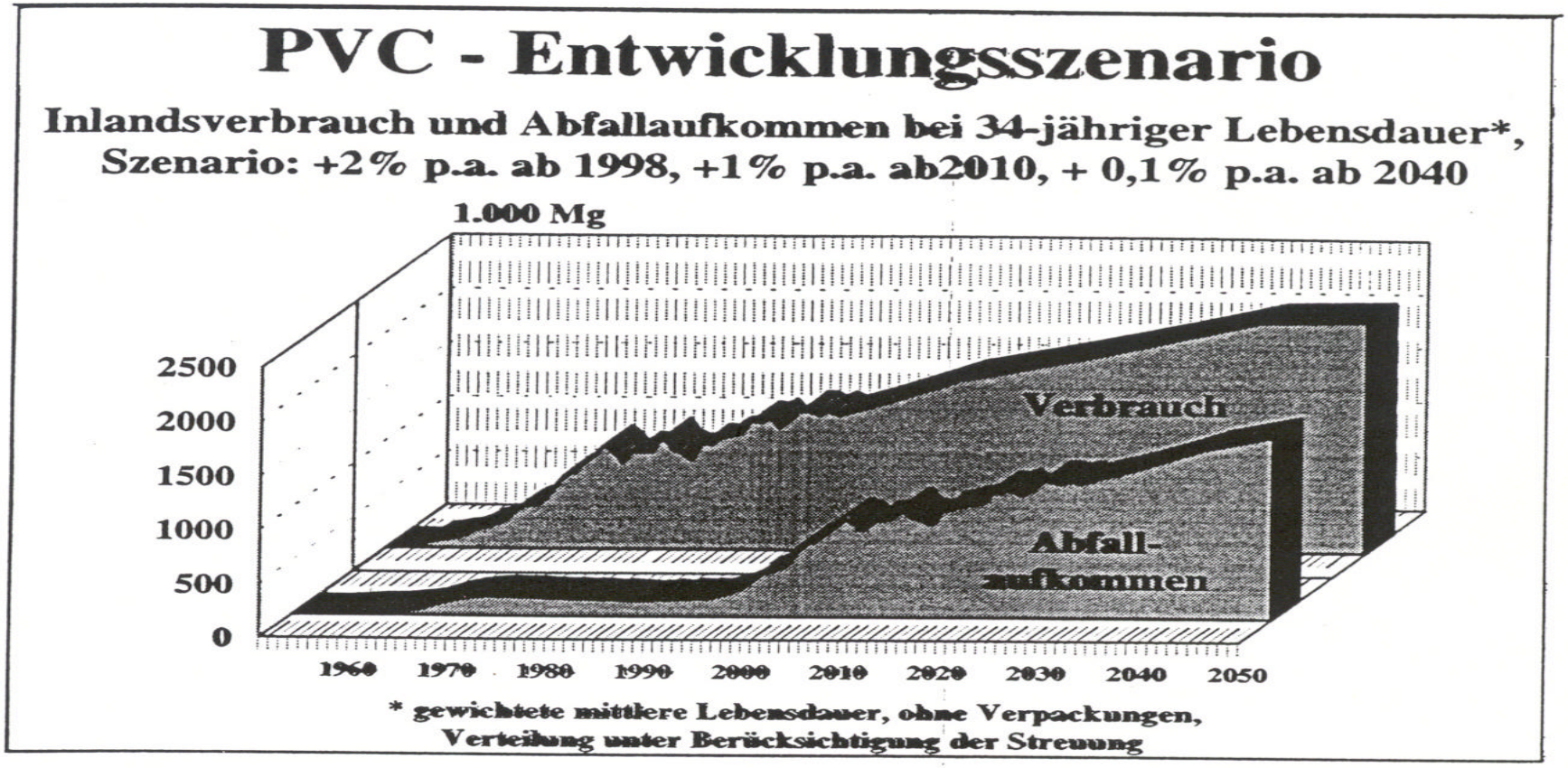



# CADMIUM, PLASTICS & indicative CONT INUOUS HCl- Monitoring

ANALYSENERGEBNISSE VON AUFBEREITETEN KUNSTSTOFF-FRAKTIONEN 1997

| | Maßeinheit | Mittel | Minimum | Maximum | Anzahl |
|---|---|---|---|---|---|
| Chlor gesamt | % | 1,20 | 0,35 | 2,19 | 527 |
| Feuchte | % | 10,00 | 1,00 | 40,00 | 527 |
| Heizwert | J/g | 28.554 | 14.702 | 42.491 | 527 |
| Pb | ppm | 88 | 44 | 124 | 11 |
| Cd | ppm | 8 | 4 | 15 | 11 |
| Cr | ppm | 120 | 88 | 167 | 11 |
| Hg | ppm | 0,5 | < 0,4 | 0,7 | 11 |

# Abbildung 2: Zukünftige Entwicklung des PVC-bürtigen Chloreintrags in den Abfall



Verbund Umwelt

## Forschungsergebnisse Brennstoffmarkt

- Ab 01.01.2004 gesetzliche Notwendigkeit zur thermischen Verwertung v. heizwertreichen Abfällen
- Mengenpotenzial von 9 - 10 Mio. t/a an heizwertreichen Abfällen in Österreich
- Energiepotenzial von ca. 5.000 $GWh_{el}$
- Bestehende thermische Verwertungskapazitäten für ca. 1,7 Mio. t/a gemäß dem Stand der Technik. -> d.h. Bedarf an weiteren Kapazitäten
- Erhöhung der ALSAG-Beiträge.

Forschungsprojekt Verwertung von Sekundärbrennstoffen

**Potential Austrian Recovered Fuel**
**Potential: 9-10 Mio tpy, appr. 5 $TWh_{el}$**

# Standardization for Solid Recovered Fuels

# A PUZZLE OF DILEMMAS

## Opening Remarks from the Chair

**Kyriakos MANIATIS**

**Energy from Biomass & Waste**
**DG Energy and Transport**
**European Commission**

# A PUZZLE OF DILEMMAS

- **The PRODUCER's DILEMMA**
  - **relevant quality-control, material or energy recovery, large markets to be created**
- **The USER's DILEMMA**
  - **limited experience, liberalization confused**
- **The STAKEHOLDER's DILEMMA**
  - **diverging interests (public/private, global/local)**
- **The GOVERNMENT's DILEMMA**
  - **harmonized legal framework, clear, adequate and decisive control monitoring, bridging local and national interests**

# DRIVING FORCES for increased Solid Recovered Fuels/SRF use

- Increasing quantities of wastes
- Oil Crisis/Energy Dependence/Security of Supply
- EU Energy, Environmental & other Policies
- The Environment, (local/global) and Health
- Climate Change / Landfilling taxation
- Globalization/Privatization/Liberalization

# C O N S T R A I N T S
# for increased SRF use

- **EU-wide factual non-harmonization (“flexible level playing field”)**
- **on-going “mis-understanding of energy- material - fuel recovery**
- **product or waste, recycling or fuel, recovery or disposal**
- **emission legislation related to “supposed” input**
- **unclear quality standards - inadequate continuous monitoring and control procedures**

# Non-regular / Recovered Fuels for ENERGY RECOVERY TECHNOLOGY

- **D R I V E R S ……**
- abundance of „new fuels“, separate collection/waste splitting/bio-mechanical treatments
- increasing cost of land-filling and possibly legal actions against untreated land-filling practices until 2010 in EU15/Europe will lead to more energy recovery
- energy recovery is enhanced in *regional* heat and power needs (industrial, agricultural, community players) enabling local power supply and CHP infrastructure for industry and community
- understanding sustainability as being more than mere environmental considerations: infrastructure, regional guidance...
- Public Interest and Industrial Drivers to act on a WIN-WIN basis with fair judgement
- Techn. Availability of FB INCINERATION

- **C O N S T R A I N T S …..**
- EU-wide factual non-harmonization of environmental constraints leads to eco-dumping („landfilling of energy“, diluting regular fuels with low/varying grade fuels)
- the on-going misunderstanding of energy - material - and fuel recovery, waste or product/waste or fuel/quality+control+level playing field also for heating value & hazardous constitutents & emissions, bureaucracy or non-regulated „free“ market or ?...
- Recovery or disposal (R1-D10), use of energy with adequate techniques ***or deliberate co-incineration in end-of-life plants***
- missing or inadequate quality standards and control/monitoring procedures for „new“ fuels

# Non-regular / Recovered Fuels

## sustainable ENERGY RECOVERY : the quality issues

- **A L L I A N C E S .....**
- dedicated CHP/incinerators missing waste fuel / undersiege in liberalized trade schemes
- combining infrastructural needs with energy benefits for national, regional, local public and private enterprises (WIN-WIN)
- sustainable policies looking for regional CHP, energy independence, strengthening of rural/urban ties: „sustainable communities“ incorporating (new) renewables, biomass with energy recovery from regional sludge and waste streams (household, industrial, recovered fuel on a high tech basis
- sustainable material flow management with high concentration efficiency energy recovery plants as toxic sinks
- Adapting FB technolgoy to ever-new fuel/mixes with waste dealers

- **O P P O N E N T S .....**
- „Kreislaufwirtschaft“ with no other aim than „assigning“ waste types to differently competitive structures: public („mixed and hazardous“), private „source-separated“, „quality-controlled“, energy-rich to „unspecified low-tech co-incineration
- unclear legal rulings (EU and unharmo-nized reg‘l practices, BAT instead of „state -of-the-art“, recov‘d fuel quality control at lowest sampling/analysis costs; co-combustion schemes where possibly
- hazardous fuel ingredients are additive to clean, regular fuels; unharmonized proofs of emissions (no compulsory continuous gas monitoring in co-incineration)
- over-regulating bureaucratic burden for waste shipments of unclear waste definition

# ***Wise Use* of Non-regular /Recovered Fuels for Energy Recovery = *Sustainable* Regional Development: *why ?***

- ***Allows WIN-WIN for local private and public entrerpises from agriculture, industry , and utilities to strengthen infrastructure in energy (CHP)prodcution , local labor***
- ***Fulfills the objectives of „waste management“ : safeguarding of health and environment with high tech, waste/recoverd fuel-to-energy plants (FB Technology)***
- ***Fulfills the principles of „waste management hierarchy“: energy and material recovery with high-concentration efficiency plants and material flow management***
- ***Counteracts „Free Market Misunderstanding“= Anything goes Anywhere as long as it‘s cheaper“ = Global Eco-dumping***

# Wise Use of Non-regular /Recovered Fuels
## for Energy Recovery : Effect on Boiler Makers?
## Thermal Energy is Sustainable Development

- *Until 2010 all national and EU regulations will lead to stricter control of what goes to landfilling („treatment option“ required): less energy will be „buried“:* **in EU15 >200 to 400 new facilities by 2010 !?**
- *Multiple quantitites of „original nunicipal waste“ will be available for waste-to-energy plants; action must be taken that economically increasingly attractive co-incineration plants are up to standard (material flow management - material concentration efficiency)*
- *ALLIANCES HAVE TO BE SOUGHT AND STRENGTHENED: between public and private ; between waste producers, traders and plant operators; between urban and rural; between Industry, Utility and Agriculture to allow WIN-WIN on a continuously quality-controlled relationship*

# NON-Regular/Recovered FUELs BENEFITS: SUMMARY

- Sustainable development=waste/energy minded
- EU security of energy supply improved
- EU harmonized energy & environment goals
- Private market forces, public control
- local energy/labor needs - global benefits
- Fluidized Bed application on large scale

# NON-Regular/Recovered FUELs FURTHER STEPS to SUCCESS

- **Harmonization between mixed and separated waste streams markets: more DATA**
- **Harmonization for waste definitions, recovery - disposal action: more DATA**
- **Harmonization of continuous control monitoring (SRF/emissions control): more DATA**
- **Agreed quality classification of SRF, creation of credibility between producers/consumers; public/private; MSWI/industrial co-incinerators: more DATA**