Standardization as a help to facilitate SRF acceptance and use

Experience of the European Cement Industry

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HeidelbergCement in a glance

- Global top 4 in cement, ready-mix and aggregates
- Building on People, Planet and Profit
- Recover globally 5,5 million tons Waste Materials
- We see “Waste as a Resource”

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Position of cement industry in Waste Managament

Highest resource efficiency

Lowest resource efficiency

Reduce – lowering the amount of waste produced

Reuse – using materials repeatedly

Recycle – using materials to produce new products

Recovery – Recovering energy and minerals from waste

cement kilns

Incineration/WtE – Recovering energy from waste

Landfill – safe disposal of waste to landfill

3R economically not possible, co-processing best next option

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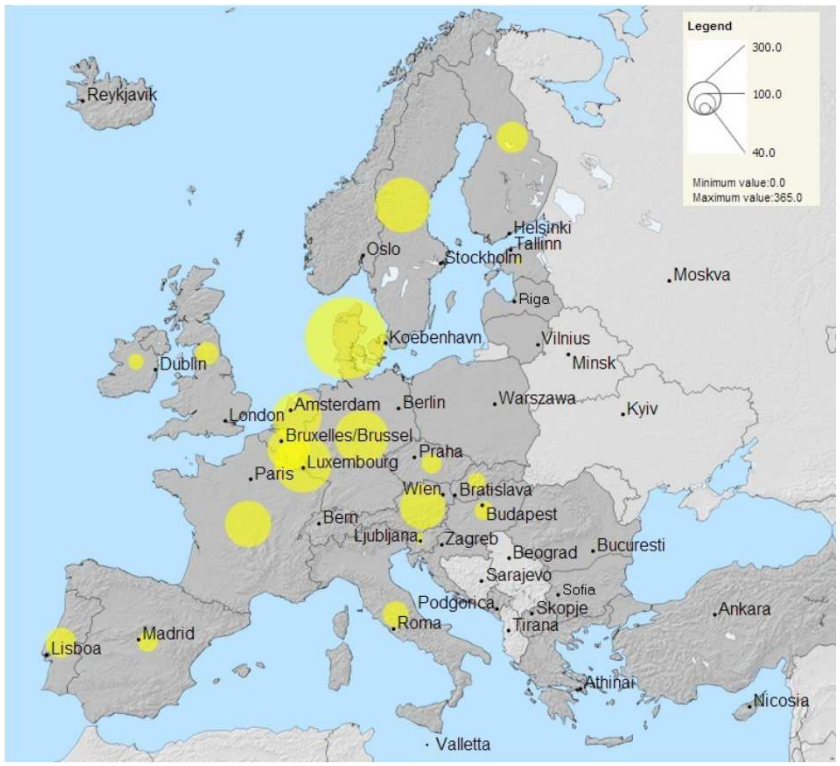
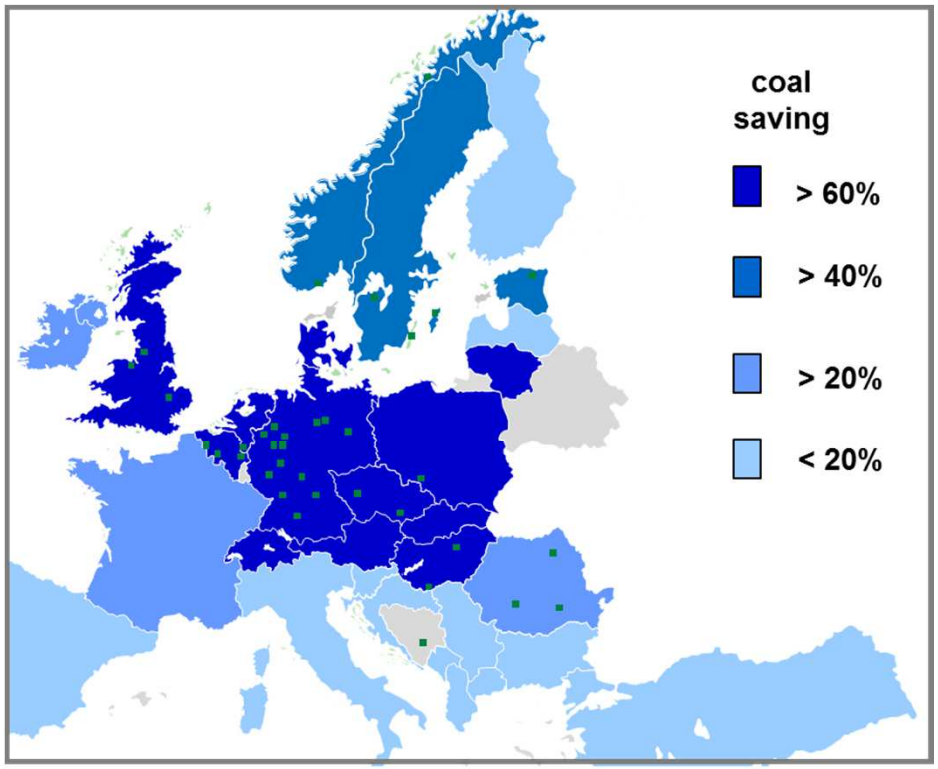
Quantity of WtE versus WtC in European countries



Waste to Energy in Europe (kg/cap)



Waste to Cement in Europe (estimation 2013)

Waste to Energy and Waste to Cement co-exist in Europe

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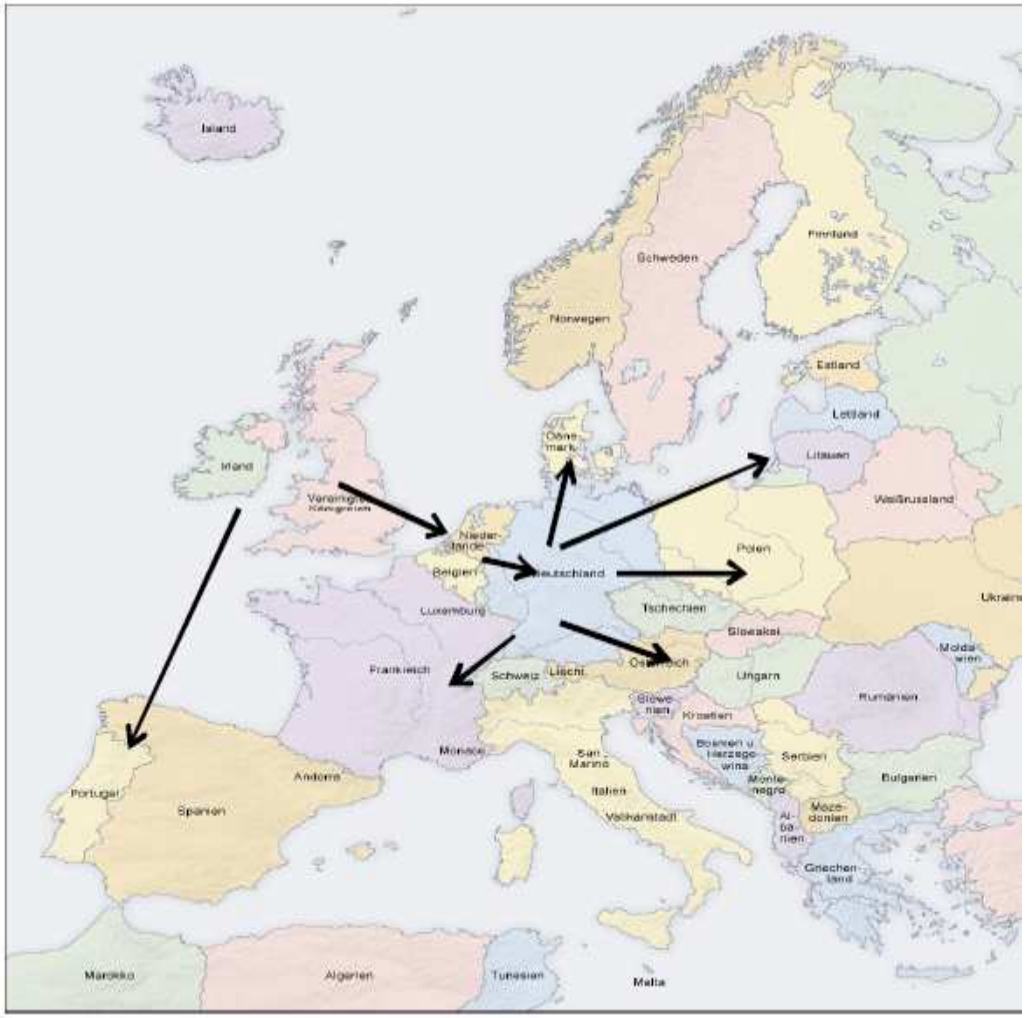
RDF / SRF flows in Europe

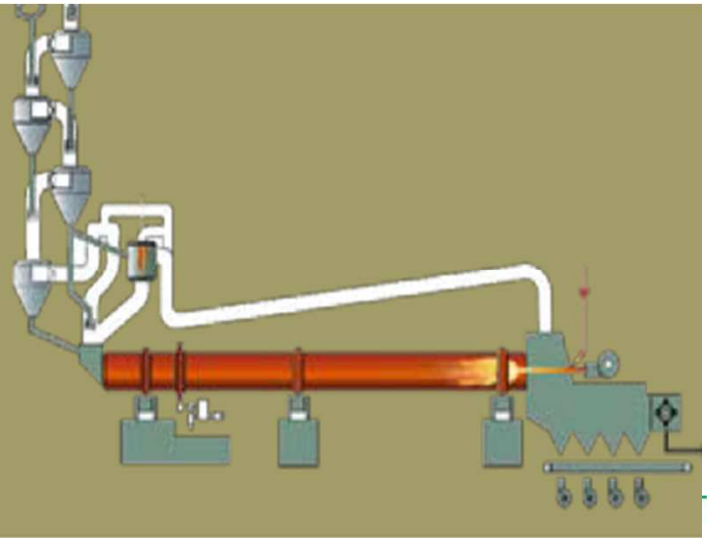


- **Export from UK is most dominant, but there are a lot of other cross border flows as well**

Co-processing of RDF/SRF in cement kiln environmental friendly

- **Long residence time at high temperature** → **Complete destruction organics, no PCDD/DF formation**
- **Combustion rich in oxygen and active lime** → **Neutralisation of acid gases, SOx and hydrogen chloride**
- **High clinker mass stream** → **Heavy metals stable embedded**
- **Ashes of fuel in clinker replacing raw material** → **Zero waste solution**

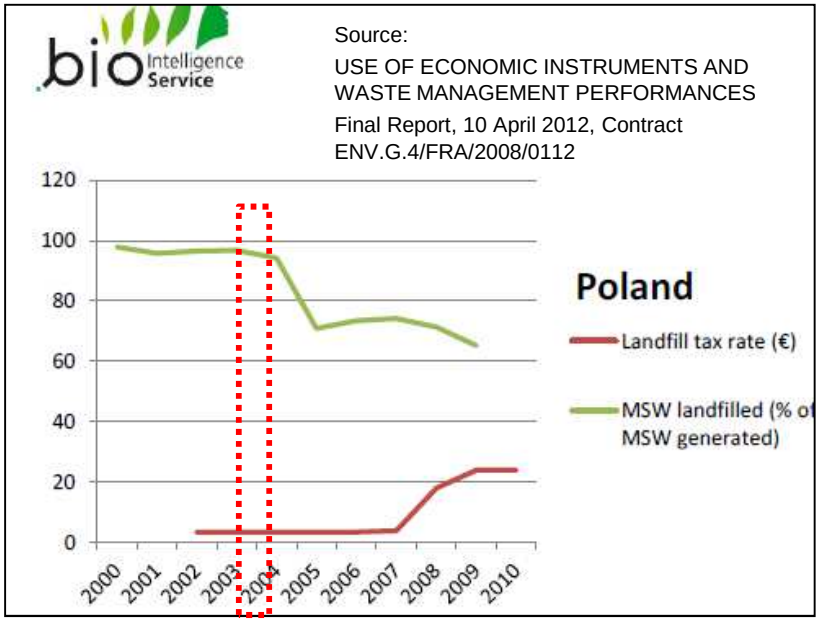
Characteristics	Temperature and time
Temperature at main burner	>1450°C: material >1800°C: flame temperature
Residence time at main burner	>12-15 sec and >1200°C > 5-6 sec and > 1800°C
Temperature at precalciner	>850°C: material >1000°C: flame temperature
Residence time at precalciner	> 2-6 sec and >800°C

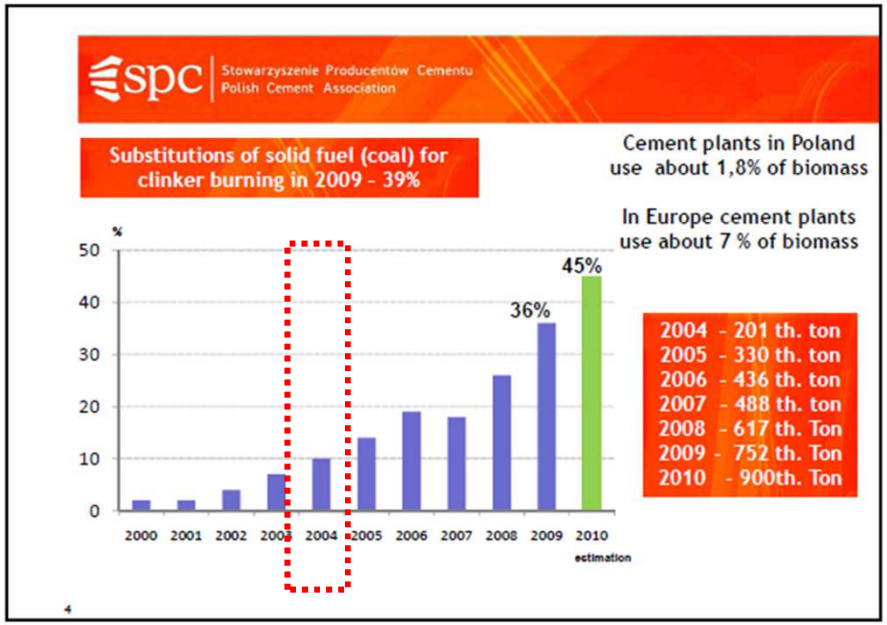


SRF potential benefits versus RDF

1. **Quality control more explicit executed at the SRF-supplier**
   → cement industry as user can limit control efforts
2. **Supplier A and supplier B better exchangeable**
3. **Network of several suppliers and several off-takers is easier to build when standards are applied**
4. **Cross border flows will become less complicated:**
   a. **Reduce paper work load**
   b. **Shorten timeframe between application and approval**
5. **Stakeholder – acceptance by cement plant is easier realized when EU-standardization is applied on waste fuels**

Best practice example: Poland





- **Cement Industry in Poland already in 2004 replaced 10% of coal by SRF/RDF**
- **Landfill diversion only 2% and very low landfilling costs**
- **Imports from Germany were the driving force for the early development**

Cross border flows SRF@ are essential for market development !

Best practice example: Poland – Quality Control

- **HC-plant in Gorazdze:**
  - **receives > 50 trucks per day**
  - **> 15 suppliers**
  - **LHV ranging from 15 to 22 GJ/t**
  - **Cl- ranging from 0,6 to 0,9 %**
  - **Each truck is sampled + analysed**
  - **> 10.000 samples per year!**

- **SRF classification will reduce the huge effort on quality control at this plant**

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SRF classification system is “only” 1 element

Table 1 — Classification system for solid recovered fuels

Classification characteristic	Statistical measure	Unit	Classes				
			1	2	3	4	5
Net calorific value (NCV)	Mean	MJ/kg (ar)	≥ 25	≥ 20	≥ 15	≥ 10	≥ 3
Classification characteristic	**Statistical measure**	**Unit**	**Classes**				
			1	**2**	**3**	**4**	**5**
Chlorine (Cl)	Mean	% (d)	≤ 0,2	≤ 0,6	≤ 1,0	≤ 1,5	≤ 3

Calculation example

Class	**NCV 3, Cl 3**	**NCV 3, Cl 3**
Analysis:	**18 GJ/t; 0,7% Cl-**	**16 GJ/t; 0,8% Cl-**
Feed to kiln	**60% (thermal)**	**60% (thermal)**
Cl- input:	**100 units**	**130 units**

A cement kiln operating 24 hours on 30% more Cl- than expected will block completely !!

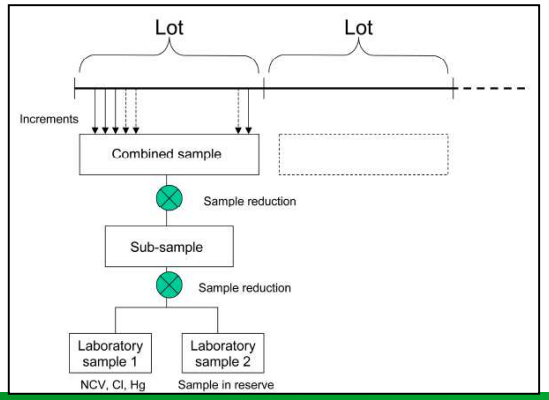
Constant /predictable quality remains key also in classified SRF!

Value SRF classification in stakeholders acceptance

- **WID, BAT for cement, IED, permits etc:**
  - **Waste co-processing limits cement kilns = incinerator**
  - **(Online) monitoring has become fully mature**
  - **Development on input-side ongoing :**
    - **end-of-waste;**
    - **mixing ban; BREF waste treatment ;**
    - **LCA, sustainable supply chain**

- **Added value for acceptance co-processing at cement kilns if suppliers comply with:**
  - **Classification standards according to CEN/TC 343**
  - **ISO-standards + OHSAS-standards**

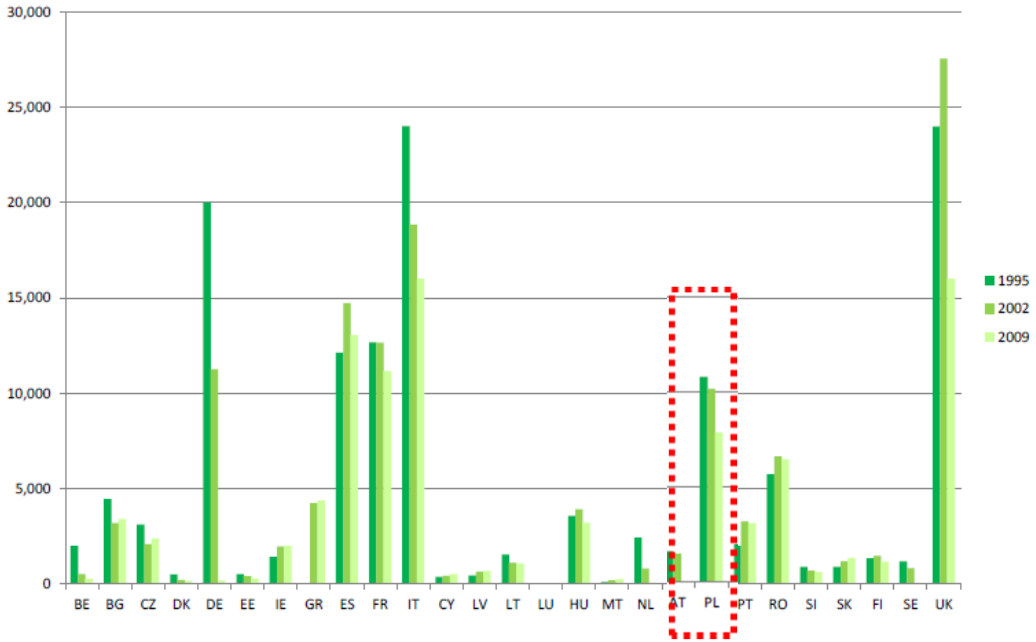
			Gorazdze	
			permit	realization
Process related emissions				
Dust		mg/Nm3	30	5
Carbon Monoxide	CO	mg/Nm3	2000	1560
Sulphur Dioxide	SO2	mg/Nm3	500	250
Nitrogen Oxides	NOx	mg/Nm3	800	709
Waste burning related emissions				
Hydrogen Chloride	HCl	mg/Nm3	10	2.3
Hydrogen Fluoride	HF	mg/Nm3	1	0.2
Total Organic Carbon	TOC	mg/Nm3	100	15
Cadmium + Tallium	Cd + Tl	µg/Nm3	50	3
Mercury	Hg	µg/Nm3	50	7
Sum of Lead, Arsenic, Chromium	Pb, As, Cr	µg/Nm3	500	75
Total Dioxines and Furanes	PCDD/F TEQ	ng/Nm3	0.1	0.02

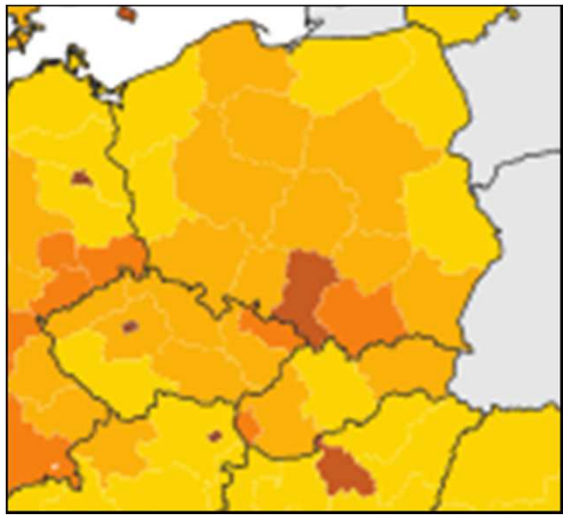


Standardization requires professionalism in QA-QC and supports to respond on concerns of stakeholders !

Best practice example: Poland – Future

Figure 3 Municipal waste landfilled, EU 27, 1995-2002-2009 (1,000 tonnes)



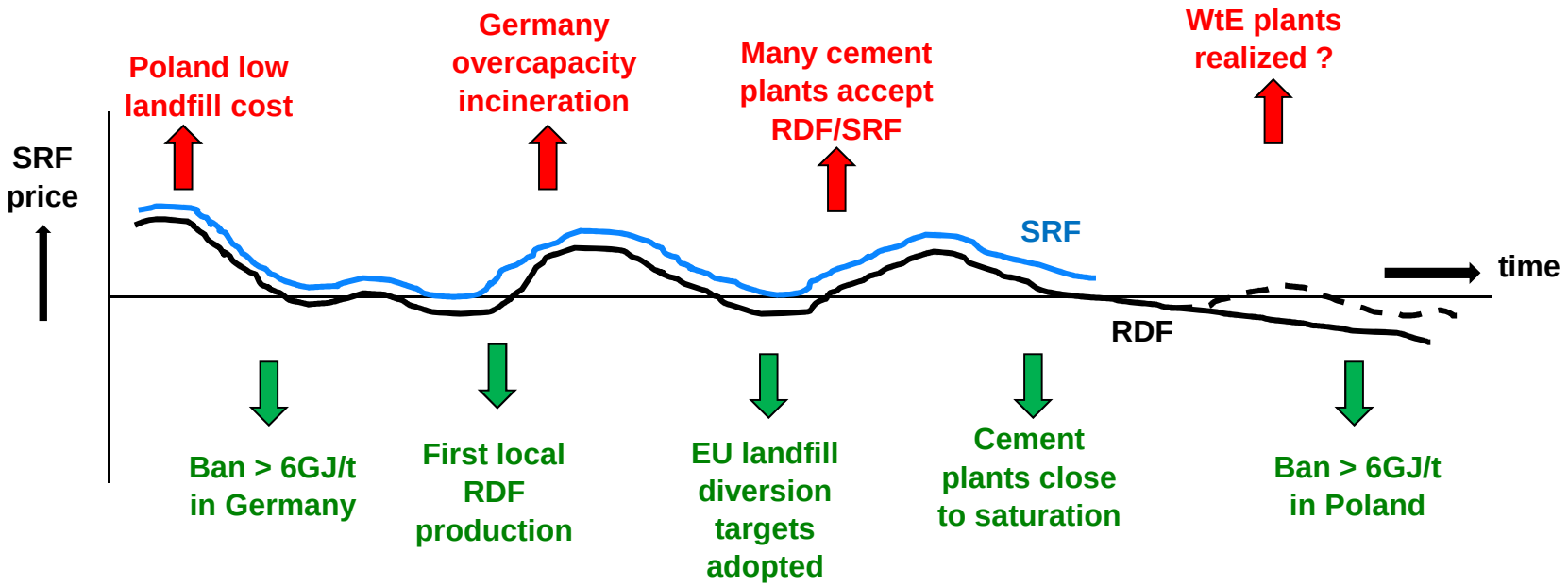


- **Poland 2012: 8 mio ton to landfill**
- **Capacity: cement plants 1,5 mio tons + 6 incinerators 2015: 1,2 mio tons**
- **2016 ban on landfill of MSW > 6 GJ/t**

Classification SRF important for export out of Poland!

Poland – market value RDF / SRF

- Actual market price of coal limited influence – long term trends do
- Regulation is influencing market price significantly
- SRF will follow same path as RDF, probably with some premium



Classification results in price premium, but impact less than other price drivers!

Concluding remarks

1. The use of SRF / RDF is widely adopted in the European Cement Industry
2. SRF classification has a major importance for
   - Reducing complexity and crucial lead time in approving cross border flows
   - Minimizing the required quality control efforts at cement sites that are managed on lean as possible operations
   - Stakeholder acceptance of co-processing waste derived materials from solid organized suppliers working with approved and standardized methods
3. SRF classification will give a price premium compared to RDF of similar specification although other drivers are more dominant in pricing
4. SRF classification will support faster development of RDF co-processing in cement kilns in upcoming waste markets in- and around Europe