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Für Mensch und Umwelt

Putting the Protocols into Practice – Application of Best Available Techniques in the Cement Industry

Workshop to Promote the Ratification of the Protocols on Heavy Metals, POPs and the Gothenburg Protocol across the Entire UNECE Region

St. Petersburg, 26 –28 October 2009

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Outline

1. Provisions for cement plants from the existing Protocols
2. What will be the provisions for cement plants in the future protocols?
3. Use of the EU BREF documents as an information source under CLRTAP
   a. Short Introduction into IPPC and the BREFs
   b. How to Read the BREF
   c. Contents of the Cement, Lime and Magnesium Oxide BREF
4. Conclusions

1. Provisions for cement plants from the existing Protocols

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- Ü the Protocol on Heavy Metals (1998)
- Ü the Protocol on POPs (1998)
- Ü the Gothenburg Protocol (1999)

Provisions for cement plants from the existing HM protocol (1998)

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Cement industry (annex II, category 7)

53. (...) To reduce direct dust emissions from crushers, mills, and dryers, fabric filters are mainly used, whereas kiln and clinker cooler waste gases are controlled by electrostatic precipitators.

Table 8: Emission sources, control measures and reduction efficiencies for the cement industry

Emission source	Control measure	Reduction efficiency	Emission level
Direct emissions from crushers, mills, dryers	FF	Cd, Pb: > 95%	10 mg/m³
Direct emissions from rotary kilns, clinker coolers	ESP	Cd, Pb: > 95%	< 50 mg/m³
Direct emissions from rotary kilns	Carbon adsorption	Hg: > 95%	

Provisions for cement plants from the existing HM protocol (1998)

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II. SPECIFIC LIMIT VALUES FOR SELECTED MAJOR STATIONARY SOURCES

Cement industry (annex II, category 7):

15. Limit value for particulate emissions: 50 mg/m^3.

(No ELV is specified for the heavy metals covered by the Protocol.)

Provisions for Cement Plants from the existing POP Protocol (1998)

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Cement plants are not directly addressed, but if waste is used as fuel, Annex V, Part IV. A. Waste incineration applies:

14. The main control measures for PCDD/F emissions from waste incineration facilities are:
    a) Primary measures regarding incinerated wastes
    b) Primary measures regarding process techniques (e.g. Temp. > 850°C, sufficient residence time > 2 sec)
    c) Measures to control physical parameters of the combustion process and waste gases (e.g. temperature stages, cooling rate);
    d) Cleaning of the flue gas and (e) treatment of the residuals.
19. The methods mentioned above are capable of reaching an emission level of 0.1 ng TE/m^3 PCDD/F

Provisions for Cement Plants from the existing Gothenburg Protocol (1998)

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Cement plants are only addressed in Annex V, No. 11:

Limit values for NO_x emissions from cement production

		Limit value (mg/m^3)
New installations (10% O_2)	Dry kilns	500
	Other kilns	800
Existing installations (10% O_2)		1200

2. What will be the provisions for cement plants in the future protocols?

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- Ü Draft background document submitted to the UNECE Task Force on Heavy Metals (TFHM, 2006)
- Ü Guidance document on control techniques for emissions of sulphur, NOx, VOCs, dust from stationary sources, prepared by EGTEI for the WGSR (2009)
- Ü Proposals for the revision of the Technical Annexes of the Gothenburg Protocol

BAT for cement plants according to the TFHM background document (2006)

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I. CEMENT INDUSTRY

Best Available Techniques according to other references

155. BAT for reducing PM emissions are the combination of primary measures and

- Ü Minimization/prevention of PM emissions from fugitive sources
- Ü Efficient removal of PM from point sources by application of:
  - ESPs with control equipment to minimise the number of CO trips
  - FFs with multiple compartments and 'burst bag detectors'

156. The associated BAT emission level for PM is 20-30 mg/m³ (daily average).
The best installations achieve emission levels below 10 mg/m³ (273 K, 101.3 kPa, 10% oxygen, dry gas).

BAT for cement plants according to the TFHM background document (2006)

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157.

- Ü No major difference in HM emissions between wet or dry kilns, or between kilns burning conventional or waste derived fuels
- Ü The raw material input has the greater effect on HM emissions

  Usually about 90% of the mercury is introduced into the kiln with the raw-materials, while only about 10% originate from the fuels.

158.

- Ü The best way to reduce heavy metal emissions is to avoid feed materials with a high content of volatile metals such as mercury.

  Mercury can build up over time in the cement kiln PM, which is usually returned to the kiln system. When high build-ups occur in the PM, emissions may increase. This can be dealt with by discarding (part of) the cement kiln PM rather than returning it to the kiln feed.
- Ü As metals are often bound to PM, particulate abatement methods will help to reduce HM emissions.

BAT for cement plants according to the TFHM background document (2006)

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IX. MUNICIPAL, MEDICAL AND HAZARDOUS WASTE INCINERATION

Co-incineration of waste and recovered fuel in cement kilns

- Use of suitable wastes as raw materials reduces the input of natural resources, but requires satisfactory control on the substances introduced to the kiln process.
- Use of waste fuels may increase the input of metals into the process => accumulation of these substances in the kiln system
- Use of waste containing volatile metals can result in an increase of the emissions of mercury, thallium or VOCs => These materials should not be fed into the kiln at the upper end or as lump fuel.
- In general, the BAT for cement kilns apply.

BAT for cement plants according to the WGSR Guidance Document (2009)

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SO_2:

- SO_2 emissions are mainly influenced by content of volatile sulphur in the raw materials
  è The main measure to reduce SO_2 emissions is the use of sulphur free fuel or fuel with low sulphur content
- SO_2 emissions may be very low without additional measures
- When initial SO2 emission levels are higher, different flue gas cleaning systems are BAT:
  - Addition of absorbents, such as slaked lime ($Ca(OH)_2$), quicklime (CaO) or activated fly ash with high CaO content
  - Wet scrubbing with an atomized solution of alkali compounds. The by-products can be upgraded as sulphuric acid, sulphur, gypsum or scrubbing agent.

BAT for cement plants according to the WGSR Guidance Document (2009)

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NO_x:

- NO_x emissions are influenced by the type of fuel, the type of combustion, the combustion air-ratio and the flame temperature.
- The main primary measures are flame cooling, low NO_x burners, staged combustion, mid kiln firing and addition of mineralisers to the raw material
- Secondary measures can be added to further reduce NO_x emissions
  - With Selective non-catalytic reduction (SNCR), the reduction rate is 10–50 %; in combination with primary measures, emission values of 200-500 mg/Nm3 are achievable
  - Selective Catalytic Reduction (SCR) is BAT, while still subject to appropriate catalyst and process development for the cement industry. Large reductions (85–95 %) can be expected. The investments for SCR are significantly higher than for SNCR.

BAT for cement plants according to the WGSR Guidance Document (2009)

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Dust:

- Main stack emissions: from kiln, clinker cooler and cement mills
- Diffuse sources: handling and storage of materials. Crushing and grinding of raw materials and fuels handling can also be significant.
  - § Roads used by lorries need to be paved and periodically cleaned.
  - § Water spraying (incl. chemical agents) is used to avoid dust emissions.
  - § As far as possible, material handling should be conducted in closed areas. The waste air needs to be collected and cleaned by fabric filters.
- Dust abatement by Electrostatic precipitators and fabric filters
  - § Fabric filters (FF) should have multiple compartments with 'burst bag detectors'. Emissions < 5 mg/m3 can be achieved.
  - § Sufficiently dimensioned ESPs, with both good air conditioning and optimised ESP cleaning regime, achieve emission levels < 10 mg/Nm3. Control of CO level is necessary because of explosion risk.

BAT-AELs for cement plants according to the WGSR Guidance Document (2009)

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Para-meter	Emission source	Techniques	BAT-associated Emission level (mg/Nm^3)
SO_2		Absorbent addition / Wet scrubbing	<50 – <400
NO_x	Preheater kilns	Combination of primary measures (flame cooling, low NO_x burner, mid kiln firing, addition of mineralisers), staged combustion (also in combination with a precalciner and the use of an optimised fuel mix), SNCR/SCR	<200 – 450
	Lepol and long rotary kilns		400 – 800
Dust	All kiln system Clinker cooler Cement mills	Fabric filters or ESP	<10 – 20
	Dusty operations	Dry exhaust gas cleaning with a filter	<10

Suggested limit values for the Technical Annexes of the Gothenburg Protocol

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Para-meter	Emission source	BAT-associated Emission level (mg/Nm^3)	Suggested limit values for the Annexes V and VII		
			Option 1	Option 2	Option 3
SO_2		<50 – <400	No ELV proposed		
NO_x	Preheater kilns	<200 – 450	300	400	500
	Lepol and long rotary kilns	400 – 800	400	800	800
	Existing installations		400	800	1200
Dust	All kiln system Clinker cooler Cement mills	<10 – 20	15	20	50
	Dusty operations	<10			

à While options 1 and 2 are based on the BAT-AELs, option 3 is worse (it sticks to the limit values of the current protocols)

3. What will be the provisions for cement plants in the future protocols?

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- Ü What is the main information source for the mentioned BATs and BAT-associated emission levels?
- Ü Where can you find additional information on BAT?
  - e.g. for determining permit conditions;
  - for elaborating national emission standards

The revised European Cement, Lime and Magnesium Oxide Manufactoring BREF

Excursus:
What is the purpose of BREFs under IPPC?

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IPPC = Integrated Pollution Prevention and Control

The „I‘ stands for the integrated approach:

- Across industrial sectors
- Multi-pollutant
- Cross-media, i.e. covering
  - § Pollution of air, water, soil etc.
  - § Waste (avoidance, recycling and disposal)
  - § Energy efficiency
  - § prevention of accidents
  - § pollution risk upon definitive cessation of activities

⇒ General target:
„a high level of protection of the environment as a whole “

Excursus:
What is the purpose of BREFs under IPPC?

- All installations according to IPPCD Annex I require a permit
- The permits shall include emission limit values or equivalent parameters or technical measures
- Emission limit values and the equivalent parameters and technical measures shall be based on the best available techniques, without prescribing the use of any technique or specific technology

⇒ But what is BAT according to IPPC?

- „The Commission shall organise an exchange of information between Member States and the industries concerned on best available techniques, associated monitoring, and developments in them. “(Art. 17-2 IPPCD)

Excursus: The elaboration of BAT Reference Documents (=BREFs) in the Sevilla* process

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* The information exchange is hosted by the EU Joint Research Center IPTS in Seville, and thus called the Sevilla Process

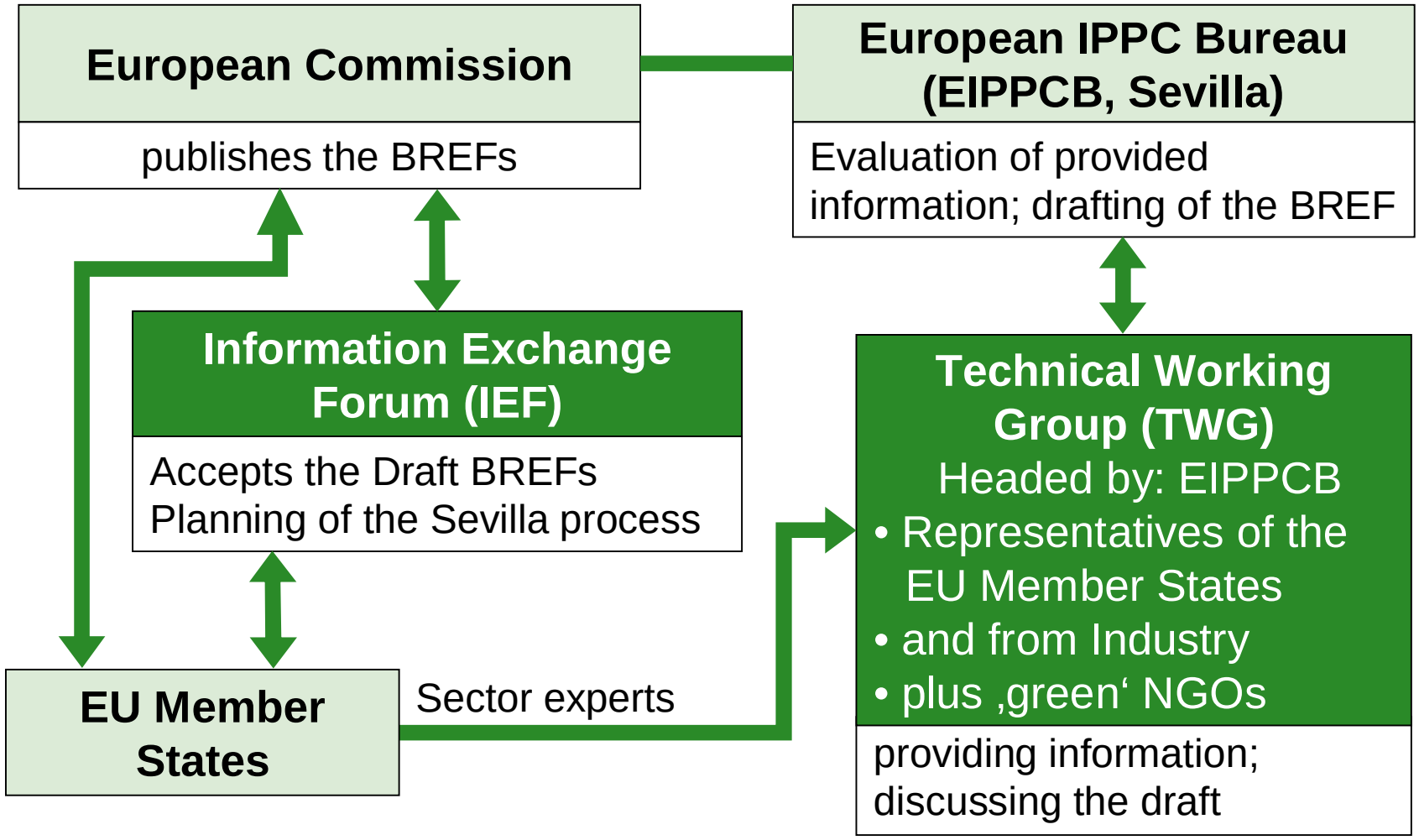
Targets:

- Homogenisation of the BAT-level across Europe
- Supporting the MS in the Implementation of the IPPC-Dir
- Promoting the dissemination of the new BATs and the associated emission levels in the EU and beyond

BREF Documents

Description of Best Available Techniques (BAT) for the relevant industrial sectors

Excursus: The elaboration of BAT Reference Documents (=BREFs) in the Sevilla* process



The outcome of the Sevilla process: Vertical and horizontal BREF documents

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Sectoral (vertical) BREFs, e.g.	Horizontal BREFs, e.g.
• Cement, Lime and Magnesium Oxide Manufacturing Industry • Iron and Steel Production • Chlor-Alkali Manufacturing Industrie • Intensive Rearing of Poultry and Pigs • Tanning of Hides and Skins (Leather Industry) • Smitheries and Foundries • Food, Drink and Milk Industry	• Industrial Cooling Systems • Monitoring • Economic and Cross-Media Effects • Emissions From Storage • Energy Efficiency

The outcome of the Sevilla process: Standard outline of the BREFs

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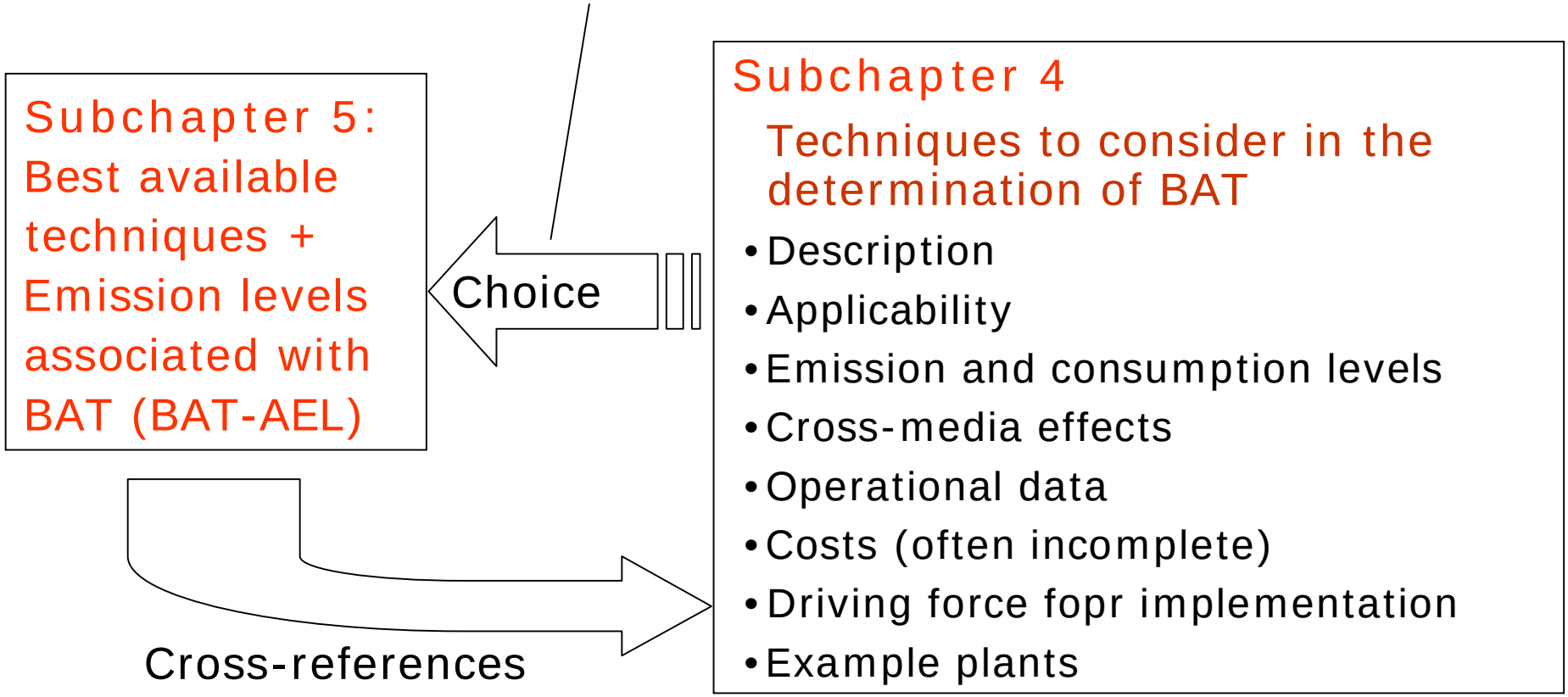
Summary, Preface, Scope

1. General Information on the Sector
2. Applied Processes and Techniques
3. Current Emission and Consumption Levels
4. Techniques to Consider in the Determination of BAT
5. Best Available Techniques
6. Emerging Techniques
7. Final Conclusions

Annexes: References, national guidelines or binding rules

The outcome of the Sevilla process: The selection of BAT

Not all ‚Techniques to consider 'will be considered as BAT



Content of the Cement, Lime and Magnesium Oxide Manufacturing BREF

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Content of the Cement, Lime and Magnesium Oxide Manufacturing BREF

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Conclusions

- The existing protocols contain only few provisions for the cement industry, but:
- The future protocols will probably follow the BAT approach as described in the TFHM background document (2006) and the WGSR Guidance Document (2009)
- The European BREF documents are a valueable source for additional information on BAT
  - for the revision of all protocols under CLRTAP
  - for elaborating national emission standards
  - for determining permit conditions in individual cases
- The BREFs are downloadable for free under

  http://eippcb.jrc.ec.europa.eu/reference/

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Thank you very much
for your attention !

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