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ClimaEast

Support to Climate Change Mitigation and Adaptation in Russia and ENP East countries

Polish Cement Industry
EU ETS – lessons learnt

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EU ETS
Summary

- The European Union Emissions Trading System (EU ETS) is the world's first trading system
- EU ETS represents the central pillar of the European Union's climate change policy
- EU ETS covers ~ 45% of overall GHG emissions
- Reduction targets
  - By 2020: 20% below 1990 GHG levels
  - By 2030: at least 40% below 1990 GHG levels
  - By 2050: 80-95% below 1990 GHG levels (not binding yet)

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EU ETS
GHG & Sectors covered

- **Phase I (2005 – 2007) – CO_2**
  - Power stations and other combustion installations with >20MW thermal rated input
  - Industry including oil refineries, coke ovens, iron and steel plants and production of cement, glass, lime, bricks, ceramics, pulp, paper and board
- **Phase II (2008 – 2012) – CO_2**
  - Aviation (added in 2012)
- **Phase III (2013 – 2020) – CO_2, N_2O, PFCs**
  - CCS installations
  - Production of petrochemicals, ammonia, non-ferrous and ferrous metals, gypsum, aluminum, nitric, adipic and glyoxylic acid

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EU ETS
Allowances allocation

- **Phase I (2005 – 2007)**
  - Decentralized cap-setting
  - The EU cap – aggregation of the National Allocation Plans of each Member State
  - Nearly 100% free allocation through grandfathering
  - Some Member States used auctioning and some used benchmarking
- **Phase II (2008 – 2012)**
  - Similar to Phase I with some benchmarking for free allocation and some auctioning in eight EU Member States (about 3% of total allowances)

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EU ETS
Allowances allocation

- **Phase III (2013 – 2020)**
  - Single EU-wide cap for stationary sources: 2,084 $MtCO_2e$ in 2013, which will be annually reduced by a constant linear reduction factor 1.74%
  - Aviation sector cap: 210 $MtCO_2e$/year
  - Electricity sector
    - 100% auctioning
    - Optional derogation for the modernization of the electricity sector in certain Member States

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EU ETS
Allowances allocation

- **Phase III (2013 – 2020) cont.**
  - **Manufacturing sector**
    - Free allocation is based on benchmarks
    - Sub-sectors deemed at risk of carbon leakage will receive free allocations at 100% of the pre-determined benchmarks
    - Sub-sectors deemed not at risk of carbon leakage will have free allocation phased out gradually from 80% of the benchmarks in 2013 to 30% by 2020
  - **Aviation sector**
    - 82% of allowances allocated for free based on benchmarks
    - 15% of allowances – auctioned
    - 3% of allowances – reserve for new entrants and fast growing airlines
  - Back-loading
  - New entrants reserve

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EU ETS
Allowances allocation

- **Phase III (2013 – 2020) cont.**
  - **Back-loading**
    - Short term measure to address a growing surplus in the EU ETS
    - Postponing the auctioning of 900 million allowances until 2019-2020 (auction volumes reduced by: 400 mln in 2014, 300 mln in 2015 and 200 mln in 2016)
    - Creation of Market Stability Reserve (MSR) – the back-loaded allowances will not be auctioned but be placed directly in the MSR
  - **New entrants reserve**
    - 5% of the total allowances for new installations coming into the EU ETS or installations whose capacity has significantly increased since their free allocation was determined

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Cement Production
CO_2 emissions – MRV

- Monitoring, reporting and verification (MRV) of emissions play a key role in the credibility of the European Union Emission Trading Scheme (EU ETS)

- It is the complete, consistent, accurate and transparent monitoring, reporting and verification system that creates trust in emissions trading.

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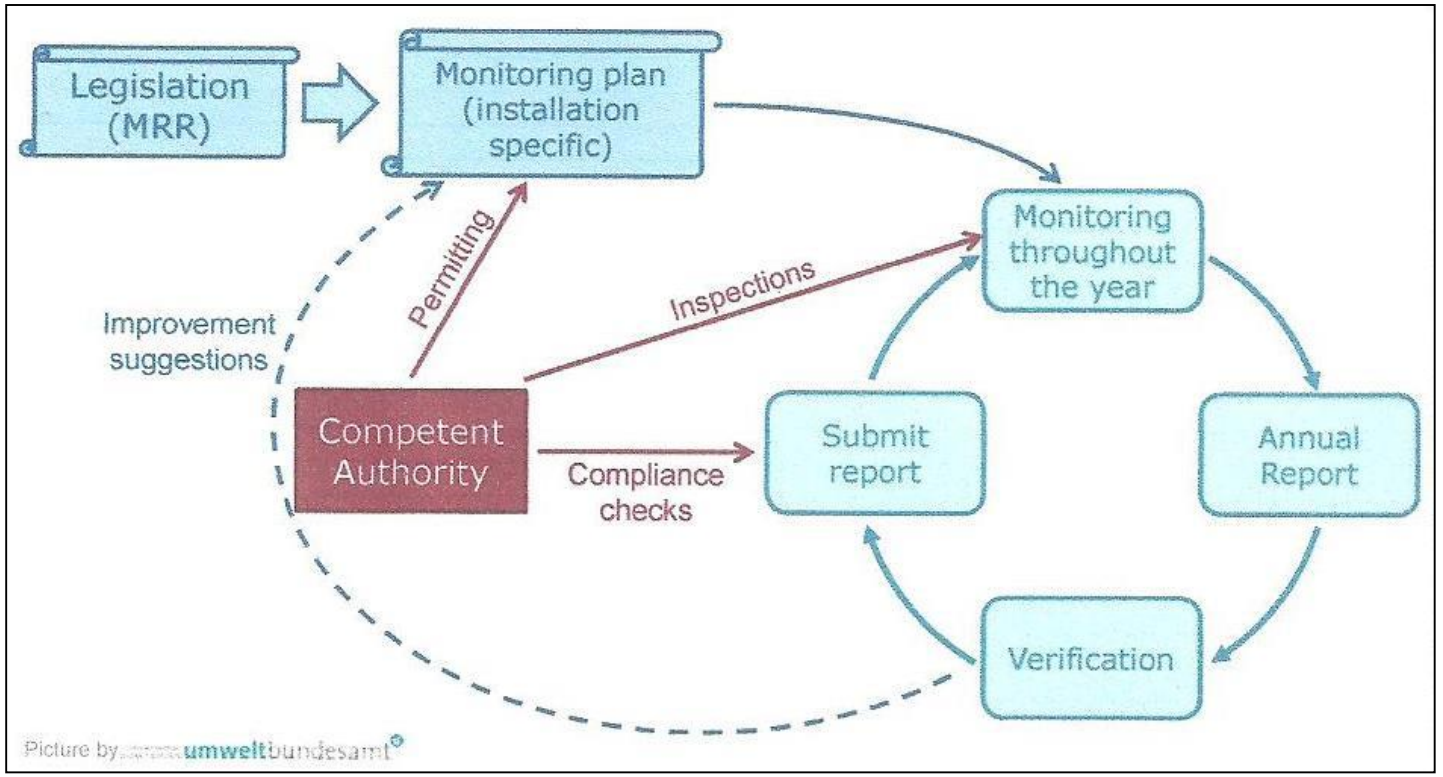
Cement Production
CO_2 emission – MRV



Principle of the EU ETS compliance cycle

EU ETS
CO_2 emissions – MRV

The main cycle

- The operator monitors the emissions throughout the year
- Annual Emission Report (AER) is prepared within 3 months after the end of the calendar year
- Verification of the AER is performed by authorized verifier
- The verified AER is submitted to the Competent Authority (CA)
- The monitoring continues without any stop at the end of the year.

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EU ETS
CO_2 emissions – MRV

The monitoring process

- Resulting data must be sufficiently robust for creating trust in the reliability of the ETS, including the fairness of the surrender obligation, and it must be consistent throughout the years
- The operator must ensure that the monitoring methodology is documented in writing, and cannot be changed arbitrarily
- Monitoring Plan (MP) – written methodology every installation in the EU ETS must have for the emission of greenhouse gases
- MP must follow the requirements of the EU-wide applicable legislation, in particular the Monitoring and Reporting Regulation (MRR)

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EU ETS
CO_2 emissions – MRV

Competent Authority

- Supervise the compliance of the operators
- Approve every MP before it is applied
- Carry out inspections at installations
- Carry out checks on the AERs

The second cycle

- Regular review of the MP
- Improving the monitoring methodology and identifying elements of the monitoring methodology which are not appropriate any more, for example, after technical changes have been made to the installation

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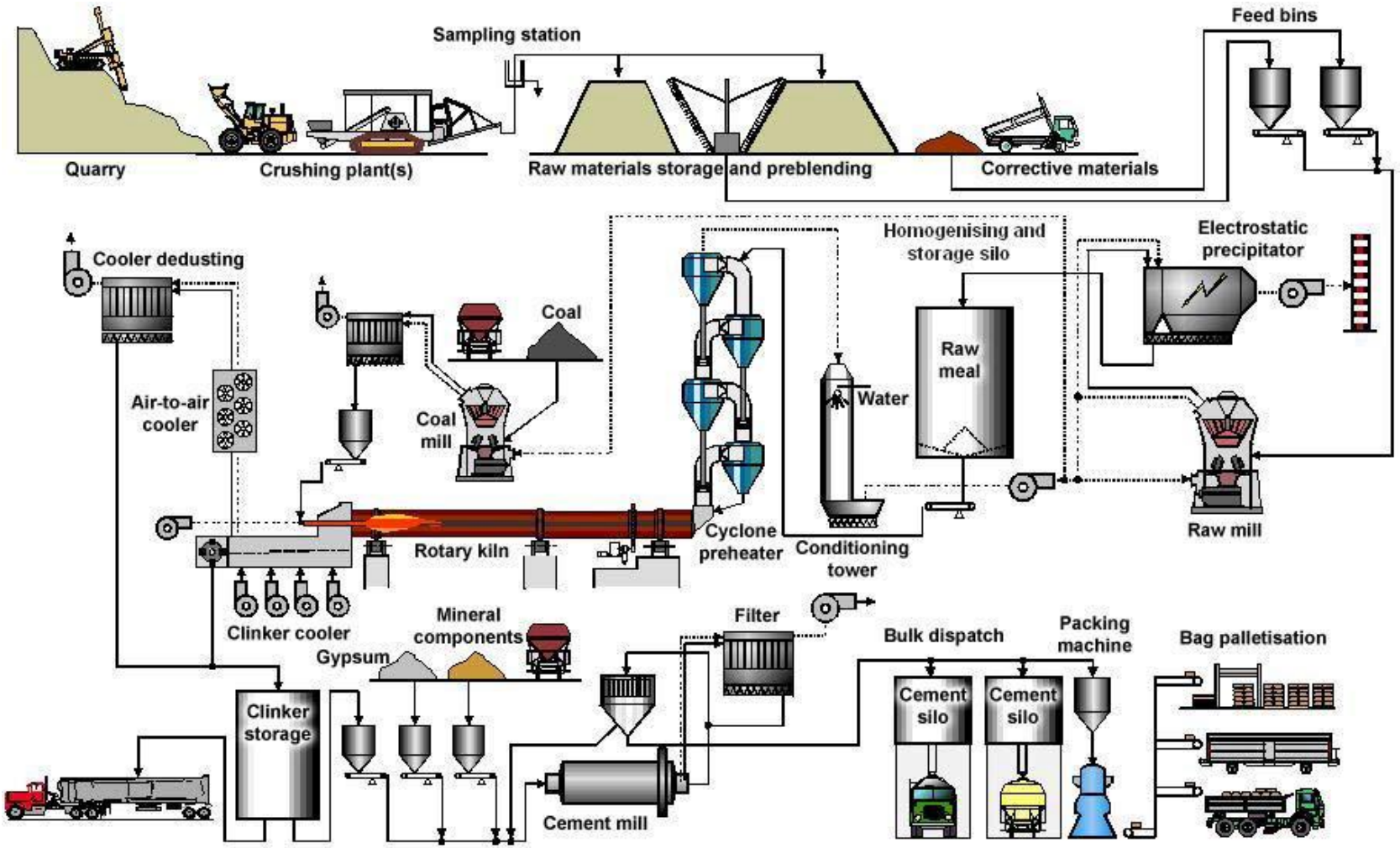
Cement Production Process



Cement manufacturing
The core process

- **Calcination**
  Decomposition of calcium carbonate ($CaCO_3$) at about 900°C to calcium oxide (CaO, lime) and liberated gaseous carbon dioxide (CO_2)
- **Clinkering**
  The calcium oxide reacts at a high temperature (typically 1400–1500°C) with silica, alumina, and ferrous oxide to form the silicates, aluminates, and ferrites of calcium which comprise the clinker.
- **Grounding & Milling**
  The clinker is ground or milled together with gypsum and other additives to produce cement.

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Cement production
GHG emissions

CO_2 emissions in cement production are threefold:

- **Process emission**: as the limestone is heated, it changes into lime and CO_2. These emissions represent **60 to 65%** of total emissions linked to cement production

$$CaCO_3 \longrightarrow CaO + CO_2$$

- **From the fuel combustion** to heat the raw materials in a kiln to form clinker, which is later crushed and blended with additives to make cement – **35 to 40%**
- From the **production of the electrical energy** used to grind the raw materials and clinker – **Indirect emissions**

Emissions of CH_4 and N_2O are marginal

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Cement production
GHG emissions

- ~ 60% CO_2 – Process emission

$$CaCO_3 \longrightarrow CaO + \mathbf{CO_2}$$

- ~ 40% CO_2 – Emission from Fuel combustion
- Marginal emission of CH_4 and N_2O

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Cement production
Main process routes

- **Dry process**
  Raw materials are ground and dried to raw meal in the form of a flowable powder. The dry raw meal is fed to the preheater or precalciner kiln or, more rarely, to a long dry kiln
- **Semi-dry process**
  The dry raw meal is pelletized with water and fed into a grate preheater before the kiln or to a long kiln equipped with crosses.
- **Semi-wet process**
  The slurry is first dewatered in filter presses. The resulting filter cake is extruded into pellets and then fed either to a grate preheater or directly to a filter cake dryer for raw meal production
- **Wet process**
  Raw materials (often with a high moisture content) are ground in water to form a pumpable slurry. The slurry then is either fed directly into the kiln or first to a slurry dryer.

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Cement Production
CO_2 emission

	Unit	Dry method	Wet method
Heat consumption [1]	GJ/Mg clinker	3,4	6,8
CO_2 factor related to fuel consumption [2]	kg CO_2/GJ	94,5	94,5
CO_2 emission from fuel combustion [1]*[2]	Kg CO_2/Mg clinker	321	643
CO_2 emission from raw materials burning	Kg CO_2/Mg clinker	535	535
Total CO_2 emission	Kg CO_2/Mg clinker	856	1.178

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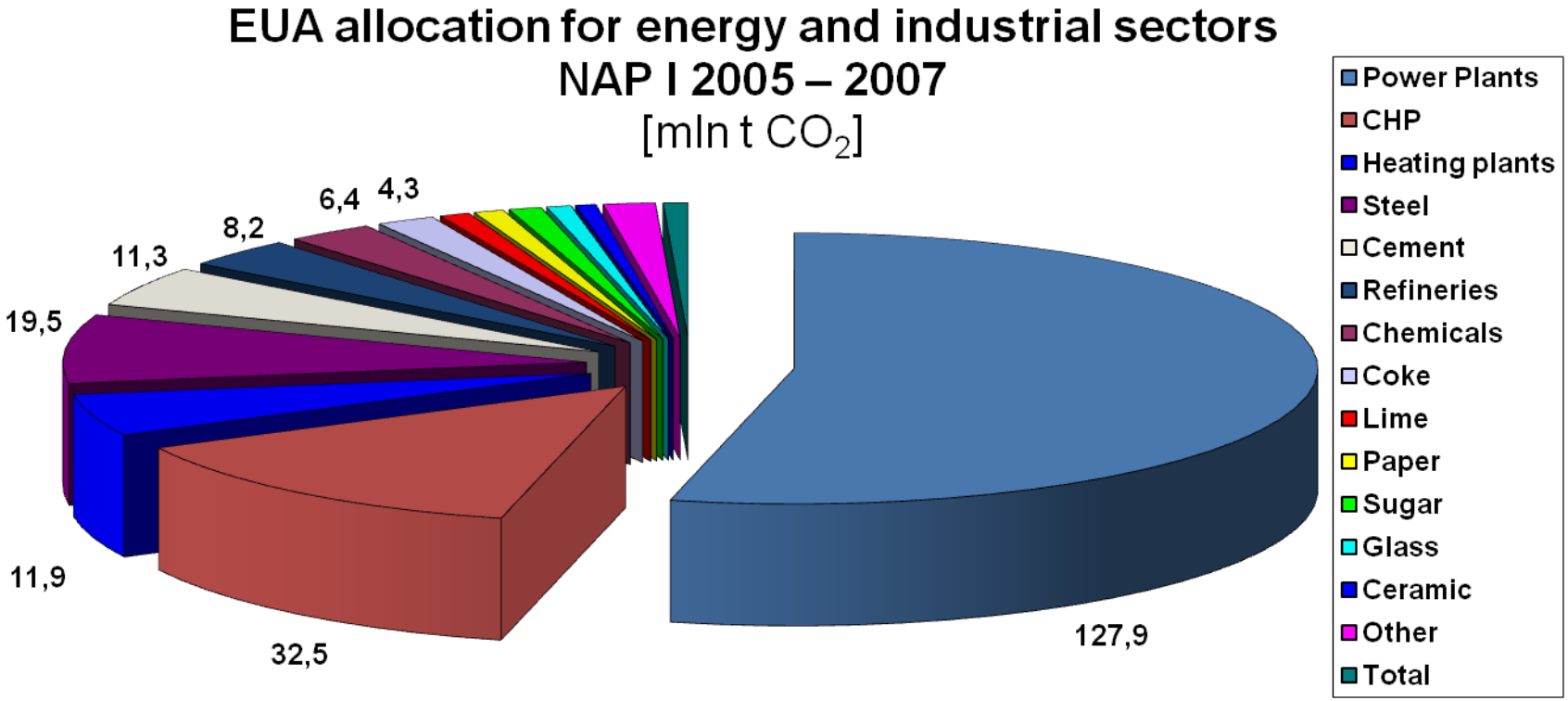
EU ETS – Phase I 2005 – 2007
EUA allocation – Poland



Total allocation – 239 mln t CO_2/annum

EU ETS – Phase I 2005 – 2007
Learning by doing

- 1 January 2005 Start EU ETS
- 2005 ÷ 2007 Learning by doing, getting familiar with the System
- Lack of credible data from installations due to absence of reliable MRV system – limits established as *„Best guess",* companies „*to be on the safe side*" reported higher emissions numbers
- Carbon Market first structures and institutions
- Appointment of National Administrators
- New alliances of energy-intensive industries – FORUM^{CO2}
- Creation of infrastructure for monitoring, reporting and verification of the emissions – MRV (Monitoring, Reporting, Verification)
- Begining of EUA trade within the European Union

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EU ETS – Phase I 2005 – 2007
Learning by doing

- **The System failed as a driver for GHG emission reduction**
- Main reason – too many allowances allocated to the installations (surplus of **200 mln EUAs**)
- It applied to most of the EU installations
- Consequence – drop of EUA close to **zero!**
- Collapse of EU ETS in 2007

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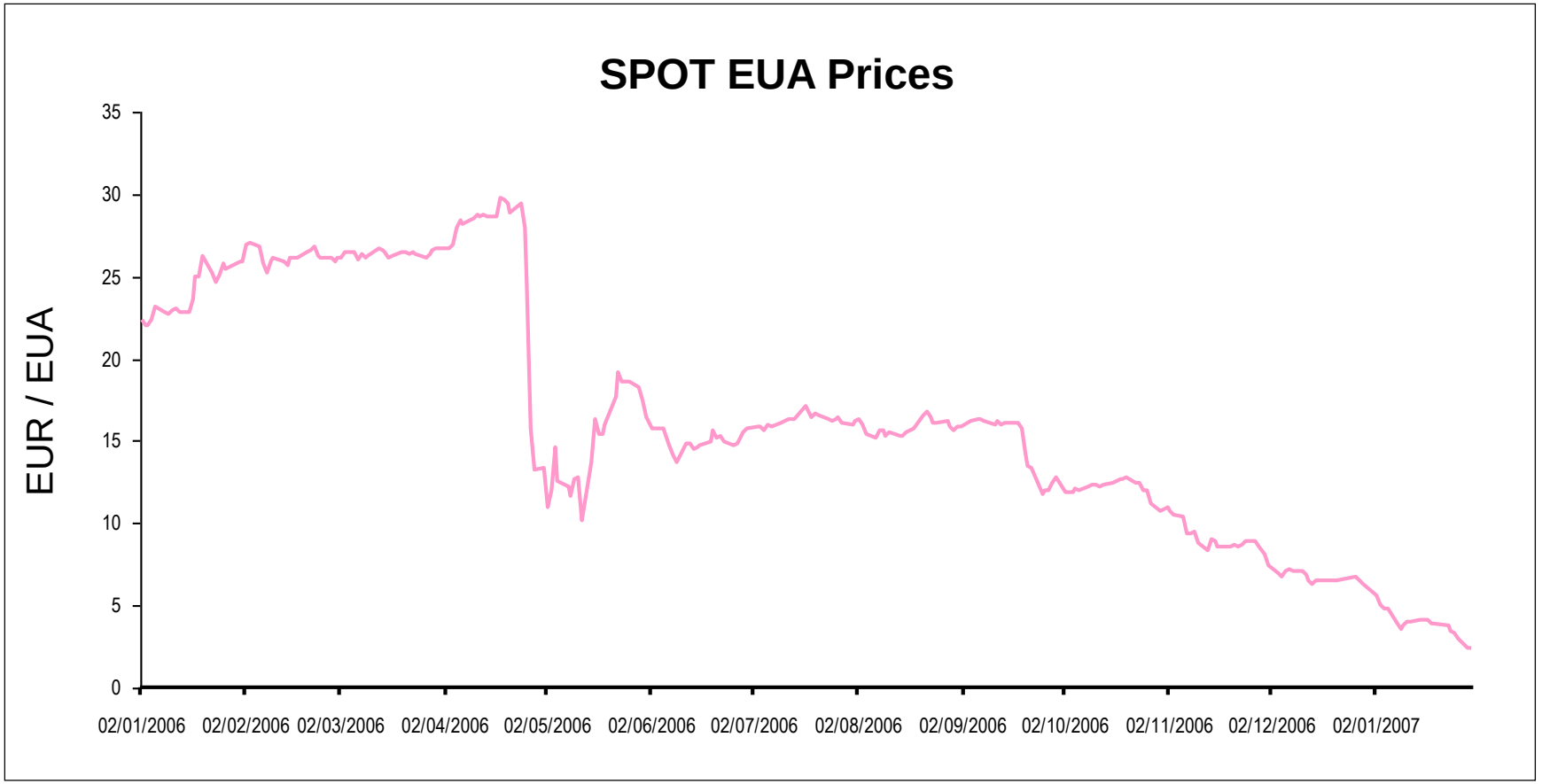
EU ETS – Phase I 2005 – 2007
Drop of EUA price



EU ETS – Phase II 2008 – 2012
Lessons learnt

- Data from installations based on real emissions from 2005
  - MRV systems implemented
- Planned deficit of allowances in the System 150 – 200 mln EUA/annum

but

- Financial crisis in 2008 – 2011 resulting in production decrease „helped” the installations to stay below the established caps
- Similar to Phase I – lack of strong impulse from EU ETS for CO_2 reduction
- Good news – further development of reliable MRV systems

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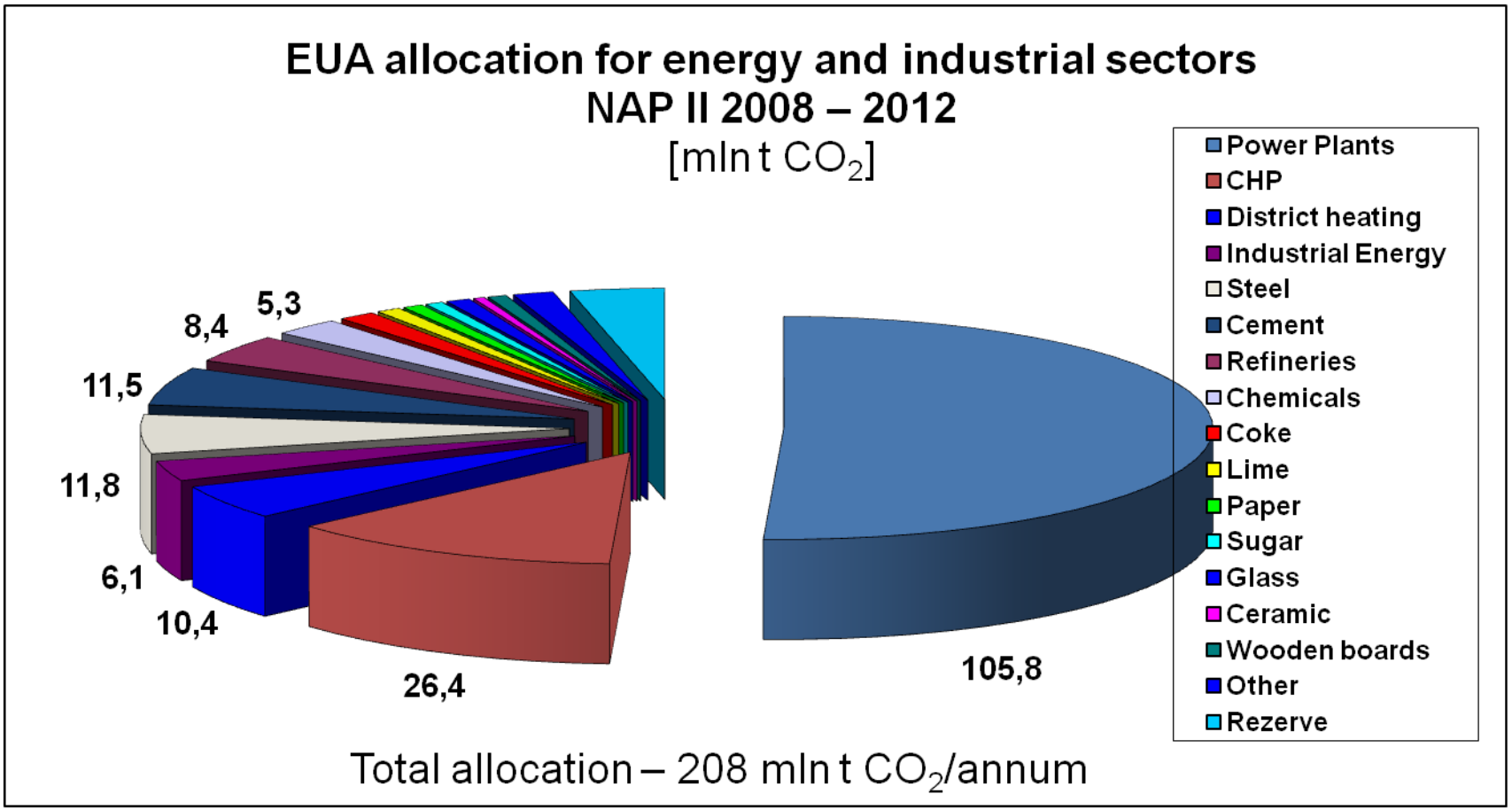
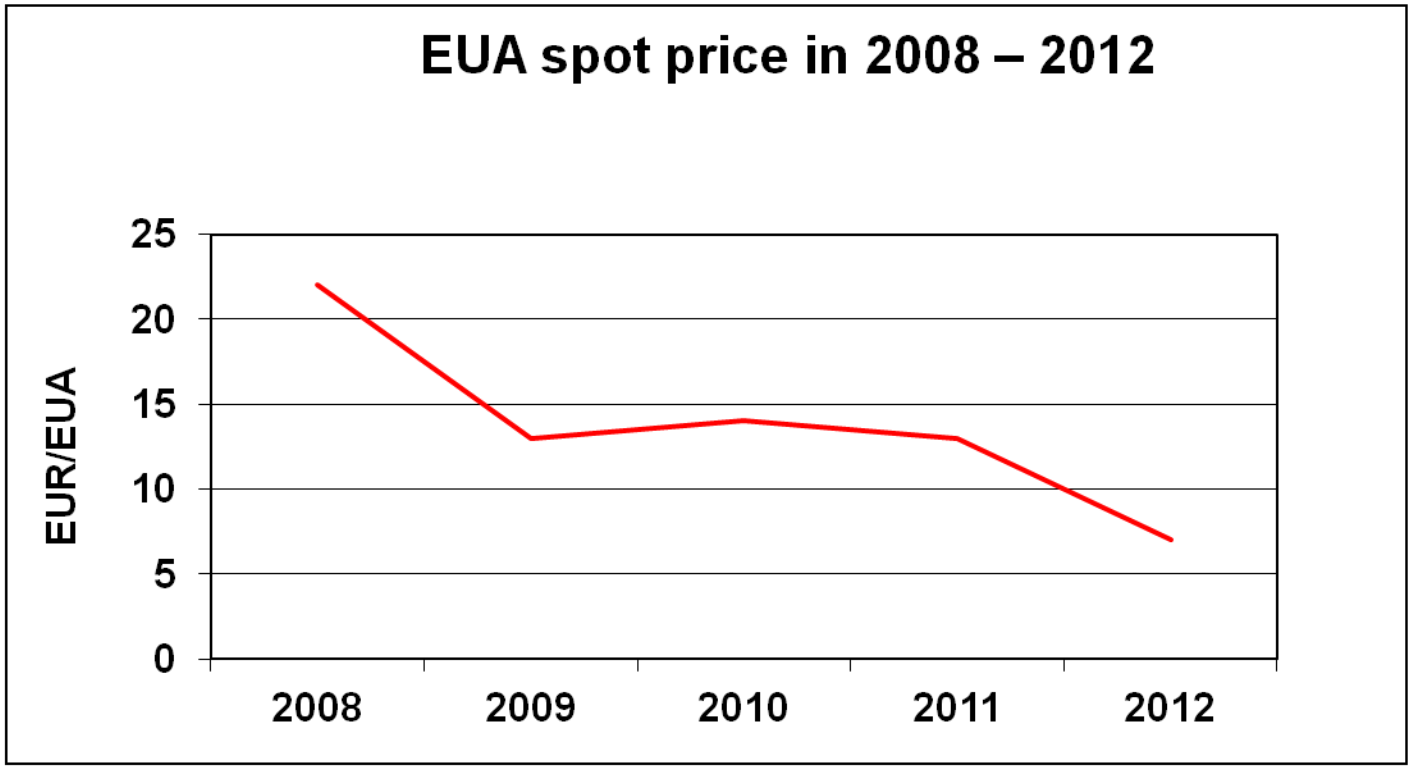
EU ETS – Phase II 2008 – 2012
EUA allocation – Poland



EU ETS – Phase II 2008 – 2012
Drop of EUA price



EUA price did not reached the assumed level of € 35 ÷ € 40
Quick drop from € 20 to € 13, and at the end of the Phase II
EUA price reached its minimum € 6 ÷ € 7

EU ETS – Phase II 2008 – 2012
Drop of EUA price

- Despite weak influence from EU ETS cement industry continued in 2008 – 2012 implementation of energy efficiency related projects resulting in CO_2 abatement and decrease of energy usage, both thermal and electric
- Those activities were driven mainly by economic factors, growing competition and IED – IPPC requirements

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