UDC 621.9

P a r t 3

ASH AND SLAG HANDLING

3.7. Analytics

3.7.27. Forecast in power production and impact of CCPs in Europe

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ABSTRACT

In Europe, more than 145 million tonnes of Coal Combustion Products (CCPs) are annually produced during coal combustion in power plants. Due to the huge amount and constant qualities the utilisation of CCPs as replacement for natural occurring raw and construction materials was established in several countries. The production and also the utilisation of CCPs in Europe is influenced by political decisions, environmental regulations and market development.

The most important political decisions influencing the power plant operation are the revised Industrial Emission Directive focussing effective combustion and reduced emission limit values and the initiatives and CO_2 reduction. This results in shut down or retrofit of existing and construction of new power plants. This also results in the increased use of biomass for co-combustion in coal-fired power plants, increased use of biomass in FBC- and dry-bottom boilers, increased production by wind-, solar-, hydropower and others. On the other hand, fossil fired production is reduced and operated more flexible.

The environmental regulations have to be considered in the management of CCPs, especially regarding utilisation. Due to the harmonisation of product and waste legislation evaluation schemes for hazardous properties are under revision. A consistent evaluation scheme is the most important legal base for the utilisation of CCPs which are registered as products according the REACH regulation. But also the Construction Products Directive requires additional information for health and hygiene (ER3) in the CE marking of construction products leading to the inclusion of requirements for environmental parameters in product standards.

This paper gives on overview on the management of CCPs in Europe, on the impact of political decisions and environmental regulations and aims in a short term forecast on quantity and quality of CCPs.

1. INTRODUCTION

CCPs are produced with the production of electricity in coal-fired power plants. “CCPs” are a synonym for the combustion residues such as boiler slag, bottom ash and especially fly ash from different types of boilers and the desulphurization products like spray dry absorption product and FGD gypsum.

In Europe, more than 145 million tons of CCPs were produced, about 48 million tonnes of this amount in EU15 member states. CCPs are mainly utilised as a replacement for natural materials in the building material industry, in civil engineering, in road construction, for construction work in underground coal mining as well as for recultivation and restoration purposes in open cast mines. The majority of the CCPs are produced to meet certain requirements of standards or other specifications with respect to utilisation in certain areas.

In the last years the production of these CCPs has been increased in the member states due to legal requirements for flue gas cleaning. In some countries, in parallel to this development, the subsidizing systems for coal mining, mostly hard coal, were shortened and are subject to be stopped. The necessary amount of coal is then imported from different sources of the world. Also the supporting systems for production green power are under development. Furthermore, the requirements on CO2 reduction are resulting in constructing more effective coal-fired power plants, the increased use of biomass for co-combustion in coal-fired power plants, increased use of biomass in FBC- and dry-bottom boilers, increased production by wind-, solar-, hydropower and others.

As the utilisation of CCPs is well established in some European countries, based on long-term experience and on technical as well as on environmental benefits, they are part of regular production and therefore requested on a regular base. Availability is becoming a major problem in some member states as the production with imported coal, the use of biomass for co-combustion and the production by renewables result in a lower amount of CCPs. In addition, the increased use of wind power results in unstable operation conditions for some coal-fired power plants, which in addition to amount and availability, also has an impact on the quality of CCPs and the related efforts in the power plant.

2. PRODUCTION OF CCPS

CCPs are produced by the production of electricity and steam in coal-fired power plants. The ECOBA statistics on production and utilisation of CCPs [1] reflect the typical combustion products such as fly ash (FA), bottom ash (BA), boiler slag (BS) and fluidized bed combustion (FBC) ashes as well as the products from dry or wet flue gas desulphurisation, especially spray dry absorption (SDA) product and flue gas desulphurisation (FGD) gypsum. However, the ECOBA statistics reflect the situation in EU15 countries only. This statistics is prepared annually by the members of ECOBA starting in 1993. ECOBA is working to implement also the figures from their members in Poland, Czech Republic, Romania and Serbia. However, due to missing of complete utilisation figures the total production can be described as given in Figure 1.

The development of CCP production in the EU-15 member states from 1993 to 2010 is shown in Figure 2. The total amount decreased from 57 million tonnes in 1993 to 55 million tonnes in 1999 and rose again to 64 million tonnes in 2005 due to higher coal-based generation of electricity and heat. From 2006 a continuous decrease is observed. In 2010, the amount of CCPs produced in European (EU-15) power plants totalled 48 million tonnes.

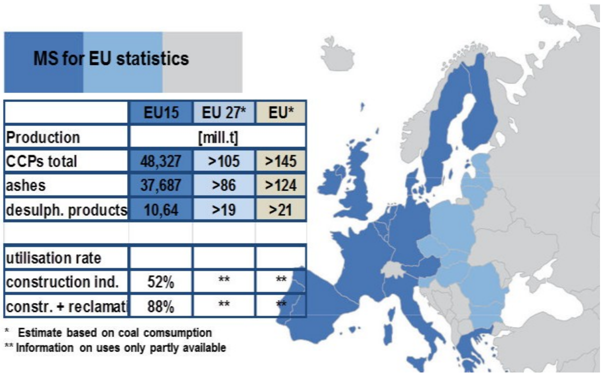

Fig.1. Production and utilisation of CCPs in Europe [1]

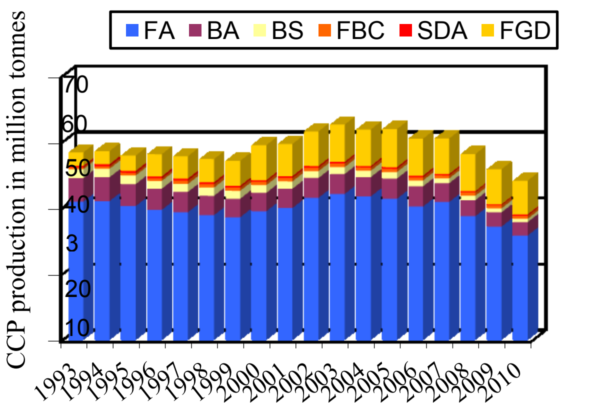

Fig.2. Development of the CCP production in Europe (EU 15) from 1993 to 2010 (FA – fly ash; BA – bottom ash; BS – boiler slag; FBC – fluidized bed combustion; SDA – spray dry absorption; FGD – flue gas desulphurisation) [1]

This reduction was due to less coal-based power generation in some countries because of the lower economy crisis and the industrial/financial crisis in 2008 as well as the political decisions on CO_2 reduction resulting in e.g. increased production by renewables. It has to be noted that the ECOBA statistics refers to EU-15 countries. The total amount of CCPs in EU-27 did not decrease that much because the EU-12 countries generate more electricity in coal-fired power plants which is estimated to a total amount of CCPs of more than >105 million tonnes.

3. UTILISATION OF CCPS

The CCPs are mainly utilised in the building material industry, in civil engineering, in road construction, for construction work in underground coal mining as well as for recultivation and restoration purposes in open cast mines. In 2010, about 52 % of the total CCPs are used in the construction industry, in civil engineering and as construction materials in underground mining and about 40 % for the restoration of open cast mines, quarries, and pits. About 2 % were temporarily stockpiled for future utilisation and about 6 % were disposed of (see Figure 3). The graphics regarding the utilisation of specific CCPs in 2010 in EU-15 countries is given in annex 1 a to f.

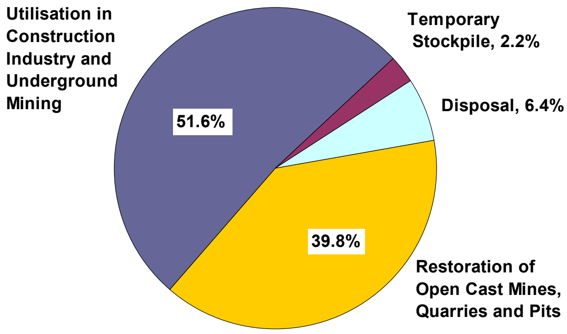

Fig.3. Utilisation and disposal for CCPs in Europe (EU 15)[1]

4. IMPACT ON CCP PRODUCTION BY POLITICAL DECISIONS

The energy and steam production by coal and by this the CCP production is influenced by political decisions and respective legislation. Political decisions are either introduced by law, i.e. national law or European regulations, which have to be considered after publications in the official Journal of the EC, or by Directives, which have to be introduced into national law with a respective co-existence period. The decisions regarding energy and heat production by coal-fired power stations either have an impact on the power plant technology or on the combustion process. The decisions on the power plant technology can be covered with the heading “Clean Coal Technology”. The most important decisions and their impacts on coal-fired power stations and on CCPs are described in the following.

4.1 CLEAN COAL TECHNOLOGY – IMPACT OF DIRECTIVES

Industrial activities, including the use of coal in coal-fired power plants, have a significant impact on the environment, which must be kept as low as possible. Emissions from industrial installations have therefore been subject to a EU-wide legislation. Individual member states may set their own national legislation but all member states must comply with EC Directives, although derogations may be permitted. The most important Directives are:

- IPPC – Integrated Pollution Prevention and Control
- LCPD – Large Combustion Plant Directive
- IED – Industrial Emissions Directive

The IPPC Directive [2] sets out the main principles for the permitting and control of installations based on an integrated approach and the application of best available techniques (BAT) [3]. It covers all emissions and overall plant performances.

The LCP Directive [4] aims to reduce acidification, ground level ozone and particulates by controlling the emissions of sulphur dioxide, oxides of nitrogen and dust from large combustion plants (i.e. plants with a rated thermal input of equal to or greater than 50 MWth). All combustion plants built after 1987 must comply with the emission limits in LCPD. Those power stations in operation before 1987 are defined as 'existing plants'. Existing plants can either comply with the LCPD by installing emission abatement (Flue Gas Desulphurization) equipment or 'opt-out' of the Directive. An existing plant that chooses to 'opt-out' is restricted in its operation after 2007 and must be closed by the end of 2015. Therefore, several old boilers in the member states are subject to close or are retrofitted.

The IE Directive [5] is the successor of the IPPC Directive and in essence, it is about minimizing pollution from various industrial sources throughout the European Union. The IED replaces the IPPC Directive and the sectoral Directives as of 7 January 2014, with the exemption of the LCP Directive, which will be repealed with effect from 1 January 2016.

As a result of these regulations the emissions from power plants are reported in the European Pollutant Release and Transfer Register (E-PRTR [6]), which replaces and improves the previous European Pollutant Emission Register (EPER).

After several years of evaluation, the reduction of emissions can be shown best using the example of SOx (see Figure 4) as it demonstrates the largest percentage reduction of emissions since 1990 of the main pollutants across the European Union. Emissions in 2008 were 78 % less than in 1990, mostly by the reduction in the EU 15 countries. It is noteworthy that SOx emissions decreased rather sharply, falling 20 % in 2008 compared to 2007, mainly due to reductions reported in Bulgaria, Poland and Spain. In each of these member states, the lower emissions were mainly reported from public power plants due to reductions. For example in Spain the emission reduction was higher due to the use of lower amounts of more polluting coal for electricity generation and the use of more natural gas and renewables such as wind, photovoltaic and biomass [7].

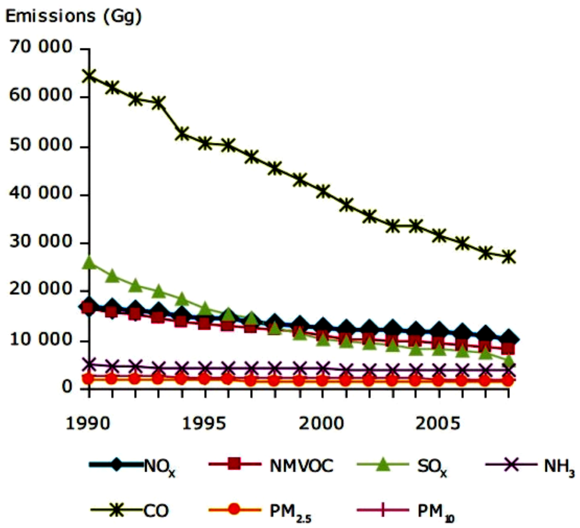

Fig. 4. EU-27 emission trends for main air pollutants [9]

Together with the reduction of emissions the amount of residues from flue gas cleaning, i.e. fly ashes and FGD-gypsum, is increased. The development follows the implementation of the IED in the member states. By that shut down, retrofit and new construction have to be considered. In parallel, the modified operating conditions are of importance as in most of the west European countries renewable production will serve first and the fossil-fired production is considered more and more as backup capacity. However, in some countries the production was at same level or even higher than the year before, which was also caused by closure of national coal mines and use of imported coal with mostly lower ash contents.

Due to retrofitting of power plants in the East European countries the amount of FGD gypsum is expected to increase. But this effect is reduced by the development in the West European countries regarding increased production by renewables.

4.2. CLEAN COAL TECHNOLOGY - IMPACT OF ENERGY PLANS

On 11 December 1997, the representatives of 37 industrial countries agreed to reduce greenhouse emissions (GHC) to an average of five per cent against 1990 levels over the five-year period 2008-2012. This agreement is known as Kyoto Protocol [8] which entered force in 2005. The protocol is linked to the United Nations Framework Convention on Climate Change [9]. When the Convention encourage industrialised countries to stabilize GHG emissions, the Protocol only commits them to do so.

One instrument given in the Kyoto to reach the reduction aim it the so called clean development mechanism (CDM). The *CDM* allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO_2. These CERs can be traded and sold, and used by industrialized countries to a meet a part of their emission reduction targets under the Kyoto Protocol. The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets.

In December 2008, the European Parliament and the Council agreed upon the so-called "Climate and Energy Package", which entered force in 2009. The legislative package put in place what is collectively known as the EU-20-20-20 targets to be met by 2020:

- Reduction of greenhouse gas emissions of at least 20 % below 1990 level,
- Increasing the share of renewable energy to 20 % , and
- Improving the EU's energy efficiency by 20 %.

With this package additional legislation was installed for promotion of the use of renewable energy (RES), geological storage of carbon dioxide and a revised Trading Scheme for greenhouse gases (GHG). From 2013, the system for allocating emission allowances will change significantly compared to the two previous trading periods (2005 to 2012). At first, the emission allowances will be distributed according to fully harmonised and EU-wide rules. At second, auctioning will become rule for the power industry, i.e. the allowances will not be any longer allocated for free.

In addition, the EU is of the opinion that there is a potential to further reduce emissions. In Article 28 of the revised EU ETS for GHG an adaptation of the already ambitious mandatory target to reduce GHG by 20 % in 2020 to a 30 % reduction is foreseen if an international agreement is reached. The European Council has also given a long-term commitment to the decarbonisation path with a target for the EU and other industrialised countries of 80 to 95 % cuts in emissions by 2050 [10]. To reach this again ambitious aim the European Commission adopted the Communication "Energy Roadmap 2050" on 15 December 2011. In the Energy Roadmap 2050 the Commission explores the challenges posed by delivering the EU's decarbonisation objective while at the same time ensuring security of energy supply and competitiveness. The Energy Roadmap 2050 is the basis for developing a long-term European framework together with all stakeholders.

On 4 February 2014, the European Commission published first proposals on its 2030 energy and climate policy framework [11]. Most notably, the Commission proposes a binding greenhouse gas reduction target of -40% and consequently a renewables target of 27%. The Commission also published draft legislation for structural reforms of the Emissions Trading Scheme (ETS).

The 2030 Framework provides predictable and certain energy and climate objectives applicable beyond 2020 up to 2030 (excerpt from [12]):

1. A greenhouse gas emissions reduction target of 40% percent below 1990 levels, to be achieved through domestic measures alone (ie without the use of international credits). This will ensure that the EU is on the cost-effective track, set out in the Commission's low-carbon Roadmap, towards meeting the 2050 objective of an 80-95% emissions cut.
2. Renewable energy target of at least 27 % percent of energy consumption above 1990 levels, with flexibility for Member States to set national objectives. This would come with significant benefits in terms of greater reliance on indigenous energy sources and in terms of energy trade. Such target will also continue to drive growth in the renewables sector, e.g. with a share of renewable energy in the electricity sector increasing from 21 % today to at least 45 % in 2030.
3. Energy efficiency is a key component of the 2030 framework, and the Commission will return to this later this year, following its assessment of progress made towards meeting the 2020 target provided for in the Energy Efficiency Directive, to be concluded in 2014.

The instruments of the industry to reduce greenhouse gases (CHG) are on one hand the increase in energy efficiency. A most effective use of coal will on the other hand also lead to the reduction of CO_2-emission. In figure 5 the CO_2 reduction potential of European power plants is given together with the energy efficiency, fuel consumption and – based on this – the CO_2 emission. The state-of-the-art efficiency in the EU is 45% which is going to be increased to 50 % with the construction of the new power plants. Further reduction with carbon capture storage will give higher CO2 reduction rates but will counteract all efforts regarding efficiency by efficiency losses of 10 to 12 % [13].

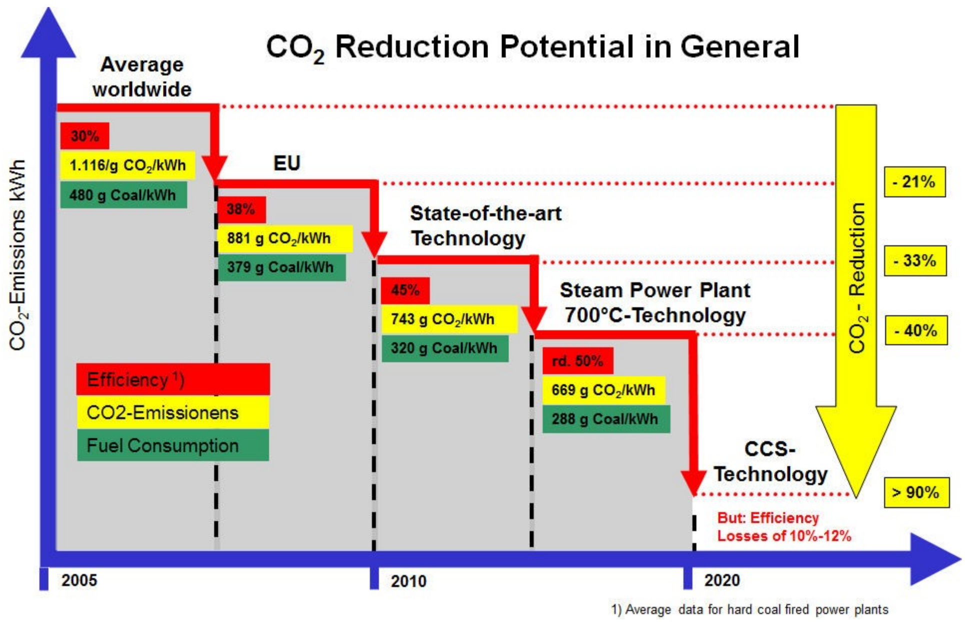

Fig.5. Power Plant efficiency and CO_2 reduction potential of the European power industry [13]

With the construction of new power plants the EU member states on one hand prepare to meet the increasing demand for energy and on the other hand meet the GHG emission reduction targets. Due to the country specific situation (own coal reserves, availability of rivers for hydropower, accessibility for see trade,…) the energy plans of each country is different.

Due to the announcement of projects for the production plants by wind, hydropower, nuclear power, lignite and turf, hard coal, oil and gas the way to improve EU energy efficiency as well as to increase the share of renewable energy is shown. With the increased use of biomass in pure biomass combustion plants the load of coal-fired power plants is reduced. Together with production by other renewables like wind, solar and hydropower a change from base load to partly peak load production was observed in some countries. This has an impact on the maintenance of the power plants and therefore to production cost. The quality of CCPs is effected too and more attention must be given to CCPs production.

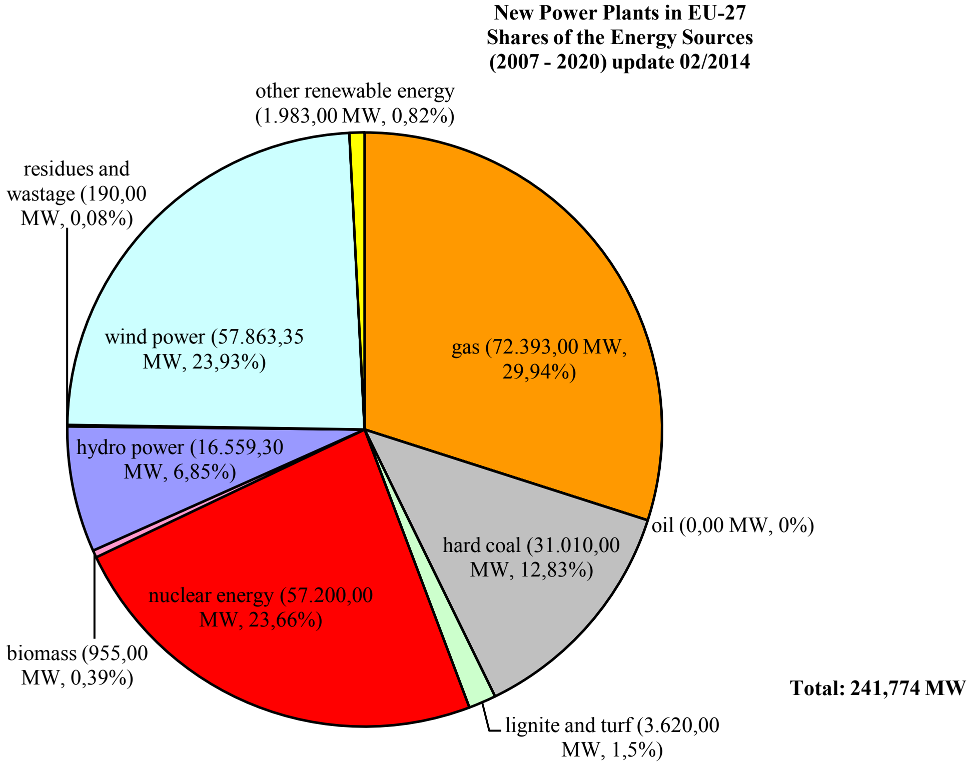

Fig.6. New power plants projects in European member states [14]

The projects for coal-fired plants - 42.565,00 MW in total- are partly already started and/or near to start energy production. The power plants will partly replace old power stations. The construction of coal-fired power plants in Germany and the Netherlands are far advanced and are mostly under fire (see table 1).

The power plants in the Netherlands and Germany for hard coal are all developed are designed to burn import coal as well as for co-combustion of higher shares of co-combustion materials. The boilers and the process control advices are designed to produce fly ash for the use according EN 450 fly ash for concrete.

Table 1**New power plants in European member states [15] (exc. of the VGB data base on power plant projects)**

Country	Name of Plant	Name of Company	Site of Plant	No. Units	Unit Cap. MW (gr.)	Tot. Cap. MW (el.)	Main Fuel	Project Start (Y)	Start up (Y)	Status
Germany	Datteln 4	E.ON	Datteln	1	1055,0	1.055,0	HC	2007	2013	UCON
Germany	Walsum 10	STEAG/Evonik	Duisburg-Walsum	1	725,0	725,0	HC	2005	2013	UCON
Germany	Moorburg 3-4	Vattenfall Europe	Hamburg-Moorburg	2	820,0	1.640,0	HC	2006	2014	UCON
Germany	Westfalen D-E	RWE Power	Hamm-Uentrop	2	800,0	1.600,0	HC	2008	2013	UCON
Germany	Rheinhafen RDK 8	EnBW	Karlsruhe	1	874,0	874,0	HC		2013	UCON
Germany	Lünen	Trianel Power	Lünen	1	750,0	750,0	HC	2007	2013	UCON
Germany	GKM 9	Grosskraftwerk Mannheim AG	Mannheim	1	912,0	912,0	HC		2015	UCON
Germany	Wilhelmshaven	GDF Suez, BKW Energie AG	Wilhelmshaven	1	800,0	800,0	HC		2013	UCON
Netherlands	Eemshaven	RWE Power	Eemshaven	1	1600,0	1.600,0	HC	2008	2014	UCON
Netherlands	Maasvlakte	Electrabel	Rotterdam	1	750,0	750,0	HC	2007	2012	UCON
Netherlands	Maasvlakte 3	E.ON Benelux	Maasvlakte	1	1100,0	1.100,0	HC	2006	2012	UCON
Czech Republic	Ledvice 4	CEZ AS	Ledvice	1	660,0	660,0	LIG		2013	UCON
Poland	Kozienice 11	Enea Wytwarzanie	Kozienice	1	1075,0	1.075,0	HC	2012	2017	UCON

Based on the long term experience with co-combustion of higher shares of co-combustion materials the revised EN 450-1 will cover fly ash with up to 40 % of co-combustion material (50 % in case of green wood). The boilers for lignite combustion are designed to burn the specific coal types mined nearby the plant. Also these boilers are designed for co-combustion.

The new coal-fired power plants are designed to meet the requirements for carbon capture storage, a process for CO_2 separation from industrial processes and its safe and long-term disposal. Most of the plants today are designed as CCS-ready, means that they are designed to apply the technology when the research regarding capture is advanced and the storage technology and respective site is defined. CCS requires a 3-step approach: separation in the power plants, transport and storage.

There are three main types of technologies existing to separate the CO_2 from the fuel or the flue gas:

Post-combustion,

Pre-combustion

Oxy-combustion

The basic technology exists for each of the solutions and was partly proven, at least in pilot plants or lower scale industrial applications. However, the cost for upscaling of existing plants and the cost for CO2-certificates have to be considered. Doubts comes with respect to the up-scaling and their costs. After separation the geologic storage is proven with high success in several different places, although yet with capacities 1 Mton/y. The assessment of local storage areas is of importance. In East Germany, the Test to store CO_2 in deep mining have now been stopped. The transport technology is proven at an existing long network of CO_2 pipelines specially within North America. Adequate care is required with composition of CO_2 impurities. The discussion e.g. in Germany showed great problems regarding public acceptance.

Post-combustion

Post-combustion CO_2 capture is a process where the CO_2 is removed from a gas mixture after the combustion of a fossil fuel. When a fossil fuel like coal, oil or natural gas is combusted in a traditional power plant the flue gas will contain some CO_2, typically in the range from a few percent to ten percent. The rest will be mainly nitrogen and water vapour.

There are several options for separating out the CO_2 from this gas mixture by post-combustion CO_2 capture. The most common process is absorption based on a chemical reaction between CO_2 and a suitable absorbent in a scrubber system, where the flue gas from the power plant is mixed with an absorbent dissolved in water. Typical absorbents that are used today are amines and carbonates.

After the absorption process, the absorbent and the CO_2 are separated in a regeneration column. The result is then a stream of pure CO_2 and a second stream of absorbent that can be recycled to the scrubber column. The CO_2 is then compressed and send to use or diposal. The post combustion process is the most recommended for retrofitting of existing power plants with CCS technology.

Pre-combustion

CO_2 can be separated from fossil fuel before combustion, which is the so-called pre-combustion CO_2 capture *method. The principle* of this process is to first convert the fossil fuel into CO_2 and Hydrogen gas (H_2). The H_2 and the CO_2 is then separated in the same way as in the post-combustion process, although a smaller installation can be used. This results in a hydrogen-rich gas which can be used in power plants or as fuel in vehicles. The combustion of hydrogen does not lead to any production of CO_2. With pre-combustion CO_2 capture about 90 percent of the CO_2 from a power plant can be removed. As the technology requires significant modifications of the power plant, it is only viable for new power plants, not for existing plants. It is *not* an option at the pulverized coal (PC) power plants that comprise most of the existing capacity. However, it *is* an option for integrated coal gasification combined cycle (IGCC) plants.

Oxy-combustion

Oxyfuel combustion with CO_2 capture is very similar to post-combustion CO2 capture. The main difference is that the combustion is carried out with pure oxygen instead of air which may lead to higher burning temperatures. As a result the flue gas contains mainly CO_2 and water vapor, which can be easily separated. Up to 100 percent CO_2 can be captured through this process.

However, it is expensive to produce pure oxygen. The currently available technologies for pure oxygen-production are based primarily on cryogenic separation of air. Here the air is cooled down below the boiling point before the liquefied oxygen, nitrogen and argon are separated. However, the high amount of energy involved in this process make it a very expensive process and much research is subsequently carried out in order to develop membranes that separate oxygen from air more efficiently

To inform about the progress of the process development and to increase the knowledge about the successful use of CCS technique i.a. the zero emission platform was created [16].

The pre- and post-combustion processes will not have any impact on the resulting CCPs as there is no change in the coal combustion and the desulphurization process. Due to higher burning temperature in the oxy-fuel process however an impact on CCP quality expected.

4.3. OTHER IMPACTS

4.3.1. Energy versus production costs

With the increased use of renewable power the impact of support sytems and fossil fuel prices is of major importance. The objective is to cut anthropogenic CO2 emission and to reduce the dependency on the finite resources of fossil fuels. Beside the use of hydro power stations, which is restricted by available and suitable rivers or coastal areas, the production capacities for wind power and photovoltaic (PV) have been drastically increased in some countries. The feed in tariffs guarantee low production cost which are subject to normal energy trading. On the other hand, the prices for fossil fuels have developed differently. While the price for imported gas has increased drastically over the last years, the price for imported hard increased comparatively slightly. Countries with own coal reserve benefit from their own hard coal or lignite resources to correct the generation cost.

However, for the energy cost the trade via energy exchange portals is of major importance. These were established following the liberalisation of the European energy markets. Before the liberalisation power was received from a few producers and delivered in customers of specific regions. The long term contracts have been replaced by short term contracts. Exchange markets were introduced to allow contracts with fair prices. The calculation by average cost was replaced by limit costs. The trading via exchange markets is steered by spot markets, means trading of power for the next day (day ahead) or the next hours (intraday), and dated markets with long term contracts. For the spot markets the prognosis for the next day are of biggest importance and are meanwhile based on a 15 minute forecast.

The first energy exchange was NordPool resulting from the first liberalization of the Scandinavian energy market in 1993. In 1999, the Amsterdam Power Exchange (APX) was founded, in 2000 the European Energy Exchange (EEX) in Franfkurt/Germany which merged with the Leipzig Power Exchange (LPX) in 2002.

Due to the higher production options by sources and the meanwhile installed capacities for wind and PV as well as the subsidy systems and legal requirements to serve the net with renewables first conventional power plants are reduced on sunny and windy days. When such a situation meet with low demand e.g. on weekend the export is rising and the prices for energy will go down. But if energy from fossil production is needed due to no availability of renewable power the price for energy does not cover the production cost. In this situation the political corrections is needed to care for the backup capacity.

4.3.2. Coal mining/Coal reserves

Other impacts on generation by power-fired power plants are based on the changes to imported coal due to a stop of national coal mining.

In Belgium, the national coal production reached a peak production of 30 million tonnes between 1952 and 1953. In the late 1950ies the Walloon mines were closed and the Limburg mines were closed 20 years later. The last mine in Belgium was closed in 1992.

In the Netherlands, hard coal was mined from 1900 to mid 1970ies in the South Limburg area. At the north-west fringe of the German lignite basin near Cologne also lignite was mined opencast from 1925 to 1968. Today, the port of Rotterdam is now the biggest port for coal imports into Europe.

In Germany, from more than 150 mines in the 1950ies only 8 are left which are subject to closure by 2018. Only the lignite mines In the three main mining areas in the western part near Cologne, in the midth German part near Leipzig and in the Lausitz area near the Polish border will remain.

The hard coal-fired power stations have to use imported coal to a higher extent than by now. This causes more efforts to guarantee an appropriate ash quality for the use in the different fields of application and also to different ash amounts due to the different ash content of the imported coal.

4.3.3 Product standards

In November 2005, CEN established a new Technical Committee (CEN/TC 351) for "Construction products: Assessment of release of dangerous substances". The TC has developed horizontal standardised assessment methods for harmonised approaches relating to the release of regulated dangerous substances under the Construction Products Directive (CPD), which was partly replaced by the Construction Products Regulation in April 2011 and fully replaced on 1st July 2013, in taking into account the intended conditions of the use of the product. It addresses emission to indoor air, and release to soil, surface water and ground water.

The standards for indoor air and for release into soil and ground for bound products will be published as CEN Technical Reports as they are not fully validated for robustness by now. The leaching procedure for unbound materials is still under development as two different upflow column percolations tests are not acceptable for the Commission. TC 351 is working on an alternative route for evaluation.

In the CE marking of all product standards information on the regulated dangerous substances have to be added. The standards for aggregates are the first standards which have to define the parameters and to propose evaluation criteria. The industry is working on dossiers with all relevant data to allow a decision whether the aggregates need a regular testing for dangerous substances (WFT – Without further testing-; and FT- further testing-procedures).

5. CONCLUSIONS

Coal is a major fuel for energy and steam production in European coal-fired power plants. The annual production of CCPs in EU 27 is still estimated to amount to about 105 million tonnes (48 million tonnes in EU 15 in 2010). Political decision regarding clean coal technology led to modifications in power plant technology and installations of de-NOx and de-SOx system, which resulted in CCP production in countries without a developed market.

The decision to reduce CO_2 emissions led to increased use of biomass and production by renewable systems (wind-, solar-, hydropower) and force coal-fired power plants to be operated more flexible and mainly for backload. New coal-fired power plants have to consider carbon capture storage (CCS) technologies which are still under development. However, in north-west Europe several coal-fired power plants have been building which are now under fire. In east European countries projects are on the way to realisation and retrofit of existing plants will allow the further use. coal combustion is expected to play further an important role in European power production although in single countries the situation is subject to changes.

Based on all the political decisions and plans which effect the power production in the European member states – and therefore also the production of CCPs - coal is expected to play an important role in European power production. Facing the situation of established markets for CCPs as construction materials the power industry will take all efforts to provide always good quality products to the construction market.

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