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Profiles

Prospects for coal, CCTs and CCS in the European Union

'The use of hard coal and lignite remains crucial to much of the EU'

'Around 30% of electricity generation in the EU-27 is coal-based'

'Clean coal and carbon capture and storage activities now form part of the RD&D landscape'

The report is, in part, an update of one produced in 2004 that examined the impact on overall coal reserves, production and consumption resulting from enlargement of the EU. This was a period when a number of new Accession Countries (such as Poland, the Czech Republic, and Hungary) became full EU Member States, bringing with them considerable reserves of hard coal and/or lignite. In 2007, there was a further round of accessions and several other countries, each heavily reliant on indigenous coal, also joined. However, the present report provides somewhat more than a simple update as since then, technological advances have been made and applied increasingly in the clean use of coal. Furthermore, in effectively all current coal-using Member States, carbon capture and storage activities now form part of the RD&D landscape.

Despite concerns over the continuing use of coal, for many Member States, it remains of considerable importance and will remain part of the respective national energy mix for the foreseeable future. Recent reports suggest that a significant proportion of the EU's new electricity generating capacity to be installed over the next decade or so will rely on various renewable technologies. However, around 12% of this new capacity is expected to be coal-based, all of which will need to adopt some form of advanced CCT and/or CCS.

Since the EU enlargements of 2004 and 2007, the economic importance of coal for many Member States, and indeed, the EU as a whole, has continued. In a significant number of states, coal has maintained an important role for power generation as well as in major industrial sectors such as iron and steel and cement manufacture. Overall, the use of hard coal and lignite remains crucial to the commercial and industrial life of much of the EU. In 2008, between them, Member States produced around 146 Mt of hard coal (43% of total EU hard coal consumption) and 434 Mt of lignite (99% of total EU lignite consumption). A further 211 Mt of hard coal was also imported. Therefore, total EU coal consumption amounted to783 Mt.

In virtually all coal-consuming Member States, the biggest coal user is the power sector and at the moment, around 30% of electricity generation in the EU-27 is coal-based. However, for a number of countries, this overall figure masks the scale of dependence on coal. In some (such as the Czech Republic and Greece) coal accounts for more than 50% of total electricity generation. In Poland, it is over 90%. Within the EU, more than 90% of the lignite and two thirds of the hard coal consumed is for power production. Some countries produce most of the necessary coal and/or lignite, whereas others rely almost exclusively on imports. Many others fall some way between these extremes, and it is not uncommon to find countries with combinations of power plants fired on both indigenous lignite and imported hard coal. Within the EU, hard coal is mined in the Czech Republic, Germany, Poland, Romania, Spain and the UK, and lignite is produced mainly in the Czech Republic, Germany, Greece, Hungary, Poland, Romania, Slovakia, Slovenia and Spain. Data for coal production and consumption in the twelve largest coal-consuming Member States are shown in the table.

Overall, much of the EU depends heavily on imported sources of energy and this has created specific challenges that have been reflected in recent EU decisions on energy policy and climate change activities. In the report, these are addressed through a general overview of the European situation, followed by more detailed case studies of individual Member States where coal consumption remains significant.

Thus, the present report builds on the Clean Coal Centre report, *Coal in an Enlarged European Union*, published in 2004. The first section includes a general review and update of the earlier report but also examines CCT- and CCS-related initiatives and activities that have since developed. The scope and status of major EU clean coal and carbon capture and storage programmes are discussed. This includes such initiatives as the creation in 2006 of the Zero Emission Platform (ZEP), plus related major national (both government and private sector) RD&D CCT and CCS programmes under way or planned. The different technological options being pursued such as supercritical PCC, CFBC, IGCC + CCS, oxyfuel combustion, and post-combustion CO_2 capture, are addressed and the status of each is reviewed.

The second part of the report comprises a more detailed examination of coal use, CCT- and CCS-related activities in selected EU Member States, several of which have become full members since 2004. Twelve states were selected and examined. Each

Coal production and consumption in the twelve largest coal-consuming EU Member States

Country	Hard coal production, Mt	Lignite production, Mt	Total coal production, Mt	Hard coal imports, Mt, 2007	Total coal consumption, Mtce
Bulgaria	–	28.7	26.0	4.9	11.1
Czech Republic	7.5	52.7	60.2	2.5	29.3
France	–	–	–	18.2	18.1
Germany	19.1	175.3	194.4	45.9	114.0
Greece	–	65.7	65.7	0.8	15.0
Hungary	–	9.4	9.4	2.0	38.2
Italy	–	–	–	24.6	24.1
Netherlands	–	–	–	13.0	11.4
Poland	84.3	59.5	143.8	5.8	84.8
Romania	3.0	36.0	39.0	4.0	12.8
Spain	7.3	2.9	10.2	24.9	20.2
UK	16.5	–	16.5	42.8	49.7
Total EU-27	146	434	580	211	438.5

consumes more than 10 Mt of hard coal and/or lignite a year. Of these, nine rely to varying degrees on production from indigenous reserves. The remaining three (France, Italy and The Netherlands) rely almost entirely on imported supplies. The energy situation, with particular respect to coal, is examined for each of these and case studies are presented for Bulgaria, the Czech Republic, France, Greece, Germany, Hungary, Poland, Italy, The Netherlands, Romania, Spain and the UK. Within each study, the current and possible future use of coal is considered. Major applications for coal are examined and activities in related areas addressed. For each country, the use of coal and clean coal technologies is examined. Carbon capture and storage (where associated with coal use) is also covered. CCS-related activities were not considered in detail in the 2004 report as, at the time, the development and application of the various technologies was not well advanced. However, efforts to mitigate and control greenhouse gas emissions have increased significantly during the past six years, hence the present report reflects the increasing activities ongoing in coal-consuming Member States.

Despite moves in recent years to increase the use of alternative sources of energy, in the countries considered, there are often strong commercial and strategic incentives to continue using hard coal and/or lignite as a component of the national energy mix. This is especially so in the power generation sector. Many of the reasons are self-evident and focus on the continued provision of a secure, affordable national energy supply.

Each issue of *Profiles* is based on a detailed study undertaken by IEA Clean Coal Centre, the full report of which is available separately. This particular issue of *Profiles* is based on the report:

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