IEA CLEAN COAL CENTRE executive summary

New regulatory trends: effects on coal fired power plants and coal demand

Coal has historically been, and continues to be, a main fuel in the power-generating sector throughout the world. In 2014, coal provided >30% of global primary energy requirements, ~40% of the world's electricity generation and ~68% of steel production. Asia is the world's largest consumer with a 63% share of total use and North America, mainly the USA, is the world's second largest consumer with a 14% share of total use. In terms of total coal imports, steam and coking, in 2013/14 Asia held the top five positions (China, India, Japan, Korea (Republic) and Chinese Taipei) followed by Germany and the UK, while the main exporters were Indonesia, Australia, Russia, USA, Colombia, South Africa and Canada.

Legislation for coal combustion is becoming increasingly more stringent to the point where, in some parts of the world; such as the EU, power providers/utilities are *required* to construct only state-of-the-art, advanced power plants or invest in retrofitting pollution control technologies in existing facilities or shut down plants altogether. The investment in pollution control technology is necessary, if not unavoidable, to ensure the continued, reliable supply of electricity with a reduced detrimental environmental impact. The result has been a reduction in air pollutant emissions (SO_2, NOx and particulate matter) in many regions throughout the world, achieved over the last few decades. However, the combustion of coal results in relatively high GHG emissions compared to other fossil fuels, such as gas, and the technologies to deal with these emissions, remain at demonstration level and are considered prohibitively costly both in their parasitic power requirements and in monetary terms. The review discusses international, bilateral, multilateral, regional and national regulations and agreements, introduced and adopted globally, for the control of air pollutant emissions as well as GHGs from coal combustion.

The control and reduction of anthropogenic CO_2 emissions are addressed by the annual international conferences of the UNFCCC parties as well as by the Intergovernmental Panel on Climate Change, World Energy Council and the European Union. To date, the measures discussed and adopted, have proven insufficient and the anthropogenic emissions of GHGs, particularly CO_2, continue to increase. Some reduction in CO_2 emissions growth rate occurred in the Organisation for Economic Co-operation and Development (OECD) countries, but the growth rate accelerated in non-OECD countries, particularly in China and India.

The latest development in the process to reduce global GHG emissions was the 21st Conference of Parties (COP21), that is, the annual meeting of countries that wish to take action on climate change on a global political level. The meeting was held in Le Bourget, France, from 30 November to 11 December 2015. On Saturday, 12 December 2015, the Paris Agreement on Climate Change, in which 195 Nations agreed to set a path (based on their historic, current and future responsibilities) to keep the global temperature rise well below 2°C, was adopted. The full document of the agreement is available @http://www.cop21.gouv.fr/wp-content/uploads/2015/12/l09r01.pdf.

Population and economic growth are the two main drivers for increasing energy demand. The continuing, dynamic growth in world population is mainly in developing

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

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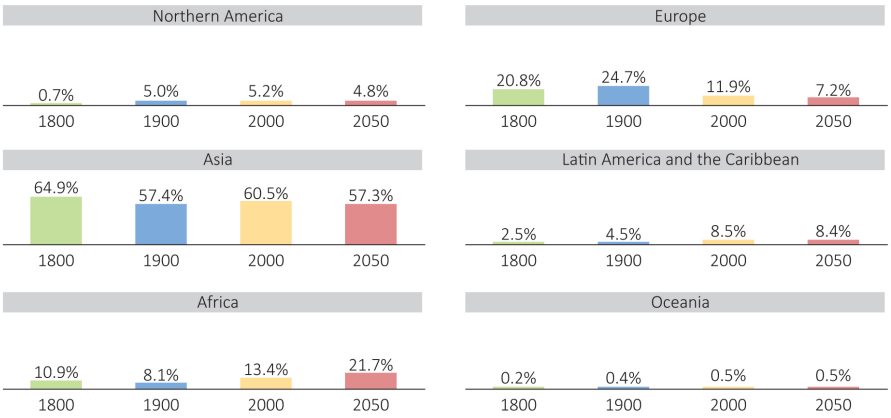
countries and particularly in Africa, South Asia, Latin America and the Middle East. Among the developed countries, a relatively high rate of population growth took place in North America between 1800 and 1900.



World population distribution, growth and projected growth, by region (1800-2050)

The high growth of global production of electricity in the last three decades of the 20th century was uneven in the different regions of the world – high, per capital, in the industrialised regions of Europe, North America, the Far East and the Pacific, but immensely lower, per capita, in most countries in Africa, South Asia and Latin America. This trend continues today especially in Africa and South Asia.

In 2014, coal retained about 30% share of global primary energy and >36% in globally generated electricity. This trend continues today and is forecast to continue for the foreseeable future mainly due to the continuing growth in coal-fired power generation in China and India and, although to a lesser extent, the ASEAN countries. However, forecasts indicate that the share of coal in global primary energy will decline to 24% in 2040. On the other hand, projections show that global coal demand will increase 15% by 2040. The utilisation of coal will differ dramatically by region. Coal demand is forecast to decline in all OECD regions, particularly in the USA where a significant reduction (about one third) in coal-fired power generation is expected to occur in the next decade. This will be due, not only to increased regulation but also competition from other fuels, especially unconventional (shale) gas and renewables. Conversely, the forecast for coal demand in developing countries is an increase by about one third by 2040, with significant growth in Southeast Asia, India, Africa, and Brazil. Coal demand in China is expected to peak in 2030. The largest producers of hard coal in the recent years include China, USA, India, Indonesia, Australia, the Russian Federation and South Africa. Leading exporters of coal are Indonesia, Australia, the Russian Federation, USA, South Africa and Colombia.

The long-term future of coal as a major energy source is portrayed as being in jeopardy due to a variety of reasons including regulations, market forces and environmental arguments. However, despite these pressures, *there are currently no viable, immediate, substitutes to match the relatively low-cost, availability, reliability and scale of electricity production provided by coal-fired power plants, globally***.** Forecasts, short-term, 2020, mid-term, 2035 and 2040, and long-term, indicate that coal consumption will increase but the share of coal-based power generation will decline somewhat in the global generation mix but very gradually. The consensus seems to be that coal will remain an essential fuel, especially when addressing the current lack of access in many regions, throughout the world, to energy services such as electricity and subsequently, a better standard of life.