Coal Industry Advisory Board submission to the International Energy Agency to inform its forthcoming *Special Report on Energy & Climate* for UNFCCC COP21 decision makers

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Introduction

The 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) known as COP21 starting in Paris on November 30, 2015 will be a key moment for global action on the combined challenges of energy and climate.

The International Energy Agency will have an important role to play in advising governments, and other negotiation participants, of the realities of the world's energy system. As an advisor to IEA on matters relating to the utilization of coal, the Coal Industry Advisory Board (CIAB) encourages the IEA to explain to UNFCCC negotiators the indispensable role of advanced coal technologies in fulfilling the aspirations for COP21. Members of the CIAB also believe that an effective and sustainable approach to meeting emissions objectives must integrate the equally critical aims of energy security and economic development.

The coal industry is a key stakeholder in the UNFCCC process, and the CIAB commends IEA's efforts to provide energy sector input to COP21 decision makers. The CIAB is pleased to provide this submission to inform IEA's forthcoming Special Report on Energy & Climate, which draws from the findings of CIAB studies in recent years including:

- The Global Value of Coal (2012);
- 21st Century Coal: Advanced Technology and Global Energy Solution (2013);
- The Impact of Global Coal Supply on Worldwide Electricity Prices (2014); and
- Study On The Socioeconomic Impact of Advanced Technology Coal-Fueled Power Stations (2015, forthcoming).

These studies have drawn heavily on IEA publications such as the World Energy Outlook and Energy Technology Perspectives series, as well as the IEA roadmaps for high efficiency low emissions (HELE) coal-fueled power generation and carbon capture and storage.

The CIAB respectfully requests that the recommendations contained in this submission be incorporated into the IEA Special Report for COP21 decision makers. These recommendations have been developed to be constructive, aimed at producing a solution for achieving the compatible objectives of universal modern electricity access and meaningful emissions reductions. These recommendations are technology-centered, urging leaders to be guided by the history and promise of technological development in approaching the issue of coal and the CO_2 challenge. Finally, these recommendations are pragmatic, illustrating the instrumental role of international financing mechanisms in making possible the development of high-efficiency low-emissions coal-fueled generation technology projects.

The benefits of coal

Because of its scale and affordability, coal is playing a major role in supplying electricity to meet the world's enormous energy needs. In fact, both developed and developing countries are turning to coal to produce the power and steel necessary to sustain, and improve, their citizens' quality of life and the industrial competitiveness of their economies. The future use of increasing quantities of coal worldwide is inevitable if the world is to avoid a damaging energy crunch and support the needs of developing nations.

In this context, it is understandable that coal is the world's fastest growing fuel. Today it comprises nearly 30% of global energy use – its highest share since 1970[i], and it provides 40% of the world's electricity. Apart from electricity, coal is critical to infrastructure development. Metallurgical coal is an essential ingredient in steel, which provides the backbone to modern civilization. In addition, much of the world's cement is produced using coal.

Coal is the world's most prevalent and widely distributed fossil fuel; the amount of proven recoverable coal reserves is enormous and exceeds one trillion tonnes. Its global distribution provides energy security across broad political arenas. Affordability and price-stability are also key reasons why nations rely heavily on coal-based electricity generation. This makes coal an attractive fuel for baseload electricity generation and it is often the first source to be dispatched on electric grids.

Coal-fueled electricity also provides the critical foundation of dispatchable capacity to enable intermittent renewables. A case study based on the German power market concluded that existing coal power plants can operate flexibly in response to the dynamic market required by increased renewables on the grid.[ii] Thus coal is not in contrast with an increased use of renewable energies, but instead coal and renewables complement one another, and are partners in meeting present and future energy needs. Furthermore, given the future expansion of renewables, coal power generation in certain regions might decline. However, the coal price impact on power prices can nonetheless increase, as coal plants are likely to increasingly become the price-setting power units. Therefore, future security of coal supply is necessary to keep wholesale electricity prices stable.[iii] Lastly, countries around the world have been utilizing coal's versatility in other ways, initiating an increasing number of projects converting coal to liquid fuel, substitute natural gas or chemicals.

The provision of secure, low-cost, reliable electricity, the development of infrastructure and the option to produce liquid fuels are three specific ways in which coal directly contributes to greater economic growth, job creation, and higher personal income and wealth. Coal has significant benefits as an energy source to aid global efforts to expand economic growth; indeed it is the only practical and – in some cases – only available large scale energy option in many developing countries. Advanced coal technologies mitigate the carbon emissions of coal combustion, allowing nations to reduce energy poverty and meet climate change objectives concurrently.

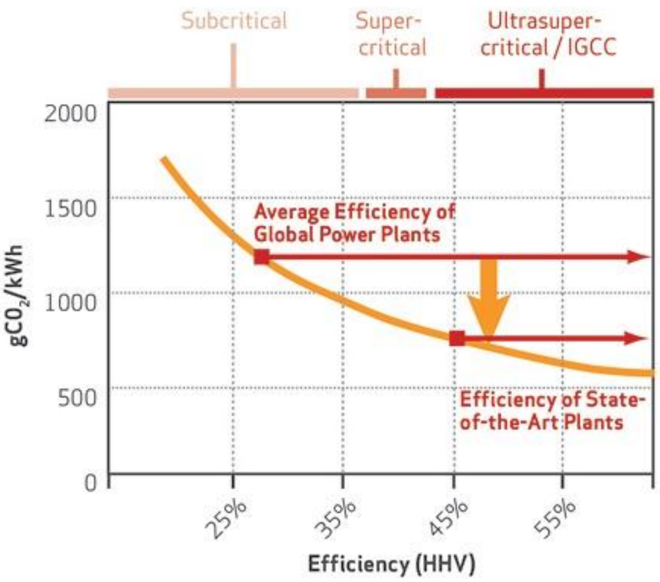
It is essential for COP21 decision makers to understand that these benefits are retained and expanded by greater deployment of advanced coal technologies, and that there are numerous specific examples of successful deployment. For example, the Reliance Sasan supercritical power plant in India, at full capacity, can generate enough power to fulfil the electricity requirements of more than 17.5 million people across seven states, enabling 22 million people to obtain access to safe water supplies. In China, the ultra-low level of non-GHG emissions from the Zhoushan and Ninghai plants creates over USD 350 million per year in air quality benefits.

The importance of high-efficiency low emissions (HELE) coal-fueled power generation

Significant CO_2 mitigation benefits can be achieved in the short term by supporting deployment of HELE coal technologies. HELE technologies are commercially available now and, if deployed, could reduce greenhouse gas emissions from the entire power sector by around 20%. They are the low-hanging fruit available to international climate negotiators in global GHG mitigation.

With the current UNFCCC process leading towards countries putting forth intended national contributions toward achieving global climate objectives, recognition should be given to the immediate mitigation benefits provided by coal-based HELE technologies. IEA's 2012 Energy Technology Perspectives (ETP) report highlights the significant potential to reduce CO_2 emissions through deployment of more efficient coal-fueled power generation:

Reducing emissions through efficiency improvements



Source: IEA "Focus on Clean Coal" (2006)

Note: 1% increase in efficiency = 2-3% decrease in emissions

The average efficiency of coal-fueled power stations around the world today is 33%. This is well below the state of the art rate of 45% and 'off-the-shelf' rates of around 40%. Increasing the efficiency of coal-fueled generation by one percentage point reduces CO_2 emissions by between 2-3%. Moving the current average global efficiency rate of coal-fired power plants from 33 to 40% by deploying more advanced technology could cut CO_2 emissions every year by 2Gt, which is the equivalent of:

- India's annual CO_2 emissions;
- running the European Union's Emissions Trading Scheme for 53 years at its current rate; or
- running the Kyoto Protocol three times over.

Furthermore, coal combustion technologies continue to evolve. There is further potential beyond current HELE technology for future deployment of advanced ultra-supercritical and Integrated Gasification Combined Cycle (IGCC) plants. These technologies are likely to be commercially available around 2020 with efficiencies approaching 50%.

Analysis of the impact that various policies or events have had on global CO_2 emissions demonstrates the significance of supporting efficiency improvements in the global coal fleet. If a global initiative had been in place to increase the average efficiency of the world's coal power stations to the level of off-the-shelf technology, its 2Gt of savings would place this action fourth on the list shown below, or more than three times as effective in reducing CO_2 emissions as the global deployment of all non-hydro renewable energies combined:

Emission reductions by policies / actions, bn tonnes CO_2 equivalent

Policy / Action	Cumulative emissions	Period	Annual emissions*
Montreal protocol	135.0bn	1989-2013	5.6bn
Hydropower worldwide	2.8bn	2010	2.8bn
Nuclear power worldwide	2.2bn	2010	2.2bn
Increase average global efficiency of coal-fired power plants to 40%			2bn
China one-child policy	1.3bn	2005	1.3bn
Other renewables worldwide	600m	2010	600m
US vehicle emissions & fuel economy standards†	6.0bn	2012-2025	460m
Brazil forest preservation	3.2bn	2005-2013	400m
India land-use change	177m	2007	177m
Clean Development Mechanism	1.5bn	2004-2014	150m
US building & appliances codes	3.0bn	2008-2030	136m
China SOE efficiency targets	1.9bn	2005-2020	126m
Collapse of USSR	709m	1992-1998	118m
Global Environment Facility	2.3bn	1991-2014	100m
EU energy efficiency	230m	2008-2012	58m
US vehicle emissions & fuel economy standards‡	270m	2014-2018	54m
EU renewables	117m	2008-2012	29m
US building codes (2013)	230m	2014-2030	10m
US appliances (2013)	158m	2014-2030	10m
Clean technology fund	1.7bn	project lifetime	na
EU vehicle emission standards	140m	2020	na

* Annual emissions are cumulative emissions divided by the relevant period.
The estimate for the current emissions avoided under the Montreal protocol is eight billion tonnes of CO_2e.
The annual figure for the collapse of the USSR refers to the years 1992-1998. †Cars and light trucks ‡Heavy trucks

Sources: The Economist 2014 and International Energy Agency 2013

In addition to significant benefits from reduced CO_2 emissions, high efficiency 21st century coal-fueled electricity generating plants with state-of-the-art emissions controls have significantly reduced emissions of nitrogen oxide (NOx), sulphur dioxide (SO_2) and particulate matter (PM). In the United States since 1990, the amount of electricity from coal generation has remained constant, and the emissions of NOx, SO_2 and particulates have reduced 70% through employing state-of-the-art emission controls. This has led to air quality improvements moving the U.S. to the Top 7 in air quality using PM10 measures for industrialized countries of the world (per World Health Organization 2014 study), even as coal generation continues to provide approximately 40% of U.S. electric generation and the country retains among the lowest cost power prices in the world.

As the global coal fleet moves to install these types of emission controls, much of the air quality concerns related to coal generation will be mitigated. Reduction in these pollutants is of critical importance at the local and regional level to address air quality and related health concerns. Further, many modern HELE plants are also now fitted with mercury control technology.

Significantly, the 2012 ETP report proposed a range of technology and policy actions for CO_2 reduction in coal-fueled power plants, amongst which were:

- pursue technology development for plants with efficiencies in excess of 45%;
- reduce generation from less efficient subcritical plants and/or significantly increase their efficiency; and

- promote the deployment of ultra-supercritical technology for new installation and repowering.

Similar technology and policy recommendations were made in the 2013 World Energy Outlook, in particular focussing on the role of coal in Southeast Asia. In the ‘Efficient ASEAN Scenario’ the IEA looks to an improvement in the average efficiency of coal plants in the region from 34 to 39% as the share of coal in the electricity mix increases from 31 to 50%. If global ambitions to reduce CO_2 emissions are to be achieved, then it is essential that the most advanced technologies possible are deployed.

It is for these reasons that the World Coal Association, which shares many common members with the CIAB, recently launched an initiative for the establishment of a global Platform for Accelerating Coal Efficiency (PACE). The objective of PACE is to bring together governments, technology providers, public and private financiers, amongst others, to overcome the barriers to the deployment of HELE plants in developing countries.

Making CCUS a reality

Deployment of HELE plants is also a key first step towards the deployment of carbon capture, storage and utilisation technology (CCUS).

CCUS technology is critical to achieving global climate objectives, and also plays a significant role in reducing the economic costs of limiting CO_2 emissions. Recent research by the Intergovernmental Panel on Climate Change (IPCC) noted that failing to deploy CCS causes the cost of climate action to rise by about 140%,[iv] but that the most likely outcome is that the 2°C target could not be reached at all. This echoes similar findings in a number of recent reports from the IEA, which has called for 20 large scale CCS projects to be built by 2020.

The Global CCS Institute reports there are 13 large-scale CCS projects in operation around the world, with a further nine under construction.[v] Despite this progress – most notably the recent commissioning of SaskPower’s commercial scale, coal-fueled Boundary Dam CCS plant in Canada – significant international effort is required to demonstrate CCUS technology to provide a line of sight to commercial availability. Technology-neutral policies, government funding, incentives, and continued robust research to reduce costs are needed to attract investment for additional large-scale CCS projects and enable sustainable deployment of the technology.

The 2012 WEO analyzed the level of policy support for renewables and estimated the total annual value of renewables subsidies in 2011 at US$88 billion, increasing to US$240 billion in 2035, with a cumulative subsidy for renewable technologies through to 2035 estimated at US$3,500 billion, assuming existing policies are maintained. One quarter of that amount (US$875 billion) is already committed and 70% of the US$3,500 billion is likely to be locked in by 2020 under the 450 Scenario. This is an extraordinary amount of funding dedicated to only one abatement measure over a long time frame given that other policy alternatives are available.

By comparison, between 2007 and 2012 some US$10.02 billion was spent (according to the IEA) on CCS projects, with US$7.7 billion of that amount privately financed. The GCCSI estimates that the total global commitment to CCS is US$20.7 billion, which is less than 3% of the funding already being committed towards renewables. It is clear that CCS does not share the same funding or policy support as exists for renewables and so it should be of no surprise that CCS is not being deployed currently."

There are two key factors that we believe will be critical in making CCUS a reality:

1. **Public sector support** – Governments and international financial institutions should join with industry to finance CCS projects, but the policy settings must also be right. Policy parity should be established for all low emission technologies. For example, feed in tariffs and other subsidies provided for renewable technologies have not been applied to CCUS technology.

2. **Storage mapping** – Long term storage remains a significant challenge for CCS. In many developing countries, where coal-based electricity is forecast to grow significantly for many years to come, significant work is required to better quantify and characterize storage sites to ensure captured carbon is securely and safely stored. (Some developed countries also require further mapping).

Investment in advanced coal technologies

Recent years have seen significant policy moves made against coal technology in order to pursue climate objectives. This has included financing policies of multilateral development banks and campaigns, supported by the United Nations, to disinvest from coal.

The IEA made an important contribution to this debate in the 2014 World Energy Investment Outlook by highlighting the risk of unintended consequences from such action. We encourage the IEA to call the attention of governments and international bodies to its assessment that in the 450 Scenario "world investment in coal-fired capacity totals $1.9 trillion (25% higher than in the New Policies Scenario), of which $800 billion is for plants fitted with carbon capture and storage (CCS). Furthermore, without financial support, countries that build new capacity will be less inclined to select the most efficient designs because they are more expensive, consequently raising CO_2 emissions and reducing the scope for the installation of CCS. In addition, many of the countries that build coal-fired capacity in the 450 Scenario need to provide electricity supply to those who are still without it, a problem that may be resolved less quickly if investment in coal-fired power plants cannot be financed."

The IEA should be clear that investing in advanced coal technologies is an essential part of global action to meet emissions objectives and achieve the intended outcomes of COP21.

Recommendations

The Coal Industry Advisory Board recommends to the International Energy Agency that its report ahead of COP21 in Paris:

1. Articulate the extensive role which coal is expected to play in the global energy mix to 2040 and beyond.
2. Explain the CO_2 mitigation potential of high-efficiency, low emission (HELE) coal-fueled power generation and the absolute necessity of international financial support for such projects.
3. Reiterate the imperative of carbon capture, utilisation and storage for meeting global climate objectives and call for increased international action and financial support to deploy this technology.
4. Recommend that CCUS technologies be given policy parity with other low emission energy technologies in international climate mechanisms.

i BP Statistical Review of World Energy, 2014.
ii IEA Coal Industry Advisory Board, *21st Century Coal: Advanced Technology and Global Energy Solution*, IEA Insights Series, 2013
iii IEA Coal Industry Advisory Board, *The Impact of Global Coal Supply on Worldwide Electricity Prices*, IEA Insights Series, 2014
iv Intergovernmental Panel on Climate Change, *Climate Change 2014 Synthesis Report*, IPCC Fifth Assessment Report, 2014
v Global CCS Institute, Global Status of CCS, 2014