Major Economies and Climate Change Research Group

Reduction Potential in Energy Production

Executive Summary

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EXECUTIVE SUMMARY

The energy production sector is one of the largest contributors to greenhouse gas emissions on the global level. This report identifies the top five emitters within the energy production sector (China, the US, Russia, the EU, and India) and examines three complementary strategies for reducing energy production emissions within each country. These include carbon capture and sequestration (CCS), renewable technologies, and fuel switching, which offer the greatest abatement potentials within the energy production sector. The IEA identifies 36.25 $GtCO_2$ emissions reduction potential within the top five emitters in the year 2050. Key findings of the paper include:

(1) Coal Will Persist as Important Energy Source

- Coal will likely remain the primary fuel source for most of the world's energy production. However, the top five emitters have or are shifting their policies with respect to coal use.
- As China and India continue to develop, citizens will increasingly demand government policy to mitigate pollution and the negative health externalities associated with coal-intensive power production.
- High-efficiency low-emissions coal generation technology in the medium-term will help to reduce emissions in pursuit while CCS technology becomes commercially feasible.

(2) Renewables Have Strong Potential but Barriers Remain

- Renewable technologies are in many cases cost competitive with fossil fuel powered sources in the long term, although up front capital costs and limited technical capacity present obstacles in both OECD and non-OECD countries.
- Poor grid interconnections and rigid market structures limit China's ability to take advantage of renewable technology, while India's decentralized decision-making approach with respect to renewable deployment has resulted in large inefficiencies.
- Russia's dependence on fossil fuel intensive industries makes it unlikely that it will race to deploy renewables on a large scale basis in the near to medium term.

(3) The Shale Gas Revolution Needs Assistance to Take Off Globally

- Currently, the US and Canada are the only countries that commercially extract domestic shale-gas, which is ultimately driving the transition in these countries.
- The EU remains politically divided on natural gas and the current cost calculus for a coal-to-gas transition does not work for member countries. Eastern European countries could remove the ban on fracturing to reduce their dependence upon coal and Russian gas.
- China and India possesses large natural gas reserves but currently lack the infrastructure and regulatory framework to take advantage of it. In the short-term, China and India will continue to burn domestic coal in order to meet their growing demands for electricity.

RECOMMENDATIONS

(1) HELE / CCS

Policymakers should focus on encouraging the adoption of high-efficiency low-emission technology in new coal generation. This includes increasing

supercritical generation capacity while further developing ultra-supercritical and advanced ultra-supercritical technologies. Access to finance to support cleaner coal may be an issue.

Policymakers should adopt strict environmental standards limiting carbon emissions for existing plants to encourage the retirement of older, less efficient coal powered plants. With over 75% of world coal generation at subcritical standards, this will significantly reduce the levels of emissions associated with coal generation.

Continued investment and development of carbon capture and sequestration technology could provide the long-term mitigation carbon emissions from coal-generated electricity. Further investment will help to speed the development of the technology from its current levels of limited deployment and testing towards a mature and practical solution.

(2) Renewables

The Indian government should attempt to better align existing policies. India has considerable potential for expanding renewable energy but suffers from a lack of harmonized policies. Simply put, there are too many incentive programs in place.

The EU should reform either its renewable energy subsidy programs or the market-based ETS system, because they are poorly aligned to work toward emissions reductions. Reducing some subsidy programs within the EU may be preferable, due to the market distortions and inefficiencies that result from them.

The Chinese government should relax rigid electricity market structures that reduce incentives to invest in renewable technologies. Long term contracts lock different regions into selling at fixed prices, often at a loss, thus discouraging investment in renewables capacity.

(3) Fuel Switching

Stricter emissions standards in OECD countries can encourage utilities to retire their aging coal-fired power plants. Replacing this capacity will lower carbon alternatives will be a major challenge. The United States, in particular, is using natural gas to displace coal.

Non-OECD countries should build out their natural gas infrastructure to supplement their new coal-fired power plants. Coal provides the most electricity at the lowest cost to meet the growing demand in non-OECD countries. China and India possess natural gas reserves that they could build out to someday reduce their reliance on coal-fired electricity generation.

Eastern European member states should remove their bans on hydraulic fracturing to reduce the EU's reliance on coal and Russian gas. The phase out of EU nuclear power and the moratorium on fracking has forced European utilities to increase their coal-fired generation and has raised electricity rates. EU member states with significant shale gas reserves should lift the moratorium on fracturing and put in place strict standards to regulate drilling activities.