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King Abdullah Petroleum Studies and Research Center

Coal in Asia: The Challenge for Policy and the Promise of Markets

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About KAPSARC

The King Abdullah Petroleum Studies and Research Center (KAPSARC) is a non-profit global institution dedicated to independent research into energy economics, policy, technology and the environment, across all types of energy. KAPSARC's mandate is to advance the understanding of energy challenges and opportunities facing the world today and tomorrow, through unbiased, independent, and high-caliber research for the benefit of society. KAPSARC is located in Riyadh, Saudi Arabia.

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Key Points

When balancing the objectives of affordability, reliability and environmental sustainability of energy supply, the answer in developing Asian economies has historically been unequivocal: Coal is king. This is because these nations placed greater emphasis on the first two objectives at the expense of the third. However, coal markets in Asia now face increasing community pressures for better local air quality and, to a lesser extent, concerns about global climate change. Consequently, policymakers are struggling to find a new optimal energy mix, which preserves the economic benefits of cheap coal but also helps them adhere to increasingly stringent emission norms and climate accords.

The penetration of renewables has introduced additional challenges of managing their intermittency and grid integration without incurring excessive costs. At the same time, the reduction in utility rates offered by renewables has challenged the assumption of coal's cost competitiveness. Key insights from the workshop are:

- Where the solution to air quality concerns is policy-driven renewable energy, the resulting disruption to coal markets could lead to under-investment in coal production capacity.
- Under-investment in future coal supply may undermine the perceived economic and operational reliability of coal as the dominant player in the fuel mix.
- Disruptions to coal supply could bring increased volatility and high prices, leading to inflationary impacts on developing economies and short-term damage to societal welfare.
- The coal industry has been guilty of complacency, failing to adequately invest in clean and efficient technology to retain its competitiveness because they assumed that policymakers would not accept the higher costs of renewables.
- Clean coal technology has been leapfrogged by developments in renewables technology (especially solar). Boiler efficiency gains have not matched the reduction in emissions that corresponding investments in renewable energy could achieve.

Summary for Policymakers

Policymakers in Asia have for decades focused on securing the cheapest energy for their growing economies. This meant that Asian countries invested heavily in cheap and often locally available coal and the resulting infrastructure – mines, ports, railways and power plants and electricity grids.

Asian energy policies supported fuel security and affordability. Regional disparities in per capita income and a highly competitive export-led growth focus has meant that few countries could diversify their energy mix to include comparatively cleaner but more expensive fuels such as natural gas and renewables (mainly hydro) unless they were available domestically. While world coal consumption grew at a sedate pace of 0.7 percent (annualized) from 2007-2016, Asia witnessed comparatively stronger growth of 2.28 percent over the same period. However, the Asian growth rate has declined significantly from the earlier 7.44 percent, which was prevalent during 1998-2007, driven primarily as China and India aggressively added coal capacity.

Over the past decade, renewables (mainly solar) have immensely grown in capacity as increasing acceptability and technological developments drove prices down, making it a viable choice for a diversified energy mix. Solar electricity consumption has shown strong growth (albeit from a far smaller base), with Asia growing at almost 50 percent, comparable to world solar consumption growth at 46 percent during 2007-2016. Societal pressure regarding local air quality and increasing awareness of the impact of carbon emissions on the climate have also forced policymakers to focus on increasing the penetration of renewables in their energy mix.

As a result, Asian policymakers now have to pivot from their earlier fuel choices and initiate a transition to a cleaner and more sustainable energy mix. They have been forced to acknowledge the externalities of coal, but have so far not been able to move completely away from the relative cost economics of coal given the sunk costs involved. Legacy infrastructure issues have made the transition much more difficult and policy choices have been dictated by the availability of resources and finances.

Complacent in the continued belief of unabated growth of their markets, coal producers are suddenly being forced to accept that their markets have changed to being driven by policy, rather than the economics of supply and demand. The coal industry has been a laggard in developing highly efficient clean coal technology and left behind by technological developments in renewables. For coal to continue its growth in Asian markets, it has to address the emission concerns associated with its usage. Stricter international emission norms and increasing global awareness of the impact of unabated carbon emissions are serving to shrink the policy acceptance of cheap coal.

For coal to compete on environmental grounds with cleaner renewables, the industry needs to enhance investments in technology and address climate change concerns by tackling the externalities of carbon. The challenge for policymakers, on the other hand, is to ensure a transition to a low carbon energy model without burdening their economies with excessive costs. Asia will continue to utilize coal because of its current cost economics, however, the environmental externalities associated with coal are going to be increasingly priced in by policymakers. This will impact the future competitiveness of coal in Asia.

Background to the Workshop

The KAPSARC Energy Workshop series on coal was launched in October 2014. It provides a collaborative space for discussion on some of the most pressing issues facing coal markets, including fossil fuels' position in the energy mix, potential ways forward for cleaner generation technologies, improvements in policy processes and the impact of new power market designs. The workshop 'Coal in Asia: Challenge for Policy and the Promise of Markets' was hosted in Singapore in June 2017 as the fourth in the series.

Asian countries are increasingly seen to be the future of coal and the intent of this workshop was to appreciate the drivers of coal consumption from an Asian perspective and understand how energy policy objectives and environmental policies are being incorporated into markets, particularly in the wake of the COP21 Paris Agreement. The workshop dialogue among key stakeholders including policymakers, academics, and industry executives focused on the policy challenges facing coal in Asia and the extent of future growth in these markets.

Coal and Drivers of Fuel Choices in Asia

Over the past two decades, Asia has been the dominant market for coal with China, India and Japan leading global demand. However, energy policymakers in Asia are now struggling to address several issues including diversifying the energy mix, moving toward a low carbon future, evolving the means to absorb intermittent renewables into their grids and ensuring the accessibility and the affordability of energy to its citizens while safeguarding sustainability and adhering to environmental norms. Diverse stages of economic growth across Asia mean that the policy issues encountered are not uniform. The policy challenges are also heightened by new environmental conventions aimed at limiting the use of coal.

For the prosperous economies of North Asia apart from China, which is discussed below, the challenge is to ensure that their growth is sustained and at the same time, their local environment is safeguarded from further pollution. To do this, policymakers have focused on increasing the penetration of renewables and cleaner fuels such as natural gas in their electricity sector. High per capita income, increased energy efficiency and availability of surplus electricity capacity built over several decades of strong growth have altered priorities. The ability to afford alternatives, including natural gas and nuclear, and access to renewables has meant that these countries have developed energy markets designed to deliver a higher quality of life and security through diversity of supply. These are stronger policy drivers than ensuring energy is provided at the lowest cost.

For countries in South and Southeast Asia, the challenges center on ensuring accessible and affordable energy for their growing populations and economies. These economies have a high rate of growth in electricity demand and their growth is, at least in part, predicated on access to cheap energy. Their electricity infrastructure is being built and this imposes constraints. They are focusing on ensuring adequate energy supplies and utilizing the cheapest energy sources to maintain their economic competitiveness. Unlike import dependent North Asia, South and Southeast Asia are blessed with local reserves of coal and/or gas, and they have equated security of supply with self-sufficiency. They have, to the extent that they could, regulated domestic prices to reflect costs of extraction and transferred the resource rents to their local consumers. Investments over the years in infrastructure that is linked to their national resources mean that these countries have limited fuel switching or substitution options.

China and India, the two largest consumers of coal in Asia, face different challenges because their economies are at different stages of growth. Growth in Chinese coal demand has moderated after soaring for the past several years. There has been a steady focus from Chinese policymakers to address air quality concerns in major urban centers. This led the government to diversify its energy mix with a massive increase of renewables capacity and greater consumption of cleaner fuels like natural gas (from indigenous sources, pipeline imports and liquefied natural gas). Public pressure has ensured that Chinese policymakers are no longer focused on the coal-fired capacity for their electricity needs.

The consequence of this change of focus is that Chinese policymakers are struggling to rollback coal production capacity to match their new demand goals. The challenge is in ensuring that reduced employment and potential social unrest that could develop from the closure of coal mines is managed prudently. This is a challenge for the coal industry globally because mines become the main source of income for the local communities. This is also an issue at the national level because a reduction in

coal consumption will mean an increase in gas and oil imports. The sheer scale of Chinese consumption will have an impact on global markets, possibly raising energy costs for the Chinese economy. For example, a policy of production capacity cuts in 2016 raised domestic coal prices causing some roll back to restore supply but also resulting in higher imports. This raised global seaborne coal prices. Undoubtedly, increasing demand for imports of natural gas will underpin a market that looks oversupplied for the medium term.

India finds itself in a different position. It is still trying to increase domestic coal production to replace imports and to fuel the expansion of dispatchable thermal generating capacity. Domestic coal can currently provide this integration capacity more cheaply than imported natural gas. At the same time, India has embarked on an ambitious plan to massively increase renewables capacity to meet its growing electricity needs. This means that, through its energy transition, there is still a large pipeline of coal-fired power plants in various stages of development but all face prospects of low load factors, which will challenge their economics.

Asian countries with legacy energy infrastructure based on coal, face economic challenges transitioning to a cleaner energy mix built on natural gas and renewables. Most of the countries do not have the gas infrastructure in place and face challenges in funding their investment decisions toward this more diversified and cleaner energy mix. Social resistance to coal, pollution concerns, and active environmental groups have kept the pressure on the policymakers to take decisions that are environmentally sustainable.

“Cost is king in an uncertain world”

Having ignored the ‘Environmental Leg’ of the energy trilemma during their rapid economic development, the economies of China, South and Southeast Asia are now having to factor it into their calculus to address local air quality concerns and, perhaps in the future, climate change. Coal has been the fastest growing component of the global energy mix in absolute terms with 37,037.8 million tonnes of oil equivalent (MTOE) consumed in the past 10 years (2007-2016) vs 10,479.7 MTOE of renewables (BP 2017). However, Asia looks less likely to be the powerhouse of coal demand growth unless coal finally begins to compete on environmental grounds as well as cost.

Asian Energy Policy Objectives and Clean Coal

Energy security and reliability of the energy infrastructure have been cornerstones of Asian energy policies. Countries with access to domestic reserves of fossil fuels – coal and/or natural gas – invested in developing these resources with strong policy support and commensurate investments in energy infrastructure. While investing, the externalities of coal, namely environmental pollution were marginalized to a large extent. As a result, today Asia faces an expensive transition managing the emissions from coal.

Access to advanced technology and supportive policies are critical to ensuring that coal continues to play a key role. In the electricity sector, the Asian boiler fleet has seen the introduction of supercritical and ultra-supercritical steam generation technology that has led to lower emission rates and usage of better quality coal. Penetration of the supercritical and ultra-supercritical technology has been far higher in the richer North Asian economies like Japan, Korea and Taiwan when compared with the South Asian countries. The Chinese boiler fleet has lead the transition to supercritical and ultra-supercritical technologies. However, despite stringent emission norms, rising air pollution concerns have led to an increase in community pressure. If efficiency improvements and clean coal technology cannot address the issues of outdoor pollution adequately then there will be massive community pressure to shift to low-carbon energy models. Energy policies thus need to be developed to be able to cater to such scenarios.

Invest in clean coal technology or diversify energy mix

key issue facing Asian policymakers is whether to focus on the continued investment in technology for clean coal or to use available financing options to diversify by incorporating gas and renewables into the energy mix. Depleting economically mineable reserves, increasing strip ratios, deeper mines and improved boiler technologies that have reduced coal usage, retirements in coal power and structural shifts in economies mean that new investments have reduced drastically. New coal projects also face enhanced environmental scrutiny and public pressure. The Adani coal mine in Australia is a case in point. These have increased supply chain challenges for Asian policymakers.

The challenge of ensuring a steady supply for the coal-fired power plants (especially import-dependent countries in North Asia) is underlined in the declining investments in coal mines. There has been continued pressure on large coal mining companies to divest their portfolio. Recent initiatives like the climate-related financial disclosure regulations, which require public companies to disclose the climate impact of their portfolio of investments will only add to that. Increasing the transparency of climate exposure in financial terms could potentially deter investments in coal mining projects, thus constraining future supply options.

While there has been coal-fired capacity addition in electricity sectors in Asia, there hasn't been commensurate investment in the development of new coal mines. This has had an impact in terms of increasing risks for coal-fired power projects that are currently being planned. With growing availability of renewable options coupled with low prices of natural gas, utilities are being forced to focus on a future scenario where coal's role would be less central than earlier. As renewables ramp up, flexibility could be provided by smaller coal- or gas-fired power plants. Clean coal technology has not yet had the impact that was envisaged, while technological

developments in renewables have leapfrogged ahead. Continued focus on carbon mitigation efforts from the international community has meant that coal faces major challenges in its future.

Politics of coal

An environment of societal pressure, activism and technology breakthroughs in shale and policy support for development of renewables has buoyed a movement away from coal in the U.S. and Europe. Such an environment, though still at a very nascent stage in most of Asia, is maturing faster with increased economic prosperity.

"Unabated coal faces a bleak future"

Policy support for coal is still present and financing for coal projects is available from increasingly Asian and predominantly Chinese and Japanese financial institutions. However, without the development of adequate abatement mechanisms, be it in the form of taxation on carbon or technology enhancements to reduce and capture emissions, public support for coal in Asia will wane as cheaper alternatives develop rapidly.

An Asian Future for Coal Markets

The wide availability of this cheap resource in Asia has fueled a growing dependence on the coal industry. However, recent policy measures and developments in renewables have taken their toll on the growth of the coal industry. Policymakers are increasingly becoming cognizant of the environmental and sustainability concerns that coal generates and are looking to diversify their fuel mix. For the rich and prosperous nations of North Asia this is a much easier pursuit than the comparatively less developed economies in the south. The largest coal consumers, like China, India and Japan are diversifying their energy mix to reduce dependence on coal. Over the past few years, with the advent of international emissions agreements and focus on carbon mitigation, the largest coal markets are slowly changing from being driven by economics to being driven by policy. China is restricting domestic coal production capacity as it had raced further ahead of demand. India has moved to increase domestic coal production as it tries to take advantage of domestic coal resources in an increasingly carbon-constrained world. Events in South Korea where it moved to replace planned coal-fired capacity with natural gas and renewables point to a future where policies will be driving coal markets. This increases future risks for coal producers and investors, and generates supply uncertainties for imported coal users.

The earlier prevalence of coal is being rebalanced by policy support for renewables and technological advancements, which enable a greater roll out of gas and alternatives to coal. Resource endowments and fuel economics are an advantage for coal, however, there is increasing awareness that carbon dioxide emissions need to be curtailed and clean coal technology has to deliver on its long overdue promise.

From the viewpoint of reliability, coal continues to be the cheapest energy source (without pricing in its externalities) and its role cannot be immediately wished away in Asia. The ease of access to coal supplies in Australia and Indonesia has contributed to the development of secure energy supplies for Asian coal consumers. The disruption that shale gas brought about in the U.S. and which has been duplicated by renewables and gas in Europe has provided Asian policymakers with a better understanding of the policy challenges that will arise from diversifying energy sources. The coal industry seems to be complacent about its future in Asia. Technology disruptions and policy support for new energy technologies such as renewables and storage illustrate that coal's position can and will be challenged. For coal to survive, it must adapt fast to the changing scenarios.

Advances in technology and political support in terms of ease of financing for new ultra-supercritical technology coal plants and mining projects, and increased investments in clean coal technology can play a huge role in extending its environmental competitiveness. This is a challenge for policymakers considering future energy market policies. Policymakers understand that in the short term the use of coal is inevitable given past investments in coal-based infrastructure. Future growth of the coal industry, however, is dependent upon policy decisions and development of renewables and managing the transition will be a challenge.

About the Workshop

KAPSARC convened the workshop in June 2017 in Singapore with some 30 experts in the areas of coal markets, finance, environment, academia and policy to facilitate a discussion on coal policy in Asia. The workshop was held under a modified version of the Chatham House Rule under which participants consented to be listed below. However, none of the content in this briefing can be attributed to any individual attendee.

List of Participants

Philip Andrews-Speed, Principal Fellow & Head, Energy Security Division, Energy Studies Institute, Singapore

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About the Workshop

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Alessandro Vitelli, Carbon Reporter, United Kingdom

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Kang Wu, Program Director and Senior Research Fellow, KAPSARC, Saudi Arabia

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About the Team

Jitendra Roychoudhury

Jitendra is a research fellow at KAPSARC working on global coal and India energy research projects. He previously worked in consulting, advising organizations on commodity flows and markets.

Kang Wu

Kang is Program Director of Markets and Industrial Development Research and a senior research fellow at KAPSARC. His areas of work include oil and gas markets, energy security and China energy studies.

About the Project

KAPSARC is engaged in analyzing the dynamics of the Future of Coal Markets. This project seeks to study the competing forces of declining demand in advanced economies and rising consumption from developing countries. Policies undertaken by developing countries to meet climate change targets and their ability to bear the additional costs incurred from using alternative and more expensive energy sources will help provide deeper and more comprehensive understanding of the energy challenges and policies needed to address these issues. The research project aims to investigate the global consequences of changes to energy markets within Asia, thus allowing assessment and analysis to obtain policy relevant insights. In line with KAPSARC's overall objectives, the aim is to assist stakeholders outside Asia to understand the consequences of decisions taken by Asian policymakers.

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