



POTENTIAL MARKETS FOR HIGH EFFICIENCY, LOW EMISSIONS COAL-FIRED POWER PLANTS

Coal generates around 38% of the world's electricity and is set to remain an integral part of the global energy mix well into the future. Therefore it should be used in the cleanest and most efficient manner possible. Compared to older coal-based power generation systems, modern high efficiency, low emissions (HELE) power plants remain an attractive proposition in some economies. They provide cleaner, affordable electricity, and are capable of flexible cyclic and low load operation, needed to compensate for the fluctuating output from increasing amounts of intermittent renewables supplying the same grid.

HELE technologies encompass several main variants: supercritical (SC), ultrasupercritical (USC), advanced ultrasupercritical (AUSC) in development, and integrated gasification combined cycle (IGCC). Their inherent advantages mean that many countries are, or plan to, develop proposals for new coal-fired power generating capacity. This may be to replace outdated coal power plants, or to provide electricity to populations experiencing energy poverty. Even smaller-scale projects can have a major impact, particularly in emerging economies such as Morocco. Effective, affordable electricity is a prerequisite for driving meaningful social and economic development.

There are many coal power projects proposed or at different stages of development. Countries that currently use coal or have firm plans to do so, such as Botswana, Cambodia, India, Indonesia, the Philippines, Vietnam, and Sri Lanka, frequently cite combinations of reasons for this choice, such as:

- use of indigenous energy resources;
- easy availability;
- enhancing national energy security and reducing energy imports;
- diversification of sources of energy;
- growing electricity demand or shortages of supply;
- generates cheaper, more affordable electricity than alternatives;
- drives economic and/or social development; and
- can be instrumental in providing universal access to electricity.

A range of approaches is being adopted for coal-generated electricity. As of December 2020, around 301 GW of USC and nearly 50.7 GW of SC capacity was in operation. There was 141 GW of coal-fired power generation under construction, 92% of which was in Asia. Some 125 GW of the new capacity scheduled to come online will be SC or USC; 115 GW of this total will be in Asia, in particular in China and India. Most of the balance is subcritical plant. In total, there are currently more than 270 GW of new coal-fired power plants planned, encouraged by supportive energy policies and continuing technological advancement.

A growing number of new projects being developed are in emerging economies who have not previously relied heavily on coal; for example Bangladesh, Pakistan, Thailand, and Myanmar. The precise nature of

technology proposed or adopted varies by country, reflecting different national circumstances such as predicted future demand, local energy and environmental policies and resources, and grid access. Thus, individual countries adopt strategies appropriate for their particular circumstances. Most developing countries aspire to grow their economies, and therefore simply need affordable and secure generating capacity. This report examines coal-based power projects proposed or in development via a series of case studies of countries where coal is viewed as a viable option for generating affordable, reliable electricity. For each, it considers the influence of government policies and environmental regulations, and examines the scale and type of technologies that might be deployed in the future.

THE CHOICE OF TECHNOLOGY

There is no single solution for all situations, and decisions on the choice of technologies are based on a range of factors that differ between countries, reflecting their economic status, individual circumstances, and future needs. Choice of technology can influence the decision on whether a project proceeds, it can limit financing options, impact on the extent of local involvement, and can affect the degree of opposition on environmental grounds.

ENVIRONMENTAL CONSIDERATIONS

Almost all countries aspire to increase their reliance on intermittent renewables. However, these alone will be unable to meet the power requirements of most economies in a reliable and affordable way. Hence, other forms of power such as coal or gas are needed to compensate for the inevitable fluctuations in output. Compared to traditional subcritical systems, HELE-based technologies have a lower environmental impact per unit of electricity generated and are generally amenable to the deployment of state-of-the-art emission control systems, unsuitable or too expensive for older facilities.

SOURCING PROJECT FINANCE

Globally, fewer organisations are now willing to fund coal-based projects in general, and this often includes any type of HELE-based technology. This has made it difficult to secure funding and develop new coal projects. Although the situation continues to evolve, funding currently remains available from some sources – the largest and most accessible source is China. However, it is not uncommon for a proportion of project finance to be provided from domestic sources, and there are numerous examples of this type of arrangement in, for example, Cambodia, Egypt, Indonesia, Kosovo, Mongolia, Mozambique, Pakistan, Turkey, Tanzania, and Zimbabwe.

Inevitably, some projects will not proceed and thus, there is uncertainty over the precise totals. Changing policies, priorities and access to finance influence the ultimate delivery of coal power projects. Uncertainty is also due partially to the Covid-19 pandemic and associated lock-downs that have reduced power demand in many locations. In some cases, this reduced demand is likely to have a knock-on effect that will delay new power projects and could lead to the cancellation of others. A further layer of complexity has been added by several ongoing international trade disputes.

Globally, more than 1.1 billion people still lack a supply of electricity. The greater deployment of power generation systems based on HELE technologies would help address this need through the provision of reliable, affordable electricity, vital for sustainable economic and social development.

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Each executive summary is based on a detailed study which is available separately from www.iea-coal.org. This is a summary of the report: Potential markets for high efficiency, low emissions (HELE) coal-fired power plants by Dr Stephen Mills, CCC/312, ISBN 978-92-9029-635-5, 133 pp, June 2021.