IEA
CLEAN COAL CENTRE

EXECUTIVE SUMMARY
NO 45 – MARCH 2019

HELE TECHNOLOGIES AND OUTREACH IN JAPAN AND SOUTH KOREA

This study is one of a continuing series undertaken by the IEA Clean Coal Centre into the impact of high efficiency, low emissions (HELE) power generation technologies. It investigates the role of HELE technologies in the economies of Japan and South Korea in the light of national policy and legislative drivers, and outreach to other countries through assisted finance initiatives. Japan and South Korea have been selected for study as both countries:

- are world leaders in having relatively young, highly efficient coal fleets;
- are active in developing HELE technologies, such as advanced ultrasupercritical (AUSC) and integrated gasification combined cycle (IGCC) plants;
- export HELE technology and support services worldwide; and
- are major forces in meeting the increasing demand for power in Asia with state-of-the-art coal utilisation technologies.

Nghi Sơn-1 power station, Viet Nam – supported by Japan and South Korea (Shutterstock)

As successful, developed economies, Japan and South Korea share many characteristics. Both are urbanised and very strong in the high technology sector. Their extensive participation in international trade makes them outward looking and therefore natural participants for ventures in other countries. Domestically, they share the relatively limited prospects for economic growth with other developed countries, in contrast to many of the emerging economies in South East Asia. Japan also has an ageing and declining population, as does South Korea, although to a lesser extent. Thus, domestic prospects for significant additional HELE technology uptake are limited, and exports present a better option.

Both countries have pursued ambitious development programmes to commercialise advanced steam cycles and IGCC systems. IGCC is of particular interest as it opens the way to the incorporation of fuel cells and modified cycles that could achieve high overall efficiencies in the longer term. In the near term the fact that some consider AUSC capable of incorporation into new or existing plants is encouraging, as it offers efficiency improvements over the current state-of-the-art USC cycle.

The study shows that with their highly efficient coal fleets the further deployment of HELE technology yields only marginal gains until AUSC plants begin to replace older capacity, when concomitant reductions in emissions of CO_2 are achieved. The predicted decline in Japan's population and corresponding demand for energy, coupled with a more efficient coal fleet suggest a reduction of 28% in CO_2 emissions is possible by 2040 from a 2015 baseline. The emission reduction of CO_2 for South Korea is lower at 7%; a consequence of the country's higher projected level of economic growth. For both countries, the greatest reductions in CO_2 would be achieved with the deployment of carbon capture and storage coupled with the introduction of AUSC plant

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: HELE technologies and outreach in Japan and South Korea by Dr Ian Barnes, CCC/293, ISBN 978-92-9029-615-7, 68 pp, March 2019.