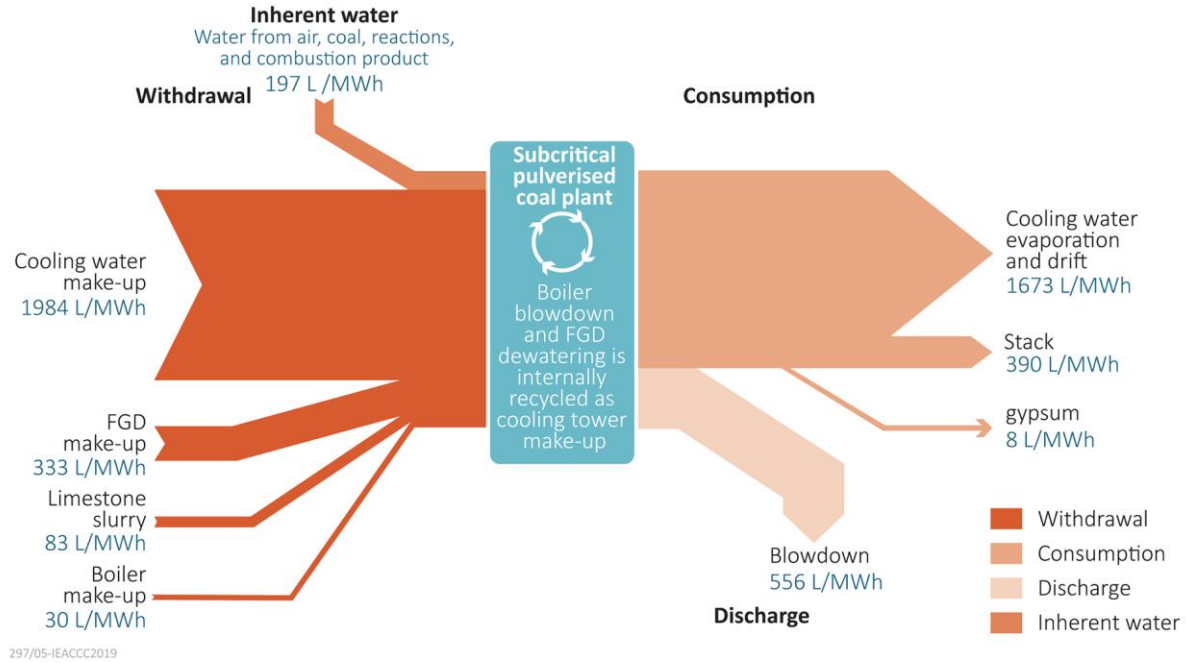
WATER ISSUES FOR COAL-FIRED POWER PLANTS

In a world that is becoming increasingly urban and industrialised, water and energy are indispensable for human well-being and prosperity. They are mutually reliant, as energy production requires large volumes of water, and the water purification and distribution infrastructure needs substantial amounts of energy. This interdependence is generally referred to as the water-energy nexus. Growing populations and economic growth are driving the demand for energy and water. Bringing freshwater and sanitation to the millions of people currently without these facilities is a global priority. However, freshwater is a finite resource and is subject to competing demands. Concerns over its availability and quality are growing, especially in regions that are increasingly impacted by climate change. Water scarcity affects more than 40% of the global population and is projected to rise. Water use by coal-fired power plants is significant (*see* Figure) and given the importance of this issue within the water-energy nexus, this report by the IEA Clean Coal Centre (IEACCC) has been produced to present an overview of the water-related issues associated with coal-based power generation and how they are being tackled.



Water balance on a subcritical 500 MW power plant (Carney and Shuster, 2014)

It opens by describing the relevant water policies of major coal-using countries. Then it explains how water is used in coal-fired power plants, how its use can be minimised and the water cleaned, before considering advanced technologies and alternatives sources of water. The report draws upon several previous studies published by the IEACCC and the reader is directed to these for a detailed study and analysis of the topic. Seven key messages arise from the study:

- The interlinking of the world's growing need for affordable energy and the increasing pressure on the quantity and quality of fresh water supplies – the water-energy nexus – continues to grow in importance.
- Energy and environmental policies that were once quite separate, have progressively converged to reflect the nexus and now aim to encourage responsible water conservation and protection of water quality.
- The largest consumers of coal for power generation globally (China, India, the USA and South Africa) have policies on water use that have been developed in conjunction with national energy needs.
- Through a systematic consideration of the many processes in power generation, schemes for saving water in the cooling stages and pollution control technologies have been identified and implemented and work continues on further savings.
- The concept of zero liquid discharge is the logical solution for current and future plants and increasingly, national legislation mandates this approach.
- The higher efficiency of modern new-build coal-fired power plants has the added advantage of a lower water requirement per MW generated.
- The drive to utilise alternative sources of water will become increasingly important. Significant developments have occurred in using readily available supplies such as municipal wastewater, but other sources have a more patchy uptake.

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: Water issues for coal-fired power plants by Dr Ian Barnes, CCC/297, ISBN 978-92-9029-620-1, 40 pp, October 2019.