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Water consumption in a renewable National Electricity Market

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In arid Australia, water conservation is an important step towards a sustainable society, but the water footprint of the current electricity generation is rarely discussed. Only the environmental impacts of pollution from electricity generation are reported by Government, industry and media, with other issues being sidelined. All coal-fired power stations in Australia require cooling, whether through open- or closed-cycle water systems – a small fraction of which utilise salt water. New thermal power stations could employ dry cooling technology, but these produce less electricity per unit of fuel, and so have higher carbon dioxide emissions. This dependency on temperature control has affected coal-fired generation availability in Australia in the past, and will be an important factor for consideration as climate change impacts access to fresh water supplies. Water is also necessary for coal mining.

The generation technologies that make up the remainder of the capacity in the National Electricity Market (NEM) – namely gas-fired power stations and hydroelectricity, also have significant water consumption. The water consumed solely for hydroelectricity is difficult to isolate, as the reservoirs have many other uses.

This study compares the water consumption in the current generation mix in the NEM with that required for a 100% renewable scenario, taken from [1]. Our analysis of the water consumption for the renewable electricity system shows that the environmental impact of Short Term Off-river Energy Storage (STORES) is likely to be very small, both absolutely and relative to other parts of the electricity industry, and a transition would result in less water being consumed for the provision of electricity. STORES sites are not like conventional hydroelectricity, where entire river valleys are dammed in order to provide seasonal storage – short term storage can be achieved with comparatively small dams, and therefore very small water consumption. As our search for suitable sites excluded national parks and other protected lands, but still found 22,000 good sites, only the most suitable few dozen would be needed to support a 100% renewable electricity system. Excluding hydroelectricity and biomass, which have the same consumption in both systems, a 100% renewable generation mix will use less than 20% of the water of the current predominantly coal- and gas-fired system.

References

Blakers, A., Lu, B. and Stocks, M, 2017, '100% renewable electricity in Australia', *Energy*, 133, p471-482.