

Abstract

Wet cooling towers (WCT) are widely used to reject the unutilized heat in coal thermal power plants (TPPs). But this comes at the cost of excessive water consumption. Adoption of air-cooled condensers (ACC), also known as dry cooling systems, in all proposed Indian TPPs would reduce their water consumption by 26% in 2030. However, power producers are reluctant to install ACC due to technical and economic disadvantages such as high capital investment and land footprint. This study evaluates the major challenges in implementing ACC by quantifying them in terms of cost of electricity generation. Critical parameters of WCT and ACC, such as water and auxiliary consumption, are also estimated at varying ambient air conditions. The study shows that cost of electricity generation in TPPs with ACC would increase by 0.26–0.30 INR/kWh (0.37–0.42 US cents/kWh) compared to those TPPs with WCT. Despite this, installation of ACC would still be economically viable for those TPPs that are susceptible to at least 1 month of shutdown annually due to water shortages. On an average, Indian plants that are located at high water-stressed regions operate 1.5 months lesser than those at low and medium water-stressed regions. Such TPPs would see an increase in cost of electricity generation by 0.17 INR/kWh (0.24 US cents/kWh) compared to TPPs with ACC.