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ANALYSIS

A thirsty business: factoring water into the true cost of coal

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South Africa's Life After Coal campaign is calling for a closer look at coal's impact on water. But just what are the true costs of the coal industry?

While a rise in renewable energy has meant the global share of coal-fired generation is beginning to fall, the material continues to make up a significant portion of many nations' energy mixes. One such country is South Africa, which currently relies on coal for more than 90% of its power, though climate targets and a national water crisis have given rise to calls for a change.

The International Energy Agency estimates that global energy production requires 10% of the world's total water withdrawals. Given that in 2017, prolonged drought and resource mismanagement resulted in Cape Town being only days away from running out of water entirely, it's clear that every drop counts, and coal power requires more than just a drop.

The Life After Coal campaign is attempting to highlight the industry's significant water costs and push the country to a cleaner, renewable future.

Launched by the Centre for Environmental Rights, groundWork, Earthlife Africa and Greenpeace Africa, Life After Coal is calling for the South African Government to address coal's impact on the country's water supply in its upcoming Integrated Resource Plan (IRP).

The IRP is the nation's electricity plan, which seeks to identify investments in the energy sector to allow maximum growth at minimum cost. The draft plan, released in 2016, has been accused of not adequately incorporating the external fiscal and environmental costs accumulated in the coal industry, and the campaign partners say they will challenge in court an IRP that fails to address the omission.

"South Africa's mining sector is a cowboy sector, and our government is a sheriff without a gun," says groundWork director Bobby Peek. "They are facilitating this bad practice by mining companies in their inaction against them.

"If we believe that this IRP is not going to provide South Africans with a future that is just, we will have to challenge it in the courts."

Water supplies: the true cost of coal

The damaging effects of coal are numerous, with reports detailing the link between air pollution from coal-fired plants and asthma, cancer, heart and lung ailments and neurological problems, as well as the environmental phenomena of acid rain and globally climbing temperatures.

With so many negative effects, coal's detrimental impact on water resources gets relatively little airtime. Yet the extraction and burning of coal uses vast amount of water, with a 2016 report commissioned by Greenpeace for World Water Day finding that the world's 8,359 existing coal plants use enough water to supply the needs of a billion people, a figure that will double if all of the world's planned plants come online.

Additionally, researchers from Sandia National Laboratories reported that a typical 500MW coal-fired utility uses 12 million gallons of water per hour – 300 million gallons a day – for cooling alone. The same study said that in the US, mining, processing and burning coal combined uses nearly eight billion gallons of water a day, citing US Department of Energy statistics.

While cooling is the primary use of water in power plants, it is also used in mining, washing and sometimes transporting coal.

Around a quarter of the coal-fired plants planned for future construction will be based in regions already running a freshwater deficit, where water is used faster than it can naturally replenish. South Africa, which is home to some of the world's biggest coal-fired power stations with capacities of up to 4.8GW, has faced the threat of drought for the past four years. Piotr Wolski, a researcher with the University of Cape Town's Climate System Analysis Group, said the period between 2015 and 2017 was the driest the country has seen since 1933.

Preparations for 'Day Zero' in Cape Town – when the reservoirs run dry and water supply will be cut – have been pushed back to 2019 from the original prediction of April this year. City authorities have warned that the impact of Day Zero "will be catastrophic".

Expenses, emissions and the threat of drought

"South Africa is a very dry country," says Centre for Environmental Rights science and policy specialist Saul Roux. "Coal mining and power generation combined consumes 5% of the country's water, while at local level in the Upper Olifants catchment – which has a concentration of power plants – power generation accounts for 37% of water use."

According to Roux, on average coal power in South Africa uses around 660 litres of water per MWh, a figure vastly higher than the amount consumed by cleaner energy sources such as concentrated solar, solar photovoltaics and wind, which use 296 litres, 98 litres and 4 litres, respectively.

Yet plans to develop renewable energy in the country have been slow to get off the ground. In April, the country signed $4.7bn worth of renewable energy contracts with independent power producers, plans that had been delayed for two years due to ousted president Jacob Zuma's preference for new nuclear plants.

Resistance to the plans remains, with opponents saying the move will result in job losses in the coal sector and add a financial burden to companies. Firms themselves have also been reluctant to pick up renewable projects. Last year, coal stations owned by public utility Eskom, the largest energy producer in Africa, generated 202,106GWh, while the firm's renewable IPP purchases were just 9,584GWh.

It is not only the volume of water used but also the effects of emissions on water quality that impacts the natural water cycle. In particular, damage has been observed from air pollutants such as coal ash and acid mine drainage.

Treating the water contaminated by coal has proven wildly expensive. Speaking of the Kusile Power Station currently under construction, Roux says sulphate pollution on river systems causes damage costs of between R4.5m and R7.7m ($297,765 and $509,509) annually.

“External water costs alone will give an additional cost of between R95 cents and R186 cents per kWh for the costs of that one power station, or an additional six to 12 billion rand each year,” he adds. “South Africa has close to 6,000 recorded derelict and ownerless mines. It is estimated that the closure of these mines, including long-term treatment of acid-mine drainage, would cost up to R60bn.”

On top of the financial strain caused by pollution from the plants, there’s also the worrying effect on the country’s overall ecosystem.

“It’s going to increase floods, increase droughts, impact water availability, quality and quantity,” Roux says. “The knock-on effects of degrading our water resources on things like our ecosystems, our agriculture, our health, our livelihoods, are severe. I don’t think there’s complete recognition of the water crisis we’re in.”

Peek stresses that the current government strategy does not reflect the severity of the situation, saying it “is not a development plan but an extraction plan”.

“A development plan means decent jobs, decent lives, decent livelihoods, services and nutrition for people,” he says. “People are protesting because they don’t have energy, water, services. If we do not take the full cost of coal in the new energy plan, we’re going to have more expensive energy, people having access to water curtailed and water being damaged. We are going to have a problem that will disrupt society in the very near future.”

Taking the long view on energy’s water usage

The campaign, while specific to South Africa, raises a problem that needs to be addressed by the industry as a whole. In the UK, Birmingham Centre for Energy storage research fellow Daniel Murrant published a paper on the use of water in the UK’s thermal electricity generation, saying rising water and energy consumption will pose a severe threat if measures are not taken to move away from coal-based power.

“Coal is the second greatest water consumer after nuclear,” says Murrant. “In a heavily climate change-affected world, there will come a point where there just isn’t enough water. If a short-view approach is taken by governments, and we get to a point where there’s no water, they will just go to extreme lengths to get it.

“Alternatively, plants can turn to air cooling, but it would prove an economic issue as it’s a far more expensive system, and that cost would get passed on to the consumer. In the UK, energy accounts for about 2% – 4% of our GDP, which may sound small but it is noticeable. So if you’re putting the cost of the energy system up, you’re making a noticeable impact to the economy as a whole.”

Murrant concludes that the only real options are to move to the coast for a more reliable water supply, and try to mitigate environmental damages, or to switch to renewable energy sources. The latter option comes with the necessity to develop energy storage, as intermittency issues with renewable sources mean fossil fuels are still used to make up the difference during calm or overcast days.

“Once we have affordable batteries,” Murrant says, “that’s when we’ll see a reduction in the demand for water.”

https://www.power-technology.com/features/thirsty-business-factoring-water-true-cost-coal/