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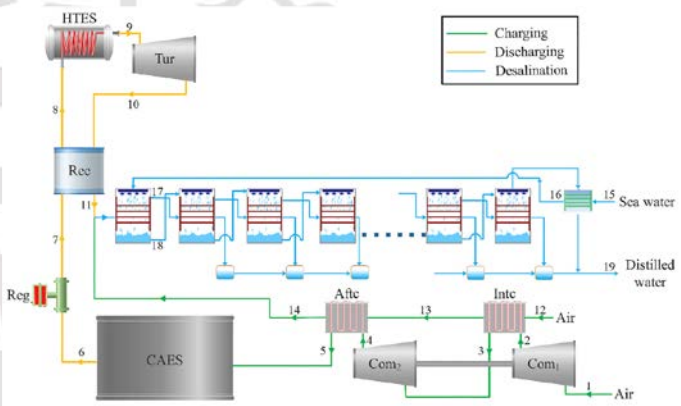

GREENER ENERGY, DRINKABLE WATER

Amirreza Razmi, M. Soltani, Mohammed Tayefeh, M. Torabi, M.B. Dusseault

Call it a double win. WISE researcher Maurice Dusseault and his Iranian collaborators have proposed a system that tackles two global imperatives: cutting carbon emissions and addressing water shortages at the same time.

Renewables like wind and solar offer green sources of electricity. But to be viable on a large scale, we need a way to store excess energy when production is high and demand is low. To achieve this, Dusseault's colleagues in Iran (Dr. Madjid Soltani, the second author, is a WISE Member and an Adjunct Professor at Waterloo) suggest using compressed air energy storage (CAES). This grid-scale solution uses surplus energy to compress air. When energy demand exceeds supply, the air can be used to drive electricity turbines.

Compressing air creates heat, and that's where the second part of this hybrid system comes in. In hot, dry climates like Iran's, potable water is a scarce resource. That's why the Iranian researchers proposed to couple the CAES with a multi-effect desalination system. The desalination process takes advantage of waste heat from the CAES system to remove salt from seawater through successive stages of evaporation and condensation.

According to their calculations, this combination could produce 38 kilograms of potable water per second when the CAES system is storing surplus energy. During periods of peak electricity demand, releasing the compressed air can generate 80 megawatts of electricity and 62.5 kilograms of potable water a second.

When the researchers compared energy stored to energy retrieved, the efficiency was 69.9 per cent. Meanwhile, the desalination process boasted a ratio of distilled water production to energy consumption of 9.47.

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Source: Razmi, A., Soltani, M., Tayefeh, M., Torabi, M., & Dusseault, M. (2019). Thermodynamic analysis of compressed air energy storage (CAES) hybridized with a multi-effect desalination (MED) system. *Energy Conversion and Management*, 199, 112047.

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