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Initiatives of the petroleum sector for efficient water management to enhance water sector climate resilience in Bahrain

Hussain Makki

National Oil and Gas Authority, Kingdom of Bahrain, email: hssn_makki@yahoo.com

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The water sector of the Kingdom of Bahrain, a Small Island Developing State, is severely threatened by multiple climate change impacts and a growing population. The main climate change threats are (i) sea level rise causing saline intrusion into aquifers; (ii) rising temperatures and greater intensity of rainfall causing reduced rates of aquifer recharge and (iii) rising temperatures causing increase in water demand across all sectors. In combination, these threats are likely to reduce Bahrain's freshwater supplies by at least 50 to 100 million m^3 of water per year in the short term.

Securing water and energy needs represents a critical issue, which has not yet received the attention that it merits. Energy production consumes significant amounts of water; providing water, in turn, consumes energy. In Bahrain like other countries in the region, confronting the issues of water scarcity and the increasing demand on energy to realize sustainable development plans represents a challenge that needs to be tackled through an integrated set of wise energy and water policy decisions.

Focusing on using efficient technologies in relevance to water usage in the production process of energy is an important issue. In the oil and gas sector for example, water is used in upstream oil and gas exploration and production for purposes such as injection water for wells and to assist in the recovery of crude oil and gas. In the process of electricity generation, water is essential for the production of all conventional fuels, where it is needed as part of almost every step in the production processes. It is noted that raw water usage for cooling in various fossil fuel-powered power plants constitutes around 79%–99% of total water usage; the remaining water is used for applications such as ash and ling, in the humidifier and condenser and in flue-gas desulfurization (FGD) at combustion-steam plants. Consequently, due considerations have to be given for improving cooling process to make the electricity production more water efficient.

Thus, Bahrain petroleum sector assessed all available options to use water and treated wastewater efficiently and has started executing some water projects such as construct a 110-ha wetland to replace the mechanical and chemical treatment processes that are currently being used to treat ~80,000 m^3 of produced water per day. The system will reduce the oil in water (OiW) concentration of the produced water from ~500 ppm to under 5 ppm. The improved quality of the treated water and absence of potentially harmful added chemicals will make the water treated in the wetland suitable for managed aquifer recharge. While there will be some loss as a result of evapotranspiration, a substantial proportion of the water entering the wetland will be available for injection into the Rus-UER aquifer after it leaves the wetland. The quantity of water treated through the wetland will vary by season, ranging from 62,000 m^3 per day in summer (April to October) to 72,000 m^3 per day in winter (November to March), and totaling 24.5 million m^3 annually. 80%–100% of the treated water will be injected into the Rus-UER aquifer to mitigate the extraction impacts of the Abu-Jarjur Reverse Osmosis Desalination Plant. This project will enhance directly the climate resilience of water resources in Bahrain.

This paper will shed light on assessment outcomes and sector project including wetland, planting mangrove using STP water, and other related projects.

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