



Review

A Review of the Water and Energy Sectors and the Use of a Nexus Approach in Abu Dhabi

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Abstract: Rapid population increase coupled with urbanization and industrialization has resulted in shortages of water in the Middle East. This situation is further exacerbated by global climate change due to greenhouse gas emissions. Recent research advocates that solutions to the global water security and scarcity crisis must involve water–energy nexus approaches. This means adopting policies and strategies that harmonize these inter-related sectors to minimize environmental impact while maximizing human benefit. In the case of Abu Dhabi, when designing and locating oil/gas refineries and associated power generation facilities, previous relevant decisions were based on simple economic and geographical grounds, such as nearness to oil rigs, pipelines, existing industries and port facilities, *etc.* The subsequent design and location of water abstraction and treatment works operated by the waste heat from these refining and/or power generation processes was catered for as an afterthought, meaning that there is now a mismatch between the water and energy supplies and demands. This review study was carried out to show how Abu Dhabi is trying now to integrate its water–energy sectors using a nexus approach so that future water/power infrastructure is designed optimally and operated in harmony, especially in regard to future demand. Based upon this review work, some recommendations are made for designers and policy makers alike to bolster the nexus approach that Abu Dhabi is pursuing.

Keywords: water–energy nexus; cogeneration; desalination

1. Introduction

Rapid global population increase coupled with urbanization and industrialization has resulted in the deterioration of water quality and shortages of fresh water supplies, especially in arid regions such as the Middle East [1], of which the United Arab Emirates (UAE) is a part. This situation is further exacerbated by global and regional climate change due to green house gas emissions [2]. Recent research now advocates that any solution to the global water security and scarcity crisis must involve a water–energy nexus approach [3]. This means adopting policies, strategies and key action plans that harmonize these inter-related sectors to minimize environmental impacts while maximizing human benefit [4,5].

For instance, in the case of Abu Dhabi in UAE, previous combined policy/strategy regarding water–energy linkages largely focused on obvious cogeneration issues [6]. Thus, when an oil/gas refinery's location was selected, it was based largely on economic and geographical issues, such as nearness to oil rigs, oil/gas pipelines, existing population centers and industries, port facilities,