Executive Summary

Energy Efficiency in Water Pumping in Jordan

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The German Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU) started in 2008 the International Climate Initiative (ICI) to support reducing greenhouse gas emissions. "Improvement of Energy Efficiency (IEE)" of Water Authority of Jordan (WAJ) is a first project under the ICI; it is implemented by the Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) with WAJ and the Performance Monitoring Unit.

Sustainable energy supply is a challenge in Jordan. Water pumping consumes 14% of electricity supply. High pumping inefficiency results in high costs and increased CO\textsubscript{2} emissions. Therefore, an eco-efficient and sustainable model for water pumping is crucial.

A step-wise approach was followed in assessing and culturing energy efficiency practices. After an initial audit in middle governorates showing promising energy saving potentials, a county wide assessment was done covering major pumping stations. Pumps performance and their electro-mechanical aspects were investigated. Water flow, pressure and electricity consumption were measured, as was the system performance. Eco-efficiency benefits were estimated assuming the use of improved technology and enhanced operation and maintenance. Technical measures were developed as well as institutional concepts and respective contracts to support implementing the measures sustainably; such as via energy service performance contracting models with the private sector investing in and operating the pumps, and sharing benefits. Pilot projects were implemented; the first was in Baqourieh pumping station in Al Salt in 2010 and the most recent is the project in Wala/Lib station in Madaba in 2014.

The assessment revealed that the annual energy saving potential from all the investigated pumping facilities (10 well fields and 15 pumping stations) would reach to 42'100 MWh (33.5% reduction), equivalent to 3.3 million Euro (based on 2013 electricity tariff). The saved power will result in reducing CO\textsubscript{2} emissions by 30,637 t/y. Around 1/3 of the savings can be obtained from 10 well-field pumping stations, while 2/3 of savings from other 15 network pumping stations.

The pilot in energy efficiency in Baqourieh was accomplished by WAJ and in partnership with Wilo, a German pumps manufacturer. The activity resulted in an average of 33.5% reduction in specific energy consumption; saving 1.5 GWh and 1100t CO\textsubscript{2} annually. The Wala / Lib pumping station project involves WAJ / Miyahuna (water utility) and an Energy Service Company (comprising an engineering consultant (Engicon) and Wilo) who is taking the responsibility of operating the stations for 5 years. The investment in the pilot project is 726'426 EUR (GIZ contribution: 24%) including 8 new high quality pumps to improve the specific energy consumption from 1.02 to 0.90 (kWh/m\textsuperscript{3}) in Wala and from 1.1 to 0.82 (kWh/m\textsuperscript{3}) in Lib. At an average of 9 Mm\textsuperscript{3}/y of pumped water and electricity tariff (0.078 EUR/kWh, in 2013), the shared annual savings would reach to (280’800) EUR/y, thus the project simple payback period is 2.6 years. The expected reduction in CO\textsubscript{2} emissions is 2’500 t CO\textsubscript{2} /y.

The outcomes demonstrate a triple win case. The savings from improved energy efficiency are shared; WAJ via the water utilities can obtain new infrastructure for water pumping together with optimized operation for a long term (due to reductions in operational costs and down time); and reduced carbon footprint of the water supply sector can be ensured.

The sustainability of energy efficiency projects in the water sector can be assured by having high quality equipment and adequate operation and maintenance. Private sector partnership via performance based contracts is crucial.