

## Arsenic remediation in Bangladesh

*Scarab Development AB has together with the Royal Institute of Technology, Stockholm, Sweden, developed systems for polygeneration.*

*The aim is to start commercial activities that combine the generation of electricity with purification of water. The system will make electricity from sustainable fuels such as Biomass, Biogas and Solar and as a by-product produce absolutely pure water. The aim for this project is to use the systems for purification of well waters containing arsenic*

In 1995, Scarab was asked if our new technology could separate arsenic from water. We tested water spiked with water at Karolinska Institute in Stockholm and removed all arsenic. After that we sent test equipment to Dhaka and researchers at BUET tested actual well water containing arsenic with the same successful result. These results were documented in a Master of Science Thesis, *Membrane Distillation Process for Pure Water and Removal of Arsenic* by Ashiq Moinul Islam, 2004.

In the meantime we also continued work on designing an ecologically sustainable and technically well designed system for treatment. In order to also make it economically viable it was developed as a polygeneration system to produce both pure water and electricity and also other services from the same input of fuel. These developments are documented in a Master of Science Thesis by Ershad Ullah Khan in 2007, *Biogas driven Stirling engine micropower generation and integrated membrane distillation process for arsenic removal.*

While work in improving the design of the equipment continued at the Royal Institute of Technology, the technology itself was verified in other research project to remove other contaminants from water such as salt water intrusion, treatment of desalination brine (concentrate), waste from power plants (flue-gas condensate), textile mill effluents and pharmaceuticals and nanoparticles.

Finally a grant from the Swedish international development cooperation agency (Sida) enabled the Royal Institute to execute a field study to model the social and financial conditions for launching the polygeneration technology. This study resulted in a report to Sida, *Biogas based polygeneration for rural development in Bangladesh*, February 2015.

At the same time Sida ordered a study performed by Swedish Institute of Public Administration (SIPU International) in consortium with Orgut and Adam Smith International with the title: *Influencing results in four target areas of Sweden's development co-operation with Bangladesh: Opportunities for private sector collaboration.* This study strongly advocates the Scarab arsenic project.

Based on these results, a subsidiary of Scarab, HVR Water Purification AB, has proposed a plan for demonstration of four biogas polygeneration systems in the field: *Demonstration phase for biogas based polygeneration for rural development in Bangladesh*, October 2015. The proposed budget for the three year demonstration program is 3.5 M€.

Scarab has presented the demonstration proposal to the Swedish Embassy in Dhaka. The Embassy has approved the project but Sida does not have a call for this project at the moment and a decision to finance has to be taken higher up at a political level.

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Scarab's ambition is to enable supply of electricity, healthy drinking water and food to people who are lacking in these essential commodities. This will be done by designing affordable polygeneration facilities. The design and development work is financed by Scarab's other activities in commercial industrial projects. The polygeneration facilities themselves must however be designed in such a way that they can be financed by the beneficiaries themselves and not depend on charity.