

A stand alone complex for the production of water, food, electrical power and salts for the sustainable development of small communities in remote areas

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Abstract

The objective of this paper is to present a specific case study example of a pilot autonomous desalination system concept from Egypt that will be implemented in line with the ADIRA project. After a short introduction into ADIRA and the tackled problems a detailed description of the stand alone system complex follows. The pilot system will be installed in a village on the North west coast of Egypt helping a small community to overcome water & energy shortage. The paper will describe the technologies used and expected socio-technical and socio-economic impacts.

Keywords: Stand-alone desalination systems; PV; Wind mill; Solar stills; Rural water supply; Renewable energy

1. Introduction

Fresh water shortage threatens a large number of the world population and make water potentially a critical matter since it has no viable substitution. According to a recent report of the International Atomic Energy Agency (IAEA), estimated 1.1 billion people have no access to safe drinking water and more than 5 million die from water borne

diseases each year. Provisions are no better even for the future. This crisis is mainly due to the mismanagement of existing water resources, population growth, and continuous climatic changes. It is, therefore necessary that sincere efforts be made to face the looming water crisis and conserve shrinking water supply amid the rising demand.

Mainly the rural population suffers from a shortage of drinking water. Especially in remote areas, the infrastructure for water and

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energy is poorly developed. Besides the lack of water, the content of total dissolved solids in the water that's available in these areas is often too high. Therefore it is not suitable for human consumption. In regions without access to the electricity grid, this lack of drinkable water often corresponds with high availability of Renewable Energy (RE) such as solar irradiation and wind speed. Hence it is a good match to use renewable energy as the driving force for water desalination and treatment systems. It is important to mention that using renewable energy sources to feed different systems in these rural areas will help to maintain a clean and healthy environment for the population. In order to gain a wide and profound knowledge of the application of small-scale desalination units powered by renewable energies under real working conditions, it is essential to move out of the laboratories and to study real projects in the field. This is the central approach of ADIRA.

2. ADIRA project

ADIRA (Autonomous Desalination system concepts for sea water and brackish water in rural areas with renewable energies - potentials, technologies, field experience, socio-technical and socio-economic impacts) aims to develop suitable concepts for providing a fresh water supply in rural areas using sea or brackish water as a source. The focus of this project is on units powered by renewable energy supply systems with fresh water output in the range of 100 l/d to 10 m³/d. Instead of developing new desalination technologies, existing concepts from various suppliers are adapted for the use with renewable energies. Various different field installations in the countries involved (Morocco, Egypt, Jordan, Cyprus and Turkey) are planned. The experience and knowledge gained from the intensive monitoring of the implemented

technologies and from the detailed evaluation of the potentials of the regions and countries allow that small scale desalination technology becomes a reliable solution for water provision. The project follows an interdisciplinary and socio-technical approach, taking into account not just technical, but also legal, social, economic and organisational issues.

In the future the following achievements of ADIRA will be available to support everybody working in the field of desalination:

- Full description of 10–15 different small-scale desalination installations including a monitoring system.
- Data of this monitoring system are available on the ADIRA web-site (www.adira.info).
- Detailed business plans for each installation to guarantee the sustainability.
- Installation/operation/maintenance guidelines.
- Monitoring guidelines.
- Decision Support Tool.
- Data base (with data from market and country surveys).
- Proposal to the national and regional government on how to support the rural water supply infrastructure (master plans).
- Workshop for stakeholders in each participating country.
- Education and training of the users.
- Handbook for users, decision makers and installers.

The project ADIRA takes about four years and will presumably end in 2007. Therefore the expected results listed above have mainly to be finalised and are still in process. However, to demonstrate a first tangible result of ADIRA the ADS concept developed by the Egyptian Energy & Water Association (EWE) is presented in the next paragraphs.

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