Solar-powered water pumping systems: Developing a course for technicians in Ghana

Degree programme: Master of Science in Engineering | Specialisation: Energy and Environment
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As the emerging market for solar-powered water pumps grows, a need for trained technicians arises. This master thesis addresses the issue by creating a course covering the skillsets required to plan, install, operate, maintain, inspect, troubleshoot and repair solar-powered water pumping systems.

Motivation

Solar-powered water pumps offer a promising alternative to fossil-fuel and grid-powered water pumps in locations where water distribution and grid electricity are a challenge. As these systems gain popularity with small-scale farmers and are implemented as solutions for communal water supply, a lack of trained technicians is becoming evident. To address this shortfall and avoid incorrectly executed installations in the field, a course aimed to train technicians is needed.

Objective and development

This master thesis covers the development and implementation of a course for solar-powered water pumping systems. The focus lies on systems suitable for small-scale farmers and for rural water supply with a power range of 0.5 to 2 HP. This course is designed to help technicians learn all the skills needed to plan, install, operate, maintain, inspect, troubleshoot and repair solar-powered water pumping systems. It aims to provide technicians with a broad foundational knowledge of the different types of solar water pumps and their various use cases, their components and the external equipment they use and includes teaching the underlying physics that determine how hydraulic systems behave.

Technicians are also schooled on client instruction to ensure the system's longevity through proper use and maintenance by the end clients.
The course will be carried out once and then handed over to a training center that can conduct the course on its own to enhance autonomy on a local level.
The specific know-how is contributed by the BFH-spinoff ennos ag. The company has several years of experience in the field through the development, sale and after-sales support of their own surface solar water pump, the sunlight pump.

Results and outlook

The course was carried out in a technical training center in Ashaiman, Ghana. The technicians that took part in the course had a professional background as solar installation technicians. They successfully completed the two-week course and have shown competency in theory and practice in a final exam.
In parallel to the course, the content was filmed and will be part of an online learning platform that provides a learning resource for technicians unable to attend the course in person.
The project included training the local teachers and equipping their training center with a designated course book, a lesson plan, as well as the required materials and tools needed for them to offer the course on their own in future installments.

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Students installing a solar water pump for residential use