SOLAR MOBILITY IN THE ANDEAN HIGHLANDS OF ARGENTINA

PROJECT'S AIM: TESTING SOLAR-POWERED ELECTRIC BIKES AS MOBILITY OPTIONS FOR SHORT AND MEDIUM DISTANCES IN THE ANDEAN HIGHLANDS OF ARGENTINA

Location:
San Salvador de Jujuy and Misa Rumi
Jujuy, Argentina

Technology:
Solar Photovoltaic

Costs:
Total: € 73,850
WISIONS financial support: € 55,000

Partners Involved:
Fundación EcoAndina
(www.ecoandina.org)

OekoAndina e.V.
(www.oekoandina.de)

Duration:
July 2014 to December 2015

Picture: EcoAndina

This project tested the potential of solar-powered electric bikes to meet the demand for mobility in two areas of north-western Argentina: the Puna region (Andean highlands, 3,700 meters above sea-level) and the capital of the Jujuy province, San Salvador. Mobility in this region is limited due inadequate public transport, fuel shortages and high costs of fuel. In addition, remote villages suffer from a deficient road network, and even short distances require significant time to cover, and result in high costs for local communities.

As part of this project, fifteen e-bikes were introduced to the participating communities and tested by the local population for use in short and medium distances. The energy to recharge the e-bikes' batteries was provided by six mobile solar PV power stations.

The implementing organization, Fundación EcoAndina, has over 20 years of experience in introducing solar power concepts to the region, having supported over a dozen Puna communities via its Andean Solar Villages initiative. The present project extends the Andean Solar Village concept to solar mobility.

TECHNOLOGY, OPERATIONS & MAINTENANCE

In a first step, EcoAndina technicians developed a prototype series of e-bikes based on adapted second hand mountain bikes, 350W electric motors and lead-acid batteries. Field tests showed frequent failures of these e-bikes, and it was agreed to develop a new batch of prototypes, this time based on 500W motors, lighter Lithium batteries and newly bought and specially designed bike frames.

A total of 15 e-bikes of this more sturdy model were assembled and tested by staff to ensure that they were suitable for use in rural areas and that their maintenance was simple. The e-bikes were then handed over to various organisations in three different areas of the Jujuy Province: 8 e-bikes are operating in the Puna area where they are used by local indigenous people in the villages of Misa Rumi, Paicone and Cienega. One e-bike is operating at the traffic police department in the town of Humahuaca. Six e-bikes are in use in the urban area of the capital of the province San Salvador and its surroundings.

Mobility needs were evaluated prior to the design phase. The final e-bike prototype can cover 30 km between recharging, which is the maximum daily distance that inhabitants of the rural Puna area need to cover to carry out economic activities such as farming, construction and gold-washing.

Five German-manufactured mobile solar battery charging stations were installed in accessible locations, each one consisting of a regulation unit connected to a 65 Watt PV panel. A further charging station was

developed in-house, using locally available components.

The technological improvements continued during the project duration. The project's experiences in the field were shared with electric engineers, e-bike providers in Buenos Aires, as well as local bicycle shops. As a result, the quality of the components and overall performance was improved, and a near-commercial product is now available.

DELIVERY MODEL & FINANCIAL MANAGEMENT

In this prototype development and testing project, the e-bikes were lent to the users at no cost. Despite the potential fast pay-back of e-bikes, their high initial investment costs, equivalent of four times a monthly minimum wage, make them unaffordable in the rural communities. Lowering the costs via large-scale production, or facilitating access to micro-credits, are some of the ways forward that EcoAndina is currently investigating.

In order to ensure the long-term sustainability of the project, a stock of spare parts was prepared, and five men from the participating communities were trained in e-bike operation and maintenance. Over the course of the project, one of these trainees emerged as a committed technician, who wil be employed in the follow up project.

ENVIRONMENTAL ISSUES

Solar mobility is a step on the way to replacing the use of fossil fuels in the Puna region. With abundant solar energy and Lithium resources, EcoAndina is particularly interested in combining the solar mobility and other solar energy concepts with the development of the local Lithium extraction and processing industry, which is still in its beginnings in the Jujuy Province. Set to be the future of energy storage for small-scale renewable systems, Lithium batteries offer better performance and much lower environmental costs than traditional lead-acid batteries.

SOCIAL ISSUES

E-mobility has the potential for improving the living conditions in the Andean highlands, where living standards of families are considerably lower than the argentinian average.

The e-bikes received very good acceptance among users, and a broad range of user types can be found. However, a marked gender bias was also observed: men were far more likely than women to take a ride on an e-bike when unaccompanied. EcoAndina aims to work on this aspect in the project's follow-up, by using bike frames of different sizes, and by targeting communication to girls and women.

RESULTS & IMPACT

The major impact of this project has been the breakthrough of introducing an innovative technology into a challenging environment. On this basis, a local entrepreneur, in cooperation with EcoAndina, has applied for finance to support the commercial production of the e-bikes. EcoAndina itself is planning on follow-up projects that can succeed in improving the e-bikes performance and in lowering their cost.

REPLICABILITY

The project team sees a great potential for solar mobility in Argentina in general and, in particular, in the Andean area. Moreover, a vision has been brought forward for pairing the development of the solar and Lithium extraction industries in the Puna region.

The project strove to disseminate the benefits of solar-powered e-mobility options in the target region. The bulk of dissemination took place via the users themselves, who acted as "multiplicators". Furthermore, regional and national radio and TV broadcasted the project, and active dissemination events took place in the province of Jujuy, at national level, and at the 2015 Argentina-Bolivia border fair, where the Solar Mobility concept reached the communities of the neighbouring country. All in all, the e-bikes have been presented to over 500 people, and a hundred of them experienced an e-bike ride, including a number of decision-makers (e.g. local mayors, members of parliament).

LESSONS LEARNED

Valuable lessons can be taken away from this project for use in similar initiatives. For example, trial and error showed that it was more expensive to adapt second hand bikes than to work with newly bought components. On the other hand, it was learnt that substantial research, development and demonstration efforts are required to adapt e-bike technology to new areas, more so if the e-bikes are to be used under hard conditions such as the high-mountain tracks in the Andes, and if locally available components are to be used.

A key success factor in this project was the fact that it engaged villages of the Puna region who were already familiar with EcoAndina and their Andean Solar Villages concept. The availability of existing knowledge and infrastructure to maintain and run the solar recharging stations were key for introducing the solar mobility concept to the rural context.

Source: Final Report submitted to WISIONS by EcoAndina in January 2016

Picture: EcoAndina