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Power to the people in Southern Tanzania

Electricity: the developed world takes it for granted but it is a luxury to many parts of the developing world. In developed countries, electricity is considered the backbone of the economy and it is generally agreed that providing access to electricity is a key element in the fight against poverty and an enabler of social and economic development.

Why is then that an estimated 1.6 billion people, a quarter of the world's population, have no access to electricity? And in the absence of any new policies, it is estimated that by 2030, 1.4 billion people will still lack access! The reason for this situation is complex and involves energy policies, technological, economical, and institutional aspects.

Across the world, those with no access to modern energy are cooking on wood, dung and charcoal. The results of this, both physically and environmentally, are devastating. Providing power to the poor without destroying the planet has become one of the biggest challenges of modern times. ABB has, in collaboration with UN organizations, governmental and non-governmental organizations (NGOs), industry partners and customers, taken on part of this challenge. Through its *Access to Electricity* initiative ABB is developing and implementing business models for the electrification and sustainable development of poor rural and semi-urban societies.

The first result of this project can be seen in the remote village of Ngarambe just outside the Selous game reserve in southern Tanzania. Inaugurated in June 2004, the effect that the power system already has on this small community is truly amazing.

It is hard for many of us to imagine what life would be like without electricity. Yet, in this day and age almost one-quarter of the world's population knows exactly what life is like without modern energy.

The harsh reality is that regions and communities without electricity are often areas that experience extreme poverty, limited freedom of choice and opportunities, high unemployment rates, insufficient health and education services, lack of basic infrastructure and an unsustainable use of the environment.

It is generally agreed that providing access to electricity is a key element in fighting such problems. But for those living on less than US$ 2 a day, paying for the electricity desperately needed for cooking, heating, agriculture, lighting for education and pumps for clean water is a real problem. It then follows that women and children must spend hours each day collecting heating fuel, which in turn destroys tree cover. Indoor air pollution, due to smoke from cooking fires, causes many deaths every year, mostly in rural areas.

Of the 1.6 billion people around the world who do not have access to electricity, more than half a billion are in India and another half a billion live in sub-Saharan Africa. Poverty, abandoned energy policies and economics are largely to blame for these appalling figures.

A vicious circle

In areas with poorly developed financial markets and low domestic savings, raising enough capital for power sector investments is difficult. There are other problems as well:

- Exchange rate risks limit the inflow of external capital.
- Rural electricity schemes are usually more costly to implement than urban or semi-urban schemes.
- Often the technical standards issued by authorities in developing countries are similar to those in European or other developed countries. This then means that they are not adjusted to local conditions, thus leading to unnecessarily high electrification costs.
- Misdirected subsidy policies.
- Tariffs that do not cover costs.
- Non-payment.
- Political interference.
- The distortion of commercial incentives.

In many cases, the policy environment and institutional structure in decentralized rural settings is not conducive to private investment. As a result, demand greatly exceeds supply and the electrification rates remain extremely low in many developing countries.

Electricity – a key to development

Electricity in the developed and many parts of the developing world has helped increase productivity and incomes as well as contributing enormously to local economic growth. Modern energy services not only free women and children from the time-consuming collection of traditional woodfuel for cooking and heating, but it also reduces respiratory illnesses caused by the indoor air pollution from cooking fires. Electricity makes streets and neighborhoods safer for women after dark, and it extends learning time for children.

Access to Electricity is an effort by ABB to develop and implement business models for the electrification of rural and semi-urban societies.

The *Access to Electricity* initiative

How does the world break the vicious circle of poverty without, at the same time, plundering the land and making the greenhouse effect worse?

As a company, ABB recognizes that sustainable development and electrification go hand in hand. In fact, sustainability is at the heart of the group's business. ABB develops and participates in initiatives that help improve the situation of those communities in developing regions that are left on the margins of sustainable development efforts.

One such initiative, known as *Access to Electricity*, is changing the way of life of one community in Southern Tanzania.

Access to Electricity is an effort by ABB to develop and implement business models for the electrification of rural and semi-urban societies.

Using its extensive commercial and technical expertise in electrical engineering, the company, in collaboration with: UN, governmental and non-governmental organizations; industry partners; specialists in infrastructure development (to achieve a sustainable rural transformation); and customers, aims at better meeting the needs of low-income populations in developing countries by providing a basis for economic growth and social development.

As part of this overall aim, *Access to Electricity* focuses on the implementation of local, bottom-up and low cost electrification projects with particular emphasis on:

- The productive use of electricity.
- The establishment of sustainable power systems that can bear its own operating and maintenance costs.

The Access to Electricity project is currently part of ABB's Corporate Social Responsibility program. The project is conducted in close collaboration with ABB's business units and it is a complementary approach to the company's proven and established business appli-

cations and offerings in developing countries. It strengthens ABB's ability to meet the needs on low-income markets, and may become a substantial part of ABB's regular business.

Challenges facing rural electrification

Technical

Providing electricity to those in need, however, is not as easy as one might think. Certain technical challenges must first be overcome in these under developed areas including:

- Adapting technical standards and technology to low electrical loads.
- Adjusting to small and intermittent consumption patterns.
- Overcoming low affordability.

The solution may therefore require simple and more robust technology with the ability to withstand severe climatic conditions, be resistant to vandalism and theft as well as being simple to operate and maintain. Costs can be cut, for instance, by designing one or two phase systems and by employing innovative metering systems.

Rural electrification schemes often employ different technologies for different types of settlements in a particular region. Grid extensions or stand-alone mini grids, fuelled for example by diesel or mini/micro hydro, are the preferred methods for villages and larger communities. For small, isolated settlements with low power demands, photovoltaic installations could be employed. Other renewable energy technologies like wind and biomass could also be useful in specific off-grid applications.

Local shops are staying open longer in Ngarambe thanks to the extra four hours of power provided daily by the generator.

ABB offers a wide range of products and services for all kinds of applications in rural electrification. This includes grid extension with subtransmission and distribution systems, substations, materials and equipment, engineering and financing, erection, testing and commissioning. The company also provides a broad range of special low voltage products adapted for rural conditions including:

- Load limiters that allow fixed tariff billing with limited consumption.
- Miniature circuit breakers for pre-paid metering.
- Antitheft systems.
- Special enclosures to protect equipment in harsh environments.

Socio-economic aspects

Another key element is the socio-economic analysis of what revenues can be generated from small and medium size industrial electrification projects and what capital and maintenance costs the operator can bear on a sustained basis, including investment subsidies and development assistance.

Socio-economic studies among rural households, and especially rural enterprises, reveal a willingness to pay for access to electricity if it is reasonably reliable and 24-hour services were available. Rural power demand is initially very low, for example: less than 200 W for rural households; 2–4 kW for many small and medium sized enterprises and shops; 3–5 kW for health clinics and schools; and 5–20 kW for a maize-mill and water irrigation system.

Looking further than just the pure electrification of a customer site, collaboration between NGOs and development assistance organizations can also increase the socio-economic output of a project.

Joint efforts involving the customer's value chain and local society can help businesses to grow and become sustainable, resulting in social benefits for the entire community. Feasible projects include the supply of power (or strengthening of an existing power supply) to rural areas with growing industries such as tourism, mining, manufacturing and agriculture. Settlements and households in and around these areas may be connected at a low cost, thus helping to establish more enterprises and improve living conditions. This way, businesses can benefit from development assistance efforts, while development assistance efforts in a region may help lower the risk for new local business ventures.

A focus on human rights

In some of the least developed countries, the absence of sound governance systems at local and national level creates a difficult and insecure business environment. This and other difficulties, including ethnic conflicts and lack of democracy, account for some of the most serious obstructions to economic growth.

With its strong commitment to good corporate citizenship and zero tolerance with non-compliance in business ethics, ABB is recognized as a strong partner in both stable and difficult environments. Within *Access to Electricity*, the group pays special attention to human rights issues by applying the experience and measures developed within the Business Leaders' Initiative on Human Rights (BLIHR). The aim of BLIHR is to find practical ways of applying the aspirations of the Universal Declaration of Human Rights within a business context and to inspire other businesses to do likewise. Incidentally, ABB is one of the initiators of this three-year program.

Project preparations

ABB is evaluating projects in Tanzania, Uganda and Senegal, as well as planning projects in India and North Africa. In Tanzania, ABB collaborates with the UNDP and other partners to develop a series of projects for poor people with clear benefits for the recipients and reasonable conditions for the participants. This collaboration is part of the UN's Global Compact initiative known as *Growing Sustainable Business in the Least Developed Countries* which recommends that multinational companies play a greater role in the fight against poverty.

The development activities in the area have contributed to stopping the unsustainable use of wildlife and other natural resources around the village.

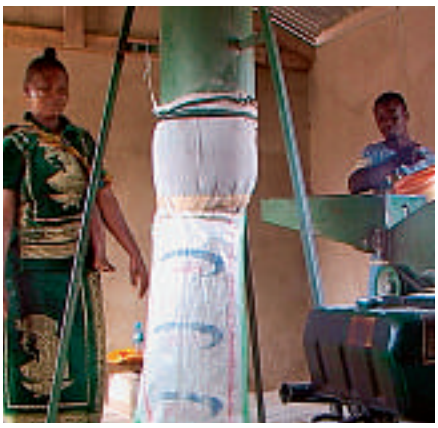
In Uganda, ABB is investigating opportunities in the newly-started *Energy for Rural Transformation* program. This program is financed by the World Bank and aims to step up rural access to electricity from 1% to 10% in ten years. In Senegal, the rural electrification authority has launched a similar electrification program with support from the World Bank. ABB is collaborating with EDF and look for joint opportunities.

Bringing light to the people of Ngarambe, Tanzania

As a first result of the *Access to Electricity* project, ABB has electrified the remote village of Ngarambe just outside the Selous game reserve in Southern Tanzania. The village, with around 275 homesteads and a population of about 1,800 people, supports itself through hunting and subsistence farming. The Selous Game Reserve covers an area the size of Switzerland and was established over a period of 40 years during the first half of the twentieth century.

The electrification project was carried out in partnership with the local community, the District Council and the global conservation organisation, WWF. The WWF is directly involved in development activities in the Selous Game Reserve and neighboring areas.

The development activities in the area have contributed to stopping the unsustainable use of wildlife and other natural resources around the village. The communities have started small household income generating groups, which are environmentally friendly and less dependent on wildlife as a source of income. Access to electrical power in



Ngarambe village increases productivity and enhances opportunities for employment and increased incomes.

Access to electricity has certainly made a difference to the lives of children of Ngarambe. Time devoted to study and learning has been greatly extended. In addition, the village school can now stay open in the evening, permitting extra classes as well as giving the teacher more lesson preparation time.

Health services have also improved. The village dispensary is open longer, allowing patients to be treated at night. It will soon be equipped with a refrigerator for the medicines, which will benefit the patients.

Small businesses along the main road have also been boosted, staying open longer in the evening: A local shop now provides cold drinks and a teashop attracts more customers because there is no longer the smell of kerosene.

The solution

The power system was designed after an assessment of available energy resources and consultations with the community and the District Council. In the first phase of the project, important buildings such as the school, the dispensary, the village government office and the mosque, were all prioritized to receive electricity. In addition, it was also decided to prioritize electrification of productive units, such as the market place, the business center and retail shops, because these can afford to pay for the electrical power.

Underground power lines have been laid so as not to disturb the wildlife in the area and electrical sockets have been installed in newly rebuilt brick walls. Power is supplied from a modern diesel generator, where retrofitted spark arrestors clean out emissions. The generator is equipped with a double skinned fuel tank and fuel leak detection system. Charging of costs is based on low-cost current limiters with an automatic reset and a fixed tariff system that allows easy collection of fees and encourages efficient use of energy. Two generator attendants from the village have been trained to operate and maintain the system.

An expansion of the project is being prepared, under which more houses will be connected to the grid. Wind measurements are being made in preparation for a planned windmill installation to supply Ngarambe and a neighboring village with renewable energy. This will reduce the dependence on diesel and turn the present generators into back-up power.

The village government, the District Council and WWF will monitor and analyze the response of the local community now that they have access to electricity before embarking on a larger renewable project.

WWF as a knowledge base

In general, the chances of success of a rural electrification project increase significantly if there is a certain level of development in the area and other development efforts are being made. With this in mind, the knowledge and experience of WWF was crucial to the success of the project in Ngarambe. Over many years, WWF has built up strong relations with the local communities and conducted development projects with the villagers and governmental institutions.

ABB and WWF are scaling up their collaboration and aim to provide electricity to some ten other rural villages around the Selous Game Reserve. ABB is carrying out inventories of the electricity needs and available energy resources in these villages. This work is being done in close collaboration with the villagers, the local government and other stakeholders to ensure local ownership, commitment and appropriate technical solutions.

Conclusion

The goal of reducing extreme poverty and hunger is a huge and complex challenge to the global community. Efforts are needed from many sectors of society both in the developing and in the developed world. Access to electricity is an important key to economic and social development and a vital component in reducing global poverty. In the *Access to Electricity* project, ABB takes on this challenge by contributing its technical and commercial expertise to develop and implement business models that facilitate electrification of low-income populations in developing countries. The public and private sectors need to establish a long-term collaboration to reduce risks and attract capital for investments in rural electrification. This is central in achieving a substantial scale-up of electrification in developing countries.

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