

# Spinning with the sun:

## Application of solar energy in rural garment manufacturing

### Background

The use of *charkhas* (manual spinning wheels) to produce hand-spun clothes (*khadi*) is common in rural India. Historically, the use of *charkhas* is associated with Mahatma Gandhi's vision of a self-reliant village economy. However, the use of hand-driven *charkhas* is slowly but steadily declining. Key factors in this development are the rise of new employment opportunities in other sectors offering better wages, competition from cheaper garments of high quality from local cotton mills, and the tedious physical drudgery associated with the use of traditional *charkhas*.

The **Mahatma Gandhi Institute for Rural Industrialization (MGIRI)** has designed a solar-powered *charkha* with the aim of reducing the spinners' physical drudgery, increasing the quantity of cloth output and thereby positively influencing livelihoods in rural communities. This briefing note aims at highlighting the potentials and challenges of integrating a technological innovation into an existing manufacturing value chain in rural India. Using the case of solar-powered *charkhas*, this note shares the lessons learned from a techno-economic assessment undertaken as part of the Indo-German Energy Programme (IGEN) in close collaboration with MGIRI.

### Mahatma Gandhi Institute for Rural Industrialization

The Mahatma Gandhi Institute for Rural Industrialization (MGIRI) is an autonomous institution under the Indian Ministry of Micro, Small and Medium Enterprises formed with the vision of accelerating the process of rural industrialization in the country. MGIRI is trying to address rural problems through the innovative use of technology. Details about the organization can be accessed at <http://www.mgiri.org/>.

<b>Project Name</b>	Indo-German Energy Programme – Renewable Energy Component (IGEN-RE)
<b>Commissioned by</b>	Federal Ministry for Economic Co-operation and Development (BMZ), Germany
<b>Country</b>	India
<b>Implementing agency</b>	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
<b>Cooperation partner</b>	Ministry of New and Renewable Energy (MNRE), Government of India
<b>Duration</b>	October 2010 - December 2014

### Integrating solar energy

MGIRI has been able to increase the energy efficiency of existing *charkhas* by integrating a DC motor that can be powered by solar photovoltaics (PV). The eight-spindle solar *charkha* designed by MGIRI consumes only 35–40 watts of power. The cost of a solar handloom unit including a solar PV panel, battery and circuit drive for an eight-spindle *charkha* is around INR 28,000. The output from a traditional handloom over 8 hours ranges from 20 to 30 hanks (1 hank = 1,000 m), while that from a solar-powered handloom using a solar *charkha* is around 40–50 hanks. Using a solar *charkha* allows weavers to earn more than traditional weavers and has reduced the physical drudgery substantially.

**Gandhi Gram Urja Vikas Sansthan**, a non-governmental organization based in the Wardha district of Maharashtra, is one of the institutions where the technology developed by MGIRI has been installed and piloted.





## Challenges for large-scale application

An in-depth assessment of the economic potential for large-scale application of solar spinning has highlighted a couple of challenges that still need to be addressed.

**Customizing the technology:** There is a mismatch between the characteristics (in particular size/capacity) of a technology required to run an economically viable business and the technology developed by MGIRI for the existing pilot project. Instead of an eight spindle solar *charkha*, local entrepreneurs have expressed the need for a 24-spindle *charkha* to make the system profitable. The required 24-spindle *charkha* is yet to be prototyped.

**Product positioning:** The Khadi Village Industries Commission (KVIC), the nodal institution in charge of promoting *khadi* garments, is currently not allowing clothes that involve solar technology in the production process to be classified as *khadi*. To allow for a premium price that would justify the investment in solar energy, solar garments would have to be positioned strategically as a desirable brand. Developing a new brand for solar garments would require sustained institutional support to generate consumer awareness in order to establish significant demand.

## Conclusion

Technological innovation in production processes is important and necessary to improve the efficiency of product value chains. However, integration of a technological innovation in a rural area

can only be sustainable if it caters to the specific needs and demands of the existing market players. Based on the present assessment of the feasibility of large-scale application of solar *charkhas*, the following conclusions can be drawn:

- To allow for large-scale application, the technological innovation must cater to and be designed for addressing the specific needs of the entrepreneurs who are supposed to use it. In this particular case, the size and capacity of the solar *charkhas* need to match the requirements of the existing garment entrepreneurs. It is important that MGIRI prototypes its design in close consultation with local garment manufacturers and should address their specific needs.
- Existing regulations are acting as a bottleneck to the integration of technical innovation. The regulations do not allow for the simple adoption of the end product (cloth prepared using a solar *charkha*) acceptable within the existing value chain. In the case of solar *charkhas*, higher production costs mean that the production output needs to be positioned as a premium product to be able to compete with similar existing products currently available in the market. KVIC, the regulatory institution for the hand-spun clothes sector, would therefore either need to include solar-spun clothes in their definition of *khadi* or create a new product category, such as 'solar garments', to allow for an economically viable business model.

**Study Context:** The Renewable Energy Component of the Indo-German Energy Programme is a bilateral technical cooperation measure between the German Federal Ministry for Economic Cooperation and Development (BMZ) and the Indian Ministry of New and Renewable Energy (MNRE). It aims at improving access to energy from renewable energy sources in rural areas of Bihar, West Bengal, Uttarakhand and Uttar Pradesh. GIZ supported a techno-economic study to explore the feasibility of rolling out the solar garment manufacturing unit and the acceptance of the technology within the local market. The study was conducted by MART. This note is a summary of the study findings.

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