



# Solar Powered Flour Mill Energy Storage Leh - Ladakh

*Ladakh Environmental Development Group and VNV Advisory*



## Scenario

Leh – Ladakh is one of the most remote regions in India. With the changing weather patterns the Ladakh region has been observing irregular rainfall and a high rate of glacier melting. Thus creating an opportunity to look for other sources to support the traditional way of living. The Ladakh Ecological Development Group (LEDeG), based out of Leh has developed the design for an efficient, and weather-based disaster resilient flour mill in the villages: **solar powered flour mill energy storage**. The deployment of this model in the villages in Leh-Ladakh is an example of developing local solutions as a part of climate adaptation.



This technology has been conceptualized to support the traditional flour mill, by changing the driving source of the mill from water to solar. An ingenious design which integrates the concept of **flywheel technology** in the system (grinding wheels are the flywheel), this model apart from being powered by solar energy will also be able to store energy when the mill is not in use for grinding purposes.

The ingenuity of this technology lies in the fact that the solar powered flour mill energy storage can be installed in ecosystems similar to the Leh-Ladakh region such as along the Himalayan range. This factor creates a **tremendous potential for this model to be scaled up** in a large way.



Traditional Flour Mills



## **Location:**

**Country:** India  
**State:** Jammu & Kashmir  
**Region:** Leh-Ladakh



*Traditional Flour Mills*

## Solar Powered Flour Mill Energy Storage

Problem Description	Proposed Solution (Solar Powered Flywheel Energy Storage)
Conventional grid powered flour mills have huge running cost.	Flywheel technology is an indigenous low cost design
Power Grid is either not available in all parts or is highly irregular	Ladakh has high solar power potential and the proposed design is integrated with a robust all weather SRM motor customized for energy storage
Present day mills use concrete grinding wheels which has led to the depletion of flour nutrient quality.	The proposed technology is been designed with a customizable RPM rate to retain the nutritional content of the flour (similar to the traditional flour mills).
Susceptible to natural disasters such as floods – as they are deployed close to a running waterbody	Does not have to be based next to a waterbody and will be able withstand weather based disasters
The mill that once started, runs continuously, and stops only when it needs maintenance.	The technology will be able to power households/community centres when the mill is not in use and since the grinding stone is mounted on air bearings, there will be low wear of the system

## What distinguishes the solar powered flour mill energy storage (flywheel) from a solar powered mill?

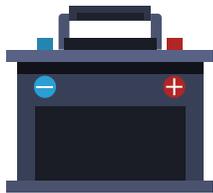
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- The gas lubricated bearings instead of conventional ball bearings have ultra-low friction – low wear, long life and an inherent capability to store energy without using batteries.
- The motor drive combination is bi-directional – meaning that the system can be used as a power storage device.
- The adverse ambient conditions have no theoretical implications on the performance of the system. This is a huge advantage over conventional Li-ion, lead acid based systems.
- All the important sub-components like gas bearings, power drive, boost-converter, motor/generator are being indigenously developed, bypassing dependency on another partner for high cost core technology.



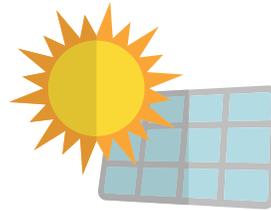
# Solar Powered Flour Mill Energy Storage - Benefits

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## STORAGE POTENTIAL

Flywheels address the issue of expensive energy storage – the excess energy can be fed into flywheels which will store it for periods ranging from minutes to hours and can power a household or a community centre nearby.



## EFFICIENT TECHNOLOGY

The flywheel technology is also superior in terms of efficiency – the grinding stone (as a flywheel) is mounted on low-friction bearings so that it does not lose as much energy to friction and air resistance as traditional flywheels would have done and, reduces the wear and tear of the model itself ensuring a lifespan of over 10 years.



## INNOVATIVE TECHNOLOGY

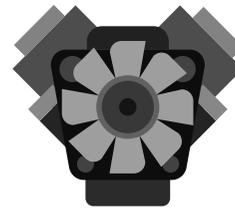
Solar is best suitable to the remote and open arid region of Leh-Ladakh, plus this model comes with a flywheel component where the wheel in itself being used as the flywheel – without any additional cost.

# Solar Powered Flour Mill Energy Storage - Benefits



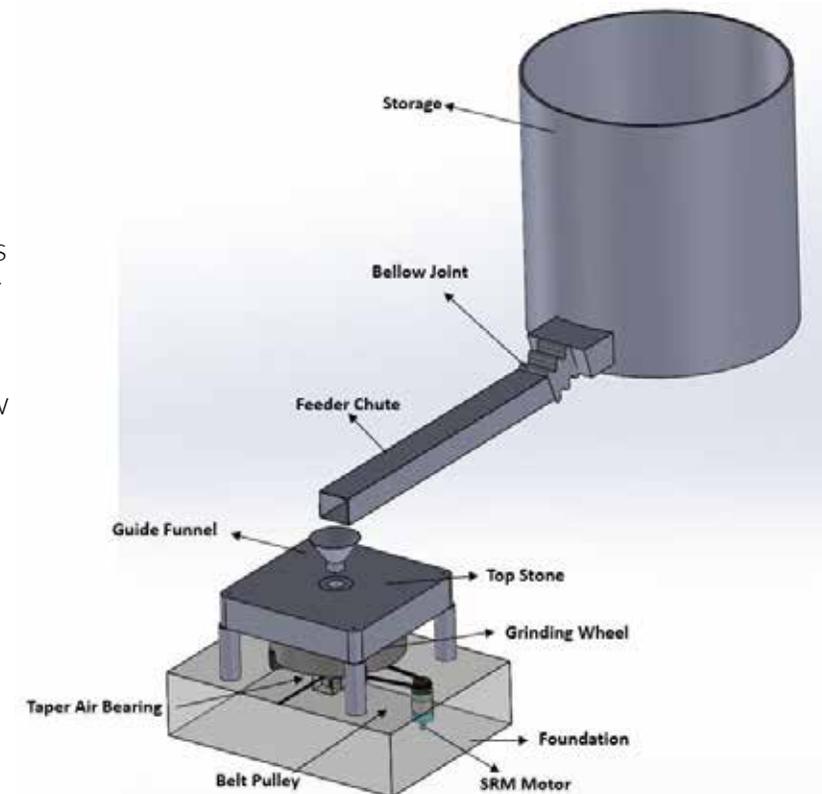
## NUTRIENT INTEGRITY

the flour mills powered by conventional power are run on a high RPM which reduces the nutritional value of the flour as the indigenous flour mills traditionally produce slightly coarse flour over the super fine flour produced by conventional grid powered flour mills.



## INDIGENOUS DESIGN

Switched Reluctance Motors (SRM), gas bearings, power drive, boost-converter have a simple and robust structure, generally suitable for high-speed applications. These components are low cost indigenous designs.



Solar powered flour mill with energy storage

## IMPLEMENTATION PARTNER: LADAKH ENVIRONMENTAL DEVELOPMENT GROUP

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Ladakh Ecological Development Group (LEDeG) has more than two and a half decade's experience of working with communities in Ladakh. The organisation has been working with the most needful populations in the remotest regions of Ladakh and has a well-developed network with various agencies governmental and non-governmental mainly focusing on Renewable Energy and Rural Livelihoods.





## VNV ADVISORY

VNV Advisory Services LLP has been at the forefront of working with climate change and livelihoods. Our decade-long experience has seen us develop low-carbon projects that support these communities in getting their basic needs while adapting to and mitigating the harsh impacts of climate change. We work in areas of clean cooking, social forestry, sustainable agriculture, rural energy access and many other related community based technologies. With support from over 40 NGOs and implementation partners, our work encompasses over 3 million rural households across the South Asian (India, Bangladesh, Nepal and Sri Lanka) region. We have also been able to engage with businesses to address issues of Social Responsibility, Environmental Sustainability and Carbon Neutrality.



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