Local SDGs on focussing Sustainable Solutions to Renewable Energy issues in the rural context of India

Technical session 1: Importance of clean and green Gram Panchayats

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Outline of the presentation

- Context setting
- Innovative technological applications
- Challenges
- Role of PRIs
- Suggestions

Context setting

- All the United Nations Member States adopted the 2030 Agenda for Sustainable Development in 2015.
- The three themes of SD – social, economic and environmental, have been divided into 17 Sustainable Development Goals and 169 targets therein, that provide the basis effective implementation of policy initiatives by various stakeholders.
- Sustainability as a way of life comes naturally to India, for way back much before the term SD was coined, a half-naked fakir in this country spoke about ***Antodaya*** leading ***Sarvodaya*** and even much more before as enshrined in ancient Indian philosophy and its practices.
- India is strongly committed to implement the SDGs. The tag line ***Sabka Saath, Sabka Vikas*** captures the essence of all the SDGs and shows the will and intent of the Government of India. Most of flagships programmes of Government of India address several of the SDGs. Few important ones are:
  - Swachha Bharat Abhiyan
  - Beti Bachao, Beti Padaao
  - Ayushman Bharat
  - Poshan Abhiyan
- For effective implementation of the SDGs its is pertinent that the goals are localized and implemented at the grassroot level.

Localisation of SDGs

- Localising* is the process of recognising subnational contexts in the achievement of the 2030 Agenda. It entails
  - setting of goals and targets, to determining the means of implementation and using indicators to measure and monitor progress
  - raising awareness through advocacy.
  - collaboration between and local and sub-national governments for achieving SDGs through bottom up action
  - develop a framework for local development policy
  - participatory planning, implementation, and evaluation.
- The process of localizing the SDGs in India is being undertaken in three phases
  - Identifying institutions and assigning specific mandate to deliver on the SDGs
  - Raising Awareness and Advocating for SDG implementation
  - Bringing on board Ministries, State governments and the UTs

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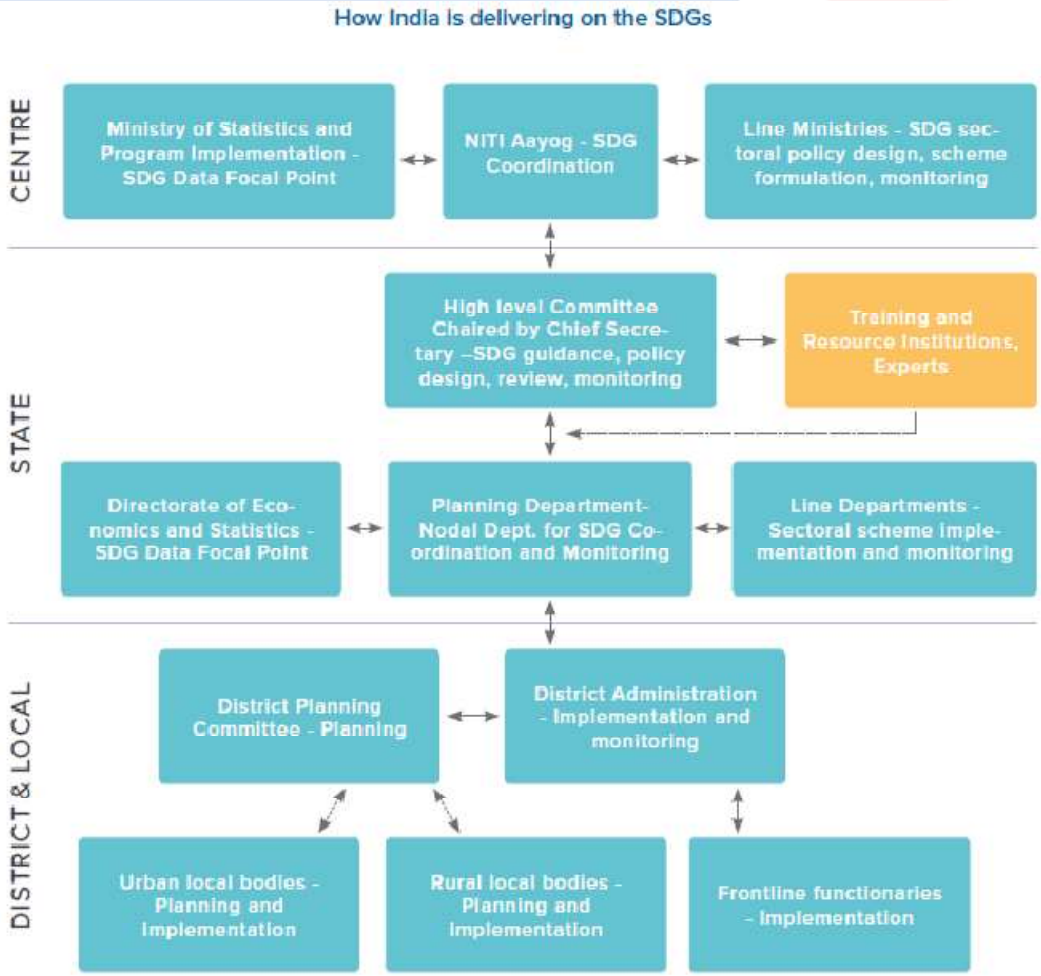
*UN Habitat Report and Global Task Force, 2016: Roadmap for Localising the SDGs: Implementation and Monitoring at Sub-national Level



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The Indian context

- One-sixth of world's population lives in India
- Of that one-sixth 70% lives in villages
- India is the sixth largest economy
- Fastest growing major economy
- The Indian example of localization of SDGs can be used as a template for other parts of world

Localisation of SDGs through Panchayati Raj Institutions

- Action on SDGs at the **district (sub-State) and local levels –** through elected representatives of **Panchayati Raj Institutions** and Urban Local Bodies and District administration.
- The Ministry of Panchayati Raj (MoPR) is achieving the SDGs through Rashtriya Gram Swaraj Abhiyan (RGSA) Scheme, under which the a Thematic Approach has been adopted for attainment of SDGs through 9 Themes

Theme 5

Clean & Green Village

SDGs
6, 7, 12, 13, 14 and 15

Vision: Creating a village, for the future of our children, which is lush and green with nature's bounty, using renewable energy, clean, protecting environment and climate resilient.

Local Goals:

1. Shift from non-renewable to renewable source of energy.

1. 100% ODF.

1. Enhanced green cover through social forestry use of local nursery.

4. Ensuring conservation of biodiversity and sustainability of ecosystems.

Local Action Points:

❖ **Ensure:**

- Use of solar energy in HHs and public places.
- Efficient distribution system of electricity.
- Efficient waste management facility.

❖ **Promote:**

- Construction and use of bio-gas systems.
- Harnessing of local hydel resource.
- Energy efficient solar pumps for micro irrigation.
- Community-based management of natural resources including forests, water bodies and sacred groves.
- Planting of natural vegetation in high-slope areas, barren and other common lands and alongside roads.
- Maintain ***Public Biodiversity Register***.
- Plantation schemes and nursery bed, composting units.

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Innovative Technological Applications

- Decentralised Renewable Energy (DRE) options in the rural context
  - Solar pumps applications in horticulture, irrigation and drinking water
  - Clean cooking energy (~75% rural household still use traditional smoke emitting fuel)
  - Off-grid solar lighting
  - RE powered micro grids
  - RE powered stand alone devices for pumping, lighting etc.
  - Major focus has been to address basic energy needs:
    - solar lanterns and solar home systems
    - renewable energy-powered micro grids
    - solar water heaters
    - improved biomass cookstoves, solar cookers
    - biogas plants

Renewable energy applications for rural community services and rural livelihoods*

Community services and livelihoods sectors	Renewable energy technology/application
Health	Solar-powered ice packs for vaccines, medicines, etc.; renewable energy-powered primary health centres
Education	Renewable energy-powered schools, classrooms, school toilets
Water	Solar pumps for irrigation and drinking water
Sanitation	Solar-powered running water and lights for toilets; toilet-linked biogas plants
Community kitchens in schools for mid-day meals, tribal hostels, tea stalls, sweet shops	Community-sized solar cookers; biogas plants; improved large biomass cookstoves
Poultry	Solar-power packs for lighting and ventilation of backyard poultry farms; biogas generation based on poultry litter; briquetting of poultry bedding material for use as fuel
Dairy	Solar-power packs for lighting and for small equipment such as testing equipment; renewable energy-powered milk chillers; biogas generation based on cattle dung
Horticulture / agriculture	Solar pumps; renewable energy-powered cold rooms for storage of fruits and vegetables; renewable energy-powered dryers for spices, ginger, garlic, herbs
Small-scale industries (e.g., khadi, bamboo)	Solar lanterns; solar packs for powering small equipment; energy generation from waste material like cane dust
Cross-sectoral electricity requirements	Electricity micro grids based on solar, biomass, small hydro or bio-diesel generators

*https://shaktifoundation.in/wp-content/uploads/2017/06/Paper-12-FINAL-Revised-13-1-14.pdf

Some examples of RE applications*

- Suryashakti Kisan Yojana (SKY) launched by Gujarat government

GUJARAT LAUNCHES SKY SCHEME FOR FARMERS TO GENERATE SOLAR POWER

The Gujarat government has launched a solar power scheme for farmers—Suryashakti Kisan Yojana (SKY) enabling them to generate electricity for their captive consumption as well as sell the surplus power to the grid and earn an extra buck.

Announcing the pilot project of the scheme in Gandhinagar, Chief Minister of Gujarat, Shri Vijay Rupani, termed it a revolutionary step towards empowering farmers to generate their own electricity using solar energy and help doubling their income.

As per the scheme, farmers with an existing electricity connection will be given solar panels as per their load requirements. The State and Central governments will give 60% subsidy on the cost of project. The farmer is required to take 5% cost, while 35% will be provided to him as an affordable loan with interest rates of 4.5%–6%.

The scheme duration is 25 years, which is split between a 7-year period and an 18-year period. "This is a first such scheme in the country, where farmer would produce his power and sell the surplus to the State power utility," said the Chief Minister, adding that the work on the scheme will begin soon. The scheme envisages setting up of separate feeders for agricultural solar energy consumption.

Source: www.theindubusinessline.com

*Akshay Urja, Ministry of New and Renewable Energy Vol 12, August 2018

The PM-KUSUMScheme (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan is aimed at ensuring energy security for farmers

Replacement of traditional pumps by solar pumps

SOLAR WATER PUMPS CAN HELP INDIA SURPASS 100 GW TARGET

India can surpass the target of attaining 100 GW solar energy by 2022, provided it replaces all traditional water pumps by solar water pumps, said a study. According to the report, these grid-connected, net-metred solar pumps will also play an important role in providing secondary income to farmers, while giving them access to quality power for irrigation.

The analysis was released at a conference hosted by Greenpeace India, GERMI, and IWMI-Tata Program to discuss the necessary steps for successful implementation of KUSUM—a government scheme promoting solar irrigation pumps. At present, while the 60-GW target for large scale solar is on track, the 40 GW target for rooftop solar is still to gather momentum, with only 2.4 GW of the total rooftop capacity installed as of March 2018, it said. A preliminary assessment shows that replacing 100% of all agricultural consumption in the next five years would require a total solar PV installed capacity of close to 150 GW. This is far more than India's solar target of 100

GW by 2022. Even achieving a modest 10% of this potential in the next five years would translate to a very significant commissioned capacity of almost 15 GW, it added. Farmtops can revolutionize the way solar energy is deployed in the country. Issues that go with large solar parks such as land acquisition, setting up expensive transmission infrastructure, transmission losses, and a host of other hassles can be avoided.

"The KUSUM scheme is timely and the Centre must work with all states to come out with a standard operating procedure (SOP) to facilitate smooth implementation," said GERMI's Akhilesh Magal.

The analysis also found that Maharashtra has the highest farmtop solar potential with 21.1 GW, followed by Karnataka (18 GW), Rajasthan (17.5 GW), Madhya Pradesh (14.9 GW), Gujarat (12.5GW), Uttar Pradesh (10.8 GW), and Telangana (10.4 GW).

Source: energy.economictimes.indiatimes.com

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SOLAR-POWERED DRIP IRRIGATION

Transforming Agriculture in a Remote Village of the Sundarbans

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- 20%–30% more yield;
- savings of 40%–60% irrigation water;
- 40% saving of labour; and
- an increase in the cropping intensity by up to 300% as compared to traditional practices

Table 1: Effect of mulching with drip irrigation on weed biomass in vegetables*

Treatment	Weed Biomass (kg plot^{-1})
Crop	
Okra	11.17
Cucumber	10.25
Bitter gourd	11.78
LSD (P=0.05)	0.46
Mulching with drip irrigation	
Control	26.78
Black plastic	2.14
White plastic	2.75
Paddy straw	12.39
LSD (P=0.05)	0.77

* Sample plot size was 153 m^2 under each crop

Table 2: Costs and return of crops grown under solar drip system

Particulars	Crops*				
	Chilli	Knol-khol	Okra	Bitter gourd	Cucumber
Total production (kg)	325	40	312	250	340
Average selling price (₹/kg)	35	24	12	18	15
Gross return (₹)	11,375	960	3,744	4,500	5,100
Total cost (₹)	2,438	636	2,675	3,610	2,444
Net return (₹)	8,937	324	1,069	890	2,656
Output-input ratio	4.67	1.51	1.40	1.25	2.09

*Area under the system is 725 m^2

Source: ICAR-Central Soil Salinity Research Institute, Regional Research Station, Canning Town, West Bengal 743 329)

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Under Lighting a Billion Lives (LaBL) campaign, TERI has built a partnership with Bihar Rural Livelihoods Promotion Society's (BRLPS) JEEViKA programme through an innovative institutional model to make clean energy products affordable to local women-based self-help groups (SHGs).

The programme has benefitted over 50,000 households across Bihar by providing access to solar home lighting systems (SHLS) and clean cookstoves.

DISTRIBUTED RENEWABLE ENERGY

Transforming Women's Lives in Rural Bihar

This article talks about the TERI–JEEViKA programme that has created a market for clean energy access at the bottom of the pyramid and has lighted up 50,000 households through self-help groups in Bihar.

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For Varanasi weavers, the adoption of solar energy is increasingly raising their competitiveness in the marketplace and boosting their income. Reliable solar supply system is now Alleviating years of struggle with the patchy grid and diesel generator supply that hurt product quality and earnings.

With the financial assistance received from Indus Towers Limited, a hybrid solar system was installed at Sultan's premises by TERI. Now, Sultan gets an uninterrupted supply of power. Aiming for optimal utilization and lower cost of the system, a 2-kWp capacity of solar panel was planned, and a hybrid system designed with solar, grid and lithium battery being the order of power source priority. With TERI-Indus Tower intervention, the profitability of loom weaving has increased, which is further trickling down in the wages of skilled artisans.

HYBRID SOLAR SYSTEM for Power Loom

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An MNRE-supported mini-grid of 22.5 kWp was installed by Mlinda at Narotoli village in Jharkhand in July 2016. The national grid reached Narotoli in early 2018. Both grids continue to co-exist supporting each other and the biggest beneficiaries are the people of Narotoli. The national grid supplies single phase power for 6–8 hours daily. The MNRE-supported Mlinda mini-grid provides 24x7, three phase electricity with less than 6 hours downtime per year and facilitating economic development in the village. This co-existing of the national grid with a mini-grid with MNRE support and facilitating pro-actively the GDP growth and farmer incomes is possibly one of the solutions to 100% access to energy in rural India.

LIGHTING HOMES AND POWERING PRODUCTIVE LOADS

Development in Narotoli Village with Mini-grids

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- Increase in the per capita GDP in the project villages of 10.6% as against 4.6% GDP growth in other villages
- Reduction in CO2 equivalent of emissions per capita of 13% against 1.5%
- Increase in energy efficiency of GDP by 115% against the 15%

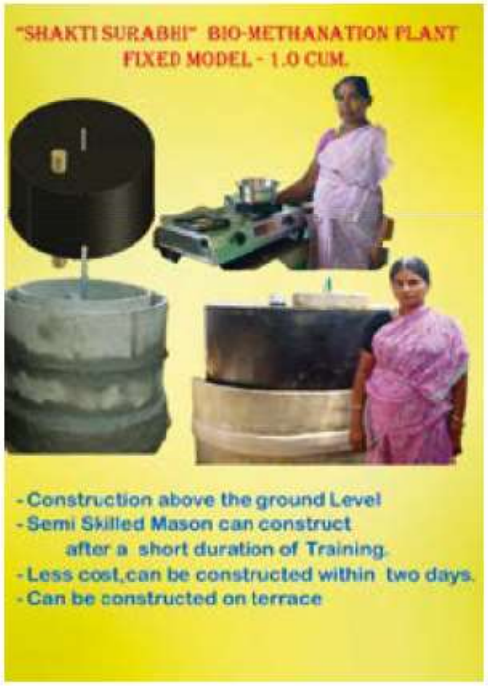
Table 1: Narotoli Productive Load Profile—powered by the MNRE- supported mini-grid

Small irrigation pumps (<=2HP)	21
Big irrigation pumps (5/7.5 HP)	2
Rice hullers (7.5 HP)	2
Oil expeller (10 HP)	1
Grinder for grain, millets, and spices (2 HP/3 HP)	2
Poultry units	62

» Micro enterprise based on oil expelling produces pure and natural mustard oil

A 1 cu m biogas plant gives about

Biogas about 1.5 hours every day.



SHAKTI SURABHI

BIOMETHANATION PLANT

A Cheaper Way to Cleaner Cooking and Greener Garden

The Natural Resources Development Project, popularly known as VK-NARDEP, is an integral part of Vivekananda Kendra and has been working in the field of sustainable development for more than 25 years. Its work in renewable energy has won the organization, the prestigious international Ashden Award. Now, VK-NARDEP has come out with Shakthi Surabhi—a biomethanation plant.

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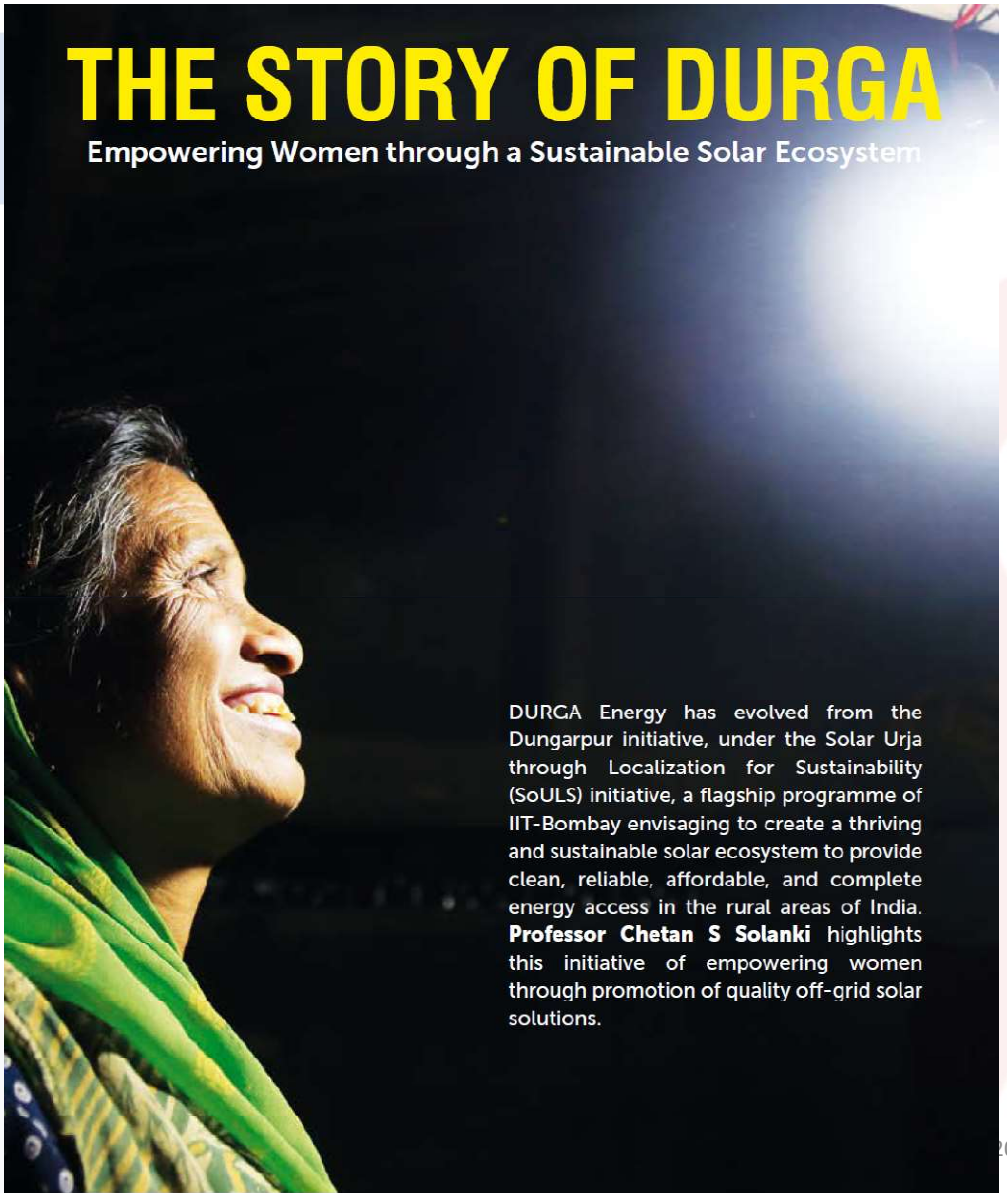
Empowering women through skill transfer of solar Technology and create livelihood through it

Providing appropriate energy access to the community

Creating a local solar ecosystem to ensure sustainability



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TERI and Deaortment for International Development (DFID), Government of UK

MICRO-CREDIT FINANCING

A Vehicle for Clean Energy in Rural India

In this article, **P B Singh** explains how TERI's partnership with a local micro-finance institution helps take clean cooking and lighting technology into poor homes in a village in Bihar.

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Aga Khan Rural Support Programme and the International Water Management Institute/ Tata Power initiative

SOLAR IRRIGATION IN RURAL INDIA

The Success Story of Samastipur, Bihar

Challenges

- Lack of needed eco-system for successful implementation of DREs
  - Such as technical knowhow, skill sets, lack of operational models due to absence of supportive systems such as banking and credit facilities, needed market for DRE products
- Often lack of business models based on systems such as franchisee models for decentralised systems, and technical and operational standards for grid interaction and interoperability act as hindrance
- Lack of productive and commercial loads create barriers for large-scale uptake of DRE system
- Behavioural issues such as lack of faith in technology and needed maintenance eco-system for sustainable operation of such systems
- Poor knowledge and lack of facilitative environment for benefitting from the publicly supported schemes such as subsidized solar systems for roof-top and/or subsidised solar pumpsets
- Lack of standardised DRE products

- DRE for cooking has not really been taken up – which is a much needed requirement now due to rise in LPG prices
- DRE for agriculture sector requires new and innovative business model
- DRE for productive enterprises requires ancillary support systems – such as creating local eco-systems and establishing supply chains
- DRE implementation requires integrating it with local level policy making and implementation
- New entities are to be created at the Panchayat scale to integrate DRE in local level activities

Role of PRIs

- Adoption to clean irrigation practices
- Rural electrification through DRE
- Adoption to clean fuel for cooking
- Conservation of biodiversity
- Rural health and sanitation

Suggestions

- Address disconnect between Government and practitioners
  - Hands-on training to policy makers and entrepreneurs
  - Development of local SDG benchmarks and indicators
  - Prioritization of research and development
- Develop
  - portable solar pumps
  - a range of standards for cooking energy devices for flexibility in choice
  - pay-per-use schemes for solar home systems
  - micro grids that can be expanded
- Bridging knowledge gaps
- Monetising the benefits of the DRE
- Improving the economics of the DRE
- Creating favourable ecosystem for considering DRE as reliable energy solution
- ~20,000+ unelectrified villages in India. The DRE options may be exercised on small-scale electrifying these villages, especially remotely locate.
- Creating a market and job opportunities by integrating DRE in local development plans.

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Thank you

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