# DEVELOPMENT OF MINI-GRIDS IN THE LADAKH REGION OF JAMMU AND KASHMIR

Raipur

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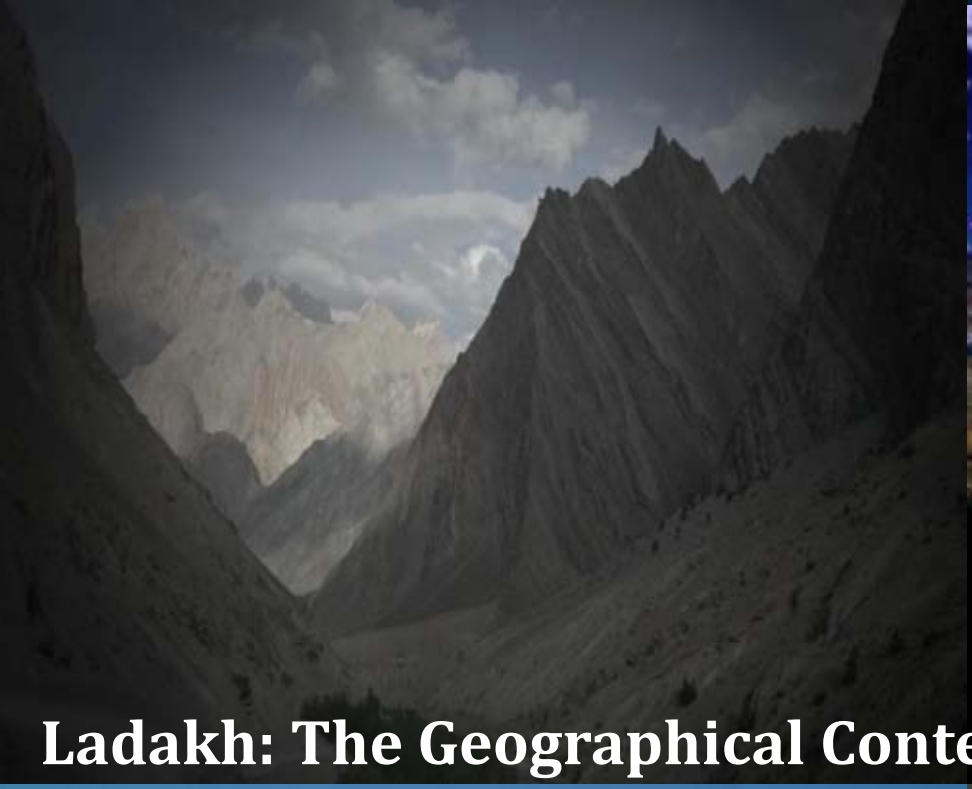
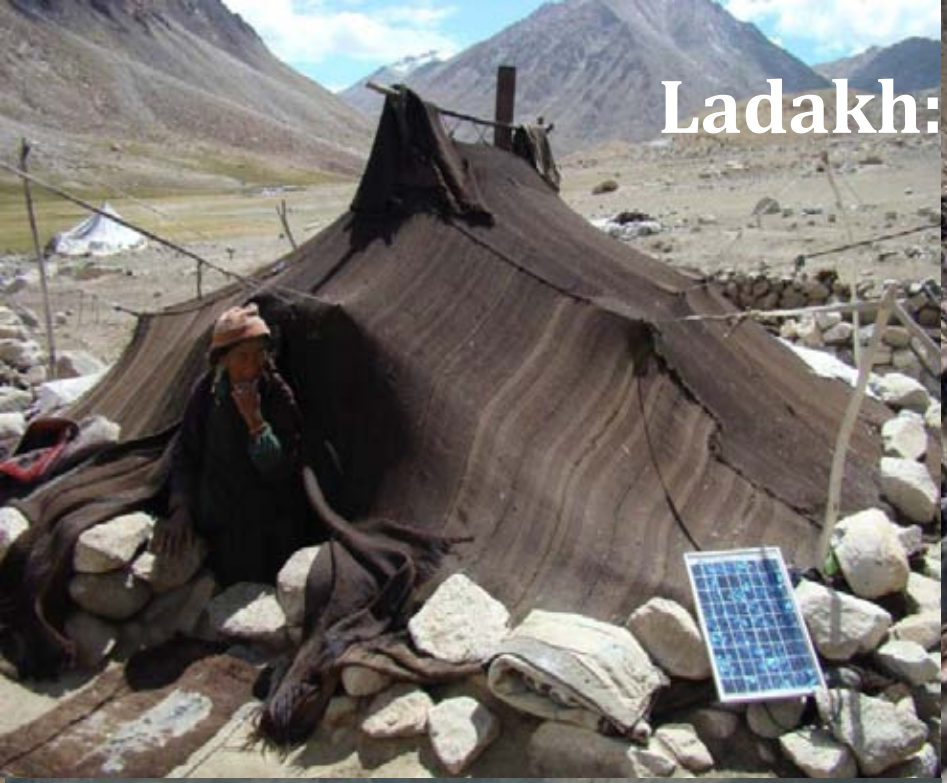


# Ladakh: The Geographical Context

# Ladakh: Socio-Economical Context



# Renewable Energy Resources in Ladakh

- While Ladakh lacks natural resources, the region is rich in renewable energy sources and amongst the best regions for development of solar projects
- Solar:
  - Direct Normal Irradiance (DNI): Leh District – 5.36 to 5.5 kWh/$m^2$/day
  - Among the areas with highest insolation levels in the world, i.e. 1200 W/$m^2$ at some areas
  - Highest clarity index in India
  - Average of 300+ days of sunshine in a year; Ladakh is in the rain-shadow region of the Himalayas
  - The low temperatures allow for better efficiency of solar photo-voltaic technology
- Wind: Annual average wind-speed in the various pockets of the region is 6.3 m/s
- Geothermal: Largest geothermal reservoirs in the country at Puga Valley and Chumathang, with a potential for generation up to 150 MW
- Hydro: Jammu and Kashmir State holds a potential of up to 20,000 MW, with the Ladakh region having a identified potential to generate 1000 MW

**Ladakh Vision Statement 2025:**

**"To transform Ladakh from an energy deficient to energy surplus region and supply the local population with reliable affordable and quality power by trapping the renewable energy sources available in the region to the maximum possible advantage."**

# Financial Perspective: Setting Up Mini-Grids in Leh thus far

Types of Models for Mini-Grids currently existing in Ladakh:

- Community Administered Solar Mini-Grids (Capital Funds financed through donations of ICEF and part funding by MNRE)
- Capital Subsidy availed by LREDA under JNNSM ("Special Category Regions" 90% subsidy, 10% share through Councillor Constituency Development Funds (CCDF) or LREDA Annual District Plan Allocation
- Ladakh Renewable Energy Initiative (Cabinet sanctioned project for Ladakh – 473 Crores) – 100% funding by Government of India
- Multi-Sectoral Development Programme (MsDP) of Ministry of Minority Affairs and Border Area Development Programme (BADP) of Ministry of Home Affairs for funding of SPV Power Plants
- Market Mode for products such as solar home lighting systems and solar lanterns (over 15,000 lanterns have been sold by LREDA

(Financing Operation and Maintenance discussed later)

# Case Study: Tangste SPV Mini-Grid

Rated Capacity: 25 kWp X 4 (100 kWp)
Array Details:
- Module Rating: 75 Wp
- Total Array Capacity: 102 kWp

Battery Details:
- Nos: 480 (2V Cells)
- Capacity: 1000 Ah at C10
- Cells/Battery Bank: 120

System Voltage: 240 V
Year of Commissioning: 2000
Battery Bank Housing: Passive Solar Tech.

No. of Hamlets Supported: 10
No. of Domestic Consumers: 379
No. of Commerical Consumers: 29
Total No. of Consumers: 408

Min. Load Observed: 38 kW at start of plant
Max Load Observed: 45 kW in winter 2010/2011/2013
Hours of Lighting: initially 6 hrs, today 3-4 hours

Operation and Maintenance: Community Run

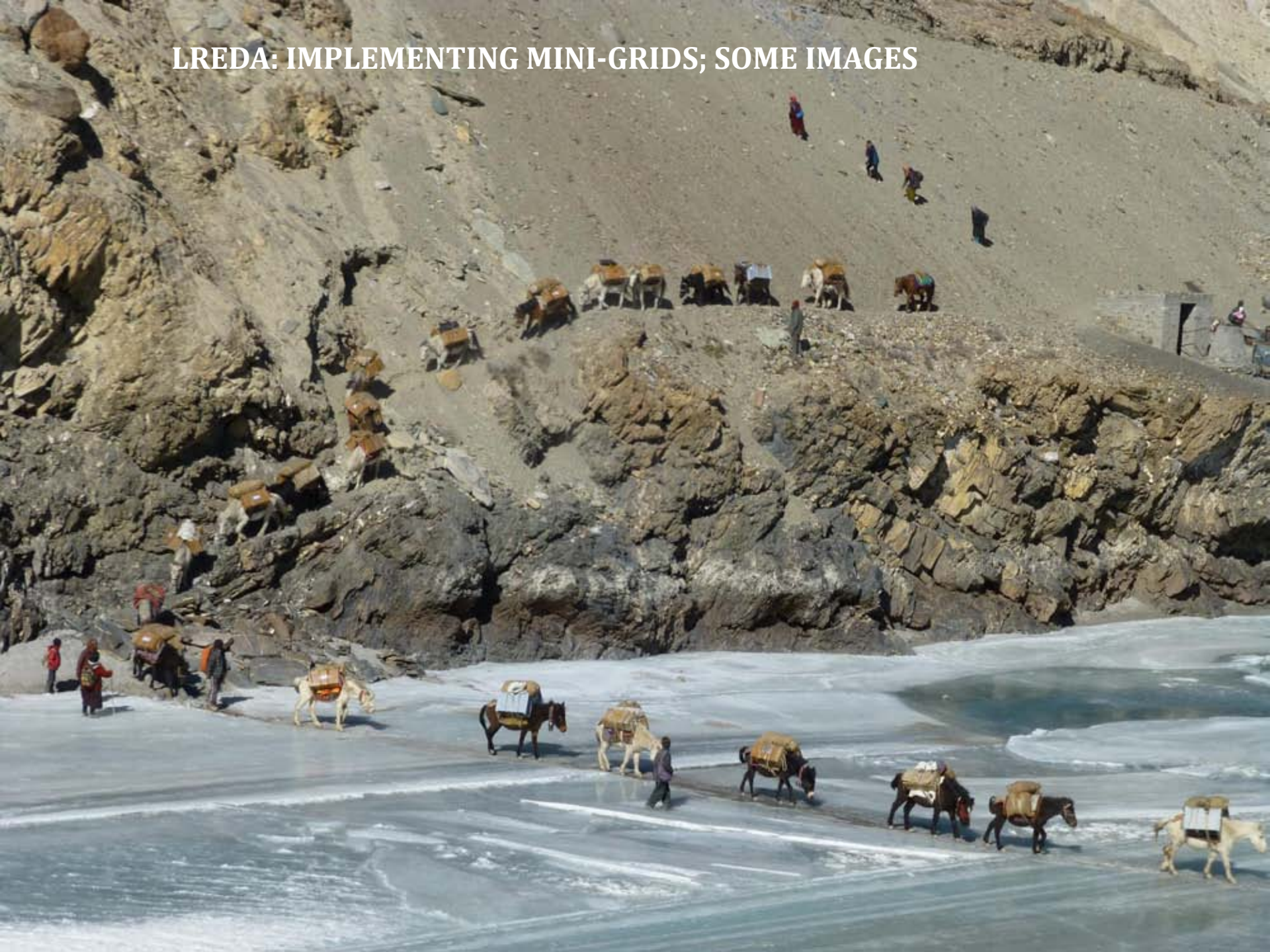
**Lesson Learned: Tariff set does not recover O&M Costs – intervention of some sort is required**

# LREDA: Approach to RE Development

1. HOLISITIC APPROACH: Micro-Level Planning and Vision Document, Conservation and Sustainability
2. SELF SUSTANENANCE FIRST : “You can’t lend if you don’t have”
3. STEP-UP APPROACH
4. DESIGN FOR THE LOCAL ENVIRONMENT
5. ENCOURAGE LOCAL SKILL BUILDING AND PARTICIPATION (stress on operation and maintenance)
6. PURSUE MARKETING THROUGH ESTABLISHED SYSTEMS (Panchayat, Councillors etc.)
7. PROVIDE A ONE STOP SOLUTION
8. DRIVING DOWN COSTS WHILE MAINTAINING ROBUSTNESS OF DESIGN (increases acceptability of product for people in rural areas)
9. TACKLING CONSUMPTION through LED Lighting Solutions and Home Energy Management Systems
10. RESEARCH AND DEVELOPMENT TO MEET LOCAL NEEDS

(Commitment is a key factor in meeting energy access goals)

# LREDA: IMPLEMENTING MINI-GRIDS; SOME IMAGES



# Issue and Challenges in Implementing Mini-Grids

- Environmentally Sensitive Area
- International Border of two countries
- Pasture/grazing lands – land issues
- Short working seasons
- Freezing during winters in Ladakh area
- Lack of Road Connectivity (in some regions throughout the year)
- Lack of critical infrastructure linkages
- Politics (clarity issues)
- Mindset of Communites/Viewpoints
- Transportation & Logistics (Cost escalation factor)
- High Construction Costs and Difficult Terrains for Construction (Cost Escalation Factor)
- Lack of integration of programmes (RGGVY etc.) – T&D planning is important
- Agreement with state utility

ADVANTAGE: Ladakh Autonomous Hill Development Council (LAHDC) – processes and approvals are quick – gestation time is significantly reduced

DISADVANTAGE: Power Distribution is a mandate of the state

# Tackling Financial Sustainability (O&M)

- O&M is currently in the scope of the parties to whom works have been allotted
- Establishment of office for companies to participate in tender is mandatory
- Training of 2 persons per village as per LREDA guidelines for O&M

**Some Proposed Policies for Mini-Grids in Leh District:**

**(currently in drafting progress for implementation)**

- Environmental Fee for tourists to include renewable energy
- Cess on "income generating electricity"
- Flat-rate tariff (small amount) for villagers on a monthly basis (will give them some responsibility towards the power plants)
- Major revenue generation from mini/micro-hydel projects by selling to defence establishments (Current Cost of running DG approximately Rs. 28/Unit in Ladakh) for further implementation of RE systems and O&M

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# Opportunities and Challenges for Solar Minigrid Development in Rural India (DRAFT)

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*National Renewable Energy Laboratory*

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# THANK YOU

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