

6. Women-Led Decentralized Renewable Energy- Environment

Even as India targets 500 GW renewable capacity by 2030, the real gap lies in quality of access—reliable power and gender inclusion in rural areas. The shift must move from mere connections to women-led Decentralised Renewable Energy (DRE). Women-led DRE can transform rural women from energy consumers to energy entrepreneurs and decision-makers.

Concept of Women-Led Decentralized Renewable Energy (DRE)

1. Women-Led Decentralized Renewable Energy (DRE) refers to a community-centric ownership model in which small-scale renewable energy systems are owned, managed, and operated by women's collectives, particularly Self-Help Groups (SHGs).
2. These systems include solar mini-grids, rooftop solar panels, solar irrigation pumps, solar dryers, solar-powered cold storage units, and biomass-based micro-plants.
3. Unlike large centralized power plants, DRE systems are installed close to the point of consumption, ensuring direct access and localized control.
4. The model positions women not merely as beneficiaries of electricity access but as designers, asset owners, operators, and revenue managers of local energy systems.
5. The approach integrates domestic energy dignity with income-generating economic activities, linking energy access to women's empowerment.

Institutional Framework- "Samaj-Sarkar-Bazar" Triad

The Women-Led DRE model functions through a tripartite framework-

1. Samaj (Society)- Community trust, SHGs, cooperatives, and local ownership structures.
2. Sarkar (Government)- Policy support, subsidies, gender budgeting, and capacity-building initiatives.
3. Bazar (Market)- Private-sector efficiency, technology providers, micro-finance institutions, and green credit lines.

This framework ensures that community-driven governance is supported by enabling public policy and market-based innovation. It blends decentralization with structured institutional support to ensure sustainability.

About Distributed Renewable Energy (DRE)

1. DRE is an alternative to the conventional centralized grid-based power model.
2. Instead of transmitting electricity over long distances from mega power plants, DRE generates energy at or near the point of use.
3. It relies on locally available renewable resources such as solar radiation, wind energy, small hydro, and agricultural biomass.
4. DRE reduces Transmission and Distribution (T&D) losses that are common in centralized systems.
5. It enables energy access in remote, forested, hilly, and disaster-prone regions where grid extension is economically unviable.

Six Core Pillars of the DRE Model

Localized Power Generation

1. DRE systems are site-specific and tailored to local needs.
2. They power individual households, schools, primary health centers, or small commercial clusters.

3. By eliminating long-distance transmission, they enhance efficiency and reliability.

Modular and Scalable Design

1. DRE systems are flexible and expandable.
2. A village may begin with solar lanterns or rooftop panels and gradually expand into micro-grids powering irrigation pumps or agro-processing units.
3. This enables incremental investment aligned with growing energy demand.

Energy Security and Resilience

1. DRE systems operate independently of the national grid.
2. They provide backup during blackouts or load-shedding.
3. In disaster-prone areas, they ensure continuity of essential services such as vaccine refrigeration, drinking water pumping, and emergency lighting.

Catalyst for Productive Use of Renewable Energy (PURE)

1. DRE extends beyond lighting and domestic consumption.
2. It powers income-generating activities such as flour milling, silk reeling, milk chilling, sewing, and food processing.
3. PURE transforms rural households from passive consumers of electricity into active economic units.
4. This increases local incomes and stimulates rural entrepreneurship.

Democratized Ownership

1. Traditional energy systems are controlled by state utilities or large corporations.
2. DRE shifts ownership to local collectives, especially women's SHGs.
3. Revenue generated remains within the local economy.
4. Women gain agency over pricing, maintenance, and expansion decisions.

Environmental and Health Benefits

1. DRE replaces diesel generators and kerosene lamps.
2. It reduces indoor air pollution caused by biomass cooking.
3. Lower exposure to smoke reduces respiratory illnesses among women and children.
4. It supports India's climate commitments by promoting low-carbon development.

The Current Landscape- Beyond Grid Connectivity

1. Schemes such as Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya) have achieved near-universal electrification in terms of physical connectivity.
2. However, "quality of supply" remains inconsistent in rural areas.
3. Voltage fluctuations and intermittent supply lead to "paper electrification," where infrastructure exists but reliable power does not.
4. Thermal energy needs, especially for cooking, remain unmet despite grid connections.
5. Energy poverty continues to disproportionately affect women.

Comparative Analysis- Centralized Grid vs Women-Led DRE

1. The centralized model prioritizes bulk generation and industrial demand, while Women-Led DRE prioritizes localized empowerment and livelihood support.
2. The centralized model follows top-down governance by DISCOMs; DRE follows bottom-up governance by SHGs and village collectives.

3. Centralized systems face T&D losses and frequent load-shedding; DRE ensures stable supply at the point of generation.
4. In centralized systems, women are passive consumers; in DRE, women are active owners and operators.
5. Centralized models measure success by connections provided; DRE measures success by economic productivity and female agency.
6. DRE builds localized technical skillsets such as "Oorja Sakhis" or "Solar Didis," reducing maintenance delays.
7. Capital for centralized infrastructure relies on public debt; DRE leverages SHG savings, micro-finance, and green credit.

Why Women-Led DRE is Necessary

Addressing Gendered Energy Poverty– Women bear disproportionate burdens of energy scarcity, particularly in cooking and fuel collection. Clean energy alternatives can prevent approximately 200,000 premature deaths annually due to indoor air pollution.

Reducing Time Poverty– Rural women spend 3–4 hours daily collecting fuelwood. Automation enabled by DRE frees time for education, entrepreneurship, and civic participation.

Enhancing Safety and Agency– Solar Street lighting improves safety in public spaces. Increased female participation in markets and local governance has been observed in states with reliable decentralized lighting.

Promoting PURE– DRE mechanizes labour-intensive activities such as milk chilling, grain milling, and silk processing. Women-led enterprises gain competitiveness and higher income.

Major Initiatives by India

Lakshpati Didi Scheme– Targets creation of 3 crore women earning ₹1 lakh annually by integrating DRE technologies into livelihoods.

PM Surya Ghar (Muft Bijli Yojana)– Aims to create 10,000 Solar Villages by 2030 with rooftop solar and community participation.

PM-KUSUM– Promotes solar irrigation pumps and de-dieselization of agriculture, with mandates for women-led associations.

Mission Shakti– Uses gender budgeting to fund clean-energy-powered livelihoods.

Key Challenges

High Capital Costs– Solar-powered productive assets, such as bulk milk chillers, can cost up to ₹25 lakh. SHGs often lack collateral to secure formal loans.

Maintenance Gap– Technical breakdowns remain unresolved in remote regions due to lack of local female technicians. Urban-centric maintenance models increase downtime.

Patriarchal Land Norms– Women own only about 13.9% of land in India. Lack of land titles restricts access to credit for solar assets.

Market Information Asymmetry– Limited awareness of subsidies and financing schemes leads to underutilization of clean technologies.

Case Studies

Chhattisgarh (Anjan Vision 2047)– Plans to generate 50,000 green jobs and train women as energy entrepreneurs.

Odisha (Solar Silk Reeling)– Solar-powered machines increased weavers' incomes from ₹1,500 to over ₹6,000 monthly.

IIT Bombay SoUL Project– Trained “Solar Didis” in Bihar to assemble and maintain solar lamps.

Way Forward

Asset Ownership Mandates– Mandate women as primary or joint owners of energy assets to ensure legal control.

Oorja Sakhi Cadre– Scale vocational STEM training for women to build local maintenance capacity.

Financial Innovation– Introduce First Loss Default Guarantees (FLDG) and Green Credit lines to reduce lending risk.

Panchayat Empowerment– Enable Panchayati Raj Institutions to partner with SHGs for Energy-as-a-Service models. Use Own Source Revenue (OSR) to co-finance decentralized projects.

Conclusion

Women-Led Decentralized Renewable Energy represents a structural shift from centralized electrification toward community-driven energy sovereignty. It integrates clean energy access with gender empowerment, livelihood generation, and climate resilience.

If supported by institutional capacity, financial innovation and gender-sensitive policy design, Women-Led DRE can become a transformative pillar of rural development and inclusive green growth in India.

Source– <https://www.thehindu.com/news/national/women-led-decentralised-renewable-energy-and-indias-last-mile-transition/article70628044.ece>

