



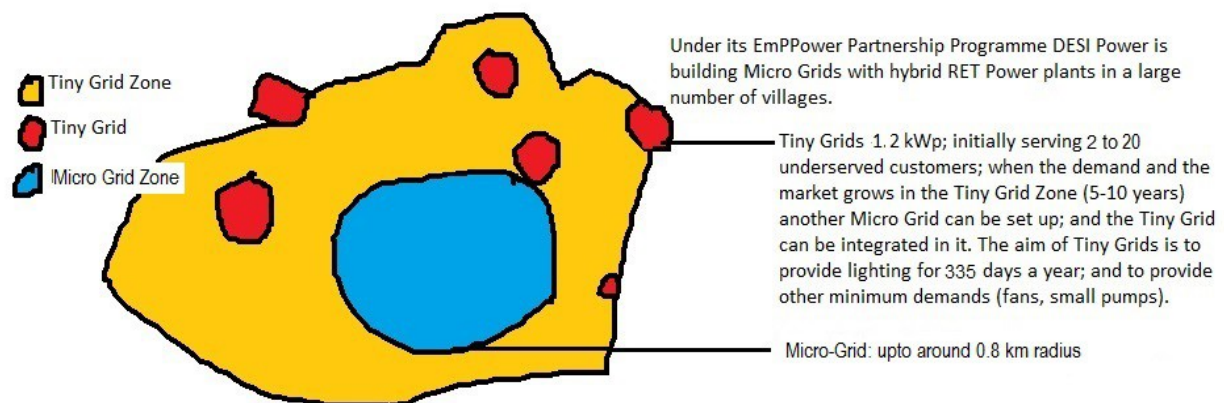
Tiny Grids for Very Basic Electricity Needs of the Unserviced Poor

Summary

While a Tiny Grid is nothing more than a small, pre-packaged solar PV power supply unit, its importance for the poorer and less-served villagers lies in its linkage to a larger Micro Grid which draws power from a stand alone renewable energy based generating station. Micro Grids can, however, service only a limited range and are thus unable provide power to small farmers and landless labourers living outside their distribution area.

DESI Power's Tiny Grids in villages ensure reliable, 365 day supply for households and whenever-needed irrigation water to the unserved villagers at affordable rates.

Tiny Grids in small towns serve as reliable providers of CO₂-free electricity for lighting and water pumping to households, shops and small businesses.



Scope of Tiny Grid services

India urgently needs efficient agricultural irrigation systems but this has to be done within the constraints of rural poverty and climate change. Current schemes do not meet the requirements of the unserved small farmers and households in rural areas. Hitherto stand alone family size photovoltaic systems in the range of 0.5 to 5 kW in India have catered for urban middle class and more-affluent rural families who can pay for 18 month consumer loans.

- One of the most important local needs is for electricity for agricultural irrigation. Government schemes for PV pumping are unaffordable for small farmers. Even under DESI Power's EmPower Program, just because there is a Micro Grid in a village does not mean any or all the poor farmers are getting their basic irrigation energy needs met. Many of them live outside the periphery of Micro Grids (marked blue on the image below). In addition, fields are scattered in a wider area. DESI Power is therefore expanding its power supply outside the coverage zone of Micro Grids (ca. 800 m) to "Tiny Grid Zones" (marked orange) in order to deliver affordable and reliable power for irrigation, lighting and mobile charging to the unserved villagers. The unserved poor earning their living from agriculture will be supplied with shared irrigation systems through DESI Power's innovative business model of selling irrigation water. By operating the Tiny Grids jointly users reduce their shared costs.
- Increased agricultural productivity based on a switch from chemical to organic farming means more agricultural income from all-year round agriculture including new vegetable and horticulture crops. The farmers will not be dependent on selling precious cow dung cakes to towns as cooking fuel. Instead it will be used for making vermi-compost, an valuable organic fertiliser and pesticide.



D.E.S.I. Power

- Energy efficient lighting is cheap as part of the Tiny Grid and affordable even for the poorer families. Children's education opportunities improve at practically no extra cost to the family.
- Year-round reliability of solar PV Tiny Grids is ensured by charging the batteries at the near-by Micro Grid on low sunshine days.
- Intensive training, skills build-up and refresher courses will be given to staff and villagers.
- There is a global and local imperative to promote affordable low carbon dioxide (CO₂) emitting power for irrigation, lighting and mobile charging.

Current Status of DESI Power's Village Projects

- DESI Power's Empower Partnership Program (www.desipower.com) has, in the past, provided irrigation services only from biomass power stations. The advent of cheaper PV electricity has enabled DESI Power to develop hybrid generation plants with biomass, PV and battery banks. These supply power at prices competitive with diesel, which today is the main fuel for the supply of electricity in villages. DESI Power has 7 existing Micro Grids, one of which is a hybrid 11 kW biomass + 3 kWp PV; four are biomass power plants of between 11 kW and 75 kW and two are PV power plants of 30 kWp each.

Photographs below show some of the present power plants with Micro Grids and related village activities:



A typical stand-alone hybrid power plant with a Micro Grid provides electricity for diesel replacement in telecom towers and agro-processing, productive usage in small industries for job creation, water pumping, lighting in households and shops and mobile charging.

In addition to the Micro Grids, 6 Tiny Grids are operational for lighting loads and 1 Roof Top Solar Tiny Grid services an office and a household for multiple currently uses including lighting, water pumping and computers. Photographs below show some of the PV based Tiny Grid lighting, mobile charging and water pumping activities which provide the experience for designing and building the REPIC pilot projects.



D.E.S.I. Power



DESI Power's Tiny Grids can supply the need for electricity for water pumping, mobile charging and lighting of small shops and households in an affordable manner. DESI Power is going to build 40 Tiny Grid units to optimise the system, strengthen its delivery capacity and demonstrate the profitability of Tiny Grids which have the potential to provide power to under- and un-served villagers on a very large scale and non-polluting power in small towns.

Totally, DESI Power's Micro Grid and Tiny Grid projects are currently working in 14 villages and bring direct benefits to about 2000 people.

(REPIC-Dasag + DESI Power) Pilot Project for Tiny Grids

Dasag Energy Engineering, Seuzach, Switzerland (the ur-promoter of DESI Power) has received a grant from the Swiss Government under its REPIC Scheme to provide 50% of the capital required to build 40 Tiny Grid Pilot Plants by DESI Power. The aim of this project is to setup 40 Tiny Grids mostly in villages but also in a small town for irrigation, lighting, mobile charging and water pumping.

- The connected equipment consists of LED lights, efficient water pumps and sockets for mobile charging. The 40 Tiny Grids of 1.2 kilo-Watt (kW) each will be set up for 30 groups of up to around 20 farmers each in villages and 10 groups of up to 20 households and shops and cottage gardens each in one small town.
- 50% the Capex will be provided by REPIC through Dasag. DESI Power needs to raise the rest of the money.
- These systems will be owned by DESI Power (and its partners, if any) and operated by DESI Power with increasing involvement of the users, and will be handed over to the users after training and a period of successful operation.
- In the second year of the Dasag-REPIC project, Dasag will, jointly with DESI Power and Swiss experts, prepare a Business Plan for financing and building another 1000 Tiny Grids on a commercial basis. North Bihar Power Distribution Company Limited (NBPDC) will be approached



D.E.S.I. Power

to work with the Dasag-REPIC project by providing their new customer lists so that non-electrified customers for irrigation services can be identified by a process of elimination.

Sustainable Development Impacts of Tiny Grids

Resource efficiency:

The benefits will be in terms of energy efficient electricity generation and low line losses; LED lamps will reduce electricity consumption compared to conventional lamps; we will do efficient battery charging; we will use modern irrigation pumps; the other domestic and small commercial appliances that we use will be low energy devices.

Environmental compatibility:

Power generated in Tiny Grids directly replaces diesel and kerosene at the local level, and also reduces the necessity to generate mostly coal-based electricity that is still the dominant fuel source in the grid. Recycling of batteries and used lights/e-components will be organised through the supplier industry chain.

CO₂ relevance:

The UNFCCC's Small-scale Methodology, AMS-I.L, titled "Electrification of rural communities using renewable energy" can be applied. For the methodology please see the United Nations Framework Convention on Climate Change website at:

<https://cdm.unfccc.int/methodologies/DB/CCZKY3FSL1T28BNEGDRSCKS0CY0WVA>

Thus in a 1.2 kW Tiny Grid shared by 15 households the emissions reductions will be 5.7 tCO₂/year. For the 40 Tiny Grids in the Dasag REPIC Tiny Grid project the reductions will be 228 tCO₂/year, and for 1000 Tiny Grids in the replication/multiplication phase the reductions will be 5700 tCO₂/year.

Tiny Grids will Replace Diesel Engines used for Irrigation Pumping



Socio-economic aspects:

This REPIC project will improve the quality of life of the unserved poor. Irrigation increases the income of poor farmers. Smokeless lighting helps children's education and provides earning opportunities to women and small businesses and improves health. To ensure economic sustainability, the financing of village Tiny Grids linked to farming & irrigation, health & hygiene and household electricity for the under-served poor (pilot projects are being promoted by DESI Foundation) will be done with grants and soft loans. The replication model will ensure that a local group owns, manages and runs the plant and utilises the surplus generated for supporting the installation of similar Tiny Grids in the village.

Cultural aspects:

Involvement in Tiny Grid projects and training increases the empowerment of the poor. Electricity and water are basic rights. They improve the quality of rural life and make it possible to defend the rural economy and way of life.