



Waste to energy - Innovation for social good

Grassroots Energy



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Off-grid energy access problem

- Need to use local resources (dairy, agri waste) that produces billions of tons of waste that can be converted into energy
- Need for continuous biogas based generation (no scrubbing etc.)
- Need for 24/7 solution with low cost of generation
- Need for low maintenance, long shelf-life of assets
- Need for small-scale, modular, clean and cost-effective solutions
- Need to create local employment and support small-medium enterprises
- Need to reduce emissions and replace diesel

The Solution

- Stirling generator for continuous power from:
 - biogas / biomass/ biofuels
- Continuous Operation 24/7
- > 60,000 hours lifetime
- No noise, < 60dBA
- Low Maintenance
- 7.5 kW electric + 22 kW_e thermal
 - Thermal energy for cooling, drying etc.



Comparison with Solar

	STIRLING ENGINE	SOLAR PV	ADVANTAGE
Operating Life (hours)	60,000+	36,000	1.6X longer operating life
Efficiency	95% (24% electric, 71% thermal)	14-16%	6X
Operating hours/day	24X7	4-6 hours (winters <4 hours)	4X
Generation	Continuous power, <u>primary</u> source	Intermittent, needs storage for back-up	50% CAPEX savings

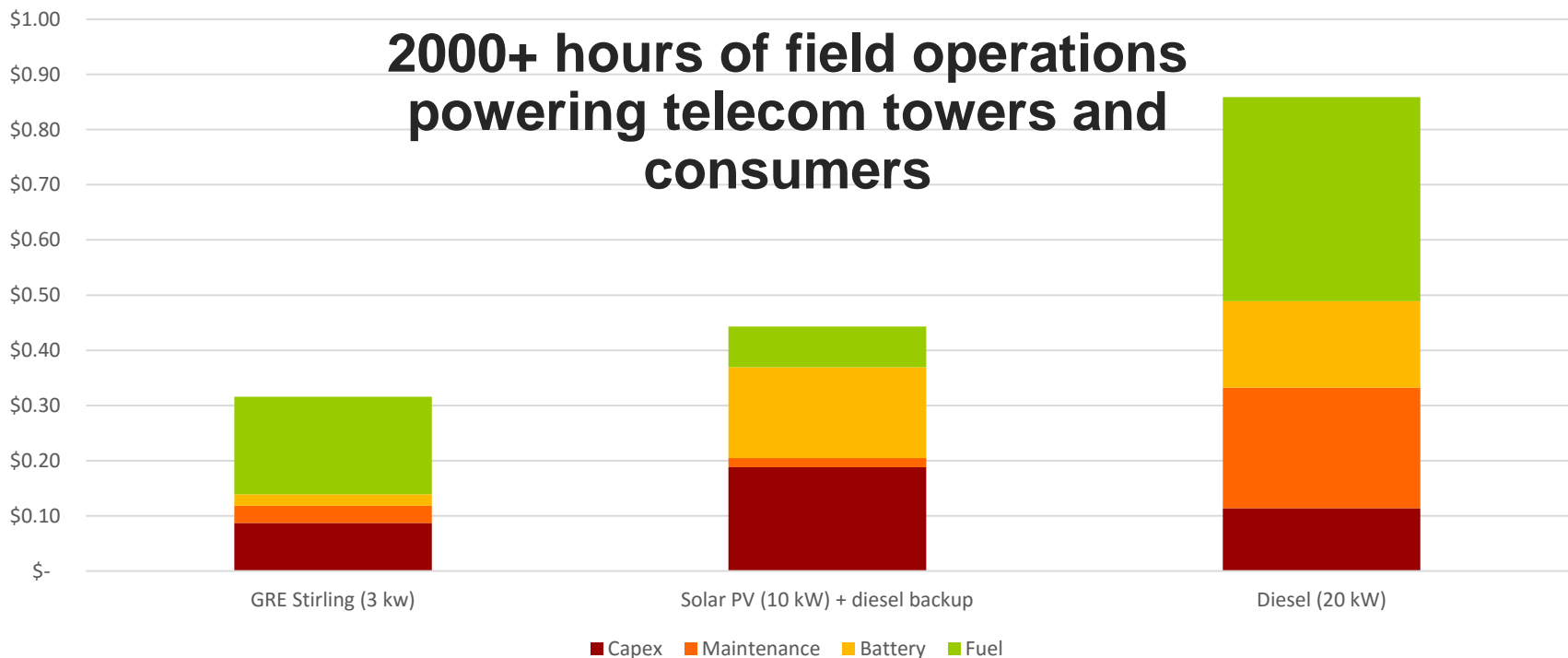
Social Impact

- Remediation of waste (reduces pathogens - SWACHH Bharat)
- Job creation through waste processing (2-4 jobs)
- Energy access for business and consumers (150 houses)
- Direct payments to farmers for biogas (increases farm productivity)
- Production of organic manure (increases farm yields)
- Reduced methane emissions (25X of CO₂) from burning biogas
- 24/7 operation, no intermittency issues, replaces diesel

Levelized Cost of Electricity over 10 Years

	GRE Stirling	Solar + Diesel	Diesel
Cost / kW hour	\$0.32	\$0.44	\$0.86

Levelized Cost of Electricity Breakdown



Applications

Telecom Towers



Smart Cities



Rural Energy



Remote Power

