



RE Based Microgeneration – Global Overview and Indian Scenario

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RE Based Technologies

For microgeneration

- **Small Wind Turbines**
- **Wind Solar Hybrid Systems**
- **Photo Voltaic Systems**
- **Biomass based Gasifiers**

GLOBAL OVERVIEW

Small wind Turbines

- Small Wind Turbines gaining same importance and privileges as that of Photo-Voltaic.
- **\$160 million** investment made into 18 manufacturers worldwide over past three years.
- Manufacturers estimate growth of over **20 folds** in the next few years.
- Volatility in the international crude market led to actions by nations to reduce foreign oil dependency and to produce sustainable energy. State incentives, consumer education and an increased public concern for environmental issues are observed in all major countries of the world.
- The global recession led into decreased sales of consumer electronics and consequently to widespread availability of poly-silicon (chief raw material for PV), leading to decreased costs of SWT-PV hybrids.

Installations in 2008	Global	U.S	U.K
Installed SWT (No.)	19,000	10,500	3453
Installed SWT (MW)	33.7	17.3	7.2

* Indicative figures as per AWEA and BWEA reports

Classification of Small Wind Turbines

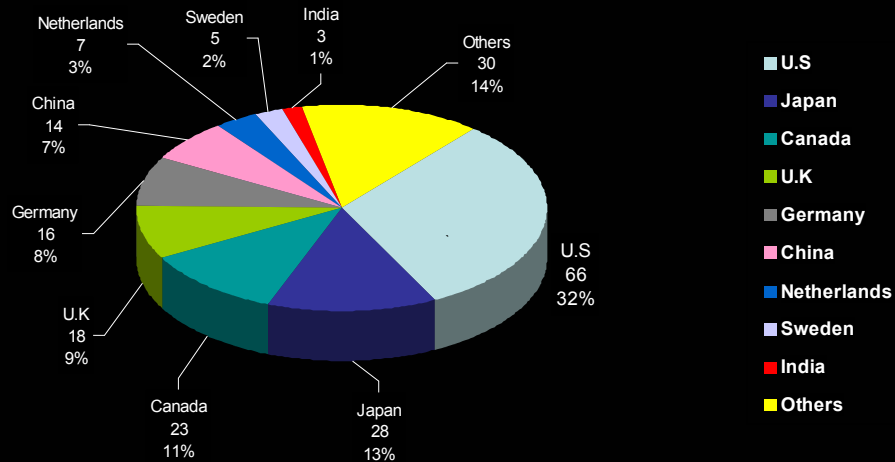
Rated power kW	Rotor swept area m ²	Category
< 1 kW	< 4.9 m ²	Pico-wind
1 kW-7 kW	< 40 m ²	Micro wind
7 kW-50 kW	< 200 m ²	Mini wind
50kW-100 kW	< 300 m ²	No clear definition

Rated power/system	Wind-diesel										Wind mini-farm									
	Wind hybrid					Single wind turbine					Build integrated									
	Wind home systems																			
P < 1kW	X	X	X	X	X	X	X				X	X	X	X						
1 kW < P < 7 kW	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X
7 kW < P < 50 kW					X	X	X	X	X				X	X	X	X	X	X	X	X
50 kW < P < 100 kW									X	X							X	X	X	X
Small wind systems applications	Selfcoats	Signalling	Street lamp	Promote houses/dwellings	Farms	Water pumping	Sewerage desalination	Village power	Mini-grid	Street lamp	Buildings rooftop	Dwellings	Public centres	Car parking	Industrial	Industrial	Farms			
	Off-grid applications										On-grid applications									

(Source: CIEMAT – Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, Soria, Spain.)

GLOBAL DISTRIBUTION OF MANUFACTURERS

- At least **219 companies** manufacture, or plan to manufacture small wind turbines in the world. (Companies that have responded to AWEA global survey)
- 32% of them are based in the US
- At least **45 manufacturer** or plan to manufacture **vertical-axis systems**.



Source :AWEA Small Wind Turbine Global Market Study Year Ending 2008

GLOBAL POLICY OVERVIEW

- **Feed In Tariffs:** A **set price** at which a utility purchases electricity from a renewable generator, such as a small wind system, and lets market forces adjust the amount of energy produced (supply) and demand accordingly. And unlike net metering, all electricity generated – not just the excess – is sent into the grid and awarded payment from the utility at a **price above regular retail electricity rates**.
- **Net Metering:** Excess electricity produced by the wind turbine will spin the existing home or business **electricity meter backwards**, effectively banking the electricity until it is needed by the customer. This provides the customer with **full retail value** for all the electricity produced.
- **RPS:** A **renewable portfolio standard** is a state regulatory policy that requires electricity providers to obtain a **minimum percentage** of their power **from renewable energy** resources by a certain date.
- **Grants and Subsidies:** Capital Subsidies, Interest Subsidy, “Buy downs”, Rebates, export incentives, etc.
- **Permitting and Zoning:** Special permissions for Small Turbines and Hybrid systems to mitigate **local zoning laws**, which differ from zone to zone and state to state.
- **Testing and Certification:** Standardization of the products for maintaining **quality and reliability**.

GLOBAL POLICY OVERVIEW



= Not Implemented



= Implemented

Country	Feed In Tariff	Net Metering	RPS	Grants & Subsidies	Permitting & Zoning	Certification
U.S	Not Implemented	Implemented	Not Implemented	Implemented	Implemented	Implemented
U.K	Not Implemented	Implemented	Implemented	Implemented	Implemented	Implemented
Canada	Not Implemented	Implemented	Not Implemented	Implemented	Not Implemented	Implemented
Spain	Implemented	Not Implemented	Not Implemented	Implemented	Not Implemented	Not Implemented
Netherlands	Implemented	Not Implemented	Implemented	Implemented	Implemented	Not Implemented
Portugal	Implemented	Not Implemented	Implemented	Implemented	Not Implemented	Not Implemented
China	Implemented	Not Implemented	Not Implemented	Implemented	Not Implemented	Not Implemented

FEED IN TARRIFS

Countries with Feed-In Tariffs	
Australia	Italy
Austria	Japan
Canada	New Zealand
China	The Netherlands
Czech Republic	Portugal
Great Britain	South Africa
France	Spain
Germany	Switzerland*
Greece	Turkey
Ireland*	Ukraine
Israel*	USA

* Specifically benefits small wind technology.

• **Feed In Tariffs (FIT)** are being increasingly recognised as an effective incentive to promote SWT's and Hybrids.

• The concept of "Net Metering" is contributing to reduce the cost of SWT's as it **decreases** cost factor of **battery banks**.

• Net Metering makes it easy for Distributed Power Producers to take benefit of grid electricity when **variability of wind** comes into play.

• it also helps dissipate the **excess electricity** to the utility grid and thus gain financial benefits.

• FIT's and Net Metering are increasing the "**Retailability**" of SWT and Hybrid Systems.

Existing World Small Wind Tariffs

	Years	€/Wh	CAD/Wh	USD/Wh	INR/kWh*
Italy >90 kW	15	0.300	0.489	0.399	19.55
Israel <15 kW	20	0.297	0.485	0.395	19.50
Israel <50 kW	20	0.252	0.379	0.309	15.10
Switzerland <10 kW	20	0.131	0.214	0.174	8.50

*1 USD = 49 INR

Source: Paul Gipe, "wind-works.org"

TESTING AND CERTIFICATION

•**Small Wind Certification Council (SWCC)** will start certifying Small Wind Turbines from mid 2009 for the entire North American Market.

•**North American Board of Certified Energy Practitioners (NABCEP)** are in the process of introducing a "**Certified Small Wind Turbine Installer**" course, which will create a reliable pool of SWT technicians and Engineers.

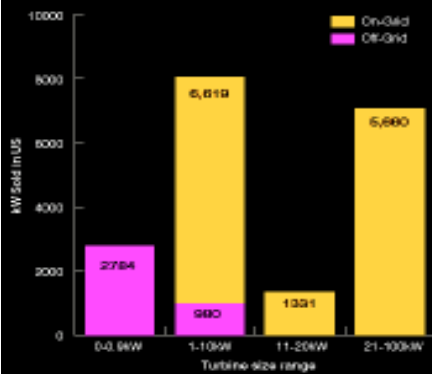
•AWEA and BWEA, both have their own certification standards.

•Various other associations from different countries, like that of **Canada** and **Japan**, are in the process of creating their **own certification guidelines based on the American and British benchmarks**.

•Danish DNV (Det Noorske Veritas), German GL (Germanischer Lloyd) and the Dutch institute ECN are actively involved in certifying **Building Mounted SWTs**, most of which are VAWTs.

•In 2006 the technical quality norm for HAWT was introduced: **IEC 61400-2**, for a rotor area of less than 200m²

US: Global Leadership in SWT and Hybrids

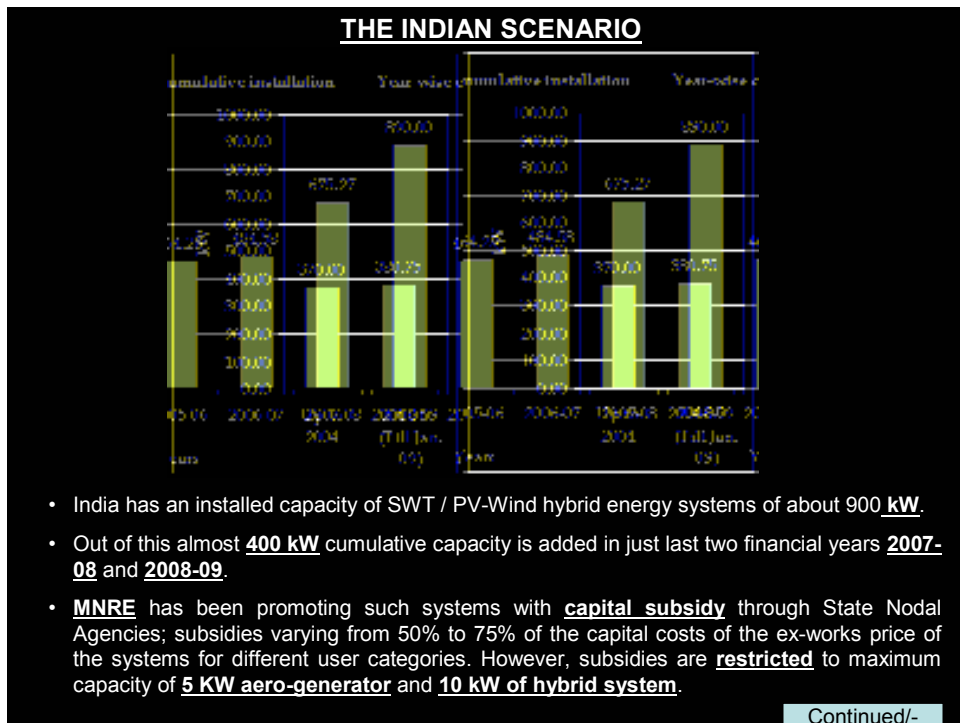
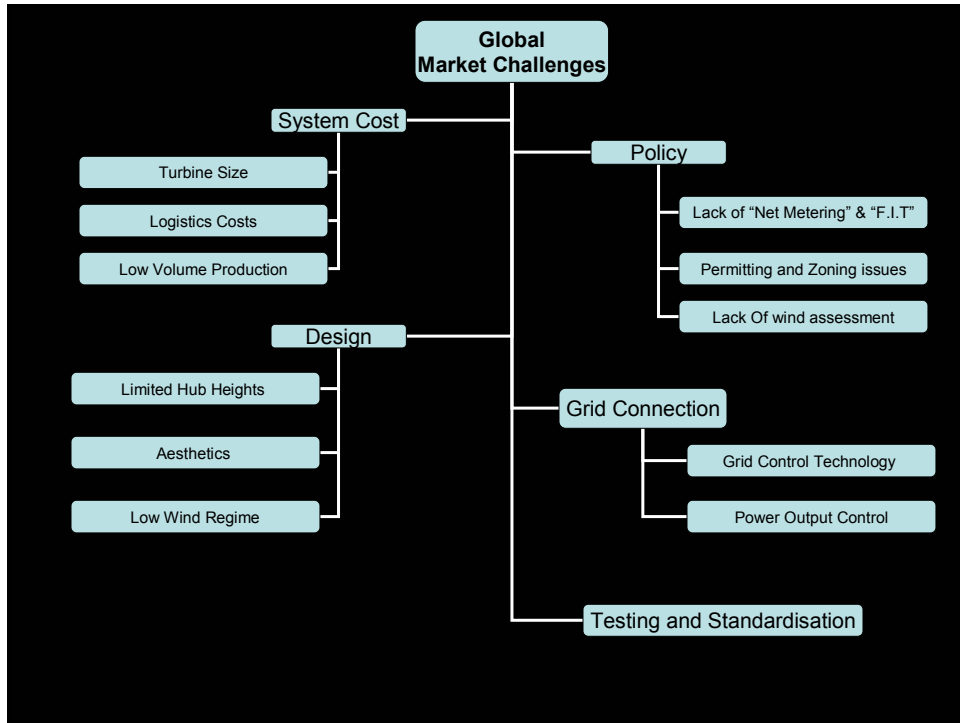


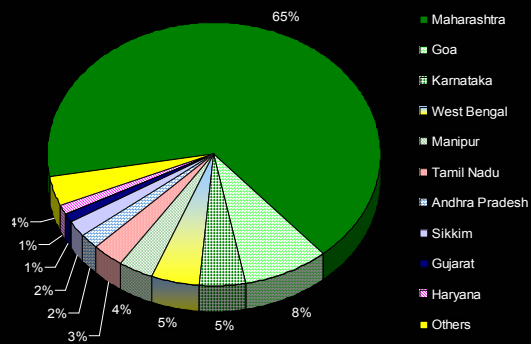
US: State-wise Policies

What are they working on

- What helped them**
- Investment Tax Credit. (30%)
 - The Economic recession.
 - Rise in Utility based Electricity Price.
 - Installer and Equipment Certification.
 - Improved resource assessment technology.
 - Increase in Venture Capital investment

- Federal renewable electricity standard (RPS).
- Increase the availability and size of financial incentives.
- Standardize grid interconnection and zoning rules and procedures.
- Implement or improve state/utility net metering policies.





•The otherwise “windy” states like Tamil Nadu and Gujarat **fair poorly** in the SWT and Hybrid scenario.

•The present **annual market** size for SWT and Wind-SPV systems in India is close to **200 kW**.

•**More than 73%** of the total cumulative installations in the country are in the states of **Maharashtra and Goa** itself.

•Most of the SWT systems installed in India are in '**off-grid mode**'. While the trend world over is towards 'grid-connected' systems.

•**Only 10 States** have managed the **10 kW** cumulative milestone.

Wind – Solar Hybrid Systems - Status

13 small aero-generators manufacturers/suppliers and **14 manufacturers / suppliers** of **wind-solar & wind-diesel hybrid systems**.

• Findings of an evaluation Study

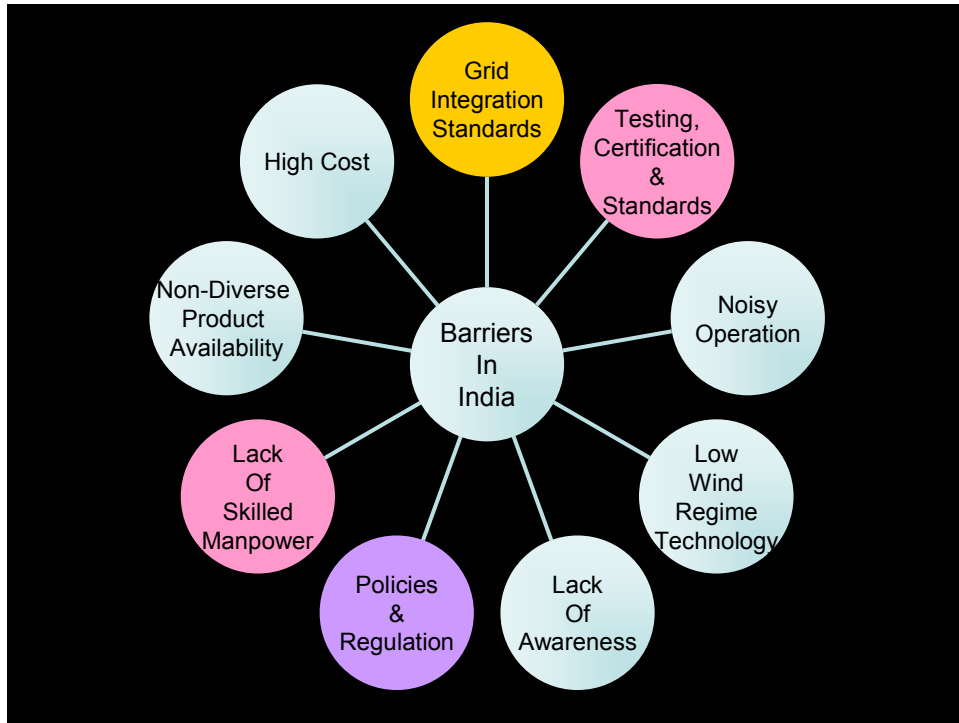
-Despite various fiscal and financial incentives provided by MNRE, the **SWT market is not catching up** in India to the extent required.

-The subsidy scheme and few implementations related aspects of that are really **limiting** the market. Though there is a growing interest among the users to go for such systems, even **beyond 10 kW** systems, the scheme does not allow more than 10 kW systems per user.

•The general **delay in processing subsidy** proposals is discouraging the users as well as developers interest.



The scheme has been modified with a market mode implementation strategy involving manufacturers.



Biomass Gasifiers for Microgeneration

- Biomass Gasifiers are promoted for off grid / distributed power in villages, for captive needs of industries and grid connected systems..
- CFA @ Rs.15000 per kW.
- Simplified project based implementation strategy announced in December 2009, involving manufacturers, entrepreneurs, NGOs etc.
- Project based PPAs are signed in MP, TN, Karnataka & WB.

NEW INITIIVES

- MNRE has announced **Roof-top SPV system demo program in FEB 09** with or without grid connection with total physical target of **4.25 MW**. The program **may be extended** to include SWT / Wind-SPV hybrid systems.
- Under the **Electricity Act-2003,Sec. 86.1(e)** empowers regulators to create suitable environment and ensure **grid connectivity for renewable energy systems**. Taking benefit of this provision SWT may be connected to the local grids.
- **Net metering** concept can be introduced so as to feed extra energy generation in the local grids. Net metering concept for SPV systems is already introduced in **West Bengal during 2008** for government buildings.
- SWT, SPV-Wind hybrid, Wind-Diesel hybrid systems are also covered under village electrification program through **Decentralized Distributed Generation (DDG)** under **Rajiv Gandhi Grameen Vidyutikaran Yojana**. Up to **90% of the total project costs** (capital cost and soft cost) will be provided as a financial assistance to the implementing agency.
- . Centre for Wind Energy Technology (C-WET), Chennai has set-up **testing and certification** unit which provide testing and certification services to the SWT manufacturers in India.

Policy Support for Grid Interactive Renewable Power

- **Electricity Act 2003**
 - **Section 86. (1)**: The State Commission shall discharge the following functions....
 - (e): promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;

National Electricity Policy 2005

- The National Electricity Policy 2005 stipulates that progressively the share of electricity from non-conventional sources would need to be increased; such purchase by distribution companies shall be through competitive bidding process; considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the commission may determine an appropriate deferential in prices to promote these technologies.

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National Electricity Policy

- **Non-conventional Energy Sources**
 - Feasible potential of non-conventional energy resources, mainly small hydro, wind and bio-mass would also need to be exploited fully to create additional power generation capacity.
 - With a view to increase the overall share of non-conventional energy sources in the electricity mix, efforts will be made to encourage private sector participation through suitable promotional measures.

Contd/-

Policy Support by States

- Intra-state open access regulations have been notified in Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Orissa, Tamil Nadu and West Bengal.
- The State Electricity Regulatory Commissions (SERC) in **26** States have announced preferential tariffs for renewable power.
- SERCs in **22** states have issued RPS orders

Rural Electrification Policy-2006

- In compliance with Sections 4 & 5 of the Electricity Act, 2003, the Central Government notifies the Rural Electrification Policy on 23rd August 2006.
- **Goals**
 - The Policy aims at :-
 - Provision of access to electricity to all households by year 2009.
 - Quality and reliable power supply at reasonable rates.
 - Minimum lifeline consumption of 1 unit per household per day as a merit good by year 2012.

Foreign Investment Policy

- Foreign Investors can enter into a joint venture with an Indian partner for financial and/or technical collaboration and also for setting up of renewable energy based Power Generation Projects.
- Liberalized foreign investment approval regime to facilitate foreign investment and transfer of technology through joint ventures.
- The proposal for up to 74% foreign equity participation in a joint venture qualifies for automatic approval.
- 100% foreign direct investment as equity is permissible with the approval of Foreign Investment Promotion Board (FIPB).
- Government of India is also encouraging foreign Investors to set up renewable energy based power generation projects on Built- Own and Operate basis.

Fiscal Incentives

- A package of incentives are available to renewable power projects such as:
 - fiscal concessions such as 80 per cent accelerated depreciation,
 - concessional custom duty,
 - excise duty exemption,
 - sales tax exemption,
 - income tax exemption on profits from power generation for 10 years, etc.

Other Incentives

- In addition, a host of fiscal incentives and facilities are available to both manufacturers and users of renewable energy systems, which include:
 - No excise duty on manufacture of most of the finished products.
 - Low import tariffs for capital equipment and most of the materials and components.
 - Soft loans to manufacturers and users for commercial and near commercial technologies.
 - Financial Incentives/Subsidies for devices with high initial cost.

SCOPE

Net captive power generation capacity (from all fuel sources) is estimated at about **₹20 and 25 GW** (2007-08) and diesel accounts for a sizable portion of this.

•As per Central Electricity Authority (CEA) over **1,05,011 (as on Dec. 2008) villages** remain **to be electrified** and are difficult to supply conventional electricity due to inherent problems of location and economic feasibility.

•As per Central Electricity Authority (CEA) over **1,95,94,000 (As on 31.03.09) pumps** need to be energised in India.

•There were over **1,80,000 cell phone towers** across the country. **90,000 more** towers are expected **to be added in 2009**.

Category	No.	Avg.Rating	Potential (GW)
Captive Power	N/A	N/A	25
Village Electrification	1,05,011	20KW	2.1
Pumps to be Energised	1,95,94,000	2.5KW	48.75
Cell Phone Towers	1,80,000	4KW	0.72
Approximate Total Potential			- 88 GW

Way Forward

- Promotion of Mini Grids based RE / RE Hybrid systems.
- Net metering practice in case of Small scale distributed RE generation systems to be allowed.
- Small scale distributed RE generation system to be included as eligible source for meeting the RPS obligation by the utilities.
- State Governments to provide additional incentives for promotion of such systems .
- promotion of Entrepreneurship for development and operation of RE based Micro-generation projects on viable revenue models.
- Skill Development for O&M services.
- Development of standards and certification systems to ensure quality
- Manufacturer/ Entrepreneur friendly implementation strategy
- Extensive Public Awareness programmes.

Thank You!