

Our, **S**mall **W**indmill **S**ystem – **SWS** is based upon the Patented **eSWS**- **e**lectrically **S**elf-powered **W**indmill **S**ystem. The eSWS primarily consists proprietary first-in-class *SEiSG-Self-Excited Synchronous Generator*, a never-before “digital ‘mechanical-speed’ to ‘electrical-torque’ convertor” and the intelligent *Auto-Changeover-Switch*.

The invention has helped us to attain the aforesaid through Low initial and O&M cost, Higher Generation, Revenue at the maximum unit rate etc, as follows:

1. **Low initial capital cost:** This is achieved as SWS does not use the imported (only available in China) permanent-rare-earth-magnets, Charge-Controllers or the specific brand Invertors, etc.

Best-in-class Weight to Power ratio further reduces the initial and O&M cost.

2. **Tested Proven Local Product:** SWS is an indigenously ‘**Made in India**’ after a decade of R&D, real-time rigorous testing and certified by ERDA- Electrical Research & Development Association, accredited by India Government NABL & Intertek (ASTA), UK.

SWS being locally made leads to low cost of manufacturing and speedy after sale on site service.

3. The Low Operational-&Maintenance Cost has been passed-on to the end-users. Unlike fixed Annual Maintenance Charges irrespective of performances, the SWS AMC is proportionate to it’s performance. Low generation lowers the AMC.

This dynamic cost of maintenance ensure the user do not have to pay for the AMC from their pocket. The SWS earns enough for itself.

4. (a) **Economic of transportation**, (b) **manual (without heavy machines) erection** and (c) **semi-skilled local installation**; has been achieved through the proprietary - compact, light-weight, stackable tower design.

This light weight and ease to transport & erect tower saves on the initial cost. The SWS uses just the 3% or 4M² of space for tower erection that-too can be used for multi-purposes (mix-uses of space beneath the tower).

5. **Long Life Span and minimum O&M Cost:** SWS achieves this through the following:
 - 5.1 No or negligible mechanical wear-&-tear as SWS is a *Direct Drive* with *No (Electrical) Load Start* and has *no-initial magnetic-forces or starting-torques* to overcome. This enables early & low-wind (2m/s) start and also keeps it up-&-running (rotating). Hence there are no structure threatening “Wakeup Losses”.
 - 5.2 Unlike other **P**ermanent-**M**agnet-**G**enerator where magnetism is predetermined & unchangeable, the SWS patented generator can increase-or-decrease its electrical resistance (air-gap flux), in real-time, for linear acceleration to avoid any sudden moments.
 - 5.3 Unlike other PMGs, SWS neither change the pitch nor stops the blade / generation, in the winds beyond the max-rated. This ensures lethal potential energy of high-wind is always converted into useful Kinetic-Energy for generation, which otherwise would have thrusted the tower blades and damages the whole system.

- 5.4 The higher CUF is achieved at low average-operational-speed, further ensuring low operational-noise, minimal surface-erosion of blade, keeps the structure stable and makes the yawing (aligning in-line of wind) effortless.
 - 5.5 In SWS the regular generation and even the rated power is attained at low speed; unlike other direct drive PMGs where only way to increase the power is to increase the voltage through higher-speed even though it is neither economical nor-safe for the surrounding.
 - 5.6 Double hot zinc dipped MS structures, double-Z imported Bearings, high quality electrical & electronic; further ensure longer life, minimum O&M cost and adds to faster ROI.
6. **Safe & Secure**: The SWS's proprietary intelligent "Digital Dynamic Load Management" further ensures a very smooth & gradual transition from no load to full load. This along with 'Low Speed Generation' makes SWS apt & utter safe for itself & the very surrounding too.
Note: as the power & rotation speed is propionate to cube of the wind speed, so even the little increase in wind raises the RPM exponentially with sudden bust of acceleration, which is fatal for the structure. SWS contagiously controls this speed & acceleration without sacrificing the output power, making the system safe.
7. **Self-Reliance - Generation without consuming any external power:**
- 7.1 Patented - **Self Excited Inverted Synchronous Generator (SEISG)**, non-PMG, self-reliant technology.
 - 7.2 Regulation of Voltage & Speed at source (generation level) itself without the need of any external power ensure - SWS never fails to protect itself and the very surrounding from over-voltage or over-speeding, for because of un-availability of external power.
 - 7.3 SWS is self-powered and there is No Negative Metering, just the desirable Reverse (net) Metering. This allows SWS to be used at unmanned and remote locations as off-grid and standalone system.
SWS, apart from primarily pushing the generated power first (beyond the back-up needs) automatically for Captive (self) usages, also provide prolonged unconditional back-up for your Disaster Management System as when needed, even while all other back-up fails when it is needed the most.
This very ability to produce usable electricity without any external electricity makes you self-sufficient, too.

8. Best-in-class Higher Generation:

Since SWS is "always rotating", just a little add-on wind quickly starts the meaningful generation. Once generating (loaded), the patented Dynamic Load Management ensures SWS is never either over-burdened or under-loaded. This always extracts "maximum power per rotation", at all/any winds, irrespective of the nameplate KW rating of the system and the changing end loads.

Unlike other PMGs & Direct-drive Windmills, SWS can generate more & more power while keeping the output terminal voltage and speed constantly low within the range. The patented - Digital Dynamic 'Mechanical Speed to Electrical Torque' converter ensures higher charging current. This, along with the simultaneous empowering the load (in parallel) leading to huge saving in the back-up cost, otherwise needed for high voltage bank or ampere hour (AH).

Note: While exploitable Sun is there for about six hours a day & that too for around ten months a year, the momentous wind is always there (4 times the sun) at the top of the building, which is harnessed & transformed into usable electricity through our patented technology.

9. **Revenue at the highest Unit (KWH) Rate;** not just at the competitive PPA rates.

SWS being the Off-grid Standalone system for Captive Power Generation, off-sets your electricity bill at the same rate as in the bill. While offsetting the regular electric bill @ Rs 9 /Unit or more, SWS also protects you from ever increasing inflated (at the rate of 4.0%) electricity, as shown in the table.

Year	Unit rate	Year	Unit Rate	Year	Unit rate
1 st	9.00	6 th	10.95	11 th	13.32
2 nd	9.36	7 th	11.39	12 th	13.86
3 rd	9.73	8 th	11.84	13 th	14.41
4 th	10.12	9 th	12.32	14 th	14.99
5 th	10.53	10 th	12.81	15 th	15.59

10. **Maximum Utilization of SWS produced Power first,** speeds up the Return on Investment.

Scenario	Grid	Windmill	Battery	Power to Load, will be from:	
1	ON	ON	ON	Windmill	1. SWS always by default push wind / battery power first than Grid Power is utilized, irrespective of the availability of Grid. 2. The extra generated power is delivered to load either through Inverter if AC or from battery if end load is DC. 3. In-absence of windmill as well as battery power, load is seamlessly toggled to Grid and pushed back to windmill as soon as generation commences vice-versa. 4. While running the load primarily on Inverter/ Battery still Power need for Backup and Disaster is taken care. 5. Manual SOS toggle switch is also there.
2	ON	OFF	ON	Battery	
3	OFF	ON	ON	Windmill	
4	OFF	ON	OFF	Windmill	
5	OFF	OFF	ON	Battery	
6	ON	OFF	OFF	Grid	

11. SWS economically offers prolonged back-up much needed for “**Disaster Management System**”. SWS being electrically self-powered provides rare electrical self-sufficiency. Even when there are no other power (back-ups) available, SWS’s early start and meaningful generation even at low wind ensures basic or the critical amenities are always powered.
12. **No additional or major changes in the existing electrical infrastructure** are needed as SWS being an Off-grid Standalone system. Unlike other renewable that require major investment in infrastructure (for example solar street lights requires changes to each electric pole), SWS does not require such expenses and any consent from the Utility Company.
13. **Versatile apt for mass usages:** SWS’s (1) early & low wind start, (2) generation at constant low RPM in A//Wind, (3) independent of any external electricity, (4) best-in class CUF & ‘Weight to Power ratio’ and, (5) ease of transportation, erection & installation etc. makes it a versatile universal renewable solution. (SWS automatically continuously adjust its output KVA to match the input wind KW power irrespective of its name plate rating and the changing loads).

SWS also adds to the aesthetic and creates a WOW factor with distinct prominent landmark. SWS can be customized, tailor-made to-order; SCALED or POOLED to suit ANY of your needs be it powering common/street lights, pumps, fountains, mobile towers, powering LED hoardings etc. SWS may further help in achieving **Corporate Social Responsibility & carbon credit**.

Summary:

1. Low Initial Capital Cost
2. Reliable 'Made in India' and 'tested & certified'; quick after sale support.
3. Low as well as Dynamic (proportionate to generation only) Operational & Maintenance Cost
4. Economical to transport, easy to erect & user-friendly installation
5. Long Life
6. Safe & Secure (generation at Low Speed constant acceleration)
7. Self-reliant (no negative metering).
8. High Generation- best in class CUF.
9. Revenue at maximum rate INR 9/unit.
10. Maximum Utilization of SWS generated units – smart changeover.
11. Prolonged back-up and apt for Disaster Management System
12. No major changes required in the existing infrastructure to integrate
13. Versatile and apt for mass usages.

SWS's ability to generate with 'same-ease, efficiency and safety' in ALL-winds, economically; makes SWS a much effective alternate to solar and other PMGs.

SWS can generate upto twice the electricity while occupying fraction of the precious space and without needing any external electricity for itself.



The 'Invented' **E**lectrically **S**elf-powered **W**indmill **S**ystem delivers electricity without consuming any external electricity for the same; and hence can also provide perpetual power for DISASTER MANAGEMENT SYSTEM, at times when even the solar & other conventional battery or diesel generator runs-out.

Our Small-Windmill-Solutions can either be used hand-in-hand with main-power or can be the source for main-power itself!

So only, while 'solar' & 'other small windmills' can just get you the Green Tag; SWS can actually make you electrically self-sufficient too!!