

GLOBAL POWER SOLUTIONS



Wind, Solar & Micro-Turbine Electric Power Systems

Presented by:

Reinhold Ziegler, C.E.O.

Synergy International Inc.

www.synergyii.com

Who inherits the future?



The people that plan for it!



Synergy International Inc.

Our company helps developing regions of the world to
PLAN and DEVELOP their ecological future.

Synergy electric systems improve the quality of people's lifestyles without damaging the environment. These systems make it possible to secure the power source where the commercial power grid is non existent.

These *Stand-Alone* electric power systems can generate power independent of any other power system. They can be installed with little or no difficulty anywhere the sun shines or the wind blows. Our systems are clean and reliable and *never need fossil fuels*.

Synergy electric systems can also become part of a *village power grid* and *national power grid* where electricity is shared by transmission lines to other houses, factories, farms, water pumps and schools.

Synergy International Inc.

Our Services include:

- Conducting in-country site surveys & feasibility studies.
- Building Solar, Wind and Biomass powered housing.
- Building Solar and Wind Farms.
- Provide electricity for water pumping systems, medical clinics, telecommunication, educational facilities, manufacturing, and village electrification.
- Integrate other forms of energy such as small-hydro and biomass energy to operate electric cars and trains.

Global Energy Poverty

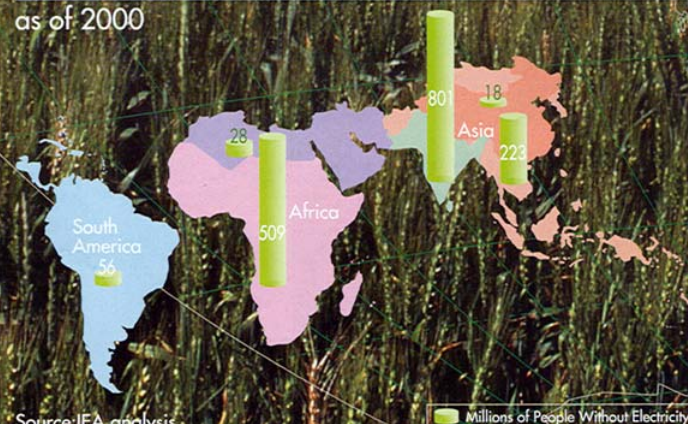
India: 801 Million people without electricity

Africa: 509 Million people without electricity

ASEAN Countries: 223 Million people without electricity.

Global Energy Poverty
as of 2000

©OECD/IEA, 2002



Global Power Solutions

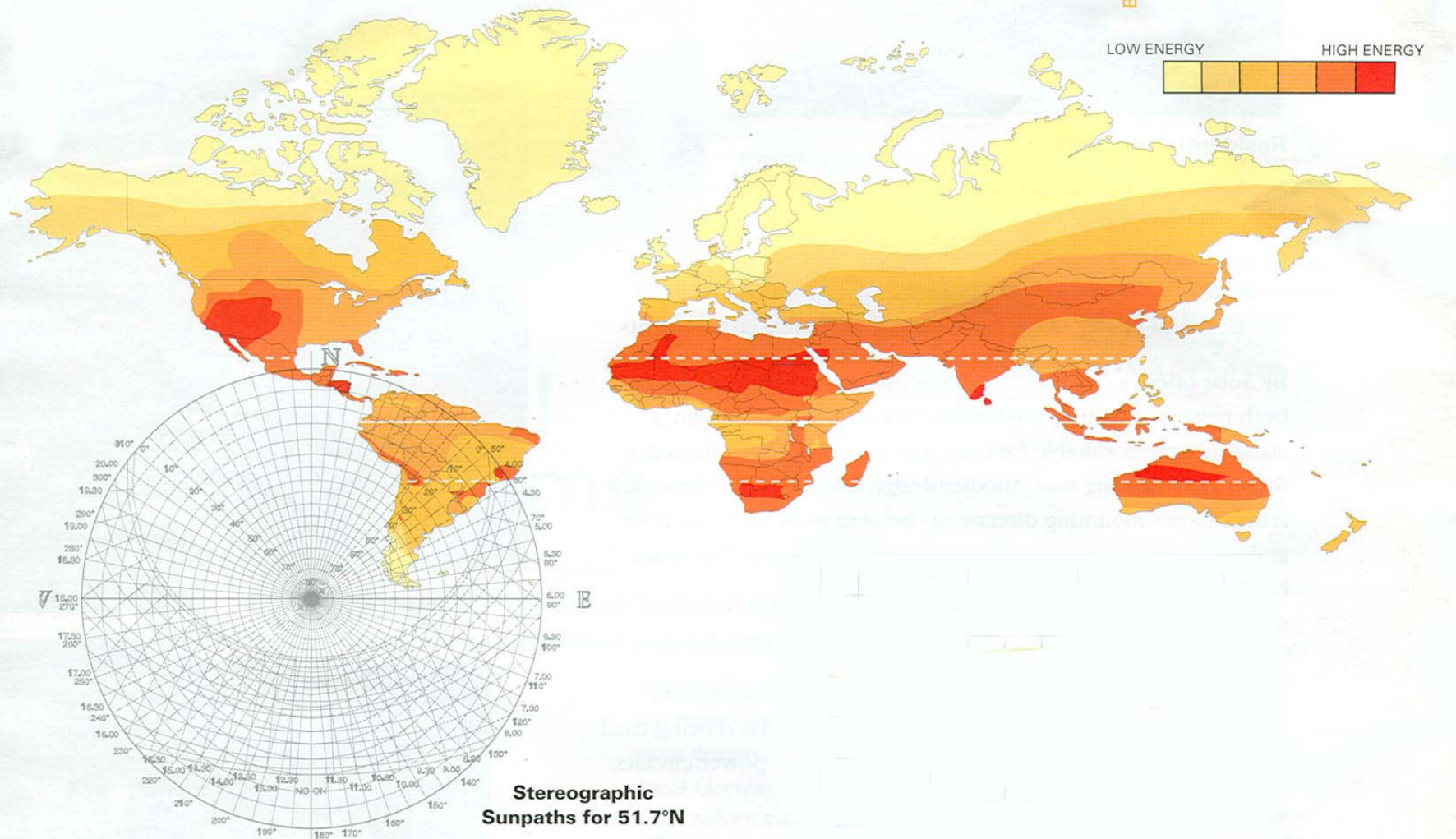
Topics in this Presentation:

- Solar Water Pumping Systems
- PV Solar Medical Systems
- PV Solar Education Systems
- Village Electrification
- Small Wind-Energy Systems
- Wind Farms
- Biomass Harvesting Equipment utilizing Gasifier Stoves and Micro-Turbines

PV ELECTRIC ENERGY IN kWh/M²

MetData from Meeonorm, assumes a module area efficiency of 13.5% and a Performance Ratio of 78%

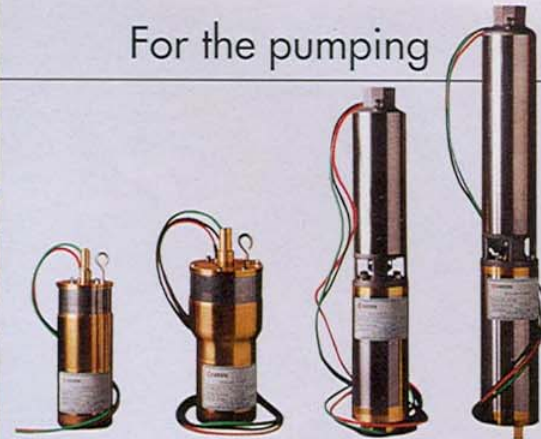
Energy Output kWh/m²/y	121	111	201	201	191	129	143	124	180	183	143	132	176	223	227	182	189	205	220	233	169	147	253	201	232	203	217	233	149	171	156	119	
Optimum Tilt Angle (°)	35	35	35	30	35	40	30	35	45	30	35	35	30	25	30	30	25	20	25	30	35	35	30	30	30	5	15	30	30	0	20	40	
Orientation	latitude	52	52	40	39	42	62	46	50	60	38	47	48	41	25	-32	-38	-28	19	26	33	41	47	32	-34	-35	-1	13	28	35	1	22	37
	longitude	13	0	4	9	13	5	6	20	11	23	19	16	29	55	116	145	153	-99	-80	-117	-74	-122	-111	-58	18	36	77	77	140	104	114	56
	BERLIN	LONDON	MADRID	LISSON	ROME	AMSTERDAM	GENEVA	KRAKOW	OSLO	ATHENS	BUDAPEST	VIENNA	ISTANBUL	ABU DHABI	PERTH	MELBOURNE	BRISBANE	MEXICO CITY	MIAMI	LOS ANGELES	NEW YORK	SEATTLE	TUCSON	BUENOS AIRES	CAPE TOWN	NAIROBI	BANGALORE	DELHI	TOKYO	SINGAPORE	HONG KONG	MOSCOW	



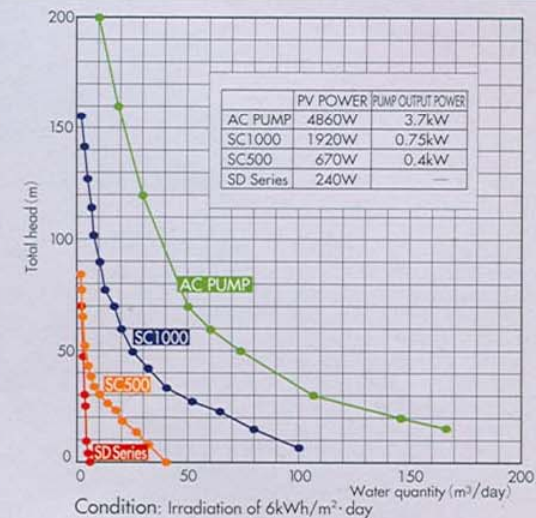
SOLAR WATER PUMPING SYSTEMS



For the pumping



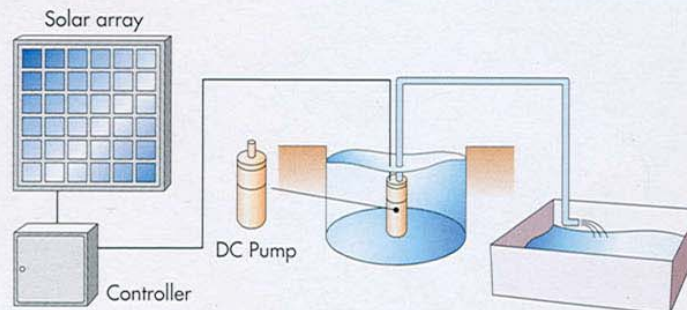
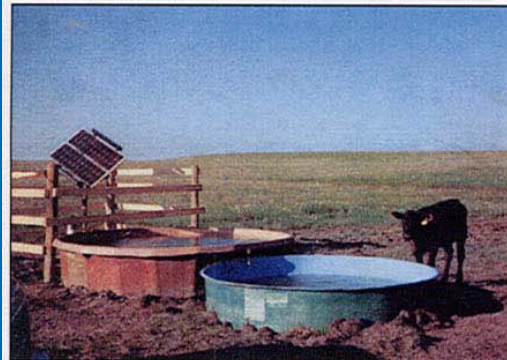
Typical water pumping system characteristics



● AC Pump 3.7kW ● Brushless DC pump SC500
● Brushless DC pump SC1000 ● Diaphragm Pump (SD)

Solar powered pumps are an adequate solution to water delivery. Anywhere the sun shines, Synergy pump systems cleanly and quietly provide a steady supply of affordable water for villagers, livestock, irrigation, and home water systems.

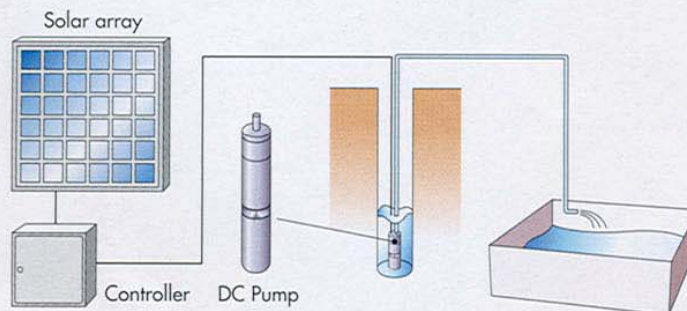
☐ Submersible Diaphragm DC Pump System



The system operates with a minimal amount of electricity to pump drinking water for humans and livestock from shallow wells and ponds.

System	SD12-30	SD6-35	SD3-70
Solar Array	40W~240W		
Controller	MPPT control		
Pump's rated input(V)	DC30V		
Optimal Flow	0~16.5LPM		
Optimal Head	0~70METERS		

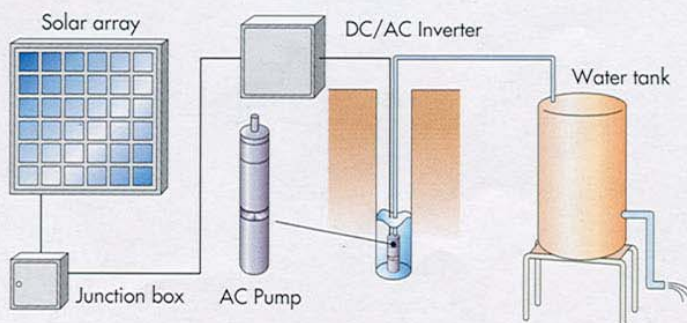
☐ Submersible Centrifugal DC Pump System



This mid-sized pumping system is suitable for pumping larger amounts of water from deeper wells. Ideal for drinking and irrigation purposes.

System	SC500	SC1000
Solar Array	480W~640W	960W~1920W
Pump's rated input(V)	DC90V	DC120V
Controller	MPPT control	
Optimal Flow	0~162LPM	
Optimal Head	0~167METERS	

☐ Submersible Centrifugal AC Pump System



The AC pump system is capable of pumping water from deep wells and rivers. Ideal for villages and irrigation purposes.

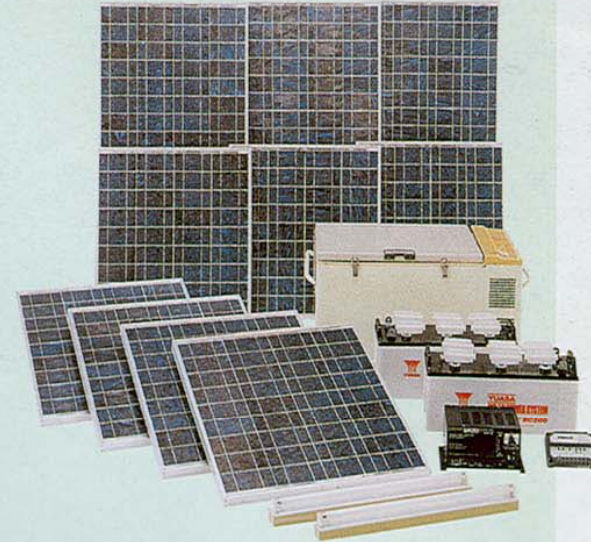
System	Submersible AC Pump
Solar Array	972W~6480W
Inverter input Voltage	DC300V
Pump's rated Voltage	AC200V
Pump Output	3 phase Max. 3.7kW



MEDICAL SYSTEMS



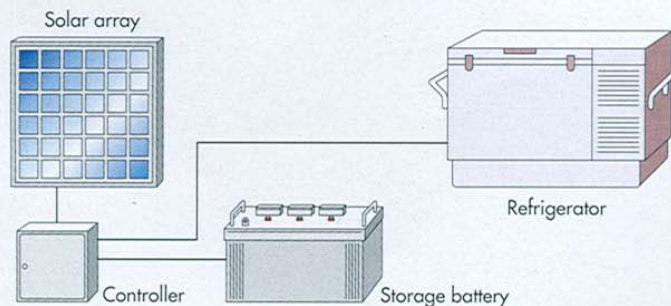
For the hospital



Conserving vaccine and other sensitive medical supplies is crucial to the health of rural people. For over a decade, Kyocera has been a global leader in supplying solar powered clinic systems while earning a World Health Organization (WHO) and UNICEF designation as a Qualified System Supplier of solar powered vaccine refrigeration systems.

Synergy Systems

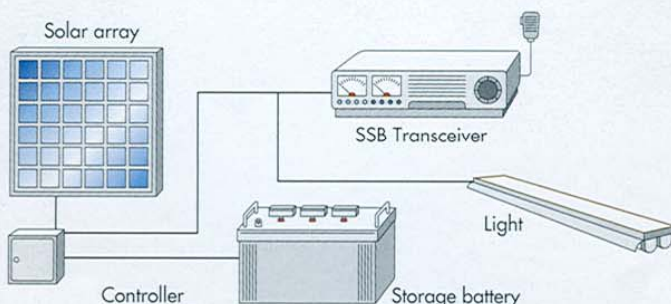
☐ Vaccine Refrigerator System



With our extensive international experience in the engineering, integration and deployment of such systems, Kyocera has produced a solar powered vaccine refrigeration system, a WHO tested and approved vaccine refrigerator/icepack freezer with the lowest energy consumption reported to date.

System	Note
Solar Array	240W
Controller	Overcharge prevention Overdischarge prevention
Storage Battery	DC12V/150Ah
Refrigerator	WHO approved Vaccine storage capacity 21 litres

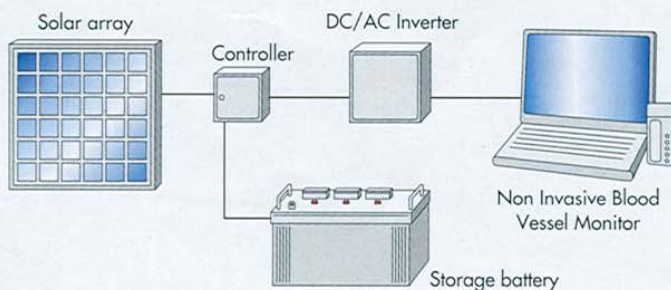
☐ SSB (Single Side Band) Transceiver System



Kyocera's solar electric system can be expanded to power communications equipment. The solar powered communications systems enable rural medical clinics to communicate with hospitals in urban areas in case of emergency.

System	Note
Solar Array	240W
Controller	Overcharge prevention Overdischarge prevention
Storage Battery	DC12V/250Ah
Load	SSB Radiotelephone Lighting : FL 10W
Operating Time per day	less than 2 hours

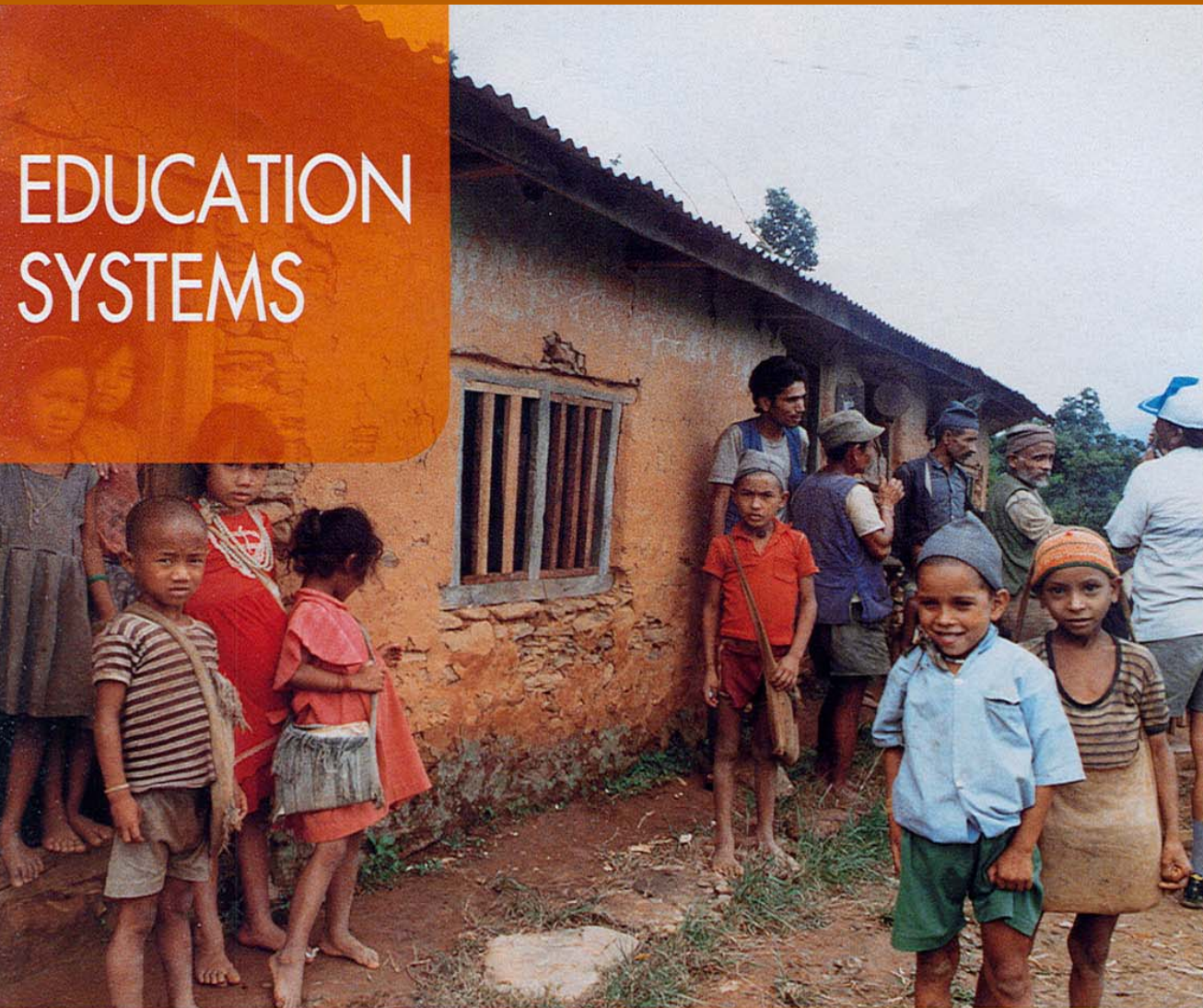
☐ Hemoglobin Measuring System



This solar electric system is capable of measuring the amount of hemoglobin in the bloodstream, which is an important index for diagnosing health conditions.

System	Note
Solar Array	60W
Controller	Overcharge prevention Overdischarge prevention
Storage Battery	DC12V/65Ah
DC/AC Inverter	DC12V/AC100V, Sine Wave
Non Invasive Blood Vessel Monitor	Input Voltatage AC100V
Operating Time per day	less than 2 hours

EDUCATION SYSTEMS

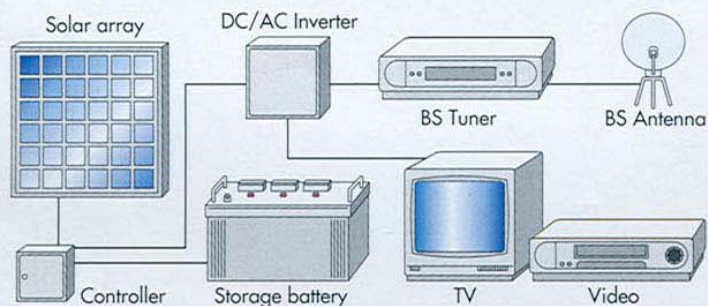


For the school



Offices and schools require an increasing amount of electricity to keep pace with the rapid flow of information exchange. Unfortunately, many rural schools in developing countries lack even basic lighting. Solar electric systems can help these schools to extend learning opportunities.

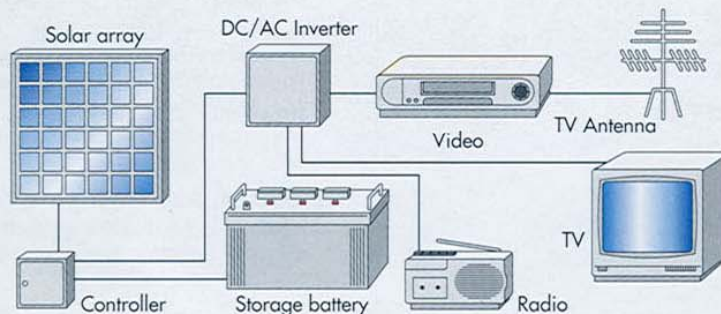
☐ BSTV-Video



The solar electric system brings the world's latest information through BSTV, even in the off-grid area.

System	Note
Solar Array	480W
Controller	Overcharge prevention Overdischarge prevention
Storage Battery	DC24V/250Ah
DC/AC Inverter	DC24V/AC100V, Sine wave
Load	BSTV, VIDEO, TUNER
Operating Time per day	less than 2 hours

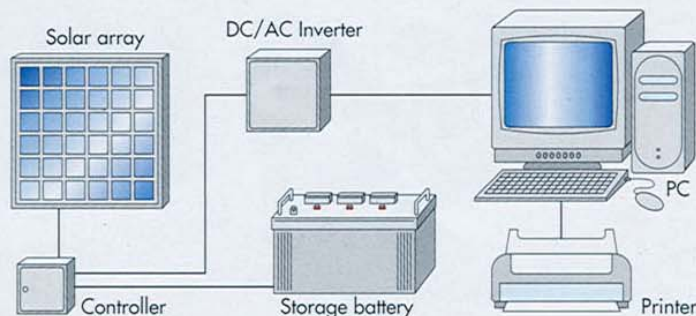
☐ TV Video/ Radio



More advanced distance learning will be available by powering audio-visual equipment with solar.

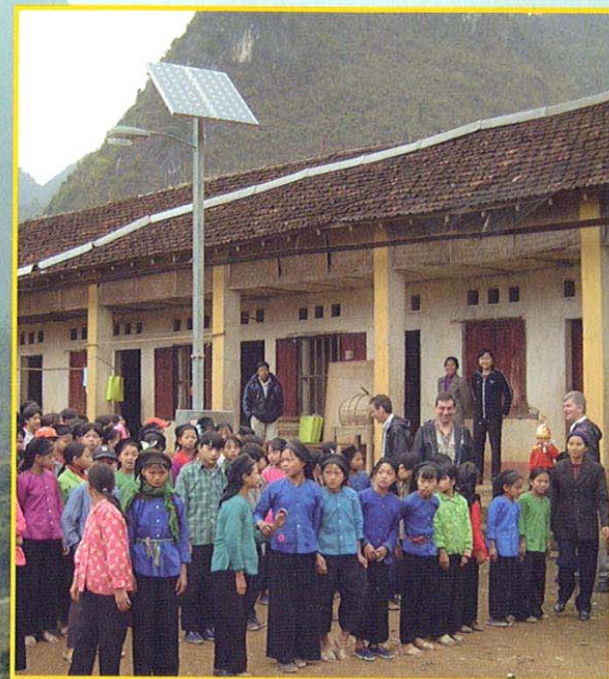
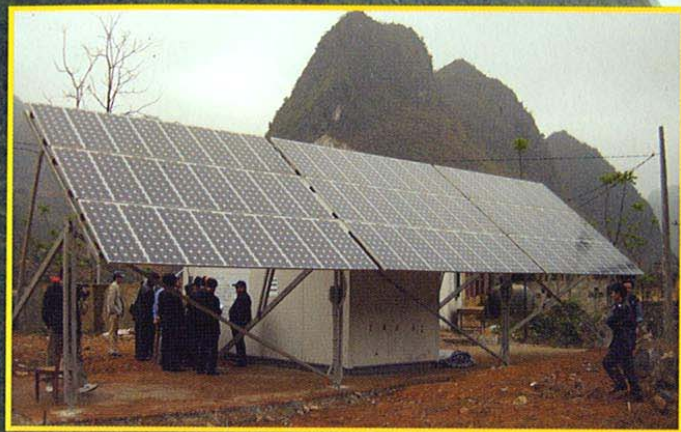
System	Note
Solar Array	480W
Controller	Overcharge prevention Overdischarge prevention
Storage Battery	DC24V/200Ah
DC/AC Inverter	DC24V/AC100V, Sine wave
Load	Color TV, Video
Operating Time per day	less than 2 hours

☐ Personal Computer (PC) / Printer



Advanced information technology(IT) education will be accessible in rural areas by installing solar powered PCs and printers.

System	Note
Solar Array	960W
Controller	Overcharge prevention Overdischarge prevention
Storage Battery	DC48V/400Ah
DC/AC Inverter	DC48V/AC100V, Sine wave
Load	PC×2pcs, Printer
Operating Time per day	less than 2 hours

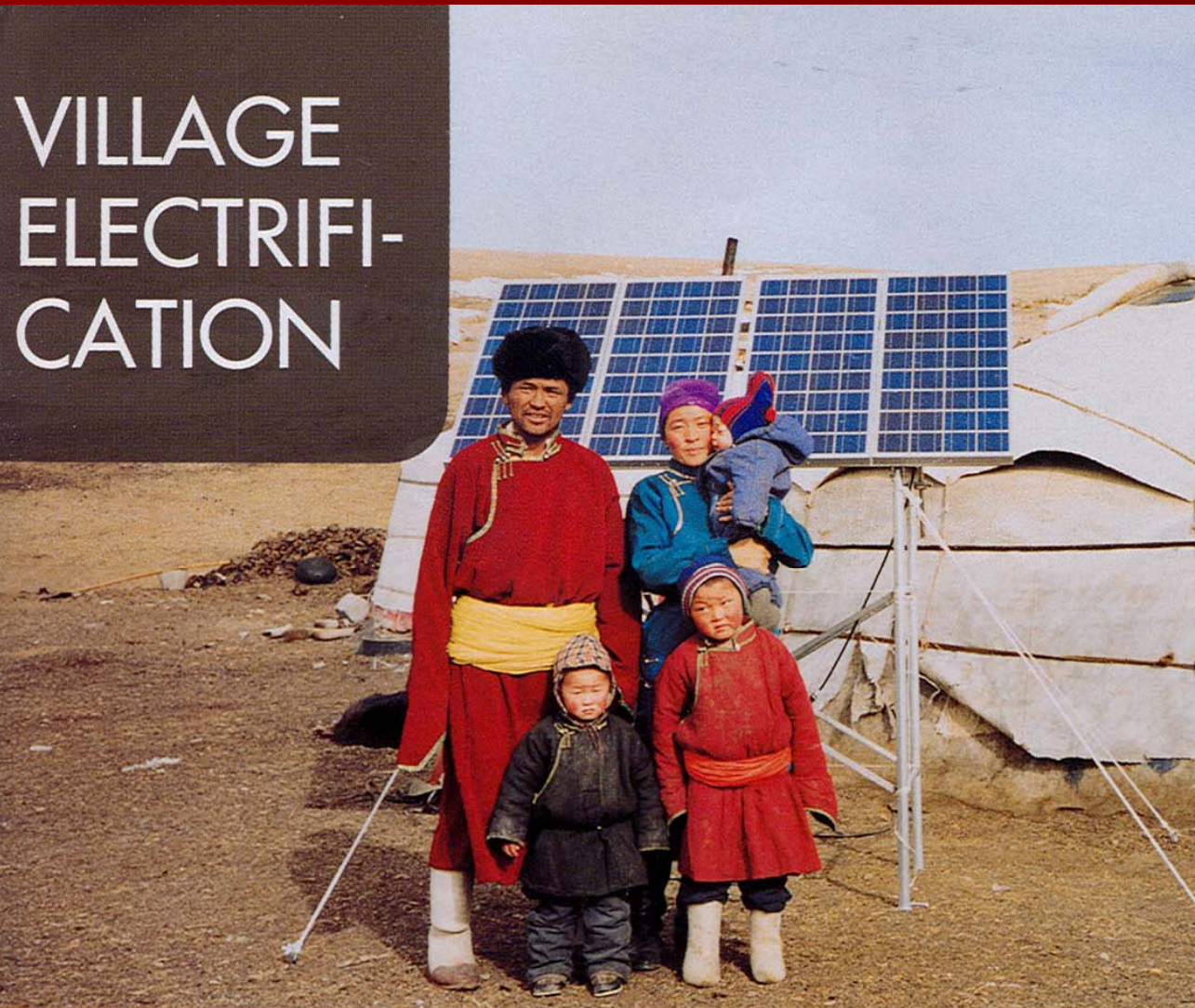


Sy Hai

Cao Bang Province

Vietnam

VILLAGE ELECTRIFI- CATION

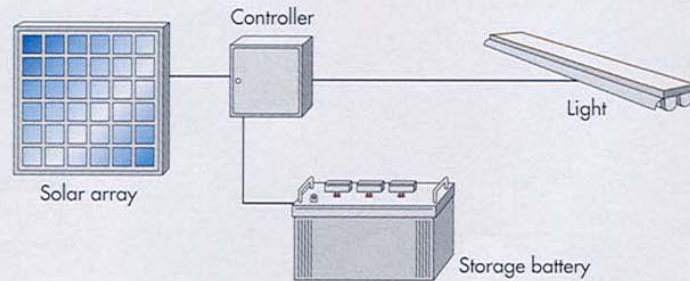


For a village and a colony



Rural electrification brings the benefits of electrical power to those living in areas where traditional power is not available. Remote villages can improve the quality of life with solar electric power, which can literally power anything electrical. Kyocera supports the use of appropriate technology for sustainable development.

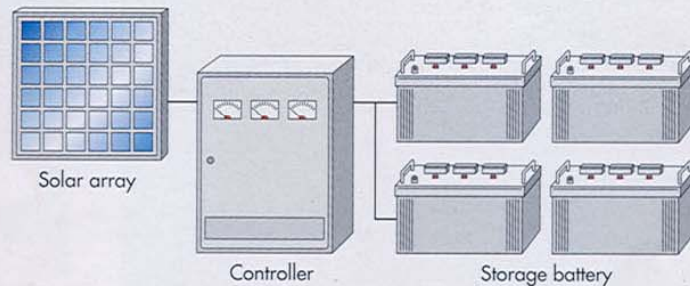
☐ SHS (Solar Home Systems)



These are small solar electric systems designed to operate a few lights for families living in most remote areas.

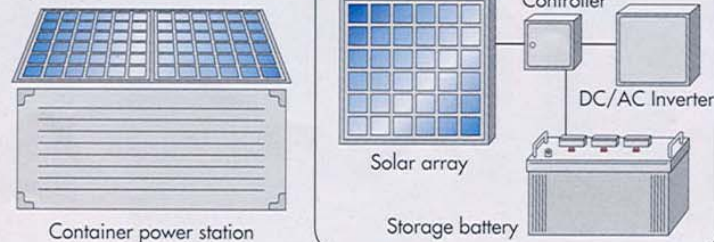
System	Note
Solar array	60W
Controller	Overcharge prevention Overdischarge prevention
Storage Battery	DC12V/65Ah
Lighting	FL 10W
Operating Time per day	less than 5 hours

☐ Battery Charge Station



The station provides solar generated electricity to villagers by charging their batteries at low cost. It works just like the regular gas station for vehicles.

☐ Container Power Station



The photovoltaic panels, batteries, and controllers are included in the container, which functions as an electric room and a mounting frame at the site. It minimizes the hassle of on-site construction by making it easy to carry additional components to the system. Several residences can be powered from the station just by extending the cable.

The future of electric power

“It is becoming clear that the future of our electric power will come less from large coal, gas and nuclear power plants, but more from millions of building-integrated micro generators and urban wind-turbines, photoelectric solar panels mounted on the roof-tops of the city with wind farms and solar farms in the countryside.

Existing national power grids won't disappear. They will operate more like the Internet, as part of a complex web through which people will supply electricity, by uploading, as well as downloading it.”

We call this process, distributive generation and it is being introduced all over the world.

Reinhold Ziegler
Founder, Synergy International Inc.

Synergy PV Technologies

Ready for licensing and manufacturing.



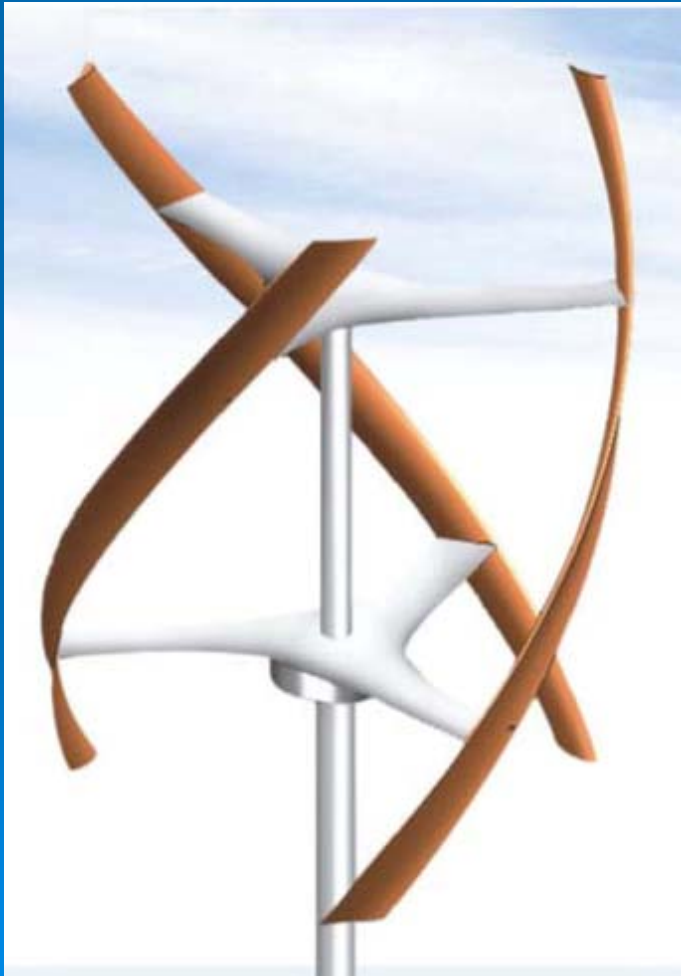
SOL-LINK 500 watt PV Generator Residential Module
220 volt out. Utility Intertie,
3 KWhr/day fed into the Power Grid.
2 Units = 6 KWhr/day
4 Units = 12 KWhr/day



SOLMAN Mobile PV Generator, 130 watt KYOCERA PV
3KWhr in battery storage, 2KW AC Sine Wave Inverter

Synergy Wind Technologies

Ready for licensing and manufacturing.



PAC-WIND Delta II >

Rated 10 KW in a
37 mph wind

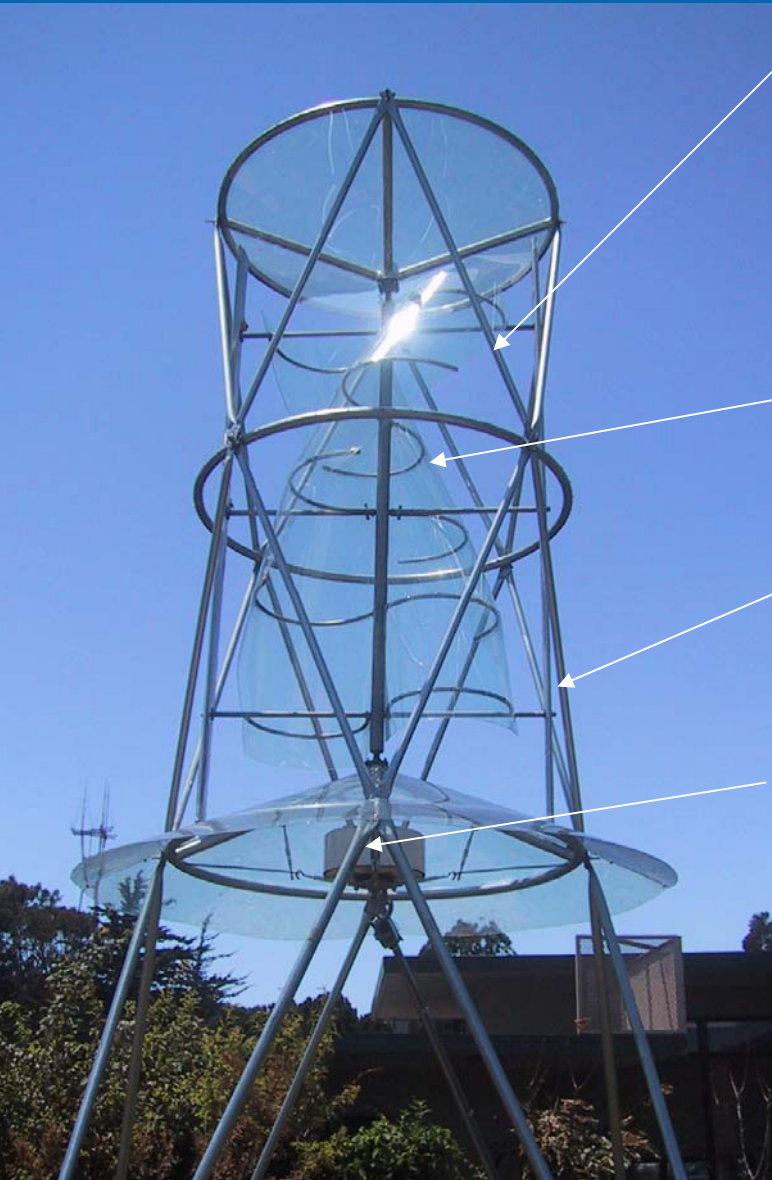
220 VAC 3 phase out.
Utility Intertie.

Made in U.S.A.



< **AERO-WIND Windgenerator**, 1 KW at winds mph.
Utility Intertie or battery storage. (Made in China)

The Aerotecture Urban Wind Turbine



Integrated Space Frame Tower: 5' Diameter and 10' high. Can be mounted vertically or horizontally. Can also be enclosed with wire mesh to keep birds out or ducted for increased wind velocities.

LEXAN Double Helix S Rotor: a drag rotor with high starting torques. Can accept wind from any direction. Works with low-speed winds.

Darrieus Rotor: Two vertical airfoils produce aerodynamic lift. $TSR = 4$ (blades go 4 times as fast as the wind).

Boron Neodymium Permanent Magnet Direct Drive, 3 phase Alternator: Ideal for utility intertie applications.

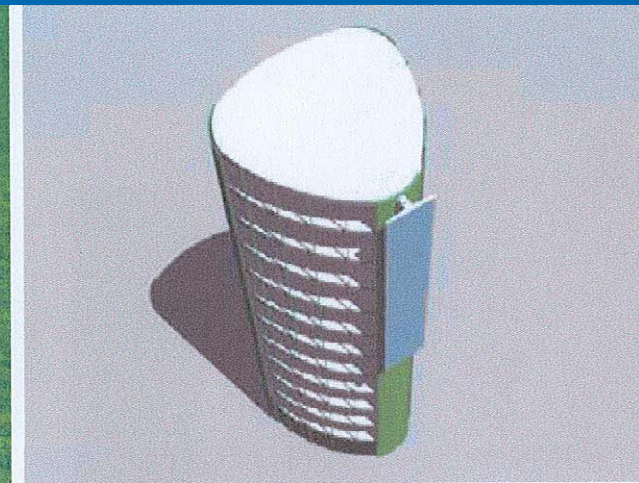
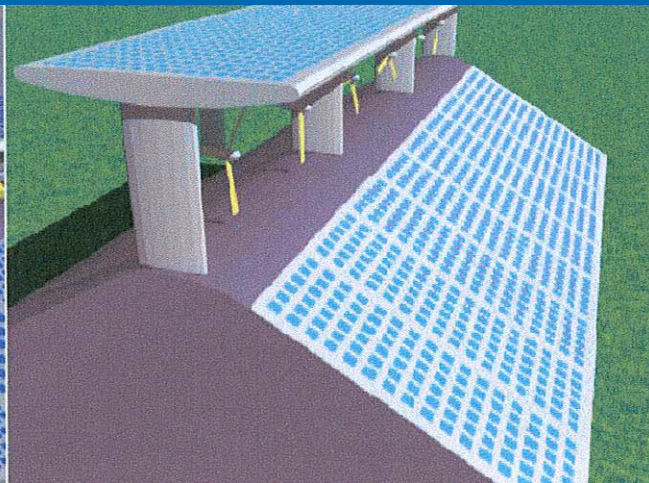
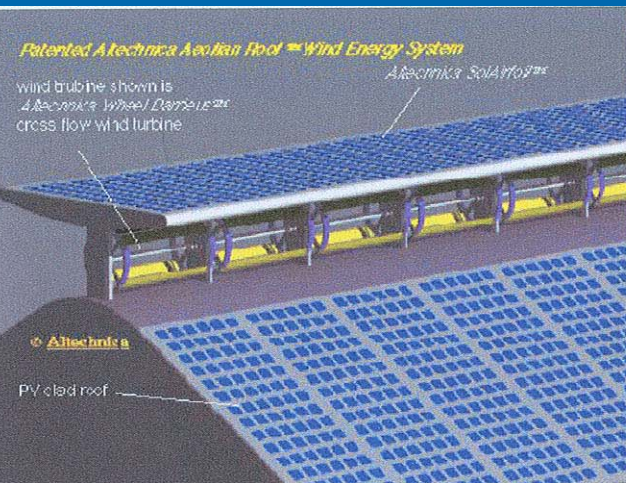
Works very well in cities and other turbulent areas.

The entire system is patented.

Aerotecture Turbines on Buildings

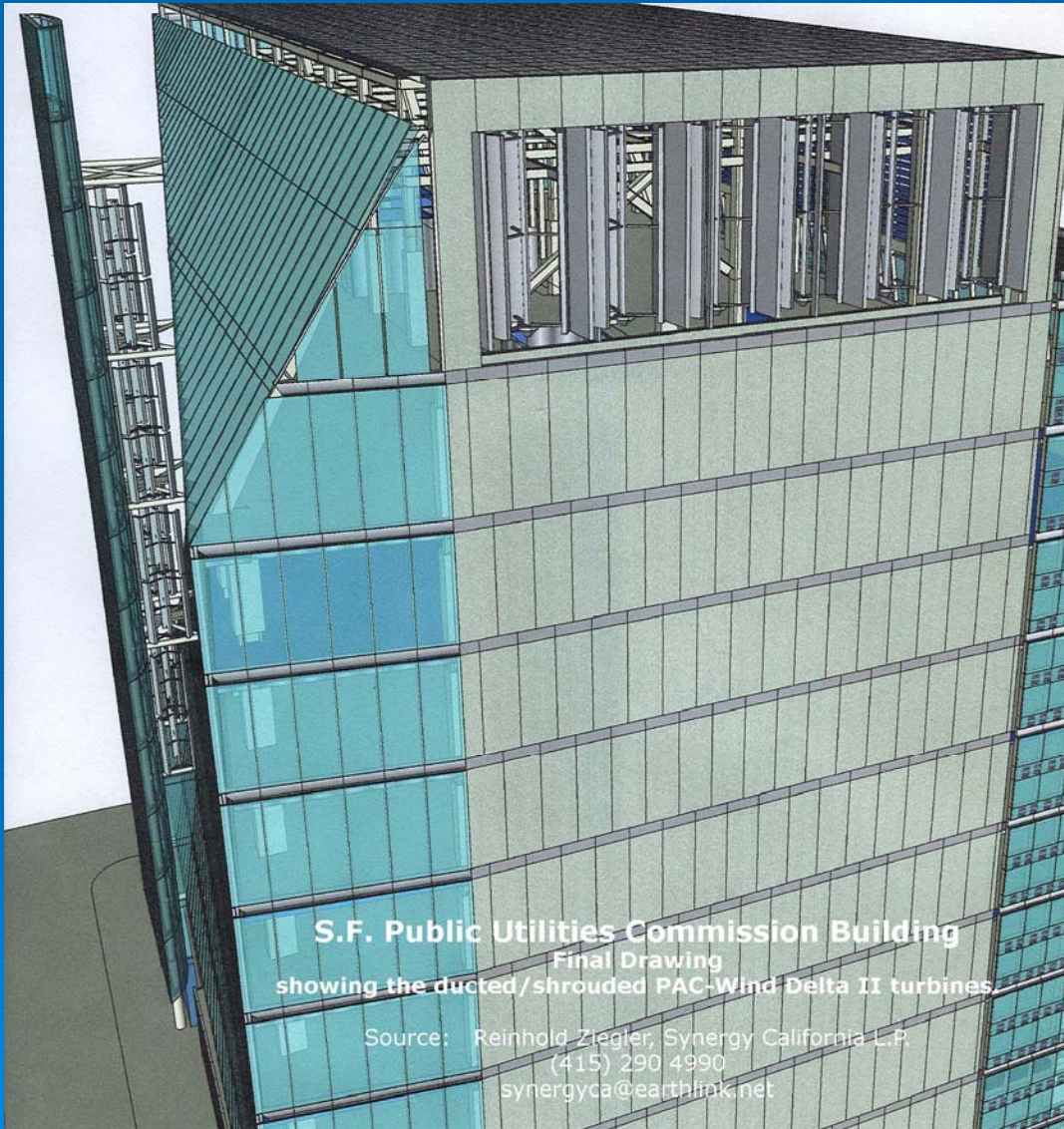


Architectural Energy Elements



The new energy architecture will have diffusers and augmentors for the wind turbines. These building elements will accelerate the mass flow of air through the turbines. Diffusers can be horizontal across the roof or mounted vertically along a high-rise. In some cases these shrouds can also be mounts for PV collectors. The diffusers can also have inlet and outlet screens to keep birds out. An increase of 2.5 mph in windspeed through the shroud will double the output of a wind turbine.

S.F.P.U.C. Building, California USA



We are currently studying how to achieve maximum energy self reliance for this proposed building.

Aside from substantial energy conservation...

Methods are being explored for generating new energy including:

Solar PV on the roof and south façade,

Urban Wind turbines systems utilizing a ducted shroud and perhaps,

Unique Flywheel storage devices for storing night time energy for "On-peak" delivery.

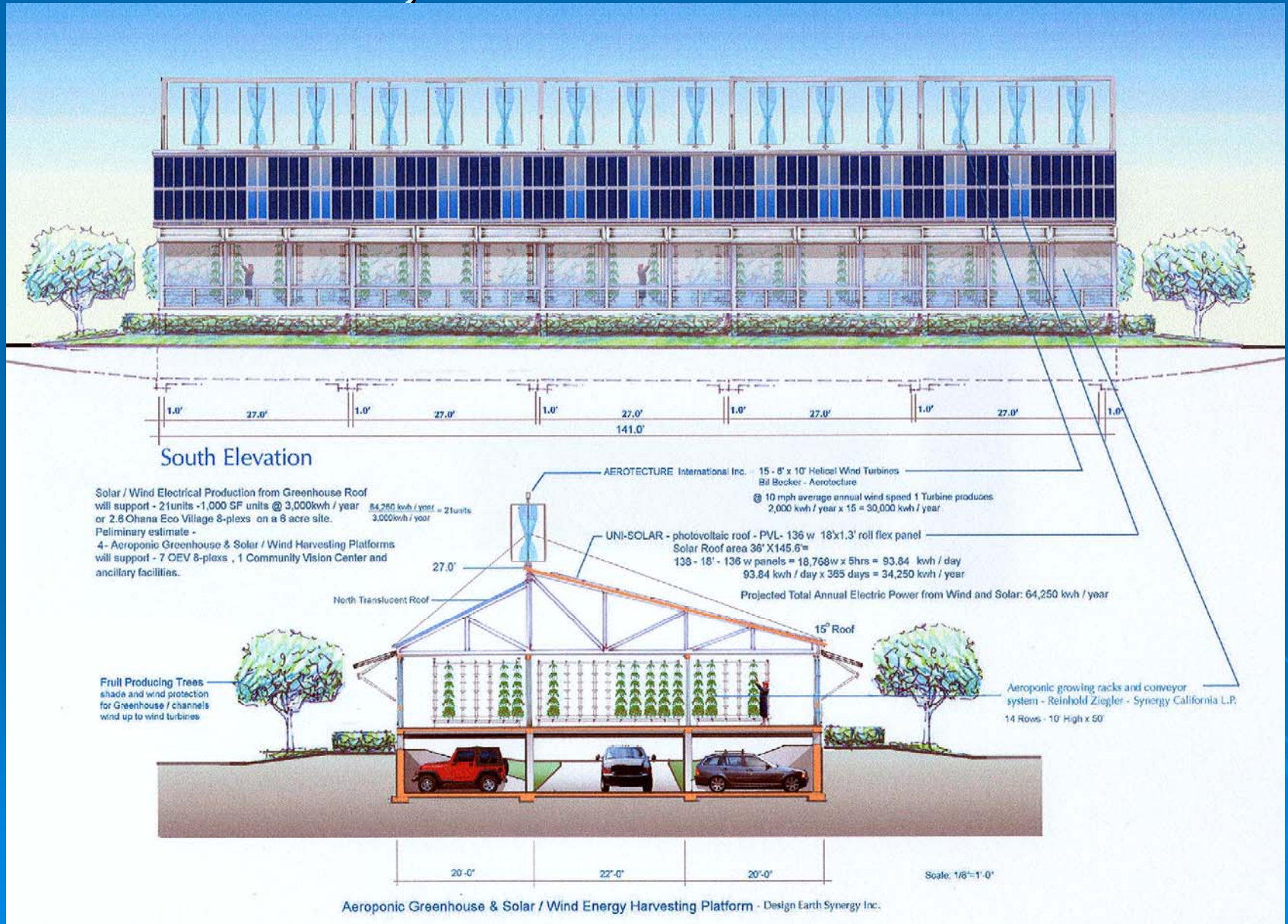


Future San Francisco Public Utility Commission Building
Building Integrated Wind Energy Systems Design: Reinhold Ziegler, Synergy California L.P. (415) 290 4990

Roof Mounted Turbines from Holland



Energy Harvesting Platforms for Solar, Wind and Food Production





*Up to 2.5 times the output of
conventional wind turbines*

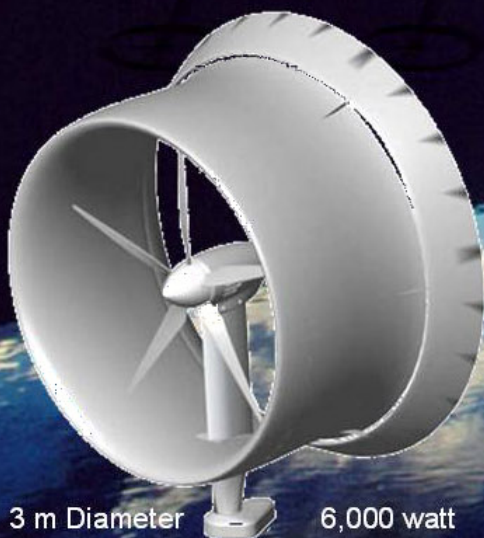
TURBOSTAR

Ducted Wind & Water Turbines

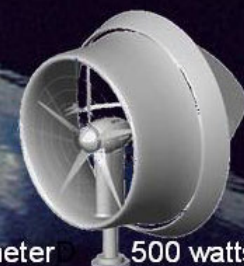
Available from: Synergy California L.P.

(415) 290-4990

synergycalifornia@earthlink.net www.synergycalifornia.com



3 m Diameter 6,000 watt



.5 m Diameter 500 watts

Wind Farm Developments

Wind Power is the greatest terrestrial medium for harvesting solar energy.

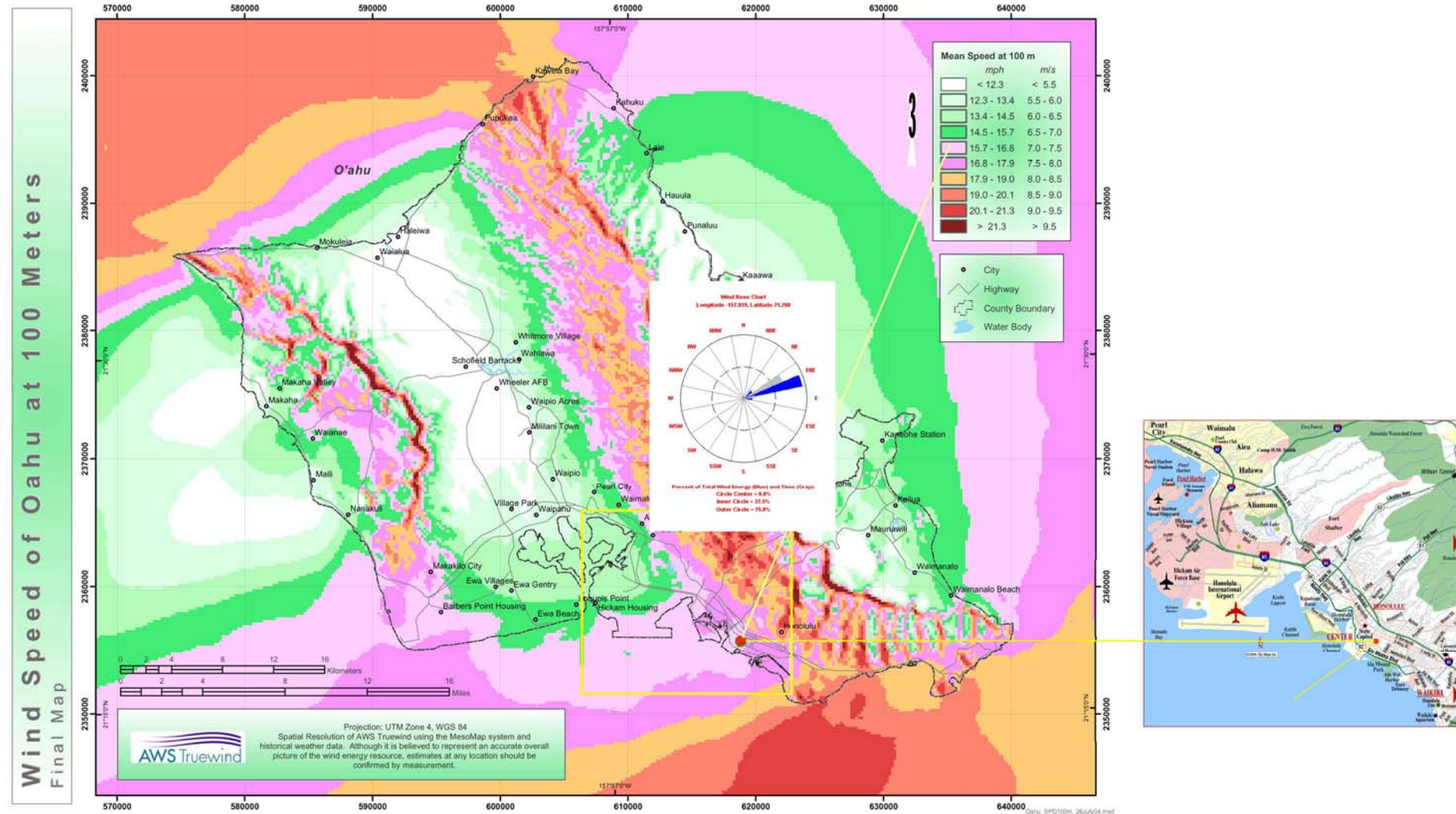
The atmosphere represents a 4 billion cubic kilometer storage battery for solar energy. The uneven heating and cooling of the land and sea creates the wind

Planning any wind farm development begins by studying the count of the number of hours per year that the wind blows at various velocities.

Given this data plus the output curves from various wind-turbines allows us to predict with scientific accuracy the future performance of the Wind-Farm and the return on investment.



The first step is do **wind studies** followed by extensive **site surveys**.
What is shown below is a wind study of the island of Oahu, Hawai'i.
The colors represent wind velocities at 100 meters above the ground.
What is also shown is the prevailing direction of the wind called a Wind Rose



Synergy International: Your Wind Energy Partner

We give you access to competitive state-of-the-art expertise within all aspects of wind energy.

Project Development

We offer assistance in all phases of project development including:

Site Selection

Wind Resource Assessment

Project Feasibility

Wind Farm Design

Preparation of Tender

Contract Negotiations

General Services

Project Due-Diligence

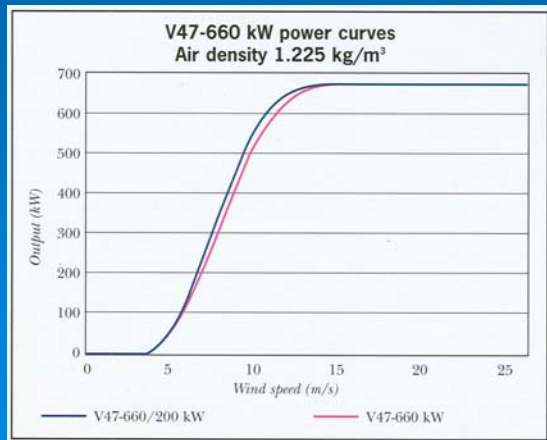
Development of Control Strategies

Grid Connection Studies

Wind Power Prediction

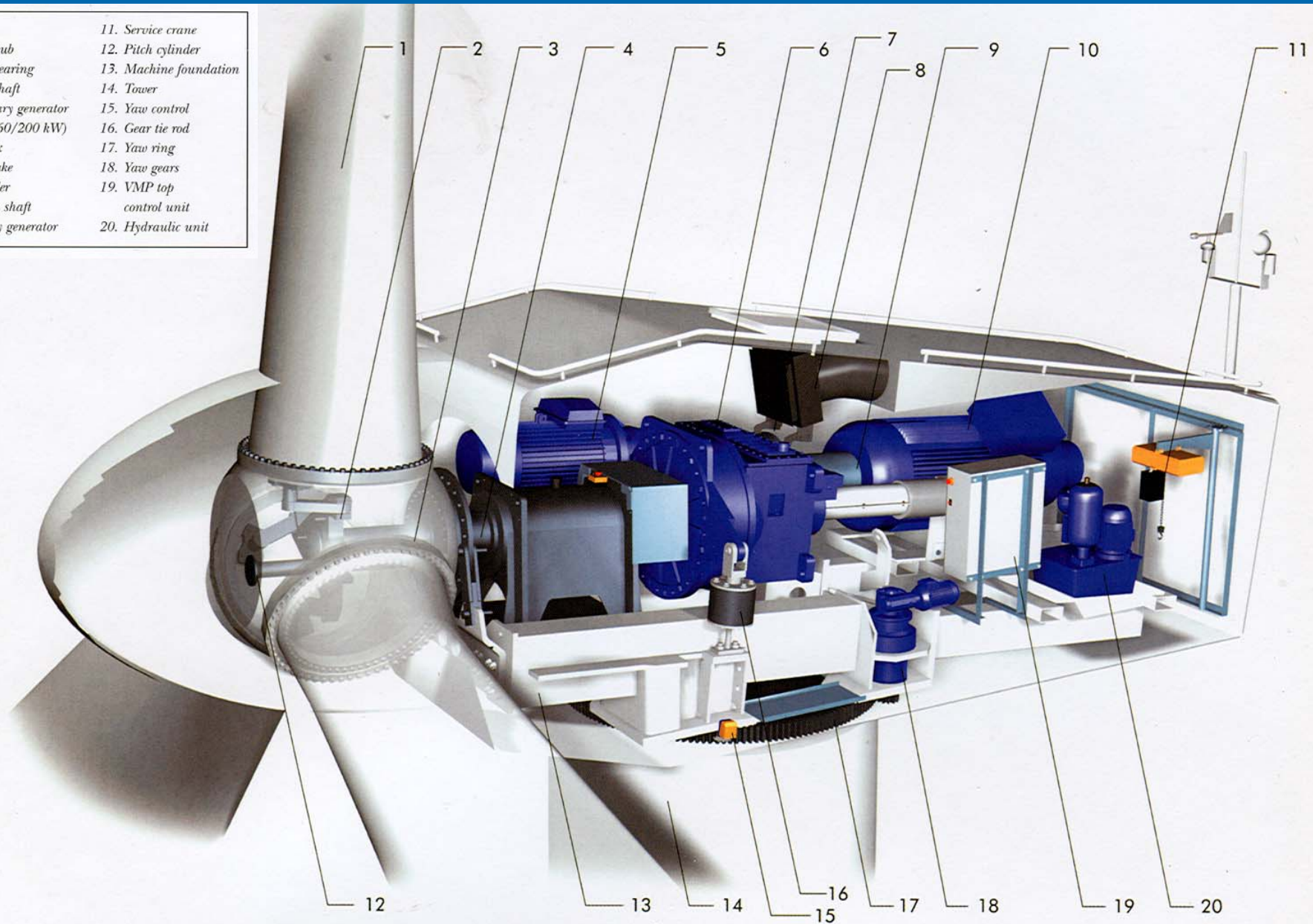
Turbine Simulation (FLEX5)

The VESTAS V47 660 kw



Schematic of the VESTAS 660 KW Wind Turbine

- | | |
|--|-----------------------------|
| 1. Blade | 11. Service crane |
| 2. Blade hub | 12. Pitch cylinder |
| 3. Blade bearing | 13. Machine foundation |
| 4. Main shaft | 14. Tower |
| 5. Secondary generator
(V47-660/200 kW) | 15. Yaw control |
| 6. Gearbox | 16. Gear tie rod |
| 7. Disc brake | 17. Yaw ring |
| 8. Oil cooler | 18. Yaw gears |
| 9. Cardan shaft | 19. VMP top
control unit |
| 10. Primary generator | 20. Hydraulic unit |



VESTAS V47 Turbines in a 150 MW Wind Farm in Wyoming USA.





The answers to our energy problems may be blowing in the wind...

Biomass Energy

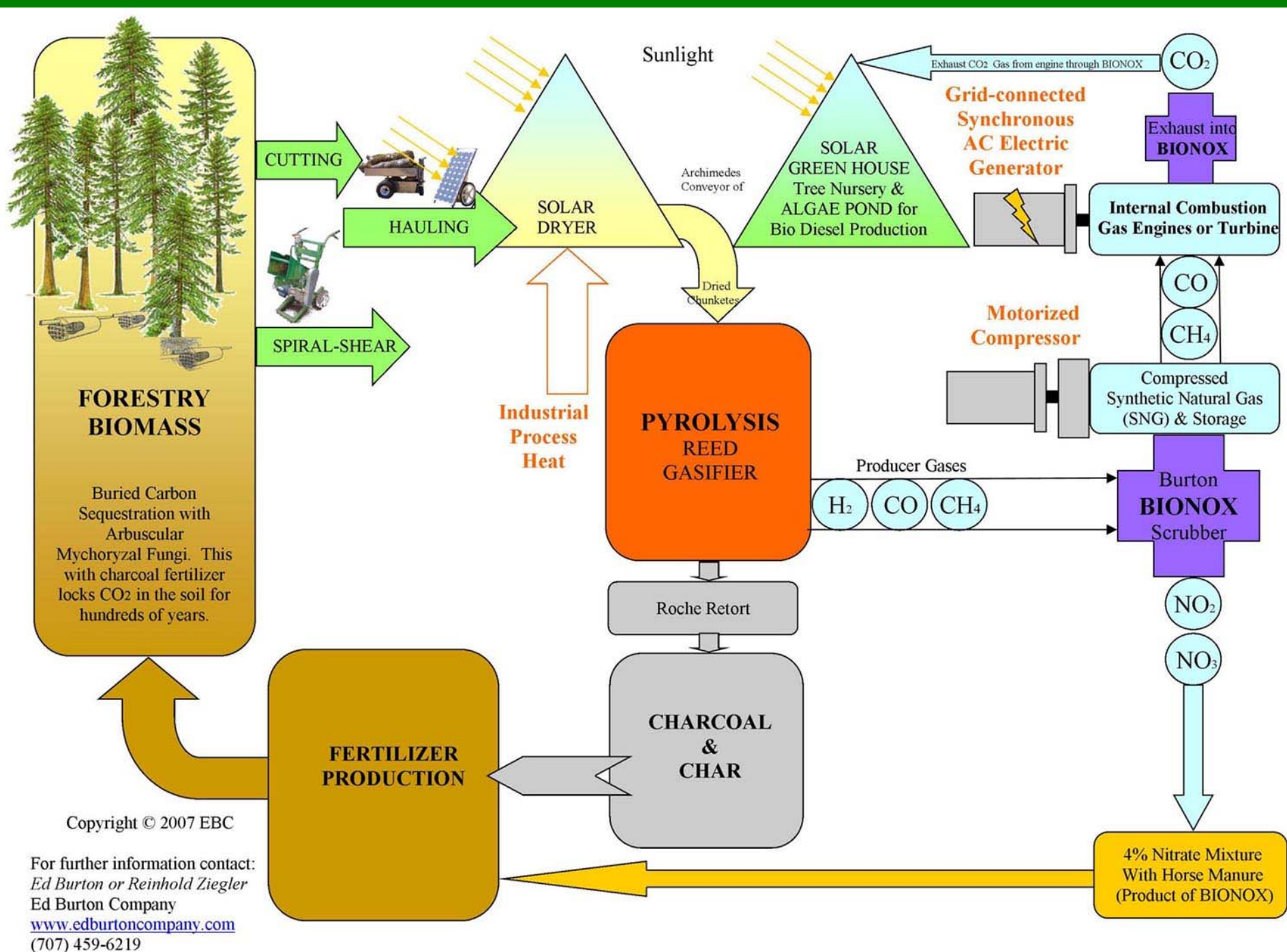
Of all sources of renewable energy, biomass is perhaps the most widespread, versatile and potentially valuable.

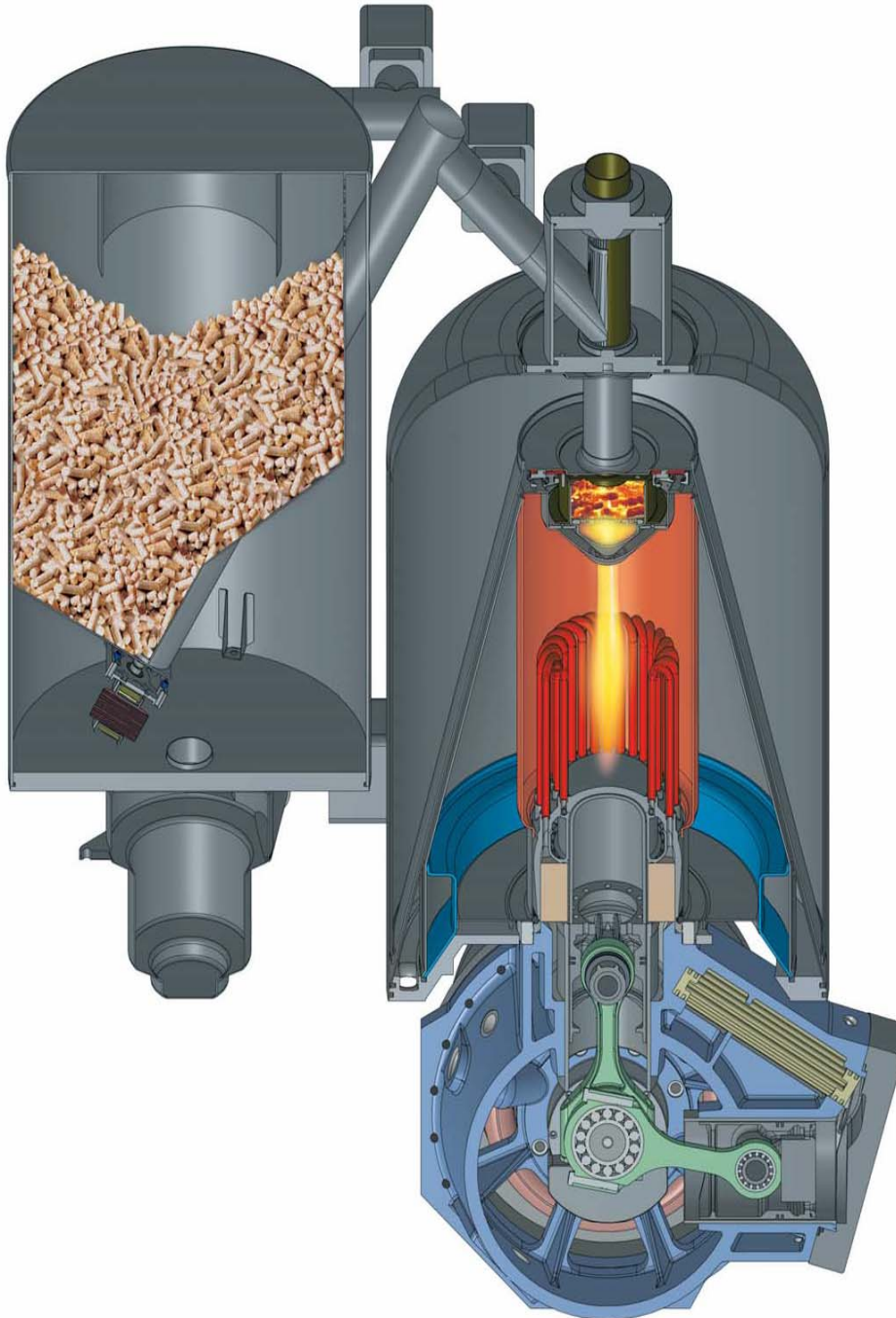
Virtually every region of the world has biomass resources. This can provide a large amount of transportation fuel, electricity and heat.

Our company over the years has developed, built, and field tested electric powered vehicles powered by the sun. These vehicles are capable of going into the forest and convert the branch and brush debris into producer gas which can operate internal combustion engines and turbines.

Secondary products like CO₂ is bubbled through an algae reactor to produce biodiesel. Biomass not fully gasified becomes charcoal which becomes an incredible fertilizer to renewed growth of the forest and as a means for carbon sequestration.

Please study the following graphic.





BIOMASS POWERED STIRLING ENGINE GENERATOR

- 3 KW of Electricity
- 7 KW of Heat
- 10,000 hrs between service
- Powered by chunkettes of wood derived from the urban and rural forest, dried and gasified.
- Available in January 2008
- Made in Germany

Our team of international consultants and companies provide information, pathways, and solutions to virtually any agricultural, energy architectural, developmental or technological problem.

Contact us for a discussion of your needs!

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