

The Phoenix Linear Solar Grid Array

*A proposal for a low-cost 1,000 megawatt solar
power system*

December 22, 2008

Prepared by Ken Rieli
For Phoenix Navigation & Guidance Inc.

Introduction

The world today is being held captive to a number of insurmountable problems with few, if any, real solutions in sight.

A big part of the problem is that we have arrived at the end of the low-cost fossil fuel era. Prices of life's necessities continue to rise, in spite of the crashing oil prices. Food, water, health, heat - all of the necessities of life are moving beyond the ability of most people to pay. Most of the planet has reached the breaking point, and there is no hope in sight!

So where do we go from here?

We are all ready for a new economic, social, political awakening - a modern day global renaissance - in all areas of life!

We have to shake off the dust of the old "dark ages" industry - the mindless burning of fossil fuels, and forge full steam ahead into the real space age; the life of the planet depends on it now!

This proposal is based on PNGinc's 3-part program to rebuild the planet on real sustainable power across the board - electrical power, transportation power - all motive power.

The way forward is to begin with free power from the sun. By harnessing a limitless source of energy, we can deliver more than the world's total needs for power. Using the Phoenix plan, we can deliver an endless supply, across the globe, at a price lower than today's coal plants. And since the cost of solar energy never increases, we can continue to supply the entire planet with power at the right price to begin building the real space age - for everyone.

The time is now, the technology is here. Do you stand with us, or against us?

The Concept

The Phoenix Linear Solar Grid Array is a combination of both off-the-shelf and proprietary technologies, methods, materials and know-how.

The Phoenix system is a radical, low-cost departure from the old way of setting up solar thermal power systems. Instead of the centralized turbine/generator in the midst of a trough "farm", the Phoenix system breaks the power block element into many small turbogenerator units - which increases versatility and reliability, while at the same time drastically lowering operations & maintenance costs. We are now capable of completely unattended operations.

With this new decentralized approach to the solar array, deployment flexibility and capability reaches a new plateau.

The Phoenix Linear Solar Grid Array allows us to install our systems along road and highway rights-of-way instead of in large block clusters. Our approach minimizes land preparation and maintenance costs by utilizing existing public roadway infrastructure. By installing our systems along existing roads, power is produced closer to the point of use, minimizing line losses, and reducing or eliminating the need for additional power line infrastructure.

The linear array concept is also the best approach to inter-urban power. By locating our units along the entire power line path - from city to city - power is added along the entire length of cable, drastically lowering line losses.

The Technology

The Phoenix Linear Solar Grid Array system is a complete departure from the entrenched solar power industry mindset. Our approach begins with lower-end user costing structures rather than highest geek efficiencies. By considering the entire system as an exercise in low cost, high volume manufacturing, we are able to realize and deliver low consumer cost-per-kilowatt from day one.

Based on years of design and development experience, PNGinc is able to produce trough reflectors and receivers at a fraction of the cost of present day units. Since the trough system represents a major cost of the system, we immediately realize systems cost reductions using this approach.

By eliminating the centralized boiler, turbine, generator, and large cooling/condensing towers, we again move from high-cost components to low-cost, all-in-one boxed units. In essence, we no longer need the building expense and turbine power plant personnel to run an evolved (coal) power plant system.

The Phoenix system consists of groups or arrays of small, closed-loop, organic Rankine cycle turbogenerators coupled to individual troughs of (approximately) 1,000 square foot area. Each unit is capable of producing 10 kilowatts, ganged into unlimited numbers, and all running automatically (unattended).

Trough materials and methods of construction are PNGinc proprietary know-how, as well as the turbogenerator power boxes. Our methods of construction are designed for economy of scale operations on both the front end trough system, and the power boxes.

Financial

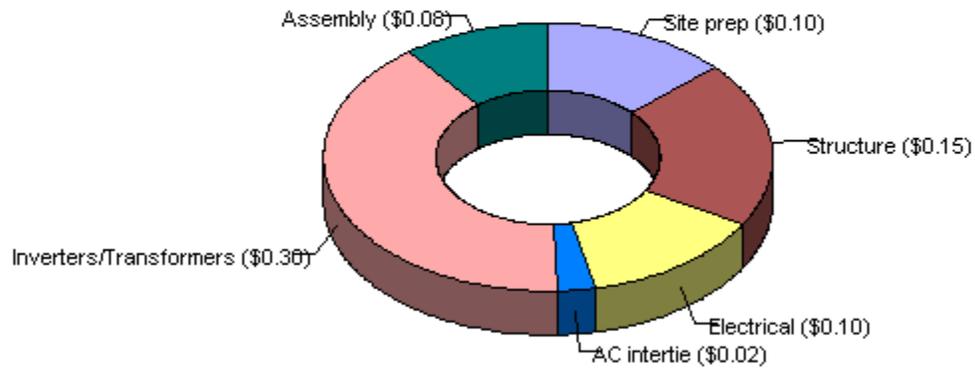
On the 1,000 megawatt solar thermal power system using PNGinc's technical approach, the final installed cost of the system will come in at \$3.75 billion USD.

The power production cost over the 100-year life of the array is estimated at \$0.037/kWh.

Given the average cost of electricity in the USA of approximately \$0.10/kWh, there is plenty of headroom between the cost of production and the end customer cost for distribution fees, as well as a drastically improved profit line (50-60% vs. 13-14% for coal).

Profit Chart		
A	Manufacturing cost/system (10kW trough, mount, tracker, powerbox)	\$25,000
B	End cost to supplier	\$30,000
C	Net profit/system	\$5,000
D	1000MW supplier/end customer cost (100,000 units)	\$3 Billion
E	Net profit	\$500 Million

Phoenix Linear Solar Grid Array
Installation Costs (\$0.75 total)



Assumptions

$$\begin{aligned}
 1,000 \text{ MW} * 2190 \text{ hrs/year} &= 2,190,000,000 \text{ watts/year} \\
 &\text{or } 2,190,000,000 \text{ kW/year} \\
 \text{capital cost divided by kW/year} &= 3,750,000,000 / 2,190,000,000 \\
 \text{kW/year divided by plant lifespan (years)} &= \$1.712 / 100 = \$0.01712/\text{kW} \\
 \text{plus annual O\&M} &= \$0.01712/\text{kW} + .01937/\text{kW} \\
 \text{production cost} &= 3.649 \text{ cents/kWh}
 \end{aligned}$$

Power Production Costs (per kWh)		
Dirty coal	10 year lifespan (to 2020)	6.385 cents/kWh
Clean coal	30 year lifespan (to 2040)	3.970 cents/kWh
PNGinc ORC	100 year lifespan (to 2110) *	3.649 cents/kWh

* *indefinite lifespan*

Profit Analysis - PNG plant - 1,000 MW	
Energy charge	3.649 cents/kWh
Distribution service (80% typical)	2.9192 cents/kWh
Subtotal:	6.5682 cents/kWh
Standard profit (14%) (Coal)	0.919548 cents/kWh
Wholesale power cost	7.487748 cents/kWh
Average consumer retail rate (USA)	10 cents/kWh
Extended profit margin	2.512 cents/kWh
Total profit margin (52.25%)	3.432 cents/kWh
Total profit per year (PNGinc solar)	\$75,160,800/year

Contact:

Pam Rieli
PNGinc

1-906-387-4373

Email: newpower@phoenixnavigation.com