PV Photovoltaic Panel Intro and Summary

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The Bottom Line...

- To date, pv photovoltaics cost way too much. Causing them to remain a net energy sink.
- Present costs are around EIGHT DOLLARS per peak watt. TWENTY FIVE CENTS per peak watt is needed to become a major net energy source.
- Today, the amortization of the synchronous inverter alone in some home installations can consume 150 percent of the value of all the pv electricity sent through it.
- Not one power utility is yet using pv for fully burdened peaking free of subsidies, writeoffs or greenie pr.

Subsidies Hurt Rather Than Help...

- **It makes no economic or environmental sense whatsoever for subsidies that pay people to put obsolete known defective gasoline destroying net energy sinks on inappropriate rooftops.**
- **If anything, such subsidies lock the wrong people into doing all the wrong things in the wrong ways. Plus subsidy funding sets back net pv energy breakeven by many decades.**
- **It will take many years after a quarter per watt is reached to pay for all the previous pv energy sink consumption.**

Incoming...

- At its very best, incoming solar energy will be around 1000 watts per square meter.
- This incidence must be derated for angular mismatch, percent cloud cover, latitude, time of day, effective area, and season.
- Tracking is often not useful as its complexities and costs can easily outweigh its benefits. Concentration can be even less beneficial.
- Solar energy is an extremely diffuse resource. Total energy density and real-world time availability often ends up disappointingly low.

Efficiencies...

- **The best available pv system conversion efficiency at its synchronously converted grid output terminals is often about ten percent.**
- **A kilowatt of peak pv electrical power needs at least ten square meters of active panel.**
- **A panel that produces one kilowatt of power at noon is likely to produce only 5 kilowatt hours of energy during a full day.**
- **It might take THREE TO FIVE peak pv watts to match ONE conventional coal, oil or nuclear peak watt.**

Breakeven Parity...

- **A utility's Avoided Cost Peaking can be taken as a maximum reasonable price to pay for an alternative net energy system.**
- **At a dime per kilowatt hour peaking, about ONE DOLLAR PER PEAK WATT can be a magic number for serious net energy pv production.**
- **That is the TOTAL SYSTEM COST, including the synchronous inverter, all labor and shipping, amortization, and all related lifecycle expenses.**
- **PV Panel costs would have to approach FIFTY CENTS per peak watt to support such a system.**

But...

- It makes no economic or environmental sense to sell a dime's worth of conventional peaking energy and then use that dime to buy the same amount of solar pv generated energy.
- All you have is some "paint it green" nuclear or oil or coal equivalent TRANSFER PAYMENTS.
- To DISPLACE traditional sources, solar pv simply has to provide NEW NET ENERGY.
- Thus, TWENTY FIVE CENTS per peak watt panel cost in today's dollars is a more likely goal for long term pv solar net energy viability.

New Opportunities...

- **Conventional silicon pv is unlikely to ever become a net energy source. It is thus clearly a sucker bet.**
- **Emerging technologies involving CIGS thin films (Copper - Indium - Gallium - Selenide) appear to be able to reach a quarter per peak watt cost levels. Doing so in mile long rolls.**
- **Such panels are now being shipped but remain on a steep learning curve fraught with peril.**
- **Nearly all production is going to utilities rather than to end users.**

Helper Technologies…

- **Quarter per peak watt CIGS is being helped along by these compatible developments…**

  QUANTUM DOTS — By going to nanoscale quantum dots, above-workfunction energy can be used to knock loose one or more additional electrons. Thus dramatically improving short wavelength efficiency.

  TETRAPODS — These unique nanoscale four legged structures can be used to tune a workfunction independent of its semiconductor makeup. Which can further optimize cell wavelength efficiencies.

Some Players…

- **A few of the leading CIGS developers include…**

Daystar
First Solar
Global Solar
HelioVolt
International Solar
Miasole
Nanosolar
Solyndra

A Few Further Out Possibilities...

- **Alternate pv approaches may include...**

  METALLORADICALS — Applying the process used by plants for photosynthesis. Five linked processes involve organic maganese clusters.

  NANOANTENNAS — Solar "crystal sets" that work directly at light frequencies. Antennas have recently been solved; rectifiers remain.

  BETTER THERMOELECTRICS —Direct solid state conversions of light energy to electricity. Efficiencies have recently improved bunches, but still have a long way to go.

Economies of Scale Remain important…

- **Although not as utterly overwhelming as in coal or nuclear, pv economics of scale are highly compelling and will likely dominate.**
- **Power utilities have incredible buying power combined with the ability to guarantee full production quotas, insure safety, and standardize products.**
- **For most individuals, leasing panels from a utility makes more sense than ownership.**
- **A pv energy farm needs very little water. Which makes larger ones a perfect match for Government and Indian lands in the arid and largely cloud free American West.**

Why the Power Grid will Remain Supreme...

- **No known means of pv solar electricity storage is remotely as cheap, as simple, as effective, as efficient, as low in equipment demands, as safe, or as reliable as synchronous inversion to the public power grid.**

- **The peak afternoon pv solar generation is often a good match to costly peak power demands of the public power utility grid.**

- **PV grid "storage" can be thought of as a super efficient electricity to coal converter. When pv solar is synchronously returned to the grid, the pile of coal outside the baseline power plant does not diminish as rapidly.**

For More Detail:

- This has been a summary of these tutorials...

  SOME ENERGY FUNDAMENTALS
  MORE ENERGY FUNDAMENTALS

- More on electrolysis can be found at...

  MUSE153.PDF
  TRASHELC.PDF

- Ongoing energy developments are viewed at...

  WHAT'S NEW 08

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