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EROEI Short #3: Price-Estimated EROEI

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We have previously discussed the difficulty in accounting for all relevant energy inputs to a given energy production process. Drawing a boundary for what energy inputs will be accounted small enough to facilitate practical accounting necessarily excludes energy inputs that, I have argued, are quite relevant to the resulting EROEI ratio. Today I will argue that, while certainly imperfect and limited in application, it is possible to use a proxy calculation to resolve this problem: price.

This theory, what I am calling Price-Estimated EROEI, attempts to use the market's ability to fix price as a representation of a huge mass of amorphous data. As with a complete EROEI calculation, price tends to account for more individual data than we can possibly consciously account for, identify causal relationships, and resolve by some formula. Price in a free-market solves a very similar problem to the accounting problem presented by a full and accurate EROEI calculation. So, at least according to my theory, we can use this price mechanism to create a proxy for EROEI. This methodology seems especially apt for evaluating the EROEI of things such as wind power, solar power, and biofuels.

How? Let's consider solar photovoltaic panels. We begin with a fundamental assumption (and one that is certainly problematic, but more on that later): the price of the solar PV system is a proxy for the totality of energy used in its production, in terms relative to the price of its product—electricity. Assume that a 2KW solar PV system installed on a residential roof in Phoenix, Arizona, costs $16,000 (grid intertie, no battery). [1] Assume that this system, in Phoenix, will generate 4,000 KW-hours per year. [2] At prevailing Phoenix-area electricity prices of $.10/KW-hour, this is the rough equivalent of $400/year. What is the present value of $400/year for the 40-year life-expectancy of the array? Accepting the Treasury's inflation adjusted rate of return, an annuity that will make 40 annual payments of $400 costs $8500 today. [3] That gives us an Price-Estimated EROEI of grid-intertie solar PV at 0.53.

Why bother? What does the Price-Estimated EROEI methodology do that a standard EROEI calculation not do? Let's take a look at just one example—the "energy" component of the labor required to build, transport, and install the PV system. There is an obvious energy prerequisite to this—food, housing, health care, etc. for the individuals involved. If these people aren't being fed, they certainly won't be installing PV on your roof. Feeding, housing, etc. all requires energy. But how much? Calculating this energy requirement brings us right back to the devilishly difficult (or impossible) accounting problem discussed in the first installment of this series. But it can't be ignored if we want to create a realistic EROEI for solar PV, can it? Price acts as an efficient proxy for these labor costs—enough money must be paid to provide for the needs of the people involved. When all the price components of installing the PV system are accounted for, the sum is a

representation of the energy required to get that PV system intalled and operation on a residential roof. It has no meaning in Watts or Joules or other traditional means of measure, but it does have meaning in a ratio with the value of the energy produced. That's Price-Estimated EROEI.

As I mentioned above, there are certainly weaknesses. Subsidies and tax-incentives (to both sides of the price-ratio) can greatly distort the result (especially evident, for example, with corn ethanol or nuclear power). Similarly, while free-markets may be more efficient than command-economies, they are by no means perfectly efficient. Nor are our markets perfectly free. Finally, there are elasticity and fungibility issues. But even with all of those problems, is Price-Estimated EROEI any less accurate than "traditional" EROEI calculations, with their limits on what energy inputs are accounted for and their varying methodologies for calculation? At the end of the day, I submit that Price-Estimated EROEI represents a valuable way of looking at the broader issue of EROEI. If nothing else, it certainly says something if investment in energy source A outperforms (has a higher Price-Estimated EROEI) investment in energy source B.

[1] http://www.solargenerations.com/faqs.html
[2] Id.
[3] http://www.uic.edu/classes/actg/actg500/pfvatutor.htm
See also, http://www.jeffvail.net/2006/11/energy-payback-from-photovoltaics.html