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EROEI Short #4: Bootstrap-EROEI

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One significant issue related to EROEI that must be discussed is the time-lag associated with durable goods and infrastructure. Assume that the aggregate EROEI of our society is declining. Energy was invested 15 years ago in a large piece of coal mining equipment that will last for 15 years. The energy used to build it was, for the sake of example, "100 EROEI" Saudi Crude. As a result, the EROEI of the coal mined by that machine includes an input from the energy required to make that machine—we'll say this is X. The machine is at the end of its useful life, and a new machine has been ordered. This machine is made with today's energy, we'll call it "50 EROEI" Saudi Crude. As a result in this halving of the EROEI of the energy used to make the machine over the past 15 years (just an example), the energy input to the same quantity of coal mined by the new machine is now 2X...

This is an illustration of what I call "Bootstrap EROEI"—the energy that we are producing today is still using, to some extent, machinery and infrastructure that was made in an earlier, higher-EROEI era. Why does this matter? IF we accept that a "first tier" EROEI calculation of coal mining today only accounts for the energy used to operate these coal mining machine and the energy used to produce these machines (i.e. there is no diminishing marginal returns on how easy it is to find and extract the coal), then we will still see a declining EROEI for this operation over the next 15 years as the EROEI of energy used to make each new replacement machine is lower than that of the machine it replaces.

I apologize if that was a laborious explanation, but I think that this is an extremely important concept. Let's take a current renewable energy favorite: wind. Today's giant wind turbines are being built with a long-tail of industrial machinery and infrastructure that was largely assembled using higher-EROEI energy. Admittedly, there are brand-new factories being built for wind generation. But there is also an extensive and aging infrastructure upon which this depends. What about the fleet of oversize-load trucks that transport the giant blades? Or the asphalt and concrete to construct, pave, and re-pave the highway (and bridge) infrastructure over which they travel from factory to site? Or the copper wiring for generation and transmission that today costs over $3 a pound (a price representative of the greater energy now required to mine copper). To a significant extent, it seems that today's "renewable" energy infrastructure is being built on yesterday's, non-renewable, higher-EROEI energy. Can we build the day-after-tomorrow's renewable infrastructure on today's renewable energy and still maintain an EROEI of greater than 1? Maybe if we use the optimistic EROEI figures (with artificial boundaries for considered energy inputs) offered by some.

This is certainly a problematic area for precise calculations—my goal is to spur discussion rather

than to definitively answer my own question. My point is this: the problem of "Bootstrap-EROEI" is one that is not being accounted for, and one that (to my knowledge) has no reliable means of calculation. Yet it has a potentially very significant impact on our plans to transition to a renewable energy infrastructure. How can this be addressed?