

The Hydrogen Path

At this point Amory Lovins is screaming at meⁱ. “We don’t need large numbers of transmissions lines. Yes, I agree with you that we can massively reduce demand even if I don’t agree with your exact number. But for supply, why primarily rely on unevenly distributed sources like wind, and water and geothermal? The sun shines everywhere. Install photovoltaic cells on every rooftop, turn electricity not immediately needed into hydrogen, and put the hydrogen into fuel cells to produce electricity when the sun is not shining, and to run cars all the time. Or if that is too expensive, use steam reforming to create hydrogen from natural gas; then bury the carbon.”

Sadly, compared to geothermal and existing hydro and wind, both solar photovoltaic generation, and hydrogen fuel cell storage are horribly expensive – even when the avoided cost of transmission lines is taken into account. I agree that if we had cheap solar cells, and the ability to electrolyze hydrogen inexpensively from the cheap electricity they would provide, and the ability to recover power economically from that hydrogen in reasonably priced fuel cells that would be preferable. You will agree in return, I presume, that if we had some eggs, we could have ham and eggs, if we had some ham.

In terms of steam reforming of natural gas: we certainly know how. But the cost is at least 50% higher than the cost of the natural gas alone. The system costs of a natural gas based hydrogen path will be high. And nature has already sequestered the carbon nicely for us. Leave the damn stuff in the ground and produce power from something else.

Before this book ends, I will suggest ways we might get to that hydrogen future (or something comparable) that does not require massive grid extension. The problem here is that it is one thing have confidence a technical problem is solvable. It is quite another to bet the future on making a breakthrough, however small it might seem, within a specific timeframe, with a quite literal drop dead deadline (as in a lot of people will drop dead if we don’t make the deadline).

The best we can do on this is structure our investments in such a manner, and order that the choice between a grid intensive and grid light path are delayed as long possible. In practice though time is short; we will probably end having to extend and improve our electricity grid. If the hydrogen future (or flow battery future) breakthrough happens we can still make use of such a grid to minimize the use of storage; storing electricity (more or less by definition) is more expensive than using it as generated.

Now to provide 100% renewable power would require more storage than the few hours specified above. But a mixed wind and solar grid that includes some hydro, geothermal, modest storage and long distance transmission can provide between 99% and 95% of our electricity. Even if we have to get 1% to 5% of remaining power from natural gas, that still reduces greenhouse emissions to an acceptable level.

ⁱ I refer to the imaginary one in my head, of course. The real Amory is unlikely to ever read this, and probably does not scream a great deal

