Addendum to Chapter 22

A world powered predominantly by solar and wind energy

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After completing this manuscript, in order to make the ideas more concretely visible, I worked out a highly simplified model for the future of energy sources as oil and natural gas production decreases over the next few decades while solar and wind energy generation increases and the world enters an era dominated by solar and wind energy.

The main model specifications and assumptions are:

- For oil and natural gas production, the model assumes a steady 2% annual decrease, roughly in line with present expectations.
- Solar and wind energy production in 2010 is a mere 2% of oil and natural gas energy production. It is assumed to increase exponentially at the enormous rate of 35% per annum, representing an increase by a factor of twenty over ten years, which is in line with available data for the last four or five years.
- Other energy sources such as coal and nuclear energy are not included for reasons explained in the main text.

The evolution of this model during the period 2010–2022 is shown in Figure A1. I draw attention to the following two facts:

- First, combined energy production is currently almost flat and will begin to increase again in approximately the year 2013.
- Second, solar and wind energy production will overtake energy from oil and natural gas in about 2021, which we define as the point of transition from the era of oil and natural gas to the era of solar and wind energy.

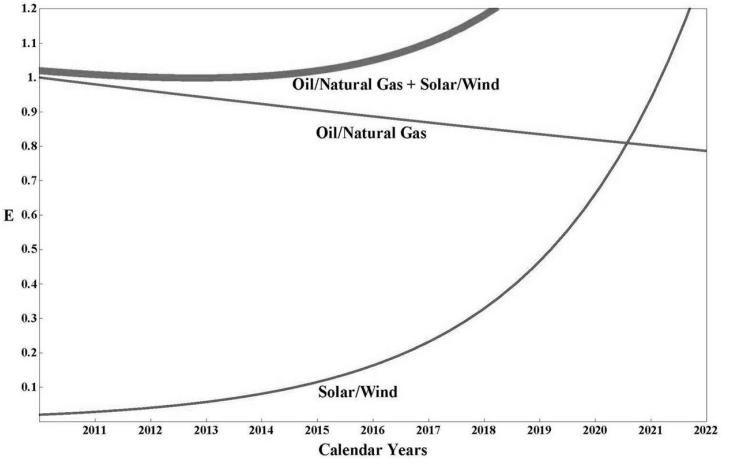

Fig. A1. The energy transition from oil and natural gas to solar and wind energy. We define the transition year as the year in which solar and wind energy production begins to exceed oil and natural gas production, and in which sun and wind become the world's dominant energy sources (here 2021). The oil and gas production level in 2010 is taken as the unit of energy (E). (*Source:* W. Kohn)

The continuing exponential increase in solar and wind energy production is, of course, unrealistic in a finite world, in which total energy costs are roughly proportional to total energy production, unless they have been reduced by successful scientific and/or technological innovation. Yet, I find the clean energy outlook brighter than I originally expected, provided we keep our eyes cooperatively on the common target.