Our Fossil Fuel Energy Predicament

Gail Tverberg, OurFiniteWorld.com, KSU Retirees, November 9, 2021
Question: Where on this line does your understanding of our fossil fuel energy predicament lie?

Too little easily extractable fossil fuel

Expect a rapid decline in employment opportunities and goods and services available

Too much fossil fuel

Climate change is our big problem
Energy warnings from the past
In 1957, Rear Admiral Hyman Rickover (father of nuclear submarines) gave a talk in which he said:

- With high energy consumption goes a high standard of living.
- Whether this Golden Age will continue depends entirely upon our ability to keep energy supplies in balance with the needs of our growing population.
- A reduction of per capita energy consumption has always in the past led to a decline in civilization and a reversion to a more primitive way of life.
- For it is an unpleasant fact that according to our best estimates, total fossil fuel reserves recoverable at not over twice today’s unit cost, are likely to run out at some time between the years 2000 and 2050, if present standards of living and population growth rates are taken into account.
- I suggest that this is a good time to think soberly about our responsibilities to our descendants – those who will ring out the Fossil Fuel Age.

In 1972, the book *The Limits to Growth* was published, showing computer models of when limits might hit

- In its base scenario, the world would hit resource limits (including fossil fuels) about now.

Chart by Ugo Bardi. Lucius Annaeus Seneca in 91 CE wrote “Increases are of sluggish growth, but the way to ruin is rapid.”
Peter Turchin and Sergey Nefedov analyzed eight agricultural economies in their book, *Secular Societies*. This is my chart of their findings.

![Chart of Typical "Secular Cycle"](image)

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Rapidly rising energy consumption does indeed correlate with good times
World Energy Consumption
Average Annual increase

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World Energy Consumption Growth
Population Growth vs. Standard of Living Incr.

Average Annual Increase


Living Std.
Population

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World Energy Consumption Growth vs. Standard of Living Incr.

Average Annual Percent

10 years ended


US Civil War

World War I

Great Depression

World War II

Soviet Union Collapse

COVID

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Living Std.
Population
The world has been encountering many energy problems recently.
The ramp up in intermittent renewables has been going very slowly. Shutdowns in 2020 acted like temporary oil rationing.
Energy prices have been too low for producers for a long time.Shutdowns made problem worse. Producers stopped drilling.
Trying to reopen the economy is leading to huge spikes in natural gas, coal and electricity prices.
“Green” energy sources are tiny compared to fossil fuels. They also require fossil fuels to produce.
There are many energy problems around the world, right now

- Rolling blackouts in China
  - Factory production lower
  - Fertilizer exports halted
  - Part of problem is low electricity production from renewables
  - Citizens are being told to hoard food

- Europe is having trouble buying enough natural gas for winter
  - Wind production has been low; last winter was cold, depleting gas in storage
  - Citizens worried about not having enough heat this winter

- India is facing a severe shortage of coal

- US coal, natural gas and electricity prices are up, but from a much lower base
What story do governments, university leaders, and newspapers want to tell the world?
Would Kennesaw State University tell its students, “We think most of you should learn subsistence farming?”

- Not likely!
- Students want to think the world will go on, as it is, indefinitely
  - Would go elsewhere, with a happier vision of the future
Would newspapers tell their readers about the problems that seem to be ahead?

- Advertisers would be very unhappy
  - New cars should have fuel available for many years
  - Emphasize the temporary nature of any problem
- Politicians would never mention that limits seem to be close at hand
  - Want to get re-elected
A much more palatable story is “We are voluntarily reducing our use of fossil fuels, to prevent climate change.”

- If reduction in fossil use is voluntary, it sounds like it might not be too bad.
  - There might be lots of jobs in renewables
- Story is especially popular in Europe
  - Area is seriously short of fossil fuels
- Climate models assume a large amount of fossil fuels will be burned in the future
  - If fossil fuel prices rise endlessly, perhaps modeling makes sense
  - If real problem is chronically low prices, fossil fuels will stay in the ground
    - Human population will fall with lower energy supplies
With nearly all readers wanting “happily ever after” solutions, it becomes impossible to publish the real story.

- No one wants to hear, “Many economies have collapsed; ours will too, perhaps soon.”
- Instead, forecasting agencies put together stories that are as plausible as possible
  - Maybe transition to renewables can work
  - Maybe electric cars will work with renewables
  - Maybe humans can prevent climate change
- Politicians dole out money to look at tiny parts of the problem
- It is only later (now!) that it becomes apparent that the plan really isn’t working
  - We seem to be encountering a near-term problem that few are expecting
Different views on how much of the inadequate fossil fuel story to tell

Tell the truth, as much as possible

- Scientists who are not pressured by the need for research grants or acceptance of written papers
- Military
- Bloggers, if they understand the story

Tell as favorable version of the truth as possible

- Politicians
- Economists
- University administrators
- Academic book publishers
- Main Street Media
- Scientists who want grants or want to get published
- Fossil fuel producing companies
- Facebook
My conclusion:

- Expect everything that Main Street Media publishes to be heavily “spun”
  - Even “science” seems to emphasize the best possible outcomes
  - College textbooks will be written with emphasis on long-term career paths
- Blogosphere may provide more of the real story
Major area of confusion: Can we count on energy prices to rise, as supplies deplete?
Common thinking has been, “Prices will rise; we can get all of the fossil fuel out that can be technically extracted.”

- Experience is showing that this is not the case
- Prices fall too low for the producers
  - Producers go bankrupt
  - Close up operations
- Much of the fossil fuel that will supposedly fuel climate change simply cannot be extracted
  - Coal under the North Sea, for example
  - Oil from shale, under the city of Paris
Economists’ view of the economy is an old view that doesn’t consider the physics of the system

- Economists believe humans are in charge, not the laws of physics
- Economy doesn’t need energy
  - All it needs is growing “demand”
  - Demand can be created by adding more debt
    - This debt leads to more spending
    - Added debt allows higher prices
    - Thus, energy prices will rise endlessly
- Favorite chart is supply and demand chart
  - Chart is not valid for energy
  - Energy affects both supply and demand
    - Energy required for jobs and for goods and services
Physics-based economy: The economy is built up in layers, like a child’s building toy. The center is hollow.

The economy is a self-organizing physics-based system (Y. Shiozawa, 1996; Chaisson, 2001; Roddier, 2017)
In a physics-based economy, many balances are necessary

- Prices must be *high enough for producers* and *low enough for consumers*
- Wages of consumers must be *high enough to afford the products* they buy
  - Tendency is toward wage disparity; too much brings down the system
- Producers need sufficient profits for reinvestment, or the system will fail
- Governments need enough resources to fulfill their commitments
- Supply lines need to hold up
- Debt needs to be repaid with interest
- No one area (say, healthcare) can become too large
- Pollution cannot be too large of a problem
- Energy is like food for the economy; economy with inadequate energy will shrink back or collapse
Forecasts of economists cannot be believed

- Fact that the economy is a self-organizing system, powered by energy, has been known for 25 years
  - Population will tend to rise; energy and other resource extraction will not keep up
  - Physics says that economies cannot last forever
- This story has never filtered over to the economics department
  - Peer review is based on prior publications in economics
- Infinitely growing debt bubble doesn’t work either
  - Debt is indirectly a promise for future goods and services, made with energy
  - Promised goods and services won’t be available
Collapses don’t happen overnight

- But changes suggesting inadequate energy supply should not be a big surprise
  - Don’t be surprised if there are more empty shelves in stores
  - Don’t be surprised at more Zoom meetings