

Are We Running Out of Stuff? Or Energy?

Based on Musings of Chiefio (EM Smith)

Two 2009 Internet Posts

Bernie's August 19, 2017 Presentation

The Short Answer is NO!

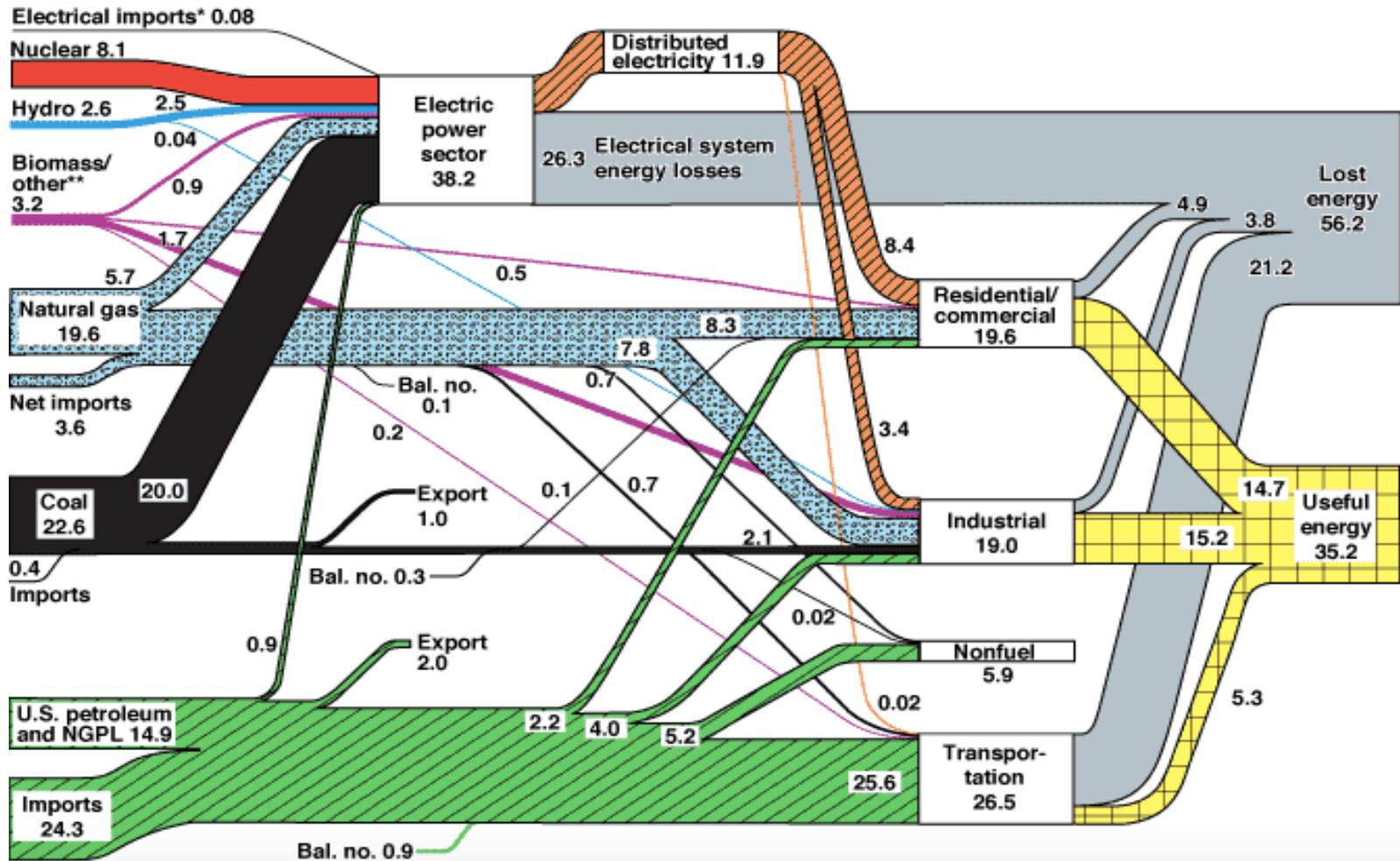
- Specifically not anytime soon (and this is particularly true for liquid and gaseous Fossil Fuels FF)
- Generally NEVER (for about everything else)
- Chiefio's analysis is very interesting and refreshing in a time of doom and gloom
- Of course the cost of stuff varies with its abundance (Smith . . . "What me worry?")

The Climate Connection

- All climate controversy leads directly to energy use
- Especially fossil fuels and their production of CO₂- What about greening from CO₂?
- And the Alarmists want us to immediately replace all of the FF with alternate energy systems
- After all FF will soon be in short supply and very expensive! Right? Well Not really

A quick look at Energy

U.S. Energy Flow Trends – 2002 Net Primary Resource Consumption ~97 Quads



Fossil Fuels

- FF are the backbone of our present energy support (Jevon's paradox – more use of coal)
- They will be that way for probably the next 100 to 200 years
- Liquid fuels are presently important to our transportation needs
- FF will not be running out anytime soon
- Peak oil has been trumped by shale FF
- All the complex calculations of reserves are meaningless with the fracking boom

Other Sources

- Liquid fuel from coal and coal fired electricity
- Someday biofuels may be viable
- Someday photovoltaics and wind will be viable
- Then there is the nuclear option
- One is Thorium with alternate fuel cycles

- EM Smith “There is a politically induced shortage of dirt cheap liquid motor fuel. Nothing more.” He said this in 2009

There Is No Shortage of Stuff

- Functionally Unlimited Resources Exist
- What follows is a short but significant analysis of important stuff to prove the point
- There is much more stuff not discussed only because of the lack of time
- Only the four horsemen –famine, plague, pestilence and war – could bar getting stuff
- Natural systems follow an S curve (such as population growth – they slow as they get larger)

Thomas Malthus

- Early economic theory with an approach to the poor that indicated there were limits to food supply
- Oddly Karl Marx argued that technology would prevent any sort of Malthusian disaster
- Of course there are modern disasters that tell us we will run out of fresh water, food, fuel, and land. Things get used up!
- Well – No - not really. . .

Fresh Water

- Large river basins produce huge amounts of fresh water (Amazon, Mississippi, Yellow etc.)
- This water is used and reused many times on its way to the ocean but eventually we allow it to go back to the ocean
- About 40,000 cubic kilometers goes to the sea
- Divided by a billion = 40,000 M³ per 6 people/year
- 6,600 M³ per person/year if used only once

Water

- Most of Amazon's water is not even "used" once
- We can easily move large quantities of water by pipeline or large ship
- Westward Ho is a project to move water in the eastern US to the dry west
- Desalinization of water - Saudis and Israelis now get most of their fresh water this way
- In the case of the Israelis – it's a non government system paid fully by the users of the service

Modern Desalinization Processes

General Electric promo

- The costs of seawater desalination have been reduced greatly over the last twenty years, most notably through the advances in reverse osmosis. In 1978, the cost to produce 1,000 U.S. gallons of potable water from seawater was over U.S. \$20. Today, the cost has decreased by a factor of six, to about U.S. \$3 per 1,000 U.S. gallons.
- Recent advances in seawater reverse osmosis (SWRO) that have allowed this reduction in the cost of desalinated water include the application of energy recovery devices and the utilization of ultra-high-pressure RO membranes in a system to recover brine from the first-stage RO system.

Stone, Rock, Clay, Bricks, Masonry, Ceramics, Glass

- Most of the earth's crust contains the above
- Limestone is the basis of cement and 10% of the sedimentary rocks are limestone
- And concrete is 3 – 2 – 1 mix of gravel, sand and cement
- Coal is generally used as the thermal source to turn limestone into cement

Iron and Other Metals

- Global banded iron deposits are estimated to be 800 billion tons of ore to make 230 billion tons of iron
- About 40 tons of iron per person (this - before it is even recycled)
- Basically unlimited concrete, steel, and glass for building
- We need copper wiring and copper is scarce and expensive – will we run out?

Copper

- Estimates of global copper are about 1.6 Billion tons or $\frac{1}{4}$ of a ton per person – is it enough?
- More and more copper is being replaced by plastic, aluminum or other materials
- But don't worry, copper is a highly recycled metal
- Well if you are really worried, copper is found in polymetallic and manganese nodules found on the ocean floor
- There 500 billion tons of these – and they contain a variety of metals (Mn, Cu, Fe, Ni, Co, Al)



Polymetallic Nodules - 500 Billion Tons exist

Never enough Silver, Gold and Platinum

- But plenty enough so we remain basically comfortable and happy
- What about building material such as wood?
- Rammed earth and earthships



Other Building Materials

- Trees can be and are actually farmed today mostly for paper (toothpicks and matchsticks)
- Straw bale houses from farm waste
- Ply, Particle and straw board sheets
- We seem to find all sorts of cheaper substitutes
- But dirt cheap substitutes don't mean there are not economically available substitutes

Modern Plastics are better and Cheap

- They have come a long way in the 130 years since they were conceived
- Bakelite was developed in 1907
- Plastics use petroleum feedstock that also produces refrigerants, motor oil, antifreeze, alcohol, pesticide, medicine, cleaners, detergent, waxes, polishes, paint, synthetic leather, nylon and polyester and on and on
- Henry Ford used soy based plastic for car parts
- Of course coal and recycled plastic can be used as a “petro feedstock”

Food and Land

- I did a full presentation on **Earth Use** several years ago that showed that there was plenty of land and food even if populations reached 16 billion people (Asian diet and relatively ecologically sound – 32 billion with pressure on forest and steppe lands)
- I used the CIA data base as did EM Smith 2005
- Arable Land = 10.57% (as presently used)
- Permanent Crops = 1.04% Other = 88.38%

Greenhouses and Hydroponics

- And rooftop gardens in the cities
- Hydroponic gardens are grown in water and sand under lights or in greenhouses
- Fish and shrimp grown in ponds and tanks
- Also vertical gardens in cities and places for small animals to be raised (100 story bldgs)
- Cost and ingenuity are limiters but need could trump the limits
- Do we really need to go this far?

How Big is Global Land Area?

- We all could live comfortably (think London) in six patches the size of the UK
- The rest of the planet is completely empty
- Or if everyone wants an ocean view with no structure over 5 stories (fractal coastline?)
- Think the North American continent from beach inland 100 feet (single building facing the coast with no other building behind it)

Choices

- Most of us are choosing to live in big cities like New York, London, Tokyo, Paris, and Buenos Aires
- We already leave most of the rest of the planet fairly empty
- Urban and suburban area is about 3% of the planet's total land area
- This means we do have a choice of living in less dense settings of farms and suburban areas

Food

- There is plenty of food
- Healthy nutritious food can be grown cheaply
- In the US we throw away more than 600 pounds of good food per person per year
- Higher cost of food is related to having a wide variety of choices
- But no one needs to starve in this day and age
- Starvation is driven by politics, wars, religion and access

The Idea of Running Out

- It's a broken idea with paranoia as a driver
- We aren't, we can't, we won't run out
- The Club of Rome promotes the scariness
- Here is a quote about the Club of Rome

“The Club of Rome created and promotes two mutually contradictory ideas: AGW and Peak Oil. They use the IPCC model of oil use of 10X more oil than is in the ground (4 deg C increase due to huge increases in CO₂).”

Doom and Actual Resources

- Resources change over time
- We really do not worry about whale oil or flint anymore
- In the past both these resources were critical to survival
- The last gap for whale oil was filled by jojoba oil in 1970
- Catalytic converters using Platinum can now be built with Palladium⁴⁶, nickel and other catalysts (including some ceramics)

The Fallacy of Stuff Going Away

- The Peak Stuff Fallacy is that most stuff does not go away in the first place
- We tend to mine the easiest stuff to refine first
- The only thing standing in the way of having all the stuff of any sort (say copper) is energy
- We know there is plenty of energy so having stuff in any case is then based on price
- Price then tends to sort replaceable types of stuff on a cost/utility matrix
- Cheaper replacements are almost always found

A Few Things “Go Away”

- Stuff we burn like oil, coal or tropical forests
- Things that go extinct like species
- Nuclear fuel but practically speaking it is infinite
- And all of the above stuff goes completely away only when we humans do stupid things
- So basically I am now running out of any idea of any stuff that disappears forever
- Except maybe common sense

What Goes Away That Does Matter

- Oil, coal and other stuff that is in the common energy bucket don't matter
- In 200 years we know even now that there are other sources to replace the oil and coal etc.
- Forests and Species disappearing would really matter
- So is there a basis for doom and gloom here?

Forests

- Forests in north and south America and China are rebounding and stabilizing
- Forests in Africa and India are disasters
- Demographics give us hope for Indian and Chinese forests
- Africa is likely to continue to be a disaster but it does not need to be
- Burning wood can be globally “sustainable” if people in Africa and India are allowed to use fossil fuels

Big Issue- Running Out of Stuff is Species

- There may be some big issues here
- But Bob Endlich has shown us that most of the doom and gloom over extinction is over done
- What about a DNA Bank of threatened and endangered species?
- How do we even characterize this issue when we have not even identified most of the species?
- The majority of all species are tropical beetle species. Most of these have a very limited range

Species

- When we consider the larger and well known mammal species we have watched only a few dozen of them go extinct
- For very little money we can stabilize this trend as well as preserve DNA from most of the other critters on the planet
- An affluent world society would have the wherewithal to also preserve habitat and build nature parks

Global Affluent Society

- Presently a large part of the world is too poor, too hungry and lacking in technology (to obtain basic levels of food, water and housing)
- A transition strategy is required
- The poor have a drive for survival along with the tools for destruction without a realization that they no longer need to destroy the forests and species to survive
- They need to quickly reach a level of affluence that transitions to this point of awareness

How to Save the Planet

- Put 4 to 5 billion 3rd world people to work in shops, offices and factories in cities, in apartments, with cars, shows, theaters, parks, stadiums and all the food they can eat from efficient farms and aquaculture.
- Then they will want to save the forests and the Tiger (or endangered fish or even beetles)
- If they remain in mud hut villages on the edge of starvation - forget the forests and the Tiger (and the rest)

Unlimited Stuff and Energy

- There are natural limits to growth especially with affluence
- But we all can have enough food, fuel and space
- We all can pursue life, liberty and happiness
- There is no need to fight wars over stuff
- We can all live in pleasant places without fighting over land even with 20 billion people on the planet (a scenario of less than 10 billion people is possible by 2100)

Modernity as the Solution

- All the tools to allow all the people of the planet access to modern lifestyles are available
- Most people want to live in urban environments
- By dumping the mindset of running out of stuff, we have the opportunity for change
- And regardless of what the politicians say, you do not have to give up life, liberty or happiness to reach that level of security

EM Smith's Final Thoughts

“This life is not a dress rehearsal, take big bites, and do not ever let anyone tell you that there is not enough stuff for everyone on the planet to live a full, happy and wealthy life.”

“Just go make it happen.”

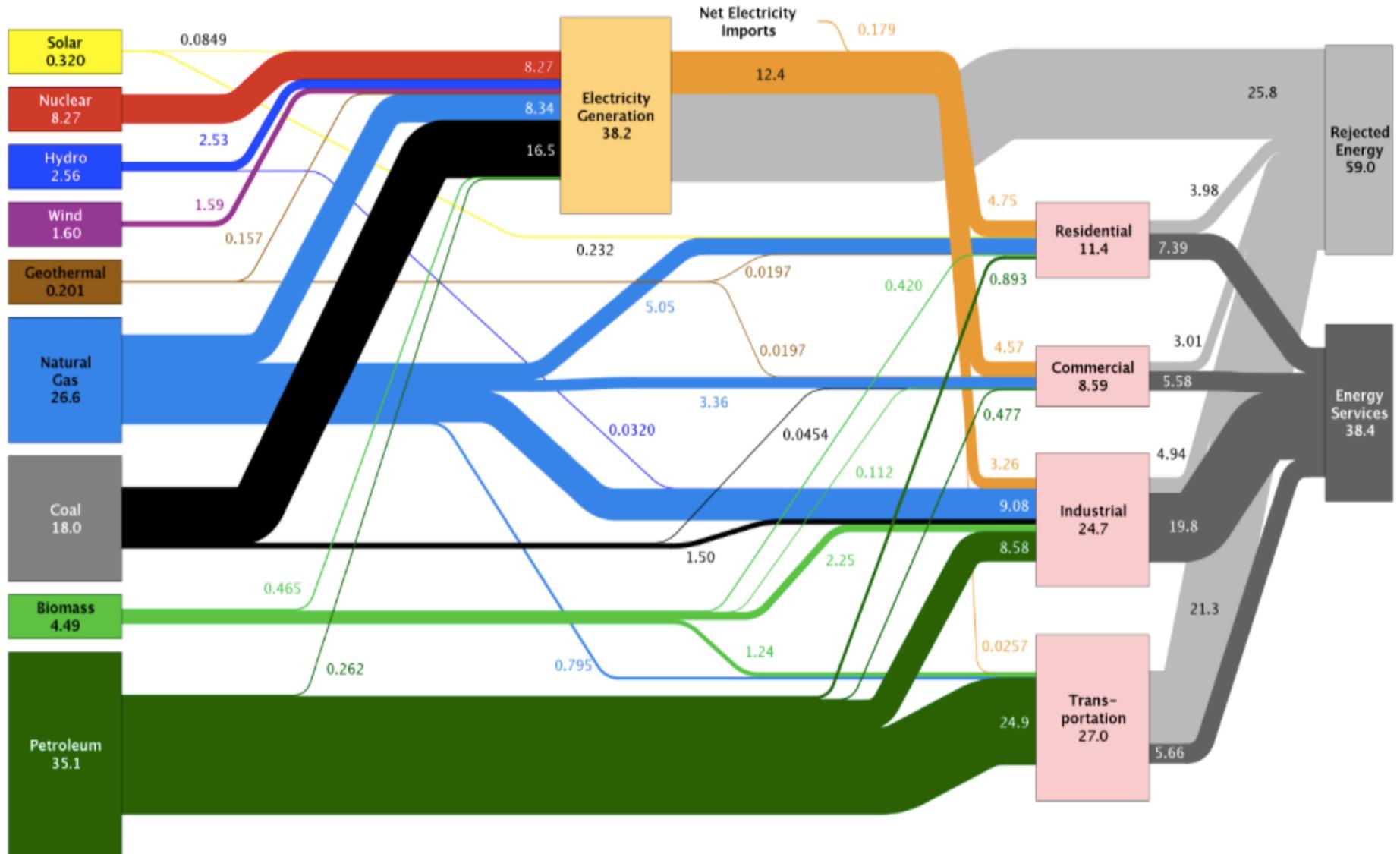
My Final Comment

And the Chiefio did not even mention robots and Artificial Intelligence (AI)

Clearly his model is based on full, gainful employment (which may limit the use of robots and AI)

Probably not a bad idea!

Estimated U.S. Energy Use in 2013: ~97.4 Quads



Source: LLNL 2014. Data is based on DOE/EIA-0035(2014-03), March, 2014. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential and commercial sectors 80% for the industrial sector, and 71% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-ML-410527

Retail electricity prices of NEM states, including taxes, compared to selected countries (¢ per kWh)

