Climate Change Won't Kill the Grandkids - Having No Energy Will

By: Tom D. Tamarkin
April 15, 2015

Abstract

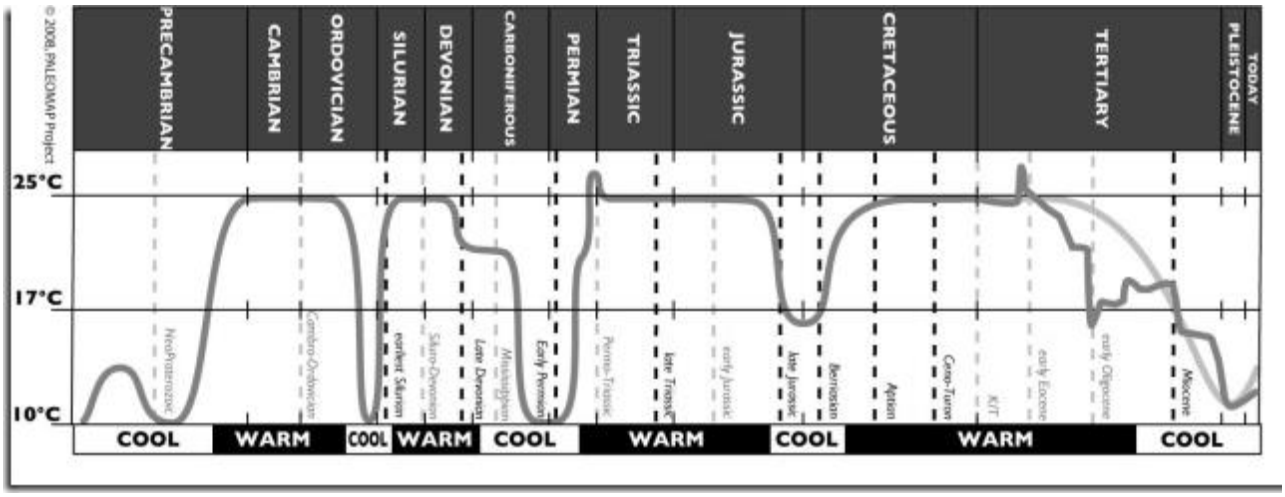
AGW or climate change is not the big problem many claim. The perceived scare of AGW has been used by sub-groups in the United Nations to bluff wealthy industrialized nations into transferring money to poor often times corrupt nations. Monies gained from this mechanism have not been invested in the root cause of AGW (if in fact any exists.) At the same time over $1 trillion USD is spent worldwide annually on climate change studies, consultants, related government agencies, and the rapidly growing but totally ineffective green and renewable energy industry. This has also lead to the emergence of the carbon trading brokerage industry. This is based on fraudulent science as CO_2 has an extremely small "greenhouse" effect far exceeded by water vapor from the oceans. Only fossil hydrocarbon fuels and nuclear energy can supply material amounts of energy due to their many orders of magnitude higher energy flux densities than so called renewables. Well over half the world's economically viable recoverable fossil fuels have been consumed while over 3 billion human inhabitants live in "energy poverty": over 1.5 billion without electricity. Once fossil fuels are depleted beyond the point of economically viable production there is only one energy source available to provide the Earth's energy needs. That is the conversion of matter into energy as formulated in the equation $E=mc^2$. Man must learn to generate energy based on his knowledge of the laws of physics and the interchangeability of matter into energy. Today we have started with the baby step of nuclear fission. Fission is practical and works today but is unsustainable due to radioactive waste issues. Therefore, we must immediately invest in the experimental understanding of the science leading to the successful demonstration of controlled atomic fusion followed by the R&D needed to commercialize it. Fusion is 100% safe, uses virtually unlimited fuel cycle non-radioactive light element components, and produces no significant radioactive byproducts. In the alternative, man will run out of fossil fuels. AGW is then a 100% moot point because hydrocarbon fuels are not being burned in material quantities. Under these conditions worldwide population will shrink to preindustrial revolution levels of about 10% of today's population or about 750M people worldwide.

Anthropogenic Global Warming (AGW) or climate change is not the BIG problem its advocates make it out to be. Even if it could be proved that man is creating it through his use of hydro-carbon fossil fuels, it is not the truly BIG problem.

Climate change has always been a part of the Earth's dynamic atmospheric system. During the last 2 billion years the Earth's climate has alternated between a frigid "Ice House" climate, today's moderate climate, , and a steaming "Hot House" climate, as in the time of the dinosaurs.

Principal contributing factors to the variability of the Earth's median temperature and climate are the Earth's complex orbit in the solar system as defined by the Milankovitch cycles, the sun's variable radiated energy output, and geological factors on Earth such as undersea volcanic activity leading to inconsistent temperature gradients in the oceans.

This chart shows how global climate has changed over geological time.



Unfortunately, the potential threat of predicted future climate change has been used to transfer enormous amounts of money from wealthy nations to poor nations [1]. This has enabled the survival instinct mechanisms of the climate change community. That includes governments, consultants, and scientific researchers who simply study the perceived problem and generate academic journal articles and reports. The ineffective green energy solutions manufacturing and service industry also owes their life…and government subsidies…to the climate change scare. No serious money raised by the "climate scare" has been spent on solving the BIG problem.

The BIG problem is the fact that man was provided with about 400 years' worth of hydrocarbon based fossil fuels which took several hundred million years to be created on Earth. The energy came from the Sun [2]. Integrated over large amounts of geological time, daily Sun energy was converted into chemicals through plant photosynthesis. These chemicals can, in-turn, be ignited to release the stored energy through an oxidation reduction reaction with oxygen [3]. Once they are gone they are gone in human life cycle terms.

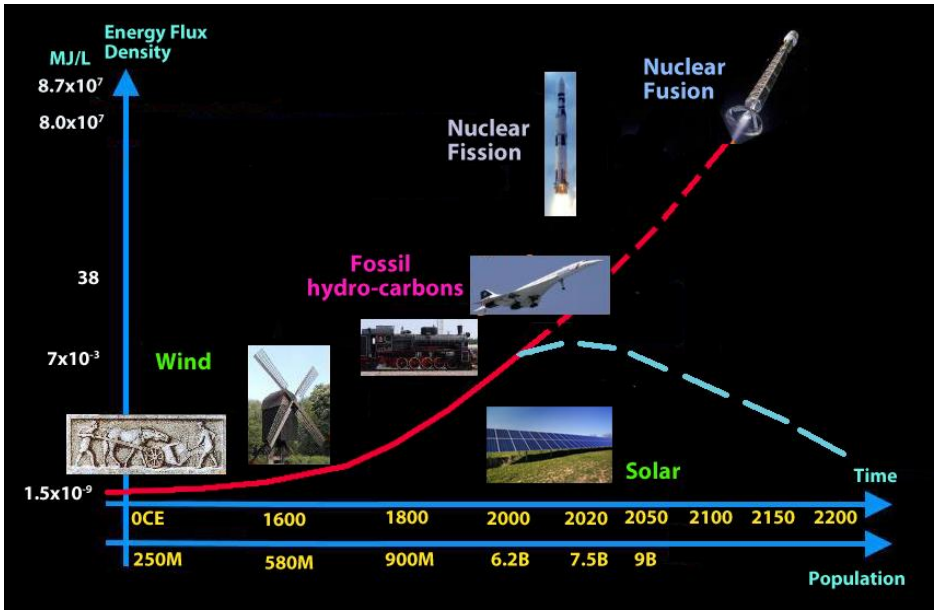
What is energy? A physicists will answer by saying "the ability to perform work." They will elaborate by saying: "energy is a property of objects which can be transferred to other objects or converted into different forms, but cannot be created or destroyed."

A housewife will say energy is what moves our cars, powers our airplanes, cooks our food, and keeps us warm in the winter – cool in the summer.

You cannot power a world estimated to have 9 billion people by 2060 on energy produced from solar cells and wind turbines.

They are not sustainable meaning they cannot create enough energy quickly enough to reproduce themselves (build more) and provide energy to man. The reason is that the amount of energy received from the Sun is far "too dilute" meaning a very small amount of energy is received per square unit of surface area for relatively short periods of time given the day-night cycle and weather conditions [4]. Wind energy is a secondary effect of solar energy because wind is created by the atmosphere's absorption of the Sun's thermal energy in combination with the Coriolis force effect [5]. This is based on the rotation of the Earth coupled with atmospheric pressure differences relating to elevation, mountains, and the like [6].

Hydro power from dammed rives is also a secondary effect of solar energy. The movement of water in the Earth's vast system of rivers occurs because of solar energy. This happens as seawater is evaporated, forms clouds, and ultimately water is released as rain and snow keeping our rivers full and flowing out to sea from higher elevations propelled by gravity. Unlike solar and wind, hydropower can consistently produce material but limited amounts of energy.



The above illustration shows energy flux density in million Joules per litter on the left hand vertical axis with a scale spanning 10 to the 16th power in scientific notation. The horizontal axis depicts time on the top row from 0 years Common Era to 2200. The bottom row depicts worldwide population which is directly controlled by available energy to produce food, potable water and to provide for man's comfort. As can be seen, once fossil hydro-carbon fuels are no longer available in quantity, fusion energy must be developed or worldwide population will contract to that of the preindustrial age in the 1600s. Energy flux density refers to how much energy is contained per unit volume of an energy source. Appendix 1 below provides tabulation for various energy sources.

We must begin to turn to what Dr. Steve Cowley in the UK calls “energy from knowledge;” the conversion of mass into energy [7]. Albert Einstein formulated the relationship between energy and mas (matter) in his famous equation $E = mc^2$. This means that a very small amount of mass is equal to a very large amount of energy as explained by Dr. Einstein in his own voice [8].

We must solve energy for the long term through the conversion of matter into energy. No other energy source has a suitable energy flux density to provide our electricity, transportation, potable water and agricultural needs once fossil hydro-carbon fuels are no longer economically viable to recover due to depletion [9].

We must begin now because it will take several decades to master the science. We began this journey when we developed nuclear fission power. However nuclear fission is not a long term solution for several reasons; most notably the long-term radioactive waste it produces. As an example, in the U.S. today, nuclear energy accounts for approximately 20% of input energy to create America’s baseload power. To produce all baseload power we would have to increase the number of active nuclear plants by five times. Baseload power generation in the U.S. consumes roughly 40% of all energy resources. Thus, approximately 600 additional 1 GWH plants would have to be built and operated to provide 100% of all input energy currently consumed in the production of consumable energy in the United States. Scale this worldwide based on population and an equivalent per capita energy and it becomes overwhelming in terms of waste issues.

The next step is the development of nuclear fusion. Fusion is much different than fission [10–11–12]. It uses light elements in the fuel cycle, is fail safe, and can do no environmental harm. It has the highest flux density of any energy source short of matter anti-matter annihilation.

It will take several more years of pure experimental scientific research to demonstrate a sustained fusion reaction in the laboratory producing a net energy gain meaning more energy is produced than was “pumped in” to start the energy production [13]. Once controlled fusion is proven in a controlled environment, regardless of how expensive and complicated the reactor mechanism and facility is, man’s ingenuity will take over in the private sector. The complexities and costs will be driven down just as turn of the 20th century vacuum tubes gave way to transistors and later microcomputers-on-a-chip.

That is the BIG problem. If we do not solve this, in 50 to 100 years our coal, oil, and natural gas resources will no longer be economically and environmentally recoverable [14]. Then mankind reverts back to life in the 16th century. If we do not solve energy the entire argument of being good environmental stewards of the Earth is moot. Why? Because in less than 100 years we will no longer be burning fossil hydro-carbon fuels. Global warming and climate change caused by man is no longer an issue. The problem takes care of itself. In a few thousand years the processes of nature…geological and geo-chemical…will erase most signs of our past industrialized existence.

If there are not sizable numbers of cognitively intelligent humans capable of thinking and distinguishing beauty, it is a nonconsequential point as aliens are not flocking to our planet. No one or nothing will

ever know the difference. Which begs the question: “Is there intelligent life on Earth?” This author believes so. As Bill & Melinda Gates recently stated in their recent foundation’s annual open letter, our youth needs to be challenged to produce what they called an “energy miracle” [15].

This is the biggest problem man faces. Climate change…if caused by man…automatically reverses itself over the next 100 years. But if we do not solve energy mankind’s population will contract by a factor greater than 10 over the course of the following 100 years. Collectively, we as a species must recognize this reality and begin the energy race today.

References:

[1] Another Climate Alarmist Admits Real Motive Behind Warming Scare, Investor’s Business Daily, March 29, 2016.
[2] Tamarkin, Tom D., Energy Basics; Where does energy on our planet come from?, Fusion 4 Freedom.
[3] Heats of Combustion, UC Davis Chemistry Wiki.
[4] Lawson, Barrie & Tamarkin, Tom D., Going Solar-System Requirements For Solar Generated Utility Baseload Power, Fusion 4 Freedom.
[5] Consequences of Rotation for Weather; Coriolis Forces, Universe of Tennessee Knoxville.
[6] Atmospheric Pressure at Different Altitudes, AVS Science & Technology of Materials, Interfaces, & Processing, https://www.avs.org/.
[7] Fusion energy with Professor Steven Cowley, Culham Centre for Fusion Energy, UK.
[8] William Tucker, Ph.D., Understanding $E = MC^2$, Dr. Albert Einstein in his own voice & explanation, Energytribune.com.
[9] Tamarkin, Tom D., Energy Basics, Comparison of fuel energy flux densities, Fusion 4 Freedom.
[10] Duke Energy Nuclear Information Center, Fission vs. Fusion – What’s the Difference?
[11] Lawson, Barrie, Nuclear Fission Theory, Fusion 4 Freedom.
[12] Lawson, Barrie, Nuclear Fusion-The Theory, Fusion 4 Freedom.
[13] Tamarkin, Tom D., Fusion Energy; Too Important to Fail – Too Big To Hoard, Fusion 4 Freedom.
[14] Tamarkin, Tom D. 2060 And Lights Out: How Will America Survive Without Oil?, Inquisitir Special Report, http://www.inquisitr.com.
[15] Gates, Bill & Melinda, Gates Foundation Annual Open Letter, James, Murray, Guardian, February 24, 2016.

Appendix 1

Energy Flux Density Comparisons

Energy density is the amount of energy stored in a given system or region of space per unit volume. Specific energy is the amount of energy stored per unit mass (weight.) Only the useful or extractable energy is measured. It is useful to compare the energy densities of various energy sources. At the top of the list is fusion followed by nuclear fission and then hydrocarbon fuels derived from petroleum, coal and natural gas. At the bottom of the list are batteries which either generate energy or store energy as well as “renewable energy” such as solar.

1 Kg of Deuterium fused with 1.5 Kg of Tritium can produce 87.4 GWH of electricity

Here are the underlying calculations supporting the statement above:
The energy released by fusion of 1 atom of Deuterium with 1 atom of Tritium is 17.6 Mev = 2.8 X 10^{-12} Joules.
The energy liberated by the fusion of 1 Kg of Deuterium with 1.5 Kg of Tritium is 2.8 X 10^{-12}X 2.99 X 10^{26} = 8.3 X 10^{14} Joules = (8.3 X 10^{14}) / (3.6 X 10^{-12}) = 230 GWHours.
This energy is released as heat. A conventional steam turbine power plant with an efficiency of 38%, would produce 87.4GWH of electricity
[1] Deuterium is a naturally occurring isotope of hydrogen readily available from sea water.
[2] Tritium is produced in the fusion reactor from Lithium as part of the fuel cycle and energy exchange process. Lithium is an abundant naturally occurring element.

Comparison of conventional fuel energy density

Storage material	Energy Type	Specific energy (MJ/kg)	Energy density (MJ/L)	Direct uses
Uranium (in breeder)	Nuclear fission	80,620,000	1,539,842,000	Electric power plants (nuclear reactors)
Thorium (in breeder)	Nuclear fission	79,420,000	929,214,000	Electric power plants (Nuclear reactors)
Hydrogen (compressed at 70 MPa)	Chemical	142	5.6	Rocket & automotive engines, grid storage& conversion
Diesel/Fuel oil	Chemical	48	35.8	Automotive engines, power plants
LPG (incluiding Propane/Butane)	Chemical	46.4	26	Cooking, home heating, auto engines, lighter fluid
Jet Fuel	Chemical	46	37.4	Aircraft
Gasoline (Petrol)	Chemical	44.4	32.4	Automotive engines, power plants
Ethanol (E100)	Chemical	26.4		Flex-fuel, racing, stoves, lighting
Coal	Chemical	24		Electric power plants home heating
Methanol fuel (M100)	Chemical	19.7		Racing, model engines, safety
Wood	Chemical	16.2		Heating, outdoor cooking
TNT	Chemical	4.6		Explosives
Gunpowder	Chemical	3		Explosives
Lithium non-rechargeable)	Electrochemical	1.8	4.32	Portable electronic devices, flashlights
Lithium-ion battery	Electrochemical	0.36 - 0.875	0.9 - 2.63	Laptops, mobile devices, modern electric vehicles
Alkaline battery	Electrochemical	0.67	1.8	Portable eletronic devices, flashlights
Nickel-metal hydride battery	Electrochemical	0.288	0.504 - 1.08	Portable electronic devices, flashlights
Lead-acid battery	Electrochemical	0.17	0.34	Automotive engine ignition

Comparison of "renewable" energy density

Source	Joules per cubic meter
Solar Radiation [1]	0.0000015
Geothermal [2]	0.05
Wind at 10 mph (5m/s) [3]	7
Tidal water [3]	0.5 - 50

[1] How much solar power per cubic meter is there? The volume of the space between a one-meter-square patch on Earth and the center of our orbit around the sun is 50 billion cubic meters (the earth is 150 billion meters from the sun, or 4,000 earth circumferences). Dividing the usable 100 watts per square meter by this volume yields two-billionths of a watt per cubic meter. Sunlight takes about eight minutes (499 seconds) to reach the earth. Multiplying 499 seconds by twenty-six billionths of a W/m^3 reveals that solar radiation has an energy density of 1.5 micro-joules per cubic meter (1.5×10^{-6} J/m^3).

[2] The only way to extract thermal energy from the atmosphere is to construct an insulated pipe between it and a reservoir at lower temperature (preferably a much lower one). This is how geothermal heat pumps work. Typical ground temperature is 52F (284 K). On a 90F day, such a system has a peak efficiency of 7%, and a power density of only 0.05 mW/m^3 (Stopa and Wojnarowski 2006): typical surface power fluxes for geothermal wells are on the order of 50 mW/m^2 and have typical depths of 1 km. To find the energy density, a characteristic time must be included. The time used should be that of the time required for water being pumped into the ground to circulate through the system once. This number is on the order of ten days (Sanjuan et al. 2006). The resulting energy density is 0.05 J/m^3, or roughly two to three orders of magnitude lower than wind or waves.

[3] Wind is driven by changes in weather patterns, which in turn are driven by thermal gradients. Tides are driven by fluctuations in gravity caused by lunar revolutions. The energy densities of wind and water systems are proportional to the mass, m, moving through them, and the square of the speed, v, of this mass, or $\frac{1}{2}mv^2$. At sea level, air with a density of about one kilogram per cubic meter moving at five meters per second (ten miles per hour) has a kinetic energy of 12.5 joules per cubic meter. Applying Betz's Law, which limits efficiency to 59% (Betz 1926), yields about seven joules per cubic meter. Thus, wind energy on a moderately windy day is over a million times more energy-dense than solar energy.

There are two prevalent mechanisms for extracting tidal energy. In one system, barrages move up and down, extracting energy with the rise and fall of the tides. On the second type strategy, tidal stream systems act more like underwater wind turbines, extracting energy from tidal waters as they move past. As with wind, the energy of a moving volume of water is also $\frac{1}{2}mv^2$. Tidal systems have the advantage

over wind systems in that water is approximately one thousand times denser than air. Their disadvantage lies in generally low tidal velocities of only ten centimeters per second to one meter per second. Thus, a cubic meter of water, with a mass of about 1000 kg, yields an energy density of about five joules per cubic meter for slow water[1]and five hundred joules per cubic meter for fast water[2]. These are also subject to Betz's law and represent only peak values, so the average energy densities are closer to one-half of a joule per cubic meter to fifty joules per cubic meter, or about the same as wind.

[1] kinetic energy (tidal low velocity) = ½ mv^2 = ½ · 1000 kg · $(0.1 \text{ m/s})^2$ = 5 joules.
[2] kinetic energy (tidal high velocity) = ½ mv^2 = ½ · 1000 kg · $(1 \text{ m/s})^2$ = 500 joules.