

How Much Longer Do We Have?

If we focus directly on American gasoline consumption as the overwhelming elephant in the room, how much longer can the U.S. lifestyle continue? Is there any thing we can do about it? First, we need to better understand how much oil is left in the world and the U.S. There is great misinformation and hype about how much oil remains, at what quality, and the rate and cost world consumers and Americans can afford to frivolously burn it up; precious finite energy gone forever. This subject is covered in detail in Chapter 4 for all resources, but will be briefly introduced here. A quick “Google” of oil reserves in the world and by country shows world proved reserves at the end of 2012 to be **1,668 billion barrels of which only 35 or 2% is in the U.S.** This infers about fifty years of oil age remaining for the world at 32 billion barrels per year, and **five years left for the U.S. without any world oil import or export.**

The definition of “proved reserves means that even these estimates may be optimistic because:

- No consideration (discount) is included for this **steadily declining ratio of oil recovered divided by the oil required for extraction** (energy returned on energy invested or EROEI which is comprehensively defined in Wikipedia.com).
- No consideration is given to the **soaring costs to extract the remaining, increasingly-unconventional oil.** Keep in mind that the American lifestyle was founded, and functions only, on easily-obtainable, conventional, light, sweet crude.
- No consideration is given to the historic **fact that over 200 billion barrels have already been extracted from the lower 48 states and Alaska.** Half of this was prior to the Hubbert-predicted U.S. peak in 1970–72, and another 100 billion barrels in the last 45 years as extraction rates continued to decline until 2010. **Since then, the increased market price justified ever-more expensive technology which added more non-conventional oil to keep Americans rolling on a flat plateau of consumption.**

- No consideration is given to **the history of extensive domestic drilling already behind us since WW II when the U.S. almost totally supplied the world.** In the short history of the oil age there are, and have been, more wells drilled in the U.S. than the rest of the world combined. You can just squeeze so much juice out of an orange.
- No consideration is given to **alternative fuels** such as biofuels, a 1 Mb/d component of the 19 Mb/d U.S. liquid fuel supply, **and natural gas liquids** which contribute another 3 Mb/d. And, it should be emphasized that ethanol is also an equally-negative drain on other liquid fuels because its EROEI is well-established at close to unity.

NINE SCENARIOS SHOWN IN FIGURE 2

In order to avoid endless argument about how much oil remains available in the U.S. to perpetuate the gasoline-intensive American lifestyle, nine possible scenarios (combinations) are summarized in Figure 2. The nine trend-lines show, in the Y-axis, the U.S. domestic oil remaining for each scenario after a specific number of years shown in the X-axis. This is just unequivocal, grade-school arithmetic, similar to being able to predict how many miles and gallons are left for a trip or heating season at various specific rates of consumption.

Closer contemplation of each of these nine scenarios will answer many questions and respond to bogus panaceas presently offered to avoid confronting the critical energy mess we are in. **Unfortunately, all of the better paths forward require drastic changes and utmost urgency to get started. Each year of time lost after 2015 further reduces any hope of pursuing a longer way forward because the remaining indigenous U.S. oil shown in the Y axis is decreased by another 7 Bb/y as long as there is no import or export (3.5 Bb/y with fifty-percent import as now).**

The primary alternatives used in the nine scenarios in Figure 2 are:

- **U.S. per capita consumption**

What if we were to reduce our uniquely-extravagant rate of 22 b/p/y to a level of 11 b/p/y, typical of western Europe or Japan? Better yet, what if we were to reduce U.S. consumption rate to the average world rate (without U.S. and Canada) of 3 b/p/y? Keep in mind, China is presently at 2.8 b/p/y and India averages 1 b/p/y.

- **Remaining U.S. oil at the start of each scenario**

Rather than argue about whether or not we have 35 billion barrels or various other numbers of recoverable proved reserves, or there are suddenly vast new stores of “yet-to-be discovered” which will give us a few more years, I give the benefit of the doubt to the optimists and start with either of two quantities in the U.S.: 50 billion barrels or 100 billion barrels.

- **Tar sands oil**

In Scenario 9, I start with 200 billion barrels to help answer the controversy about Canadian tar sands oil and the KXL pipeline. This proposed thirty-six inch pipe would facilitate delivery of some mix of Canadian tar-sand bitumen and highly-volatile Bakken “fracked” tight oil to the refineries in the gulf coast. **The KXL pipeline maximum daily-volume of 800,000 barrels would supply less than four-percent of all U.S. oil, or six-percent of the total of all liquid fuels used for transport.** At this rate, Figure 2, scenario 9 shows **an extension of the U.S. oil age to twenty-five years at the present rate of consumption with no other imports or exports and assuming the U.S. motorist can afford tar sands oil.** This minuscule band-aid for the U.S. oil addiction cannot possibly justify its incredible environmental impact and barely-positive EROEI (including massive amounts of diesel for giant trucks and excavators) of production. As this book is readied for printing in November 2015, TransCanada has placed on hold its application for the KXL pipeline. **This move effectively removes another 200 billion barrels of remaining world oil reserves thus bringing us beyond the peak of all oil, conventional and/or nonconventional.**

- **The importance of U.S. population change**

For years I have been a strong advocate of population control as well as being a believer in peak oil. Part II Chapter 4 Figure 7 (World Oil Extraction and Population) shows the population growth and decline rates for various fertility rates of children per female (cpf) based on the older-demographic age-distribution profile of the U.S. **We now see exactly why a population momentum of 1 cpf (or even 0 cpf ... no more children) cannot possibly reduce population, in any closed-border (no immigration or emigration), society fast enough to keep pace with the declining Hubbert’s curve for finite oil ... even with the benefit of the doubt of 1.8 trillion barrels of recoverable oil remaining (1.6 trillion without Canadian tarsands).** In Figure 2 only Scenarios 6 compared to 8; and 5 (the only scenario leading to a longer-than-one lifetime future) compared to 7, **extend the oil age long enough for the difference between one and two children per female to have an effect. So much for unpopular population talk.**

In round numbers, U.S. population is increasing about one percent per year. Four- million new births every year, plus one-million immigrants, minus two million deaths of senior Americans born when there were far fewer people starting families, adds up to a net increase of about three million Americans per year: **two hundred and fifty thousand per month, all expecting food, social welfare, a job, and a share of the American Dream. Within the time scales of seven to thirty years remaining in the U.S. gasoline age, the change in population, even at one child per female (1 cpf) will be far less a factor than physically running short of oil for all forms of transportation.** Closing our borders to any further immigration would still leave two million new Americans every year.

- **The effect of import or export of oil to the U.S.**

This variable will do much to answer questions related to geopolitics, U.S. involvement in world crises, and U.S. fuel-export economics. Presently we import about half of our conventional crude oil (7½ Mb/d). We can do this only as long as residual (but waning) American wealth (as used for gasoline consumption) trumps the purchasing power of the rest of an energy constrained, food starved, and over-populated third world competing for what's left at less than 3 b/p/y per year. Should we export our crude oil or refined liquid products because a few advanced countries, or the wealthy minorities in third-world countries, can still outbid the poorer American consumer? How much longer will our global military presence (with its priority-consumption of 1 Mb/d of our waning oil endowment) be able to keep the world's remaining oil moving in our direction?

Scenarios 2 and 4 are **in my opinion the most likely business-as-usual scenarios indicating twenty-eight and fourteen years left for our gasoline-intensive lifestyle**, including the mitigating effect of continuing to source one-half of our oil from foreign countries including Mexico and Canada. These would quantitatively be the same time-frames as if we suddenly reduced our per-capita consumption by one-half down to the Western European and Japanese level of 11 B/p/y, and continued to rely only on domestic oil with no import or export.

CONCLUSIONS

Clearly, there is no easy way forward

The curves and numbers in Figure 2 tell the story. The best we could possibly do, with heroic and highly-unlikely measures such as reducing per capita consumption from 22 b/p/y to 3 b/p/y, is shift the two-lifetime oil party towards the end of the eighty-year lifetime expected of a child born today. This is why I remain a strong,

albeit unpopular, advocate for **not having children**. It's not that the extra consumption by increased population would make a significant difference in the short time frames of any of the various Scenarios in Figure 2 except for 6. Instead, it's the extreme challenges these children and their parents will face as the familiar American lifestyle crashes along with our complete dependence on gasoline, cars, travel, and all the supporting infrastructure (refer again to Appendix A).

The only possible window of opportunity for a U.S. long-term sustainable future is Scenario 5. This path combines the extraordinarily optimistic acquisition of 100 billion barrels of remaining domestic oil, a 3 b/p/y world average per capita consumption, a reduction of fertility to one child per female (1 cpf), and no immigration.

Scenario 7 shows the same goals, **but the oil-age ending in 90 years instead, because population at 2 cpf did not eventually decrease as with 1 cpf**. Population continues to increase and then stabilizes at "replacement" level as shown in Chapter 6. Scenarios 6 and 8 only give us one-half a lifetime left. There is not enough time for different fertility rates to make an impact.

Climate change and environmentalism divert attention

The American public is bombarded daily by **these perfectly legitimate concerns**. However, the time frame for serious impact is far longer than the eight to thirty year crises we face in the most likely Scenarios 1 through 4. **Also, it will be much easier (at least somewhat possible) to adapt to weather changes than to continue forward without the oil absolutely essential for every mode of transportation, our oil-intensive food system, access to the other two fossil fuels, all other energy sources including clean solar-electric, national security, and the thousands of other oil-based products which are critical to modern civilization.** I am a firm believer that mother nature will some day prevail after we run out of the earth's oil we used to devastate the ecosystem. Coal is a longer-term issue, but cannot be accessed or distributed without oil. And we've already extracted the easy, high-energy, cleaner grades.

Our rural farm in Maine was established long before the fossil-fueled industrial age and global warming. I can't imagine how our predecessors could have cleared the land, built stone walls, built our sturdy buildings, and had a long-enough growing season to grow 100-day beans, tomatoes, squash, and corn **if the weather was significantly colder than it is now**. In my 40 years on this farm, I see little long-term evidence of global warming but, instead, colder winters because of arctic-melting-caused polar vortexes. It's not wise to talk to Mainers about global

warming when we had our first frost in September 2014 and winter days below zero by December. December of 2015 and record breaking warmth have been exactly the opposite. But no one is complaining about lower heating bills.

Food will be the critical issue as we face collapse

The trade-off we imminently face is: is our continued addiction to gasoline more important than going hungry a few years hence? It is a well-established fact that we Americans are consuming about ten Kcalories (K=one-thousand calories) of **fossil-energy content** for every Kcalorie that we use for our personal food. Certainly, climate change exacerbates this predicament. But the fact remains that, thanks to fossil fuels (including natural gas-based nitrogen fertilizer), the current U.S. corn harvest is at record levels including supplying one-million barrels per day of ethanol and bio-diesel non-food yield with very poor EROEI. This synergism can not last without oil input as its backbone. (See Part III, Chapter 8 for more of my life-long farmer's perspective on this subject.)

A third of the world is already collapsing into food-crisis mode because regional populations over-shot the carrying capacity of their local support system. This is similar to nearly all previously-failed civilizations but, back then, on a regional basis. Now, this human predicament is playing out on a global scale, especially since declining national oil exports can no longer pacify ever-growing populations. This is a major context behind the riots and civil collapse in Egypt, Syria, Libya, and Nigeria. Even countries like Saudi Arabia and Iraq which still have surplus conventional oil have less and less to export each year after keeping their own growing populations fed and under control. Relentless depletion (over-pumping) of ground water adds to regional crises and refocuses the blame back to climate change and population.

Why does everything suddenly look so rosy in the U.S.?

Unemployment is falling. Home sales are improving. Car sales are up (to dealers and on \$860 billion dollars credit). The stock market is skirting record highs. Gasoline prices are down. This short-term remission is a result of the resurgence of U.S. oil production from the 5 Mb/d level to above 8 Mb/d in the last five years. The remission is exacerbated by long-term "demand destruction" described earlier. Also, the dollar is stronger against the euro and yen because the other industrialized countries do not have a last gasp of their own oil endowment to revive their economies. Just because a terminal cancer patient sits up in bed or we have a warm stretch in October doesn't change the bigger picture. This grace period is the last chance to

recognize and gain some control of our fate. It's too bad we didn't get serious in 1971 when U.S. oil peaked, or in 2005 when conventional oil extraction in the world leveled off. Instead, we continue to live for the day and totally ignore the future. This sounds like a "three-little-pig" story. Even squirrels and migrating birds know better.

How could Americans possibly get to 11 barrels per person per year, or better yet, 3 b/p/y like the rest of the world average? We will have no choice. It will happen whether we like it or not as we run short of oil. If we accept reality and start immediately we still could buy some time for a few more years and have some chance to mitigate our fate. I can only offer the following thoughts:

1. **Get involved! Help to exponentially network this story and book.** Distribute more copies. Reveal the American gasoline "elephant" on blog sites, letters to the editor, rallies, any thing you can think of. Your added energy to a movement is the only way to help. From the Chinese proverb: "To know and not act is to not know." The sub-heading in my fourth-edition manuscript was: "It's up to you." The source is not important. The unequivocal math is the message. I will make my book available at cost or free if necessary.
2. **Whenever a critical resource is in jeopardy, the only orderly recourse is equitable rationing.** Otherwise, infighting and wealth disparity (price rationing) leads to chaos. Increased fuel taxes, as in Europe, are regressive and the wealthy continue to consume while the poor walk. Everyone must equally share the necessary drastic reduction. There are myriad ways we could immediately reduce gasoline consumption and be better off as well **if only everyone else had to do the same. We all need to be forced out of our cars.** I would suggest that half of U.S. gasoline consumption is frivolous and not much more than an unnecessary joy ride, too fast, in a comfortable four-thousand pound chariot our ancestors could not have imagined. A controlled decrease in gasoline (and oil) consumption would divert billions of dollars elsewhere into the economy and revive the demand for other products which have been left at the curb. There are a million reasons why national, tradable fuel coupon (TFC) gas rationing can't be instituted and won't work. My only response is: what is the alternative?
3. An immediate fifty-percent reduction of our 9 Mb/d gasoline addiction would still leave U.S. oil consumption at 1.6 billion barrels per year just for gasoline. **This would slot the U.S. gasoline-consumption bloc still third in the world (tied with Japan's total oil consumption).** One would think that we Americans could make that "sacrifice."

4. Personal diesel use could be left un-rationed for a few more years. There is not time or wealth left for a mass exodus to more efficient small diesels as has been the norm in Europe because of much-higher fuel taxes. Hopefully the VW debacle will soon be resolved.
5. Extravagant use of commercial gasoline and diesel must also be curtailed. Eighteen-wheelers, school buses, UPS delivery of a mail-order economy, six-day a week mail delivery; all cannot continue. Possibly, with a national educational effort, each can be addressed and downsized in an orderly manner before our economy collapses into fuel-starved chaos.
6. The American love affair with gasoline-powered entertainment must soon end. Stock car racing, ATV's, RV camping, jumping into the car to drive 50 miles for a foot race or skiing are all totally unnecessary examples of our future being sacrificed for nothing but fun the today. Whoa! Now we're really getting serious. "Not my favorite pastimes"! The best I can answer is that with equitable rationing we could all make personal decisions to save, or barter open-marketable TFCs to continue some of our own life choices.
7. Legitimate commercial agricultural and critical public service needs would be exempt. Obviously, national defense needs of about 1 Mb/d today will take priority.
8. The administration of a TFC rationing system would be immense. I'm old enough to remember WWII gas rationing when my folks had to get by with three gallons per week. That was during a "National Emergency." Can anyone think of a greater emergency than we face now with seven to thirty years left (Scenarios 1 through 4 in Figure 2) in the U.S. oil age? Remember, our only last chance for mitigation is to start now.
9. National gas rationing would give immediate impetus to myriad transportation alternatives. Electric cars, bicycles, public transportation, electric tractors for small farms, and healthy walking would all become popular **if there is still oil left for the absolutely-necessary peripheral support of all non-oil transport**. Energy-intensive sprawl would be discounted in value. Localized food production and non-travel entertainment and healthier lifestyles would be enhanced.
10. Air travel would remain the domain of the diminishing percentage of Americans who can still afford to fly. By drastically reducing profligate gasoline consumption the other means of public transportation and the traditional American lifestyle could continue a few more years ... possibly into a far-distant sustainable future if Scenario number 5 finally combines

dwindling oil with a significant reduction of population. Our children could at least have a taste of the fading lifestyle we took for granted while burning away their energy inheritance.

11. Regional home heating with oil can continue only a few more years as the attention focused on finite oil would encourage the transition to better efficiency, bio fuels, and solar. Grid electricity from coal, nuclear and hydro. will last longer than oil, but all require oil to function, another reason to keep the oil-age going albeit at a much lower per capita rate.
12. See Part III Chapter 7 for further discussion and quantitative details regarding gasoline rationing.

WHO AM I AND WHY DO I CONTINUE THIS UNPLEASANT WORK?

No one else seems to be telling the whole story especially with the daily bombardment of hopefully-self-fulfilling prophetic, feel-good news, cherry-picked partial solutions, and copious misinformation. **The quantitative interaction between U.S. gasoline consumption and the world oil market is unreported anywhere else.** The “experts,” from our politicians, to economists, to the investors, to most everyone associated with energy and oil; have a nearly unanimous intent to perpetuate our high-energy lifestyle and cannot comprehend the pace that we’re running out of gas. Even the population experts and ngo’s infer that two children per female (cpf) is an acceptable goal; if and when reached, “problem solved.”

As a retired R&D engineer, I come from a business career and mind-set dedicated to pondering the future and patiently directing the back-room development of the next-generation product line. This, while the company is at the top of its game. My goal was to be ready with the answers **before the company president calls a crisis-mode meeting.** I’m also a “numbers-guy” attempting to find the facts and quantitatively see through and around much of the subjective obfuscation we hear every day. Finally, as a life-long farmer, my ancestors were ten generations of “hard-rock” New England farmers. Where and how does food-energy come from? I vehemently support the re-localization, solar-electric (with respect to battery limitations), permaculture, resilience, and healthy food movements. That’s a primary reason we moved to Maine 40 years ago. We grow and store a large share of our vegetarian diet. Unfortunately, these efforts on personal and local levels do nothing to address the imminent, easy-energy, gasoline-fueled crisis. The technological “magic” of solar cells and modern electronics is well established, but their future potential can’t possibly work without continued minimal support from remaining liquid fossil fuels of at least 3 b/p/y.

