

Sierra Club Three Lakes Group

Fall 2018 Newsletter

Three Lakes Group Officers: Roger Blanchard; Chair and Secretary, Carol Ward; Vice Chair and Forestry Chair, Jim Page; Treasurer, Dave Aho; Communications and Internet Technology, Stephanie Aho; Communications, Rich Robinson; Outings Chair, Kathy English; Group Representative

Three Lakes Group Fall Programs

Fall programs will be held in Room 207, Crawford Hall, Lake Superior State University at 6:30 pm.

The programs on *Blue Gold: World Water Wars* and *Megafauna* are being co-sponsored by the Lake Superior Watershed Conservancy.

Wednesday Oct. 17 - POLITICS of the ENVIRONMENT, Mike Berkowitz, Legislative & Political Director, Sierra Club Michigan Chapter

Find out what the Michigan legislature has been up to in regard to environmental issues, how your lawmakers vote when it comes to protecting the environment, who the Sierra Club has endorsed in your area, and what impact the 2018 election will have on clean air, water, energy and natural resources. A presentation by the Sierra Club Michigan Chapter's Political Chair Richard Barron, Political Director Mike Berkowitz, and Political Organizer Sarah Tresedder. Time for Q&A.

Wednesday Nov. 21 - *Blue Gold: World Water Wars* - *Blue Gold: World Water Wars* examines environmental and political implications of the planet's dwindling water supply, and posits that wars in the future will be fought over water. ^[4] The film also highlights some success stories of water activists around the world.

Plans for a December program dealing with Megafauna are not complete. A separate notice will be sent out concerning this program.

What we are working on

Bicycle Issues Update - Bike Friendly Soo (BFS) worked with the city of Sault Ste. Marie on an application to obtain Bicycle Friendly Community status for Sault Ste. Marie. The city submitted the application in August. The evaluation of the application will be completed in November but we expect not to obtain Bicycle Friendly Community status on this try. Probably the best we can hope for is Honorary Mention. A Bicycle Advisory Committee has been set up within Sault Ste. Marie to work on how we can improve the bicycle infrastructure in the city so that when we submit the application in the future, we have a higher probability of obtaining Bicycle Friendly Community status.

BFS had a Bike Safety Rodeo in June. The objective of the event was to teach children how to safely ride bicycles. The event involved a set of courses that the children had to negotiate. The courses involved different aspects of bicycle safety. The rodeo was cosponsored by the Sault Ste. Marie Police Department and Lake Superior State University. A total of 26 children obtained certificates for completing the training.

During the summer of 2018, BFS had a series of slow bike rides. These rides allowed people with limited riding experience, as well as experienced riders, to enjoy a pleasant bike ride. Our rides went from the parking lot across from Bird's Eye Outfitters down to either Rotary Park or 4 Mile Beach.

In late summer, a Bike Route Guide for the Eastern Upper Peninsula was printed and distributed to various locations such as ProSports, Bird's Eye Outfitters, the Convention and Visitors Bureau, Visitors Center, etc. The guide has bike routes in Chippewa and Mackinac Counties, attractions on routes, traffic laws that apply to bicycles, bike safety and much more.

Graymont Limestone Mine Update - Trout Lake Township received notice that the DEQ has granted Graymont permits to drill five (5) wells for monitoring the flow and quality of the water in the immediate area. Exploration related to these wells continues. Al & Kathy English have been part of a Hiawatha Federal Forest Trails Working Group. At a summary update as to which projects the Federal Forest would be able to implement, expansion of a snowmobile trail to help provide connectivity between communities be designated as not being able to move forward. Upon review of the maps, the area/trail in question was designated as closed and the property listed as owned by Graymont.

Although the Federal Forest staff denied that the land transaction was not complete (and in fact, is just starting), they have it formally designated on their maps. In addition, according to an article in the St. Ignace paper, Graymont has started mining limestone at the Hendricks mine on Borgstrom road with much fanfare. This process was observed by a local Township Supervisor who stated that there was very little disturbance. However, now, concerns about dust have been raised.

PJ Stoll, plant manager for Graymont in Gulliver, said they use water for dust control, which limestone holds water for a very long time, therefore, there is very little dust created. Graymont's current plan is to truck the material down Borgstrom road to US-2, and then to the Sand Products docks in Epoufette to load onto lake freighters. Concerns have been raised related to the trucks entering US-2 where the speed limit is 65mph.

The State of Michigan MDOT is going to build two (2) right-hand turn lanes, with warning signs and flashing yellow lights at a projected cost of over a half million dollars. Another source in the know about the cost effectiveness of trucking limestone stated that they couldn't make a profit by trucking the product that distance. The land swap in Trout Lake Township on Sections 17, 18, 19, 20, appears to be a done deal with the Federal Forest maps designating Graymont's name as ownership on those sections.

This was observed at a "citizen collaborative" meeting designed to study public access to Federal Land for recreational purposes. A decision on this swap is scheduled for September. Personal observations are, if one Googles lake freighter capacity, one (1) Lake Freighter has capacity for 3000 truckloads of limestone. Given the benefit of doubt, if this estimate is based on a 10-yard capacity truck if the truck capacity is 20 yards, the number of trucks required to load one (1) Lake Freighter is 1,500 trucks.

That results in 1,500 trucks entering US-2, where the speed limit is 65 mph, freeway speeds a short time ago, is a disaster waiting to happen! As far as the local Township Supervisor stated that not much disturbance was observed, how much silt was dislodged into the water table, which will contaminate wells, streams, rivers, lakes? How much radon gas will be exposed/discharged? In addition, who knows what else?

Line 5 Update, 10/9/18 - The biggest Line 5 events are happening in Lansing, and not the Mackinac Straits. While the 65-year old obsolete pipeline keeps pushing 23 million gallons of oil a day, politicians in Lansing are doing everything they can to keep it flowing.

State Representative Lee Chatfield (R-Levering), sponsored three bills which have been approved by the State House and are now being considered in the State Senate. These bills, broadly, prohibit shippers from using anchors in the straits and it lists penalties, including jail. But on closer look the bills actually are a big aid to Enbridge, owner of the pipelines, and the bills may actually be illegal.

All navigation in the Straits is a federal responsibility. The state can pass all the bills it wants, but the first and last decisions about anchors reside with the US Coast Guard and Army Corps of Engineers (ACOE). In the 1953 easement allowing the

pipelines, for instance, the ACOE prohibits any structure that impedes navigation or puts shipping at risk. Anchors are a significant tool for ships in the event of bad weather, and particularly in tight navigation water. And around bridges.

Chatfield is running for re-election and is trying to win back opponents to the pipeline, who are now significant. He finally felt the breeze. But the bills do things such as allow whatever damaged entity is spilling into the water ten days to report the spill. These bills are sizzle, no steak.

But the more significant event coming out of Lansing is a (preliminary) agreement between Michigan and Enbridge Energy Partners to build a \$500 million tunnel under the Straits. The project would take an estimated 7-10 years. This is a subterranean project done with subterranean bargaining. It is also one of Governor Rick Snyder's last acts.

If approved this project would literally cement the 65-year old, 650-mile pipeline into Michigan territory for decades. The solution of preventing an oil spill in the Straits, a five mile "patch" would then require that the Line 5 owners upgrade and expand the rest of the pipeline to take full advantage of the tunnel under the straits.

This project has a lot of hurdles and a lot of support. The next governor, he or she, will either likely kill this project as too hazardous, or promote it as a solution. Candidate Bill Schuette supports the pipeline and the tunnel. Gretchen Whitmer opposes the pipeline.

Your vote, and the persons you convince to vote, matters on Nov. 6.

What's going on with oil and natural gas resources

Much has been made of the increase in U.S. oil and natural gas production by politicians and the media over the last 10 years due to fracking. That increase in production has been made possible by a sea of debt. Over the years, the oil and gas industry has been piling on more debt to cover previous debt. What they are doing constitutes a Ponzi scheme.

According to the second article below, the industry's total bonds below investment grade that they have to pay back each year was \$30 billion in 2016. In 2018, their total payment will be \$110 billion. The debt payment will rise to \$230 billion in 2020 and \$260 billion in 2022. To put those numbers in perspective, if the industry produces 5 million barrels of oil/day, the approximate value of what is being produced today, and the price of what they sold was \$70/barrel, the total value of what they produced in a year would be ~\$128 billion.

Considering the industry has been concentrating on the sweet spots where the oil production/well is the highest, the future looks far from rosy for the industry. When the oil industry has to concentrate on areas outside of the sweet spots, the industry will have even more serious problems.

I think it's reasonable to state that the industry will not be able to cover the debt they have accumulated. I think it's reasonable to expect that the federal government will have to pay back the debt, as they did for the banking, insurance, and auto industry back in 2008. That may solve the debt issue in the short run but it won't solve the energy return on energy investment issue, which will get worse with time.

The Secret of the Great American Fracking Bubble

By [Justin Mikulka](#), originally published by [DeSmog Blog](#)

April 20, 2018

In 2008, Aubrey McClendon was the [highest paid](#) Fortune 500 CEO in America, a title he earned taking home \$112 million for running Chesapeake Energy. Later dubbed "[The Shale King](#)," he was at the

forefront of the oil and gas industry's next boom, made possible by advances in fracking, which broke open fossil fuels from shale formations around the U.S.

What was McClendon's secret? Instead of running a company that aimed to sell oil and gas, he was essentially flipping real estate: acquiring leases to drill on land and then reselling them for five to 10 times more, something [McClendon explained](#) was a lot more profitable than "trying to produce gas." But his story may serve as a cautionary tale for an industry that keeps making big promises on borrowed dimes — while its investors begin losing patience, a trend DeSmog will be [investigating in an in-depth series](#) over the coming weeks.

From 2008 to 2009, Chesapeake Energy's stock swung from \$64 a share under McClendon to around \$17. Today, it's worth just [\\$3 a share](#) — the same price it was in 2000. A visionary when it came to fracking, McClendon perfected the formula of borrowing money to drive the revolution that reshaped American energy markets.

An Industry Built on Debt

Roughly a decade after McClendon's rise, the [Wall Street Journal reported](#) that "energy companies [since 2007 through 2017] have spent \$280 billion more than they generated from operations on shale investments, according to advisory firm Evercore ISI."

As a whole, the American fracking experiment has been [a financial disaster](#) for many of its investors, who have been plagued by the industry's heavy borrowing, low returns, and [bankruptcies](#), and the path to becoming profitable is lined with significant potential hurdles. Up to this point, the industry has been drilling the "[sweet spots](#)" in the country's major shale formations, reaching the easiest and most valuable oil first.

But at the same time energy companies are borrowing more money to drill more wells, the sweet spots are drying up, creating a Catch-22 as more drilling drives more debt.

"You have to keep drilling," David Hughes, a geoscientist and fellow [specializing in shale gas and oil production at the Post Carbon Institute](#), told DeSmog. But he also noted that with most of the sweet spots already drilled, producers are forced to move to less productive areas.

The result? "Productivity goes down and the costs remain the same," he explained.

While Hughes understands the industry's rationale for continuing to drill new wells at a loss, he doubts the sustainability of the practice.

"I don't think in the long-term they can drill their way out of this," Hughes told DeSmog.

While politicians and the mainstream media tout an American energy "revolution," it is becoming clear that — like the housing bubble just a few years earlier — the American oil and gas boom spurred by fracking innovations may be one of the largest money-losing endeavors in the nation's history. And it caught up with McClendon.

In 2016, the shale king was indicted for rigging bids at drilling lease auctions. He died the very next day in a single car crash, leading to speculation McClendon committed suicide, a rumor impossible to confirm. However, the police chief on the scene [noted](#): "There was plenty of opportunity for him to correct and get back on the roadway and that didn't occur."

The same could be said of the current shale industry. There is plenty of opportunity for these energy companies to correct their path — for example, by linking CEO pay to company profits rather than [oil production volumes](#) — but instead they are plowing [full-speed ahead](#) with a business model that seems poised for a crash.

But Hope Springs Eternal

Of course, business media and conservative think tanks are still selling the story that the fracking industry has produced an economic and technical revolution.

In 2017 Investors Business Daily ran an opinion piece with the title, [“The Shale Revolution Is A Made-In-America Success Story.”](#) It was authored by Mark Perry of the [American Enterprise Institute](#) — a free market-focused think tank funded in part by the oil and gas industry.

How does the author measure success? Not via profits. The metric Perry uses to argue the success of the fracking industry is production volume. And it is true that the volumes of oil produced by fracking shale are increasing and currently [at record levels](#). But here is the catch — when you lose money on each barrel of oil you pump and sell — the more you pump, the more money you lose. While it is true that the industry has been successful at getting oil out of the ground, its companies have mostly lost money doing it.

However, much like with the U.S. housing boom, this false narrative persists that the fracking industry is a money-making, rather than money-losing, venture.

A [Wall Street Journal headline](#) published in early 2018 projected this eternal optimism about the fracking industry: “Frackers Could Make More Money Than Ever in 2018, If They Don’t Blow It.”

This headline manages to be, at the same time, both very misleading and true. Misleading because the industry has never made money. True because if oil and gas companies make any money fracking in 2018, it would be more “than ever.”

However, the nuance comes in the sub-headline: “U.S. shale companies are poised to make real money this year for the first time since the start of the fracking boom.”

Poised to make “real money” for “the first time.” Or to put it another way, the industry hopes to stop losing large amounts of real money for the first time this year.

In March 2017, [The Economist](#) wrote about the finances of the fracking industry, pointing out just how much money these businesses are burning through:

With the exception of airlines, Chinese state enterprises, and Silicon Valley unicorns — private firms valued at more than \$1 billion — shale firms are on an unparalleled money-losing streak. About \$11 billion was torched in the latest quarter, as capital expenditures exceeded cash flows. The cash-burn rate may well rise again this year.

Some historic money-losing has been going on, and is expected to continue, as [reported by the Wall Street Journal](#): “Wood Mackenzie estimates that if oil prices hover around \$50, shale companies won’t generate positive cash flow as a group until 2020.” However, Craig McMahon, senior vice president at Wood MacKenzie, notes, “Even then, only the most efficient operators will do well.”

U.S. oil produced via fracking is priced as West Texas Intermediate (WTI), which averaged [\\$41 a barrel in 2016](#) and \$51 in 2017. The consensus is that WTI should average over [\\$50 a barrel](#) in 2018, thus providing the industry another reason to keep pushing forward. However, even in 2017 with the average over \$50 a barrel, the industry as a whole was not profitable.

Irrational Exuberance

In the introduction to [The Big Short](#), Michael Lewis' book-turned-movie about how the 2008 financial crash unfolded, he describes the finances of the housing bubble:

“All these subprime lending companies were growing so rapidly, and using such goofy accounting, that they could mask the fact that they had no real earnings, just illusory, accounting-driven, ones. They had the essential feature of a Ponzi scheme: To maintain the fiction that they were profitable enterprises, they needed more and more capital to create more and more subprime loans.”

If you substitute “shale oil and gas development companies” for “subprime lending companies,” it becomes an apt description of the current shale industry. These companies are losing more money than they make and can only sustain this scenario if lenders continue to bankroll their efforts, allowing the fracking industry to drill more wells as it points to production increases, rather than profits, as progress. Which — for now — Wall Street continues to do [in a big way](#).

This article is the first in a [series investigating the economics of fracking](#) and where the vast sums of money being pumped into this industry are actually going. The series will look at how fracking companies are shifting these epic losses to the American taxpayers. It will review the huge challenges facing the industry even *if* oil and gas prices rise: the physical production limits of fracked wells, rising interest rates, rising water costs, competition from renewables, OPEC's plans, and what happens if Wall Street stops loaning it money.

The oil industry has always been a boom or bust industry. And during each boom someone inevitably declares that “this time is different,” assuring everyone there won't be a bust. The sentiment about the early 2000s housing bubble was much the same, with critics being drowned out by the players claiming that, this time it *was* different, arguing “Housing doesn't go down in value.”

And what about for shale production? Is this time really different? Some in the industry apparently think so.

“Is this time going to be different? I think yes, a little bit,” energy asset manager Will Riley told the [Wall Street Journal](#). “Companies will look to increase growth a little, but at a more moderate pace.” There is [little evidence](#) of restraint or moderation in the industry. Until analysts and investors start talking about profits instead of growth, however, this time is likely to end, at some point, in a completely familiar and predictable way: bust. A fate even Aubrey McClendon, the highest-paid CEO, the shale king, eventually met.

David Hughes summed up his take on the industry's financial outlook: “Ultimately, you hit the wall. It's just a question of time.”

THE GREAT U.S. ENERGY DEBT WALL: It's Going To Get Very Ugly....

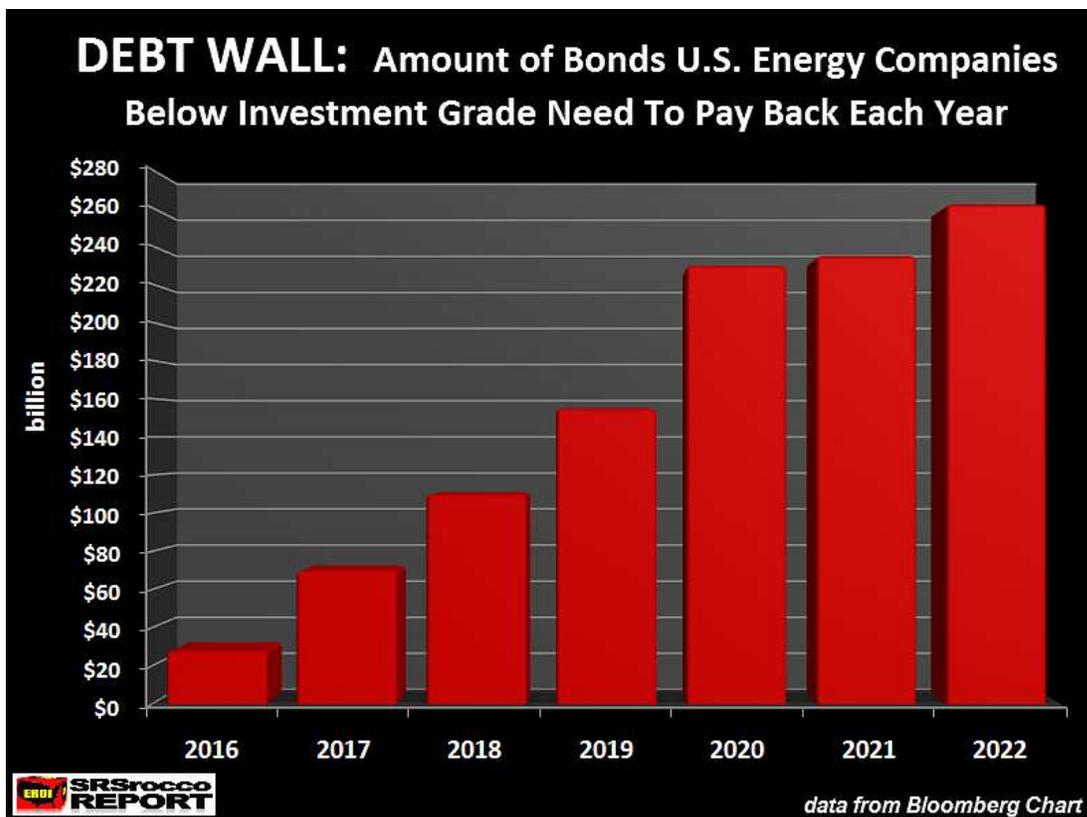
Posted by [SRSrocco](#) in [Energy, News](#) on May 27, 2017

While the U.S. oil and gas industry struggles to stay alive as it produces energy at low prices, there's another huge problem just waiting around the corner. Yes, it's true... the worst is yet to come for an industry that was supposed to make the United States, energy independent. So, grab your popcorn and watch as the U.S. oil and gas industry gets ready to hit the GREAT ENERGY DEBT WALL.

So, what is this "Debt Wall?" It's the ever-increasing amount of debt that the U.S. oil and gas industry will need to pay back each year. Unfortunately, many misguided Americans thought these energy companies were making money hand over fist when the price of oil was above \$100 from 2011 to the middle of 2014. They weren't. Instead, they racked up a great deal of debt as they spent more money drilling for oil than the cash they received from operations.

As they continued to borrow more money than they made, the oil and gas companies pushed back the day of reckoning as far as they could. However, that day is approaching... and fast.

According to the data by Bloomberg, the amount of bonds below investment grade the U.S. energy companies need to pay back each year will surge to approximately \$70 billion in 2017, up from \$30 billion in 2016. That's just the beginning.... it gets even worse each passing year:



As we can see, the outstanding debt (in bonds) will jump to \$110 billion in 2018, \$155 billion in 2019, and then skyrocket to \$230 billion in 2020. This is extremely bad news because it takes oil profits to pay down debt. Right now, very few oil and gas companies are making decent profits or free cash flow. Those that are, have been cutting their capital expenditures substantially in order to turn negative free cash flow into positive.

Unfortunately, it still won't be enough... not by a long-shot. If we use some simple math, we can plainly see the U.S. oil industry will never be able to pay back the majority of its debt:

Shale Oil Production, Cost & Profit Estimates For 2018

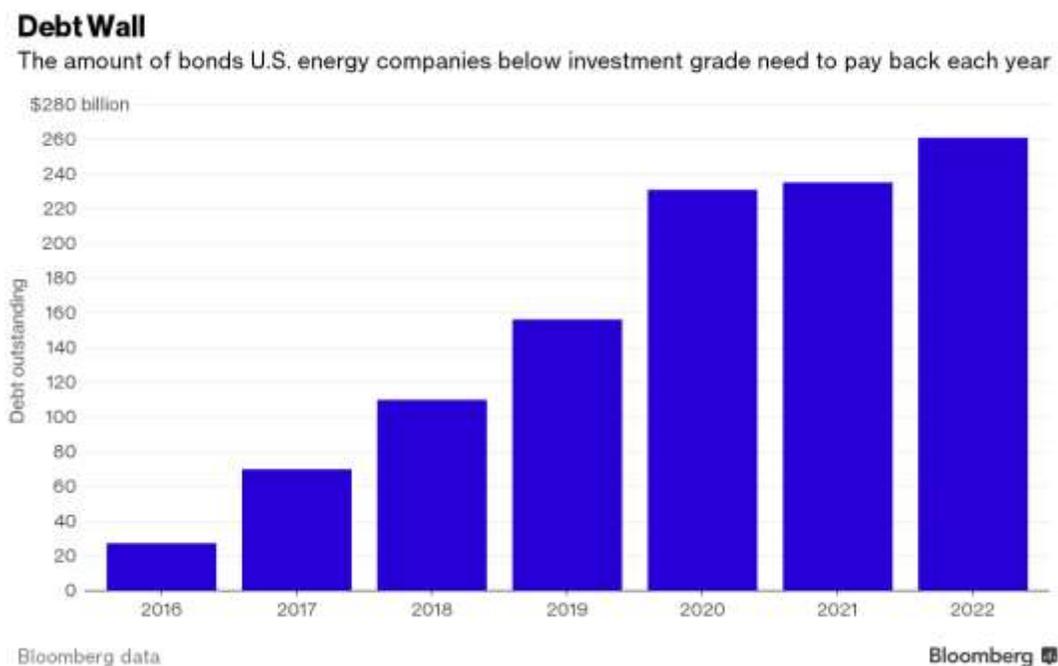
REVENUE = 5 million barrels per day shale oil production x 365 days x \$50 a barrel = \$91 billion.

EST. PROFIT = 5 million barrels per day shale oil production x 365 days x \$10 a barrel = \$18 billion.

If these shale oil companies do actually produce 5 million barrels of oil per day in 2018, and were able to make a \$10 profit (not likely), that would net them \$18 billion. **However, according to the Bloomberg data, these companies would need to pay back \$110 billion in debt (bonds) in 2018. If they would use all their free cash flow profits to pay back this debt, they would still owe \$92 billion.**

Yes, it is true, I am not including all U.S. oil and gas production, but I am just trying to make a point here. We must remember, this debt is below investment grade and is likely more of the shale oil and gas producers. Furthermore, these shale oil and gas producers are using most of their free cash flow to drill more wells to produce more oil. So, in all reality, they would not take most all of their profits or free cash flow to pay down debt. They just wouldn't have the funds to continue drilling.

The Bloomberg data on the U.S. oil and gas companies outstanding debt (bonds) came from the following chart:



I made my own chart (shown at the top of the article) by estimating Bloomberg's debt figures (they did not provide actual figures) as it seemed more fitting to show U.S. energy debt in a **BRIGHT RED** color. Their chart seemed a tad boring, so I thought it would be nifty to jazz it up a bit. While I have reproduced their data in my own chart, I give them full credit for the figures.

That being said.... there is no way in hell the U.S. oil and gas companies are going to be able to pay back this debt. **NO WAY.... NO HOW.** So, we could either see a lot more bankruptcies, companies rolling over the debt to a later date, or Uncle Sam could come in and buy the debt. However, all these options won't change the dire situation the U.S. energy sector will face as it becomes more difficult and less profitable to produce oil and gas in the future.

I would kindly like to remind all the precious metals investors as well as those who follow the alternative media.... ENERGY IS THE KEY PROBLEM.... not the debt. The debt is a symptom of the Falling EROI (Energy Return on Energy Investment) of energy. For some strange reason, a lot of people still don't get that. We must remember the following:

DEBTS = UNBURNED ENERGY OBLIGATIONS

For example, a home mortgage is a debt owed by the homeowner. **Energy must be burned every day, week, month and year(s) to create the economic activity that pays the homeowner a salary to pay off the home mortgage over the 20-30 year period.** Thus.....

HOME MORTGAGE = UNBURNED ENERGY OBLIGATION

Now, I can go on and on by using other examples such as car loans, boat loans, RV loans, credit cards, second mortgages, company and public debt. All of these debts are "Unburned Energy Obligations." When you can finally look at the market in the terms of "ENERGY", and not "FIAT MONEY", "ASSETS" or "DEBTS", then you will finally understand why the debt is not the real problem.

Why? **Because, even if we could wipe away all the debt, that would still not solve the Falling EROI – Energy Returned On Investment of our oil and gas sources or the declining net energy that is available to the market.** The massive increase in debt has just postponed the inevitable a while longer.

What's Going on in the World of Climate Science

Below is an article I wrote mostly concerning scientific work on ice loss in Antarctica.

Antarctica-The Land of Ice and Snow

By Roger Blanchard

There was a fascinating article in the July 2017 issue of National Geographic dealing with melting ice in Antarctica. Figure 1 is a map of Antarctica which shows pertinent areas described below.

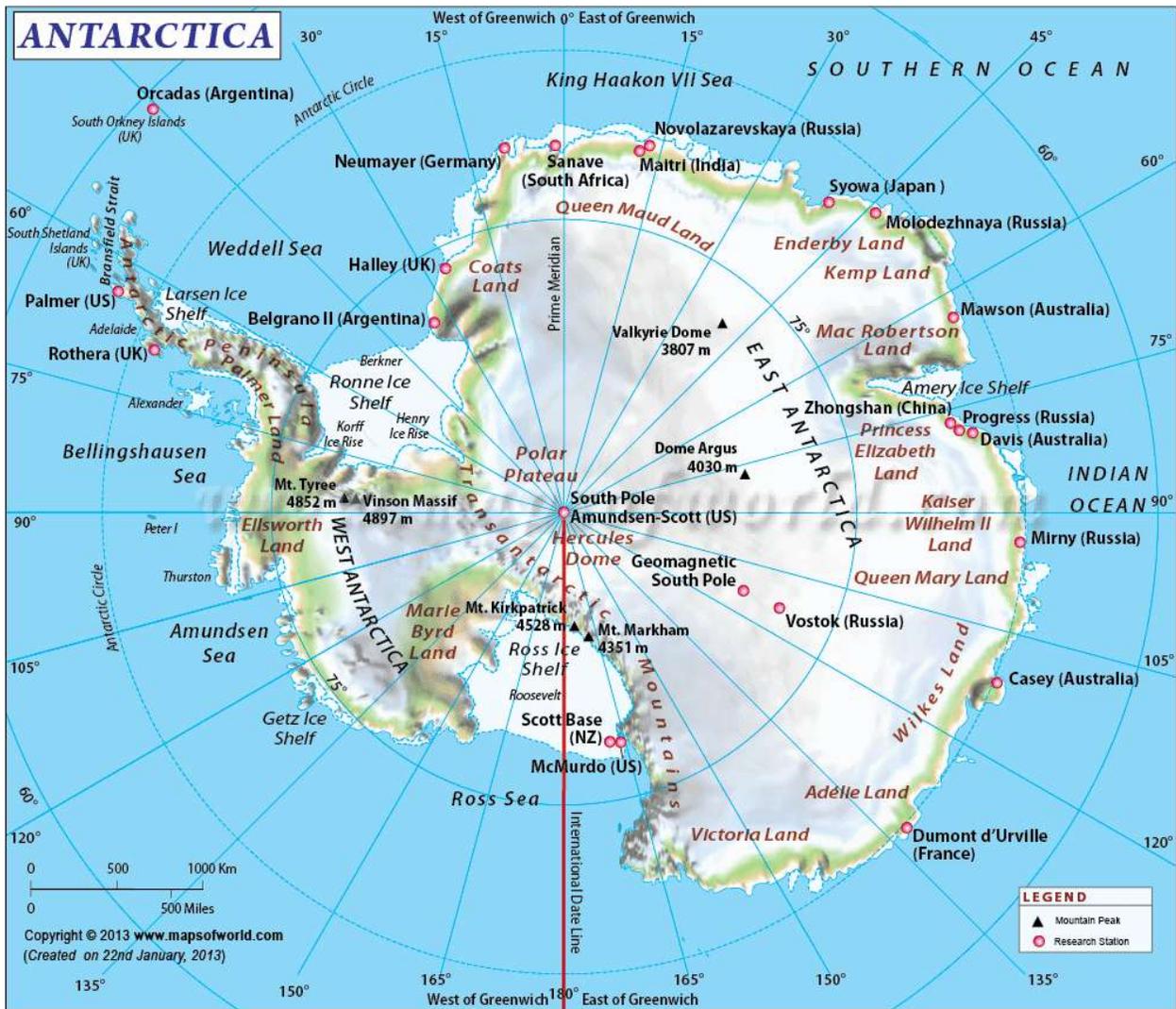


Figure 1

The basic point of the article was that ice on Antarctica is melting considerably faster than expected and that the rate of melting is accelerating fairly rapidly. The big question is how much faster will the melting accelerate? I thought this particular statement was noteworthy:

Fricker [one scientist studying the ice melt] and her team have found that from 1994 to 2012, the amount of ice disappearing from all Antarctic ice shelves, not just the ones in the Amundsen Sea, increased 12-fold, from six cubic miles to 74 cubic miles per year [The most recent issue of Sierra magazine states that melting has increased by almost a factor of 3 since 2012]. “I think it’s time for us scientists to stop being so cautious” about communicating the risks, she says.

What is happening is that the ice shelves are melting much faster from below, rather than from above, due to warm water eating away at the ice. Warm water is much more effective at melting ice compared to warm air due to the high specific heat of water. The high specific heat of water means that it holds a lot of energy per unit change in temperature. Warm water from as far as 200 miles to the north is being funneled through deep canyons to the underside of the ice shelves, particularly the West Antarctic Ice Shelf.

In the last ~25 years, Larsen A and B Ice Shelves have completely disappeared (A in 1995 and B in 2002). In 2017, a large chunk of Larsen C (~14%) broke away. It's reasonable to expect that over the next ~20 years, Larsen C will likely disappear as well.

But the big issue is that of the West and East Antarctic Ice Shelves. Complete melting of the West Antarctic Ice Shelf would raise sea levels approximately 10 feet. Complete melting of the East Antarctic Ice Shelf would raise sea levels approximately 190 feet.

What ice scientists are now saying is that the West Antarctic Ice Shelf will definitively collapse. It's just a matter of how long it will take.

To illustrate how quickly the ice is changing in Antarctica, here are a few excerpts from the article:

The Pine Island Ice Shelf (West Antarctica), about 1,300 feet thick over most of its area, is a dramatic case: It thinned by an average of 150 feet from 1994 to 2012. But even more worrisome is the neighboring Thwaites Glacier, which could destabilize most of the West Antarctic Ice Sheet if it collapsed.

These are the fastest retreating glaciers on the face of the Earth," says Eric Rignot, a glaciologist at the NASA Jet Propulsion Laboratory in Pasadena, California. Rignot has studied the region for more than two decades, using radar from aircraft and satellites, and he believes the collapse of the West Antarctic Ice Sheet is only a matter of time. The question is whether it will take 500 years or fewer than a hundred—and whether humanity will have time to prepare.

As the researchers lay in their tents at night, in the middle of a 4,000-mile arc of coastline that lacked a single permanent outpost, they heard loud pops and bangs coming from the ice. Each morning they saw new cracks, an inch wide and seemingly bottomless, cutting across its surface. During their five weeks of studying it, the ice under their boots thinned by another seven feet.



The west side of the Antarctic Peninsula is warming several times faster than the rest of the planet. Ninety percent of its 674 glaciers are now in retreat and are calving more icebergs into the sea, like this one in Andvord Bay.

Based upon a submarine study, one researcher concluded that

the melt rates “were just crazy,” says Adrian Jenkins, a glaciologist from the British Antarctic Survey in Cambridge. According to his calculations, the ice shelf [West Antarctica] was losing 13 cubic miles of ice per year from its underside; back near the grounding line, the ice was probably thinning up to 300 feet per year. It was just beyond our concept that a glacier would melt that fast,” Jenkins says.

According to the article, average annual temperatures on the west side of the Antarctic Peninsula have increased by 5°F since 1950 and wintertime temperatures have increased 9°F with sea ice now forming only 4 months of the year instead of 7 months.

Further the article states:

It’s unclear when the entire [West Antarctic] ice shelf might disintegrate. The “warm” water flowing underneath it from offshore is only 4 to 6 degrees Fahrenheit above freezing. But roughly 3,000 cubic miles of it arrives every year, which means the ice shelf is receiving an amount of heat that exceeds the output of a hundred nuclear power plants, operating 24/7.

In fact, research by Rignot and others over the past few years indicates that the collapse of several major glaciers flowing into the Amundsen Sea is now unstoppable. Between 2002 and 2009 alone, the ice shelf in front of the Smith Glacier thinned by 1,500 feet in some places, the one in front of the Pope Glacier by up to 800 feet. The

grounding lines of the Amundsen glaciers have retreated so far—tens of miles in some cases—that they now rest on seafloor that slopes down toward the center of the ice sheet. Each increment of retreat exposes a greater ice surface to warm ocean water. It’s a runaway process—and scientists are urgently trying to figure out how fast it will run.

The retreat and hemorrhage of these glaciers “will accelerate over time,” agrees Rignot. “Maybe you don’t care much about that for the next 30 to 40 years, but from 2050 to 2100 things could get really bad, and at that point listening to scientists is irrelevant.” Yet after things get really bad, they could still get worse.

The article goes on to state that the last time the carbon dioxide level was as high as it is today, ~410 ppm, sea levels were ~70 feet higher than they are now. Collapse of the West Antarctic Ice Sheet and Greenland would only raise sea levels about 35 feet.

The article then states:

Until recently the East Antarctic Ice Sheet was considered secure; unlike West Antarctica, it sits on high ground. But mapping with ice-penetrating radar has revealed a low-lying region cut by glacially carved channels that drop as far as 8,500 feet below sea level—perfect for guiding warm ocean water deep into the heart of the ice sheet. The Totten Glacier is the largest coastal outlet in this region. If it collapsed, global sea level could rise 13 feet—“roughly as much as all of West Antarctica,” Rignot points out. “One glacier alone.”

In January 2015, the Australian icebreaker *Aurora Australis* became the first ship to reach the front of Totten. Like the *Palmer* at Pine Island in 1994, it found deep, warm water flowing under the ice shelf, at a rate of 4.5 cubic miles a day. The glacier is already losing a couple of cubic miles of ice per year—small potatoes, in Antarctic terms. But Donald Blankenship, a University of Texas glaciologist who oversees the aerial survey, fears it could blow up.

With all that said, it’s not uncommon to hear or read that the ice sheets are growing on Antarctica and Greenland rather than shrinking. Climate deniers have latched onto that argument to claim that we don’t have to worry about rising sea levels. Where does that argument come from?

To the extent that there is scientific evidence supporting the claim that ice sheets are growing on both Antarctica and Greenland, it comes from a study in 2015 by Jay Zwally and his team at NASA.

Based upon satellite data, they concluded that the loss of ice in western regions of Antarctica are being more than offset by thickening in East Antarctica.

Many ice experts disagree with the Zwally study. Here is what is stated in another National Geographic article on Antarctica:

“I think there’s a serious issue with the study,” says [Ted Scambos](#), lead scientist at the National Snow & Ice Data Center in Colorado. “It’s unfortunate that it made it through peer review.”

The paper is inconsistent with [other studies that show an overall loss of ice](#) there [Antarctica] of around 100 billion tons, based on satellite measurements of the gravity of the ice and snow.

Zwally’s team used satellites to measure the elevations of glaciers on Antarctica. But University of Washington glaciologist Ben Smith, who was not involved with the study, points out that the [technology might not be up to the task](#) of distinguishing snowpack volume based on a difference in elevation of one or two centimeters.

University of Alaska, Fairbanks glaciology professor [Erin Pettit](#) calls the methodology “a really, really hard measurement that I would take with a heavy load of salt.”

From my personal perspective, I’m concerned that the study does not consider differences in density between the ice being lost and the snow being gained.

For his part, Zwally has stated that any increase in ice and snow mass in recent years is a temporary phenomenon.

There have also been claims made that the ice pack is increasing on Greenland rather than decreasing. Ice scientists strongly disagree with that conclusion as stated in the following paragraphs from the website Skeptical Science:

The evidence suggested by a multitude of different measurement techniques suggests that not only is Greenland losing ice but that these ice losses are accelerating at a rapid pace ([Velicogna 2009](#)). Further evidence suggests that although ice losses have up to this point primarily occurred in the South and Southwest portions of Greenland, these losses are now spreading to the Northwest sector of the ice sheet ([Khan et al 2010](#)).

Although there have been some gains at high altitudes, significant ice losses are occurring at low altitudes ([Wouters 2008](#)) along the coastline where glaciers are calving ice into the oceans far quicker than ice is being accumulated at the top of the ice sheet ([Rignot and Kanagaratnam 2006](#)).

In conclusion Greenland is losing ice extensively along its margins where fast flowing ice streams are pushing more ice into the ocean than is gained in the center of the ice sheet.

Figure 2 shows the results of different measurements of ice loss on Greenland over time. What the graph is illustrating is that from 2000 to 2010, the ice mass loss per year is increasing.

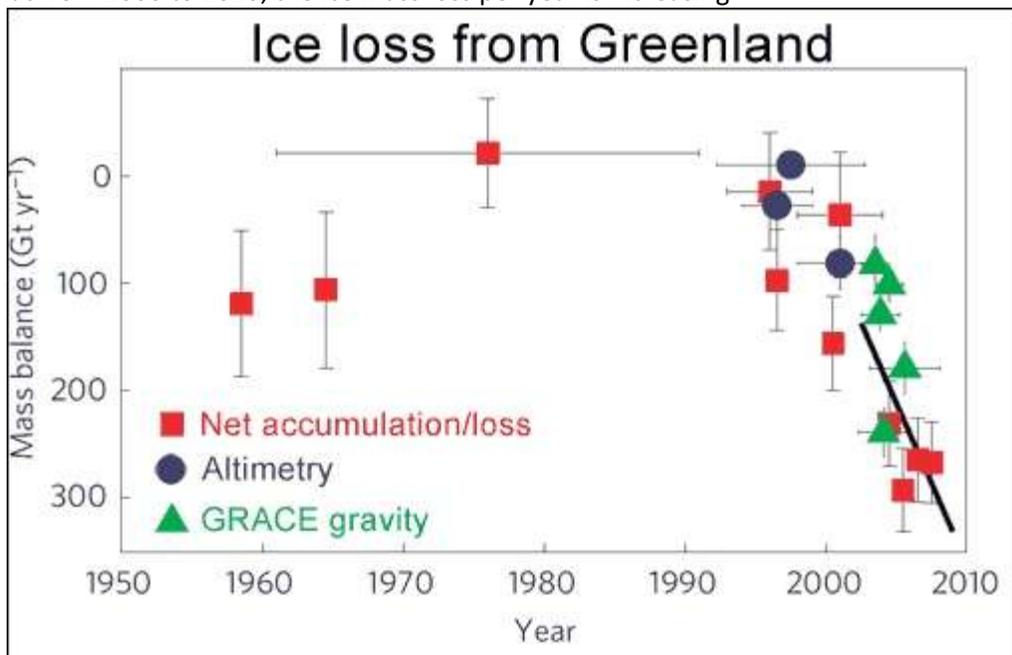


Figure 2

Like Antarctica, ice is being eaten away from below around Greenland. Ice is also melting at the surface of ice sheets creating lakes and streams that can terminate into muolons in which water drains from the surface down to the base of the ice sheet. Here is a short video (~3 minutes) showing what’s going on in Greenland:

<https://www.youtube.com/watch?v=-EMCxv22I>

The drained water can then lubricate the base of the ice sheet allowing it to flow more rapidly.

It will be interesting to see what happens in the future on and around Antarctica as well as Greenland, particularly if you’re young enough to see what it will be like in +100 years. There should be some dramatic changes in that span of time.

Climate by the Numbers

If you thought the summer of 2018 was warm in Sault Ste. Marie, you were correct. It turned out to be the second warmest summer (June/July/August) on record dating back to 1890. Table I is a list of the top 5 warmest summers on record.

Year	Temperature (°F)
1955	67.60
2018	67.34
2012	67.16
1921	66.91
2000/2005	66.28

Table I

As you can see, 1955 was the warmest summer on record. I’ve talked with someone who remembers the summer well and he said it was very hot. I expect that the summer of 1955 was characterized by a persistent high pressure system that led to many daytime high temperatures in the 80s °F or 90s °F.

This summer Sault Ste. Marie had 44 days of 80 F or above and 6 days of 90 F or above. What would be different now compared to 1955 is that the nighttime lows are considerably higher than I would expect they were in 1955. We had 29 days of 60 F or above for nighttime lows, ~33% of the total.

August 2018 tied for the 3rd warmest August on record going back to 1890 (see Table II):

Year	Temperature (oF)
1947	69.80
2016	69.19
2018/1955	68.95

Table II

For the year-to-date, it has been the 9th warmest. A major reason the year-to-date temperature wasn’t higher is because April was so cold. April was 5.13 F below the 1971-2000 average.

Table III contains a summary of Prudhoe Bay temperature deviation data, Oct.-March and June-September, relative to 1971-2000:

October-March	Ave. Temperature (F)	June-September	Ave. Temperature (F)
2010/2011	+6.47	2010	+2.46
2011/2012	-2.17	2011	+2.07
2012/2013	+2.41	2012	+5.80
2013/2014	+6.89	2013	+2.55
2014/2015	+7.56	2014	+0.25
2015/2016	+7.12	2015	+0.86
2016/2017	+8.90	2016	+3.38
2017/2018	+14.05	2017	+1.99

Table III

What is happening in the Arctic is that in winter, energy is being transferred from the relatively warm water to the atmosphere. I'm speculating that in the winter of 2011/2012 that there was a persistently strong wind off of Siberia that had a cooling effect on the Arctic in general.

Web Page and Facebook

We're on the Web and Facebook. The addresses are:

<http://tlgsierraclub.org/>

<https://www.facebook.com/ThreeLakesGroupOfSierraClub?ref=bookmarks>

Please take a look at what we have online. We'll try to supply material regularly to these sites. Feel free to contact us with questions, concerns and suggestions.

Three Lakes Group Meetings

If you would like to attend Three Lakes Group meetings, send me an e-mail at:

blanchardclimate@gmail.com

and I will put you on the list.

Political Endorsements

The Sierra Club Three Lakes Group is endorsing Jim Page for the 37th District of the Michigan Senate and Joann Galloway for Michigan's 107th District of the Michigan House in the November elections.

Here is Jim's position on the environment:

I will Protect all of our Natural Resources, which includes the decommissioning of Line 5. Protecting our water is a priority for all of Michigan's citizens. It is the responsibility of government to protect all the residents of this state which includes the environment in which we live. Clean and safe drinking water is a priority. Fracking needs to be eliminated in our state. Ending our dependence on oil is essential to our economy, I support the increase use of all renewable energy.

I failed in trying to contact Joann directly but here are some of her positions based upon statements she has made:

She is in favor of shutting down line 5. She is in favor of curbing non-point source pollution that causes problems such as the algae blooms in Lake Erie. She is in favor of promoting green energy sources such as wind and solar. She is in favor of addressing the lead pipe issue that has caused problems in Flint and high schools in Detroit and other locations. She is opposed to gutting DEQ rulemaking. Because she is involved with farming, she is concerned about chemical contamination in our food system.