

The Week That Was: 2018-06-30 (June 30, 2018)

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The Science and Environmental Policy Project

Quote of the Week: *"I tell you this story to put in perspective the value of being a Republic and having the protections of the US Constitution. Fortunately, thanks to the internet I can tell Americans these stories, so they can put things in perspective and count and defend their blessings."* Tim Ball, Canadian, See Litigation Issues.

Number of the Week: \$3 per MMBTU?

THIS WEEK:

By Ken Haapala, President, Science and Environmental Policy Project (SEPP)

Sea Level Rise – What is Measured? Last week's TWTW had an interview with Richard Lindzen a with statement questioned by some readers. The paragraph with the statement is:

*"Since 1979 we have been able to measure sea level itself with satellites. However, the accuracy of such measurements depends critically on such factors as the precise shape of the earth. While the satellites show slightly greater rates of sea level rise, the inaccuracy of the measurement renders the difference uncertain. What the proponents of alarm have done is to accept the tide gauge data until 1979, but assume that the satellite data is correct after that date, and that the difference in rates constitutes 'acceleration.' They then assume acceleration will continue leading to large sea level rises by the end of this century. **It is hard to imagine that such illogical arguments would be tolerated in other fields.**" [Boldface added]*

The issue is not the accuracy of the satellite sea surface data, but what is being measured, and how is it being interpreted (adjusted) by government entities. Several months ago, Ken Haapala attended a talk to the Physical Society of Washington, given by a spokesman for NASA, with senior NASA-Washington folks attending. The speaker claimed that sea level rise was accelerating as shown by satellite measurements. Haapala asked how did they calibrate the satellite measurements, because tidal gages do not show an acceleration? The answer was that the satellite data were calibrated using data from three drilling rig platforms in geologically stable areas of the globe.

The answer was unsatisfactory. In Euclidian geometry, three points may define the surface of a plane, but they are insufficient to define the surface of an uneven globe, much less the surface of globe that is undulating.

The NOAA web site on sea level rise contains a graph, from 1993 to 2017, that shows that satellite data may be very precise, but contain information that is in addition to a general trend in sea levels. For example, in 2010 – 2012, sea levels fell, as they did 1998-99. This was most likely due to the end of the El Niño, which result from a shift in wind patterns and cause surface temperatures to decline. El Niño winds cause water to pile up in the western Pacific, which can be seen in Asian tidal gauge data. We see an inconsistent[? With what?] decline since 2016, most likely due to the end of the 2016 El Niño. (Unlikely it was due to US politics.)

The claimed acceleration became an issue about 2011, after the University of Colorado Sea Level Research Group claimed a correction to sea level measurements is necessary for glacial isostatic adjustment (GIA).

“The correction for glacial isostatic adjustment (GIA) accounts for the fact that the ocean basins are getting slightly larger since the end of the last glacial cycle. GIA is not caused by current glacier melt, but by the rebound of the Earth from the several kilometer-thick ice sheets that covered much of North America and Europe around 20,000 years ago. Mantle material is still moving from under the oceans into previously glaciated regions on land. The effect is that currently some land surfaces are rising, and some ocean bottoms are falling relative to the center of the Earth (the center of the reference frame of the satellite altimeter). Averaged over the global ocean surface, the mean rate of sea level change due to GIA is independently estimated from models at -0.3 mm/yr. (Peltier, 2001, 2002, 2009; Peltier & Luthcke, 2009). The magnitude of this correction is small (smaller than the ± 0.4 mm/yr. uncertainty of the estimated GMSL rate), but the GIA uncertainty is at least 50 percent. However, since the ocean basins are getting larger due to GIA, this will reduce by a very small amount the relative sea level rise that is seen along the coasts. To understand the relative sea level effects of global oceanic volume changes (as estimated by the GMSL) at a specific location, issues such as GIA, tectonic uplift, and self-attraction and loading (SAL, e.g., Tamisiea et al., 2010), must also be considered. For more discussion on the GMSL and how it relates to tide gauges, see the GMSL and tide gauge FAQs.”

The issue is: is this adjustment necessary, or even desirable? In its Fifth Assessment Report (AR5, 2013,2014) the Intergovernmental Panel on Climate Change (IPCC) incorporated it starting in 1993, intensifying the claim that sea levels rise was accelerating.

However, the rebound effect from the melting of the great northern ice sheets should have been occurring for at least 10,000 years. The rebound effect is unlikely to change anytime in the future. Thus, the sea level rise data taken by coastal tidal gauges, particularly those in bed rock, in tectonically stable areas, should already include any change in the holding capacity of the ocean basins. If so, further adjustment is redundant and mis-leading. It is the relationship between the seas and the shore that is important, which is measured by stable tidal gauges.

It is particularly disturbing that entities of NASA and NOAA have incorporated a GIA adjustment in tidal gauge data, which has resulted in outrageous claims of accelerating sea level rise, where the hard data show stability in rise. An excellent example is the myth that sea levels in North Carolina will extend 100 miles (160 km) inland from the present coastline in about 100 years, or that South Florida is about to be inundated. It is true, that the coast line during the last interglacial was about 100 miles inland in North Carolina and South Florida was inundated, but the process will take thousands of years, if it comes to pass, not a few decades. The “Tides and Current” tables show sea level in Wilmington, NC, is rising 0.75 feet per century with a 95% confidence interval of +/- 0.11 feet per century (2.3 mm/yr. +/- 0.34 mm/yr.). This is based on hard data, not speculation from climate models. Accelerating sea level rise is another example of how poorly climate modelers in NASA and NOAA test their assumptions.

On her web site, Climate Etc., Judith Curry is beginning an open discussion on the issue of sea level rise. It will be interesting to read how that develops. See links under Changing Seas.

Case Dismissed: The public nuisance lawsuits by the cities of Oakland and San Francisco have been dismissed by the Federal judge overseeing the case. Federal District Judge William Alsup

decided that the Executive and Legislative branches of government were better suited with addressing the issues involved with greenhouse gas emissions than the Judicial branch. No doubt, the decision disappointed those who wished to have certain cities involved in setting climate policy and to punish oil companies for products that greatly enhance prosperity and economic development.

The decision no doubt disappoints those who wish to present the scientific case that humans are not the principal cause of global warming. The oil companies side-stepped the issue of the validity of the IPCC science, including increasing sea level rise. However, the decision demonstrates the futility of seeking redress through the Judicial branch, particularly as long as EPA's unsubstantiated endangerment finding stands, that carbon dioxide and other greenhouse gases endanger public health and welfare.

According to the Bloomberg news service, the Oakland and San Francisco city attorneys are weighing possible appeal. Oakland city attorney Barbara Parker stated:

"Our lawsuit presents valid claims and these defendants must be held accountable for misleading the American people about the catastrophic risks to human beings and all forms of life on this planet caused by fossil fuel-driven global warming and sea level rise," she said in an email."

Oakland claimed SEPP received moneys from Exxon to mislead the public on global warming but presented no evidence. Apparently, the attorney is incapable of checking IRS Form 990 and relies on rumor and innuendo instead. See links under Litigation Issues.

Law of the Air? On his web site, Bernie Lewin continues his history of several important parts in the formation of the IPCC and the fear of carbon dioxide. Lewin discusses the Changing Atmosphere Conference Statement, on June 30, 1988 following a three-day conference in Toronto. The claim was that:

"Humanity is conducting an unintended, uncontrolled, globally pervasive experiment whose ultimate consequences could be second only to a global nuclear war."

Other than carbon dioxide emissions were increasing, there was no solid evidence supporting the drastic claim that carbon dioxide is a major cause of increasing temperatures. Afterwards, the method for calculating comprehensive temperatures of the atmosphere was published, criticized and corrected. These data are a bulwark against false claims regarding unprecedented global warming, etc.

Lewin states that: "A 'law of the air' was envisaged on the model of a 'law of the sea', but progress towards agreement on that treaty remained bogged down in negotiations over the funding of 'technological transfer' to poorer countries."

Amusingly, the law of the sea treaty stemmed from CIA cover story featuring Howard Hughes and the Glomar Explorer built to recover the sunken Soviet submarine K-129, lost in March 1968 in very deep water, at a depth of 16,500 feet (5.029 kilometers), northwest of Hawaii. The cover story included details on how the Glomar Explorer would gather precious metals on the ocean floor, which, as claimed, existed as clumps waiting for the picking. Many countries believed the story and demanded a share of the bounty through the UN, even though they were landlocked.

Thus, one can argue that the IPCC and the Paris agreement stem from a CIA cover story. See links under Challenging the Orthodoxy.

Past Fears: SEPP Chairman emeritus Fred Singer has a brief essay in the American Thinker reviewing the fear of a nuclear winter, and an associated fear of the burning oil wells in Kuwait leading to a cold period. See link under Challenging the Orthodox.

Tidal Power: The £1.3 billion alternative electricity scheme based on tidal power to be located in a tidal lagoon at Swansea Bay, Wales, has been rejected by the UK government. Writing in Energy Matters, Roger Andrews covers the main deficiencies of the project, including its varying, four power spikes a day. The differences in power output between spring tides, and neap tides are considerable. (Spring tides occur when the Sun, Moon and Earth are aligned, neap tides occur when the sun and moon are perpendicular to the earth.)

Andrews exposes deficiencies in the government's thinking:

"But there's a problem with the government's approach. The three technologies [nuclear, wind, and tidal] are being compared based on the lifetime cost of electricity regardless of when it's generated, and the generation patterns are completely different."

Further,

"But no one worried about the prohibitive amounts of energy storage needed to convert intermittent renewables into dispatchable power in those days. And they still don't. Searching for 'storage' in the government's Tidal Lagoon Programme Factsheet yields zero hits."

Unfortunately, the costs of energy storage are often overlooked by those promoting and approving intermittent power. See links under: Alternative, Green ("Clean") Energy -- Other

Number of the Week: \$3 per MMBTU? Over a year ago, TWTW estimated the total transportation cost of liquid natural gas (LNG) from a pipeline on the gulf Coast to pipeline in Japan was about \$6 per MMBTU (one million British Thermal Units (BTU)). These costs include liquification, transport, and re-gasification. The opening of the widened Panama Canal and technological improvements have lowered these costs. Based on reports from energy companies involved in LNG, it appears that current costs are less than one-half the previous estimate or under \$3 per MMBTU. See links under Energy Issues – Non-US

SEPP'S APRIL FOOLS AWARD THE JACKSON

SEPP is conducting its annual vote for the recipient of the coveted trophy, The Jackson, a lump of coal. Readers are asked to nominate and vote for who they think is most deserving, following these criteria:

- The nominee has advanced, or proposes to advance, significant expansion of governmental power, regulation, or control over the public or significant sections of the general economy.
- The nominee does so by declaring such measures are necessary to protect public health, welfare, or the environment.

- The nominee declares that physical science supports such measures.
- The physical science supporting the measures is flimsy at best, and possibly non-existent.

The six past recipients, Lisa Jackson, Barrack Obama, John Kerry, Ernest Moniz, John Holdren and Christiana Figueres aka Cruella de Ville are not eligible. Generally, the committee that makes the selection prefers a candidate with a national or international presence. The voting will close on July 30. Please send your nominee and a brief reason why the person is qualified for the honor to Ken@SEPP.org. Thank you. The award will be presented at the annual meeting of the Doctors for Disaster Preparedness in August.

NEWS YOU CAN USE:

Commentary: Is the Sun Rising?

The Sun Allergy of Climate Researchers

By Ulli Kulke, Achse des Guten, Via GWPF, June 29, 2018

<http://www.thegwpf.com/the-sun-allergy-of-climate-researchers/>

Challenging the Orthodoxy -- NIPCC

Climate Change Reconsidered II: Physical Science

Idso, Carter, and Singer, Lead Authors/Editors, 2013

<http://www.heartland.org/media-library/pdfs/CCR-II/CCR-II-Full.pdf>

Summary: <http://www.nipccreport.org/reports/ccr2a/pdf/Summary-for-Policymakers.pdf>

Climate Change Reconsidered II: Biological Impacts

Idso, Idso, Carter, and Singer, Lead Authors/Editors, 2014

<http://www.nipccreport.org/reports/ccr2b/pdf/Full-Report.pdf>

Summary: <https://www.heartland.org/media-library/pdfs/CCR-IIb/Summary-for-Policymakers.pdf>

Why Scientists Disagree About Global Warming

The NIPCC Report on the Scientific Consensus

By Craig D. Idso, Robert M. Carter, and S. Fred Singer, NIPCC, Nov 23, 2015

<http://climatechangereconsidered.org/>

Download with no charge

<https://www.heartland.org/policy-documents/why-scientists-disagree-about-global-warming>

Nature, Not Human Activity, Rules the Climate

S. Fred Singer, Editor, NIPCC, 2008

http://www.sepp.org/publications/nipcc_final.pdf

Challenging the Orthodoxy

Remember Nuclear Winter?

By S. Fred Singer, American Thinker, June 27, 2018

https://www.americanthinker.com/articles/2018/06/remember_nuclear_winter.html

New paper shows issues with temperature records: Comparing the current and early 20th century warm periods in China

Guest post by Dr. Willie Soon, Dr. Ronan Connolly & Dr. Michael Connolly, WUWT, June 13, 2018

<https://wattsupwiththat.com/2018/06/13/new-paper-shows-issues-with-temperature-records-comparing-the-current-and-early-20th-century-warm-periods-in-china/>

Temporary link to full paper: Comparing the current and early 20th century warm periods in China

By Willie Wei-Hock Soo, et al, Earth Science Reviews, Accepted May 18, 2018

<https://wattsupwiththat.com/wp-content/uploads/2018/06/Soon-et-al-2018-ESR-China-SAT-trends-preprint-version.pdf>

Canadian Enthusiasm: Remembering Toronto ‘88

By Bernie Lewin, Enthusiasm, Scepticism and Science, June 27, 2018

<https://enthusiasmscepticismscience.wordpress.com/2018/06/27/canadian-enthusiasm-remembering-toronto-88/>

New Report: Save the Oceans – Stop Recycling Plastic

By Staff Writers, GWPF, June 6, 2018

<http://www.thegwpf.com/new-report-recycling-plastic-is-making-ocean-litter-worse/>

Link to paper: Save the Oceans: Stop Recycling Plastic

By Mikko Paunio, GWPF, 2018

<https://www.thegwpf.org/content/uploads/2018/06/Save-the-oceans.pdf>

Defending the Orthodoxy

Protesters Aren’t Stopping US Pipeline Network Growth

By Steve Goreham, Master Resource, June 27, 2018

<https://www.masterresource.org/pipeline-obstructionism/protesters-arent-stopping-us-pipeline-network-growth/>

An exception From Energy in Depth: (Linked in essay) March 21, 2018

“‘Keep It In the Ground’ Massachusetts Attorney General Maura Healey (D) admitted this week that she’d rather import natural gas from Russia (because climate) than build new pipelines to deliver the abundant supply of Marcellus Shale gas to New Englanders. As E&E News reported on Wednesday.”

Shipping and airline travel must be eliminated in their current forms to stop climate change, scientists warn

By Paul Homewood, Not a Lot of People Know That, June 30, 2018

<https://notalotofpeopleknowthat.wordpress.com/2018/06/30/shipping-and-airline-travel-must-be-eliminated-in-their-current-forms-to-stop-climate-change-scientists-warn/>

Questioning the Orthodoxy

What Scientific ‘Consensus’? 254 New 2018 Papers Support A Skeptical Position On Climate Alarmism

By Kenneth Richard, No Tricks Zone, June 28, 2018

<http://notrickszone.com/2018/06/28/what-scientific-consensus-254-new-2018-papers-support-a-skeptical-position-on-climate-alarmism/>

“These 254 new papers affirm the position that there are significant limitations and uncertainties inherent in our understanding of climate and climate changes, emphasizing that climate science is *not* settled.”

What Warming? The First Blooming Date For Trees In Beijing Occurs No Earlier Today Than A.D. 1741-1795

By Kenneth Richard, No Tricks Zone, June 25, 2018

<http://notrickszone.com/2018/06/25/what-warming-the-first-blooming-date-for-trees-in-beijing-occurs-no-earlier-today-than-a-d-1741-1795/>

[SEPP Comment: How does CO2 fertilization change blooming dates?]

After Paris!

Paris Lives! “Deep Decarbonization” at DOE

By Mark Krebs, Master Resource, June 28, 2018

<https://www.masterresource.org/krebs-mark/paris-climate-accord-alive-doe/>

Change in US Administrations

EPA 'Secret Science': No More Rationalization, It's Time For That To Go

By Hank Campbell, ACSH, June 15, 2018

<https://www.acsh.org/news/2018/06/15/epa-secret-science-no-more-rationalization-its-time-go-13086>

Nuclear, coal bailout worth any cost 'to keep America free': U.S. energy chief

By Richard Valdmanis, Reuters, June 28, 2018

<https://www.reuters.com/article/us-gas-conference-perry-grid/nuclear-coal-bailout-worth-any-cost-to-keep-america-free-u-s-energy-chief-idUSKBN1JO2JS>

[SEPP Comment: “See Paris Lives! ‘Deep Decarbonization’ at DOE” above]

Seeking a Common Ground

Nature Unbound IX – 21st Century Climate Change

By Javier, Climate Etc. June 28, 2018

<https://judithcurry.com/2018/06/28/nature-unbound-ix-21st-century-climate-change/>

Review of Recent Scientific Articles by CO2 Science

Impacts of Elevated CO2 on a Freshwater Algae

Huang, Y., Cui, G., Li, B., Zhu, X. and Yang, Z. 2018. Elevated atmospheric CO2 enhances grazer-induced morphological defense in the freshwater green alga *Scenedesmus obliquus*.

Limnology and Oceanography 63: 1004-1014. June 30, 2018

<http://www.co2science.org/articles/V21/jun/a16.php>

A 4000-Year Record of Climate and War in China

Wang, H., Chen, J., Zhang, S., Zhang, D.D., Wang, Z., Xu, Q., Chen, S., Wang, S., Kang, S. and Chen, F. 2018. A chironomid-based record of temperature variability during the past 4000 years in northern China and its possible societal implications. *Climate of the Past* 14: 383-396. June 28, 2018

<http://www.co2science.org/articles/V21/jun/a14.php>

Can the Quantity of Crop Yields Increase Under Elevated CO2 Without Sacrificing Food Quality?

Sultana, H., Suter, H.C., Armstrong, R., Nicolas, M.E. and Chen, D. 2018. The effectiveness of nitrification inhibitor application on grain yield and quality, fertilizer nitrogen recovery and soil nitrous oxide emissions in a legume-wheat rotation under elevated carbon dioxide (FACE). *Soil Research* 56: 145-157. June 27, 2018

<http://www.co2science.org/articles/V21/jun/a13.php>

“In commenting on their several findings, the authors say that, given the small (4%) but significant increase in grain nitrogen harvest index they observed under NI treatment conditions, the NI ‘may have enhanced the mobilization of nitrogen towards the grain,” adding that “the higher wheat grain nitrogen concentration and nitrogen accumulation with NI use observed in [their experiment] both under ambient and elevated atmospheric CO₂ conditions will have positive outcomes in terms of the nutrient value of the crop.”

“Thus, it does appear that when it comes to rising atmospheric CO₂, there is a way that we can have our cake and eat it too, enjoying both the forecasted increases in crop yields to feed the ever-growing world population without sacrificing plant nutritional quality. And that is *great news* worth reporting!”

Model Issues

Of boundary and initial conditions

By Dan Hughes and Tomas Milanovic, Climate Etc. June 25, 2018

<https://judithcurry.com/2018/06/25/of-boundary-and-initial-conditions/#more-24201>

Ocean’s heat cycle shows that atmospheric carbon may be headed elsewhere

As humans continue to pump the atmosphere with carbon, it’s crucial for scientists to understand how and where the planet absorbs and naturally emits carbon.

By Morgan Kelly, Princeton Environmental Institute, June 19, 2018 [H/t Toshio Fujita]

<https://www.princeton.edu/news/2018/06/19/oceans-heat-cycle-shows-atmospheric-carbon-may-be-headed-elsewhere>

Link to paper: Revision of global carbon fluxes based on a reassessment of oceanic and riverine carbon transport

By L Resplandy, et al, Nature Geoscience, June 11, 2018

<https://www.nature.com/articles/s41561-018-0151-3>

NCAR climate model gets an upgrade – but is it useful, or just more confirmation bias?

By Anthony Watts, WUWT, June 13, 2018

<https://wattsupwiththat.com/2018/06/13/ncar-climate-model-gets-an-upgrade-but-is-it-useful-or-just-more-confirmation-bias/>

Link to more full description of changes: What’s New in CESM2 (Community Earth System Model)

By Staff Writers, UCAR/NCAR, Accessed June 29, 2018

<http://www.cesm.ucar.edu/models/cesm2/whatsnew.html>

Measurement Issues -- Surface

25 Years of Global Sea Level Data, and Counting

By Staff Writers, NASA-JPL, Aug 10, 2017

<https://www.jpl.nasa.gov/news/news.php?feature=6915>

Changing Weather

To forecast winter rainfall in Los Angeles, look to New Zealand in the summer

Scientists find new 'teleconnection' for early and accurate precipitation prediction

By Staff Writers, NSF, June 13, 2018

https://www.nsf.gov/news/news_summ.jsp?cntn_id=245408&WT.mc_id=USNSF_51&WT.mc_e v=click

Link to paper: A new interhemispheric teleconnection increases predictability of winter precipitation in southwestern US

By Antonios Mamalakis, Nature Communications, June 13, 2018
<https://www.nature.com/articles/s41467-018-04722-7>

An Average June In The US

By Tony Heller, Real Climate, June 28, 2018
<https://realclimatescience.com/2018/06/an-average-june-in-the-us/>

Changing Seas

What is glacial isostatic adjustment (GIA), and why do you correct for it?

By Staff Writers, CU Sea Level Research Group, July 29, 2011
<http://sealevel.colorado.edu/content/what-glacial-isostatic-adjustment-gia-and-why-do-you-correct-it>

Sea Level.info

By Dave Burton, His Blog, Cary NC
<http://www.sealevel.info/contact.html#dn>

Sea level rise: isostatic adjustment

By Judith Curry, Climate Etc. June 23, 2018
<https://judithcurry.com/2018/06/23/sea-level-rise-isostatic-adjustment/#more-24194>
Averaged over the global ocean surface, the mean rate of sea level change due to GIA is independently estimated from models at **-0.3 mm/yr**

ONLY 0.8% Of Coastal Tide Gauges Show Sea Level Rise On Track To Reach IPCC Year 2100 Projection!

By P Gosselin, No Tricks Zone, June 23, 2018
<http://notrickszone.com/2018/06/23/only-0-8-of-coastal-tide-gauges-show-sea-level-rise-on-track-to-reach-ipcc-year-2100-projection/>

Yes, The Ocean Has Warmed; No, It's Not Global Warming

By Paul Homewood, Not a Lot of People Know That, **May 28, 2015** [H/t Paul Redfern]
<https://notalotofpeopleknowthat.wordpress.com/2015/05/28/yes-the-ocean-has-warmed-no-its-not-global-warming/>
[SEPP Comment: A timely reminder of a news conference in 2000 on ocean warming.]

Changing Cryosphere – Land / Sea Ice

Claim: New model for gauging ice sheet movement may improve sea-level-rise predictions

By Anthony Watts, WUWT, June 20, 2018
<https://wattsupwiththat.com/2018/06/20/claim-new-model-for-gauging-ice-sheet-movement-may-improve-sea-level-rise-predictions/>

Link to paper: Friction at the bed does not control fast glacier flow

By L. A. Stearns, C. J. van der Veen, Science, June 7, 2018
<http://science.sciencemag.org/content/early/2018/06/06/science.aat2217>

Hudson Bay sea ice update: more ice in the east than usual but less in the west

By Susan Crockford, Polar Bear Science, June 27, 2018
<https://polarbearsience.com/2018/06/27/hudson-bay-sea-ice-update-more-ice-in-the-east-than-usual-but-less-in-the-west/>

Land-based portion of massive East Antarctic Ice Sheet retreated little during past 8 million years

But increases in atmospheric carbon dioxide levels could affect stability and potential for sea level rise

By Peter West, NSF, June 13, 2018

https://www.nsf.gov/news/news_summ.jsp?cntn_id=245750&WT.mc_id=USNSF_51&WT.mc_e v=click

[SEPP Comment: Foolish disclaimer in second headline with no hard evidence.]

Volcano climate SHOCK: Heat source under Antarctica could be melting giant ice caps

VOLCANIC heat beneath the Pine Island Glacier in Antarctica could be exacerbating the melting ice sheets, according to a shocking climate study.

By Sebastian Kettley, Express, UK, June 26, 2018

<https://www.express.co.uk/news/science/979895/Volcano-eruption-climate-change-antarctica-melting-ice-caps-Pine-Island-Glacier>

Link to paper: Evidence of an active volcanic heat source beneath the Pine Island Glacier

By Brice Loose, et al., Nature Communications, June 22, 2018

<https://www.nature.com/articles/s41467-018-04421-3>

From abstract: “Our finding of a substantial volcanic heat source beneath a major WAIS glacier highlights the need to understand subglacial volcanism, its hydrologic interaction with the marine margins, and its potential role in the future stability of the WAIS.”

Agriculture Issues & Fear of Famine

As Carbon Dioxide Levels Rise, Major Crops Are Losing Nutrients

By Merrit Kennedy, NPR, June 19, 2018 {H/t Howard Hayden}

<https://www.npr.org/sections/thesalt/2018/06/19/616098095/as-carbon-dioxide-levels-rise-major-crops-are-losing-nutrients>

Lowering Standards

BBC Fail To Challenge Gummer’s Lies

By Paul Homewood, Not a Lot of People Know That, June 28, 2018

<https://notalotofpeopleknowthat.wordpress.com/2018/06/28/bbc-fail-to-challenge-gummers-lies/>

John Gummer is Lord Deben, Chairman of the UK’s independent Committee on Climate Change.

Communicating Better to the Public – Make things up.

Hansen’s 1988 climate change testimony was the answer to Stirling’s polar bear problem

By Susan Crockford, Polar Bear Science, June 25, 2018

<https://polarbearscience.com/2018/06/25/hansens-1988-climate-change-testimony-was-the-answer-to-stirlings-polar-bear-problem/>

Guardian Peddles Latest Sea Rise Scare

By Paul Homewood, Not a Lot of People Know That, June 27, 2018

<https://notalotofpeopleknowthat.wordpress.com/2018/06/27/guardian-peddles-latest-sea-rise-scare/#more-34194>

“But Hal says it doesn’t matter whether you live six feet above sea level or sixty-five, because he, like James Hansen, believes that all of these predictions are, to put it mildly, very, very low. ‘The rate of sea level rise is currently doubling every seven years, and if it were to continue in this manner, Ponzi scheme style, we would have 205 feet of sea level rise by 2095,’ he says.”

Questioning European Green

Push to Burn Wood for Fuel Threatens Climate Goals, Scientists Warn

Scientists say a new EU renewable energy policy on biomass is 'misleading' and will raise emissions. U.S. forests are being turned into wood pellets to feed demand.

By Bob Berwyn, Inside Climate News, June 24, 2018

<https://insideclimatenews.org/news/21062018/forest-biomass-renewable-energy-paris-climate-change-emissions-logging-wood-pellets-electricity>

Car and housing companies ‘should be ashamed of themselves’ as UK on track to miss emissions targets

Much anticipated report from official climate advisers is 'wake-up call' to government after controversial decisions about Heathrow expansion and Swansea Bay tidal lagoon

By Josh Gabbatiss, Independent, June 28, 2018

<https://www.independent.co.uk/news/uk/home-news/climate-change-uk-cars-houses-carbon-emissions-wind-power-renewable-energy-ccc-lord-deben-a8420146.html>

Heating homes, not going green, is what really matters

By Harry Wilkinson, The Conservative Woman, June 23, 2018

<https://www.conservativewoman.co.uk/heating-homes-not-going-green-is-what-really-matters/>

Government’s smart meter roll out ‘will lead to gas and electric surge pricing’

By Paul Homewood, Not a Lot of People Know That, June 29, 2018

<https://notalotofpeopleknowthat.wordpress.com/2018/06/29/governments-smart-meter-roll-out-will-lead-to-gas-and-electric-surge-pricing/>

Litigation Issues

American Exceptionalism in Context and Under Siege; An outsiders View.

By Tim Ball, A Different Perspective, June 26, 2018

<http://drtimball.com/2018/american-exceptionalism-in-context-and-under-siege-an-outsidere-view/>

“I received three defamation lawsuits for things I wrote or said about global warming. All were filed by the same lawyer on behalf of members of the UN Intergovernmental Panel on Climate Change (IPCC). None of these lawsuits would have been filed in an American court because of your free speech rights. After one successful defense that dragged on for 6 years, I am now defending against the appeal while preparing for the second lawsuit that is in its 7th year. The legal bill so far is \$600,000. I tell Americans this story, not for sympathy, I could have simply withdrawn what I said and signed an apology written by those who sued me. No, I tell you this story to put in perspective the value of being a Republic and having the protections of the US Constitution. Fortunately, thanks to the internet I can tell Americans these stories, so they can put things in perspective and count and defend their blessings.”

Judge Tosses City Climate Change Lawsuits Against Big Oil

By Peter Blumberg and Robert Burnson, Bloomberg, June 26, 2018

<https://www.bloomberg.com/news/articles/2018-06-26/city-climate-change-suits-against-big-oil-tossed-by-u-s-judge>

The San Francisco Decision Has Scientific Errors but Uses Sound Legal Principles

By Alan Carlin, Carlin Economics and Science, June 29, 2018

<http://www.carlineconomics.com/archives/4502>

Goodbye To The Stupidest Litigation In The Country

By Francis Menton, Manhattan Contrarian, June 27, 2018

<https://www.manhattancontrarian.com/blog/2018-6-26-goodbye-to-the-stupidest-litigation-in-the-country>

Cap-and-Trade and Carbon Taxes

We're finally told what the carbon tax will cost us. Are you sitting down?

Households in Alberta, Saskatchewan and Nova Scotia will be hit with more than \$1,000 of carbon tax per year, while those in British Columbia, Quebec and Manitoba will pay around \$650
By Kenneth Green, Financial Post, Can, June 27, 2018

<https://business.financialpost.com/opinion/and-heres-your-very-small-carbon-bill-canada>
[SEPP Comment: Estimates of cost of a proposed tax.]

Subsidies and Mandates Forever

Wind and Solar Require Massive Subsidies

By Norman Rogers, American Thinker, June 30, 2018

https://www.americanthinker.com/articles/2018/06/wind_and_solar_require_massive_subsidies.html

[SEPP Comment: What is sustainable about an electricity system built on subsidies?]

New solar installations halve for second consecutive year

By Staff Writers, The Energy advocate, June 25, 2018

<https://theenergyadvocate.co.uk/2018/06/25/new-solar-installations-halve-for-second-consecutive-year/>

Energy Issues – Non-US

WGC: DNV GL survey finds energy industry moving toward natural gas

By Christopher Smith, Oil and Gas Journal, June 20, 2018

<https://www.ogj.com/articles/2018/06/wgc-dnv-gl-survey-finds-energy-industry-moving-toward-natural-gas.html>

China to become world's top importer of natural gas in 2019, report says
Nation's demand for the fuel to rise by 60 per cent between 2017 and 2023 to 376 billion cubic metres, International Energy Agency says

By Staff Writers, Reuters, June 26, 2018

<http://www.scmp.com/news/china/policies-politics/article/2152586/china-become-worlds-top-importer-natural-gas-2019>

Analysts: Coal Generation Will Plummet More Than 70%

By Darrell Proctor, Power Mag, June 19, 2018

http://www.powermag.com/analysts-coal-generation-will-plummet-more-than-70/?mkt_tok=eyJpIjoiTm9Rd116Qm1aVFZqTXpjeiIsInQiOiJ6TnV5eHdud1dYNmJldXF3RXU5bkIHVmlzWmN3VkVWeml4a29UTIBQdnh2RVZBaUdybnFkblBpMko2U1g2bGJQOG1yS25UUE8zMWJEYWYycGh5aHlrT2NRVEZGUSTxNkxIRkhlRnlSQ0g0R1EwQ3RDNm9lY0Vcy0J0U25CYlFBSWsrUUI3b1h4R3F6T0VJK090blRURmc9PSJ9

Link to report: New Energy Outlook 2018

By Seb Henbest, et al., Bloomberg, New Energy Finance, 2018

<https://about.bnef.com/new-energy-outlook/#toc-download>

Deconstructing LNG shipping costs

We show a breakdown of shipping cost components, look at current benchmarks & consider their impact on regional LNG price spreads.

Timera Energy, Its Blog, Feb 26, 2018

<https://timera-energy.com/deconstructing-lng-shipping-costs/>

The economics of LNG

By Staff Writers, shareholdersunite.com, Accessed, June 28, 2018

<http://shareholdersunite.com/the-ioc-files-useful-background-material/the-economics-of-lng/>

In the Age of Trump and Putin, Europe Faces Hard Choices on Gas

By Naureen S Malik and Anna Shiryayevskaya, Bloomberg, June 26, 2018

<https://www.bloomberg.com/news/articles/2018-06-26/in-the-age-of-trump-and-putin-europe-faces-hard-choices-on-gas>

“Europe has become an enticing target for gas exporters as the Netherlands winds down production from the Groningen field -- the continent’s largest -- to limit damage from drilling-induced earthquakes.”

Energy Issues – Australia

Spent \$1.5 billion on an interconnector to get a tiny cut in obscenely inflated electricity bills!

By Jo Nova, Her Blog, June 30, 2018

<http://joannenova.com.au/2018/06/spent-1-5-billion-on-an-interconnector-to-get-a-tiny-cut-in-obscenely-inflated-electricity-bills/>

The Australian magical NEG target which turns black coal to white elephants

NEG – The white elephant in the room

By Tom Quirk, Jo Nova’s Blog, June 28, 2018

<http://joannenova.com.au/2018/06/neg/>

“The PM, Malcolm Turnbull, has come up with a plan called the National Energy Guarantee (NEG), which will manage to hurt the environment, jobs and industry at the same time.”

Energy Issues -- US

Feeding Off American Families

By Donn Dears, Power For USA, June 26, 2018

<http://ddears.com/2018/06/26/feeding-off-american-families/>

Reallocating Biofuels To Oil Refineries Compounds Bad U.S. Energy Policy

By Jude Clemente, Forbes, June 28, 2018

<https://www.forbes.com/sites/judeclemente/2018/06/28/reallocating-biofuels-to-oil-refineries-compounds-bad-u-s-energy-policy/#1ec83ca6462a>

Trump’s skepticism aside, the Navy is taking climate change seriously

By Gerald Harris, USA Today, June 28, 2018

<https://www.usatoday.com/story/news/politics/2018/06/28/military-bases-around-world-facing-growing-climate-change-threat/710562002/>

[SEPP Comment: Vague, discusses sea level rise, but not the “great green fleet” based on biofuels.]

Oil and Natural Gas – the Future or the Past?

What if Pa. natural gas could power Tokyo? We're getting there | Opinion

By Thomas J. Pyle, Penn Live, June 26, 2018 [H/t GWPF]

<https://www.pennlive.com/opinion/2018/06/what-if-pa-natural-gas-could-p.html>

U.S. Shale Companies Motor Ahead Despite OPEC

The companies have a shared interest in preventing overheated prices

By Rebecca Elliott and Christopher M. Matthews, Via GWPF, June 24, 2018

<https://www.thegwpf.com/u-s-shale-companies-motor-ahead-despite-opec/>

Nuclear Energy and Fears

ThorCon Molten Salt Fission Power Plant

By Euan Mearns, Energy Matters, June 26, 2018

<http://euanmearns.com/thorcon-molten-salt-fission-power-plant/#more-22249>

“Guest post by Robert Hargraves, co-founder of ThorCon. ThorCon are a leader in developing thorium fueled molten salt reactor technology with full passive safety. I invited them to submit a guest post several weeks ago and they have duly obliged with their submission to the IAEA small modular reactor booklet.”

Alternative, Green (“Clean”) Solar and Wind

AEP’s \$4.5B Wind Catcher Project Gets Louisiana’s Approval

By Sonal Patel, Power Mag, June 21, 2018

http://www.powermag.com/aeps-4-5b-wind-catcher-project-gets-louisianas-approval/?mkt_tok=eyJpIjoiTm9Rd116Qm1aVFZqTXpjeiIsInQiOiJ6TnV5eHdud1dYNmJldXF3RXU5bklHVmlzWmN3VkVWeml4a29UTlBQdnh2RVZBaUdybnFkb1BpMko2U1g2bGJQOG1yS25UUE8zMWJEYWYycGh5aHRt2NRVEZGUSTxNkxIRkhlRnlSQ0g0R1EwQ3RDNm9iY0VCY0JOU25CYlFBSWsrUUI3b1h4R3F6T0VJK090bIRURmc9PSJ9

“Meanwhile, staff at Texas’ Public Utility Commission (PUC) have recommended denial of the project, citing major concerns about the unknown cost of construction.”

Alternative, Green (“Clean”) Energy -- Other

Swansea Bay—The Basic Facts

By Paul Homewood, Not a Lot of People Know That, June 29, 2018

<https://notalotofpeopleknowthat.wordpress.com/2018/06/29/swansea-bay-the-basic-facts/>

RIP the Swansea Bay Tidal Lagoon

By Roger Andrews, Energy Matters, June 28, 2018

<http://euanmearns.com/rip-the-swansea-bay-tidal-lagoon/#more-22271>

UK Government reject Swansea tidal lagoon project

By Staff Writers, Energy Voice, June 25, 2018

<https://www.energyvoice.com/otherenergy/175153/uk-government-reject-swansea-tidal-lagoon-project/>

Alternative, Green (“Clean”) Energy -- Storage

Dry weather affects Norway’s hydro electricity output

By Staff Writers, Hazard Ex, June 16, 2018

<http://www.hazardexonthenet.net/article/155331/Dry-weather-affects-Norway-s-hydro-electricity-output.aspx>

Alternative, Green (“Clean”) Vehicles

Electric Teslas may be no greener than petrol and diesel cars despite being marketed as the world's most environmentally friendly vehicles

Energy used to build Teslas and generate electricity for them is equal to petrol

Battery-powered cars such as Teslas are charged with power station energy

Luxury Tesla Model S battery powered cars cost £66,730 each

By Vanessa Allen, Daily Mail, UK, June 24, 2018

<http://www.dailymail.co.uk/sciencetech/article-5880609/Tesla-electric-cars-not-greener-petrol-ones-according-UK-data.html>

Govt to scrap subsidy for private electric cars

By Pankaj Doval, The Times of India, June 22, 2018 [H/t GWPF]

<https://timesofindia.indiatimes.com/business/govt-to-scrap-subsidy-for-private-electric-cars/articleshow/64689285.cms>

Health, Energy, and Climate

Can Wind Turbines Make You Sick?

By Kelsey Tsipis, NOVA Next, June 27, 2018

<http://www.pbs.org/wgbh/nova/next/body/can-wind-turbines-make-you-sick/>

Environmental Industry

LEAKED: A look inside the ClimateWorks Foundation \$66 million campaign to foist climate laws on local governments

By Anthony Watts, WUWT, June 14, 2018

<https://wattsupwiththat.com/2018/06/24/leaked-a-look-inside-the-climateworks-foundation-66-million-campaign-to-foist-climate-laws-on-local-governments/>

Other Scientific News

India prepares quest to find a trillion-dollar nuclear fuel on the Moon

By Anurag Kotoky, The Economic Times, India, Bloomberg, June 27, 2018

<https://economictimes.indiatimes.com/news/science/india-prepares-quest-to-find-a-trillion-dollar-nuclear-fuel-on-the-moon/articleshow/64760124.cms>

“The nation’s equivalent of NASA will launch a rover in October to explore virgin territory on the lunar surface and analyze crust samples for signs of water and helium-3. That isotope is limited on Earth yet so abundant on the moon that it theoretically could meet global energy demands for 250 years if harnessed.”

Other News that May Be of Interest

NASA's Quiet Supersonic X-Plane Has a New Name

By Tariq Malik, Space.com, June 28, 2018 [H/t Toshio Fujita]

<https://www.space.com/41027-nasa-supersonic-plane-called-x-59-quesst.html>

BELOW THE BOTTOM LINE:

Climate Change Makes Flat and Globally Warm Beer

By Timothy Birdnow, American Thinker, June 24, 2018

https://www.americanthinker.com/articles/2018/06/climate_change_makes_flat_and_globally_warm_beer.html

Crocodile invasion – or maybe not

By Staff Writers, Climate Change Predictions, June 28, 2018

<http://climatechangepredictions.org/uncategorized/5989>

“A Warming World Could Be a Crocodile-Infested One ...there is one species that stands to gain from climate change: crocodiles. The heat-loving reptiles could thrive as the Earth gets hotter, growing not just in numbers but also in species variety, say British and U.S researchers in a new study.

“‘The past is the key to the present and the future,’ said study coauthor Jon Tennant, a paleontologist at Imperial College London. ‘The only way we can really predict how future climate change is going to impact different groups of animals is by looking at historical fossil records revealed to us.’ –

“‘It won’t be an army of crocodiles popping up overnight, but we might see crocodiles in places we haven’t seen them before,” Tennant said. “It’s not like the movies where crocodiles take over the Earth, but we now have 23 species. In the future, we could see many different forms, or we might only see one or two new species.’”

Yahoo News, 2 Oct 2015

ARTICLES:

1. World’s Biggest Battery Proposed in California

PG&E is asking for approval to build storage projects, including a battery behemoth to be owned by Vistra Energy Corp.

By Erin Ailworth, WSJ, June 29, 2018

<https://www.wsj.com/articles/worlds-biggest-battery-proposed-in-california-1530306698>

SUMMARY: *“A California utility is seeking permission to have a company build the world’s largest battery, joining a growing list of power companies investing in storing electricity.*

“Pacific Gas & Electric Co., part of PG&E Corp. detailed plans for four storage projects totaling nearly 570 megawatts in a Friday filing to regulators, including a 300-megawatt battery installation at a natural-gas-fired power plant owned by Vistra Energy Corp.

“That battery, the largest installation of its kind, would be owned by Vistra, and it would be capable of running for four hours while putting out the same amount of power as a small natural gas plant.

“In addition, the utility is seeking approval for a 182.5 megawatt system built by Tesla Inc. that would be owned by PG&E, as well two smaller projects. The California Public Utilities Commission must approve the storage projects.

“Cost estimates for all of the projects were not immediately available.

“Recent decreases in battery prices are enabling energy storage to become a competitive alternative to traditional solutions,” said Roy Kuga, vice president of grid integration and innovation at PG&E.

“A 100-megawatt battery installation built by Tesla in Australia is currently the world’s largest in operation.

After a discussion of other projects, the articles continues:

“The storage projects proposed by PG&E come several months after the California Public Utilities Commission directed Pacific Gas & Electric Co., the state’s largest investor-owned utility, to solicit bids for renewable energy resources, including battery storage, to replace three costly fossil fuel plants.

“That directive has helped put pressure on natural-gas-fired power plants in California, which are finding it harder to compete as the state looks to satisfy its aggressive clean energy goals and as the cost of renewable resources continues to decline.

“PG&E says it expects the 182.5-megawatt system to come online by the end of 2020, pending the commission’s approval. The company did not estimate the full cost of the project but predicts it will look to request about \$41.2 million from ratepayers for the project in the first year it is operational.

“The 300-megawatt battery project would be built at Vistra’s Moss Landing power plant, which has produced electricity since 1950. The battery would hook up to the grid via existing connections at the site, where two older generating units were retired at the end of 2016.

“Curt Morgan, chief executive of Vistra, said he sees more battery system investments in his company’s future, especially wherever those installations can take advantage of power infrastructure already in place.

“I don’t think it’s any secret that California over time is trying to move away from fossil fuel power plants, so batteries are kind of a natural to provide power at the peak periods,” he said.”

2. The Texas Well That Started the Fracking Revolution

Two decades ago, an engineer tried a new way to get gas out of the ground. Energy markets and global politics would never be the same.

By Russell Gold, WSJ, June 29, 2018

<https://www.wsj.com/articles/the-texas-well-that-started-a-revolution-1530270010>

SUMMARY: DISH, Texas—Twenty years ago this month, a well was drilled here that changed the world.

“Nothing at the time suggested the unassuming well in this rural town north of Fort Worth would hobble OPEC, the powerful oil cartel that had governed prices of the world’s most important commodity for more than a generation. Or that it would help turn the U.S. into a global energy exporter, or shuffle the geopolitical deck.

“But it did all of that—and more. The well used hydraulic fracturing to crack the incredibly tight shale rocks below. It fired the first shot in the fracking revolution—a blast soon felt in Riyadh, Tehran and Moscow.

“I had no idea it would cause so much change. I was just trying to keep my job,’ said Nick Steinsberger on a recent visit to the well pad. He was the engineer who obtained permission to try a new approach to completing the well that had been drilled a mile and a half deep into a thick grey wedge of rock known as the Barnett Shale.

“Mr. Steinsberger, now 54, called the experiment ‘my slick-water frack.’ It was the first commercially successful use of sand, water and chemicals, pumped into the shale under high pressure, to break open the rock and unleash the natural gas trapped inside. It was the beginning of modern fracking.

“It was a good well, cost \$600,000 or \$700,000,’ Mr. Steinsberger said, walking over the pad to the chain-link fence that surrounds the well. A sign identifies it as the S. H Griffin Estate 4.

“Today, most wells drilled in the U.S. use some variation of Mr. Steinsberger’s fracking technique. It has unleashed an unimaginable wealth of natural gas, gas liquids and crude oil, turning the U.S. from an energy pauper into a muscular exporter. It also started an often acrimonious environmental debate about the potential impacts and trade offs of fracking.

“It is one of the most extraordinarily important, disruptive, technologically driven changes in the history of energy,’ said Ed Morse, global head of commodity research at Citigroup. ‘It was revolutionary for the U.S. economy and it was revolutionary geopolitically.’

“Mr. Steinsberger’s modest experiment demonstrated that the oil and gas industry had the tools to fracture the rocks where fossil fuels were slowly baked over the millennia. A huge trove of natural gas was accessible at an economical cost.

“It was such a novel idea that it spread slowly at first, as doubters couldn’t believe that anyone could successfully tap the source rocks. After a few years, more companies began to copy the wells drilled by Mr. Steinsberger’s employer, Mitchell Energy, the firm founded by the late George P. Mitchell.

“It started in the Barnett Shale. Then other gas-bearing shales were discovered. The Marcellus Shale in Appalachia turned out to be larger and more fecund than the Barnett.

“In 2008, more than a decade after Mr. Steinsberger’s well, the industry made another quantum leap: Not only could fracking liberate small natural gas molecules from rocks, it also worked on the longer hydrocarbon chains that make up crude oil. Companies such as EOG Resources Inc. began to drill and frack shales bearing crude oil and natural gas liquids in North Dakota and Texas. The technique has since spread to other countries such as Argentina.

“The proliferation of oil and gas production transformed the U.S. energy landscape. A looming dearth of natural gas had led companies to build import terminals. Now there is so much gas the U.S. exports the fuel around the world.

“The low-cost fuel has become the leading source of power generation in the U.S. Its rise has reshaped electricity markets, leading to the closure of more than 200 coal plants, as well as a number of nuclear plants. The Trump Administration’s current proposal to subsidize coal and nuclear plants is an indirect result of fracking.

“The impact on oil markets might be, if anything, more significant. U.S. oil production had fallen persistently for years, dropping below five million barrels a day. And then: fracking. This year, it hit a new all-time high, reaching 10.9 million barrels a day in June. It is now the world’s largest producer of crude and other valuable petroleum liquids, ahead of Russia and Saudi Arabia.

“The surge has weakened the Organization of the Petroleum Exporting Countries. Facing a growing supply of oil from the U.S., the group stumbled and fought over what to do. It unsuccessfully tried to crush frackers by ramping up production in 2014 to drive down the price of oil, before making its peace with them. Last week, the cartel’s members coordinated with Russia to produce more barrels to prevent oil prices from rising further. Shale output was outside of their control.

“The U.S. emerged as a newly confident energy powerhouse. It was no longer fearful that an embargo could maim its economy. This attitude was reflected in a more aggressive foreign policy, as shown by its willingness to take a tough negotiating posture with Iran.

“‘The fracking boom was the biggest energy story around the world. But it was also the biggest geopolitical story and the biggest environmental story,’ said Michael Webber, deputy director of the Energy Institute at The University of Texas at Austin.

“The proliferation of natural gas, displacing coal, helped the U.S. lower its overall greenhouse gas emissions by 13.4% in the last decade, while growing its gross domestic product, according to BP PLC’s Statistical Review of World Energy.”

The article discusses some downsides, such as traffic, earth tremors, unsubstantiated claims of water pollution and the splitting of the environmental movement on fracking.

“Meanwhile, fracking continues to evolve. Supersized fracks have become commonplace.

“Fracking uses grains of sand to prop open the newly formed cracks to allow gas or oil to flow out. While Mr. Steinsberger’s well required 229,000 pounds of sand, a large contemporary well might require 30 million pounds of sand. The amount of water needed has increased as well.

“The S. H. Griffin well has continued to produce gas for two decades. Over the years, more than 2.6 billion cubic feet have flowed out, worth some \$8 million at today’s prices. A new well with a supersized frack can produce as much in a day as the original could in two months.

“The proliferation of large wells has kept gas below \$4 per million British thermal units since December 2016, after topping \$10 in 2008. Mr. Steinsberger, who still oversees eight to ten fracks a year, doesn’t see that changing for a long time.

“‘One day, there might be lasers shooting at the rock’ thousands of feet underfoot, he said. ‘I can’t predict that. But I can tell you natural gas prices will be low for the rest of our lives.’”
