

SUSTAINABILITY OF ENERGY SUPPLY AND RESOURCES IN NSW

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Erratum

In my Submission (designated #215) on page 3, I unintentionally presented an error (highlighted below):

*... serves to deplete its limited gas reserves (1.2% global share, ranked world's
12th largest in 2018) much sooner.*

Per *BP Statistical Review of World Energy 2018*,¹ for the year 2017, the world's 15 largest gas reserves (in descending rank order) were: **#1 – Russian Federation** (18.1% global share), **#2 – Iran** (17.2%), **#3 – Qatar** (12.9%), **#4 – Turkmenistan** (10.1%), **#5 – USA (4.5%)**, **#6 – Saudi Arabia** (4.2%), **#7 – Venezuela** (3.3%), **#8 – United Arab Emirates** (3.1%), **#9 – China** (2.8%), **#10 – Nigeria** (2.7%), **#11 – Algeria** (2.2%), **#12 – Australia (1.9%)**, **#13 – Iraq** (1.8%), **#14 – Indonesia** (1.5%), **#15 – Malaysia** (1.4%).

Per *BP Statistical Review of World Energy 2019*,² for the year 2018, the world's 15 largest natural gas reserves rankings changed to: **#1 – Russian Federation** (19.8%), **#2 – Iran** (16.2%), **#3 – Qatar** (12.5%), **#4 – Turkmenistan** (9.9%), **#5 – USA (6.0%)**, **#6 – Venezuela ▲** (3.2%), **#7 – China ▲** (3.1%), **#8 – United Arab Emirates** (3.0%), **#9 – Saudi Arabia ▼** (3.0%), **#10 – Nigeria** (2.7%), **#11 – Algeria** (2.2%), **#12 – Iraq ▲** (1.8%), **#13 – Indonesia ▲** (1.4%), **#14 – Malaysia ▲** (1.2%), **#15 – Australia ▼ (1.2%)**.

Natural gas is not a climate-friendly “bridging technology”

Natural gas is often presented by proponents as a climate-friendly “bridging technology” alternative with a key role on the way to a sustainable energy system.

A new report indicates that if methane emissions are considered in addition to carbon dioxide emissions, then overall, the switch from coal and oil to natural gas in power plants and heating systems increases the greenhouse effect of energy consumption by around 40%.³ Simultaneously, gas usage creates obstacles to developing renewable energy sources, inhibits pathways to a sustainable, emission-free economic system and delays effective climate protection. Increasing and continued use of natural gas is incompatible with the commitments to the Paris Climate Agreement.

Governments must remove all subsidies and indirect support measures for natural gas developments as soon as possible, together with implementation of an effective transition path to rapidly reduce gas dependency.

¹ Report: *BP Statistical Review of World Energy – 67th Edition*, BP, Jun 2018, <http://www.bp.com/statisticalreview>

² Report: *BP Statistical Review of World Energy – 68th Edition*, BP, Jun 2019, <http://www.bp.com/statisticalreview>

³ Report: *Natural Gas Makes No Contribution to Climate Protection: Switching from coal and oil to natural gas accelerates climate change through alarming methane emissions*, by Thure Traber and Hans-Josef Fell, Energy Watch Group, Sep 2019, http://energywatchgroup.org/wp-content/uploads/EWG_Natural_Gas_Study_September_2019.pdf

US shale oil boom showing signs of slowing as innovation plateaus

The attack on the core of Saudi Arabia's oil infrastructure has come just when US shale oil's importance has reached new highs in global markets, but there are escalating indications that the American shale boom is slowing as innovation plateaus.⁴

US Energy Information Administration (EIA) crude oil data (see Figure 1 below) indicates production increased by less than one percent during the first six months of this year, down from nearly seven percent growth over the same period last year.

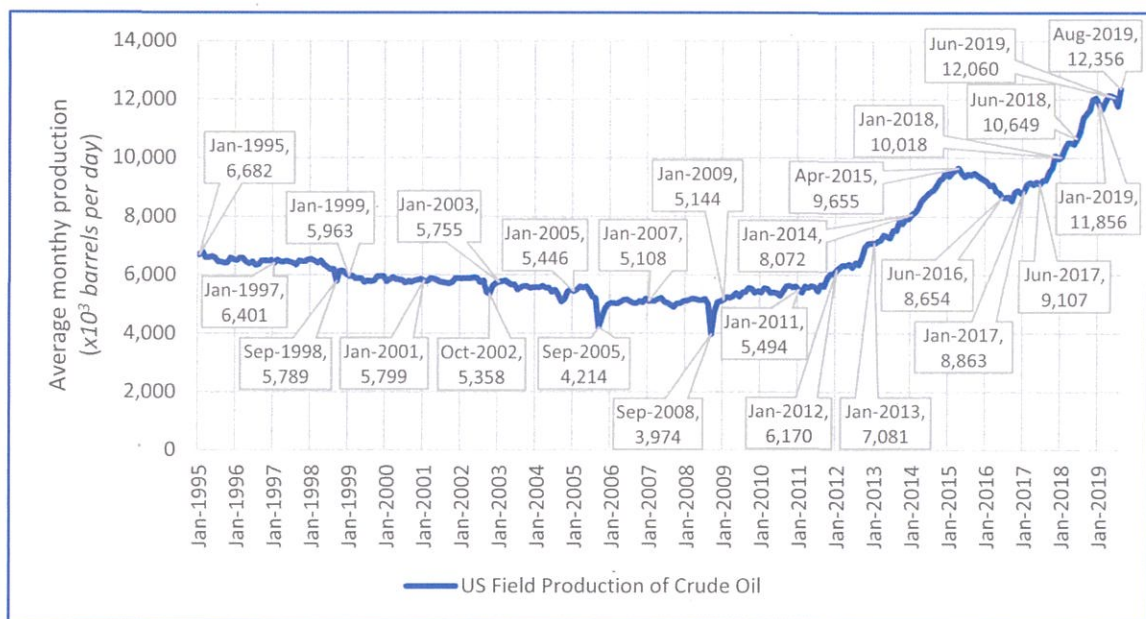


Figure 1: US Field Production of Crude Oil – January 1995 to August 2019⁵

Despite the Trump administration still seeing the US shale oil boom surging forward, recent data is indicating slowing production, falling operating drilling rig counts, and investment in new production sagging.⁶

Oilfield companies are taking the unprecedented step of scrapping entire fleets of fracking equipment, responding to the downturn in shale drilling that has been steep and fast. With almost half of US fracking machinery expected to be sitting idle within weeks, shale drillers are retiring truck-mounted pumping units and associated equipment used to hydraulically fracture shale rock.⁷

⁴ **Article:** Shale Boom Is Slowing Just When the World Needs Oil Most, by Christopher M. Matthews & Rebecca Elliot, *The Wall Street Journal*, 29 Sep 2019, <https://www.wsj.com/articles/shale-boom-is-slowing-just-when-the-world-needs-oil-most-11569795047>

⁵ **Dataset:** US EIA, accessed 5 Nov 2019, <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mcrfpus2&f=m>

⁶ **Review:** Peak Oil Review 4 November 2019, edited by Tom Whipple & Steve Andrews, *Resilience*, <https://www.resilience.org/stories/2019-11-04/peak-oil-review-4-november-2019/>

⁷ **Article:** Frackers Scrap Idled Equipment Amid Shale Drilling Pullback, by David Wethe, *Bloomberg*, 30 Oct '19, <https://www.bloomberg.com/news/articles/2019-10-30/frackers-scrap-idled-equipment-amid-pullback-in-shale-drilling>

Global conventional oil and gas discoveries are lowest in 70 years

Conventional oil and gas discoveries have fallen to their lowest level in 70 years. Discoveries aren't even close to keeping pace with the loss of conventional resources. According to Rystad (see Figure 2 below), the current resource replacement ratio for conventional oil is only 16 percent – or alternatively put, only one barrel out of every six consumed is being replaced with new resources.

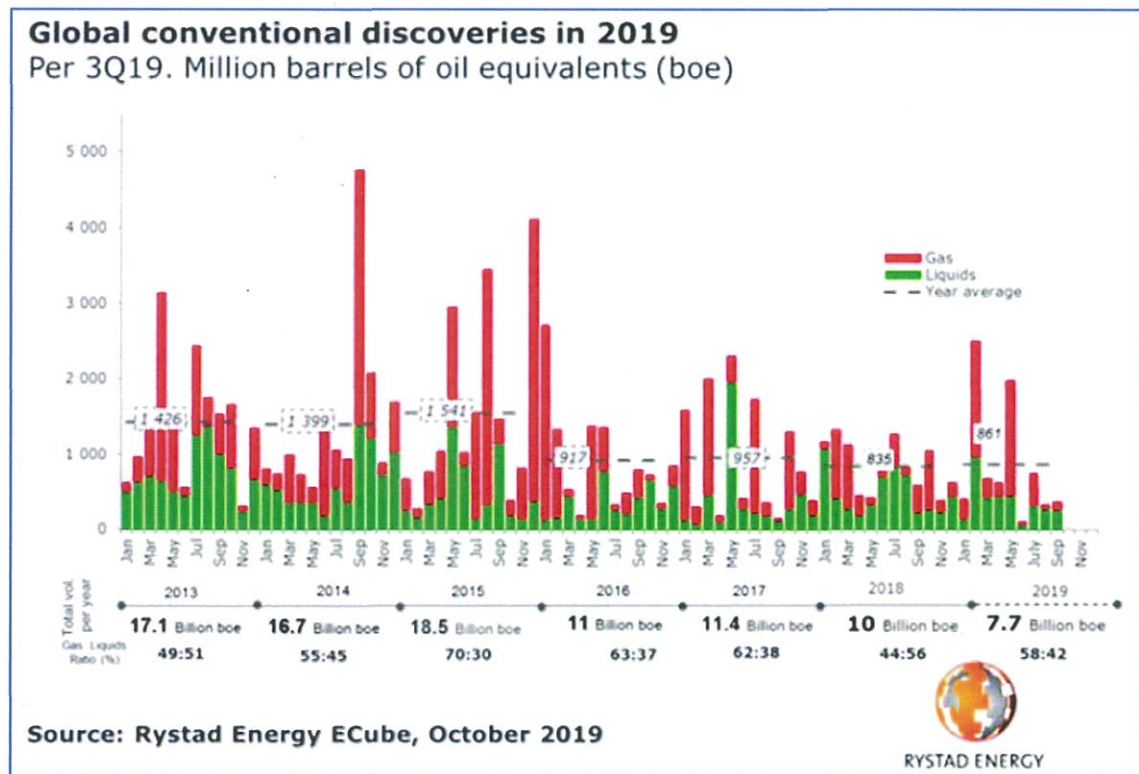


Figure 2: Global conventional oil and gas discoveries, 2013 to Sep 2019⁸

Given that the world currently consumes circa 35 billion barrels of oil per year, you would need to be a supreme optimist to think that the oil and gas industries have a bright future.

As a matter of urgency, governments need to rapidly reduce society's oil and gas dependency.

⁸ **Article:** Rystad: Oil and gas resource replacement ratio lowest in decades, *Oil & Gas Journal*, 9 Oct 2019, <https://www.ogj.com/exploration-development/reserves/article/14068305/rystad-oil-and-gas-resource-replacement-ratio-lowest-in-decades>

Wind & solar kill coal & nuclear on costs, says Lazard's latest report

Lazard's latest annual *Levelized Cost of Energy Analysis* shows that as the cost of renewable energy continues to decline, certain technologies (i.e. onshore wind and utility-scale solar-PV), which became cost-competitive with conventional generation several years ago on a new-build basis, continue to maintain competitiveness with the marginal cost of existing conventional generation technologies.

Wind and solar have been cheaper than coal and nuclear on new-build costs for a few years now, but Lazard indicates that both wind and solar are now matching both existing coal and nuclear on even the "marginal" cost of generation.

Lazard has also released its latest version of its *Levelized Cost of Storage Analysis*, which notes continuing declines in the cost of lithium-ion battery storage. The cost of battery storage is beating the cost of peaking gas-fired generators.⁹

Lazard's latest findings, together with CSIRO/AEMO's *GenCost 2018* report findings, show that wind and solar are clearly cheaper than coal and nuclear by a significant margin.

⁹ Report: *Lazard's Levelized Cost of Energy Analysis, Version 13.0*, Lazard, 7 Nov 2019;
Report: *Lazard's Levelized Cost of Storage Analysis, Version 5.0*, Lazard, 7 Nov 2019;
<https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2019/>
