

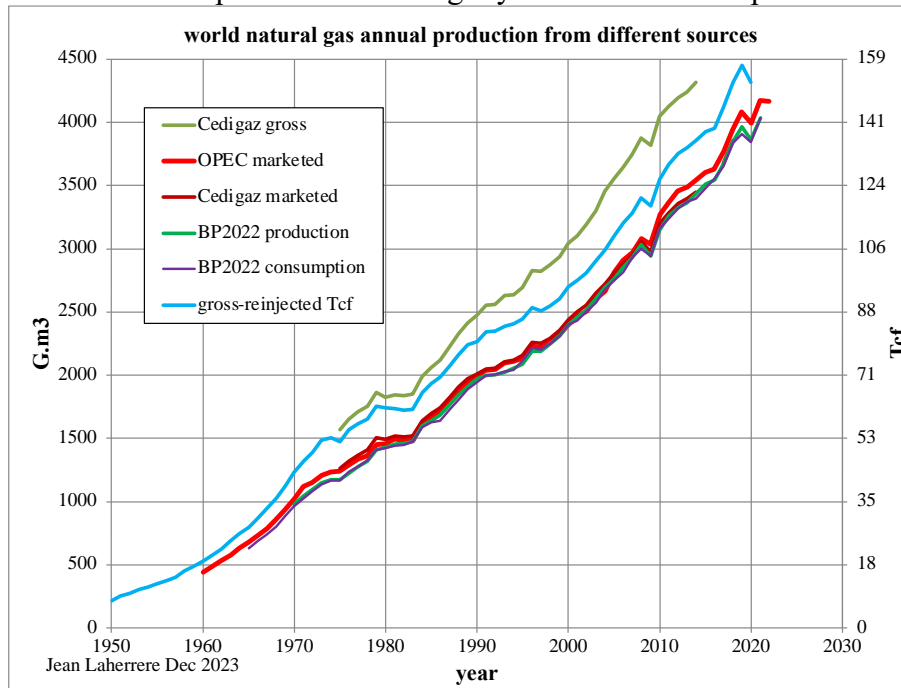
World natural gas production forecasts evolution

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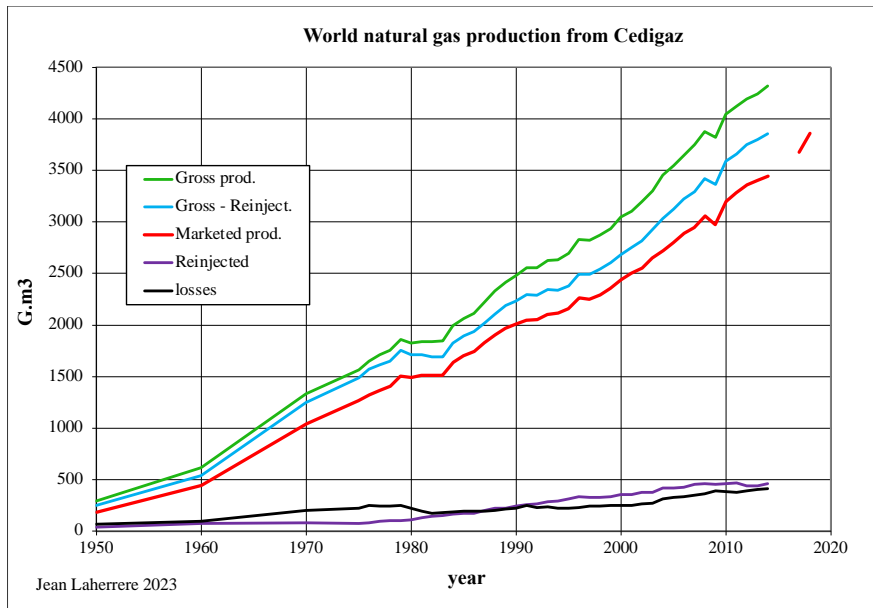
-Introduction

After my paper on the evolution of oil production forecasts <http://aspofrance.org/2023/12/04/the-evolution-of-oil-production-forecasts-for-the-world-and-the-us-by-different-reporting-agencies-a-visual-summary-jean-laherrere-3-decembre-2023/> this paper does the same for NG production forecasts:

World NG production data varies from gross less reinjected to marketed, BP NG production is lower than OPEC marketed production and slightly above BP consumption

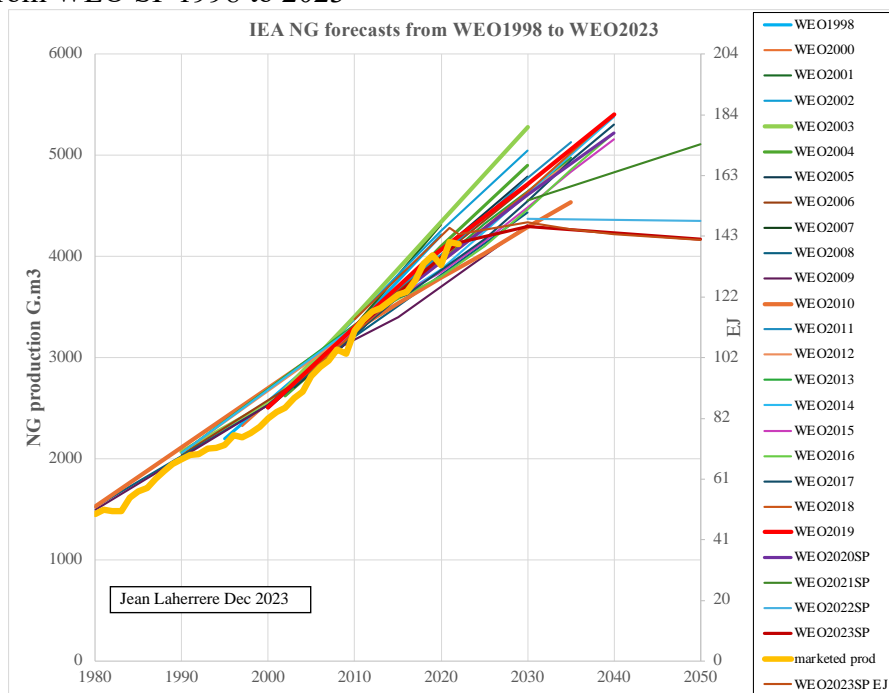


Production data 1950-2013 from Cedigaz, one of the most reliable sources



-IEA

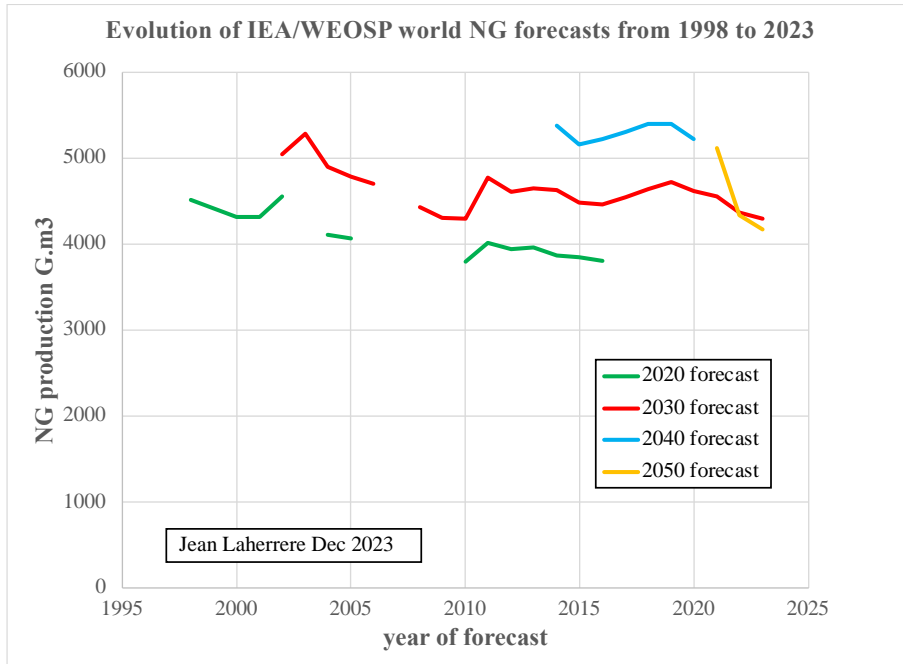
Forecasts from WEO SP 1998 to 2023



All IEA forecasts from 1998 to 2021 do not see any peak before 2050, except WEO2022 SP and WEO2023 SP.

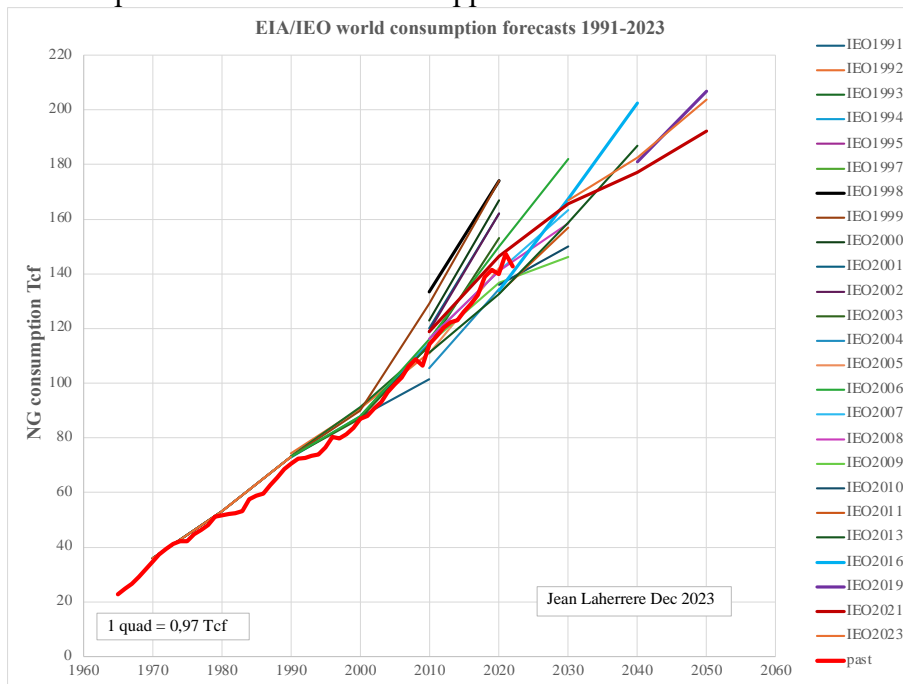
WEO2003 (light green) was very optimistic!

IEA forecasts for 2020, 2030, 2040 and 2050 decline from 1998 to 2023 peak in 2030

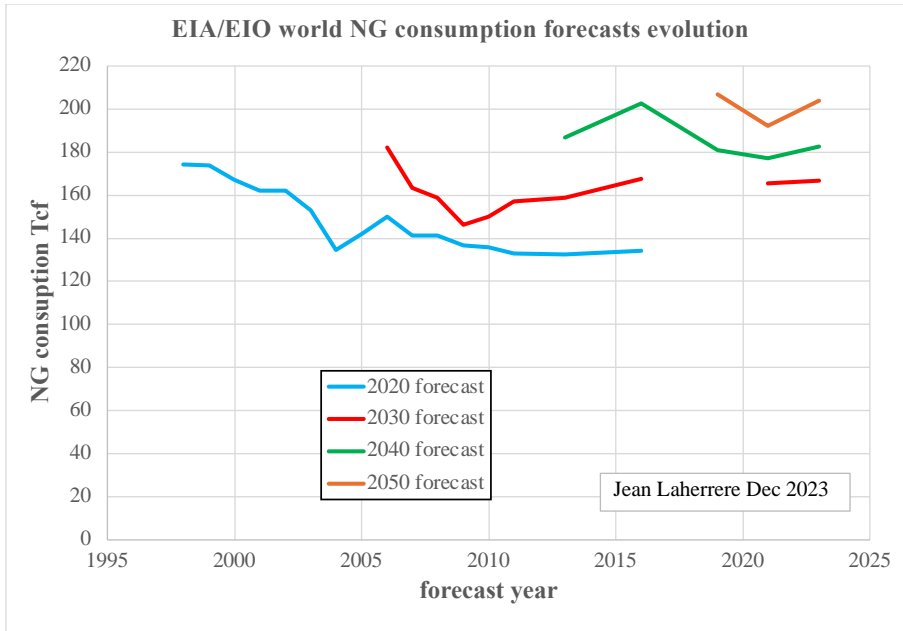


-EIA

EIA never forecasts peak for oil or for NG: it appears that EIA believes in an infinite earth!

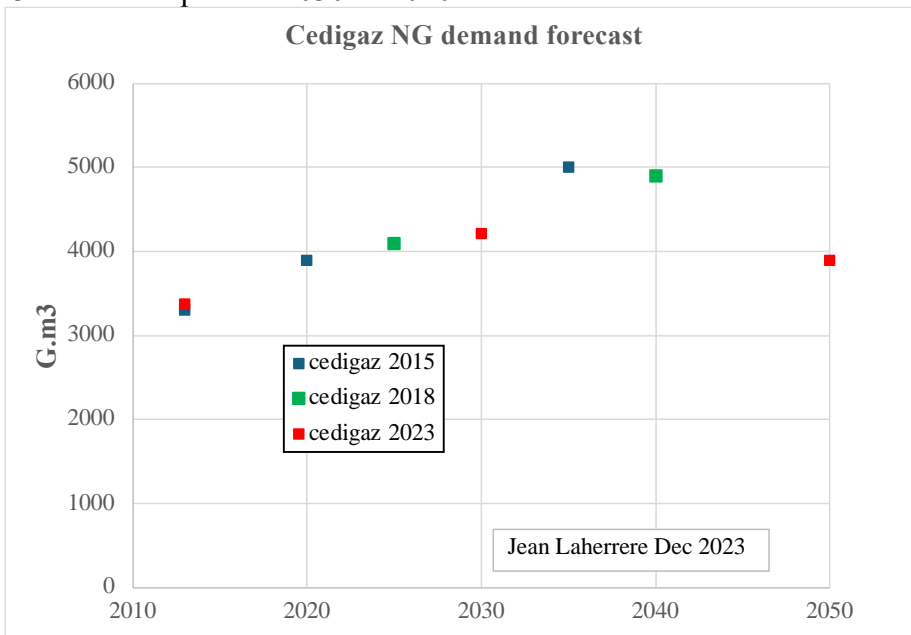


The evolution of EIA forecasts is rather on a small decline, as EIA keeps being very optimistic!



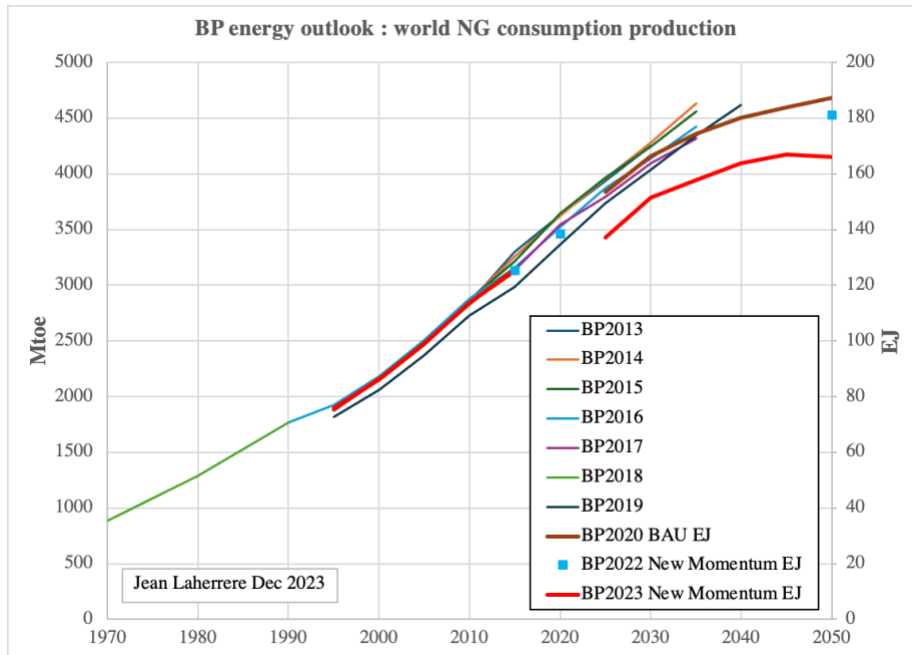
-Cedigaz

Cedigaz Medium and Long Term Natural Gas Outlook reports only few forecast data
Cedigaz 2023 forecasts a peak in 2030 or 2040

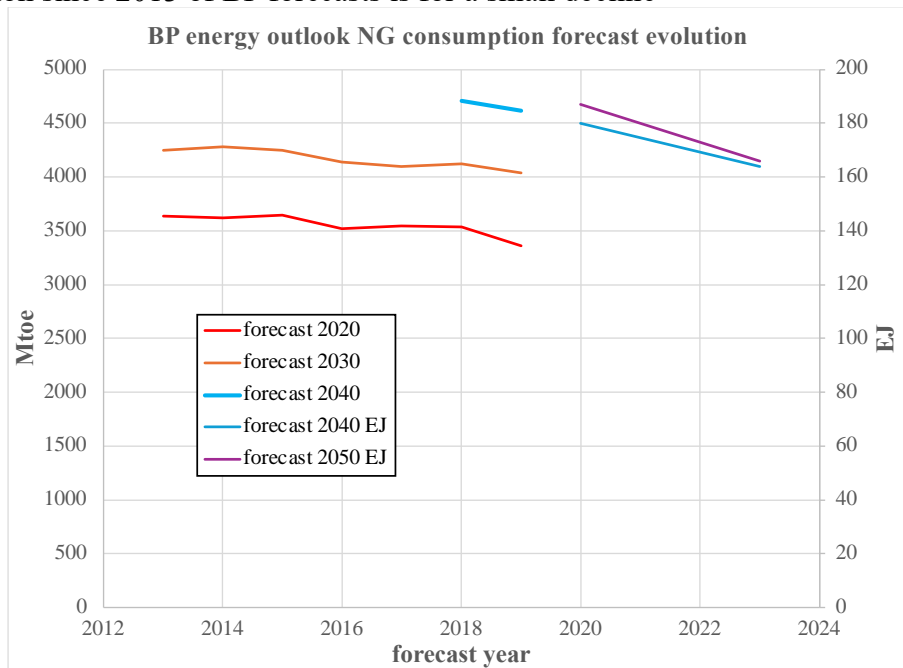


-BP

BP energy outlook forecasts no peak before 2050 for world NG consumption except New Momentum 2023, but this last forecast looks queer compared with New Momentum 2022

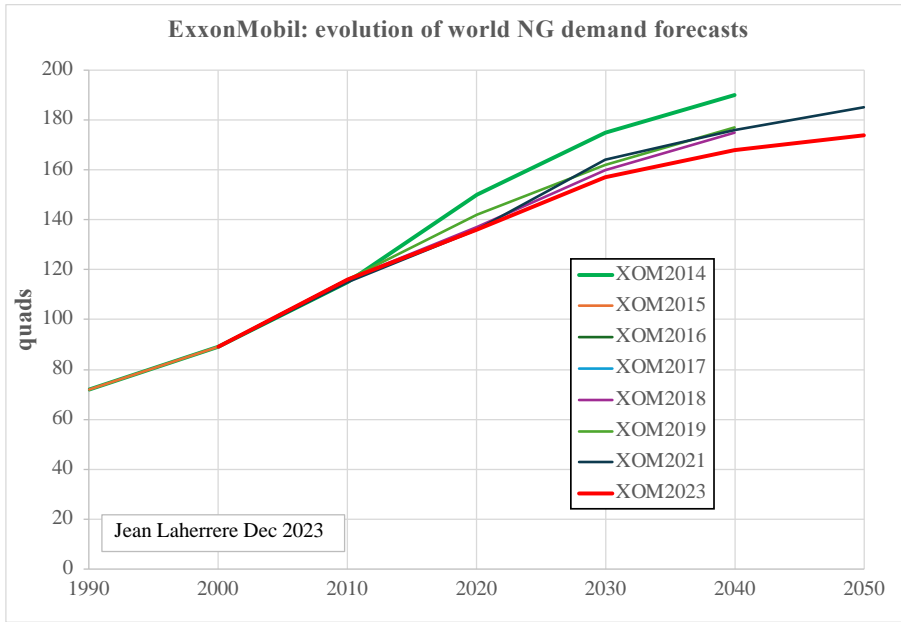


The evolution since 2013 of BP forecasts is for a small decline

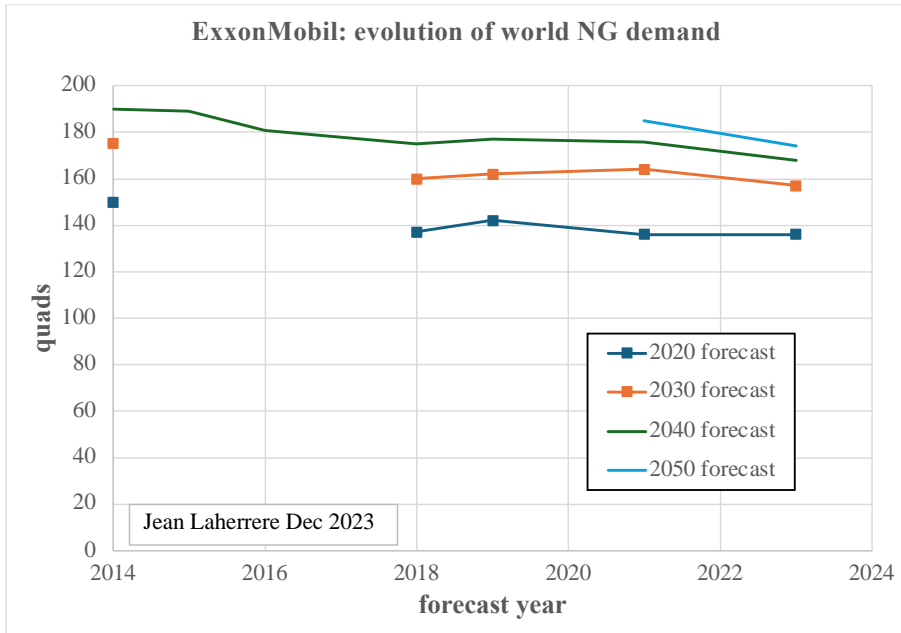


-ExxonMobil = XOM

ExxonMobil forecasts no peak before 2050

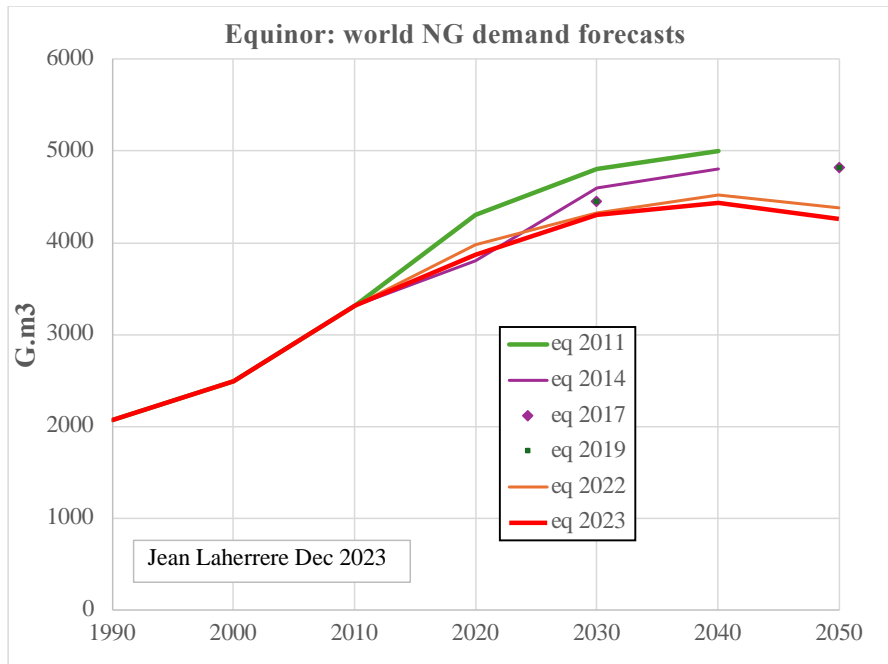


The evolution of ExxonMobil forecasts is on a small decline

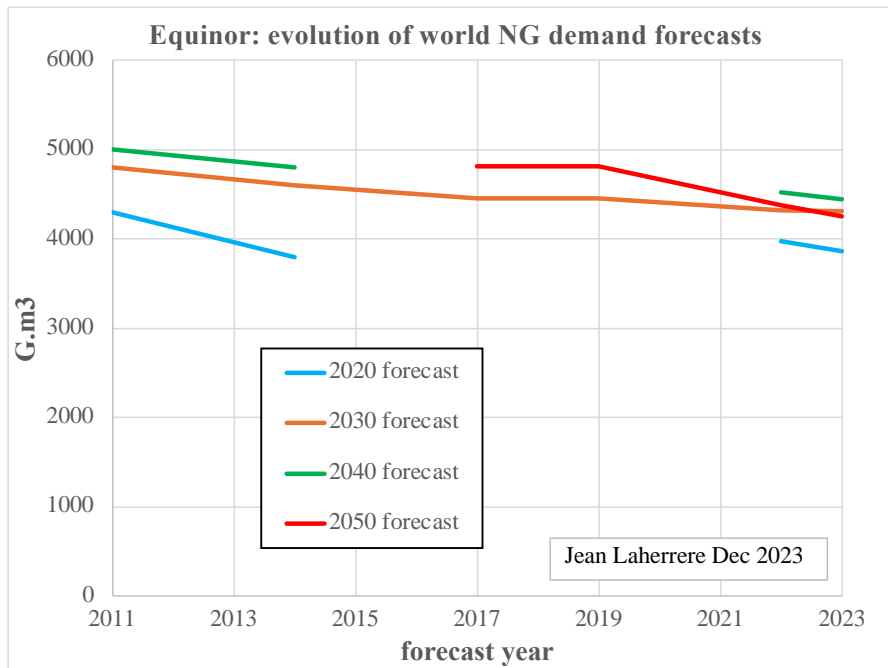


-Equinor

Equinor 2023 forecast is a peak in 2040



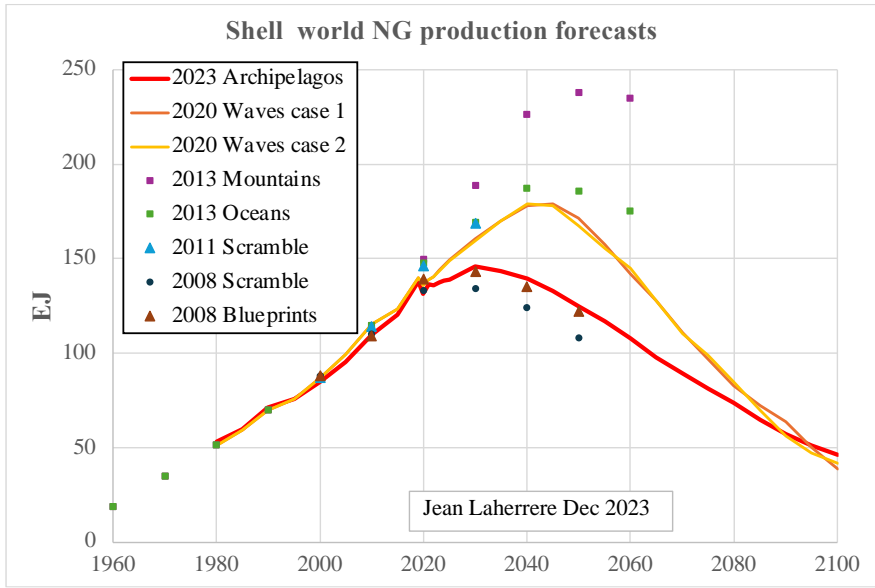
Equinor forecast evolution is on a small decline



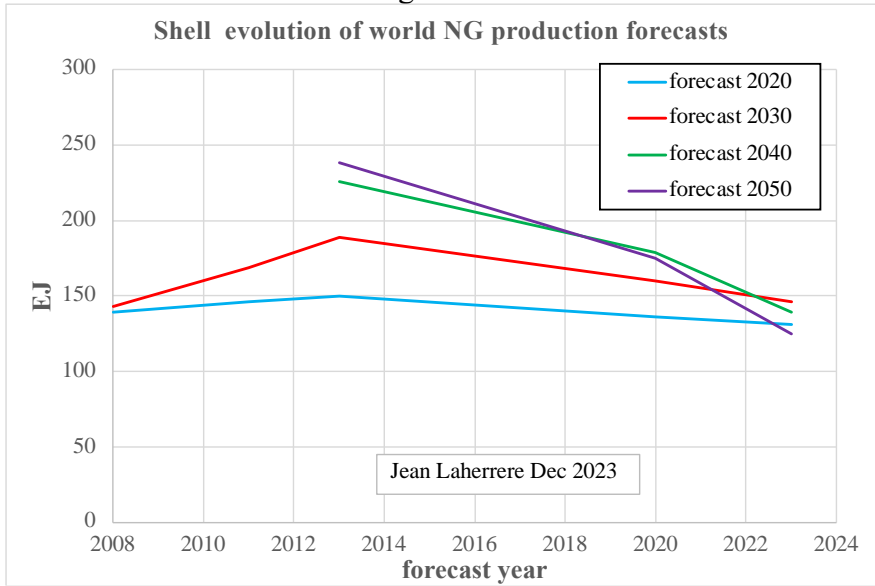
-Shell

Shell 2023 Archipelagos forecasts a peak in 2030 with a decline symmetrical of the past increase

Shell past forecasts covers a large range since 2008, but 2008 Blueprints is close to 2023 Archipelagos:

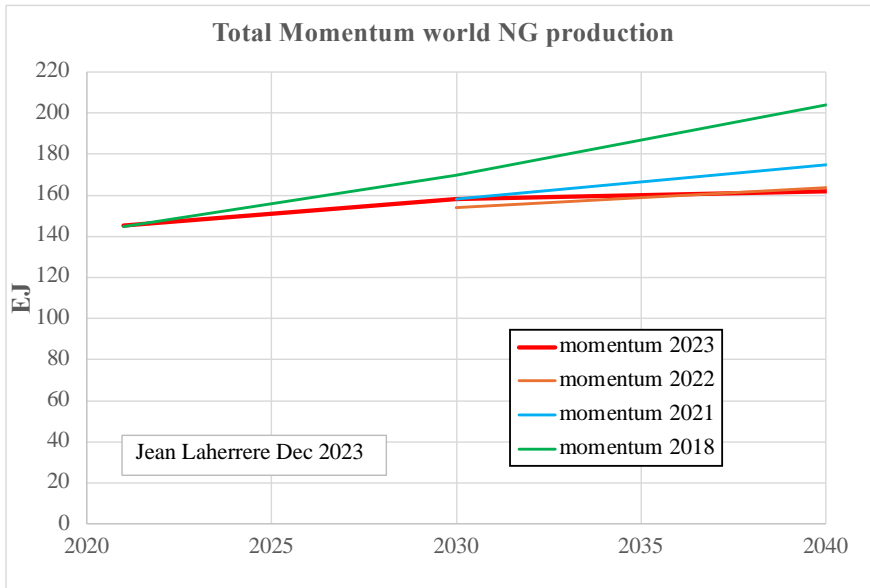


Shell NG production forecasts are declining since 2013



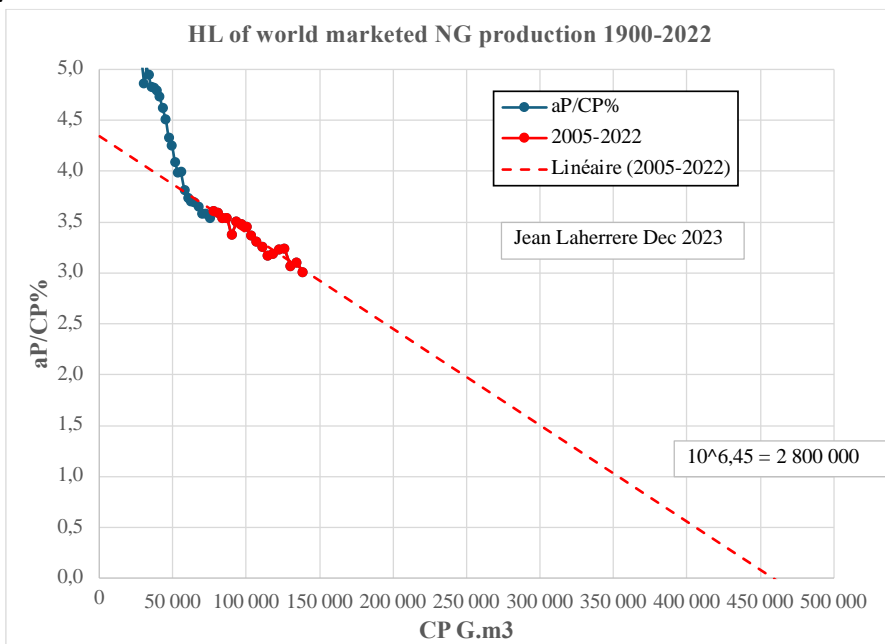
-Total

Totalenergies does not forecast gas demand peak before 2040

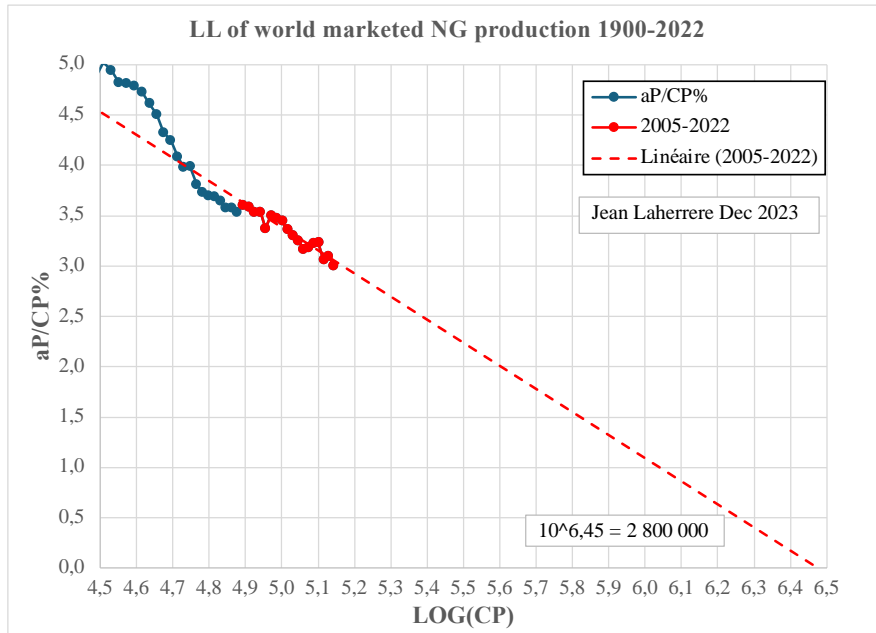


-JL

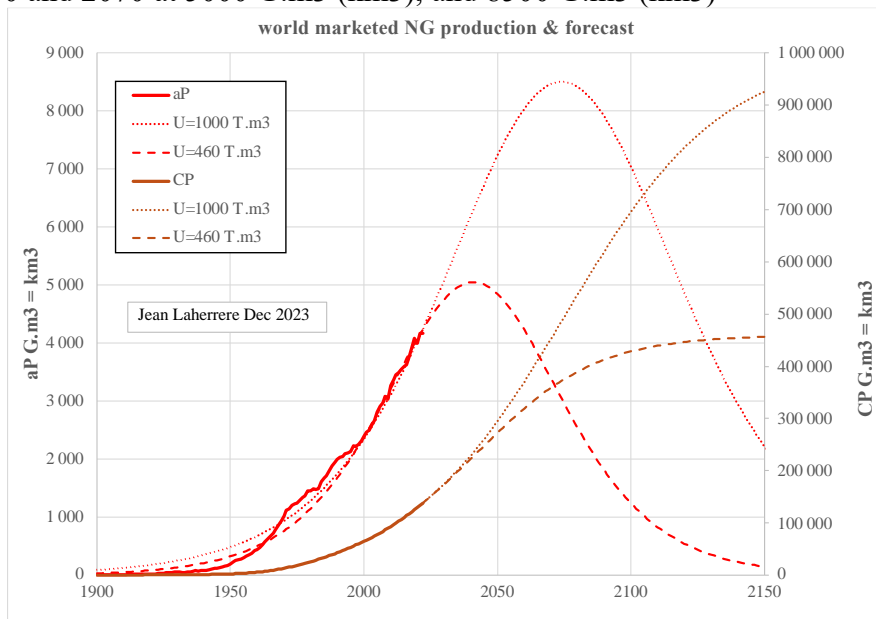
HL of world marketed NG production trends towards 460 T.m3, giving the low range of uncertainty:



LL of world NG production trends towards 2800 T.m3, giving the high range of uncertainty



World marketed NG production is modelled with ultimates of 460 and 1000 T.m3, giving a peak in 2040 and 2070 at 5000 G.m3 (km3), and 8500 G.m3 (km3)



My NG production forecast since 2005 for ultimate, peak year and peak value

forecast year	ultimate Pcf	peak time	peak Tcf
2005	10	2025	145
2006	10	2030	145
2007	10	2025	140
2008	12	2025	145
2009	12	2030	145
2010	12	2030	145
2012	13	2030	152
2014	13	2030	160
2016	14	2030	165
2020	20	2050	210
2022	20	2040	205
2023	18	2040	185

My old papers on NG forecast

-2004 NG production has peaked and will decline towards extinction after 2025. Jean Laherrere Natural gas future supply IIASA-IEW 22-24 June 2004. 15. 15. -Norway.

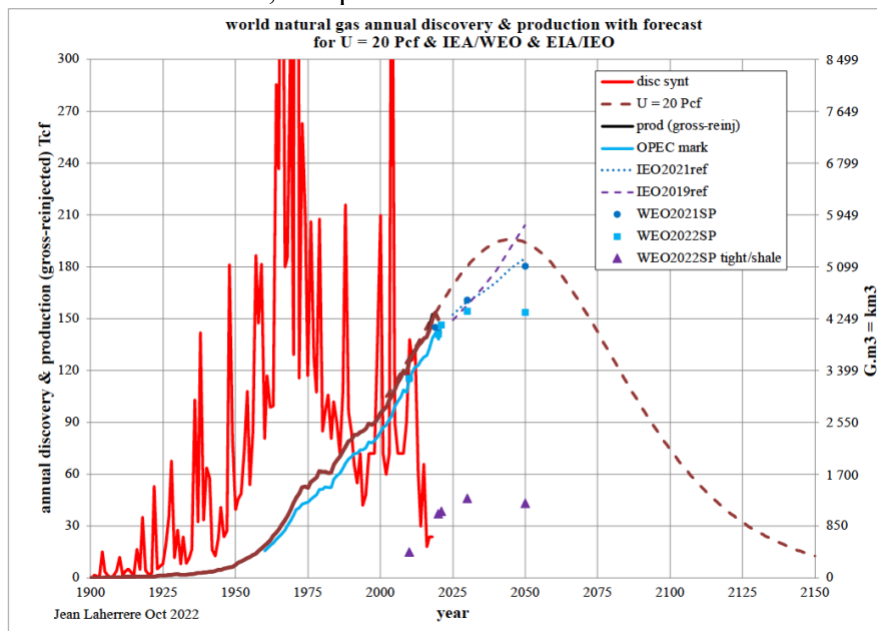
"Peak Oil - Myth or Reality?" by Jean Laherrère - ASPO ...

-2008 VII ASPO Conference Barcelona 2008

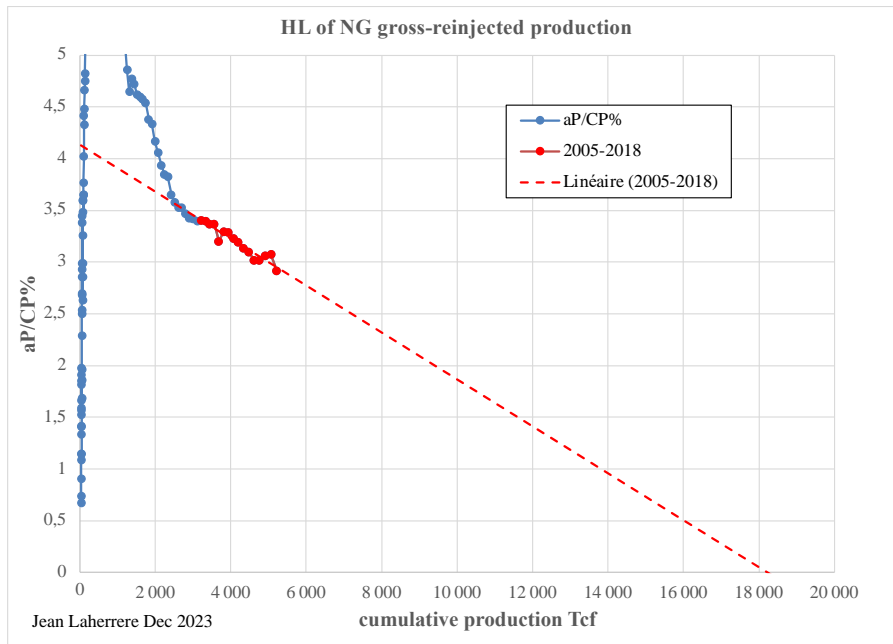
<https://www.resilience.org> > storie Jean Laherrere and Jean-Luc Wingert... NG production is expected to peak by 2040 or sooner.

-2014 NG Production is likely to fall to 10 Tcf in 2040 when AEO forecasts 3 times more with 33 Tcf! 0 5 10 15 20 25 30 35 1900 1920 1940 1960 ...The world NG production will peak in 2030 about 140 Tcf/a when USDOE 2006 ...

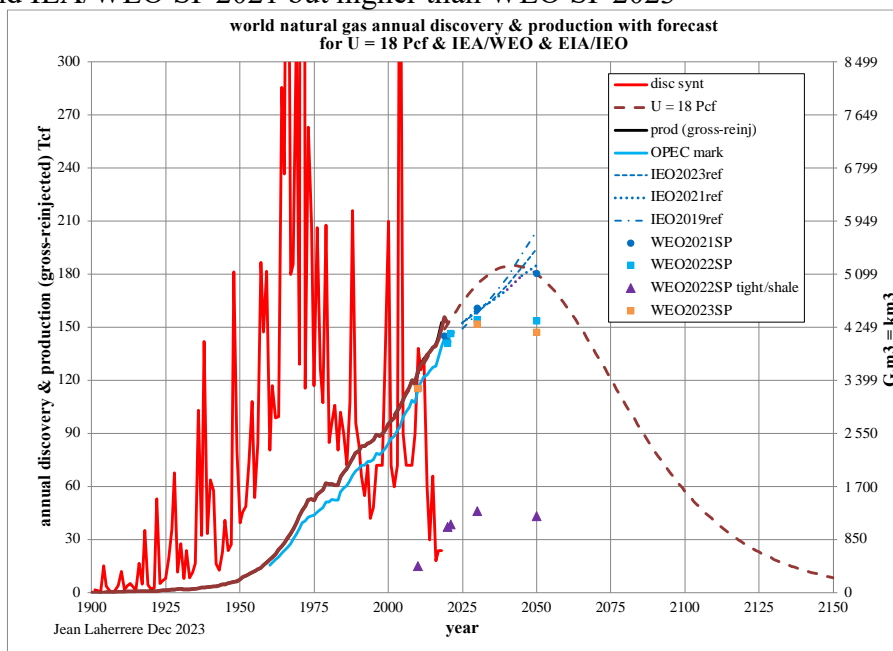
-2022 with an ultimate of 20 Pcf, NG peak is in 2040 at 200 Tcf



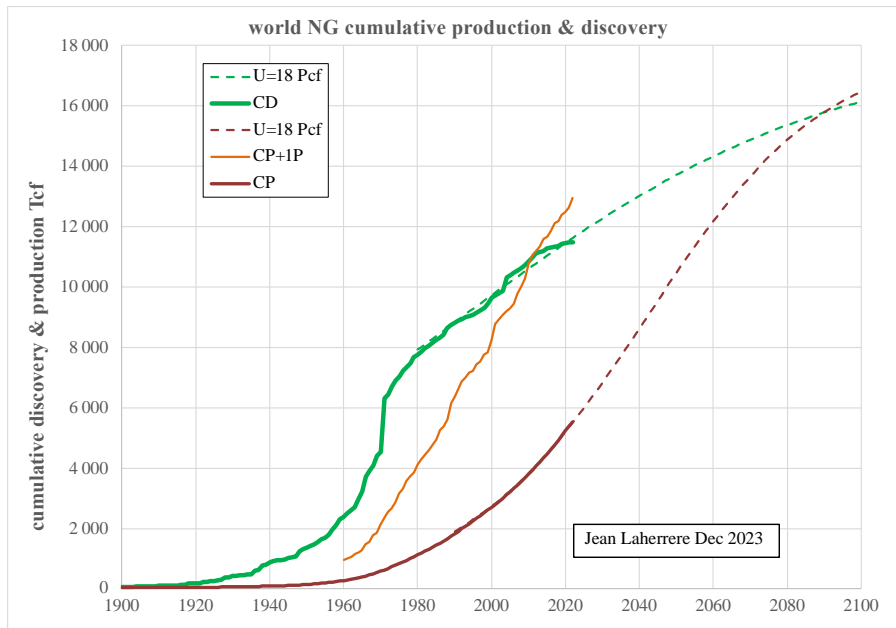
HL of world NG gross-reinjected production trends towards 18 000 Tcf= 18 Pcf



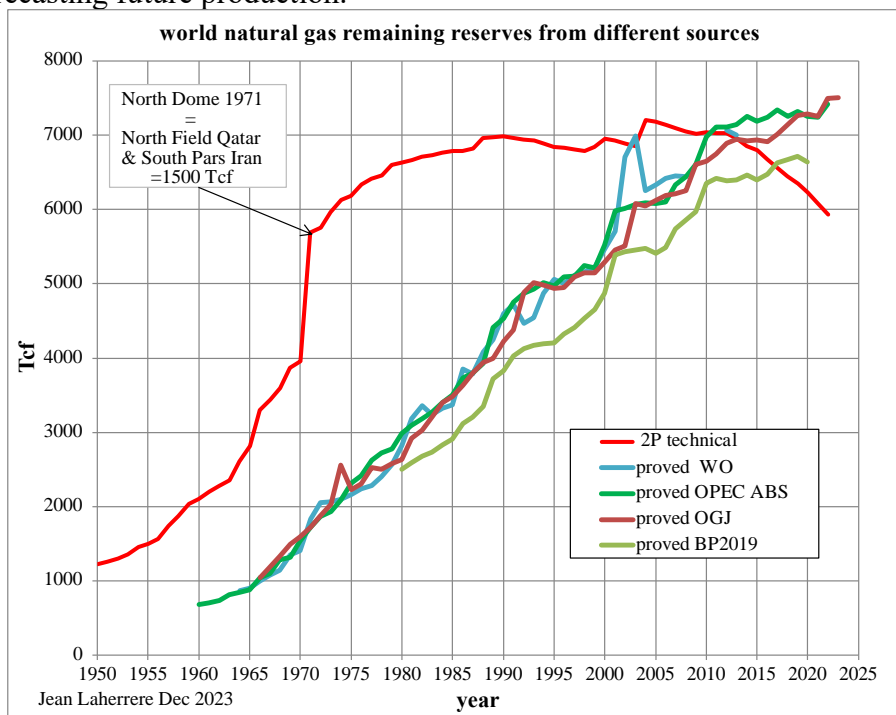
World gross-reinjected will peak around 2040 at about 180 Tcf, not far from EIA/IEO ref forecasts and IEA/WEO SP 2021 but higher than WEO SP 2023



Cumulative discovery and production are modelled with an ultimate of 18 Pcf:



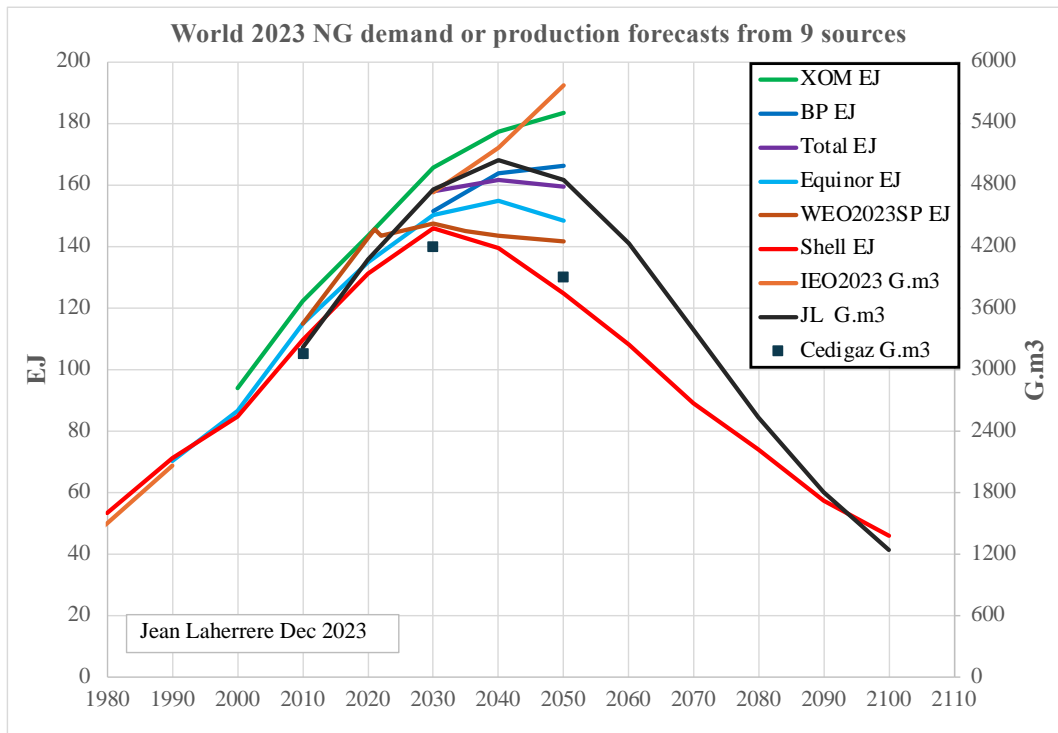
There is a drastic difference between current 1P world and backdated 2P NG remaining reserves and their trends. But 1P reserves are either political or financial and should not be used for forecasting future production.



Since 2015 2P remaining reserves decline when 1P reserves still increase.

-2023 NG forecasts

EIA, XOM, BP do not forecast NG peak before 2050, when Shell in 2030, Cedigaz in 2030 or 2040, Equinor in 2040 as my forecasts:



The average of the 9 sources gives a NG peak about 2030-2040 and the decline is only forecasted by Shell and me, being about symmetrical with increase.

-Methane hydrates

This 2013 paper forecasted methane hydrates production by early 2019: it did not occur⁸
https://www.worldenergy.org/assets/images/imported/2013/10/WER_2013_3_Natural_Gas.pdf

4. Methane hydrates

Crystalline deposits of methane, the principal component of natural gas, are found in extensive seams under deep water in various parts of the world. A recent academic assessment of gas hydrates in resource-grade deposits to be at least one third more than 2010 estimates of global natural gas reserves.²

A number of countries have clearly demonstrated their interest in this potential form of energy, including Canada, China, Japan, Norway and the United States. In March 2013 the Japanese JOGMEC Corporation was the first company to extract gas from offshore methane hydrates, with the aim of commercial production starting by early 2019.

² Boswell, R. and Collett, T.S., 2011. Current perspectives on gas hydrate resources. Energy and Environmental Science, 4, 1206-1215

Methane hydrate production is a myth!

About 70 areas with gas hydrate evidence are known in the World Ocean

But the attempts of methane hydrates production in Japan, India and US have failed.

China claims to have extracted hydrate in 2017 and is still exploring

<https://www.upstreamonline.com/exploration/china-ready-to-spud-third-gas-hydrate-well-in-south-china-sea/2-1-1388773>.

In Siberia the Messoyakha gas field (1970-1978) is often used as an example of production of in-situ gas hydrates. There is conflicting evidence as to whether the gas hydrates are being produced currently with some research indicating that the production data demonstrates their production. (Wikipedia)

I wrote few papers on hydrates from 1999 to 2009, being the chairman in Brazil in 2002 of World Petroleum Congress the hydrate panel. As a geophysicist I studied the BSR (bottom stimulating reflector) on seismic marine sections

-Laherrère J.H. 2009 «Update on US GOM: Methane Hydrates» TOD July 17

<http://europe.theoil Drum.com/node/5552#more>

-Laherrère J.H. 2008 “Hydrates updated” The Oil Drum 17 April <http://europe.theoil Drum.com/node/3819>

-Laherrère J.H. 2002 "Hydrates: some questions from an independent O&G explorer"

Introduction as chairman of RFP 9 "Economic use of hydrates: dream or reality?" WPC Rio, <http://www.oilcrisis.com/laherrere/hydratesRio/>

-Laherrère J.H. 2000 "The uncertainties of oceanic hydrates" Tomorrow's Oil p11-16

-Laherrère J.H. 2000 "Oceanic hydrates: more questions than answers" Energy Exploration & Exploitation, Special issue on hydrates vol 18 n°4 p349-383 <http://dieoff.com/page225.htm>

-Laherrère J.H. 1999 " Gas Hydrates" "Uncertain resource size enigma" & "The SOFAR channel: what and why" Offshore Magazine Part 1 August, p140-141,160-162, "Data shows oceanic methane hydrate resource over-estimated" Part 2 p156-158, <http://dieoff.com/page192.htm>

-Laherrère J.H. 1999 « Oceanic Hydrates: an Elusive Resource » Part 1: "Gas Hydrate, Uncertain resource size enigma" Offshore, 1999, p140-141,160-162, Part 2: "Data shows oceanic methane hydrate resource over-estimated" Offshore, September 1999, p156-158 <http://www.hubbertpeak.com/laherrere/hydrates/>

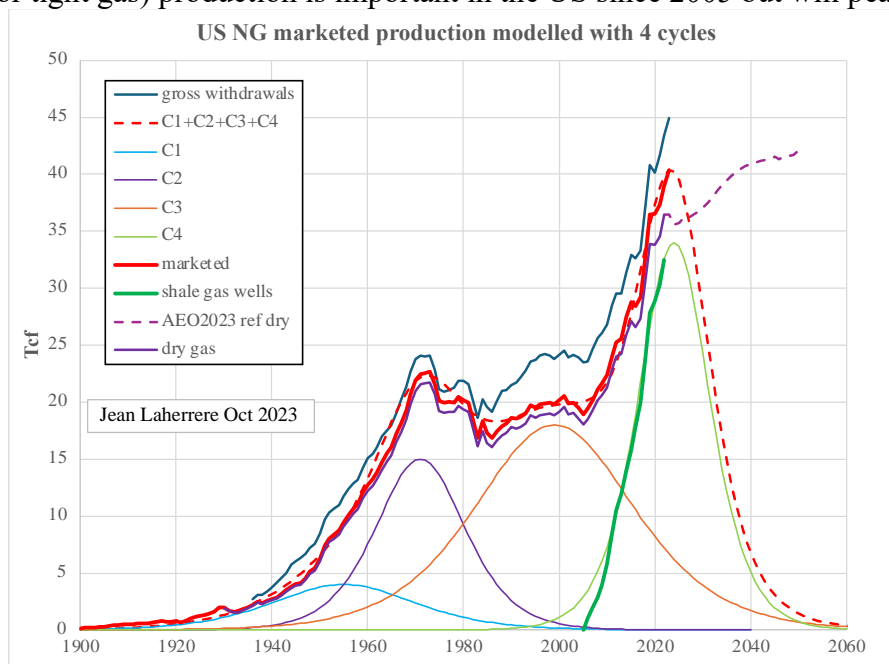
There is no significant accumulation of hydrates as the source, reservoir and seal are the same, comprising the 500 meters of unconsolidated sediment beneath the seabed. Since the hydrate is solid, there is no possibility of migration, giving a real accumulation.

Today no one can produce methane hydrates, but CO2 hydrates could interest the agencies looking for CO2 storage in CCS: CO2 hydrates are heavier than water and will stay in the bottom of very deep seas

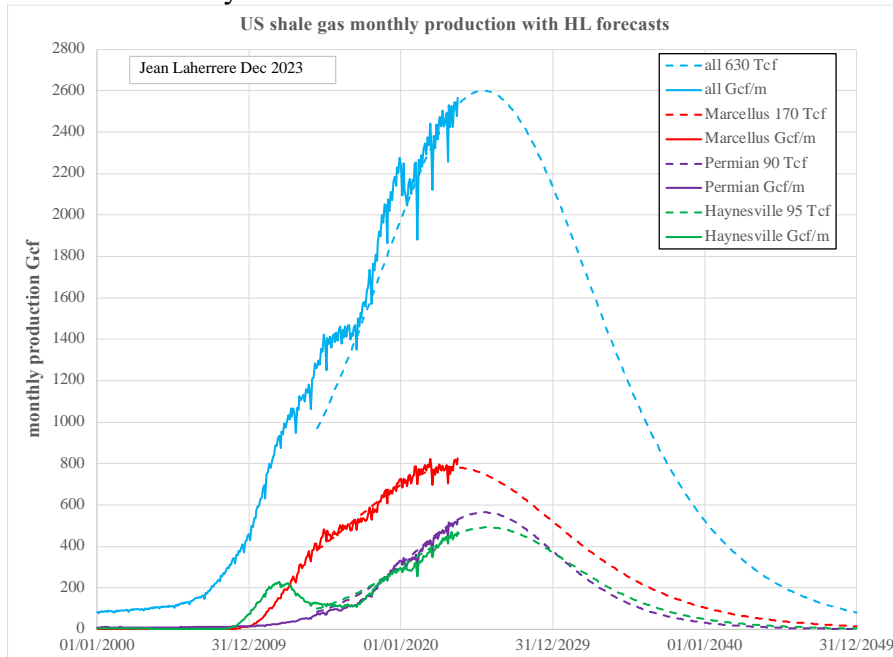
-Shale gas

Shale gas production is important in the US as gas belongs to the landowners (government for other countries) and the nuisances of the fracking are accepted as the revenues

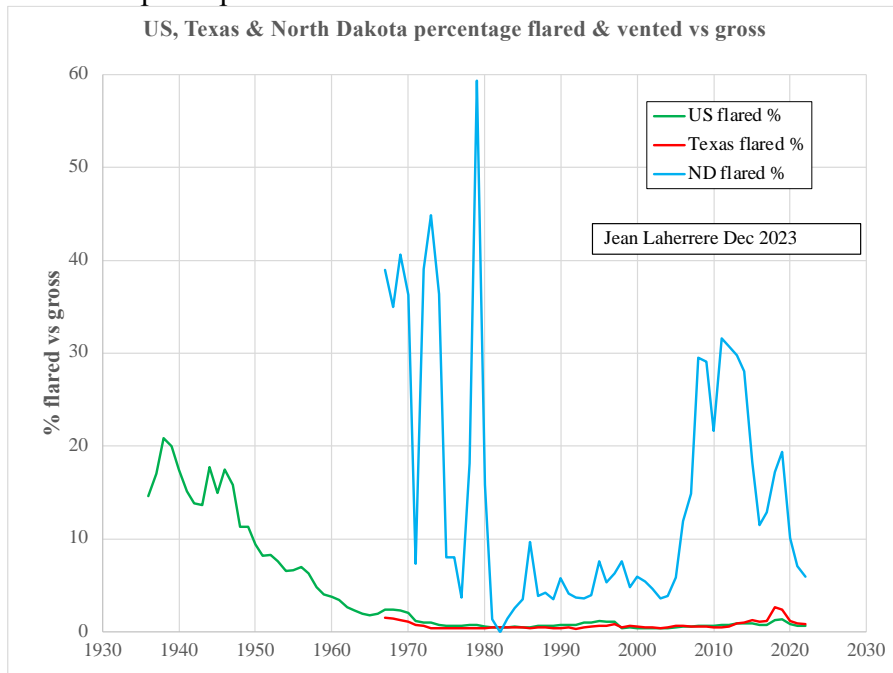
Shale gas (or tight gas) production is important in the US since 2005 but will peak in 2024



US shale gas HL ultimate is about 630 Tcf with a peak in 2024 or 2025 as Marcellus is peaking and Permian and Haynesville in 2025.



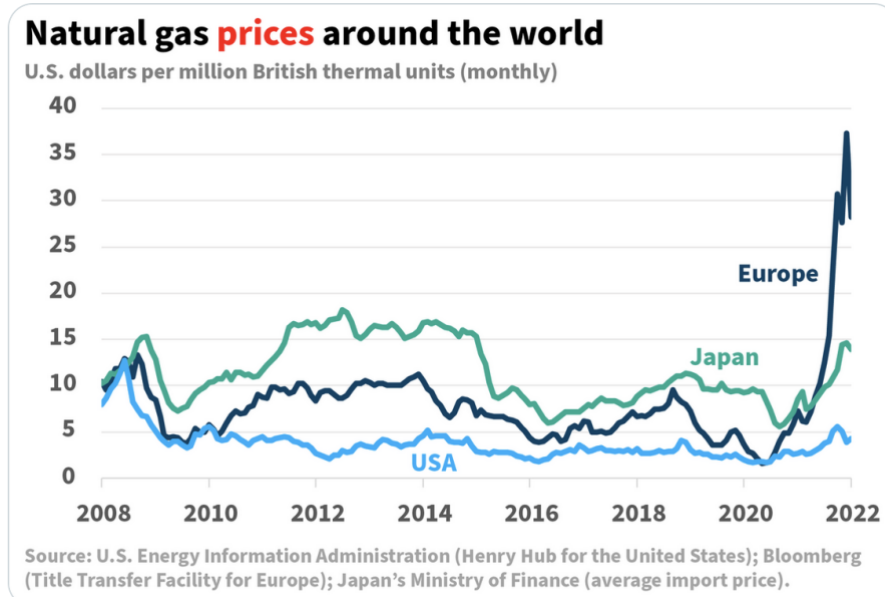
Flaring is high in North Dakota > 30% in 2011 compared with Texas and US, because lack of gas pipelines and cheap NG price



Shale gas production is small in Argentina (Vaca Muerta) and in China (below targets), because the gas belongs to the government and not the landowners!.

-NG prices

NG transport is 10 times more expensive than oil transport, because its low density
There is only one oil market when there are 3 different NG markets: US, Europe, and Japan



-Conclusion

EIA as for oil does not forecast NG production before 2050, neither ExxonMobil nor BP. Other sources forecast NG peak about 2030 or 2040. Only Shell forecast and my forecast display a future significant decline beyond 2050.

Today the discovery of new giant oil fields has almost disappeared, but the discovery of giant gas fields is still active, mainly in deep water.

NG and NG liquids will play for a decade or two an important part in future world energy as new renewables are mainly intermittent