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23 September 2024

New Middle East natural gas production & forecasts

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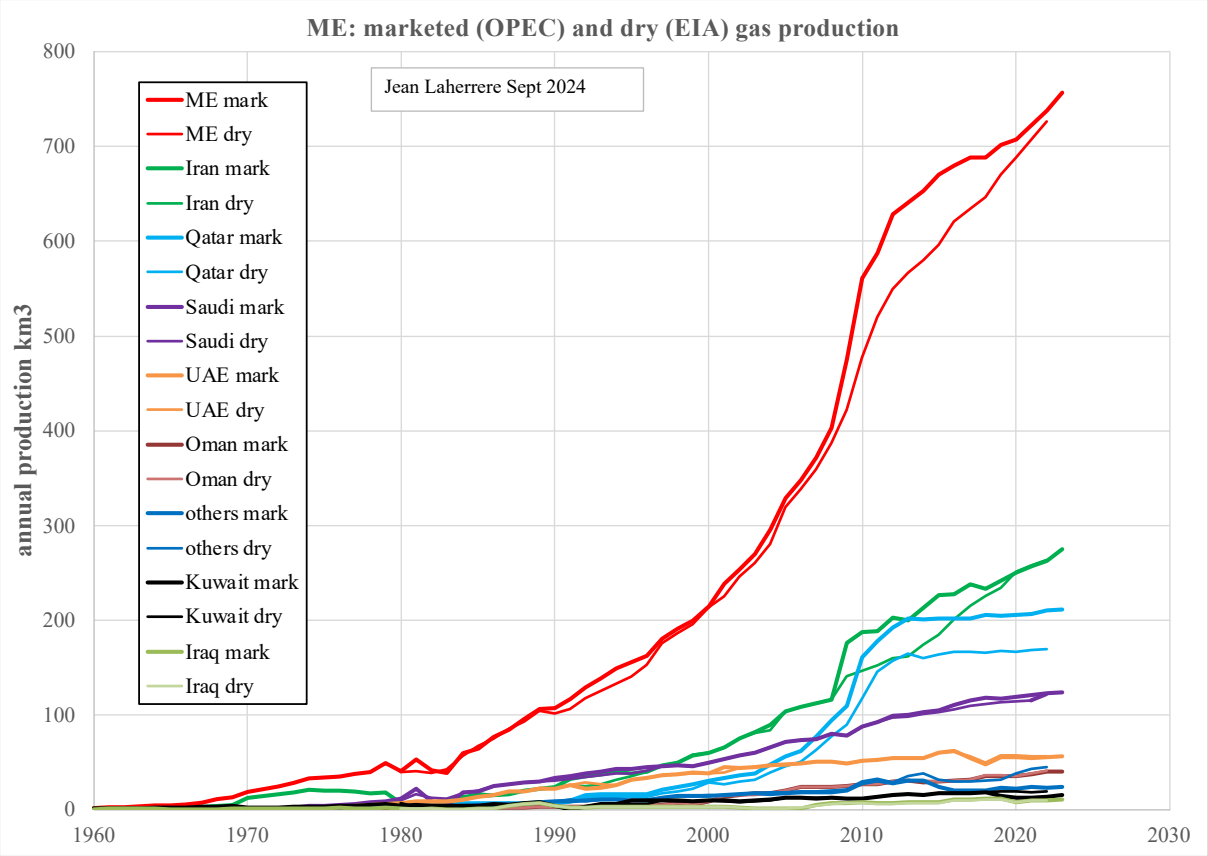
-Introduction

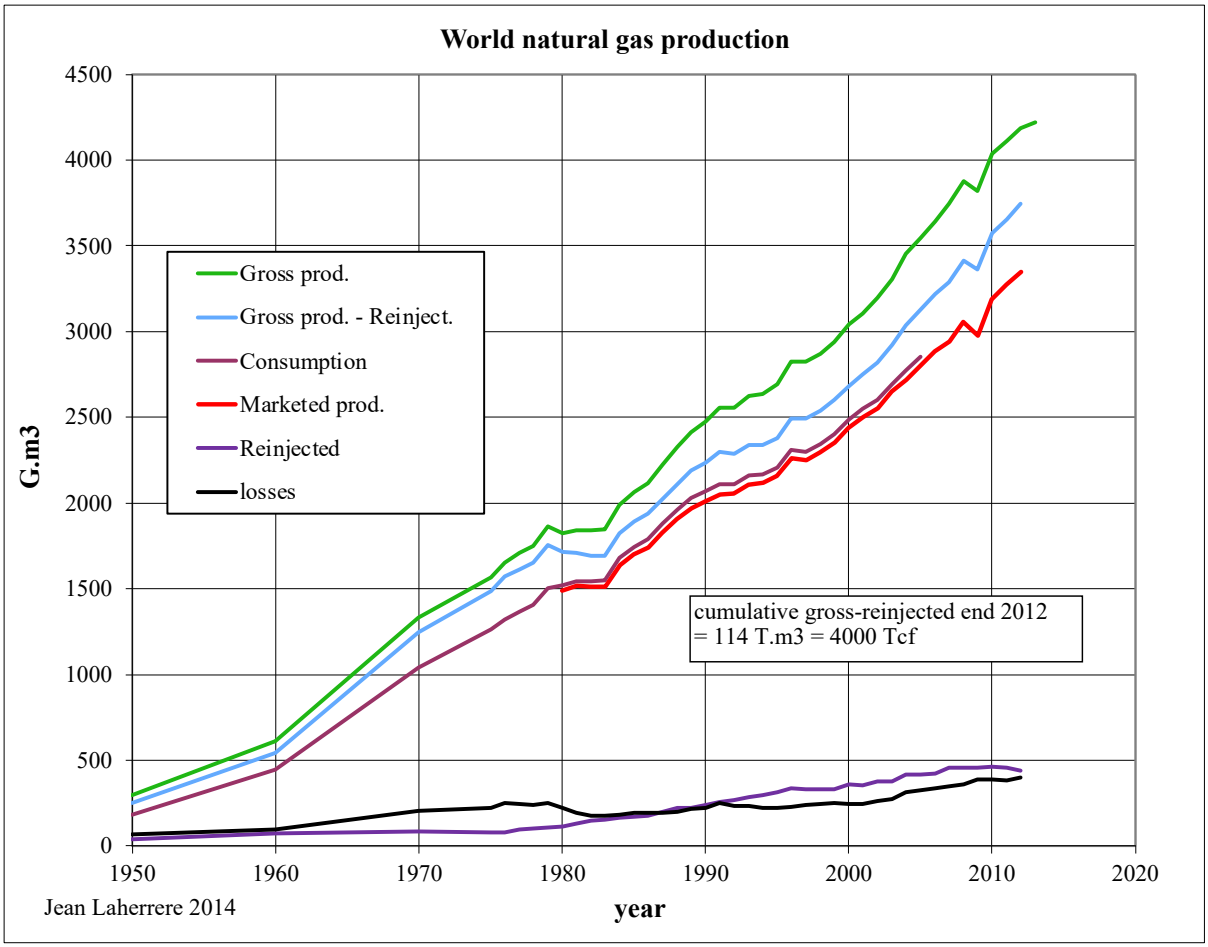
My 10 September version was short of some data from EIA international browser:
EIA data (dry gas 1980-2022), which should be close to marketed OPEC ASB (Annual Statistical Bulletin) data, differs widely for Iran on the period 2008-2019, for Qatar on the period 2000-2022, for Saudi Arabia for the period 2007-2019, for Kuwait for the last 3 years, meaning that part of my last post was questionable.
The ME geographical definition varies as some include Egypt and Turkey, which is not the case of OPEC ASB including only Iran, Iraq, Kuwait, Oman, others (Cyprus, Lebanon, Syria, Israel, Jordan, Bahrain, Yemen). Qatar, Saudi Arabia, UAE.
OPEC ASB NG data are reported in 10^9 cubic meter or Gcm= G.m3 = km3
EIA reports by country NG production in Gcf broken down in gross, dry, vented and flared, reinjected

It is obvious (see Qatar chapter) that Qatar marketed data is wrong and should be replaced by dry gas



Cedigaz is the best agency to report NG production in G.m3 = km3 by country, but it is very expensive to buy for a think tank. I have old Cedigaz data but only up to 2012

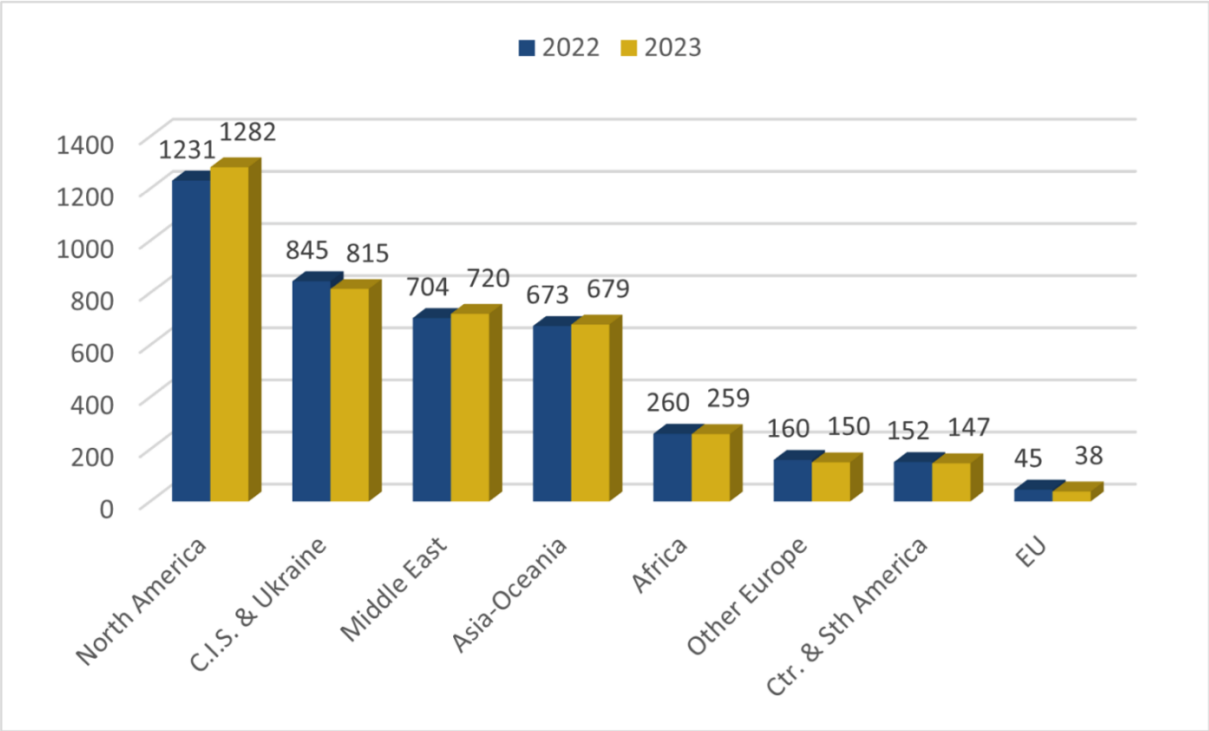
World NG marketed production 1950-2012 is quite below gross production because reinjection and losses (flared & vented)



Cedigaz reports 2022 and 2023 NG values for the world and for ME = 704 & 720
Gcm=G.m3= km3

Figure 1: Marketed gas production by region

(bcm)

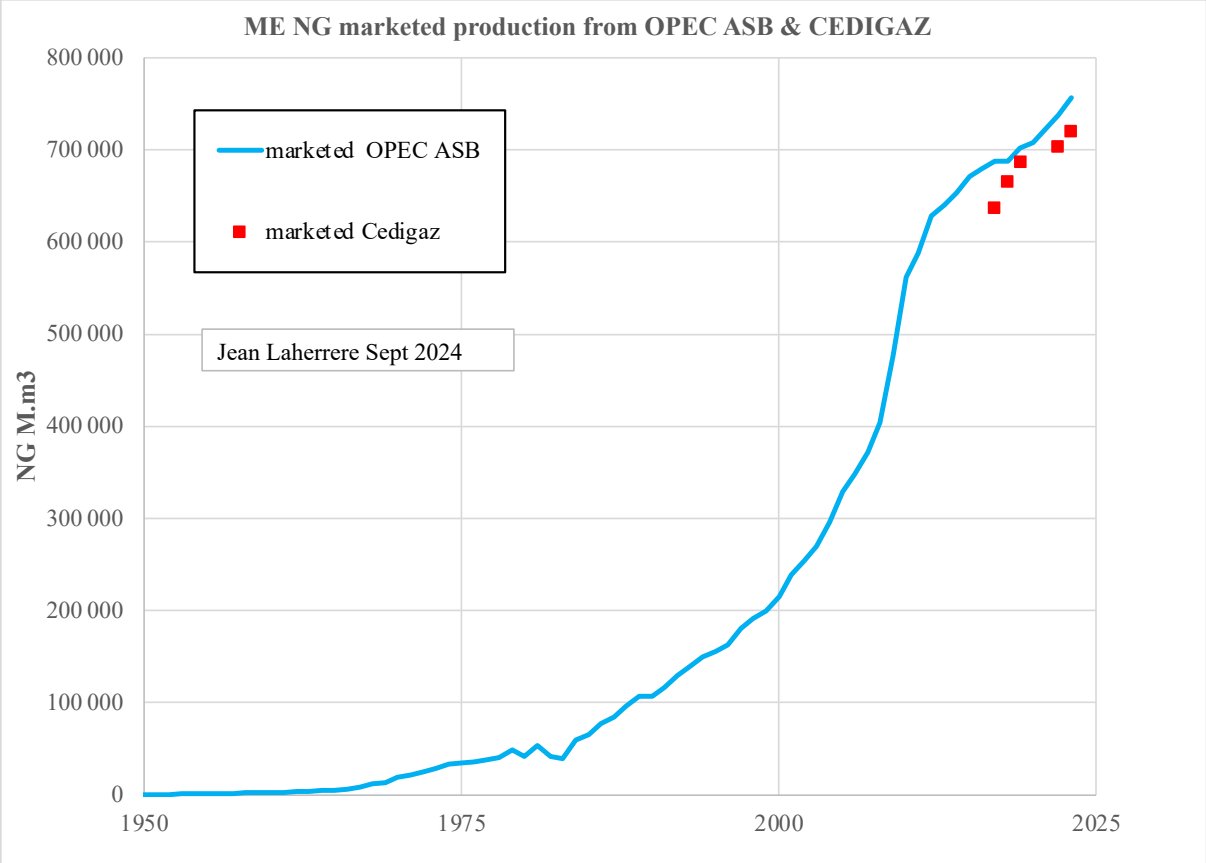


Source: Cedigaz

ME is then third region, far from North America (peaking with shale gas with a coming fast decline)

ME NG marketed production data comes from OPEC ASB (Annual Statistical Bulletin) since 1960
Table 9.1 proven natural gas reserves, Table 9.2 = marketed natural gas production

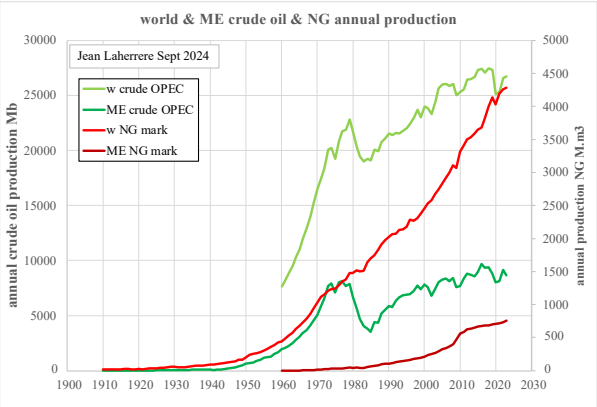
ME marketed NG production from Cedigaz (last years) is lower than OPEC ASB data The problem is that it is not sure that the geographic definition of ME is the same or if different data:

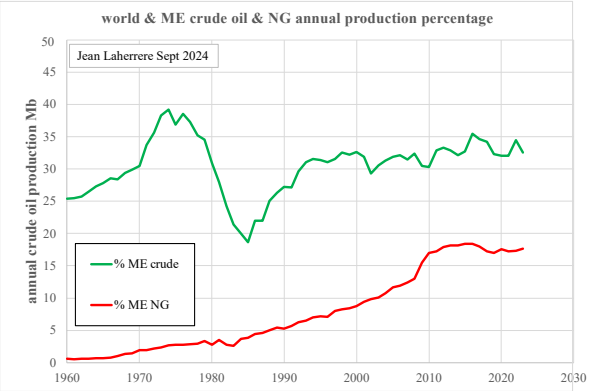


GECF (Gas Exporting Countries Forum) based in Qatar in its 2023 report gives NG data based on Rystad source: it is scout data, not genuine source

EIA in their international browser reports annual production by country for crude, NGPL (NG Plants liquids) and NG in US units (cf & b)
BP reported up to 2022 NGL in barrels but not anymore Energy Institute in 2023
UN reports NGL production data in Mt
OPEC ASB reports NG production and reserves in M.m3

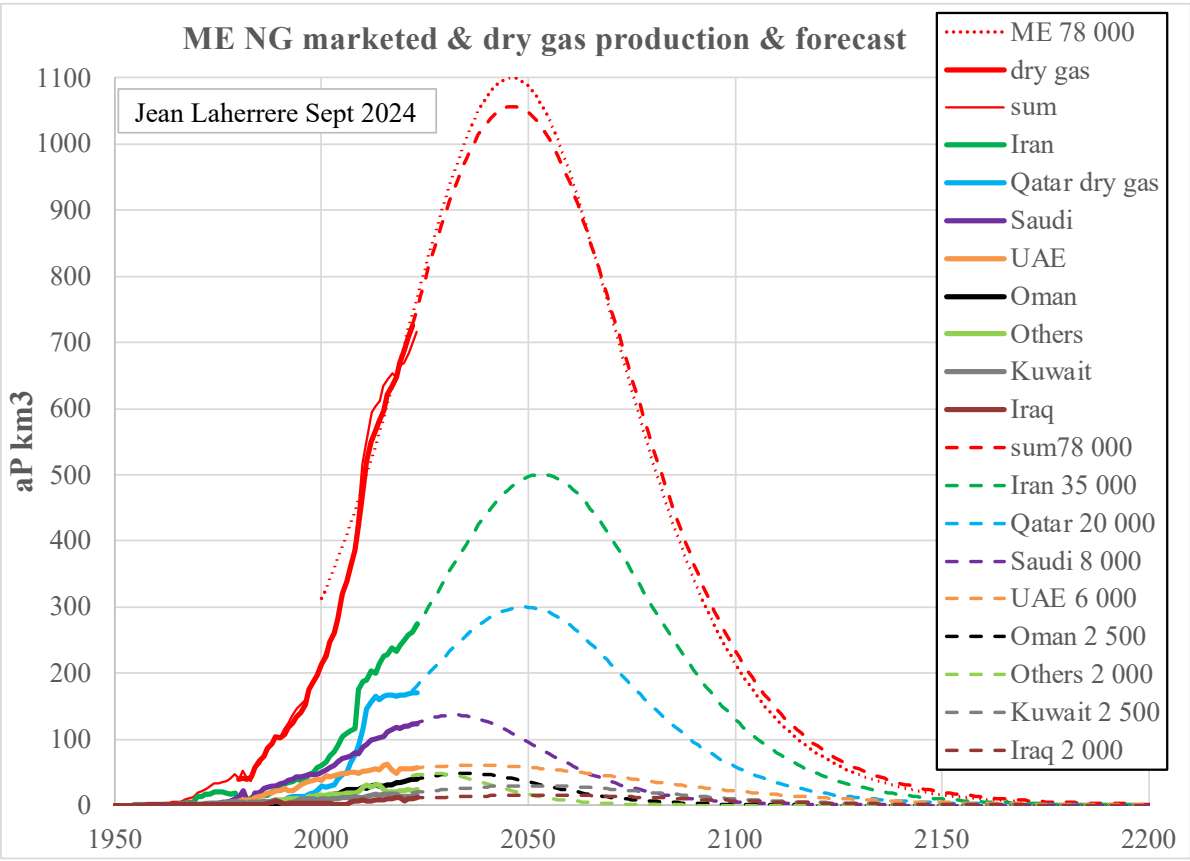
ME crude oil and NG productions are compared with the world





ME crude oil production is today about one third of the world production when ME NG is only one sixth

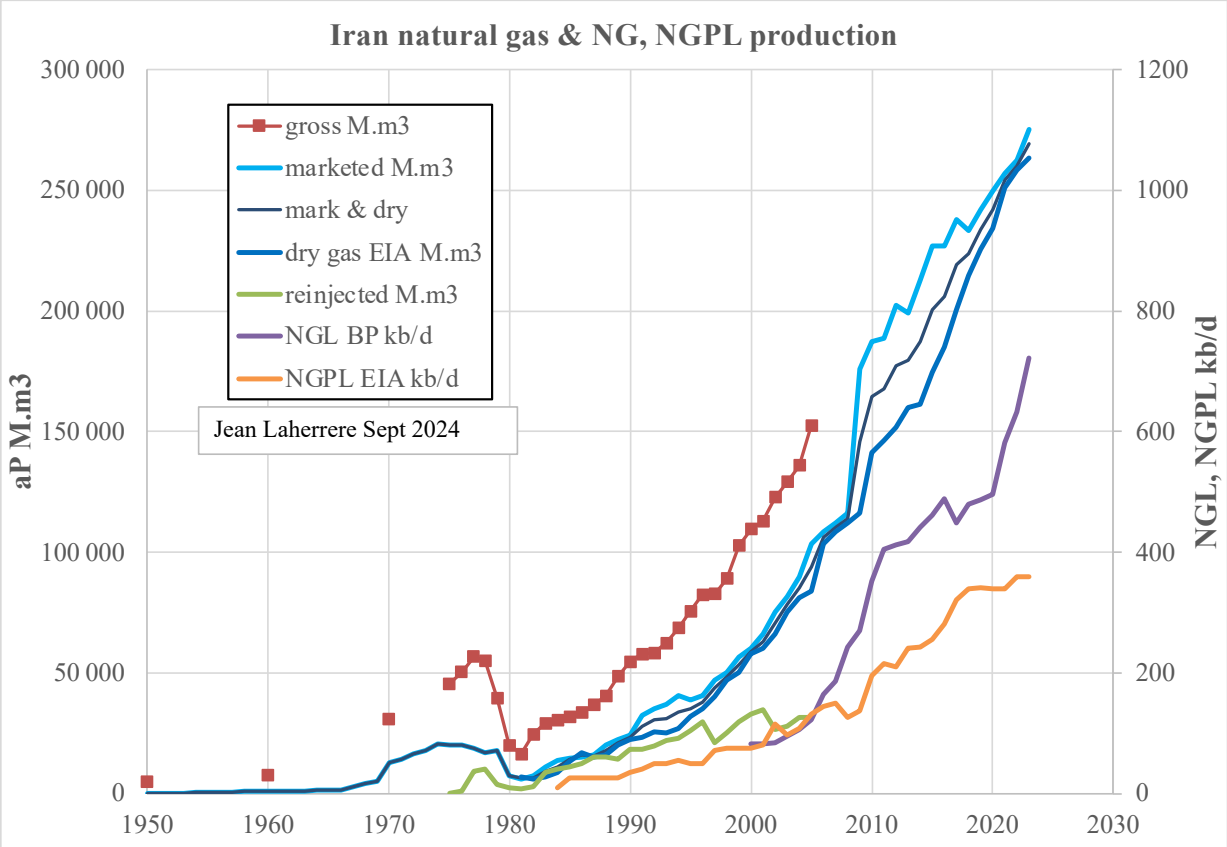
ME marketed or dry gas production (in G.m3 = km3) are extrapolated using an ultimate which is explained later



-Iran

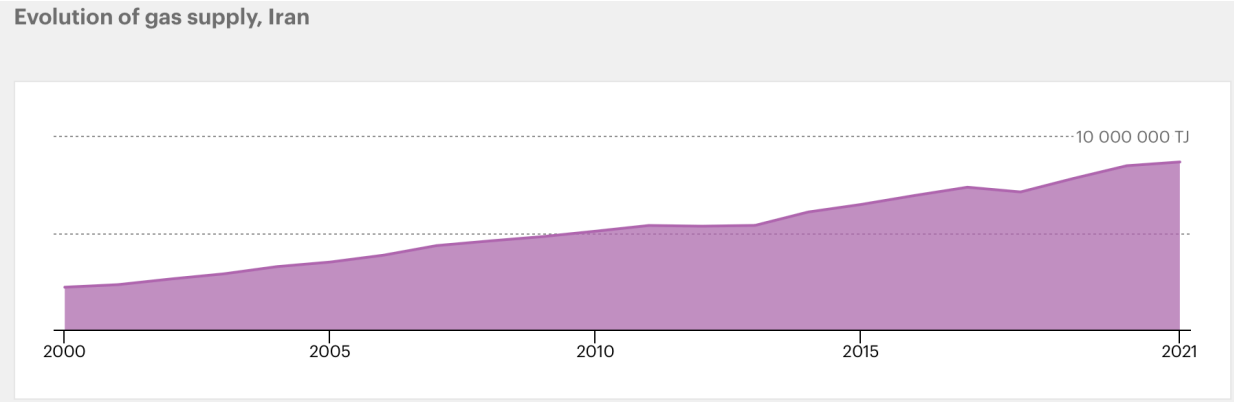
OPEC reports NG production data as marketed but not gross withdrawal as reinjected, only Cedigaz

Gross production and reinjected compared with marketed (OPEC) and dry gas (EIA) which should be very close: it is not the case in the 2010s: which is wrong?



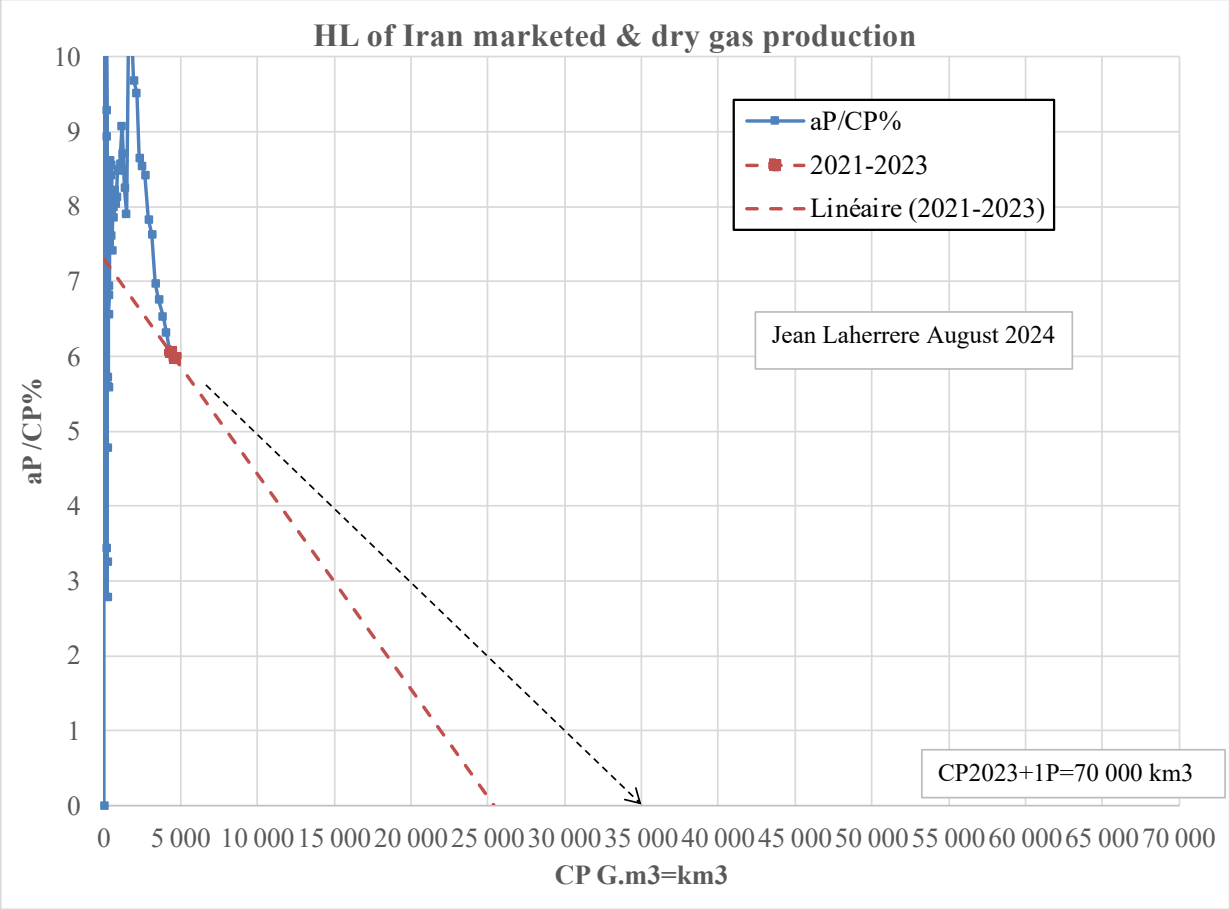
The correlation NGL and NGPL looks queer with the NG burst 2007-2009, but it depends when comparing marketed or dry gas: it is a pity that the data is so unreliable!

IEA reports NG production in energy = TJ

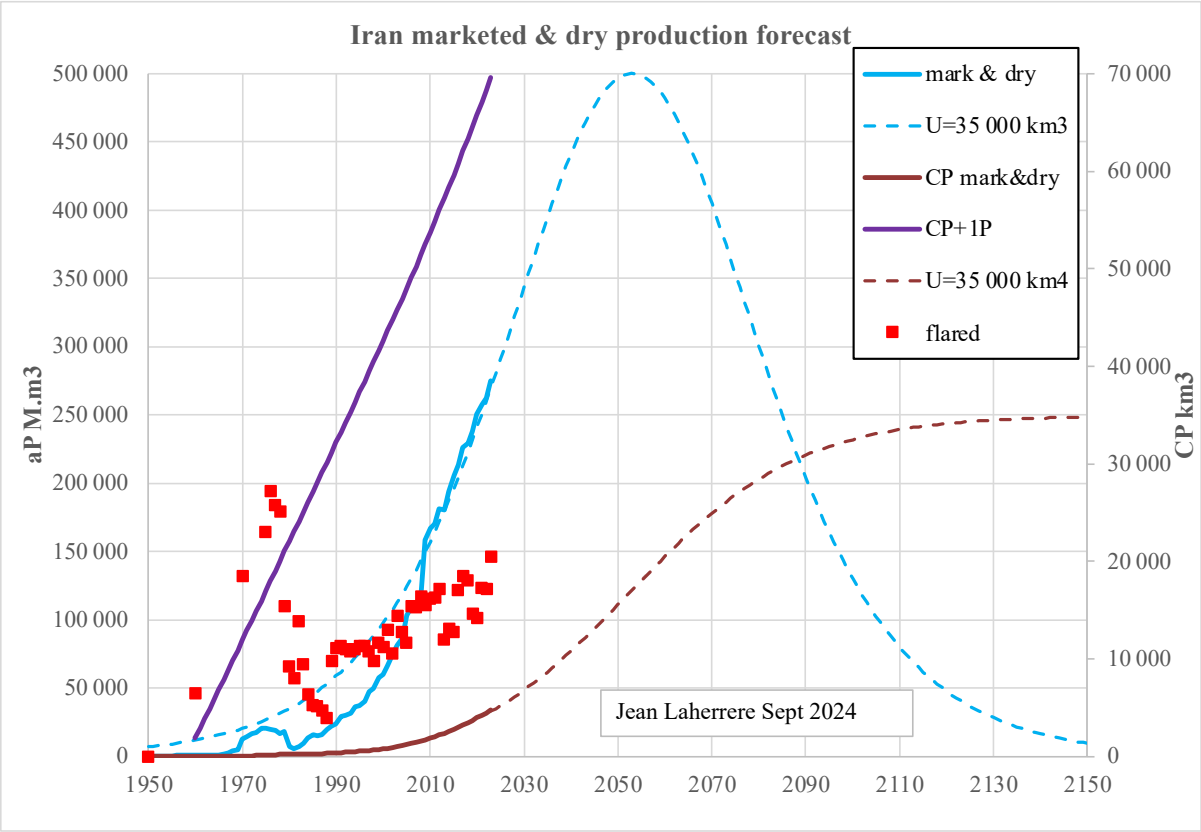


HL (Hubbert Linearization see Wikipedia) of Iran marketed & dry gas production trends for 2021-2023 towards 25 000 km3, but an ultimate of 30 000 km3 is chosen when CP2023+1P = 70 000 km3

km3, but an ultimate of 30 000 km3 is chosen when CP2023+1P = 70 000 km3



Iran marketed & dry production will peak likely around 2050 at 500 km3. Flaring was important in the 1970s, but still increasing!



In 2021 Makhdoum and Pouransari “Analytical Study of Iran Nonrenewable Energy Resources Using Hubbert Theory” forecasts (fig 9) a peak much higher of 750 km3 against my peak forecast of 500 km3

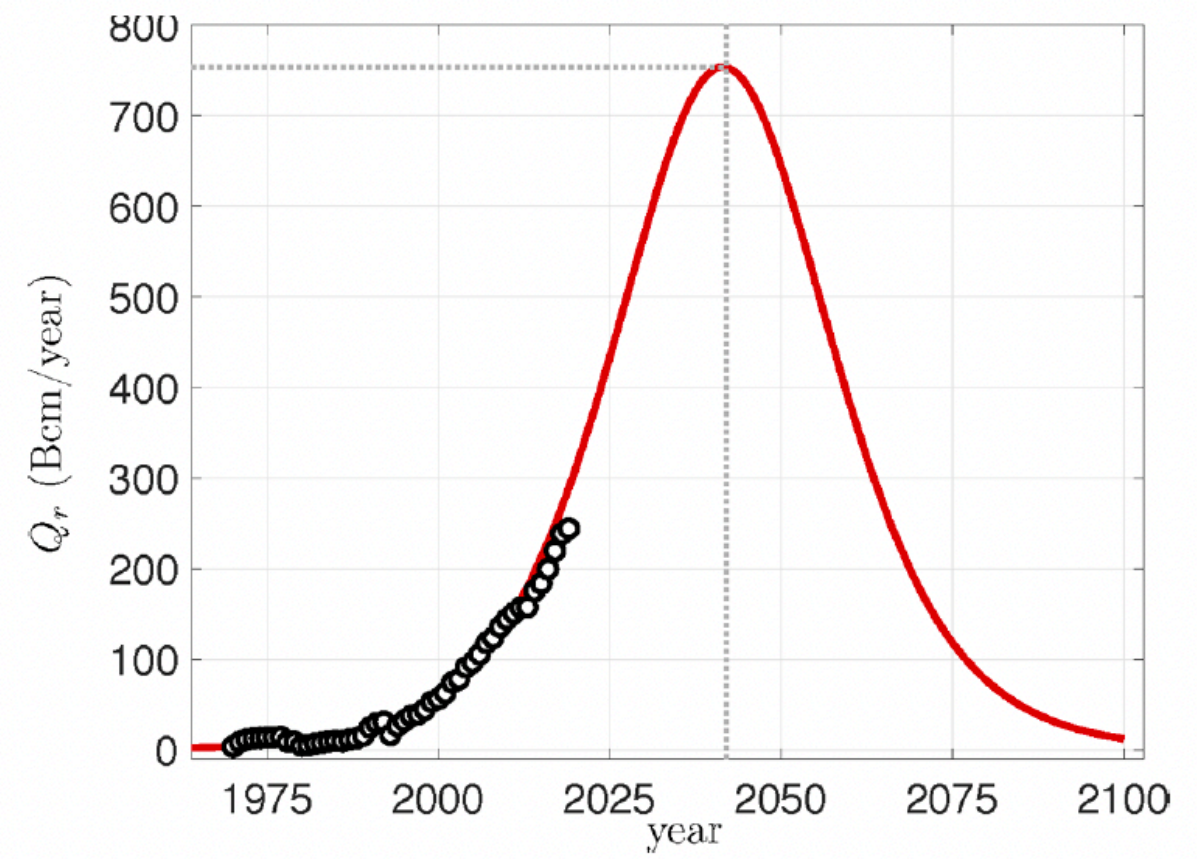
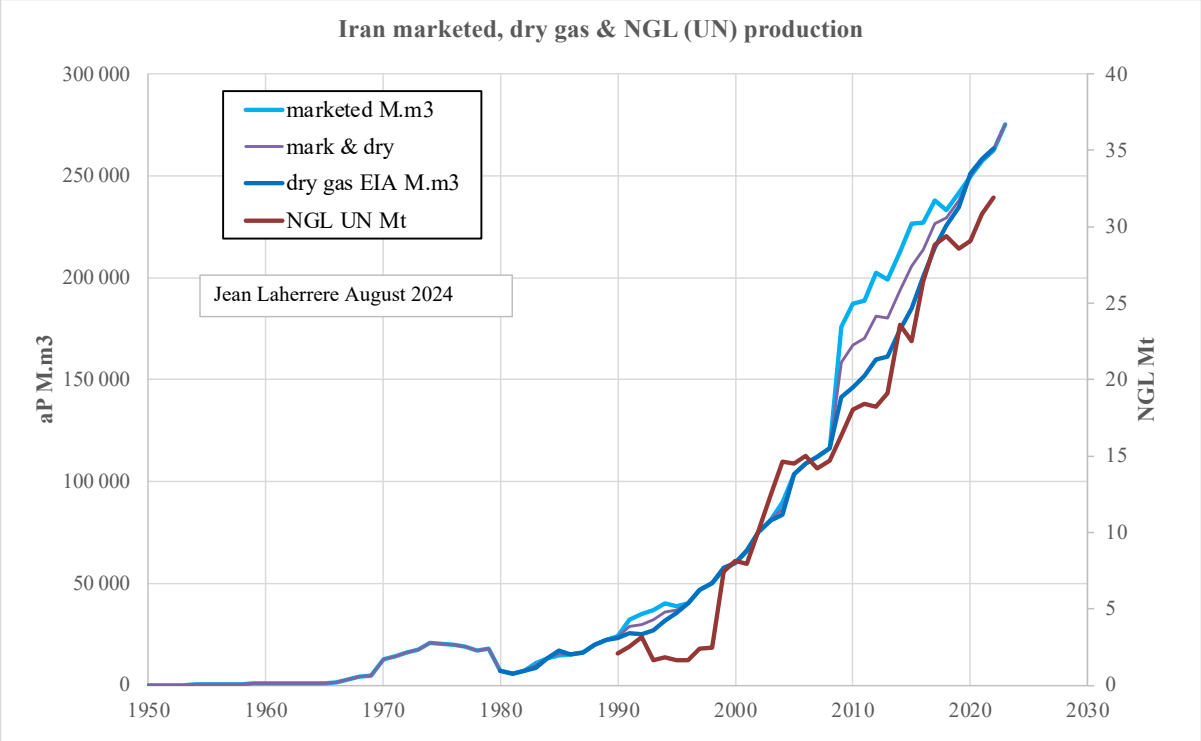


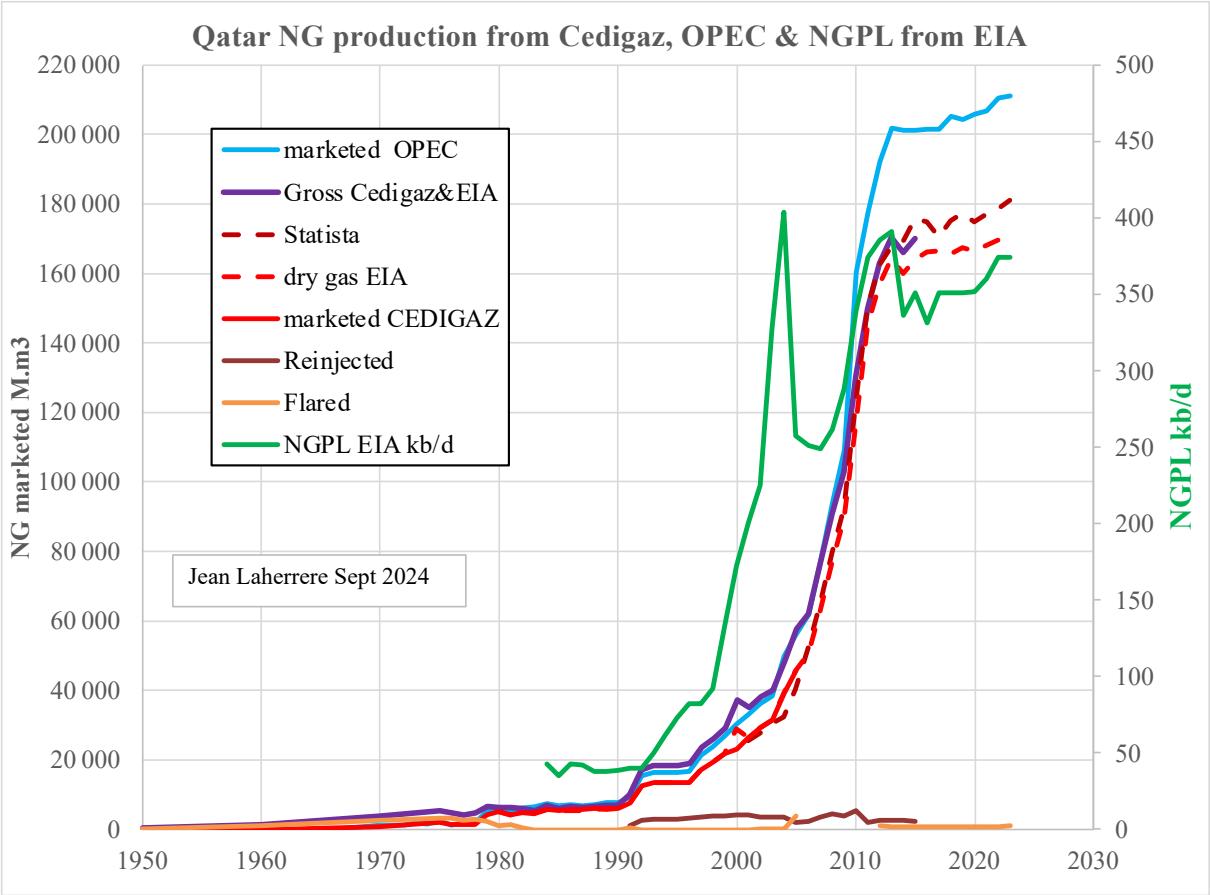
Figure 9. Iran natural gas production history and Hubbert predictions. −○−: Natural gas production rate history; red −: Hubbert prediction for Iran's natural gas production.

Iran NG marketed production in M.m3 is compared with NGL production from UN in Mt: the correlation looks fair



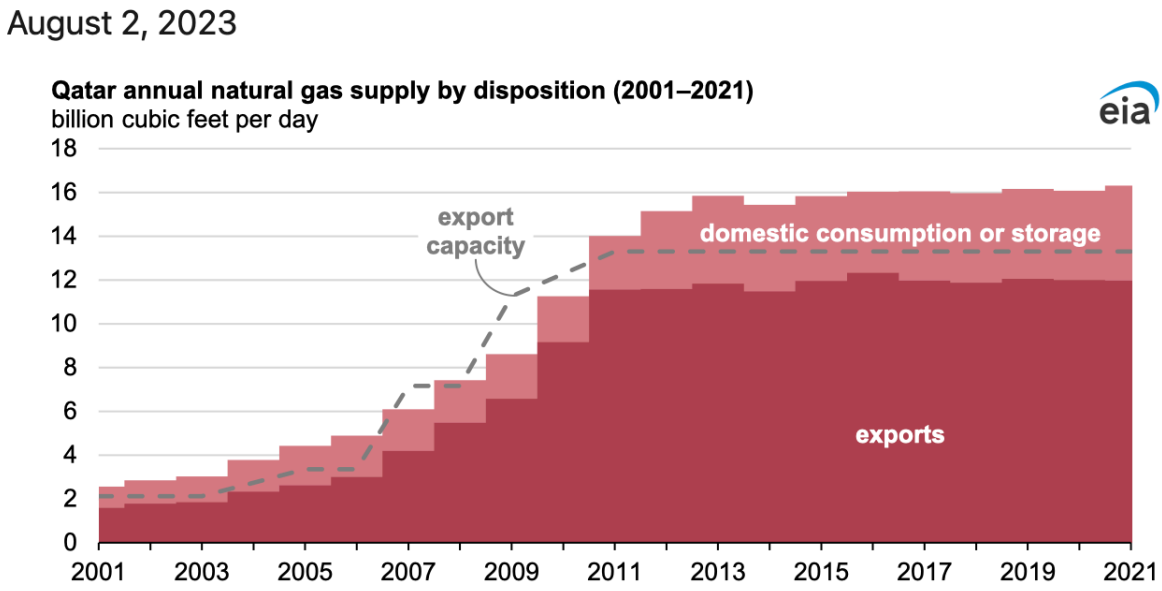
-Qatar

Qatar NG marketed production OPEC ASB data is wrong as much higher than gross EIA-Cedigaz data and with a value in 2022 of 211 km3 against 170 km3 for dry gas its equivalent OPEC ASB data is 24% too high. Statista is close to EIA. NG production is compared with EIA NGPL and the correlation is not good!

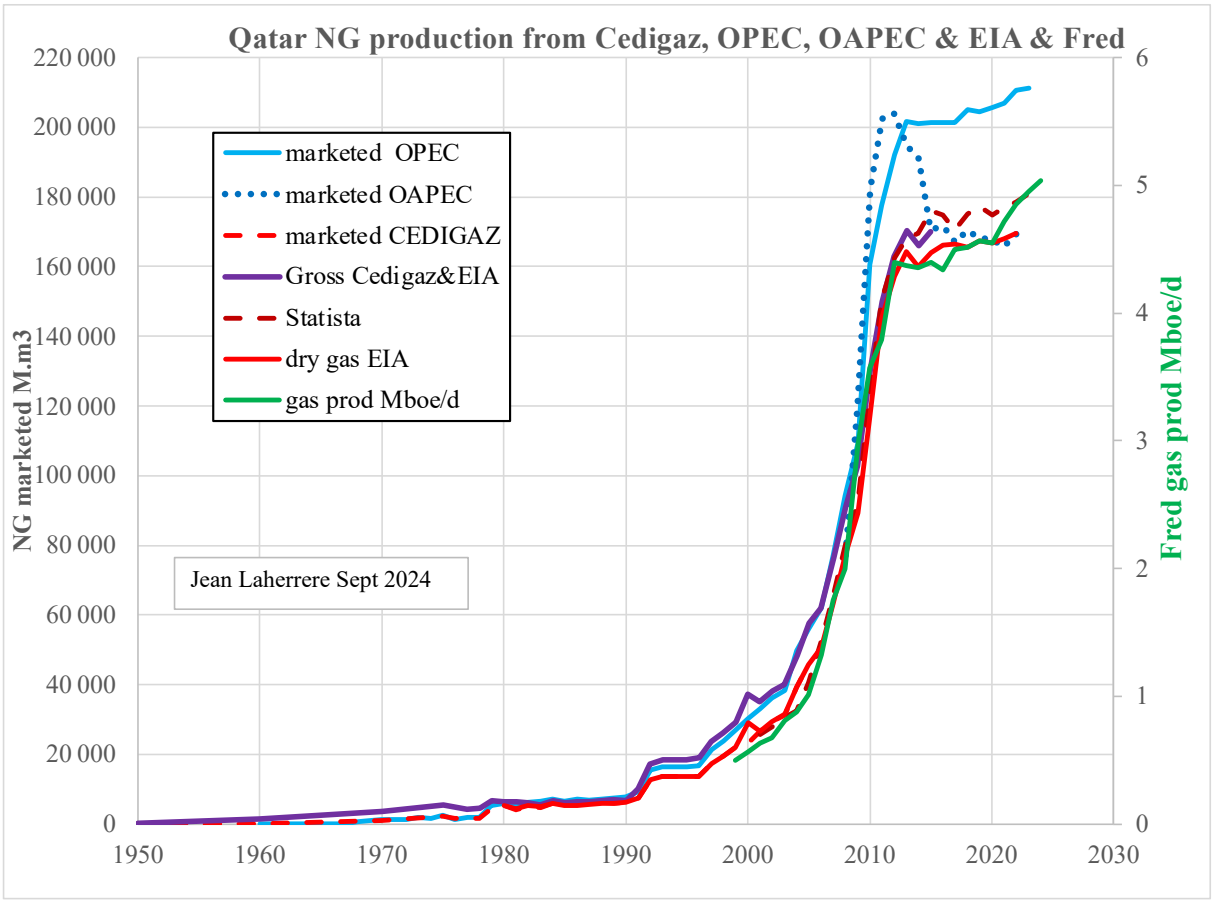


EIA NGL production displays a queer peak in 2003!

EIA displays Qatar NG production with a plateau 2013-2021 at 16 Gcf/d = 166 000 M.m3

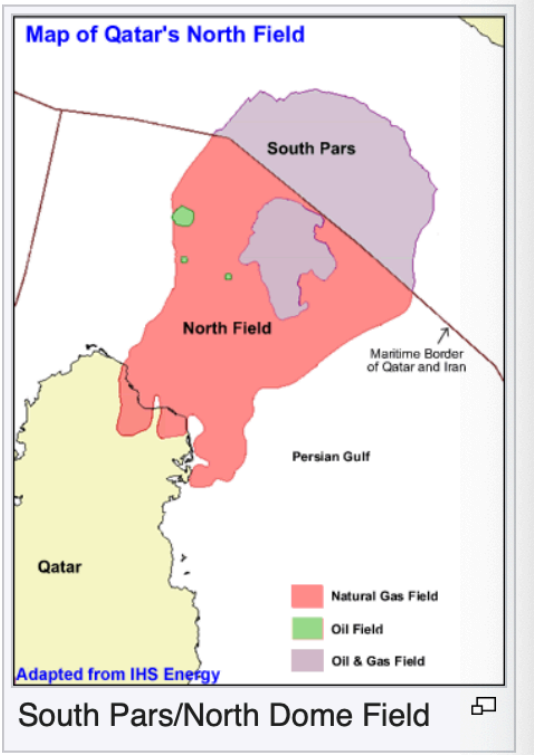


Fred https://fred.stlouisfed.org/series/QATNGDPMG reports Qatar gas production in boe/d, confirming the correlation with EIA dry gas and the rise 2020-2023.

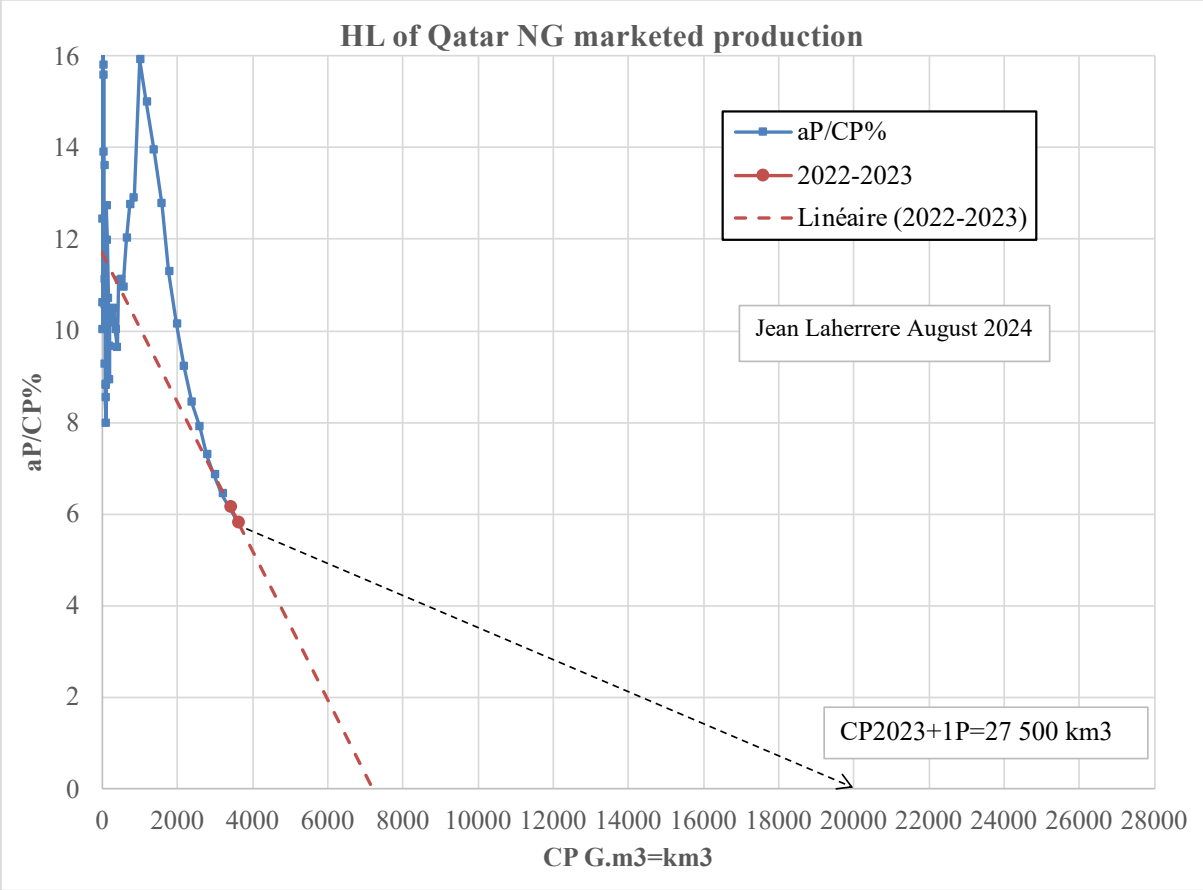


OPEC marketed data is too high when OAPEC marketed is close to OPEC data up to 2013 and completely different beyond being close to EIA dry gas

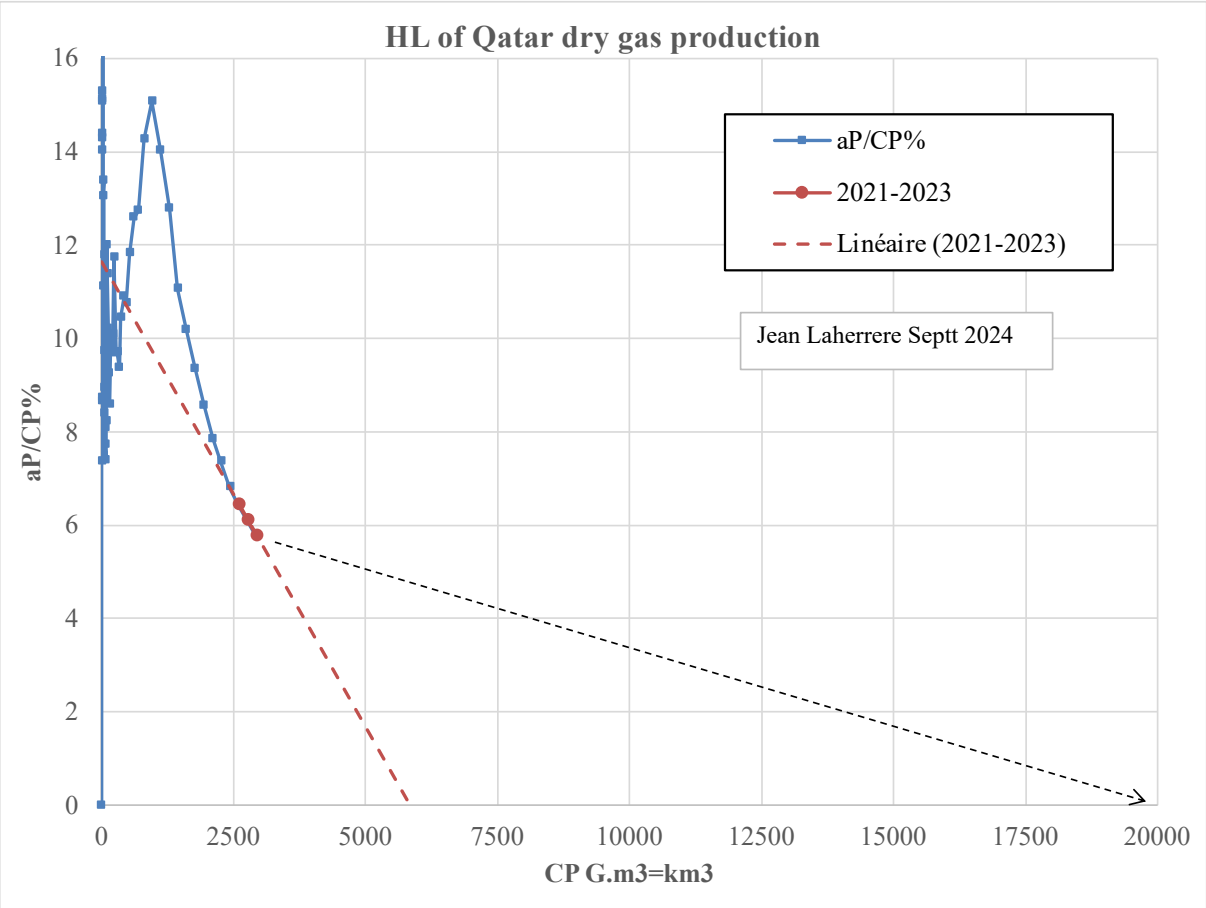
Qatar owns about two thirds of the world NG gas field = North dome (North field in Qatar and South Pars in Iran) which is by far the largest field in energy (1800 Tcf in place = 360 Gboe or more!) than the world oil field = Ghawar
(about 100 Gb): three times less!



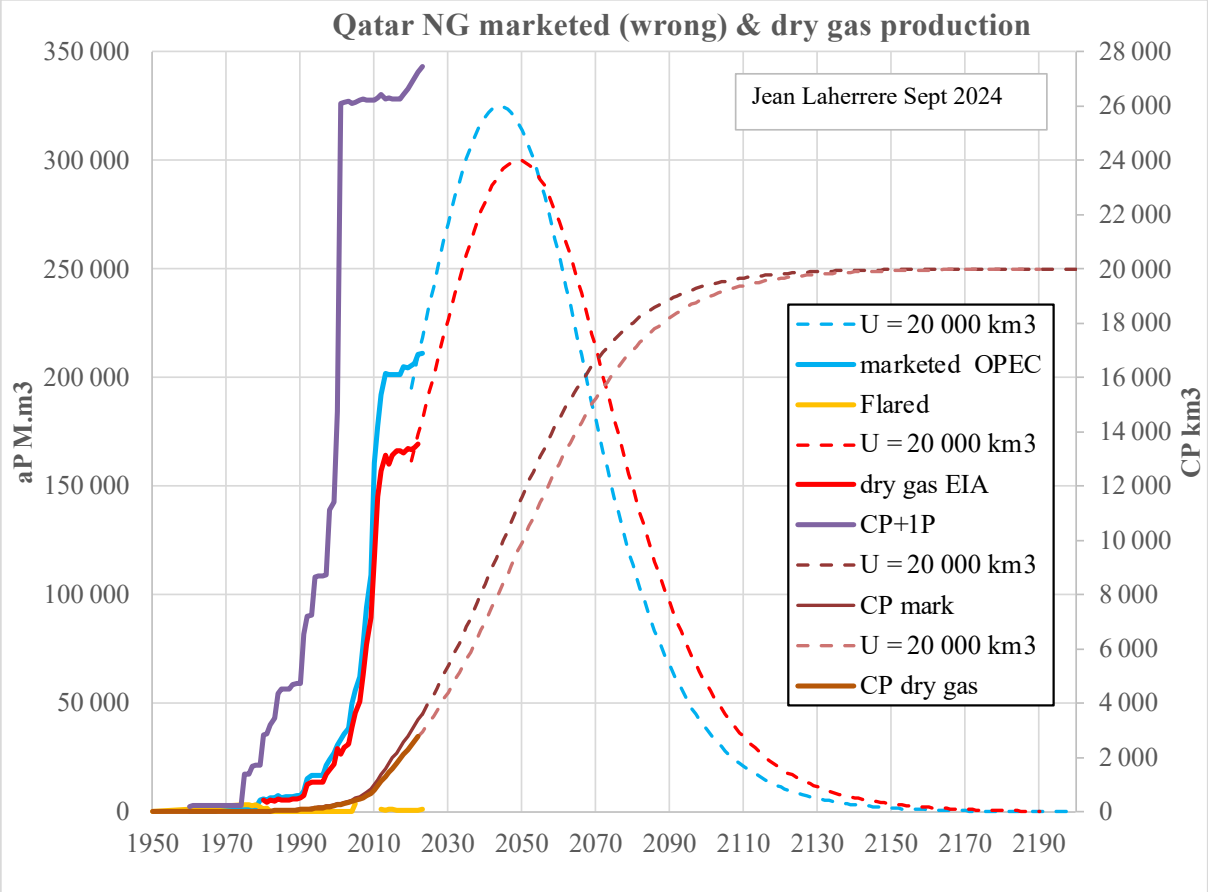
HL of Qatar NG marketed production (questionable OPEC ASB data !) trends for 2022-2023 towards 7000 km3, when CP20223+1P=27 500 km3. An ultimate of 20 000 km3 is chosen for a better fit with past production but new projects are coming, making the extrapolation of past production questionable!



HL of dry gas production (more reliable) trends for 2022+2023 towards 6000 km3 but an ultimate of 20 000 km3 is chosen



Qatar marketed ultimate is chosen at 20 000 km3 with a peak around 2040 at 320 km3.
Qatar dry gas ultimate is modelled with an ultimate of 20 000 km3 will peak around 2050 at 300 km3.



Flaring is negligible!

In 2021 Makhdoum and Pouransari *https://pubs.acs.org/10.1021/acsomega.1c04696* "Analytical Study of Iran Nonrenewable Energy Resources Using Hubbert Theory" forecast (fig 12) a peak of 800 km3 against my forecast of 320 km3: quite a difference!
Their NG data in 2020 is about 180 Gcm between OPEC and EIA data

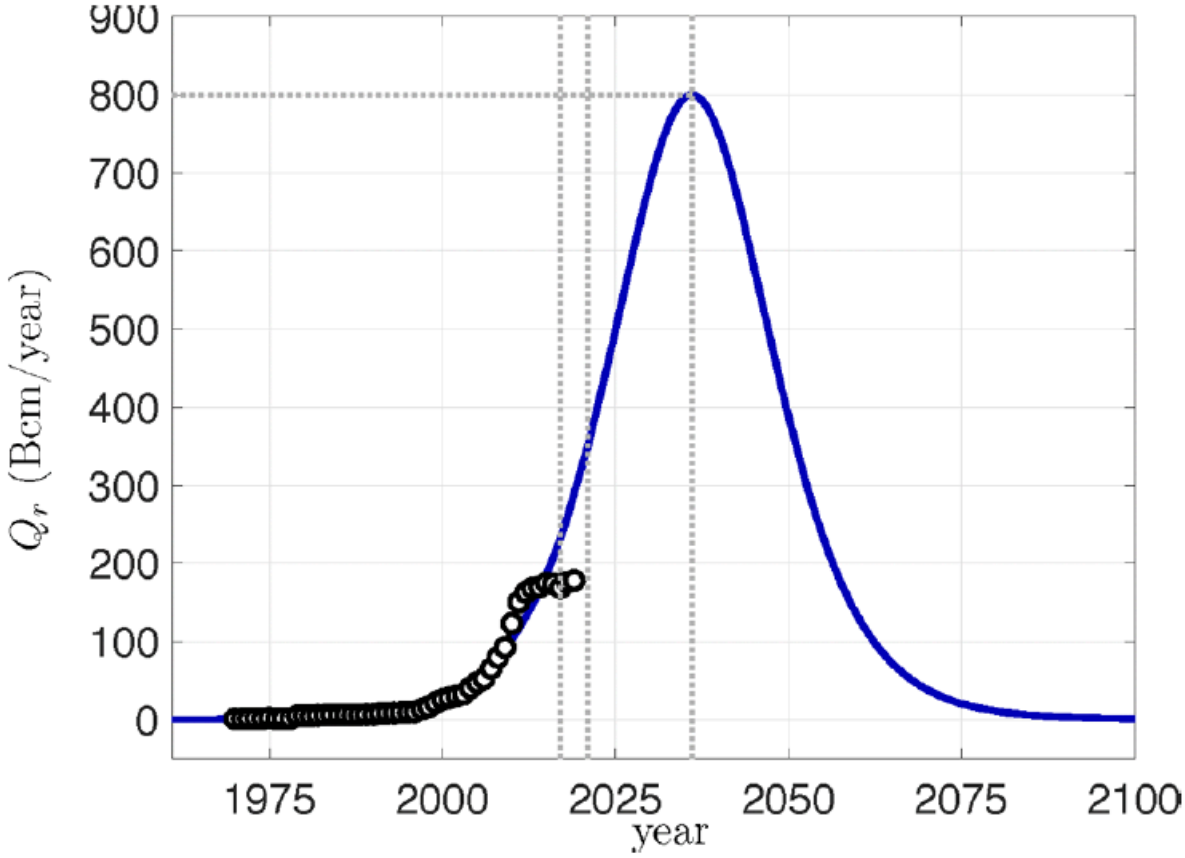


Figure 12. Qatar natural gas production history and Hubbert predictions. −O−: Natural gas production rate history; blue —: Hubbert prediction for Qatar natural gas production.

Statista forecasts a production of 325 km3 in 2050, which is about my likely forecast for marketed

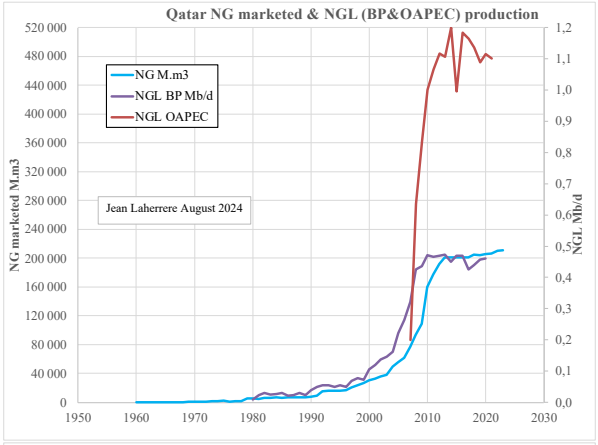
It is hard to estimate future production from past production data when many new developments are projected!
There are several NG projects for the period 2024-2029 adding a total of production of 610 Mcf/d = 6.3 km3 or 4%!

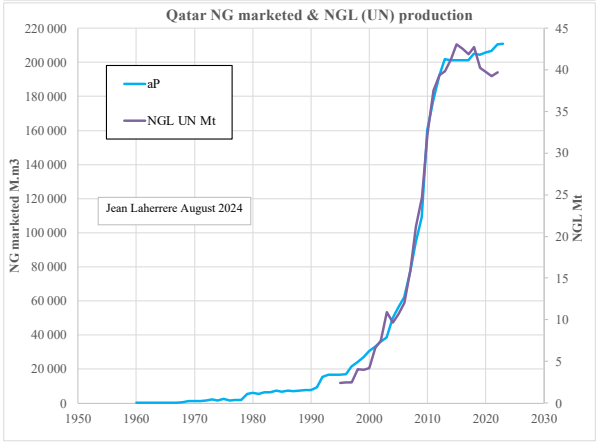
Largest natural gas fields under development in Qatar (2024 – 2028)

Field name	Constituent entity	Operator	Participants	Status	Start year	Natural gas production (mmcfd)
North Field East	Arabian Gulf	QatarEnergy	Exxon Mobil; ConocoPhillips; Eni; Shell; QatarEnergy; TotalEnergies; China Petrochemical; China National Petroleum	Planned	2026	334,143
North Field West	Arabian Gulf	QatarEnergy	QatarEnergy	Announced	2028	139,733
North Field South	Arabian Gulf	QatarEnergy	Shell; QatarEnergy; TotalEnergies; ConocoPhillips	Planned	2027	139,475

Source: GlobalData Oil & Gas Intelligence Center

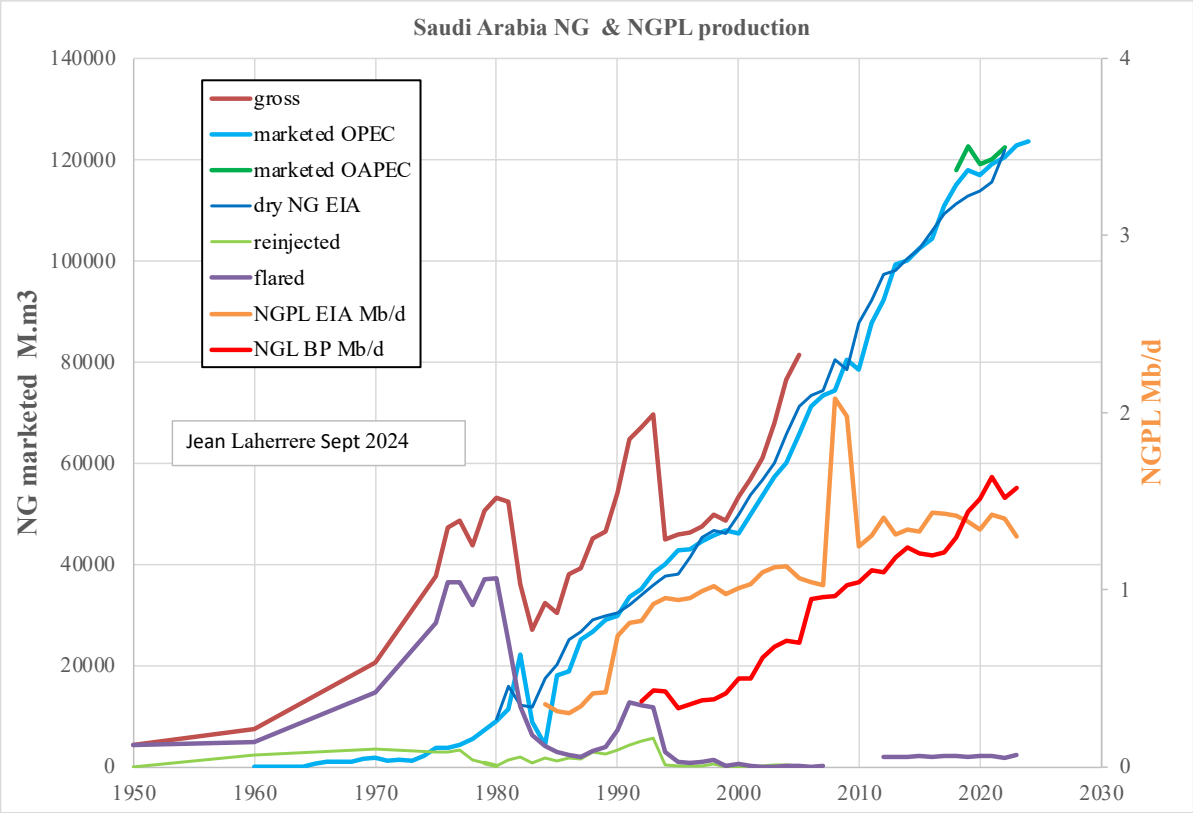
Qatar NG production is compared with NGL (BP, OAPEC (Organization of Arab Petroleum Exporting Countries) and UN) production and the correlation looks fair for BP, but bad for OAPEC





-Saudi Arabia

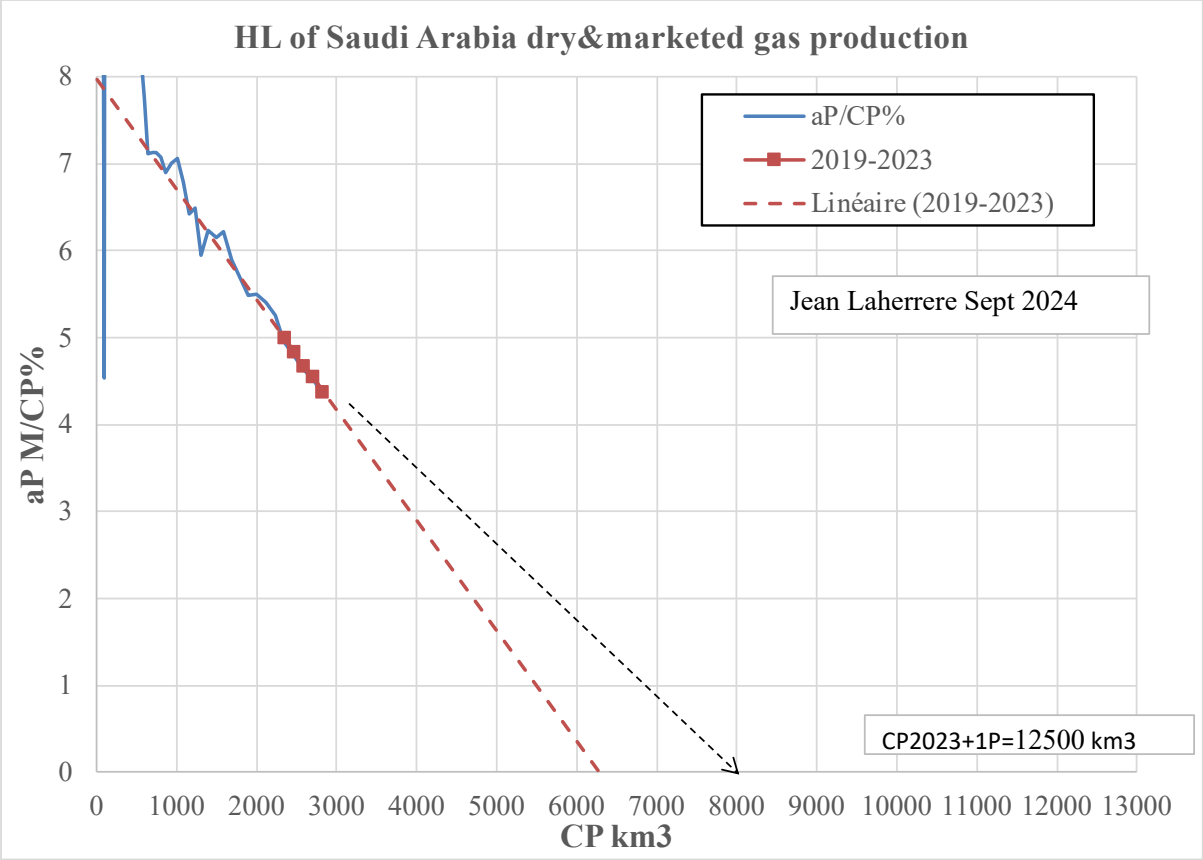
Saudi Arabia NG production (from Cedigaz) shows that flaring was important before 1995



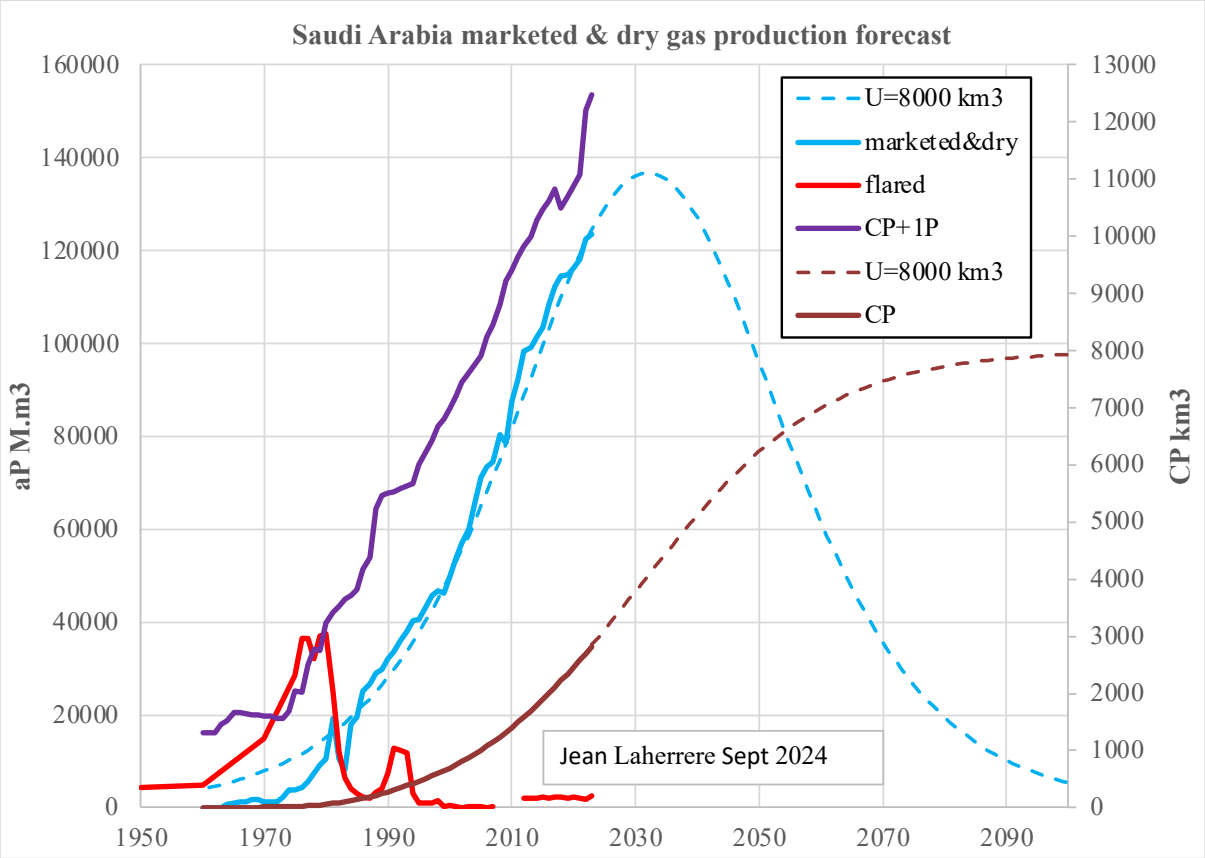
NGL BP data are contrary with NGPL EIA which should be lower, meaning that these data are unreliable

Only marketed OPEC data (close to EIA dry gas) is reliable. Saudi marketed & dry gas production is, taken

HL of Saudi Arabia NG marketed production trends for the period 2019-2023 towards 6500 km3 but CP2023+1P = 12500 km3



An ultimate of 8000 km3 was chosen giving a peak in 2032 at 137 km3.
Flaring was important in the 1970s!

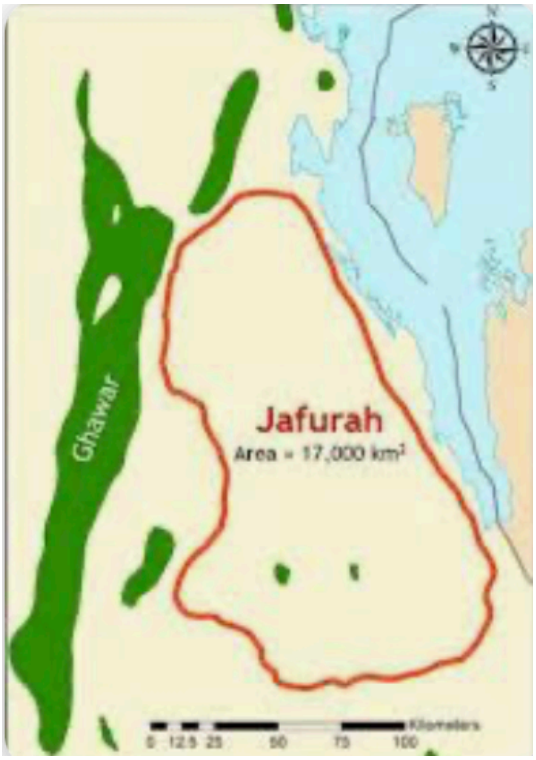


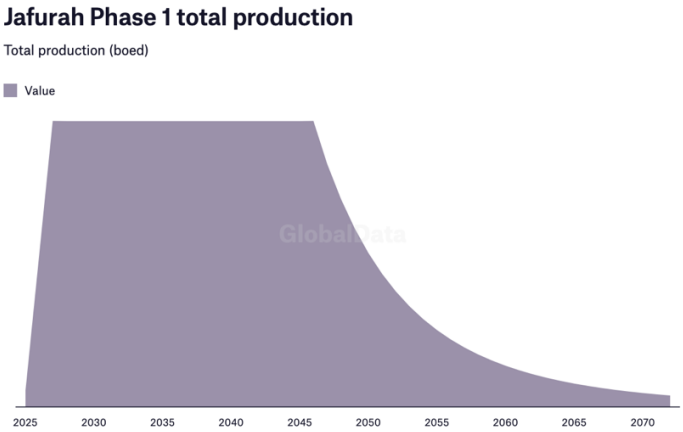
My forecast is maybe pessimistic as Saudi Arabia has discovered a huge (170 km long and 100 km wide: >200 Tcf in place) unconventional gas field = Jafurah

Largest natural gas fields under development in Saudi Arabia (2024 – 2028)

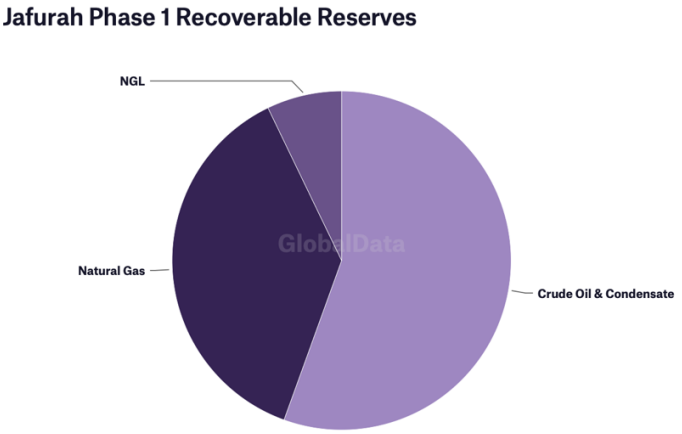
Field name	Constituent entity	Operator	Participants	Status	Start year	Natural gas production (mmcfd)
Jafurah Phase 2	Eastern Province	Saudi Arabian Oil	Saudi Arabian Oil	Announced	2027	77,976
Jafurah Phase 1	Eastern Province	Saudi Arabian Oil	Saudi Arabian Oil	Planned	2025	10,402

Source: GlobalData Oil & Gas Intelligence Center





Source: GlobalData Oil & Gas Intelligence Center

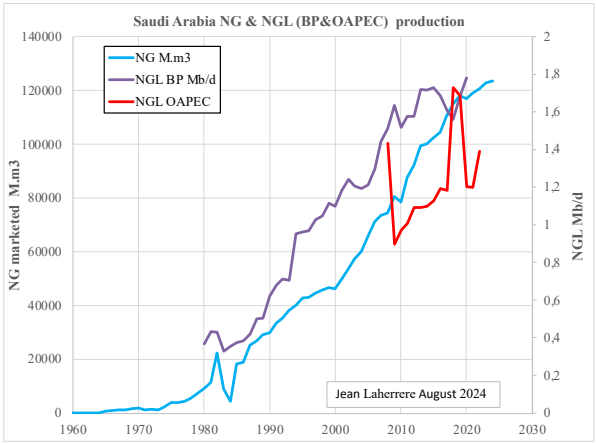


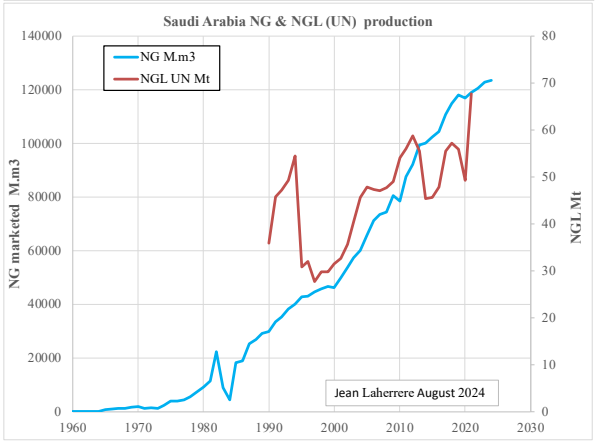
Source: GlobalData Oil & Gas Intelligence Center

But Saudi Arabia lies on its oil reserves, reporting remaining proven oil reserves about 260 Gb for the last 30 years,

meaning that for each last 30 years annual oil discoveries were about the same as annual production: it is impossible on such a long period!

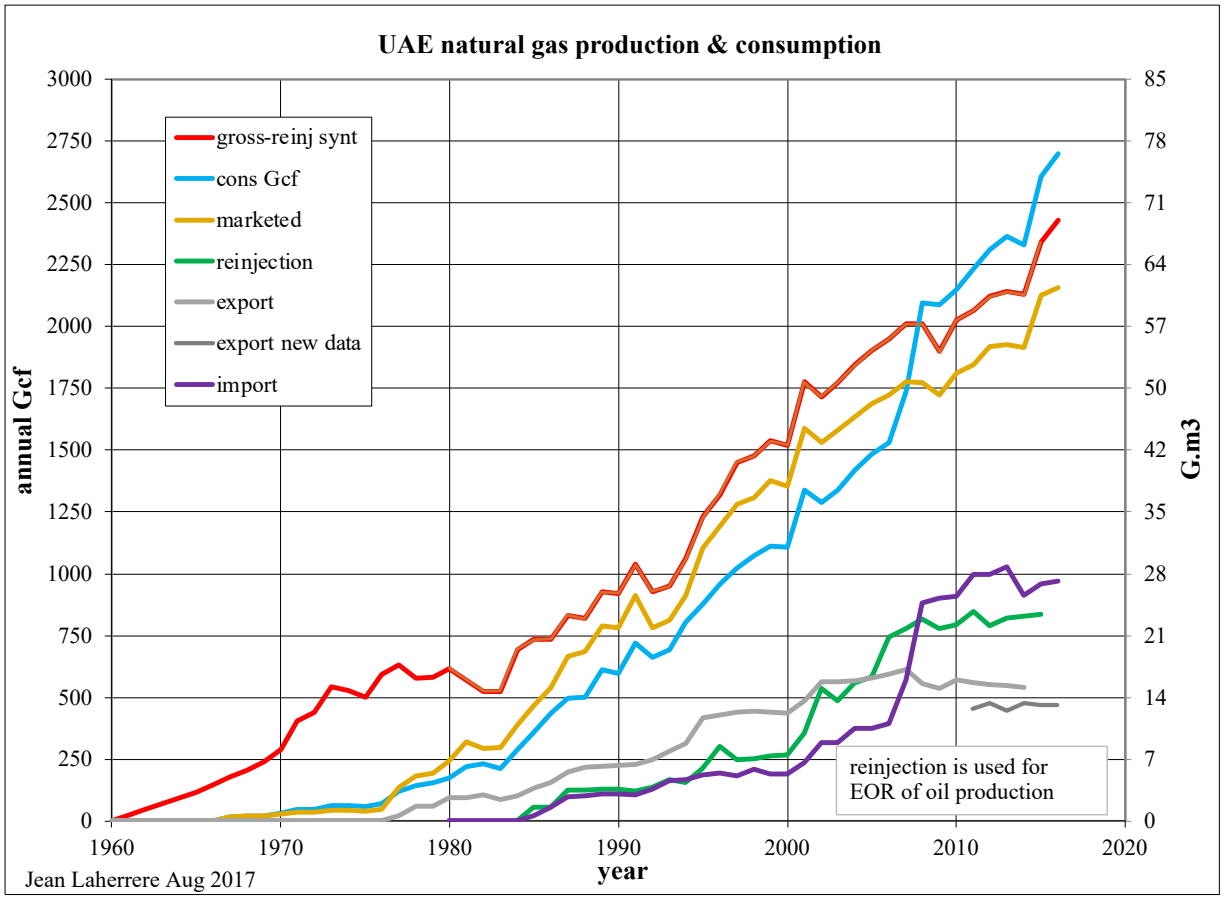
Saudi NG production is compared with NGL production from BP (fair), from OAPEC (very poor) and from UN very poor)



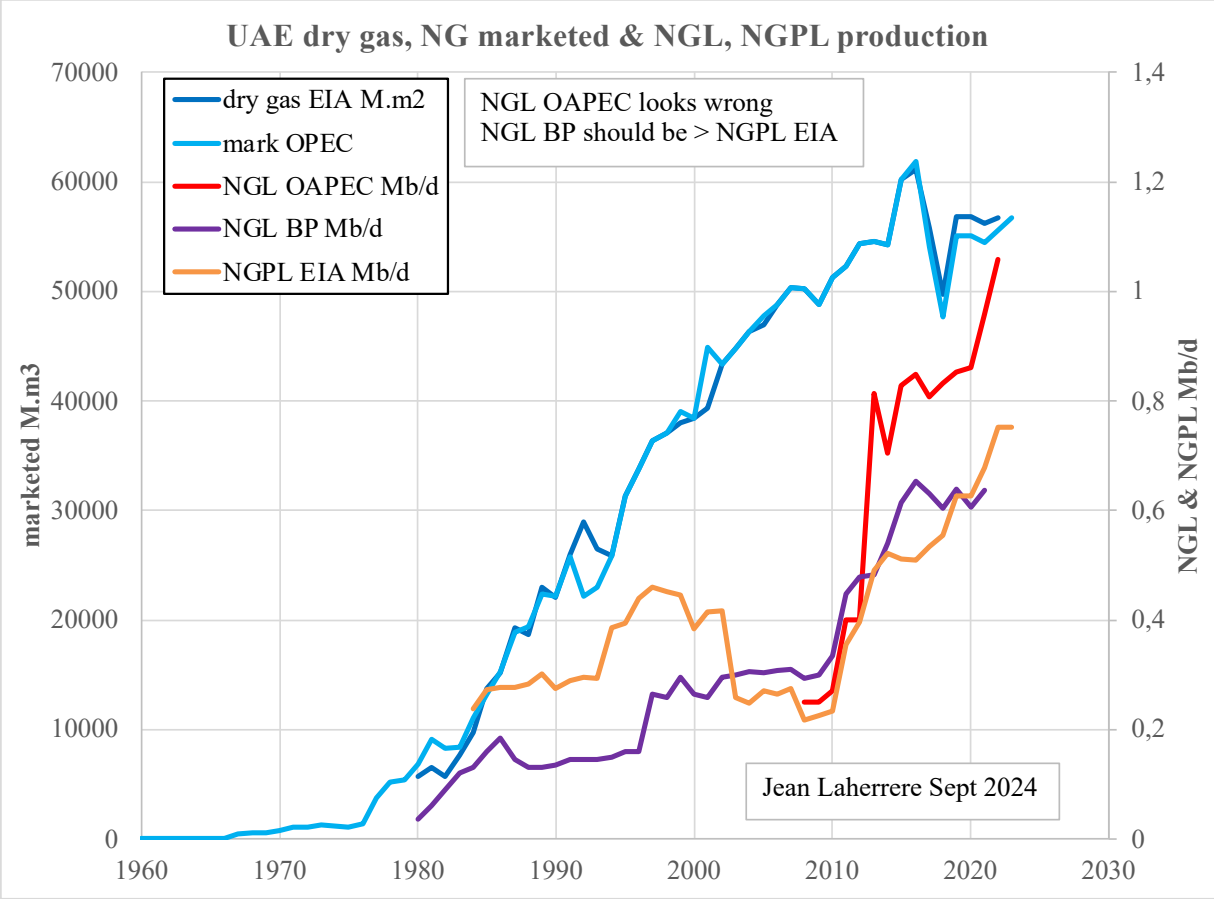


-UAE

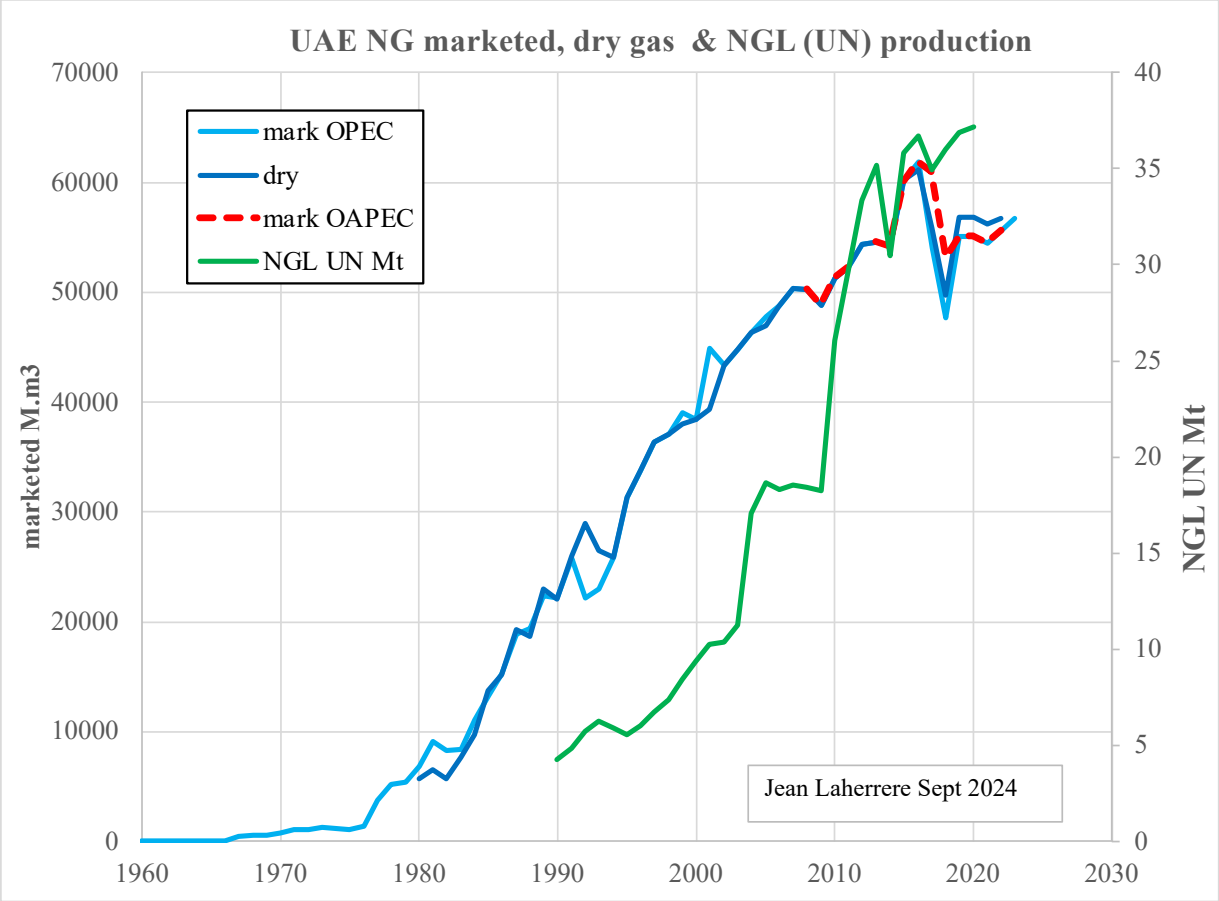
UAE NG data is poor, being the sum of several emirates This graph of 2017



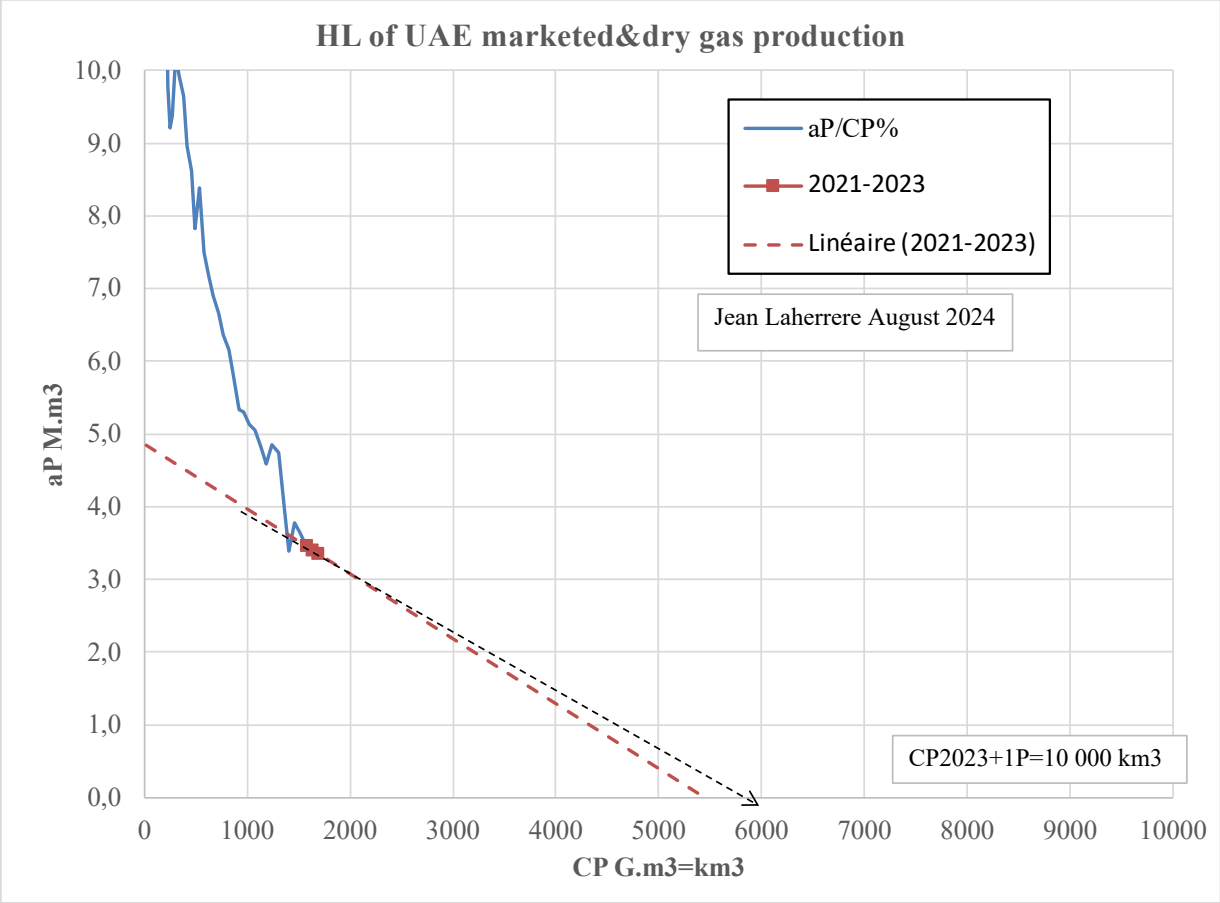
UAE dry gas from EIA is close to OPEC marketed, when OAPEC NGL looks wrong!
NGL BP should be higher than NGPL EIA: one is wrong: likely EIA



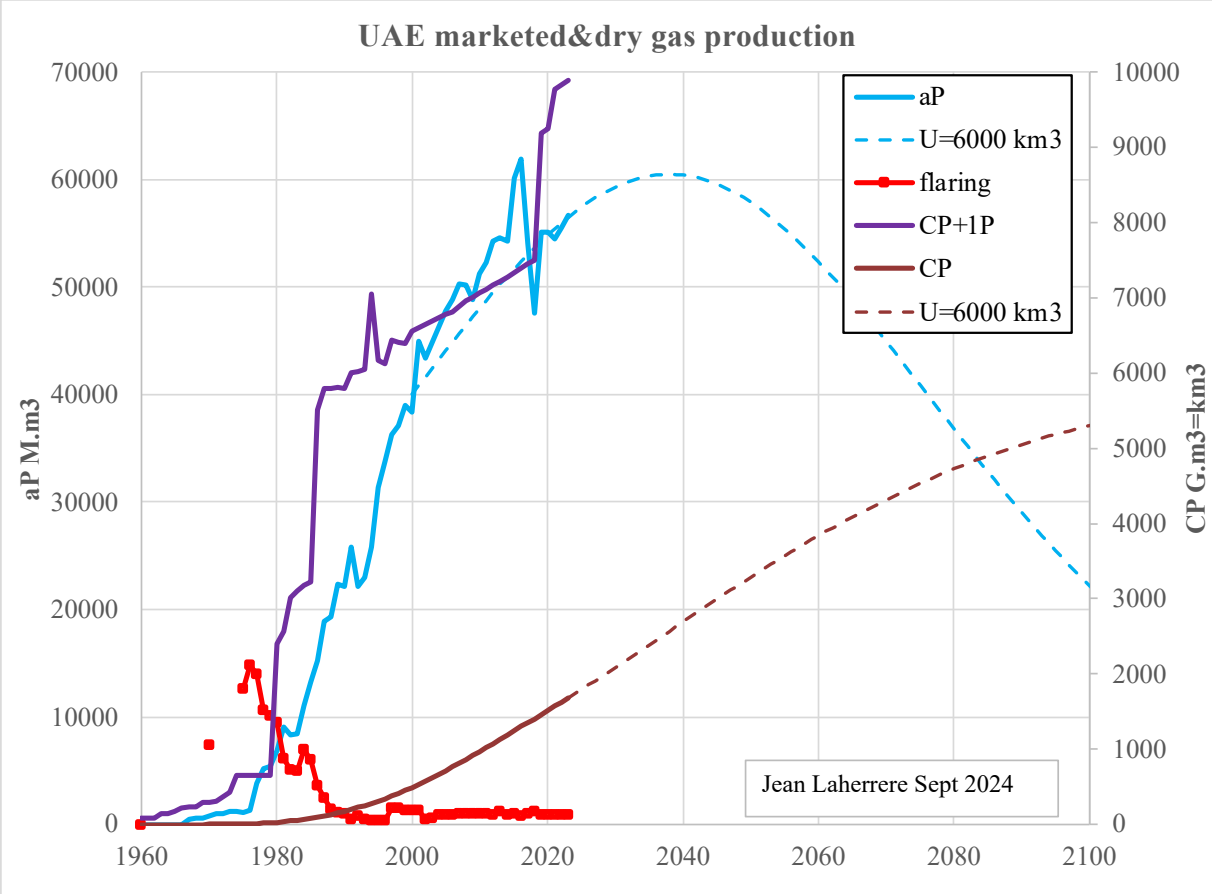
Marketed & dry gas are close and are compared with NG: the correlation is very poor!



HL of UAE marketed&dry production trends for the period 2021-2023 towards 5500 km3, when CP2023+1P = 10 000 km3



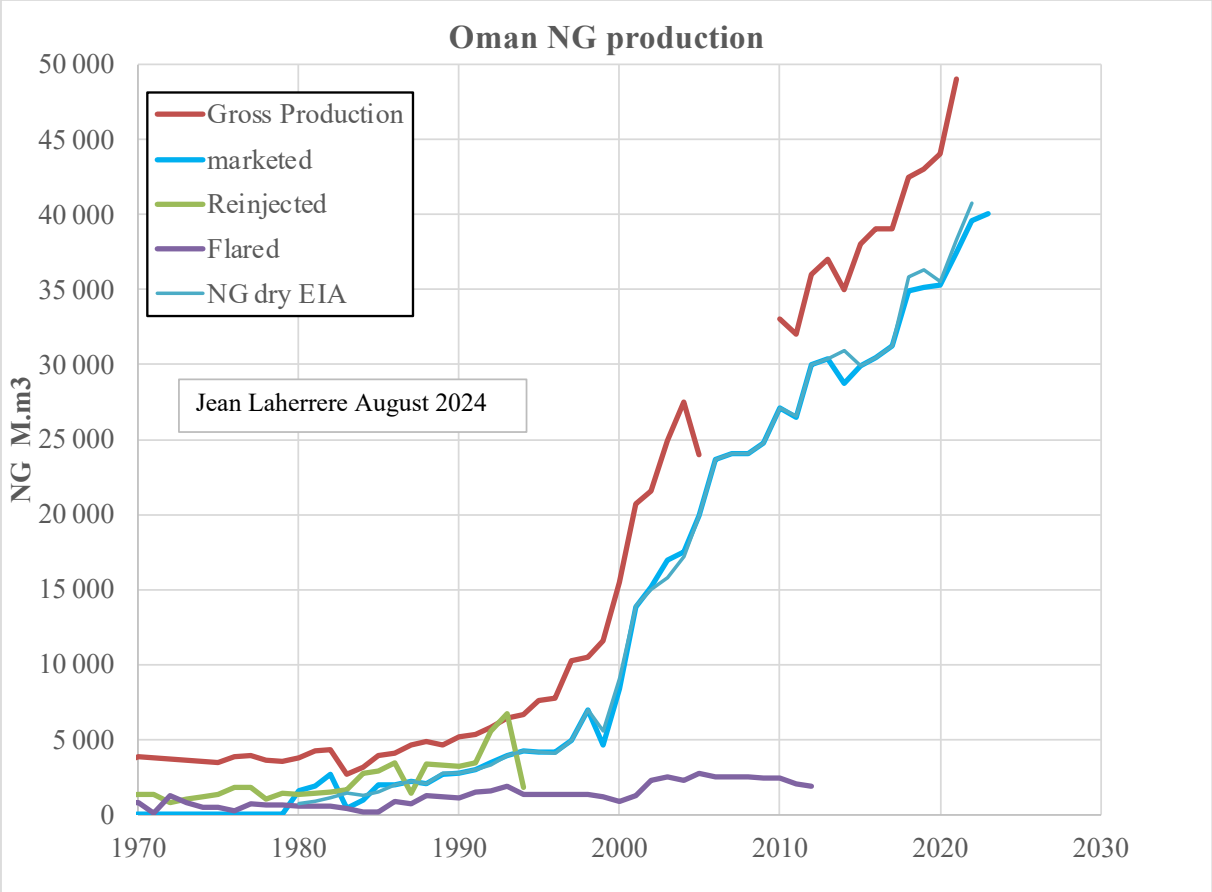
An ultimate of 6000 km3 is chosen giving a peak about 2038 at 60 km3.
The chosen ultimate is quite less than CP+1P = 60%!



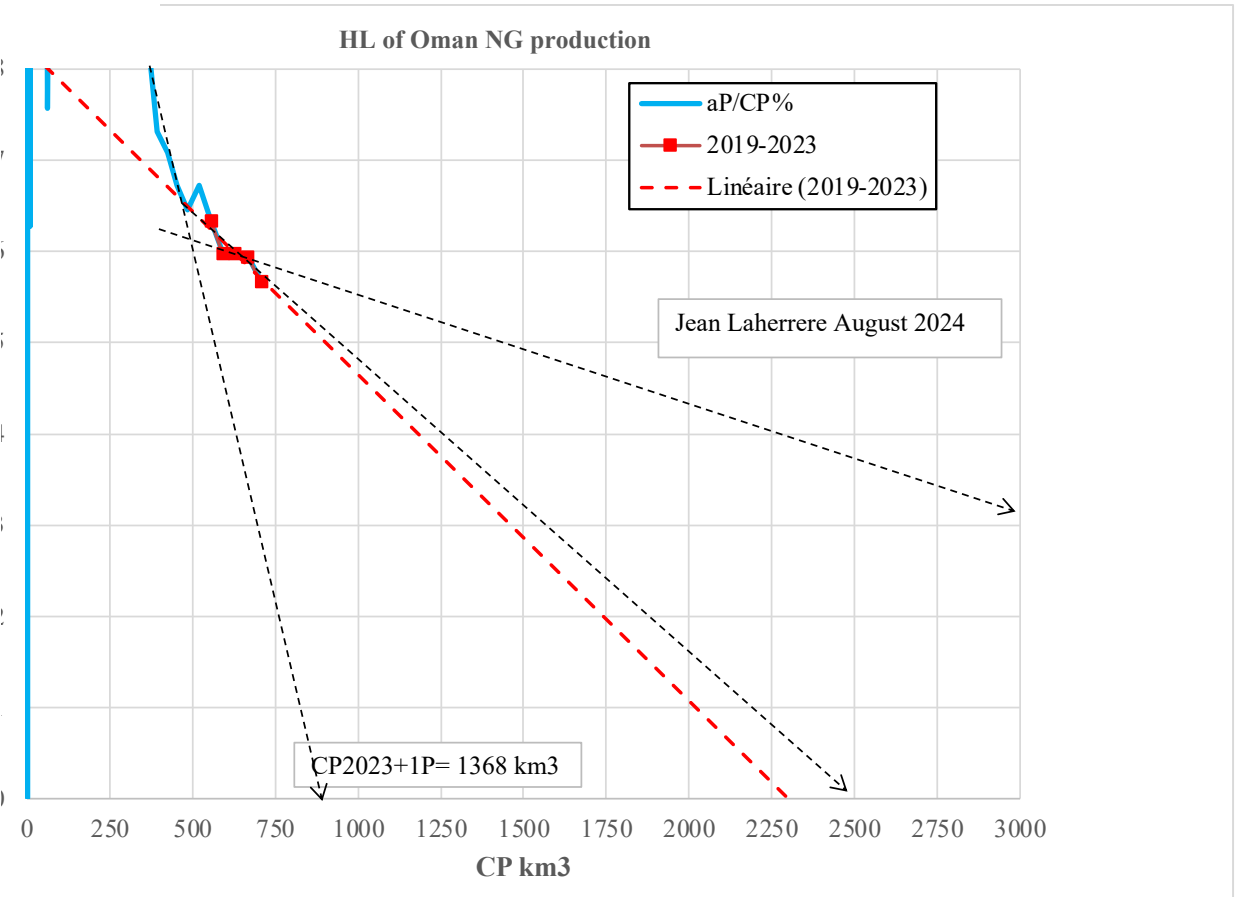
Flaring was important in the 1970s, negligible today. The chosen ultimate is quite less than CP+1P = 60%!

-Oman

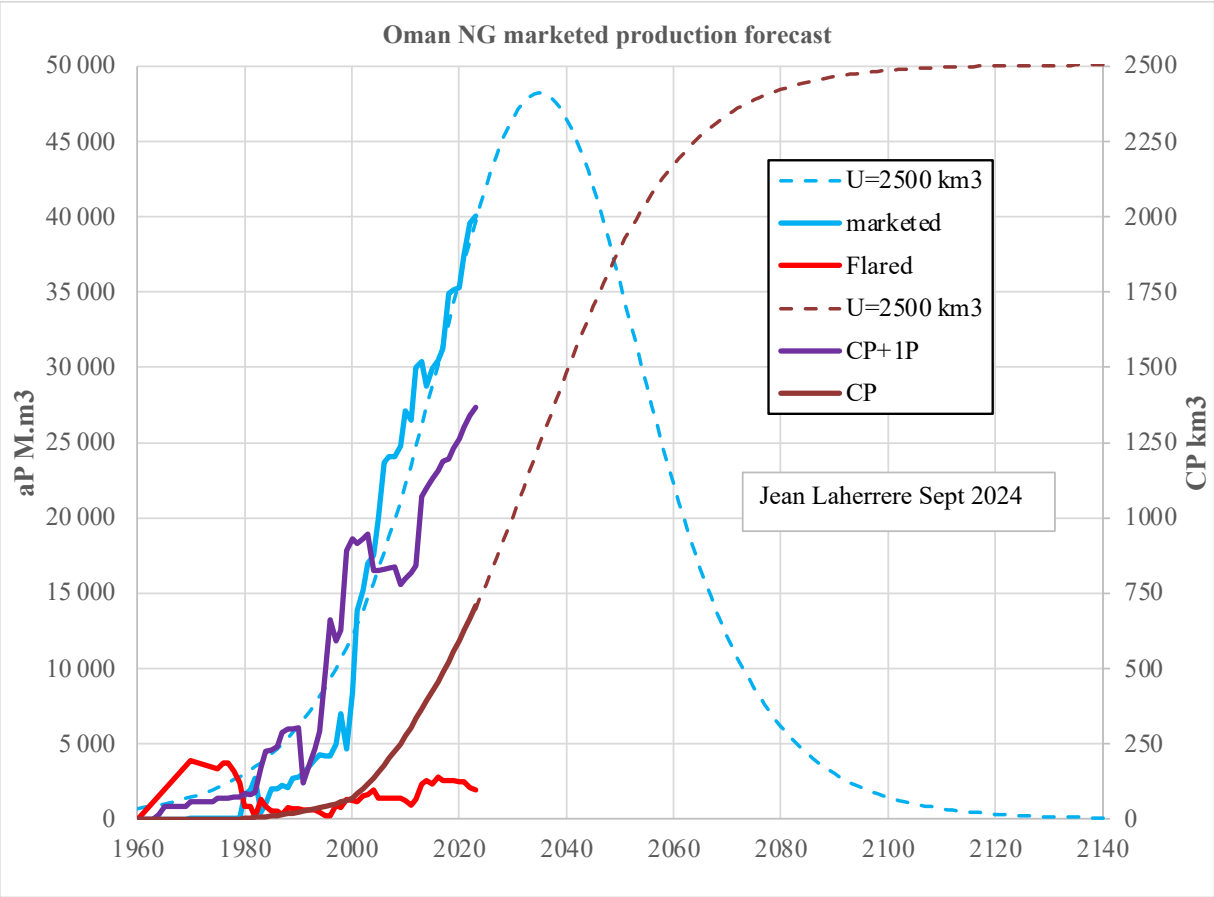
Oman NG production data shows that OPEC marketed is close to EIA dry gas,



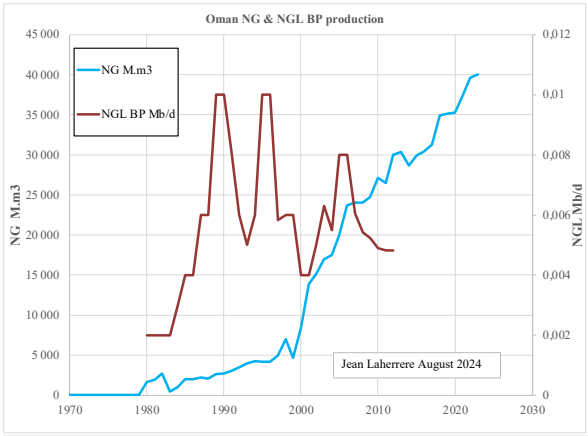
HL of Oman NG marketed production trends for the period 2019-2023 towards 2300 km3

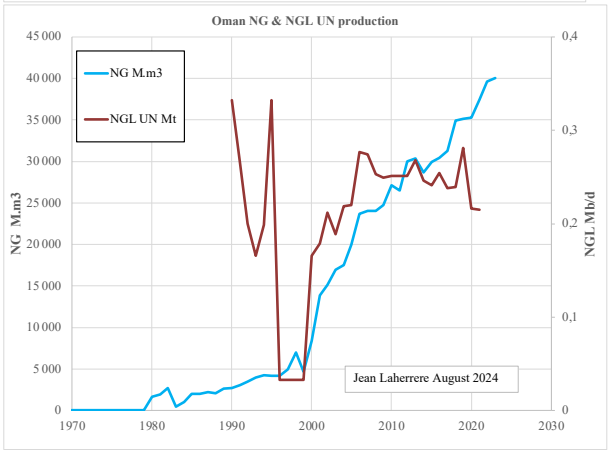


An ultimate of 2500 km3 is chosen giving a peak in 2032 at 46 km3.
This ultimate is quite lower than CP+1P, contrary to the rest of ME. But oil production in Oman was dominated by PDO run mainly by Shell good practices! 1P is the minimum (90% probability) reserves and it is 2P = proven + probable (50%) which should be considered



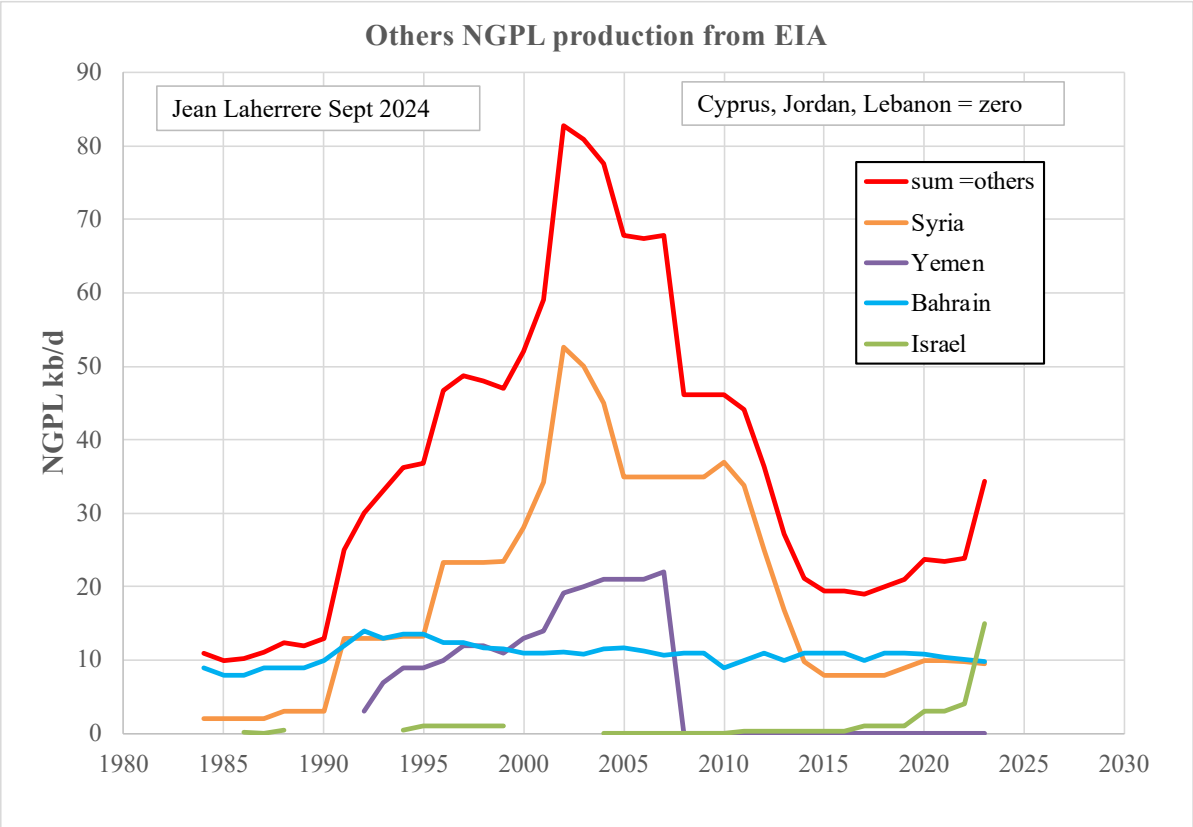
Oman NG production is compared with NGL (BP & UN) production: the data is very poor



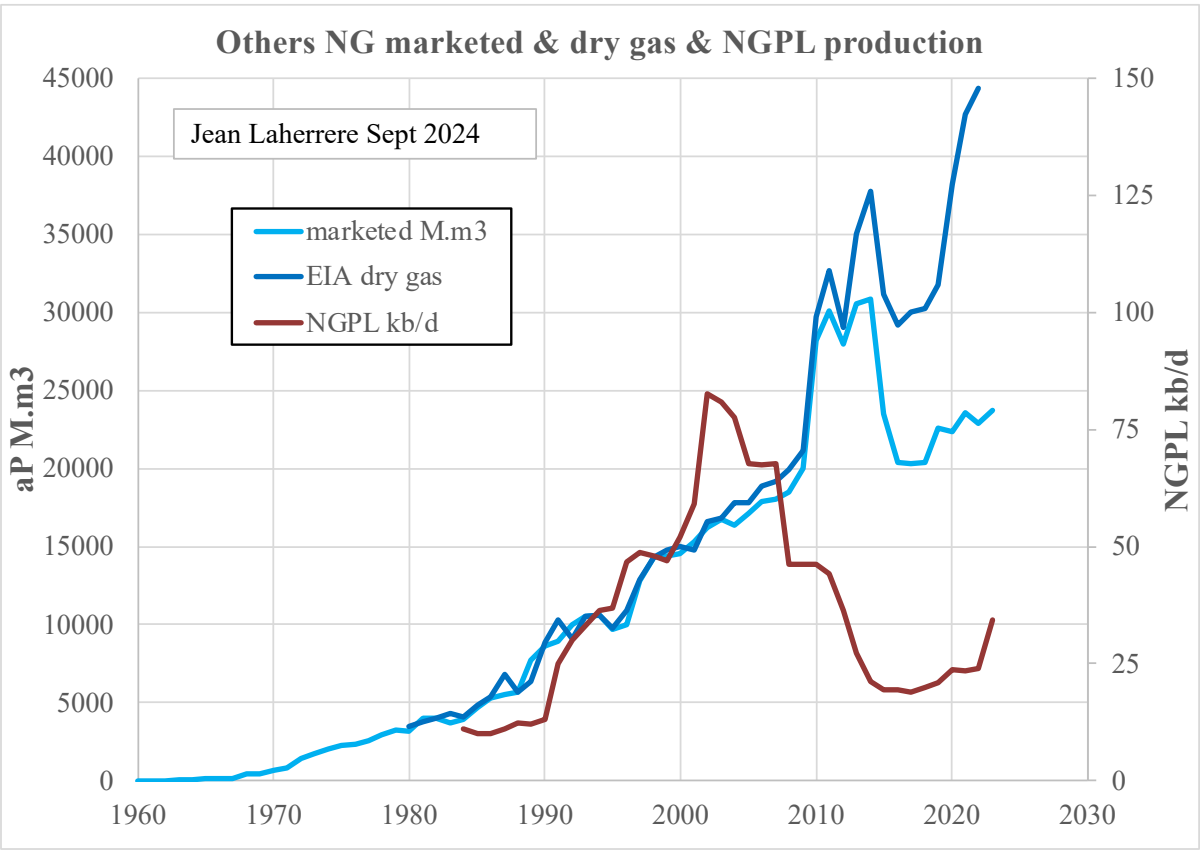


-others

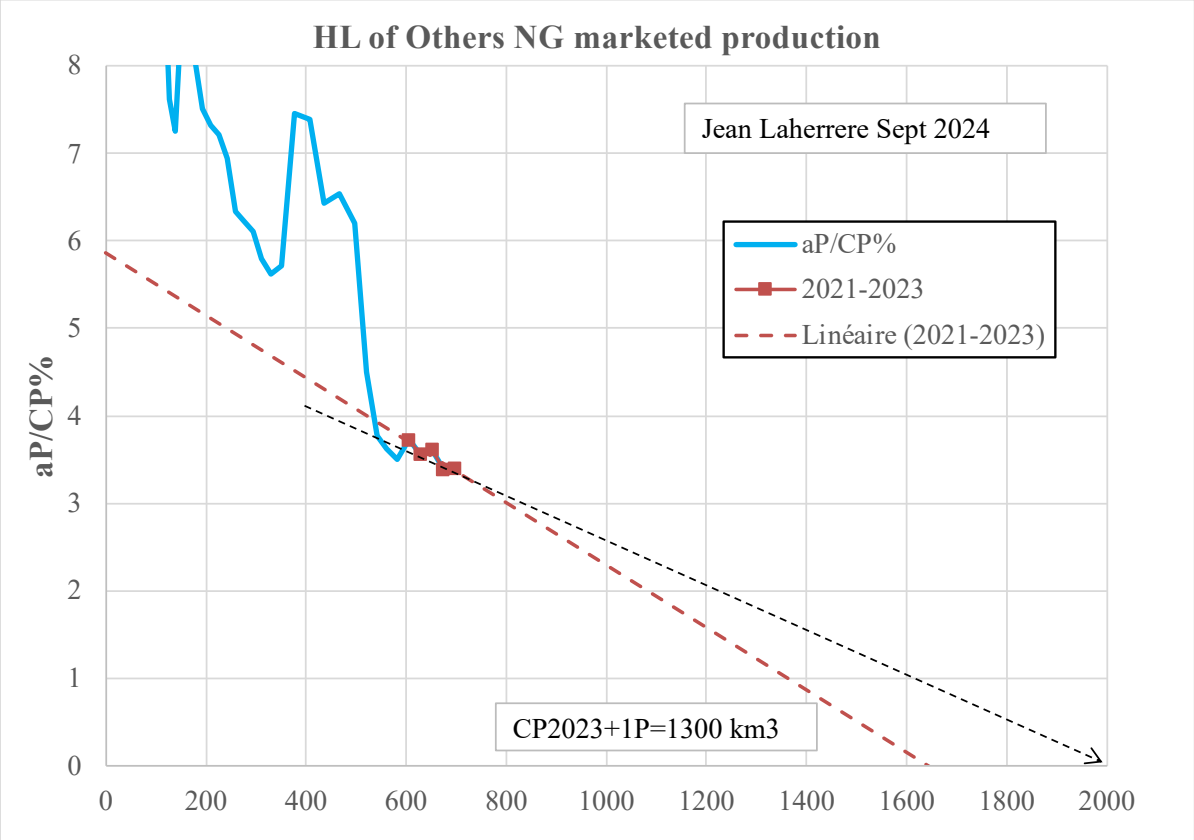
Others represents Cyprus, Lebanon, Syria, Israel, Jordan, Bahrain, Yemen
EIA reports NGPL production by country and the sum for others



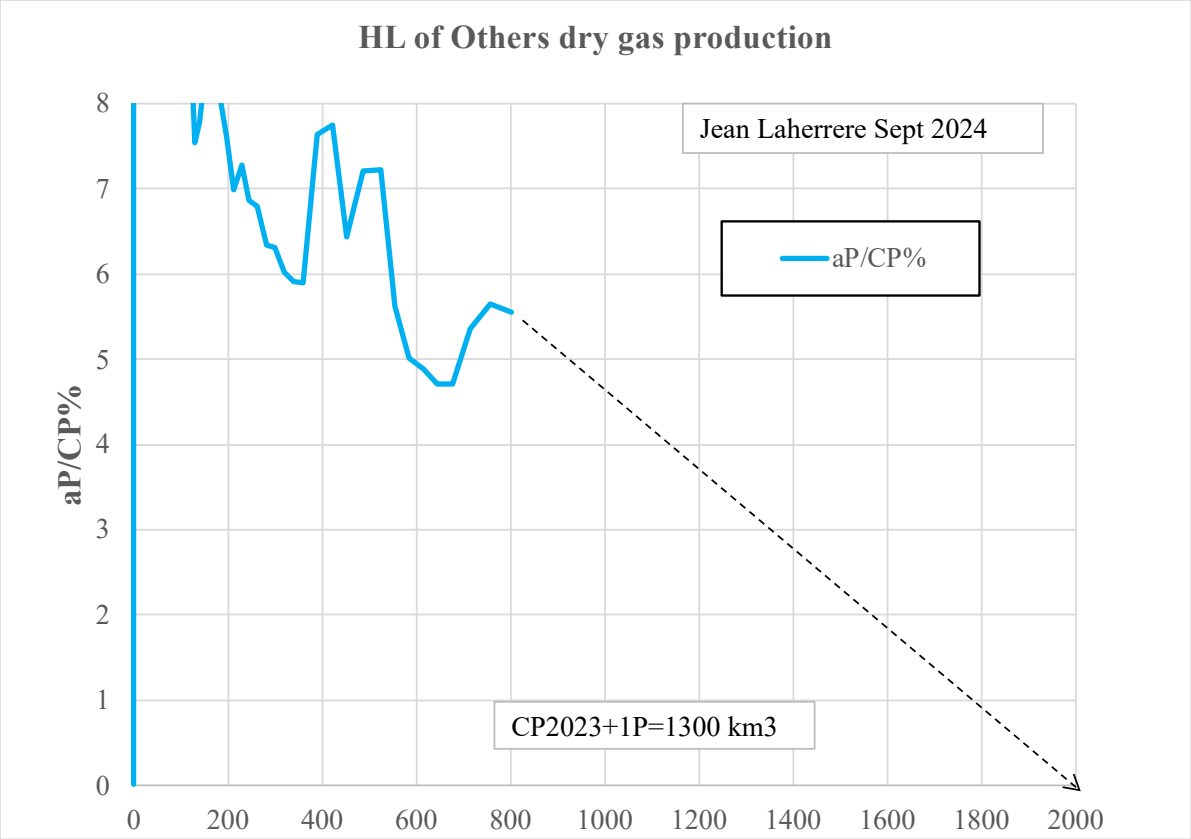
Others marketed NG is compared with dry and it is obvious that marketed data is wrong for 2012-2023. The comparison with NGPL is very poor



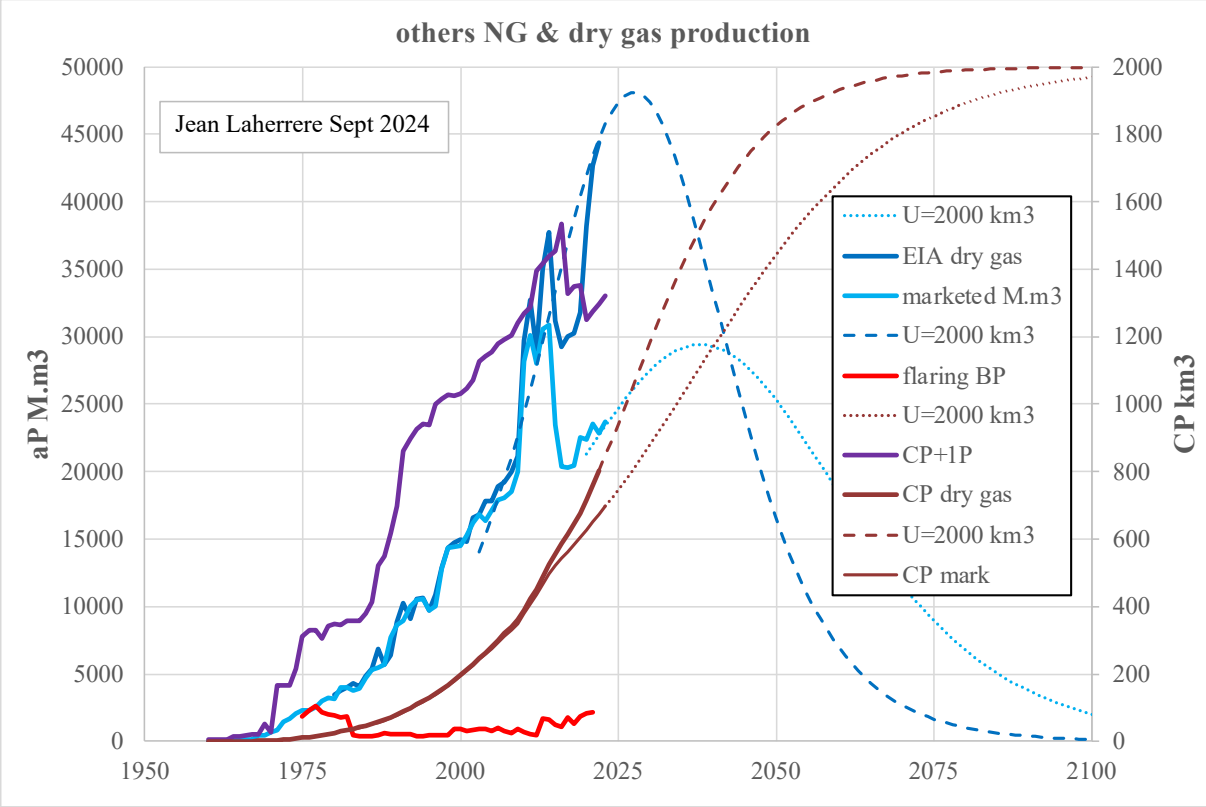
HL of Others NG marketed production trends for the period 2021-2023 towards 1600 km3



HL of Others dry gas production is useless!

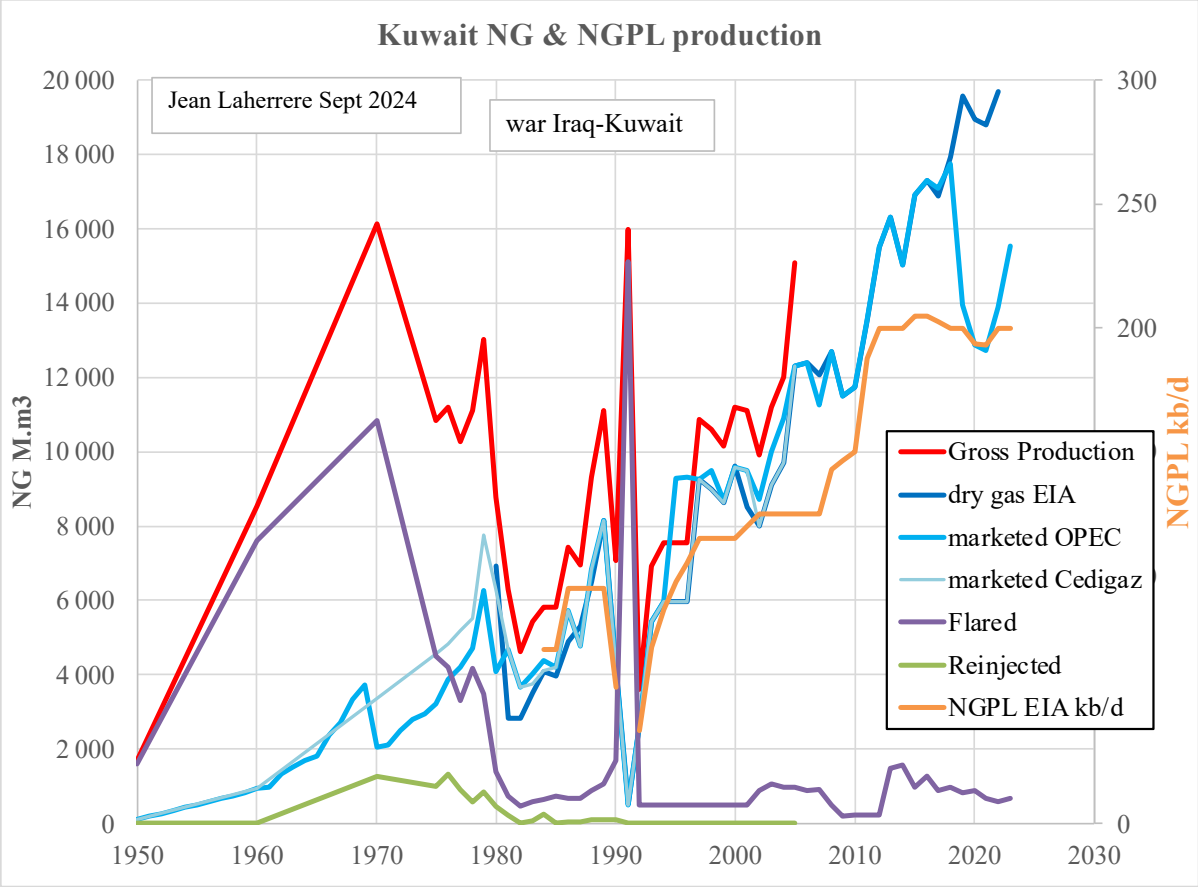


HL of others dry gas production is useless. An ultimate of 2000 km3 is chosen for marketed and dry gas ultimate With a 2000 km3 ultimate, marketed production will peak in 2038 at 29 km3 and dry gas will peak in in 2028 at 48 km3. The forecast is very poor because the data is very poor!

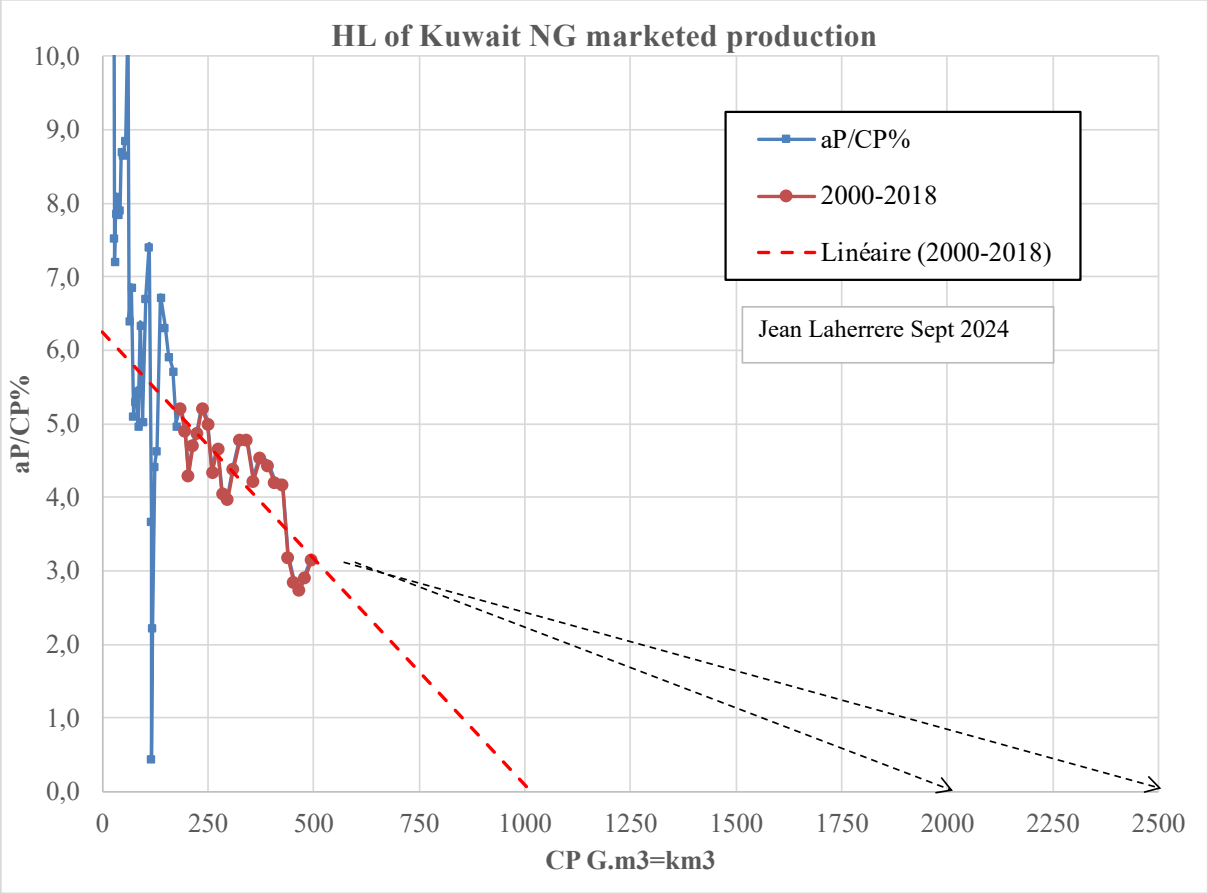


-Kuwait

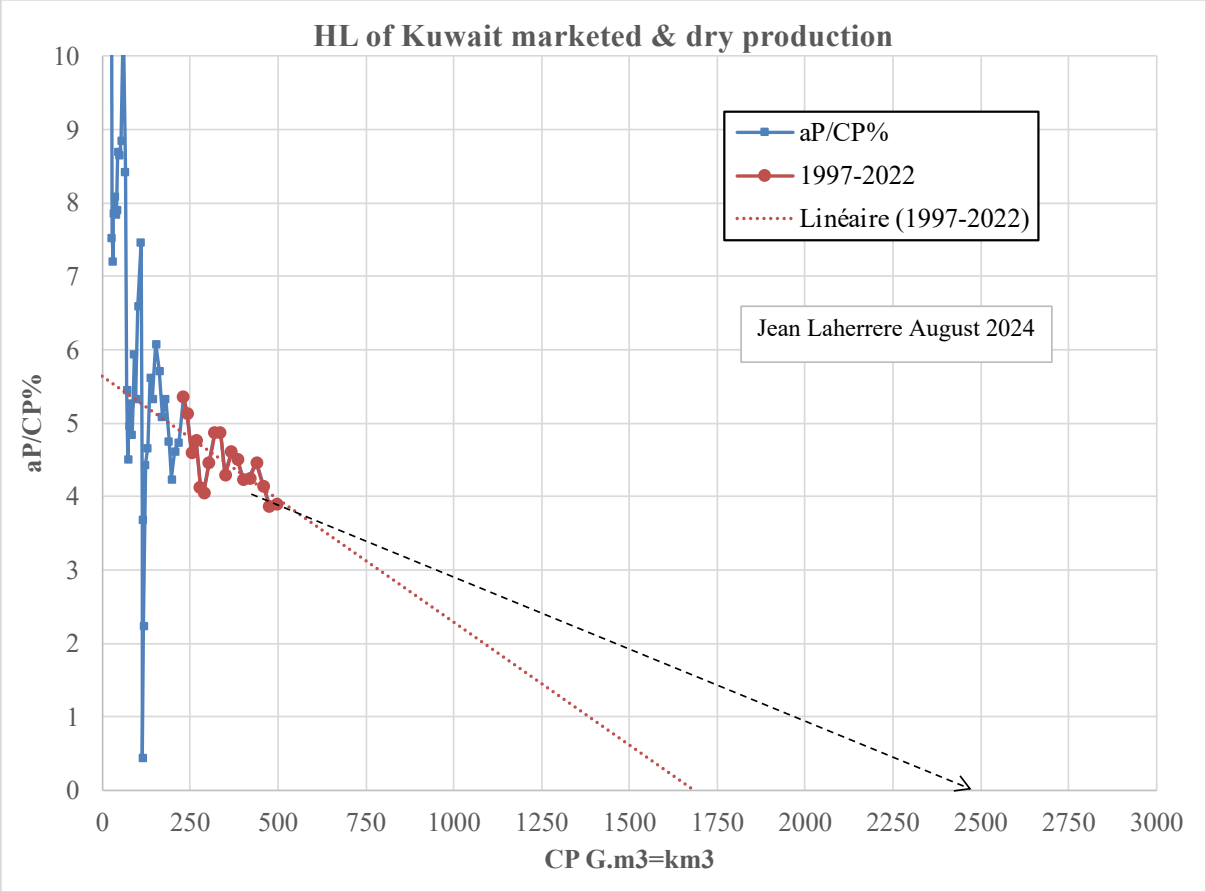
Kuwait gross production is much more than marketed before 1982 as flaring was huge, but the 1991 Iraq-Kuwait impact was huge with many wells on fire with huge losses.
Dry gas EIA is close to marketed OPEC except for the last 4 year: which is right?
NGPL is flat after 2012, confirming rather dry gas



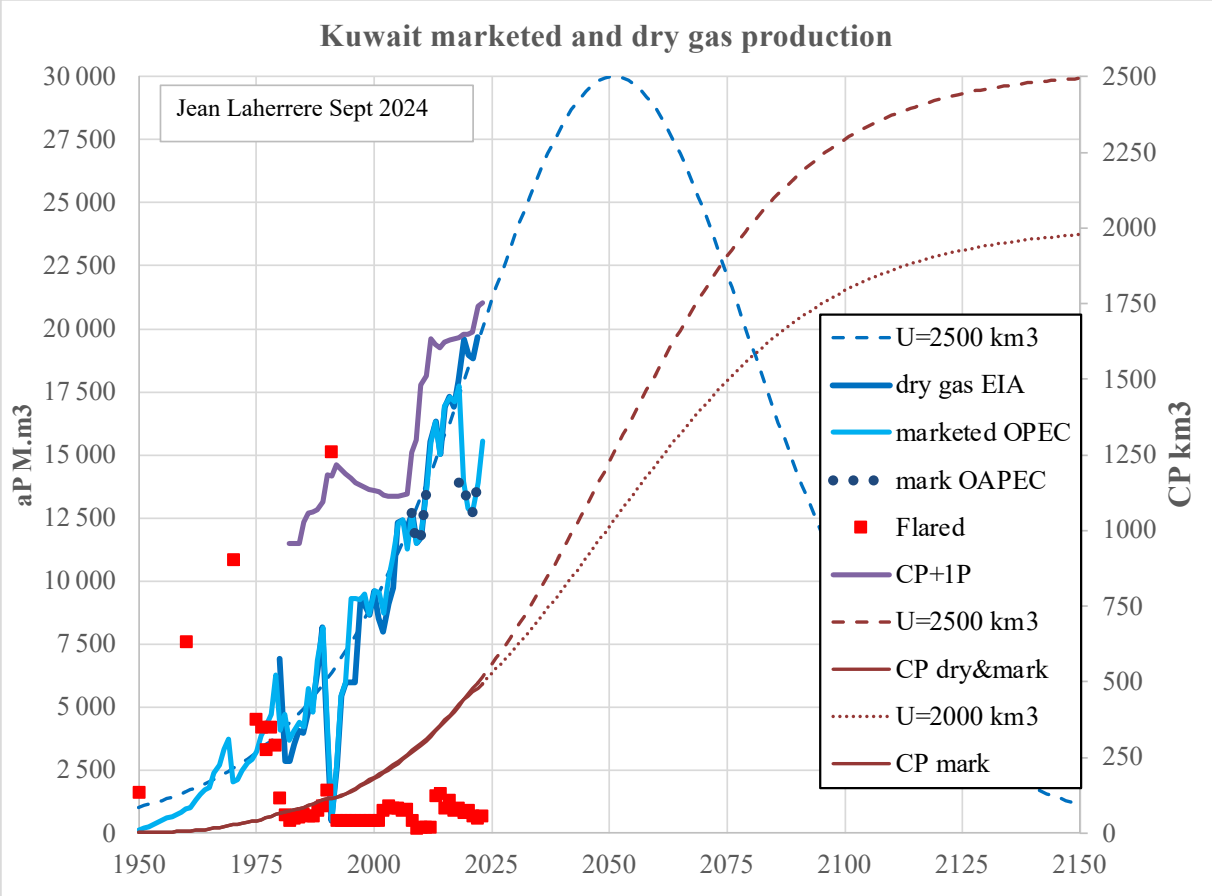
HL of Kuwait NG marketed production trends for the period 2006-2018 towards 1000 km3



HL of Kuwait NG marketed production trends for the period 1997-2022 towards 1700 km3

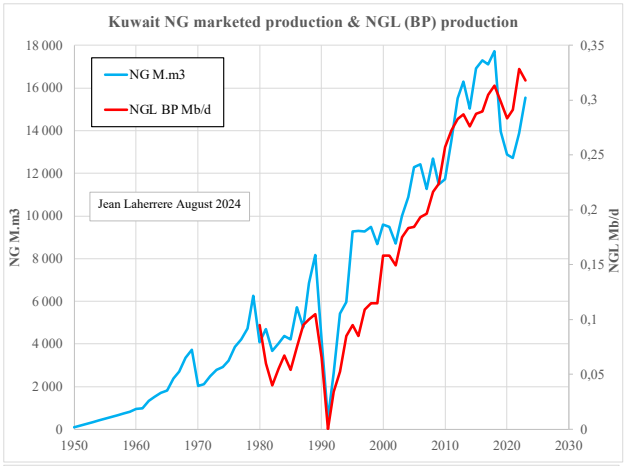


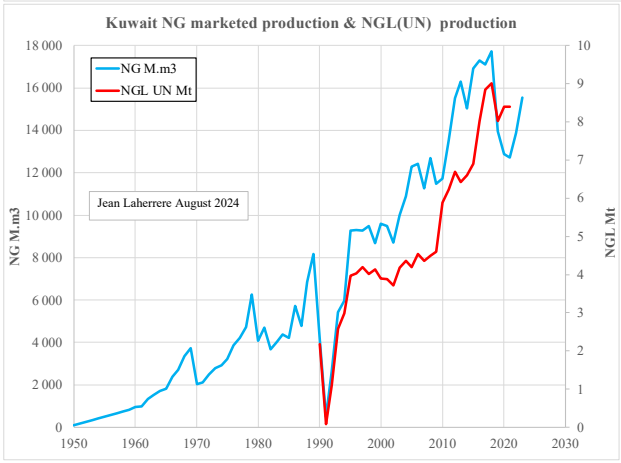
An ultimate of 2500 km3 is chosen giving a peak in 2050 at 30 km3



Dry gas agrees with marketed gas up to 2017 but higher beyond. Marketed data is wrong

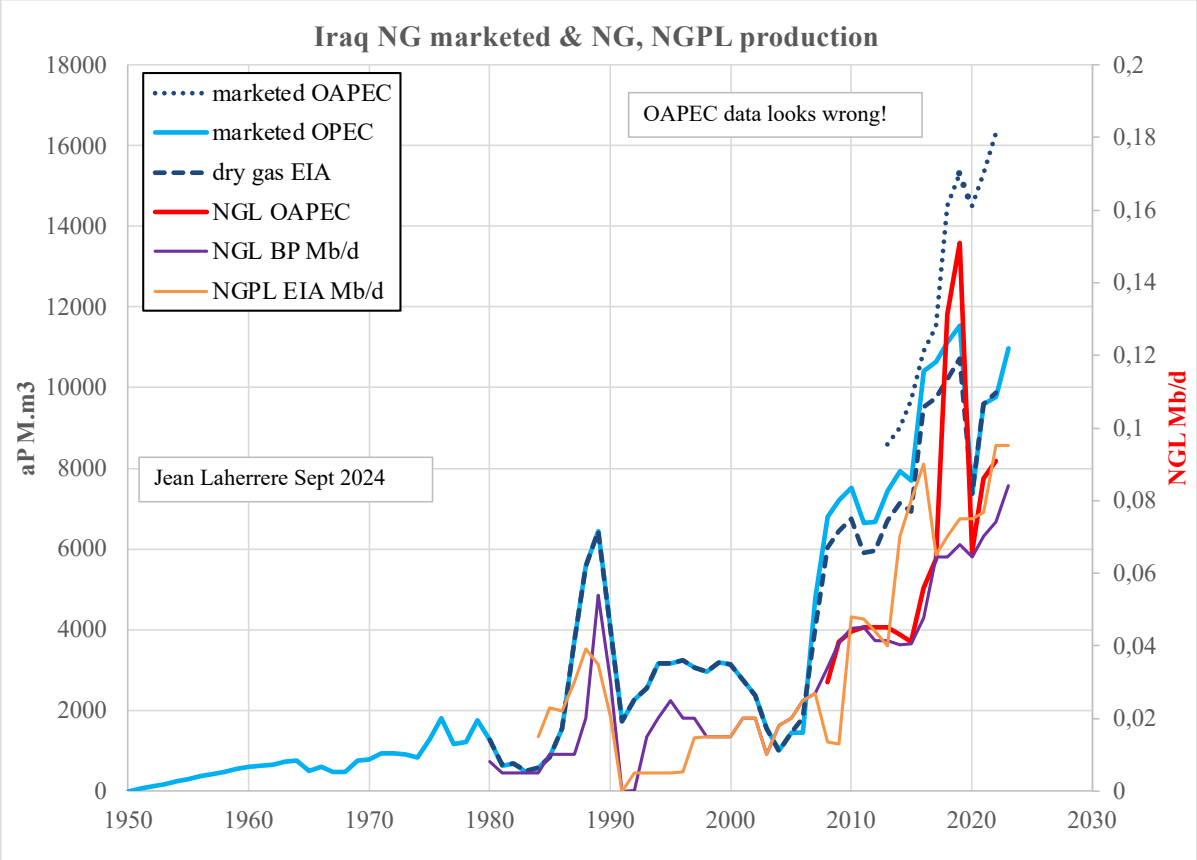
Kuwait NG production is compared with NGL (BP & UN) production: the correlation looks good, but poor with OAPEC





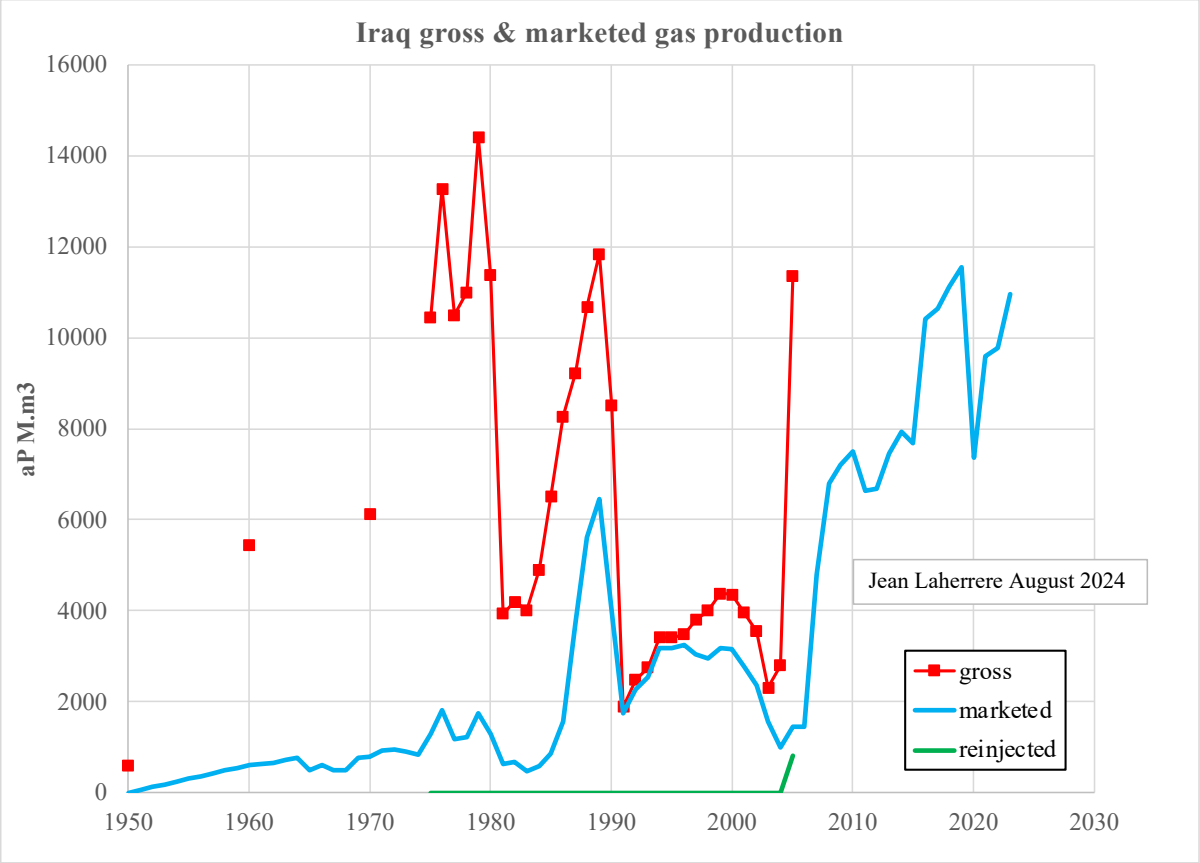
-Iraq

Iraq marketed OPEC NG is close to dry gas EIA except in for the period 2008-2016

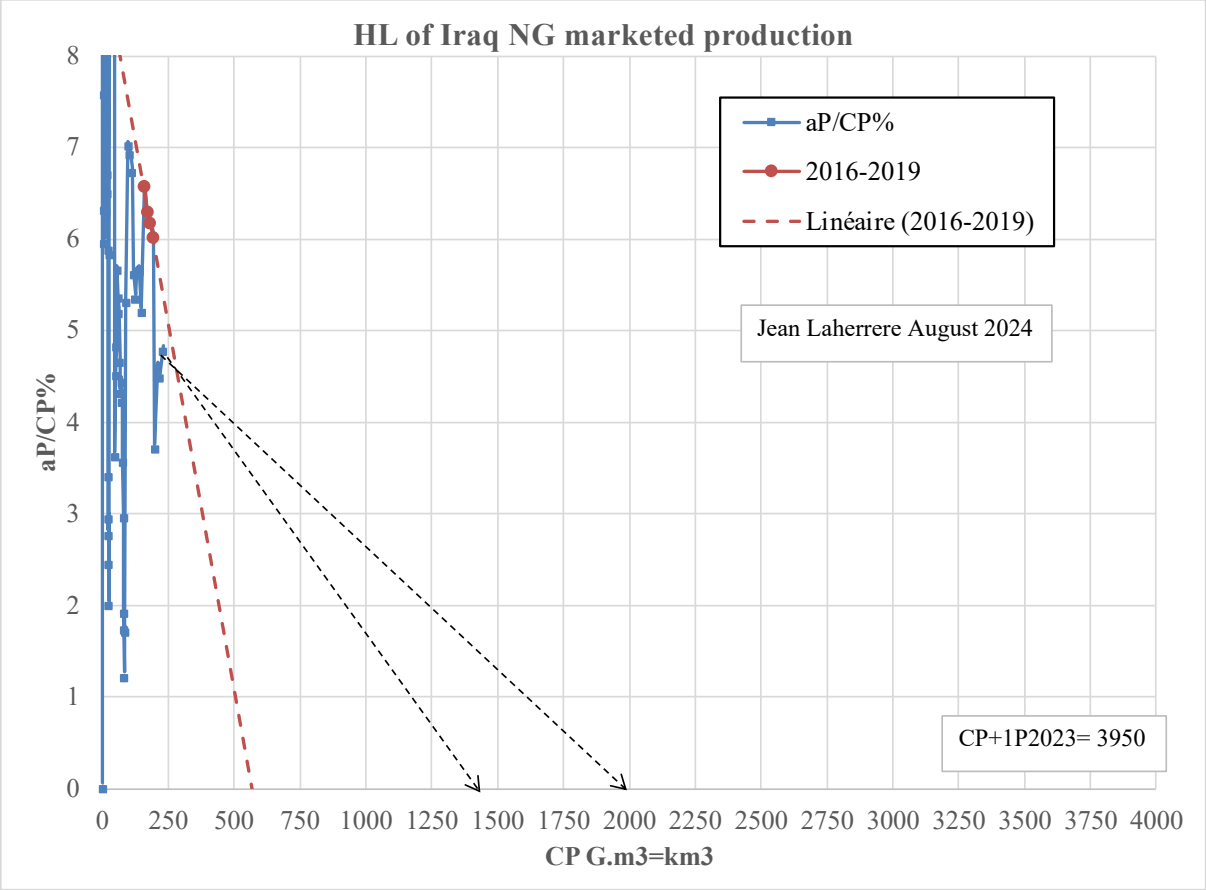


OAPEC marketed data looks too high but increases more than OPEC beyond 2019

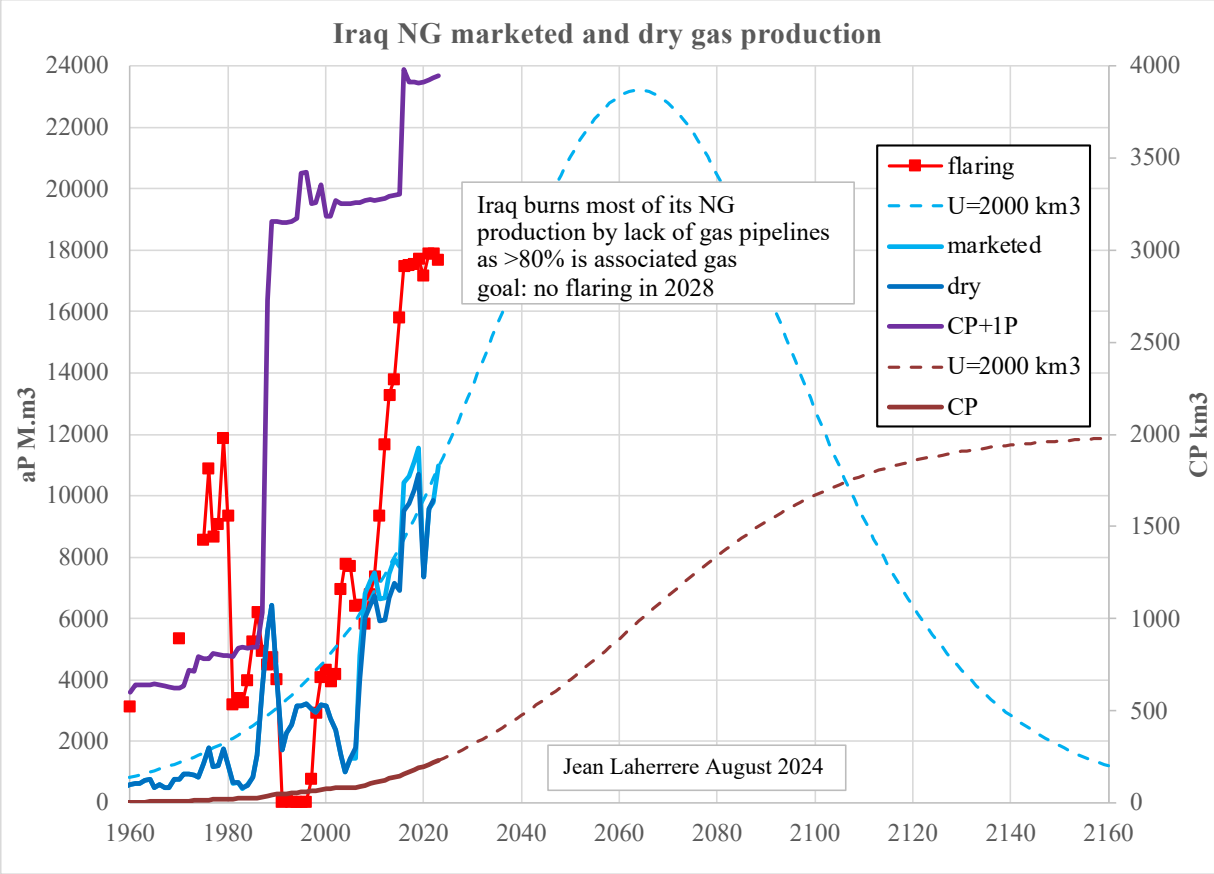
Iraq gross NG production is much more than marketed before 1989, and flaring burst again in 2005 by lack of gas pipeline near associate gas production



HL of Iraq NG marketed production trends for the period 2016-2019 towards 500 km3 when CP2023+1P = 4000 km3



An ultimate of 2000 km3 is chosen giving a peak in 2065 at 23 km3

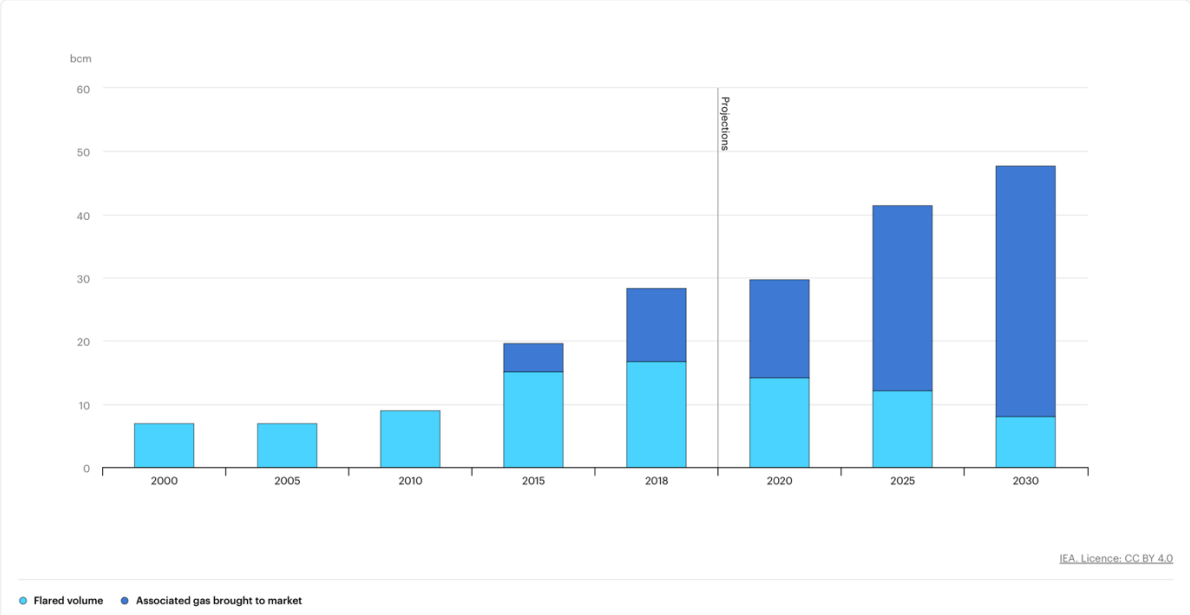


Iraq burns most of its NG production by lack of pipeline as >80 % of its production is associated gas: but its goal is no flaring in 2028 (?)
IEA 2019 forecasts a peak of Iraq flaring (light blue) in 2018 with no peak ahead!

Natural gas production and flaring in Iraq, 2000-2030

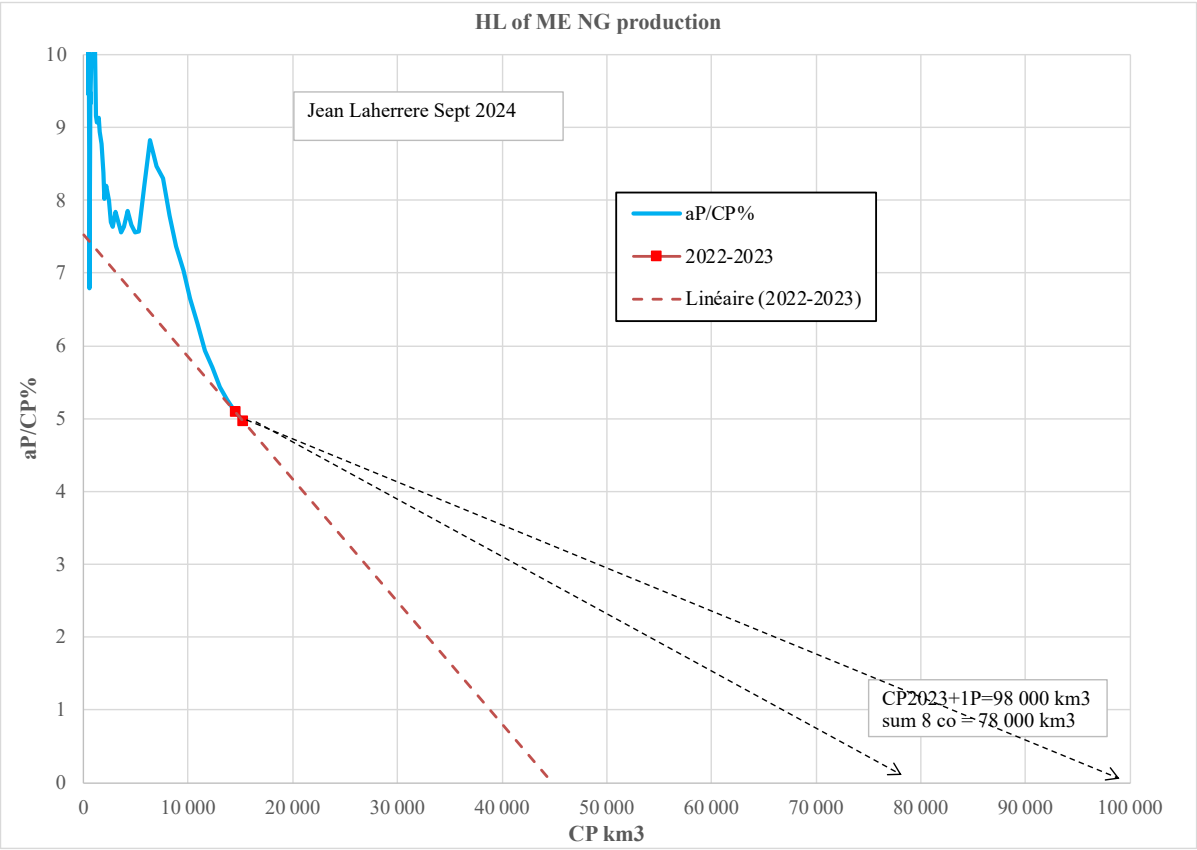
Last updated 25 Apr 2019

Download chart ↓ Cite Share

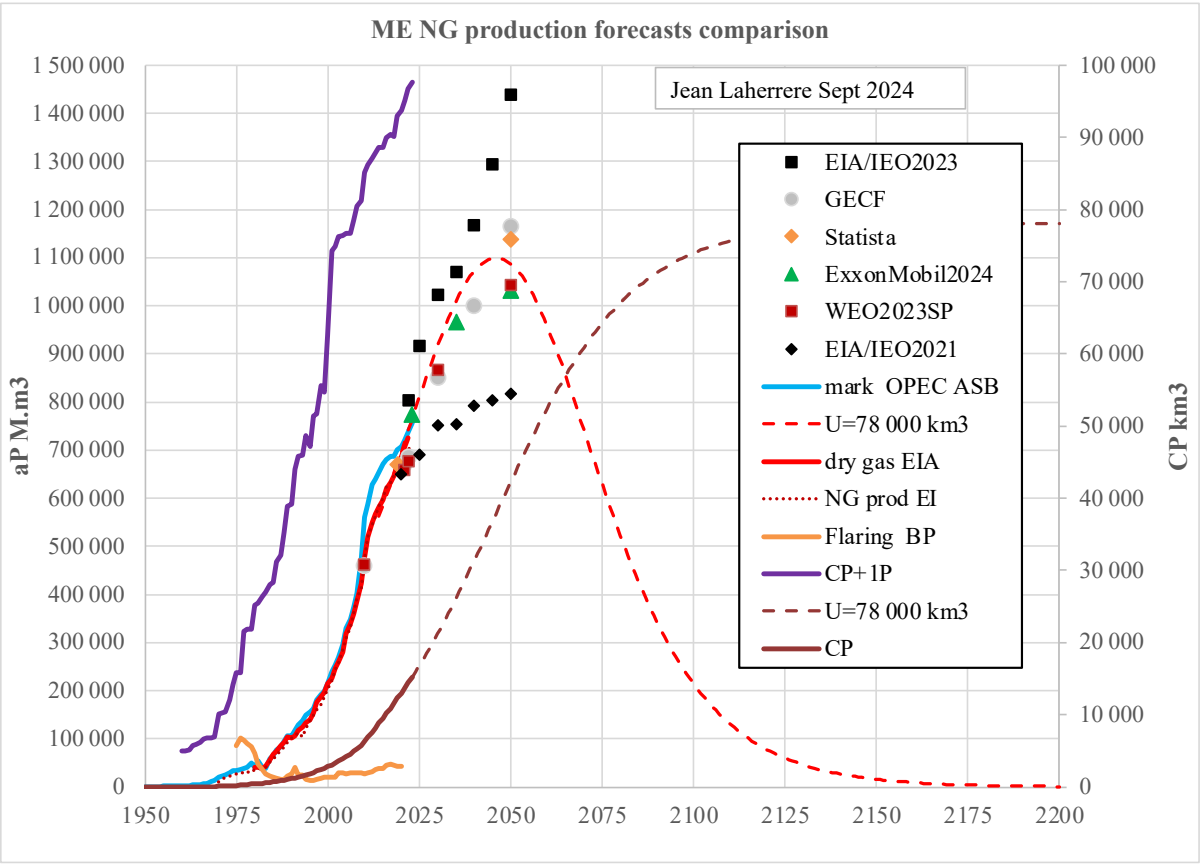


-ME

HL of ME NG production is useless when CP20232+1P =98 000 km3 and the sum of the 8 countries' ultimates is 78 000 km3

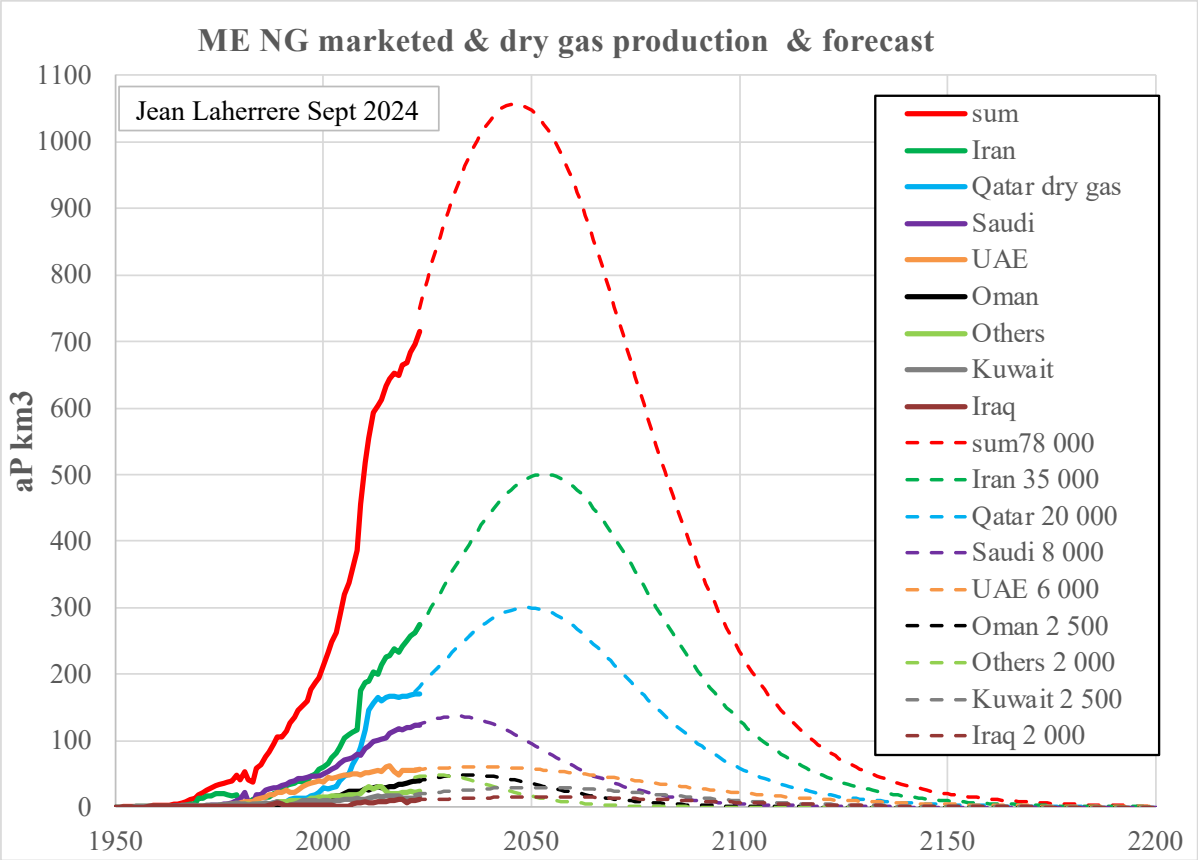


With a 78 000 km3 ultimate dry gas peak will be in 2046 about 1 100 000 km3



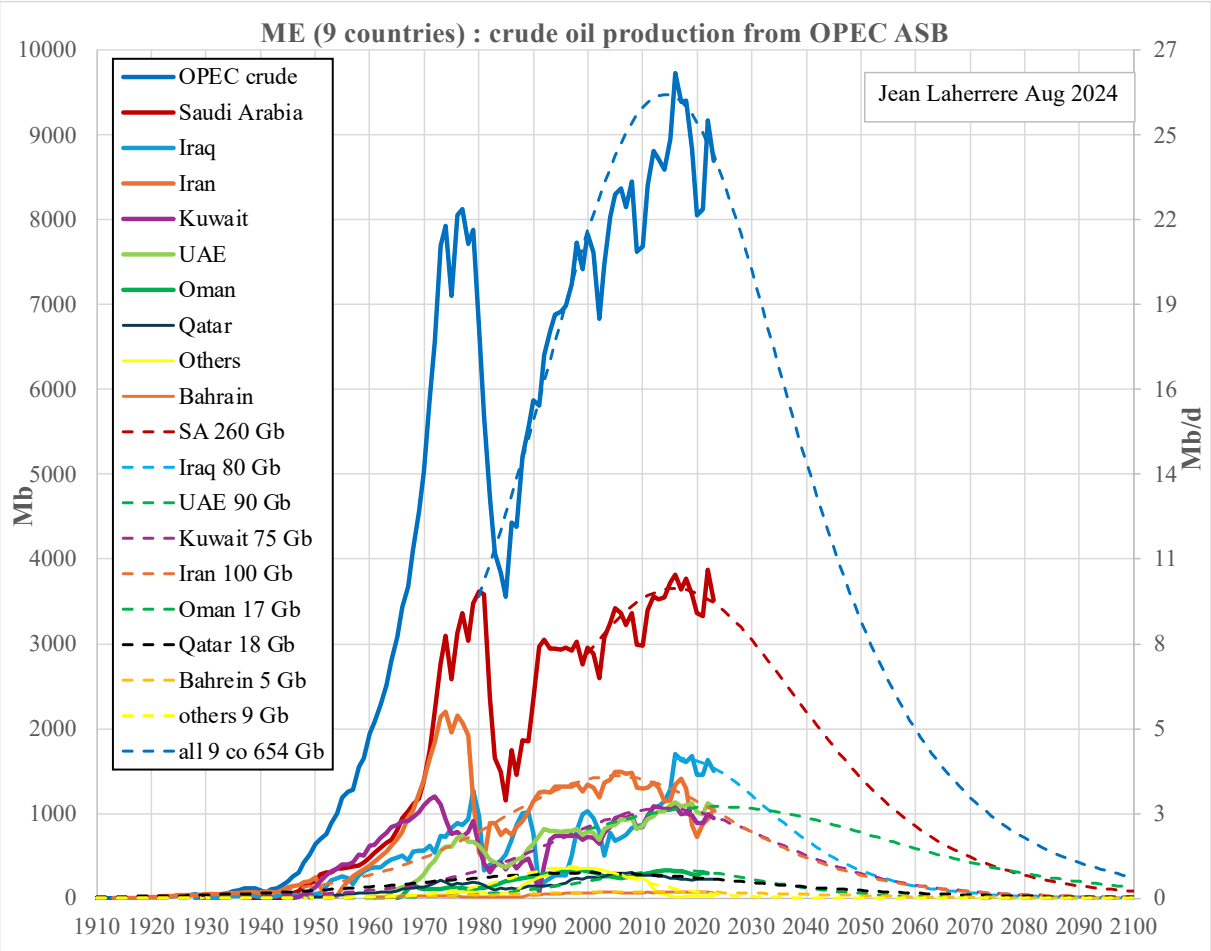
Because the high uncertainty of past data, my dry gas forecast is in line with ExxonMobil Global Outlook 2023 and IEA/WEO2023SP. EIA/IEO2023 is unrealistic!

ME NG marketed production and forecast by country 1950-2200: Iran will have the highest and beyond 2050 peak

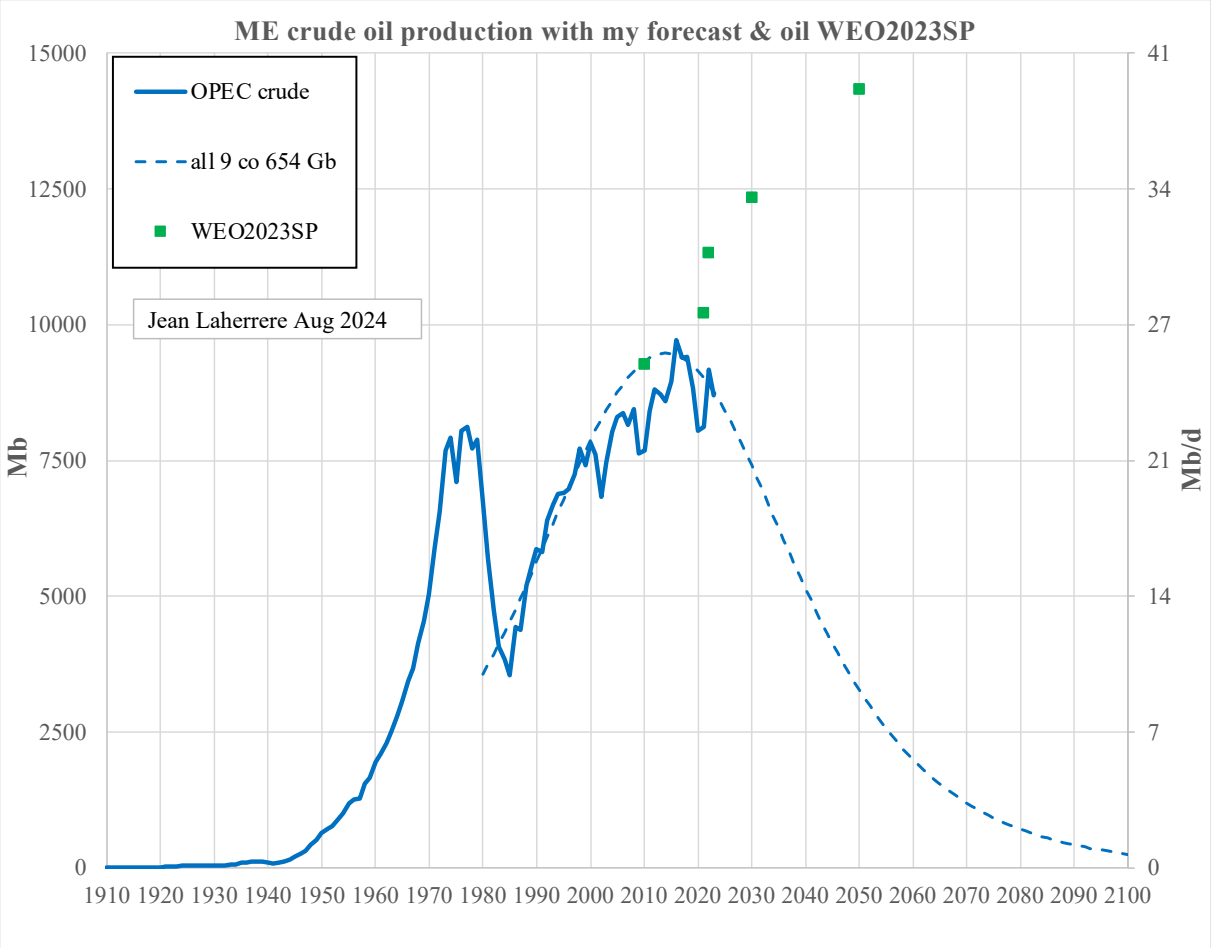


-comparison with ME crude oil

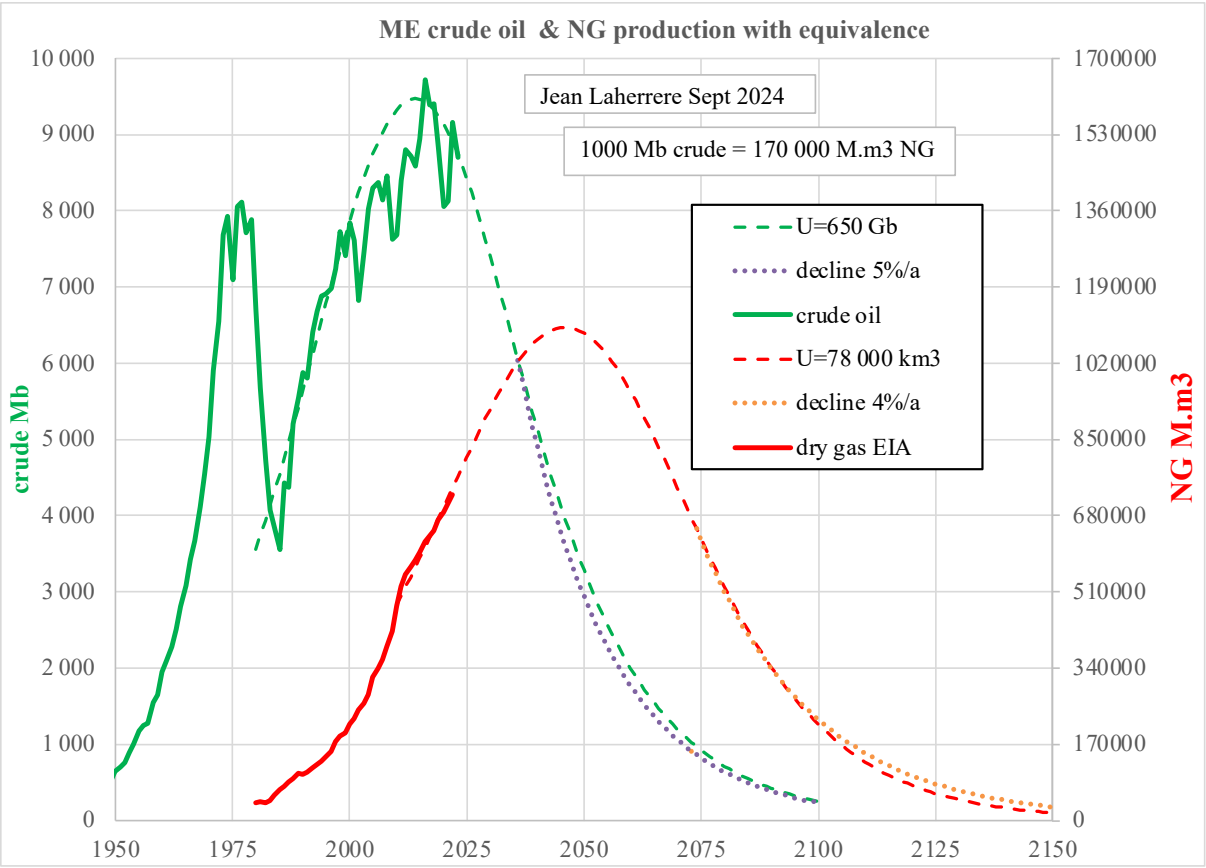
My previous post was “Middle East crude oil production & forecast” https://aspofrance.org/2024/08/23/middle-east-crude-oil-production-forecast/



ME crude production is past peak contrary to
IEA/WEO2023SP with a huge difference for 2050: 40 Mb/d against 6 Mb/d!

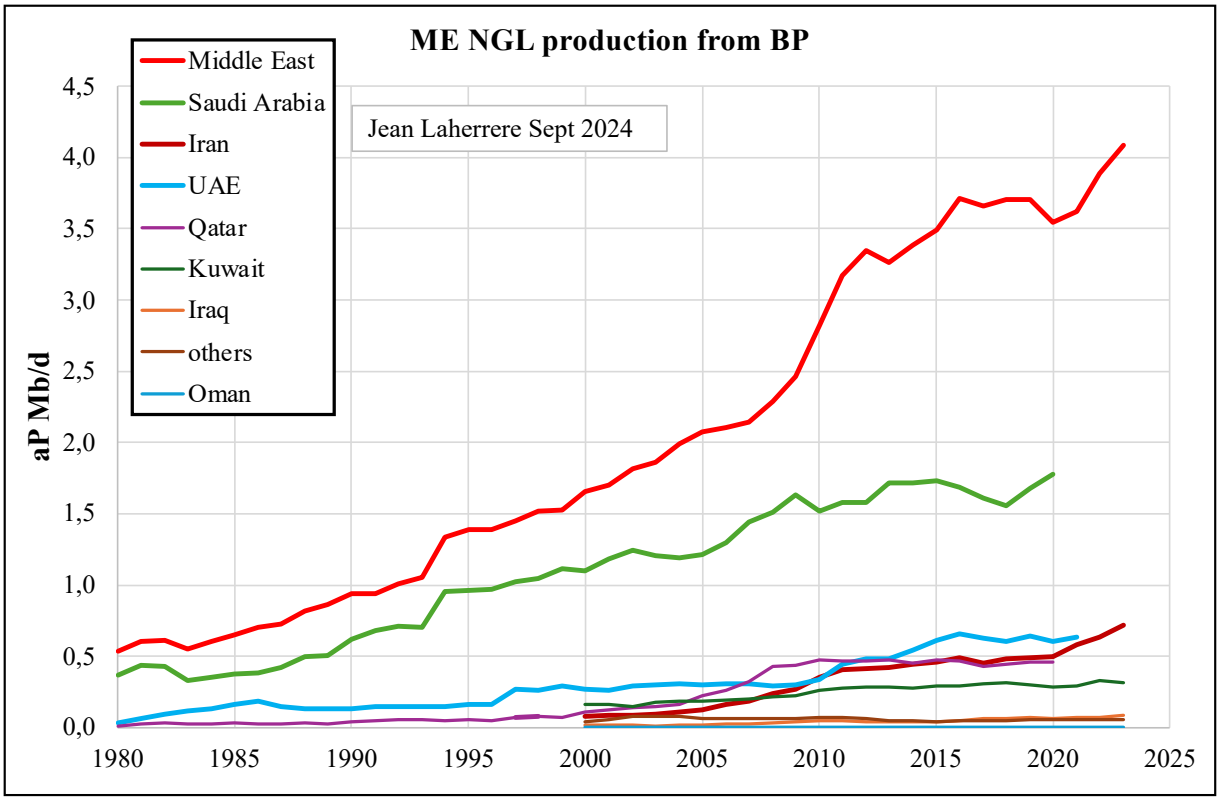


The comparison MLE crude and ME NG is shown comparing Mb and M.m3 to see the difference: peak time is 2016 for crude and 2045 for NG and with an equivalence of NG 1 M.m3= 0,0059 Mb crude or 1000 Mb crude = 170 000 M.m3 NG, oil peak is about 9.5 Gb when NG peak is about 6 Gboe.

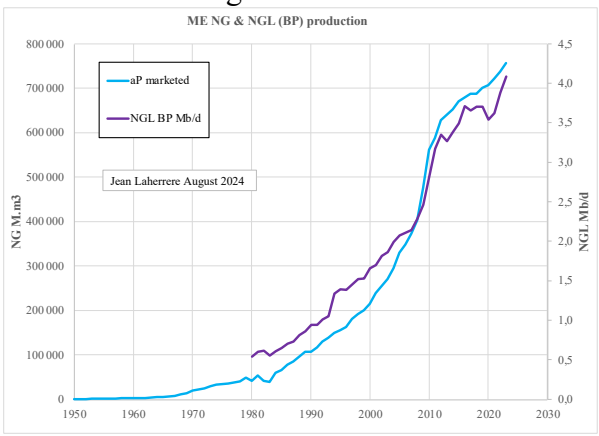


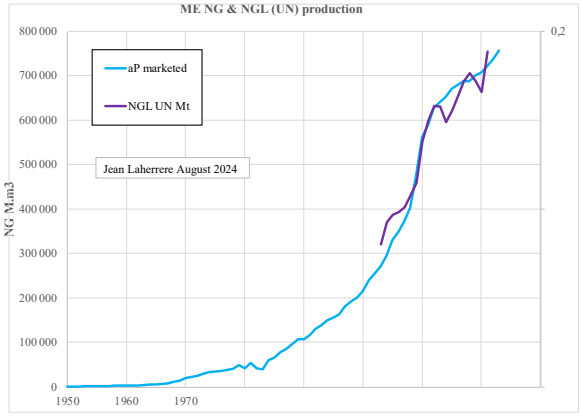
But the future crude oil decline is about 5%/a when the future NF decline is about 4%/a

But it is necessary to add natural gas liquids, but OPEC ASB does not report any NGL data by country but only BP up to 2022 (Energy Institute which continues BP Statistics has dropped NGL data). OAPEC NGL data are unreliable.

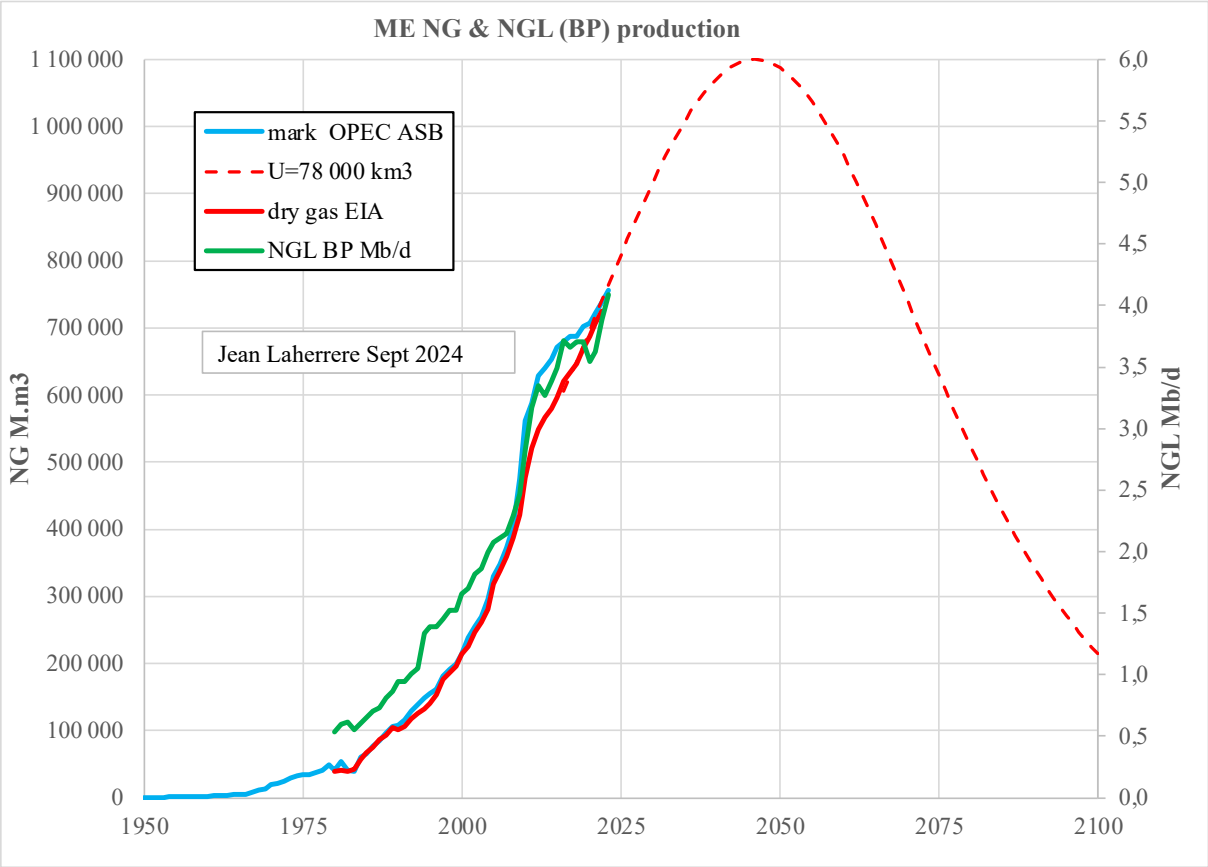


ME NG production is compared with NGL production from BP and from UN and the correlation looks good.

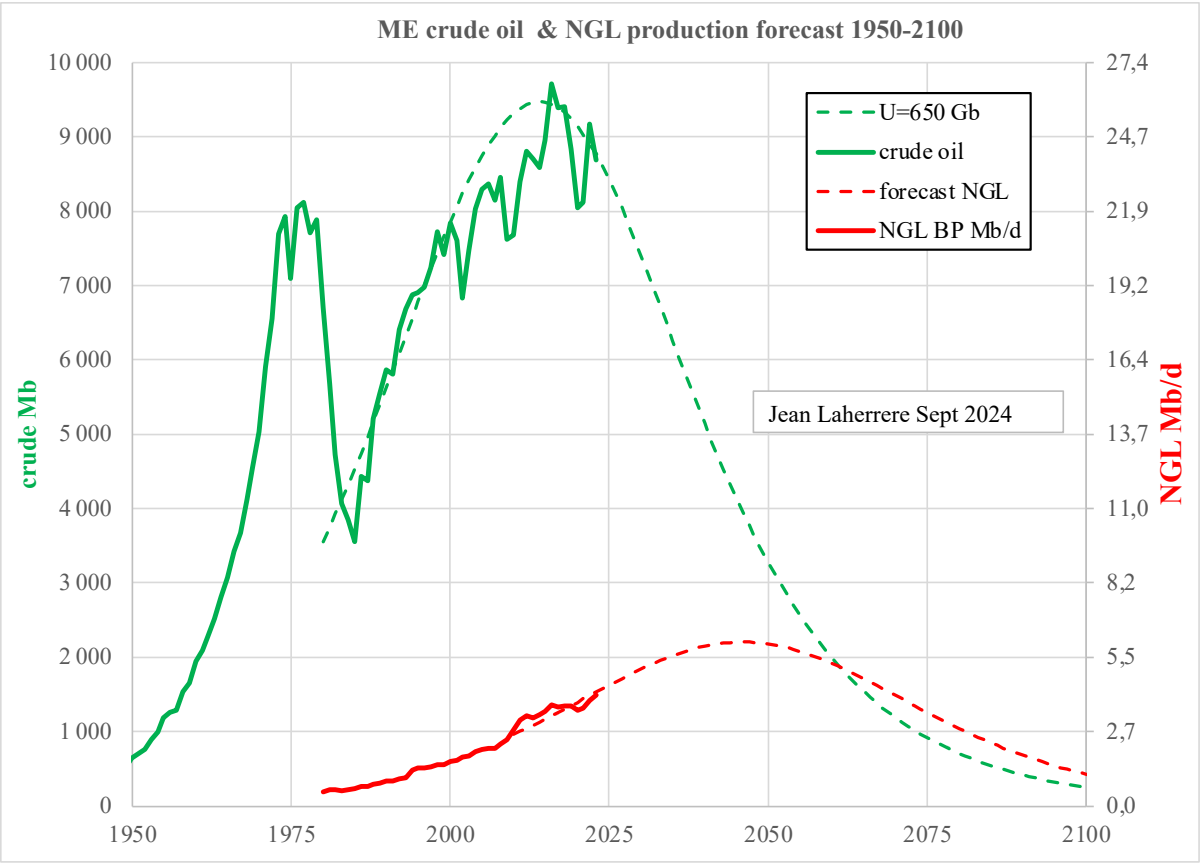




We assume that future NGL production will follow future NG production and we can compare ME future crude production with future NGL production.
In fact, marketed gas (blue) is more in line with NGL than dry gas (red)
It is possible to take dry gas forecast in M.m3 to get NGL forecast in Mb/d



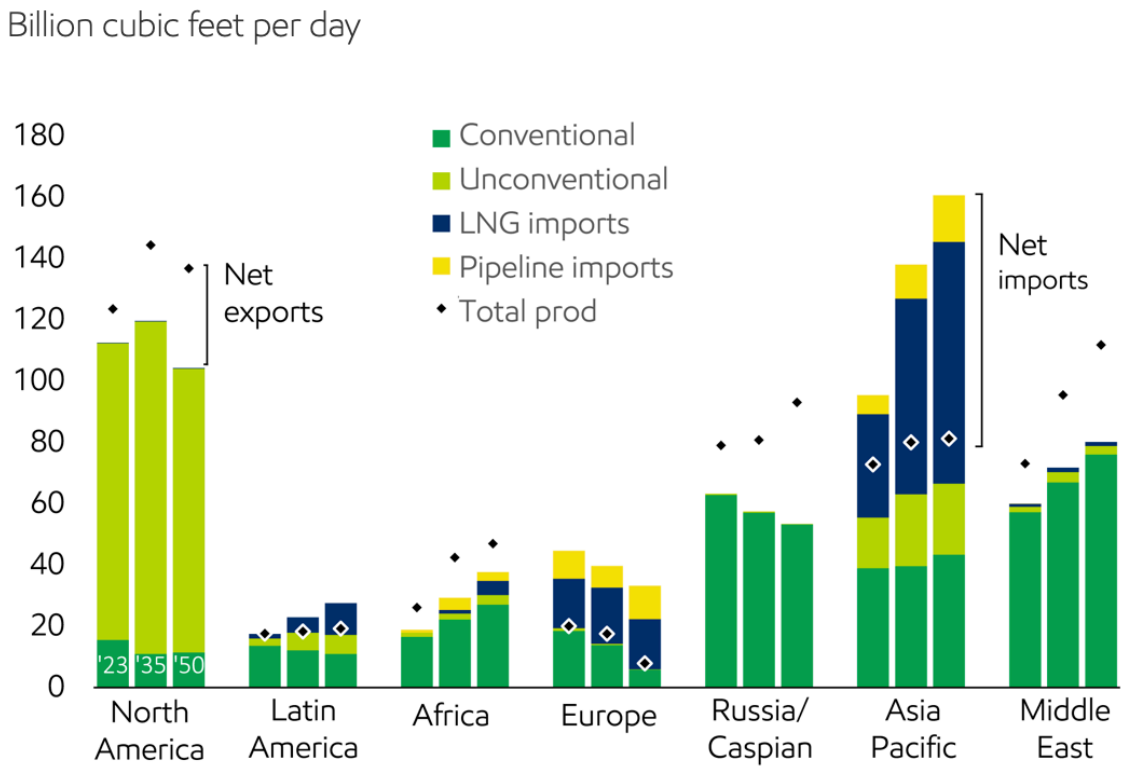
ME crude oil is compared with ME NGL: completely different with crude oil in decline after a peak in 2016



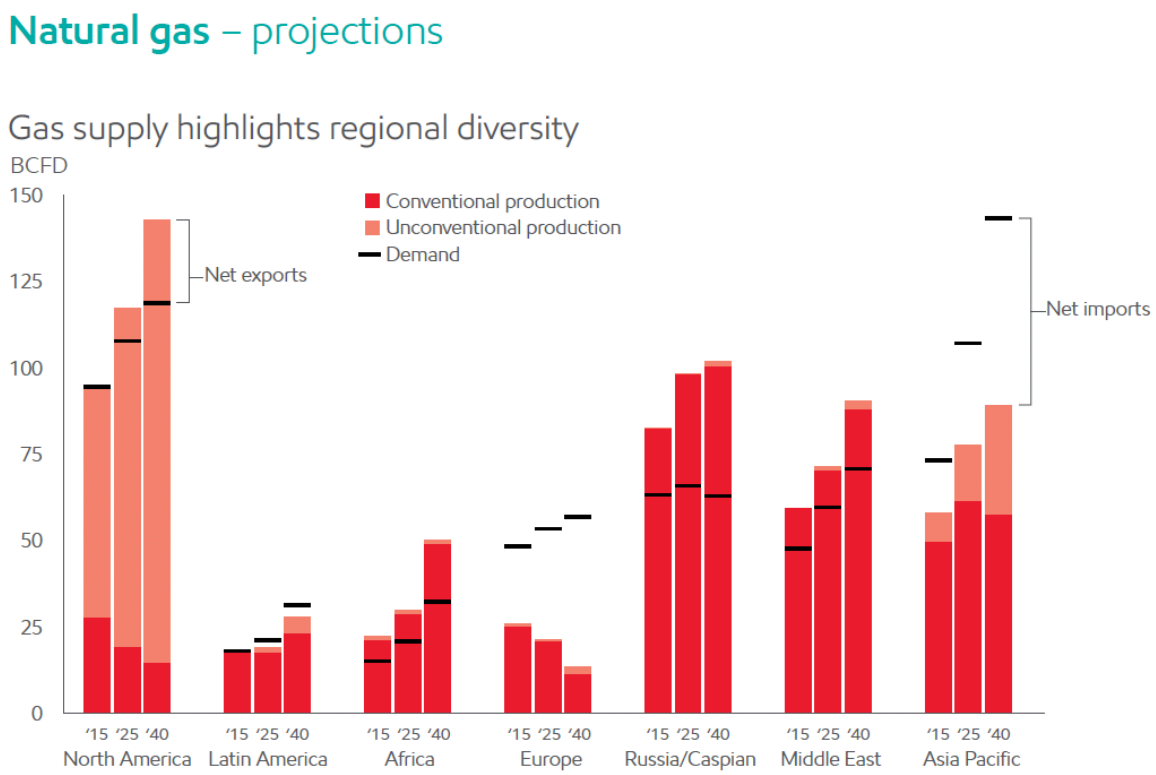
From 2025 to 2050 ME crude oil annual production will decrease by 5500 Mb when ME NGL will increase by <500 Mb =>10 times less!

-ExxonMobil NG forecasts

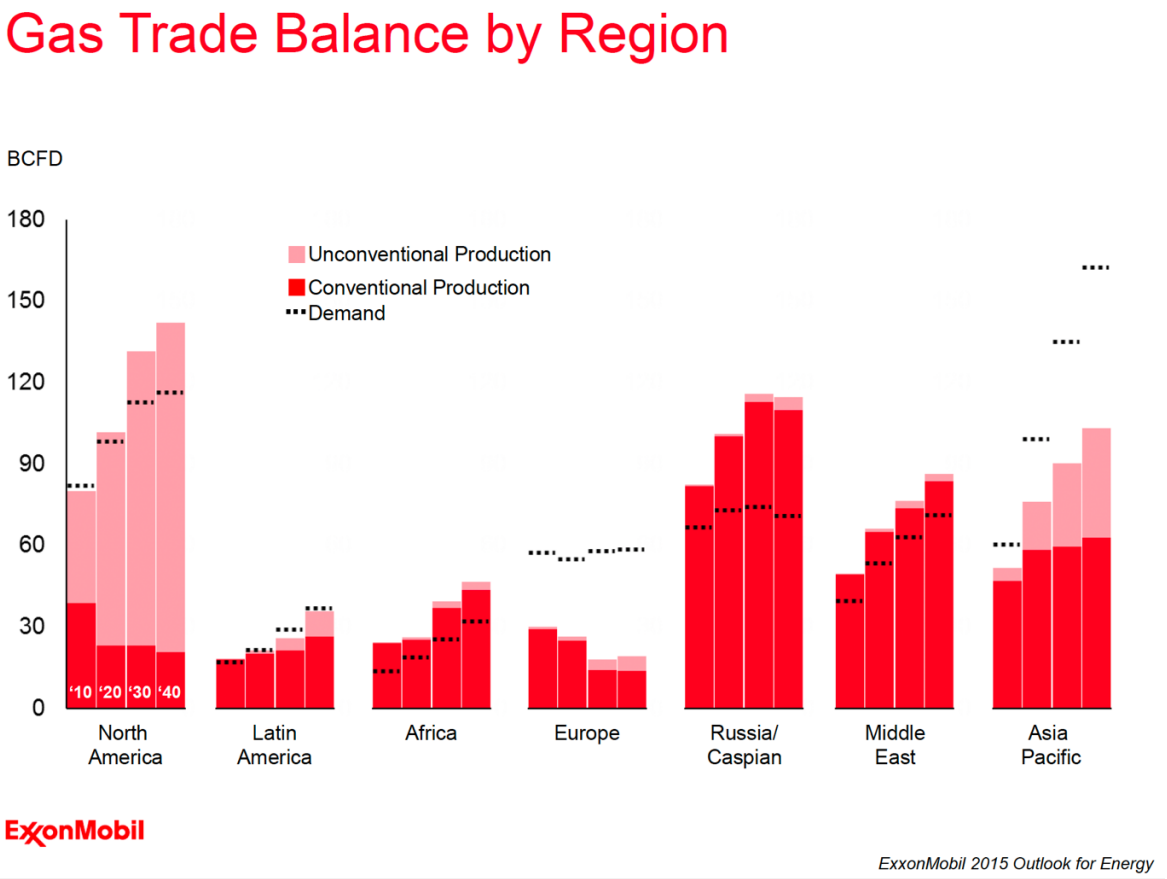
ExxonMobil Global Outlook 2024 looks queer between demand (not mentioned ?) and production (identical to Outlook 2023)!



ExxonMobil changes good 2017 graph in 2024 bad graph: what a pity!
ExxonMobil Global Outlook 2017 was different from Outlook 2024 and righter (demand and production)



ExxonMobil Global Outlook 2015 title was different (gas trade) but the forecast similar with 2017



-recapitulation

km3	2023 mark	2022 dry gas	CP2023mark	CP2022dry	CP2023+1P	U	peak yr	peak	aP 2050	2050 Statista	U 11 Sept
Iran	275	263	4924	4270	69764	35000	2053	500	497	481	40000
Qatar dry	211	170	3625	2777	26600	20000	2050	300	300	326	20000
Saudi	124	122	2856	2666	12507	8000	2032	137	96	127	8000
UAE	57	57	1684	1627	9894	6000	2041	64	62	59	2300
Oman	40	41	707	671	1368	2500	2032	46	30	22	1600
Kuwait	16	19	494	495	2278	2500	2050	21	21	18	2000
others	24	44	697	802	1321	2000	2029	25	16	37	2000
Iraq	11	10	230	209	3944	2000	2064	23	15	67	6000
sum	758	726	15217	13517	127676	78000			1037	1137	81900
ME	758	726				78000	2046	1100	1087		

The big ultimate changes from my 11 September paper are Iran (-5000), Iraq (+4000), UAE (+3700), Oman (+900), Kuwait (-500).
CP+1P, which should be below ultimate, are higher except for Oman and others! Which is wrong: my ultimates are unreliable, but I feel that ME proven reserves are more unreliable!
OPEC members because of oil quotas report high reserves values since the 1985-1989 fight on quotas leading to 300 Gb speculative resources (London 2007 S al-Husseini)
I remind that 1P (proven) reserves are defined with a probability of 90% and that it is incorrect to add proven

reserves. Every agency reports the proven reserves of a region or the world as the sum of the country proven reserves: it is wrong, the sum is too low by a lot!
Only summing 2P (proven + probable) reserves is correct.

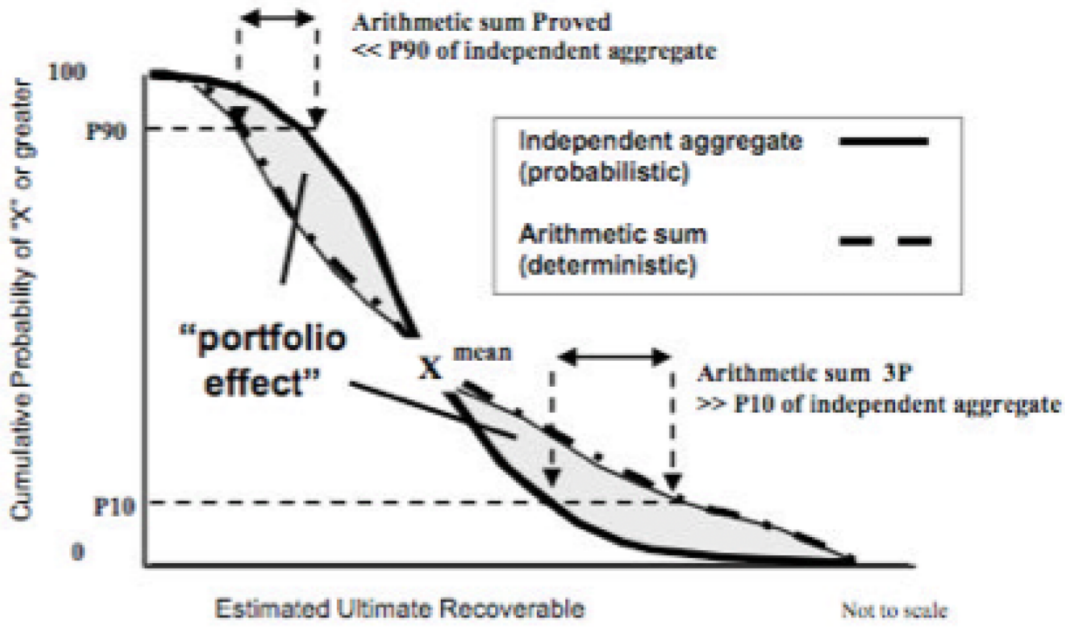


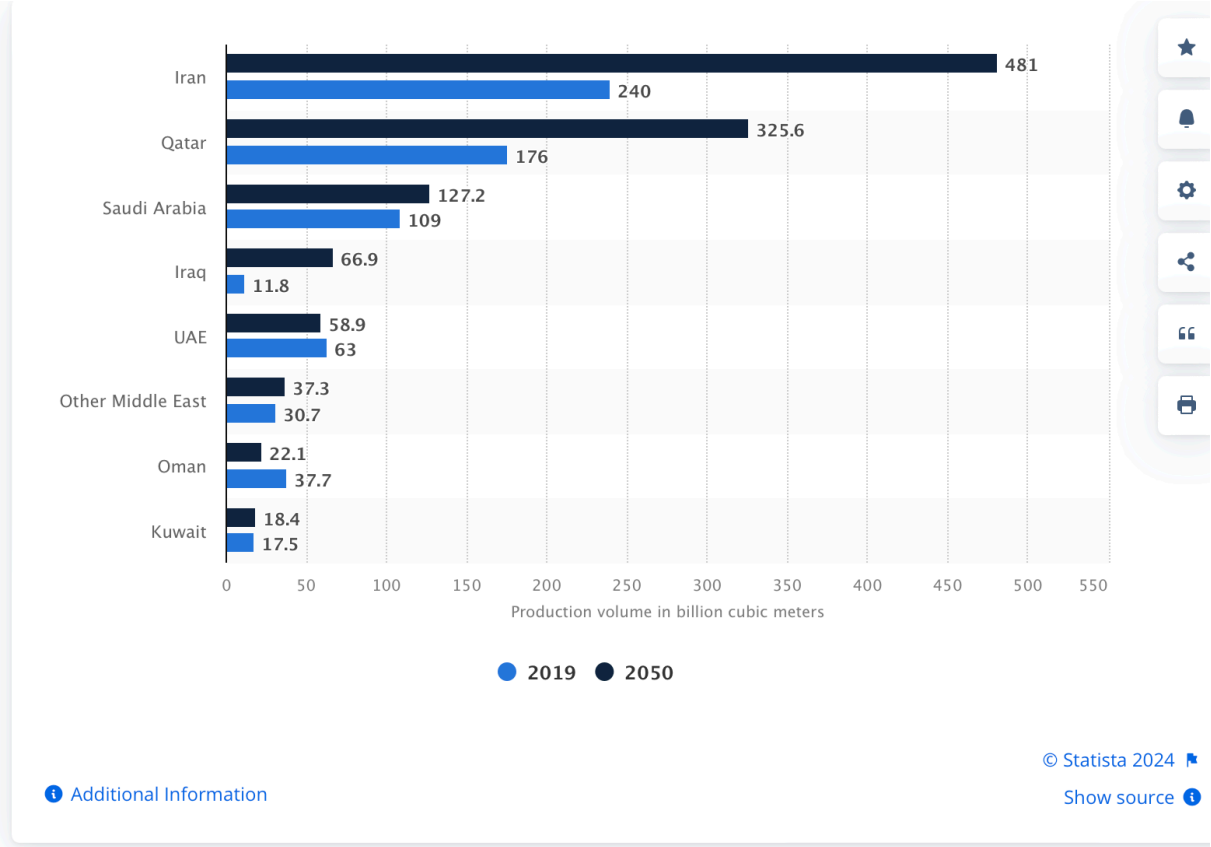
Figure 3-2: Deterministic versus Probabilistic Aggregation

-conclusion
My previous 11 September paper missed dry gas production EIA data, which is quite different from OPEC marketed gas production for Qatar and Saudi Arabia: dry gas should be equal to marketed gas.
Most of the ME OPEC ASB & EIA NG production data are unreliable.
Comparing with NGL, dry gas is as bad as marketed gas

Every ME NG production has not yet reached peak, and the first one will be Others in 2029, followed by Oman, Saudi Arabia, UAE, Qatar, Kuwait, Iran and Iraq.
ME NG production peak will be around 2050 at 1000 km3 against 760 in 2023.
ME crude oil production has peaked in 2016 and its decline post 2030 is forecasted to be 5%/a when NG decline will be 3%/a
For ME NG 2050 production, EIA/IEO2023 forecasts over 1400 km3 (rising), which looks quite optimistic, when IEA/WEO2023SP forecasts 1040 and my forecast 1000 (peaking)!
NGL production = condensate + NGPL (NG Plant liquids) is badly reported, because they are not involved in OPEC crude oil quotas (based on crude oil reserves & production as population). OAPEC reports badly NGL production, and its data should be rejected.

ME NG proven reserves look quite overestimated (as oil reserves).

-annex
Statista ME NG forecasts for 2050



Natural gas production in the Middle East by country 2019-2050

Published by Amna Puri-Mirza, Mar 10, 2023

NB: the presentation is messy as the conversion of word to pdf is different of what it was used to be: the world becomes messier!