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**GLOBAL ENERGY MIX,
Natural gas and shale gas
as a game changer?**

By

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The views expressed are those of the author and do not necessarily reflect
the views of UNCTAD.

GLOBAL ENERGY MIX, Natural gas and shale gas as a game changer?

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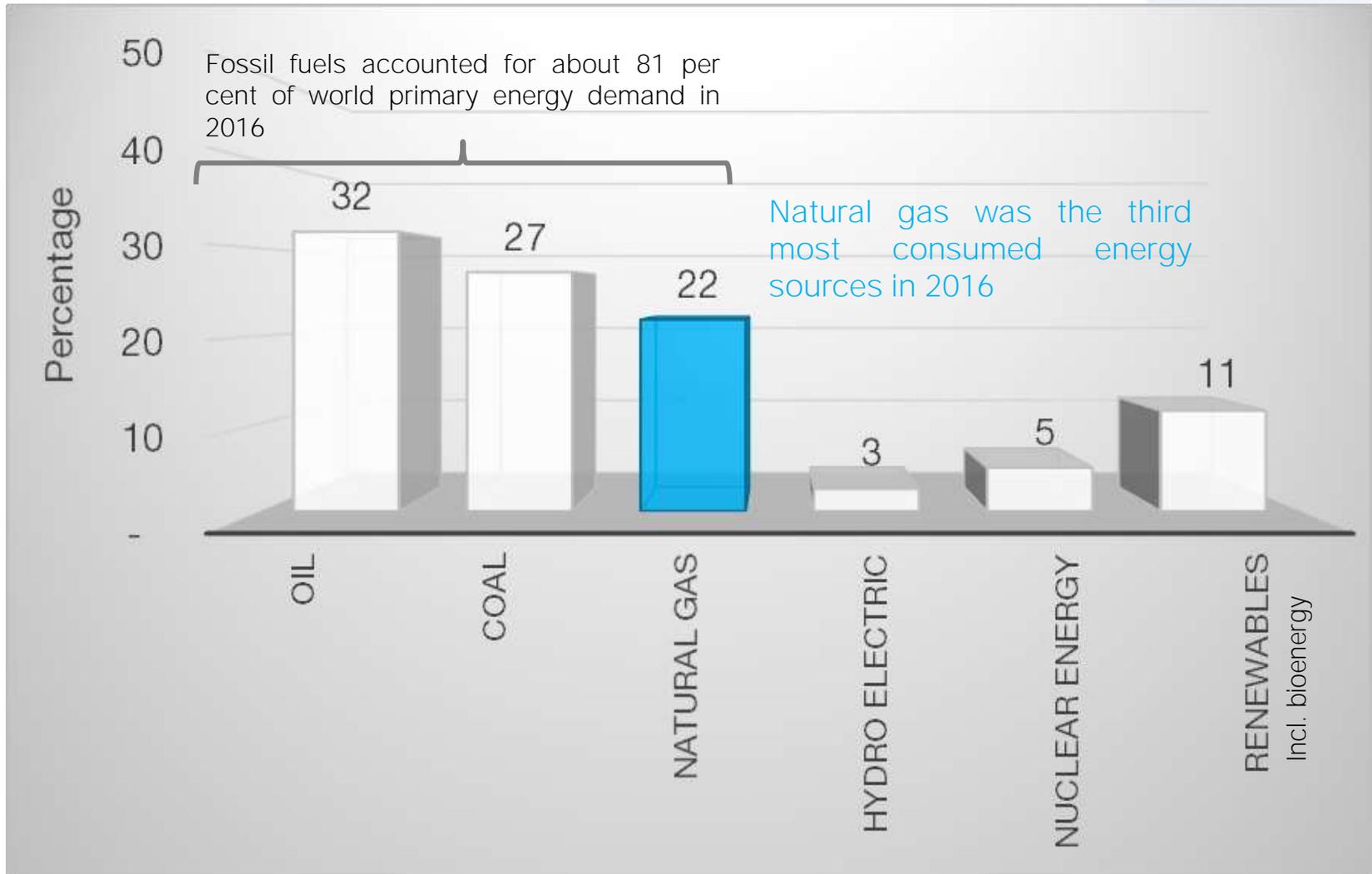
1. Introduction

2. Natural gas, as a bridge fuel?

3. Shale gas, a game changer?

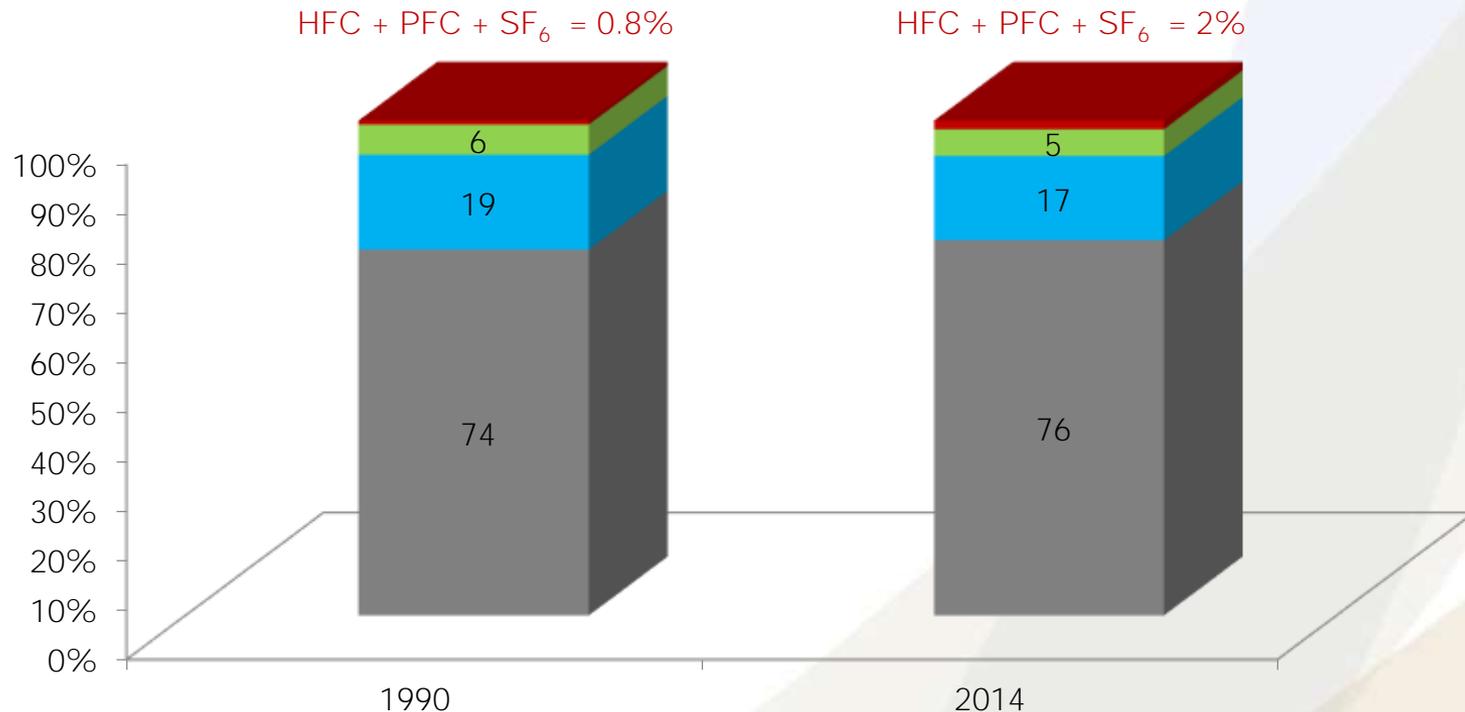
4. Conclusions

World energy mix, 2016



Emissions of GHG into the atmosphere

Since 1990, CO₂ CH₄ emissions have been responsible for the bulk of GHG emissions (more than 90%).



- Carbon dioxide (CO₂)
Dioxyde de carbone
- Methane (CH₄)
Méthane
- Nitrous oxide (N₂O)
Protoxyde d'azote
- Hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulfur hexafluoride (SF₆)
Hydrofluorocarbones, perfluorocarbures, hexafluorure de soufre

International action is now dedicated to:



« Ensure access to affordable, reliable, sustainable and modern energy for all”
by 2030

PARIS AGREEMENT

“[...] Holding the increase of the global average temperature to well below 2°C above pre-industrial levels and [...]

[...] Pursuing efforts to limit the temperature increase to 1.5°C [...]”



SUBSTANTIALLY INCREASE THE
SHARE OF RENEWABLES
IN ENERGY MIX

Achieving ambitious goals, in the context of an increasing world demand for energy

1. Global energy consumption may expand by 30 per cent by 2040
2. The increase in global energy consumption is expected to mainly come from developing countries
3. Fossil fuels are expected to remain the main source of energy to 2040. However, a transition to a more diversified and environmentally friendly energy mix is under way.
 - ✓ Natural gas: increase to 25% by 2040
 - ✓ The share of renewables in the global energy mix is also expected to rise.

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Natural gas as a bridge fuel? PROS



1. Most experts agree on the global impact of natural gas with regard to its CO₂ emissions 
 - CO₂ emissions from gas (per unit of energy produced) are lower than coal (40%) and oil (20%)

2. Natural gas is a flexible source of energy which may help meeting variable needs 
 - Adapted to seasonal demand
 - Alternative source of energy during the deployment of renewables (e.g. wind)

3. Lifetime of methane in atmosphere is shorter than carbon dioxide 
 - Methane = 12.4 years
 - CO₂ = more than 150 years

Natural gas as a bridge fuel? CONS



1. While natural gas emits less CO₂ than other fossil fuels. **It is a source of CO₂ emissions** when burned
2. The main debated topic about GHG emissions from natural gas is the issue of **methane emissions**
3. **Global Warming Potential for methane** is estimated to be 28 by IPCC over a 100-year time horizon

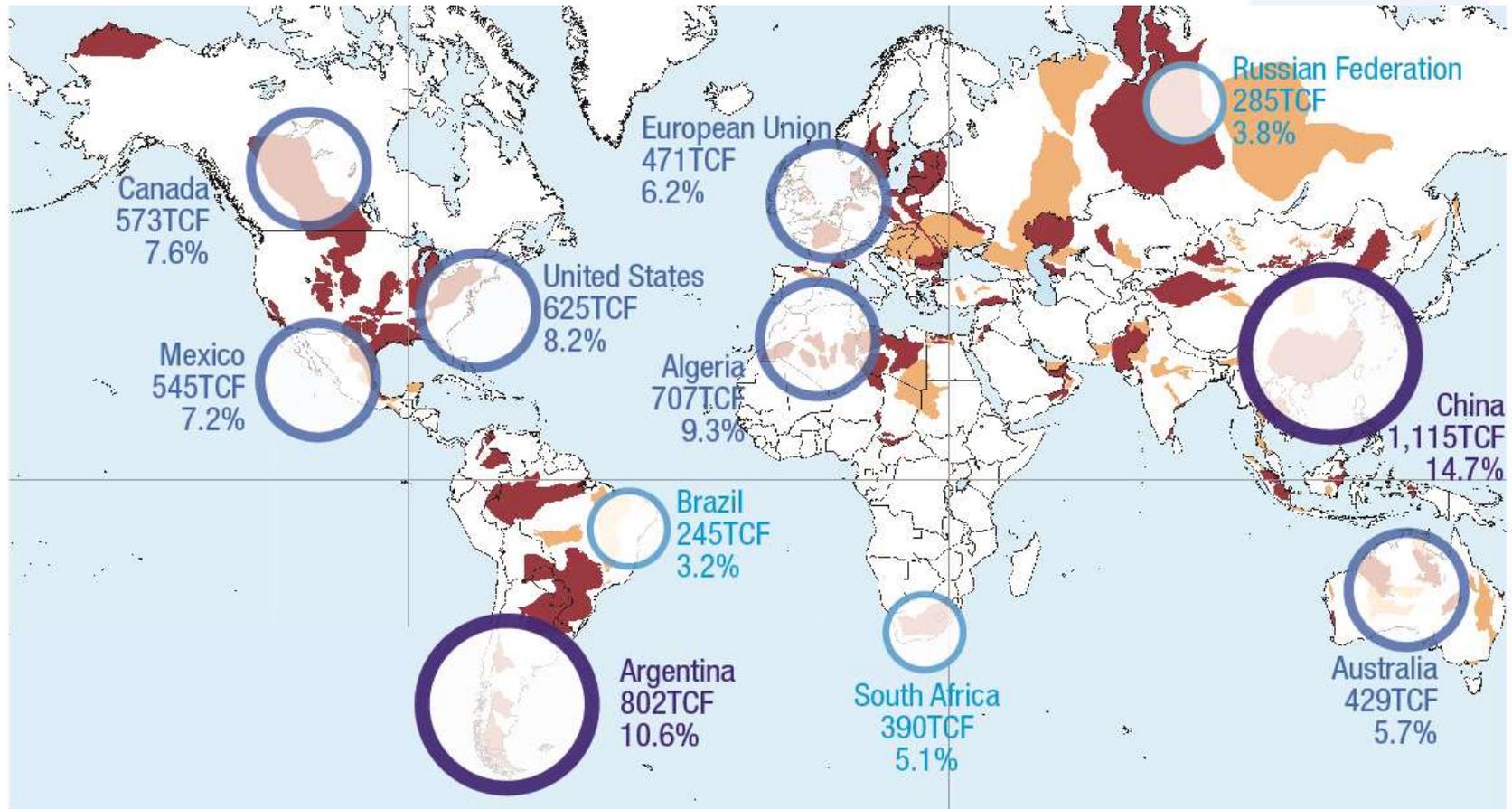
1 ton of CH₄ = 28 tons of CO₂

4. In 2015, about **13% of total methane emissions** were considered to come from oil and gas operations (55% from natural gas operations)
5. In 2016, WMO noted atmospheric methane had reached a record high at 1,853 parts per billion, **about 257% of its pre-industrial level**

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Shale gas, a game changer? World shale gas TRR, 2015



- Assessed basins with resource estimate
- Assessed basins without resource estimate
- TRR higher than 10 per cent of world total TRR
- TRR between 5 per cent and 10 per cent of world total TRR
- TRR lower than 5 per cent of world total TRR

Shale gas, a game changer? Situation in the United States

The United States are the largest shale gas producing country with more than 80% of world production and also the first natural gas producing country since 2009.

Figure 12

United States natural gas production, 1970–2016
(Billions of cubic feet per day)

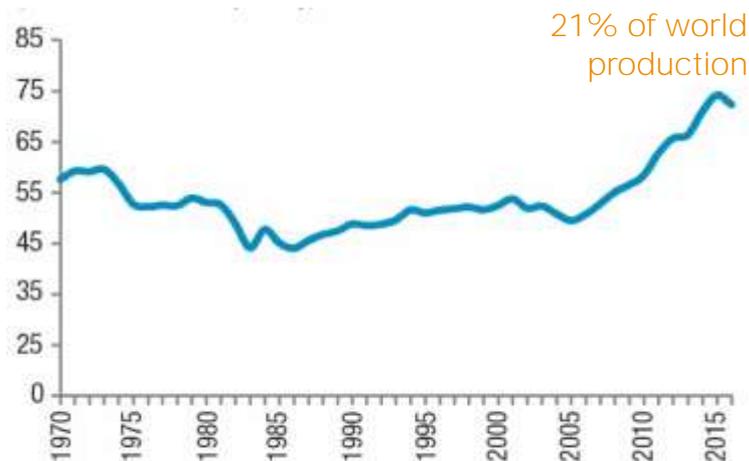
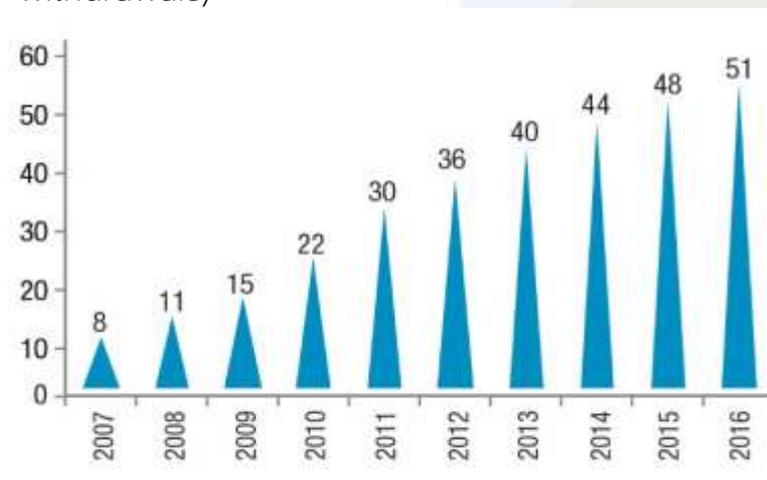


Figure 13

United States natural gas gross withdrawals from shale gas, 2007–2016
(Percentage of United States natural gas gross withdrawals)

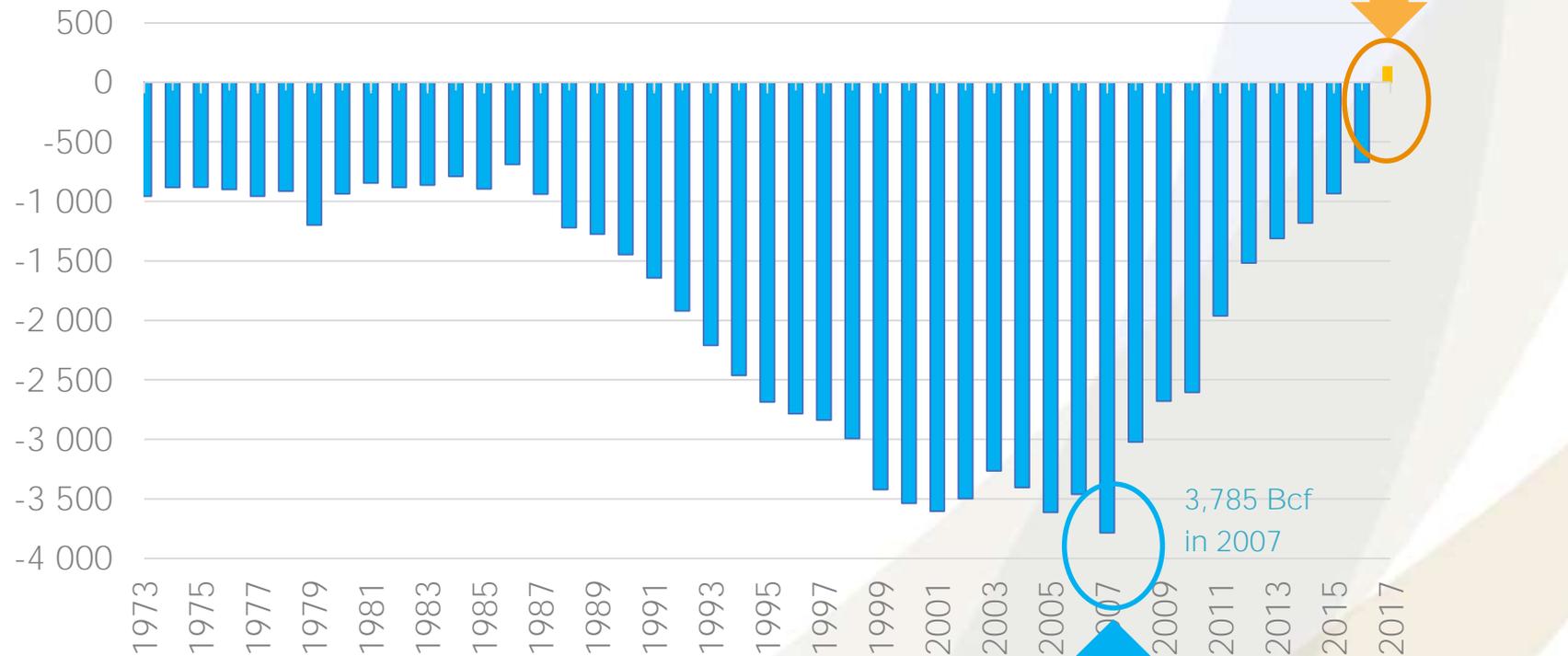


Source: UNCTAD secretariat, extracted from the forthcoming Commodities at a glance, special issue on shale gas

On March 8th, 2018, the EIA announced that the United States reached a 16.76 Tcf shale gas production for the year 2017 and 37.4 Tcf in 2040

Shale gas, a game changer? Situation in the United States

US Natural gas net-exports (1973-2017)
Billion cubic feet



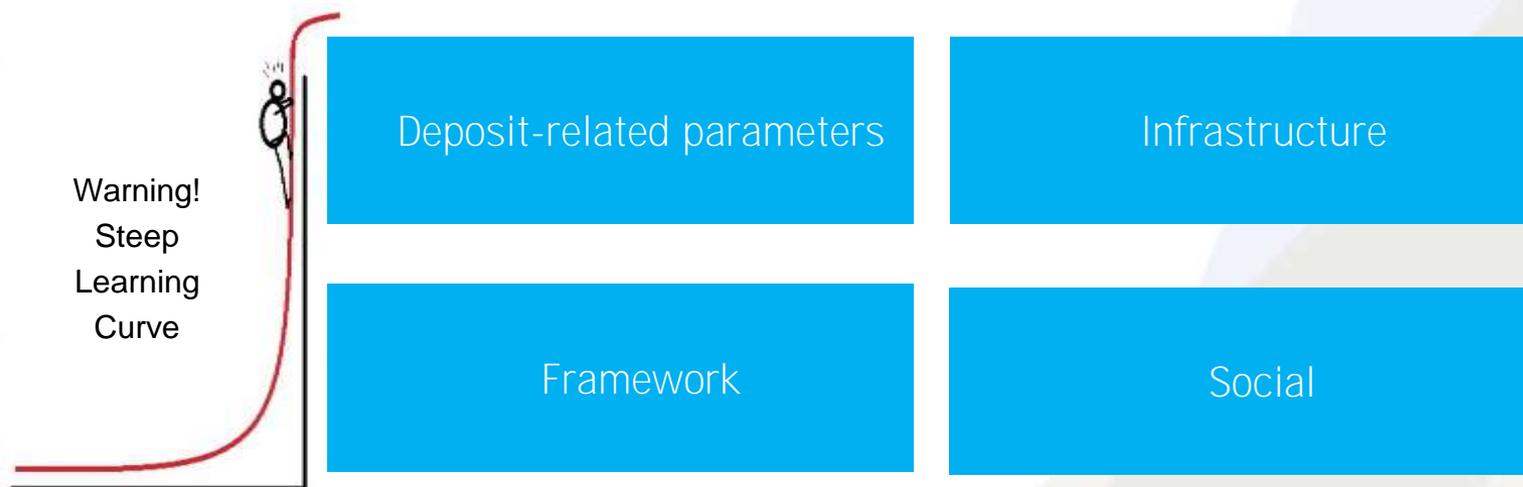
Source: US EIA (extracted on 16 April 2018)

The development of shale gas production in the United States is providing a new deal for the natural gas trade.



Shale gas, a game changer? Main bottlenecks

Some steps have been taken in other countries such as Canada, China, Argentina, the United Kingdom, Poland, Algeria or South Africa, among others, with limited success in most of them for the time being.



Learning curve may be long and costly especially in a context of:

- largely available shale gas quantities in the United States and other major producing countries
- low natural gas prices.

According to IEA, the United States will account for 2/3 of world shale gas production in 2040.

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Conclusions: We are entering a hybrid and critical period



The main trends:

1. A trend to globalization
 - ✓ The large development of the shale gas sector in the United States
 - ✓ Expansion of the trade in LNG
 - ✓ Long-term historical contracts appear to decline as well as OPE
2. To serve as a bridge fuel, natural gas would need to
 - ✓ Ensure its public acceptability, especially with regard to its footprint on the environment
 - ✓ This is particularly true with regard to methane emissions as well as hydraulic fracturing
 - ✓ Enhance transparency and reporting (e.g. fracturing fluids, leaks, methane emissions)
 - ✓ Moreover, reducing methane emissions is essential as they may negate the advantage of natural gas in tackling environmental issues in the short run
 - ✓ On the long term, the role of natural gas should be limited to fostering a smooth transition to a low-carbon economy

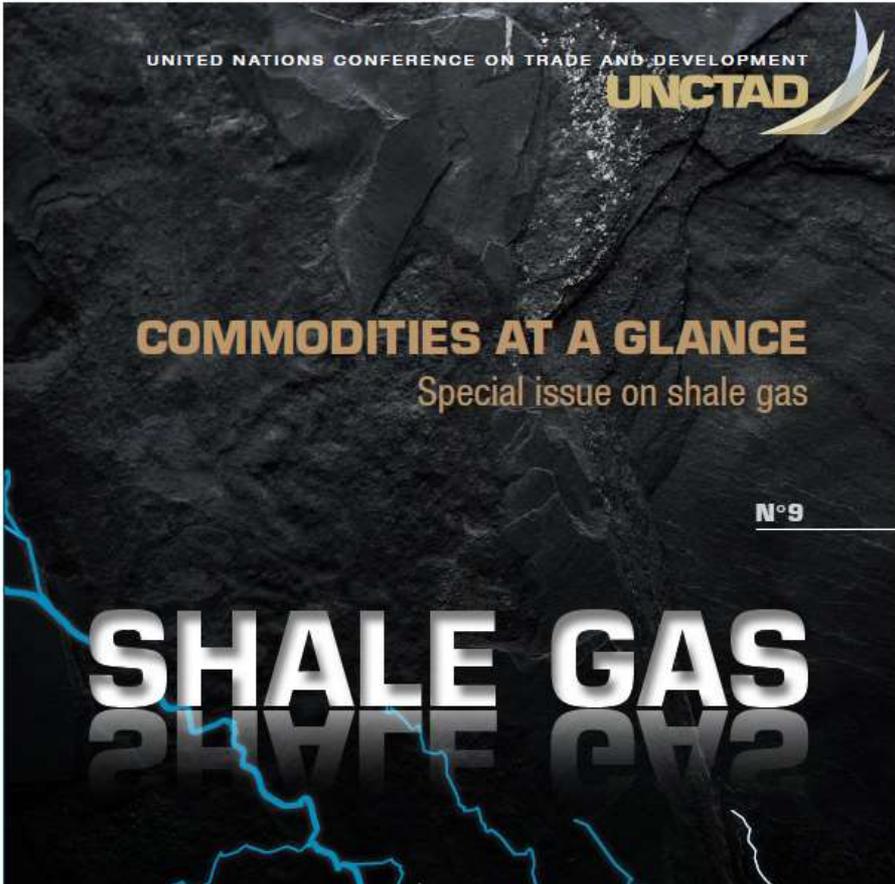
COMING SOON

COMMODITIES AT A GLANCE,
Special issue on shale gas

COUP D'ŒIL SUR LES PRODUITS DE BASE,
Édition spéciale sur le gaz de schiste

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FORTHCOMING



UNITED NATIONS
New York and Geneva, 2018



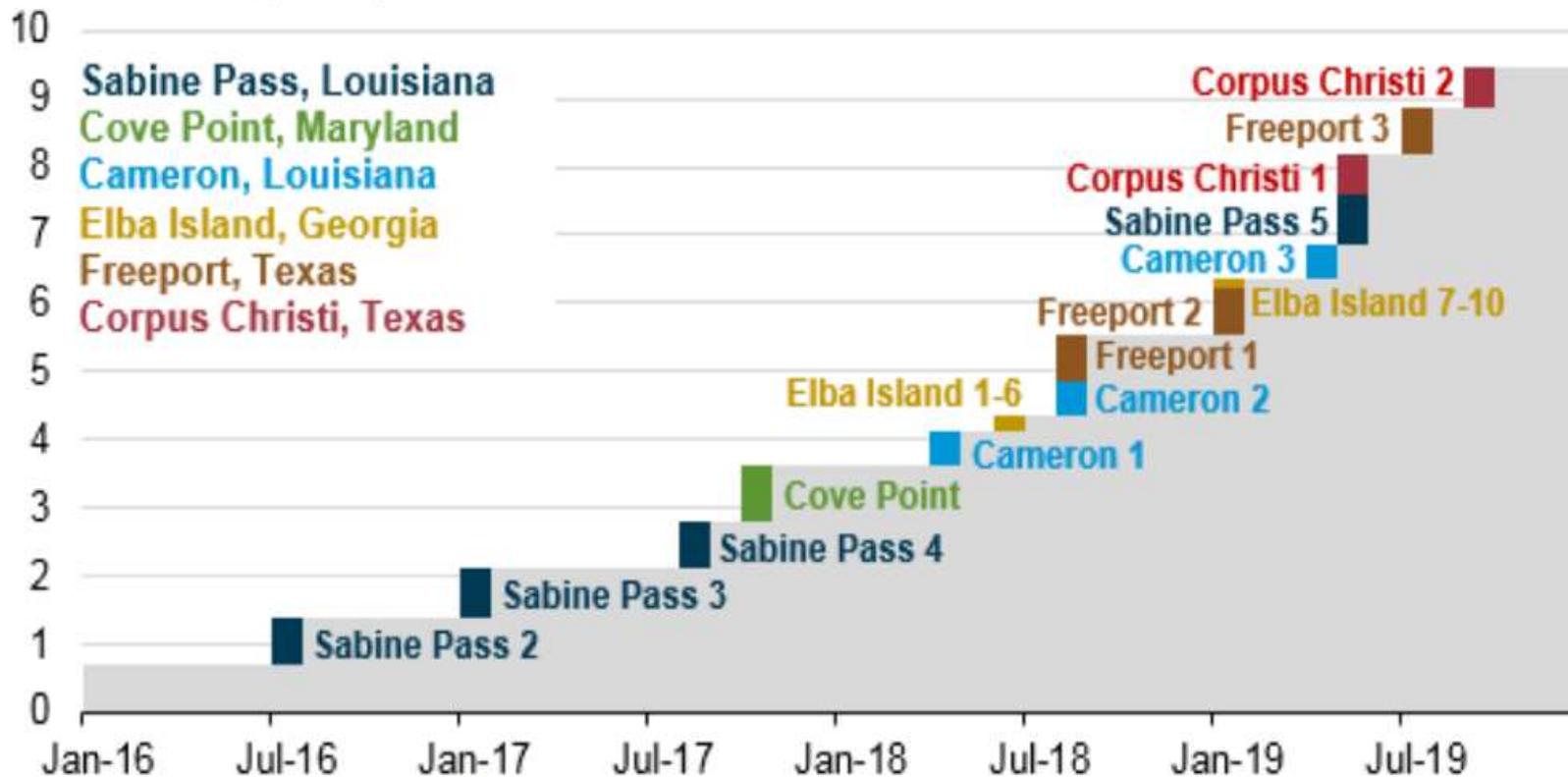
**THANK YOU FOR YOUR
ATTENTION!**



US Liquefied natural gas exports capacities

U.S. liquefied natural gas export capacity

billion cubic feet per day



Source: U.S. Energy Information Administration, compiled from trade press