NATURAL GAS REVOLUTION MEETS THE METHANE CHALLENGE

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TOPICS

• US GAS SUPPLY REVOLUTION
• SEARCH FOR NEW MARKETS
• ENVIRONMENTAL AND GHG CHALLENGE
• CONCLUSIONS & CONCERNS
BSA – DECADES AND DECADES OF GAS AND ENERGY ADVISORY SERVICES!

• **Mid-stream natural economics, rates, commodity risks, contracting.**
  - Gas market research & training
  - Index & contract negotiation
  - Fuel risks/due diligence
  - Litigation support/rate cases.

• **600+ assignments in 28 countries since March ’84.**

Clients: Energy traders, power generators, pipelines, utilities, banks, governments, universities.
**Source:** BSA 2017, from EIA; Yamal data from Gazprom, [http://www.gazprom.com/about/production/projects/mega-yamal/](http://www.gazprom.com/about/production/projects/mega-yamal/), incl. explored and provisionally estimated; Qatar data from EIA, BP 2017 statistical review.
Most rigs. 40% of all US rigs are looking for oil in the Permian Basin of West Texas.

Most production growth. 48% of gas supply growth is in Marcellus-Utica Basins of Appalachia.
CREATING DEMAND AT HOME: GAS-BASED FACTORIES... AND GLOBAL LNG EXPORT CAPACITY.

$110 bn toward 250 new chemical, petrochemical, steel and other manufacturing, # plants by region

9.3 Bcf/d of approved LNG export capacity now in service or in construction; another 6.6 Bcf/d approved/awaiting FID.

A ‘second wave’ of US LNG export projects totaling more than 12 Bcf/d will depend on prices and other LNG market conditions.

Source: BSA 2017, from 2015 American Chemical Society survey, US FERC LNG project info at 1 May 2017,
**SURPLUS GAS IS FAST REPLACING COAL FOR POWER GENERATION, CUTTING CARBON EMISSIONS.**

Gas and coal prices compete closely...

...but the US coal fleet is aging & inefficient (GW).

Newer than 30 yrs, 12%

30-40 years, 27%

40-50 years, 33%

50 years or older, 28%

Gas, wind & solar for elec-gen are all rising.

Thus, US elec-gen CO2 emissions are falling.

Source: BSA 2017; data from EIA and Statistics Canada.
GAS, ESPECIALLY LNG, IS FINDING MARKET IN OFFSETTING WIND & SOLAR PRODUCTION VARIATIONS.

LNG Regas in Spain

Hourly Wind Production in TX, MW

104 LNG Storage Plants in US

BUT NGVS, THE CLEAN FUEL, THE NON-PETROLEUM DREAM...WHY AREN’T THERE 20 MILLION IN THE US?

And there’s Chrysler’s “flat tank” CNG Dodge Charger that never was...

Since 2014, all muni buses in Los Angeles run on natural gas.

Westport Cummins LNG semi will travel up to 800 miles.
IN SOME US REGIONS, BATTERY EVS ARE JUST, IN EFFECT, VERY HIGHLY EFFICIENT NGVS.

• **Gas is the marginal fuel for most hours of the day in the mid-Atlantic states, and Texas, California, Florida, the Northeast, other US regional grids.**
THE GAS CHAIN

E&P, Gathering, Processing

Pipeline Transport

LNG Liquefaction, Shipping, Regasification

Local Gas Distribution Utilities


Also, financing, pricing, trading – all complicated by units of measure!
ENVIRONMENTAL & CARBON ISSUES OF NATURAL GAS AND SHALE GAS:

• EDF-UT studies show initial fears of high methane leakage rates (from over-flights) were greatly overstated.

• Obama Administration’s “green completions” rules likely to survive current EPA challenges.

• Other non-methane issues:
  • EPA investigations show groundwater contamination usually pre-exists fracking.
  • Over 500 drillers report fluids on Frac-Focus, as required by top producing states.
  • Recycling of return-water in Appalachia & arid regions, dodge seismic effects of water disposal wells.

NATURAL GAS BURNS 2X UP TO 2591X CLEANER THAN COAL, AND CLEANER THAN OIL AS WELL.

Source: EIA - Natural Gas Issues and Trends 1998
SUMMARY/CONCLUSIONS

- **US natural gas supplies stay long for at least two decades — prices will remain competitive, but rise to rebalance markets.**
  - Coal replacement will keep reducing US CO2 emissions through the early-2020s, when we run out of ancient, inefficient coal-fired plants to replace.
  - Newly created domestic gas demands (and pipeline exports to Canada and Mexico) will probably outpace US LNG exports.
  - Mid-stream gas infrastructure (pipelines, gathering/processing, distribution) will expand to serve gas growth throughout most of North America, but not all.

- **Private investment and public/municipal investment will continue stimulating large-scale NGV markets.**

- **Methane rules will survive current EPA challenges, but states and other countries need to enforce zero-methane emissions policies throughout the gas chain globally.**