GPCA Fertilizer Convention 2018 Muscat, Oman

USA review and trade tensions

A journey over the past 2 decades

Thomas Heinrich

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Agenda

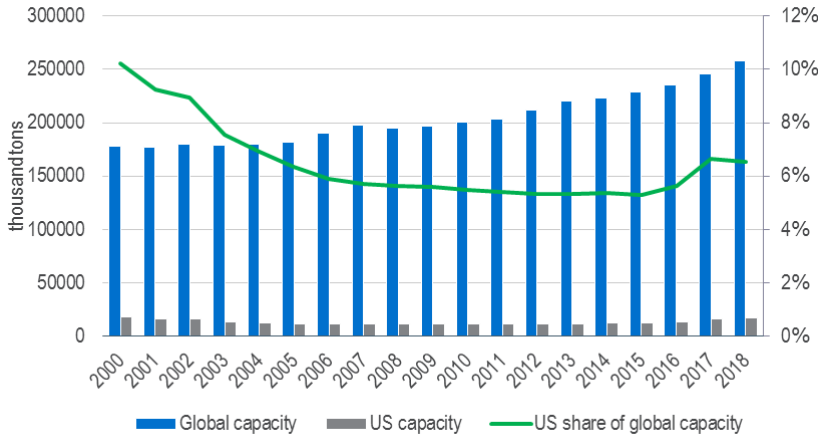
- Overview: US in global context
- Phase 1: High natural gas prices
- Phase 2: The shale gas revolution
- Phase 3: Protectionism ?
- Summary & Conclusions

Overview

US in global context

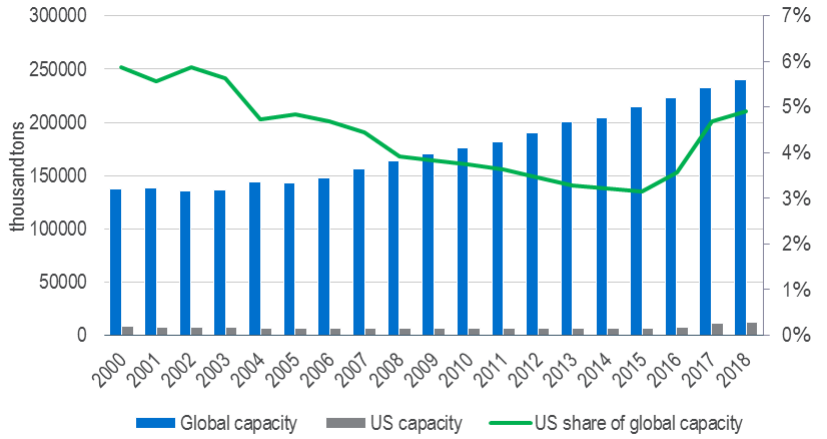
The US has always been an important fertilizer market

Ammonia capacity US vs. global



Nexant

Urea capacity US vs. global



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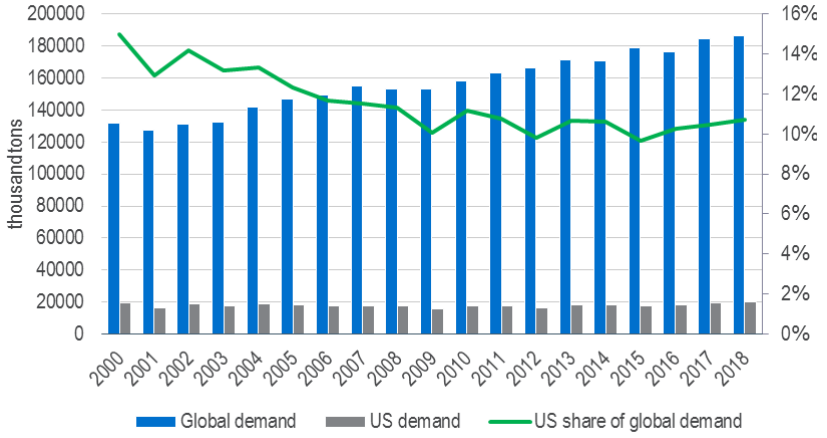
Ammonia demand US vs. global



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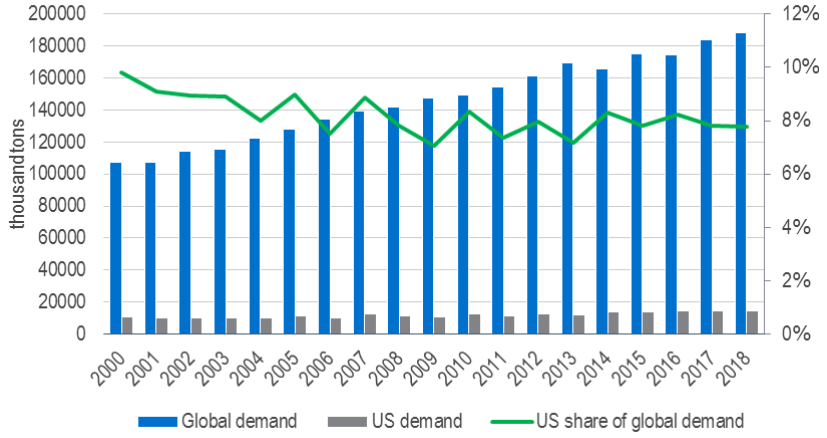

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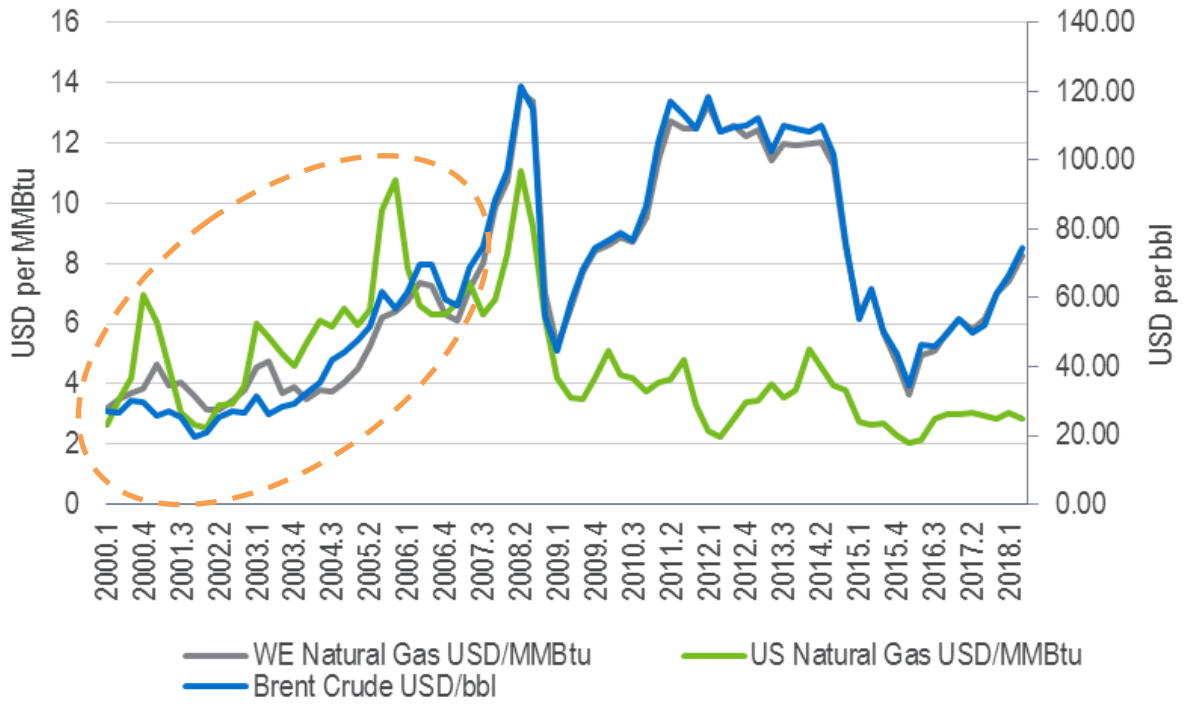
Phase 1

High natural gas prices

Natural gas cost mainly determine a project's / region's competitiveness

Raw material price development



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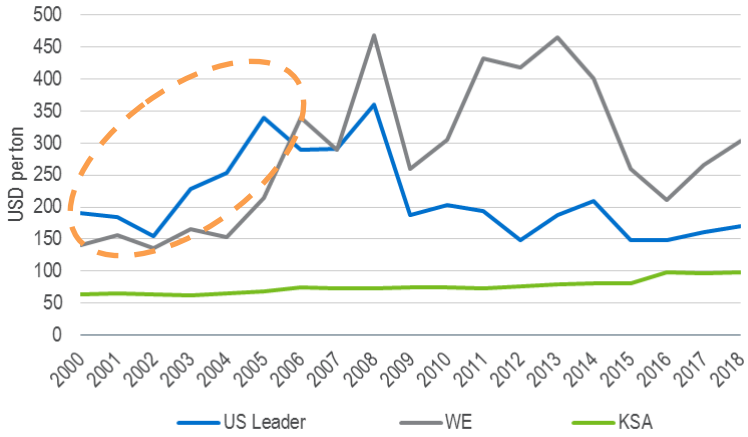
- US natural gas prices were higher than Europe's in the early 2000s
- Shale gas development significantly increased availability and reduced prices
- Europe the global laggard in natural gas
- US and WE prices highly correlated to crude prices in early 2000s
- High crude prices prompted investments in "stranded gas" regions

US cash cost of production of ammonia / urea were amongst the highest in the world.

Ammonia cash cost of production



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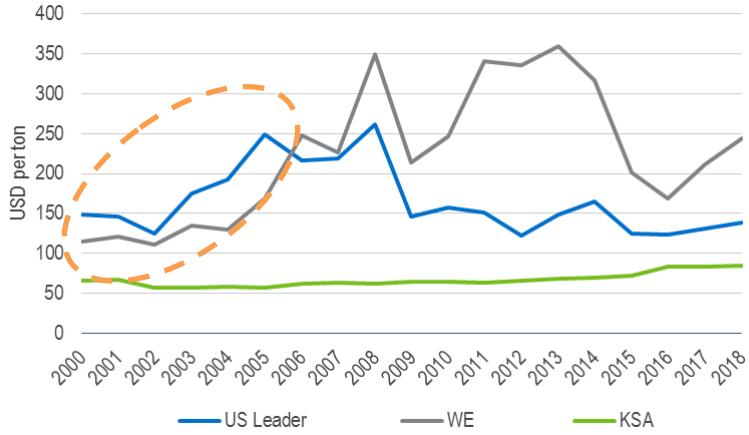
Urea cash cost of production (integrated)

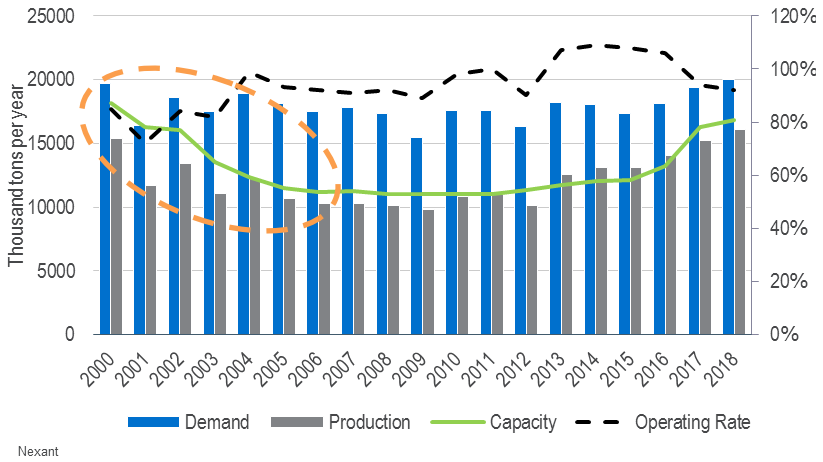


Nexant

- US and WE were the so called “laggard” regions with a strong influence on price developments
- Producers in KSA still enjoy a strong advantage on a cash cost basis due to low gas cost
- Middle Eastern producers are exporters which have to account for freight

Reduction of ammonia capacity was more profound compared to urea

Ammonia SDT US



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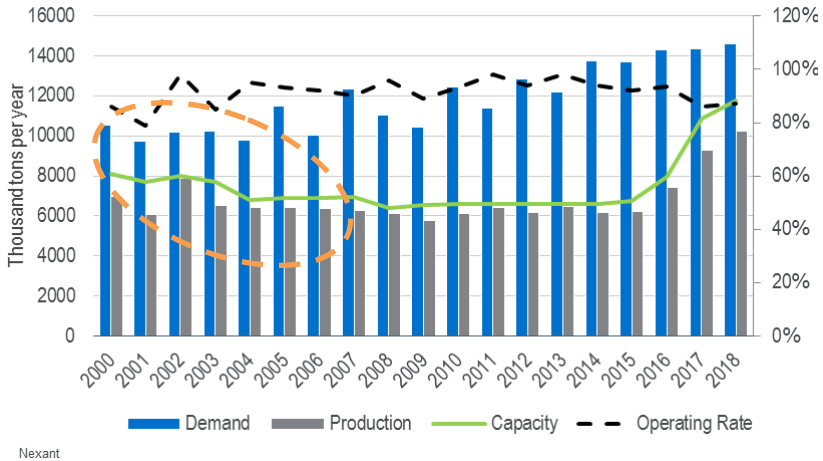
Urea SDT US

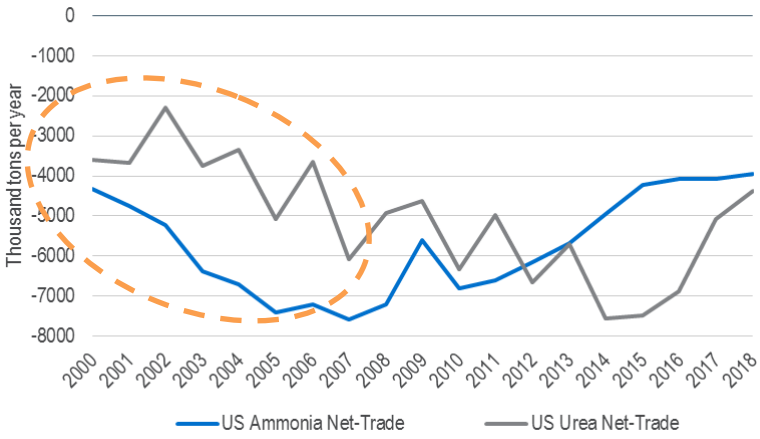


Nexant

- US capacity significantly reduced in the early 2000s due to high energy costs
- Urea capacity less affected by high energy costs as additional nitrogen requirements mainly captured by urea
- Ammonium phosphate production decreased over past 2 decades
- Ammonia demand remained reasonably constant albeit some fluctuations
- Urea demand increased

The share of urea deliveries to the US from the Middle East has increased dramatically but also from Africa (and China).

Ammonia & Urea Net-trade US



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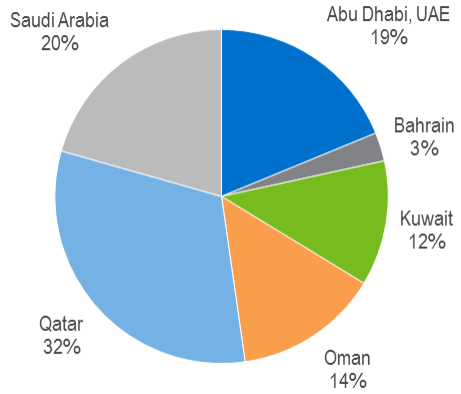
Middle East Urea Exports to the US, 2016



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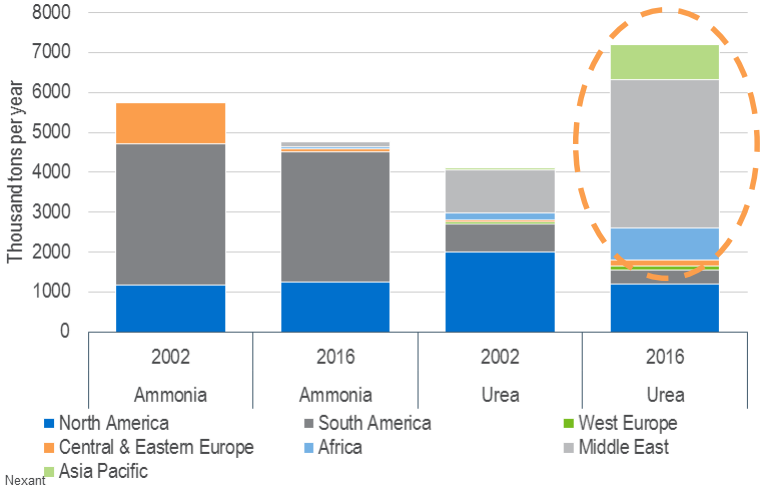
Ammonia & Urea Trade Flows



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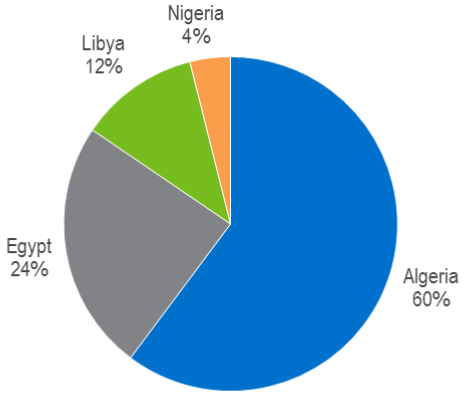
Africa Urea Exports to the US, 2016



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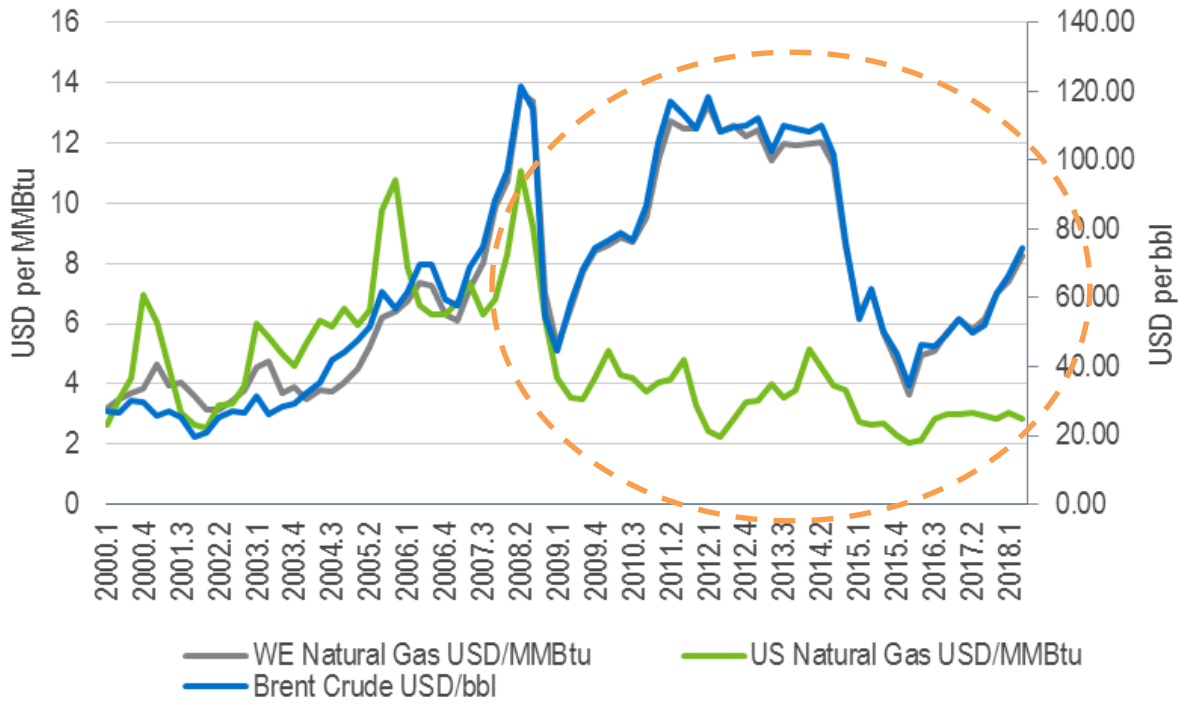
Phase 2

The shale gas revolution

Breakthrough in shale gas / oil technology increased supply of natural gas significantly in the US prompting prices to drop.

Raw material price development



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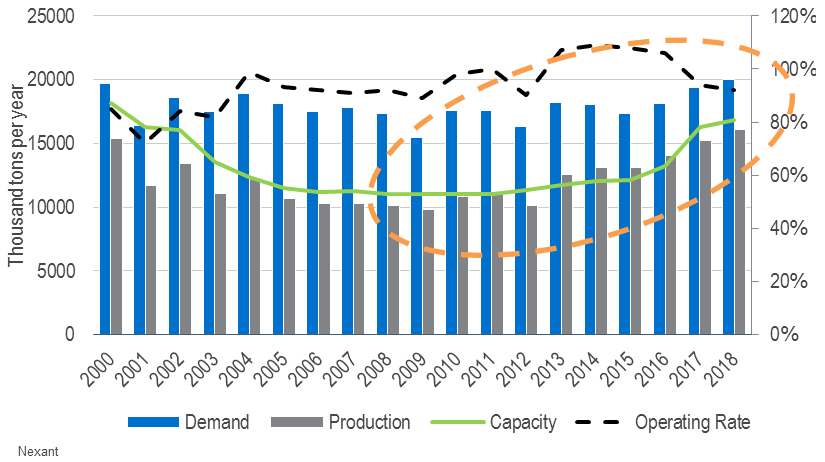
- Significant decoupling of natural gas prices in the US from crude oil
- Turned WE into global laggard (with some Chinese capacity as well)
- Competitiveness position of US producers improved significantly
- At times US rivalled leader ME producers on a delivered cost basis to USGC

Reduction of ammonia capacity was more profound compared to urea as a result of some standalone ammonia plant closures.

Ammonia SDT US



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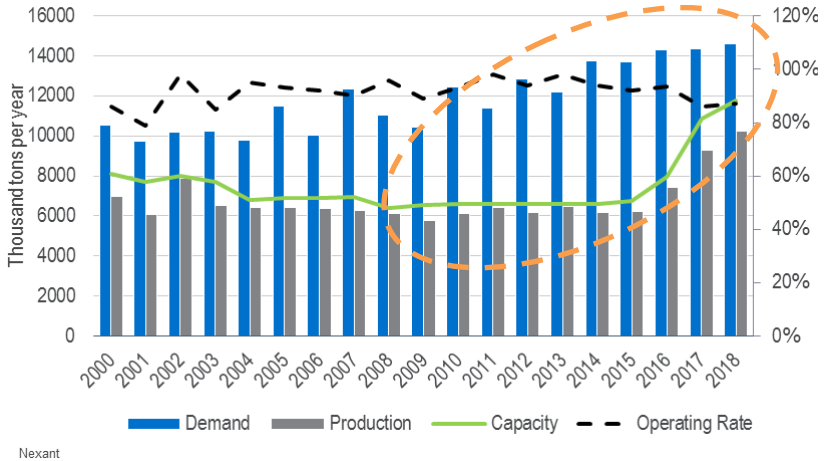
Urea SDT US



Nexant

- A flurry of new nitrogen fertilizer capacity announcements was made in the years 2012-2014 in the US (and Canada)
- However, not all of these projects have been realized
- The low energy cost environment prompted a general interest in natural gas based chemicals (steam cracking) driving up EPC cost
- Implementation (construction) time for projects ca. 3-5 years, hence only real affect of additional capacity felt as of 2016

Only a small percentage of announced capacity actually materialized.

Announced urea plants actually materialized to-date include:

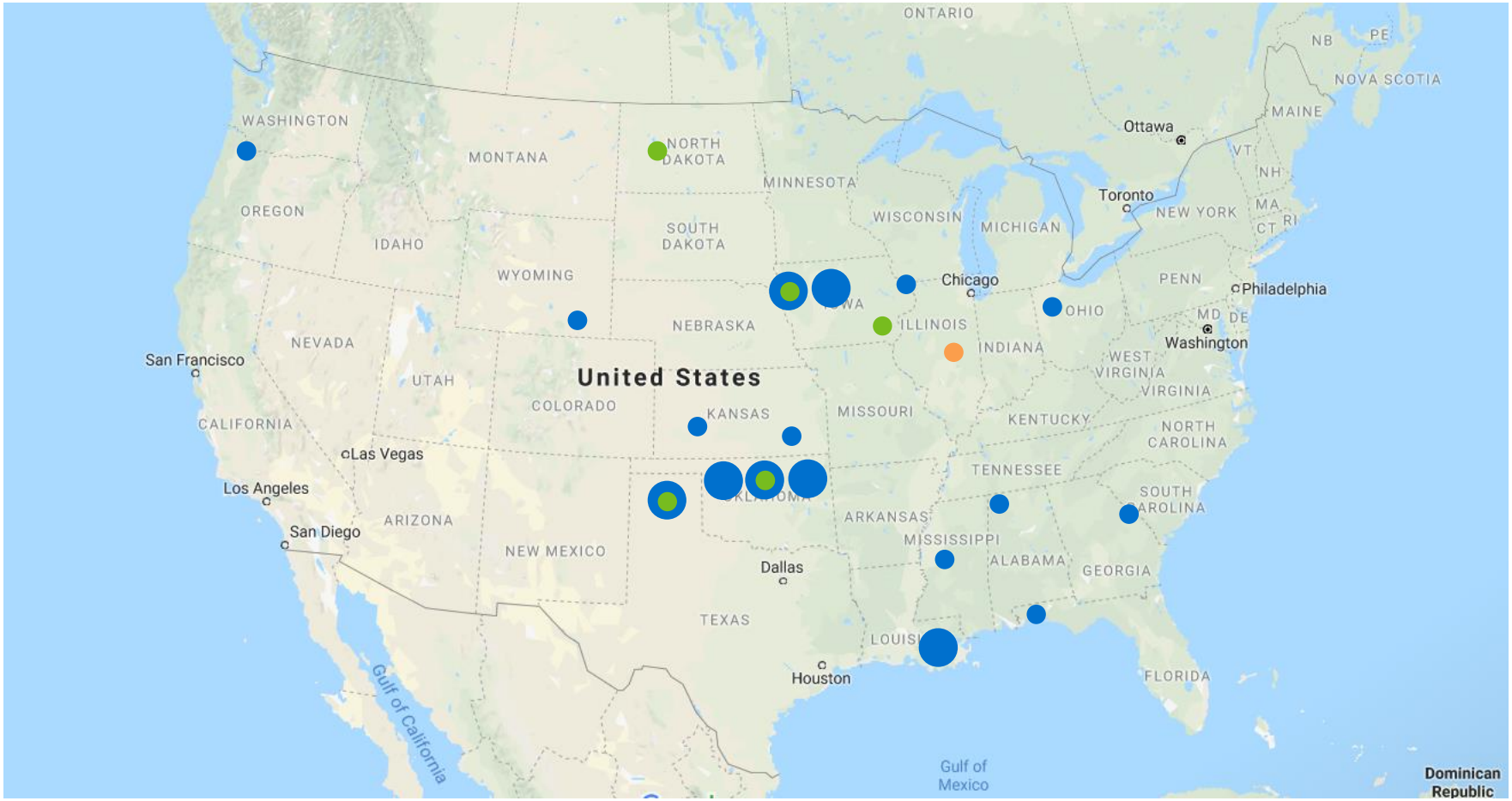
- 2016 (late) CF Industries Port Neal, IA
- 2017 Nutrien (formerly Agrium) Borger, TX
- 2017 Koch Nitrogen Company Enid, OK
- 2017 Orascom Construction Industries Weaver, IA
- 2018 Dakota Gasification Beulah, ND (coal gasification plant)

Lately, investment fever has subsided somewhat with main firm capacity addition in Gulf Coast Ammonia (Borealis, Agrifos), TX and Cronus Chemicals (ammonia/urea) in Tuscola, Il:

- High CAPEX
- Low commodity fertilizer prices (albeit prices recently increased)
- Strong international competition

Late in 2017 merger of Potash Corp and Agrium was finally approved forming Nutrien → a lot of US capacity now under this new name

Shale gas supply has not materially influenced location decisions for new urea projects in the US to date but new sites are investigated.



- Individual (old) existing plants
- Several (old) existing plants
- Recently added capacity
- Potential new capacity

Question is… how much more capacity will be added over time and will the US become self-sufficient in fertilizers?

Despite other factors low relative delivered cost of production is key!

- How long will natural gas prices remain low (supply/demand driven and by LNG export capacity)?
- How will costs in other regions develop relative to the US?
- How will freight costs develop?
- Will there be ADDs or other protectionist measures imposed?

Phase 3

Protectionism?

Governmental changes can cause trade disruptions … What are the general economic implications from protectionism?

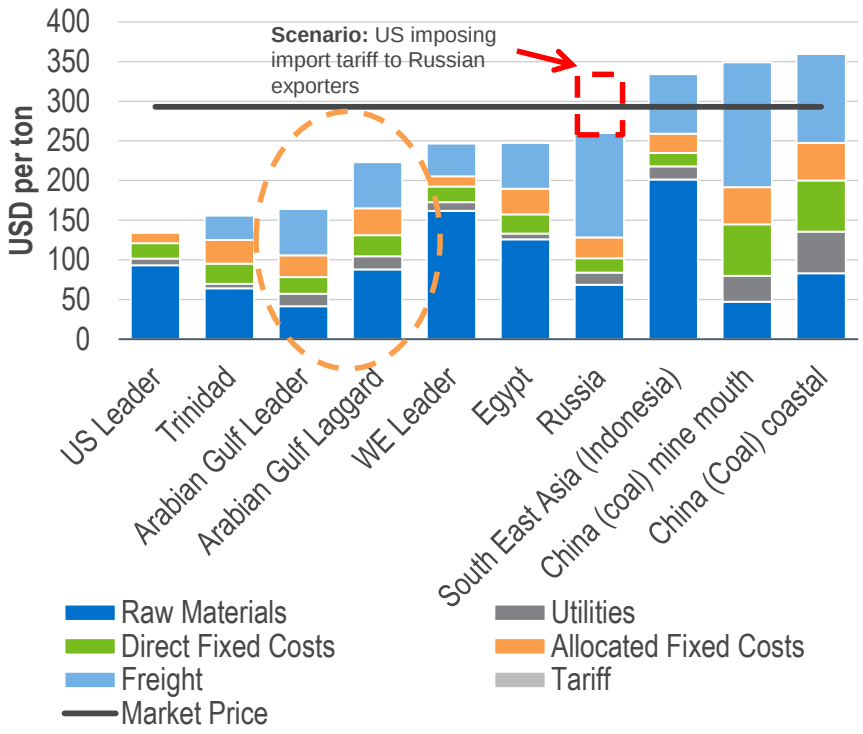
There is a big debate amongst economists about the advantages / disadvantages from protectionist measures.

- Does it create / keep local jobs?
- Does it increase local investments or slow down efficiency?
- Does it increase the cost for consumers?
- Etc.

The reality is that protectionism is a wide spread economic measure and the fertilizer industry is also affected by it.

No tariffs apply in US imports currently

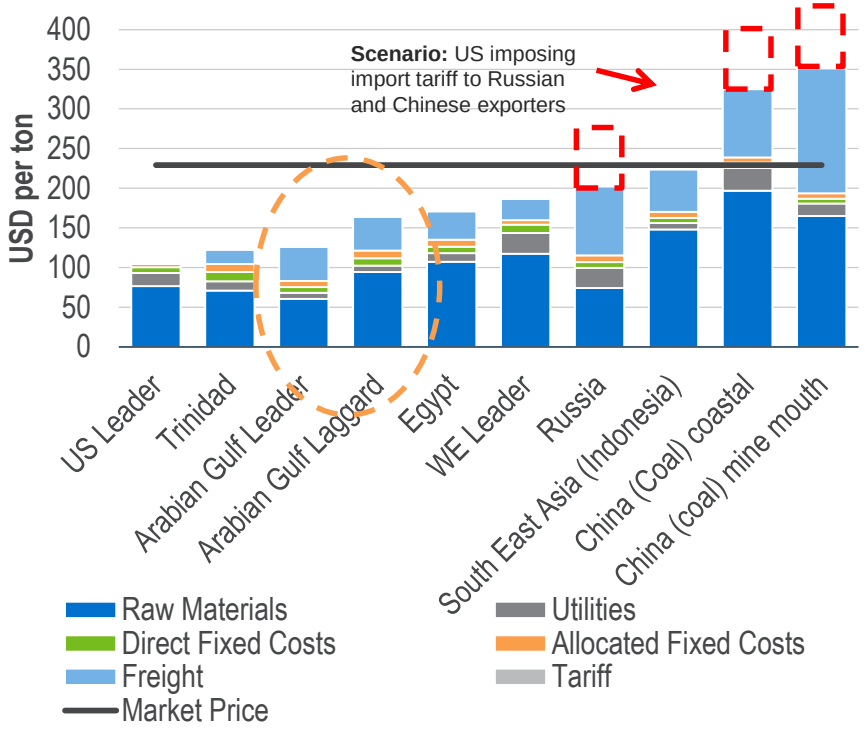
Ammonia Delivered Cost to USGC (2016, USGC)



Source: Nexant

- US and Trinidad producers are highly competitive due to low gas prices and market proximity.
- East Asian producers are at the high end of the cost spectrum.

Urea Delivered Cost to USGC (2016, USGC)



Source: Nexant

- Delivered cost competitiveness for urea is similar to that for ammonia.
- Middle Eastern producers could weather modest import duties while specific ADDs can affect anyone

The introduction of tariffs (and ADDs) can significantly reduce a producer's competitive position.

- The cost competitiveness analysis shows which producers are mainly affected by a market downturn.
- Especially producers at the high end of the cost curve would suffer if import taxes are introduced in major demand centres.
- Especially Chinese producers are vulnerable to import duties in import markets as they are at the high end of the cost spectrum due to a combination of high production cost and often high freight costs (including inland). → current trade tensions between the US and China!
- Low cost producers would typically only be affected if specific ADDs are applied which would price them out of the market. → the GCC producers have currently nothing to fear!

Summary & Conclusions

The US nitrogen fertilizer industry went through a volatile change over the past two decades.

- **Stage 1: High natural gas prices in the US in the early 2000s**
  - **Prompted considerable ammonia plant closures; urea plants were less affected.**

- **Stage 2: Shale gas revolution in the US**
  - **Prompted gas prices to fall which led to a flurry of capacity announcements.**
  - **Only small percentage of announced plants were build as a result of higher EPC costs, low commodity fertilizer prices and strong int. competition.**
  - **Will the US become self-sufficient?**

- **Stage 3: Protectionism?**
  - **Changes in governments can lead to trade tensions**
  - **There is no unity among economists if protectionist measures are beneficial or harmful**
  - **Chinese fertilizer producers could be affected by trade tensions while GCC producers would likely only be affected by specific ADDs**

1 King's Arms Yard,
London, EC2R 7AF

Telephone: +44 20 7950 1600
Facsimile: +44 20 7950 1550

www.nexant.com

Nexant, Inc.

San Francisco
New York
Houston
Washington
London
Bahrain
Bangkok
Shanghai
Kuala Lumpur

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