Natural Gas and the U.S. Fertilizer Industry

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Outline of Presentation

- Brief Intro on Fertilizer
- Focus on N Production
  - Anhydrous Ammonia
- Impact of Increased U.S. Natural Gas Prices
- Climate Change Legislation
- Concluding Remarks

Contributions of the Domestic Fertilizer Industry

- Fertilizer nutrients account for 40-60% of total crop production!

  => Enable the U.S. to feed the world; without it, the U.S. (and world) would have to plant 2X as many acres, which is impossible, or have significantly less agricultural output which would result in higher food prices and significantly more world hunger!

- Agriculture is one sector in the U.S. budget accounts where we have a POSITIVE trade surplus. Fertilizer is one of the primary inputs which makes our highly productive agriculture possible!

- In addition to it's SIG contribution to AG, domestic fertilizer Prod:
  - Creates a total of 245 thousand U.S. jobs!
  - Provides a total U.S. economic contribution of over $ 58 Billion!

NPK

NITROGEN (N)

is a primary building block for all organisms. It is essential to making proteins, helps keep plants green and is a critical component of soil structure.

COMES FROM THE AIR

PHOSPHORUS (P)

is found in every living cell. Phosphorus is a component of DNA and it also plays vital roles in capturing light during photosynthesis, helping with seed germination, and helping plants use water efficiently. Plants also use phosphorus to help fight external stress and prevent disease.

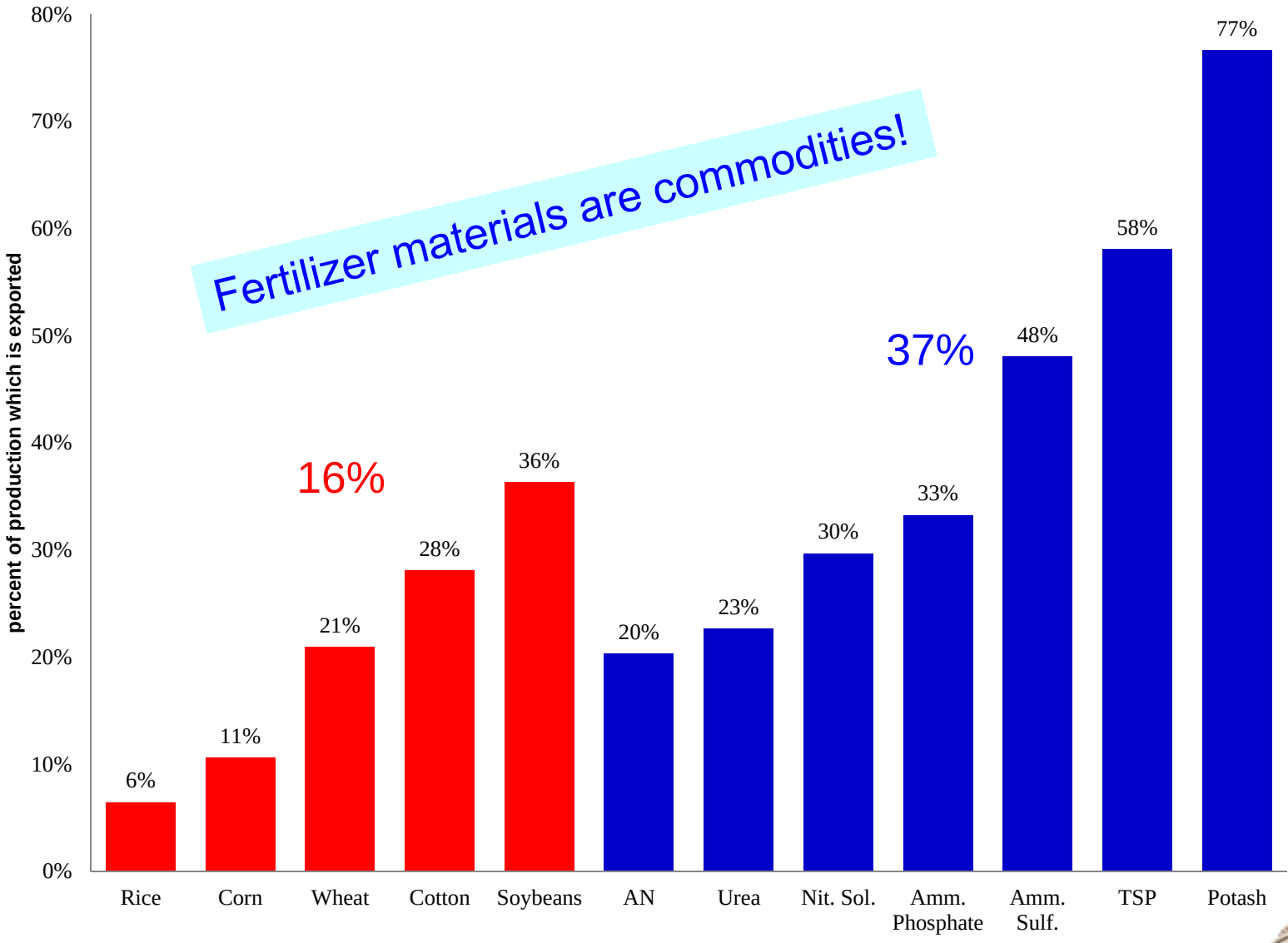
COMES FROM ANCIENT SEA LIFE

POTASSIUM (K)

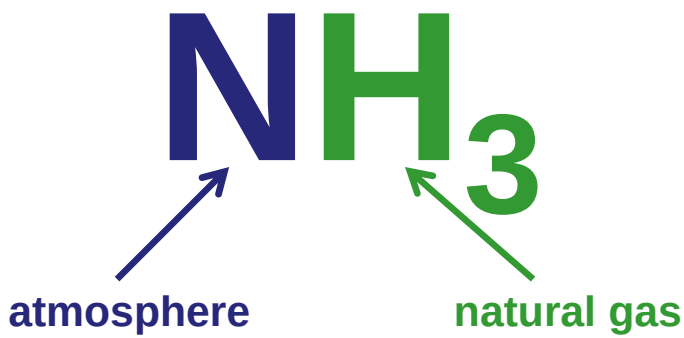
is essential to the workings of every living cell. It plays an important role in plant's water utilization and also helps regulate the rate of photosynthesis. Other aspects of plant health influenced by potassium include the growth of strong stalks, protection from extreme temperatures, and the ability to fight stress and pests such as weeds and insects.

COMES FROM EVAPORATED OCEANS

Share of World Crop and Fertilizer Products Traded, 2008



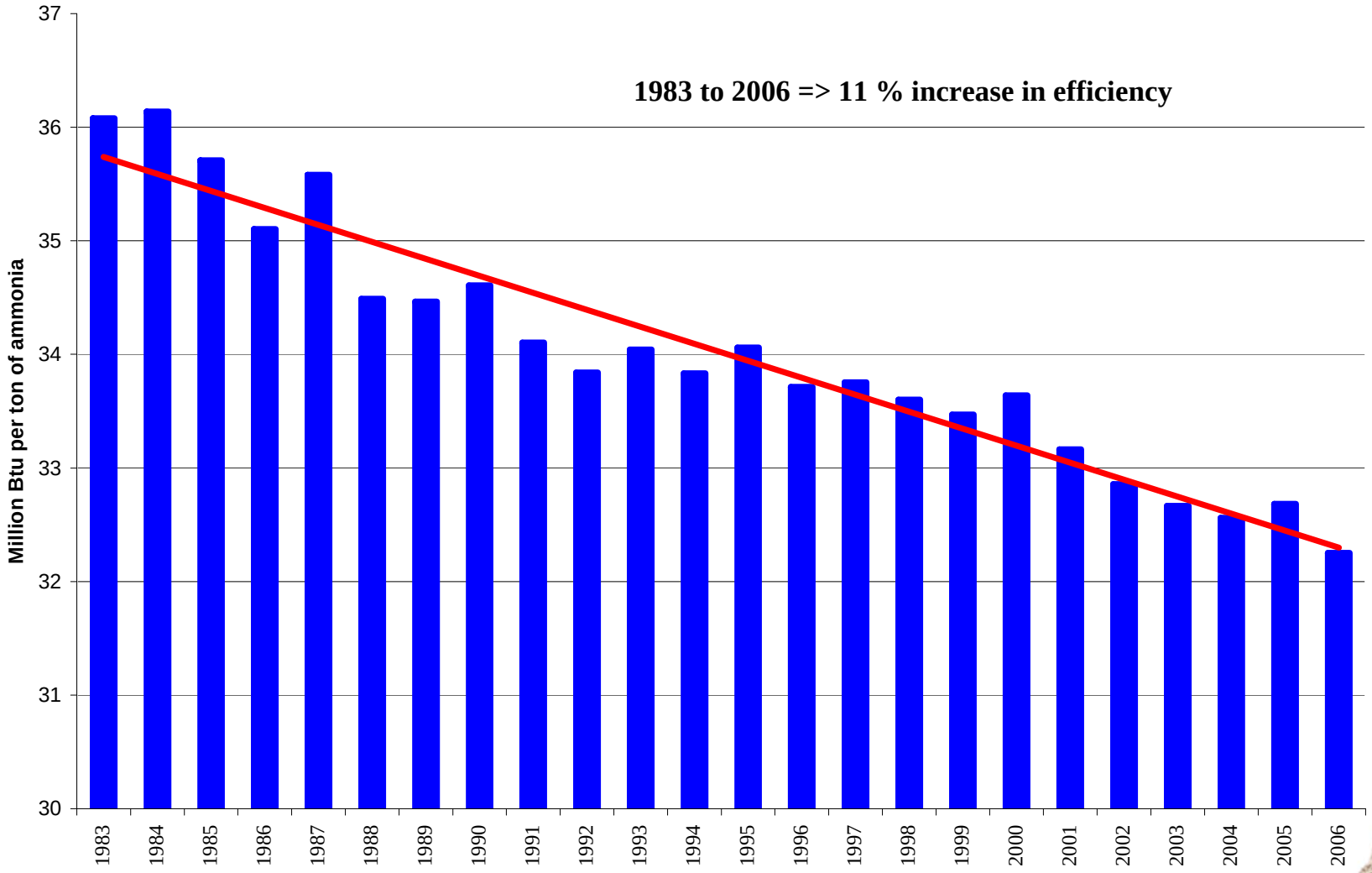
Source: USDA, IFA.



Anhydrous ammonia production

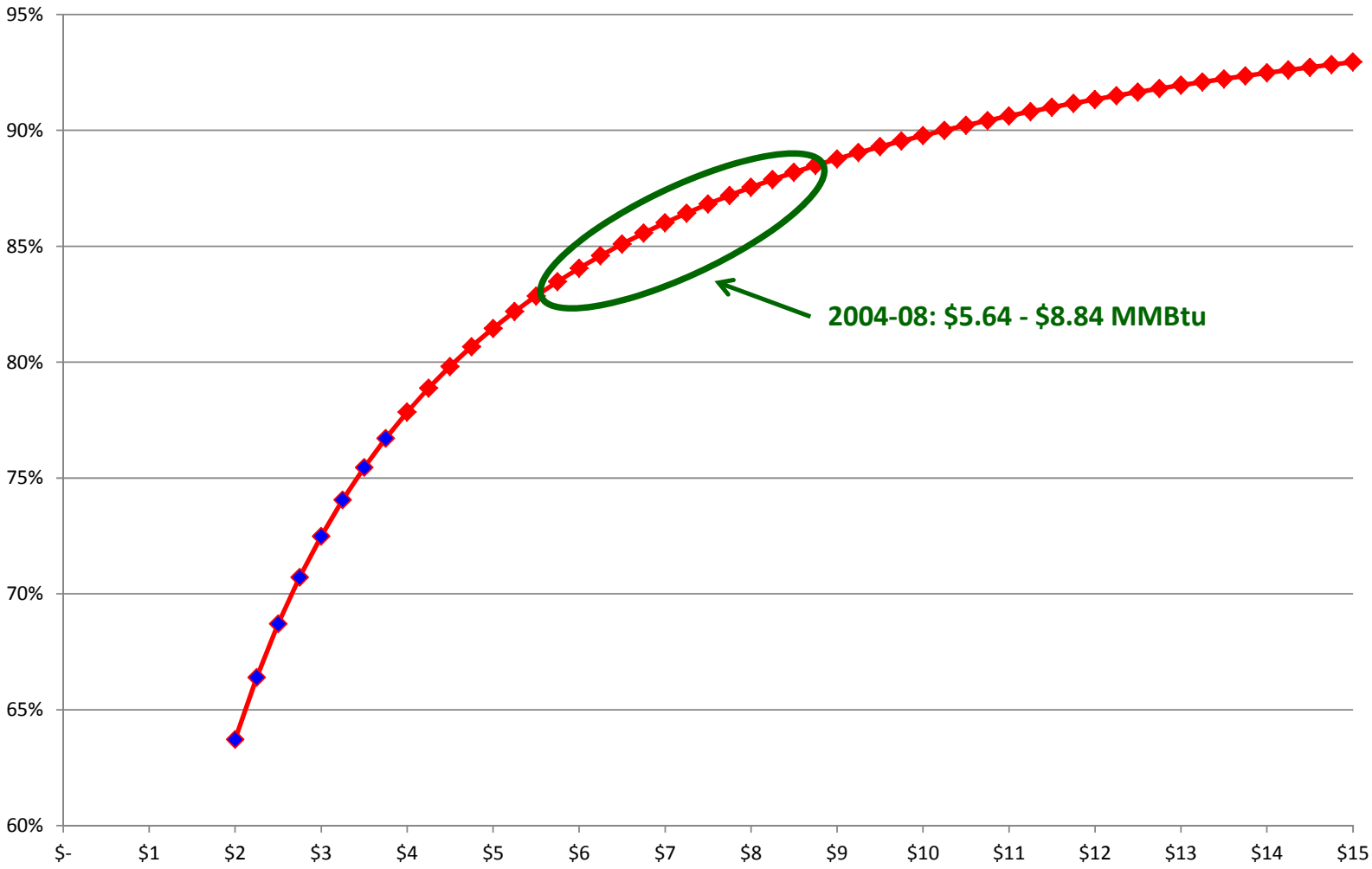
- Source of the nitrogen in fertilizer
- Haber-Bosch process (Fritz Haber/Carl Bosch)
- Combines N (atmosphere) with H (natural gas)
- 32.5 MMBtu's natural gas per ton ammonia

Natural Gas Required to Produce a Ton of Anhydrous Ammonia

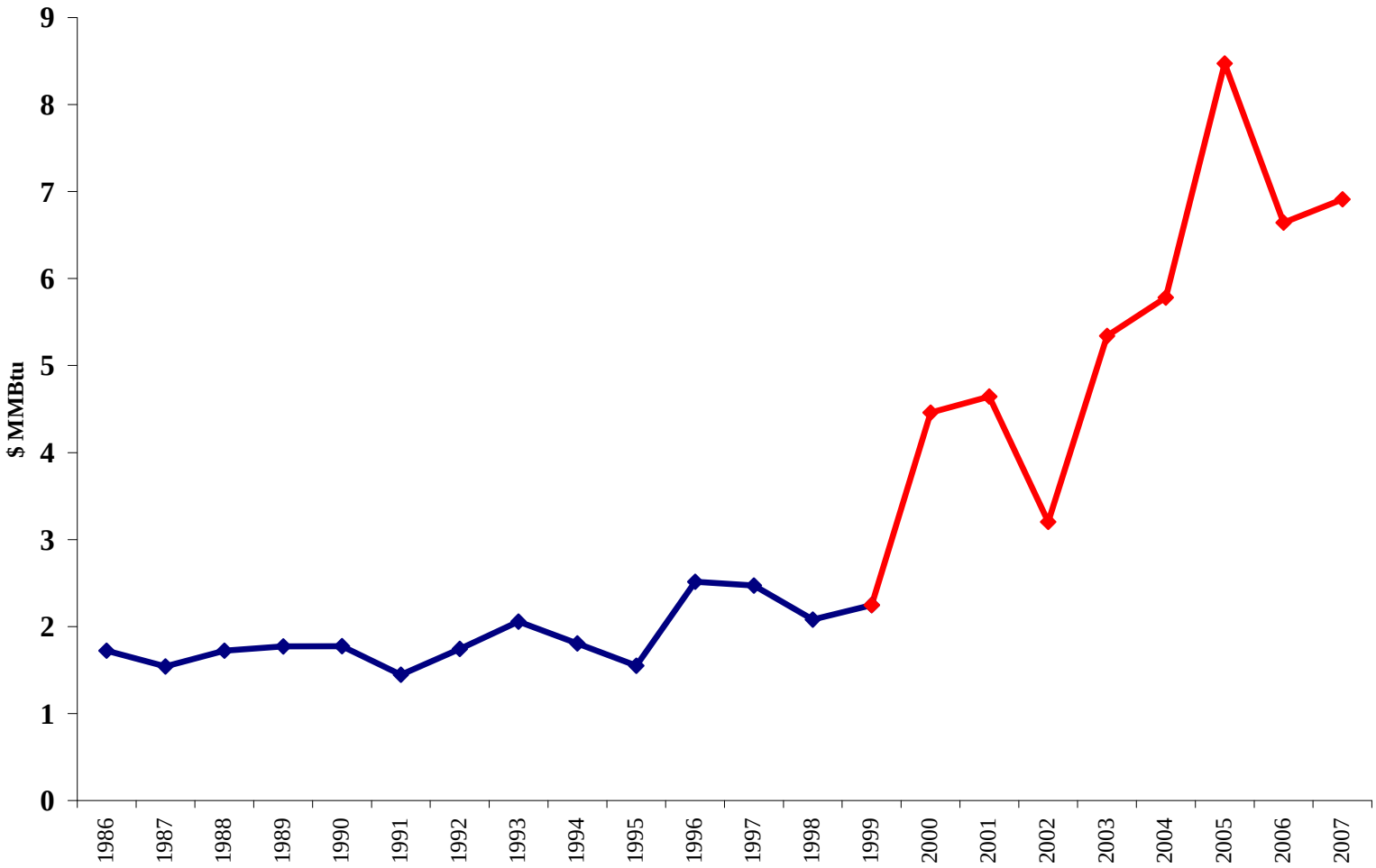


Source: TFI.

Natural Gas as a Share of Total Anhydrous Ammonia Production Cost

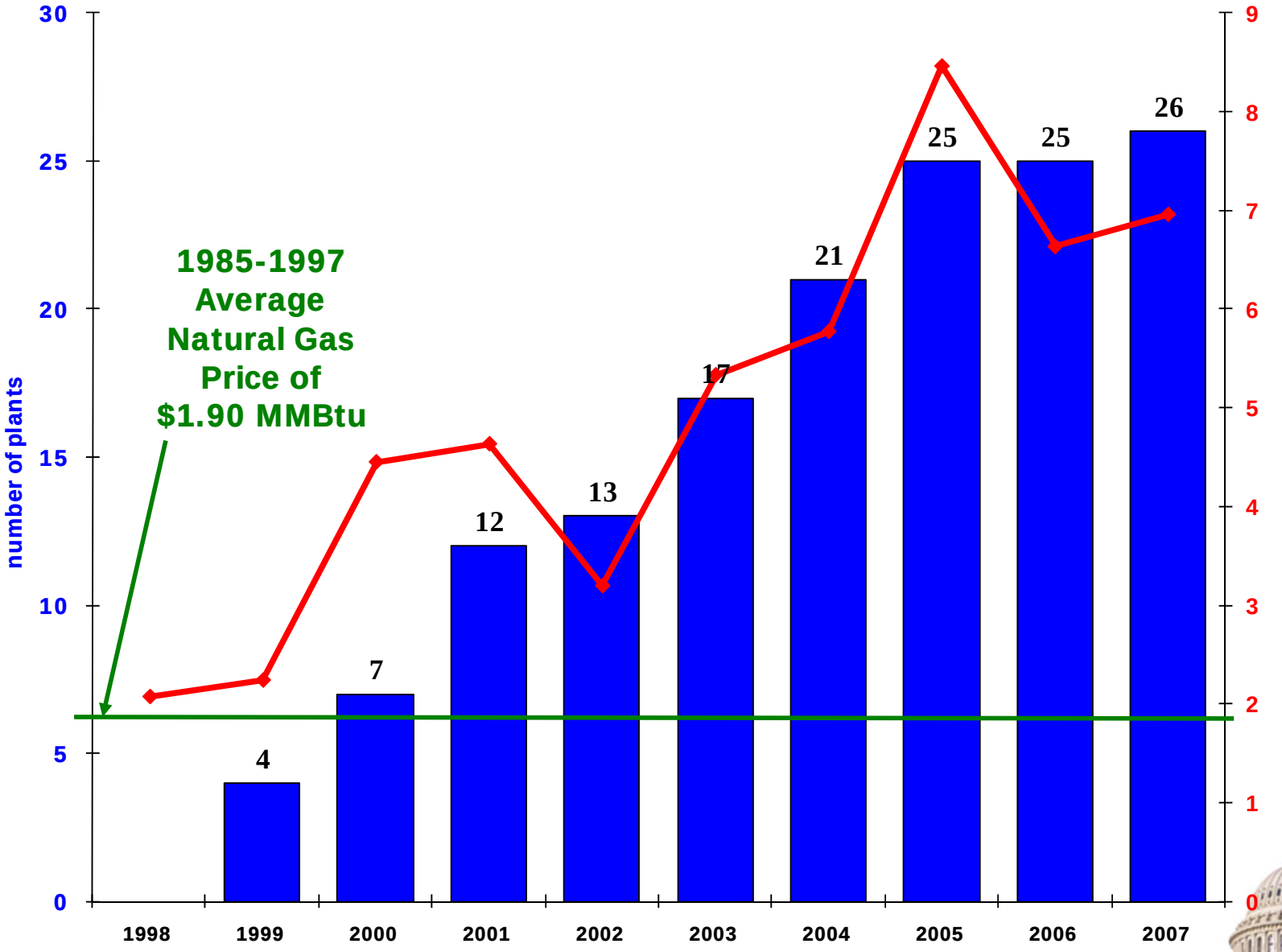


What Happened the Last Time U.S. Natural Gas Prices Increased?



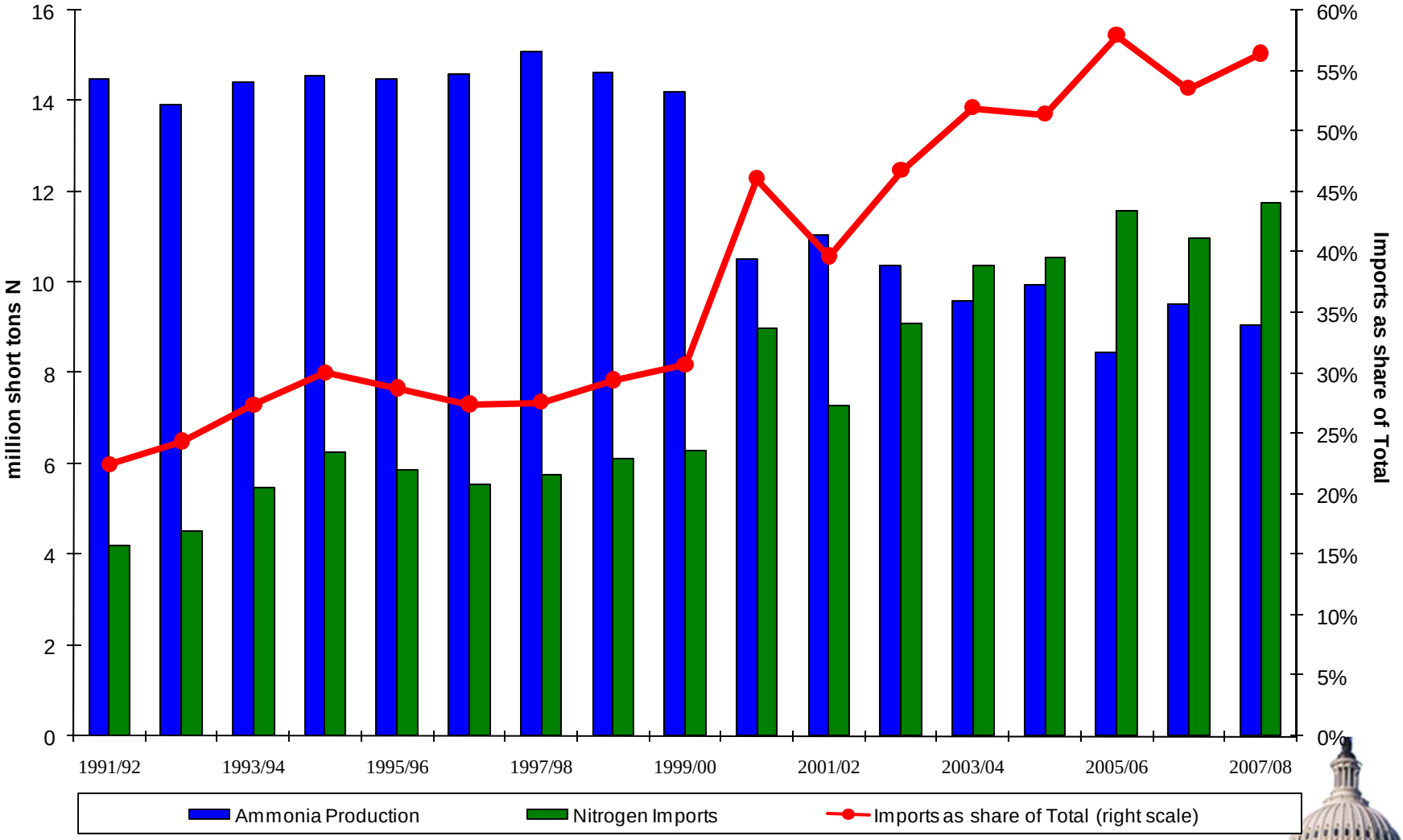
Source: Spot-delivered-to-pipeline price, Natural Gas Week.

Cumulative U.S. Ammonia Plant Closures vs. Natural Gas Prices



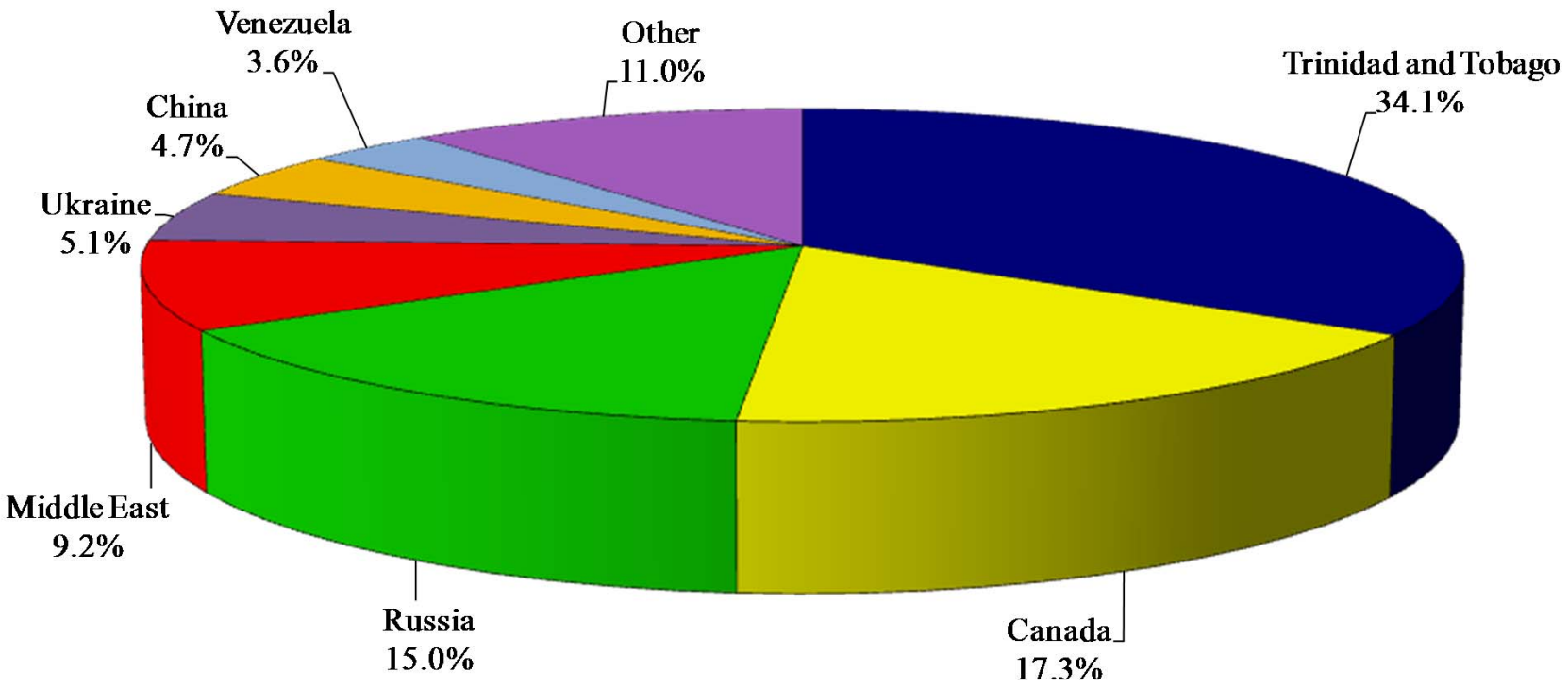
Source: Blue, Johnson and Associates, IFDC, Natural Gas Week and The Fertilizer Institute.

U.S. Nitrogen Sources - Ammonia Production and N Imports



Source: U.S. Department of Commerce and The Fertilizer Institute.

U.S. N Imports by Country, FY 2007/08

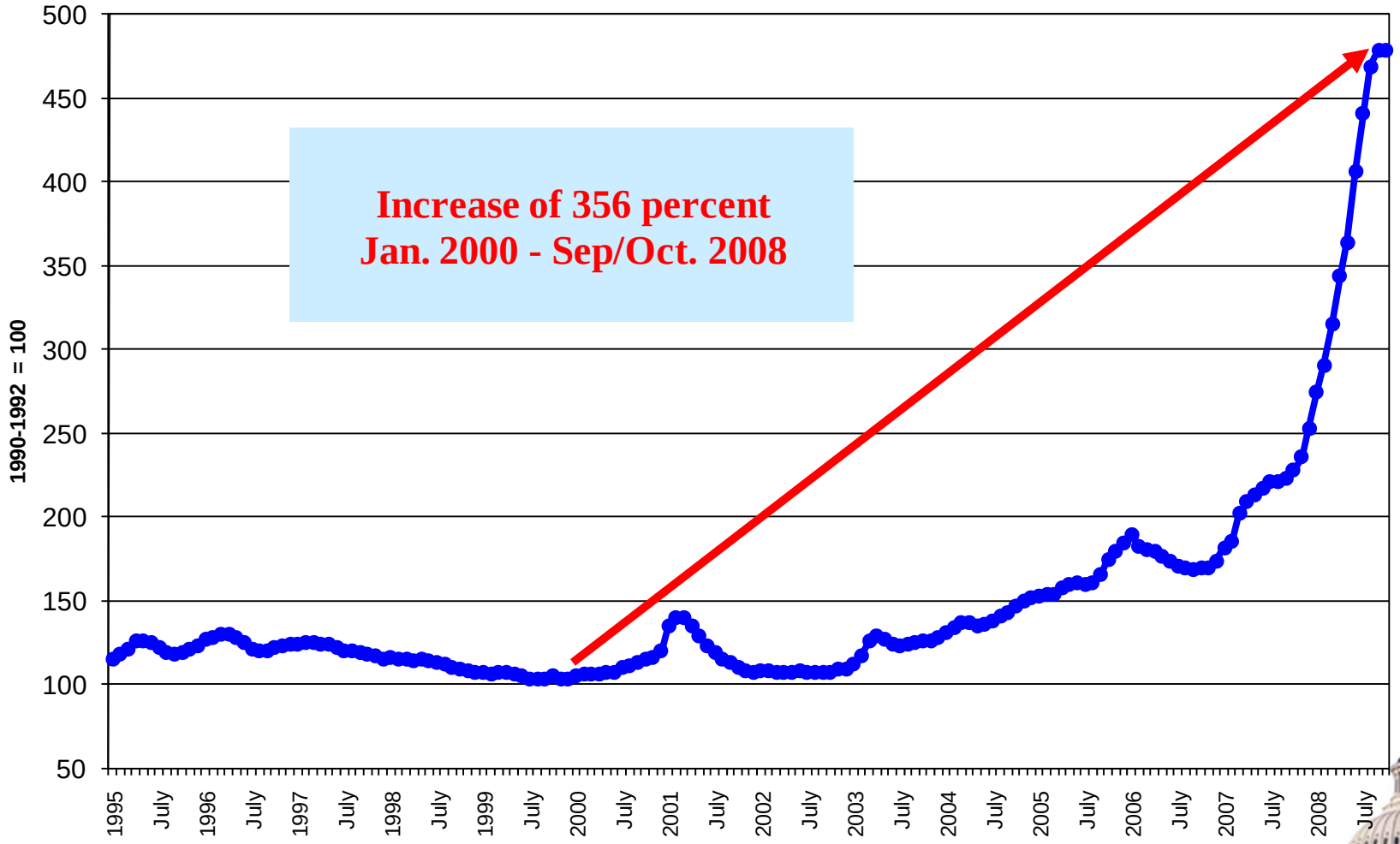


Source : The Fertilizer Institute and the U.S. Department of Commerce

11.73 mil. tons N

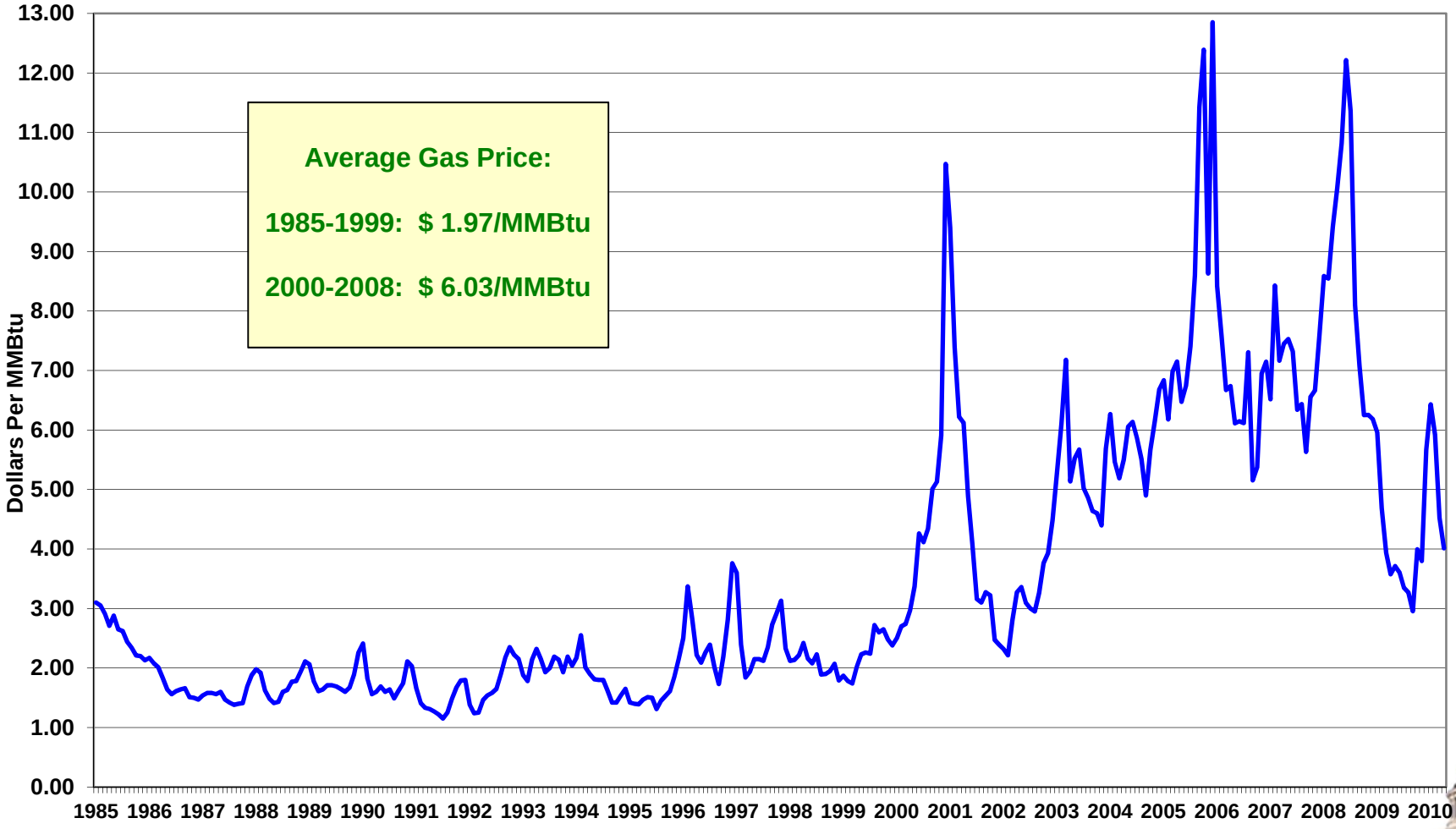
Most imports from countries with no climate change legislation!

U.S. Retail Fertilizer Prices Reach Record



Source: National Agricultural Statistics Service, USDA.

Spot delivered-to-pipeline Natural Gas Prices



Source: Monthly Average, Natural Gas Week.

Potential Impact of Climate Change Legislation on:

1. **The Domestic Fertilizer Manufacturing Industry:**
   - Direct Impacts – cost of CO2 emissions allowances
   - Indirect: Higher domestic energy (natural gas, electricity) prices

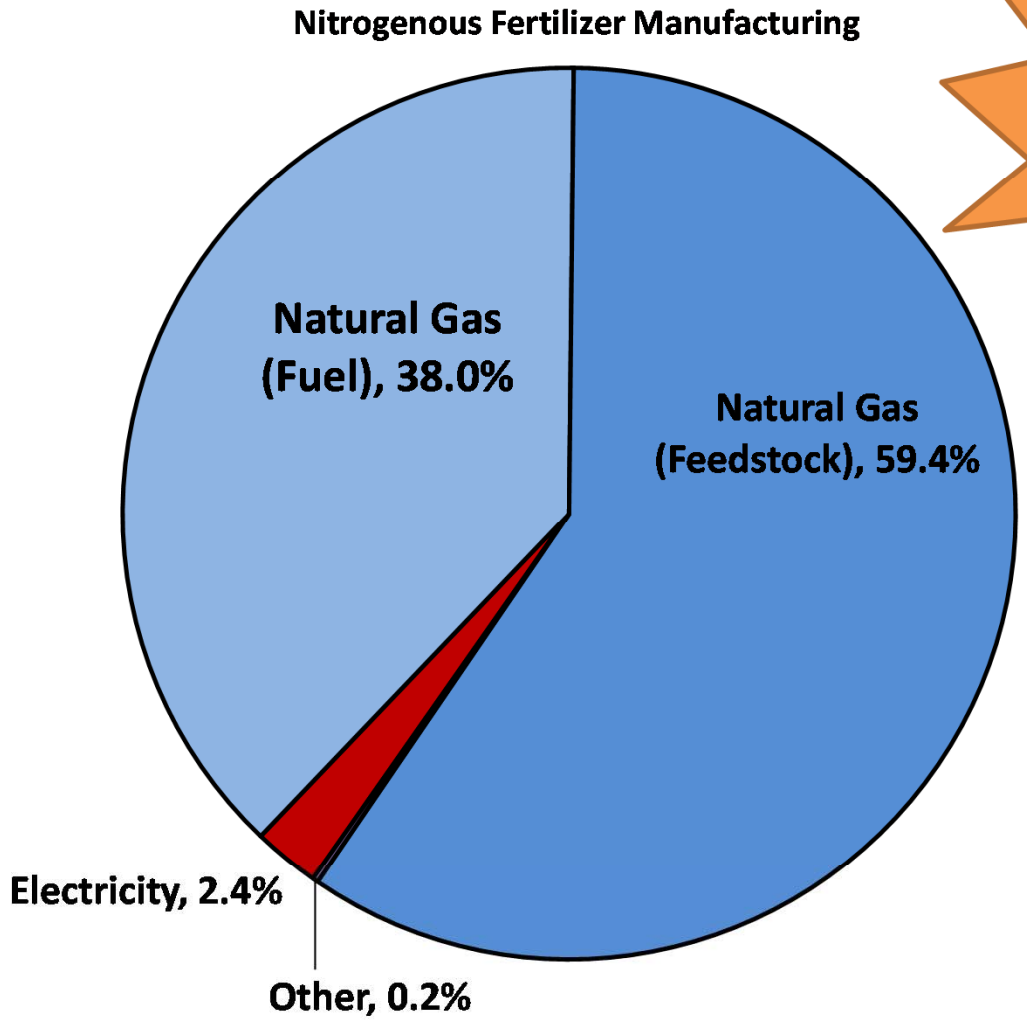
2. **U.S. Agricultural Production Costs**:

Doane Study
- Crops
- Livestock

Increased Energy and other Input Prices

USDA Estimates

Energy Use

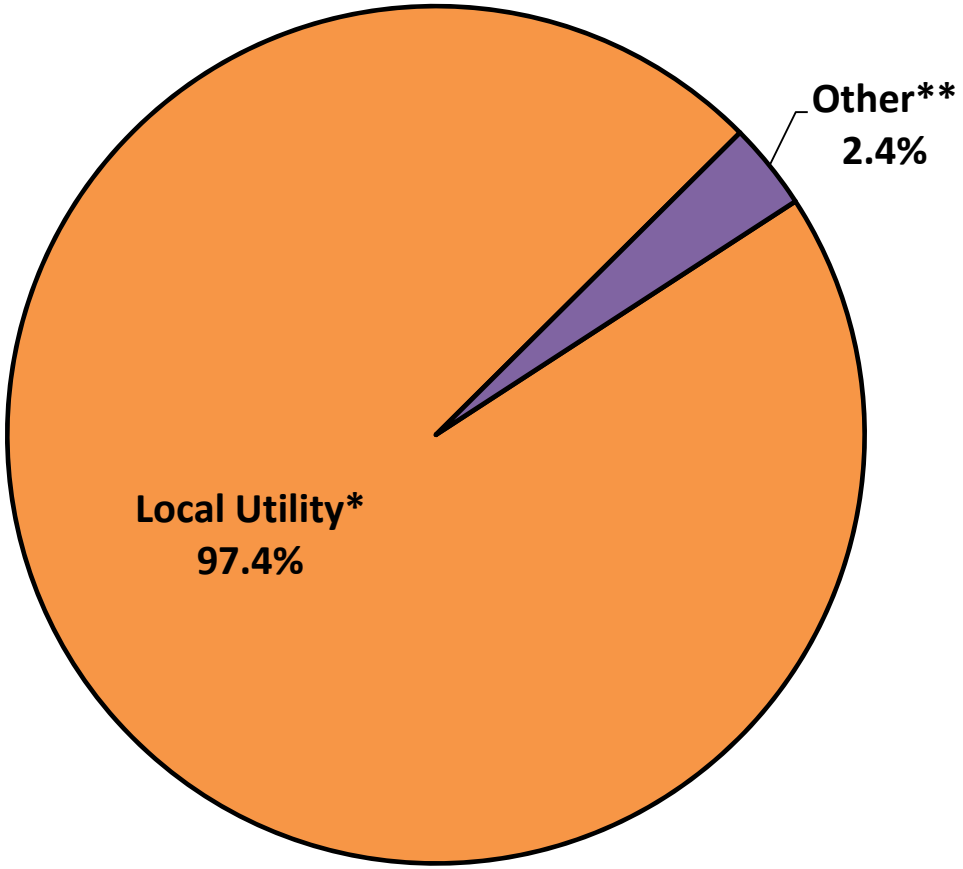


About **97%** of energy use is in the form of natural gas which is purhcased largely from producers

Source: EIA Manufacturers Energy Consumption Survey - 2002

Where do we get our electricity?

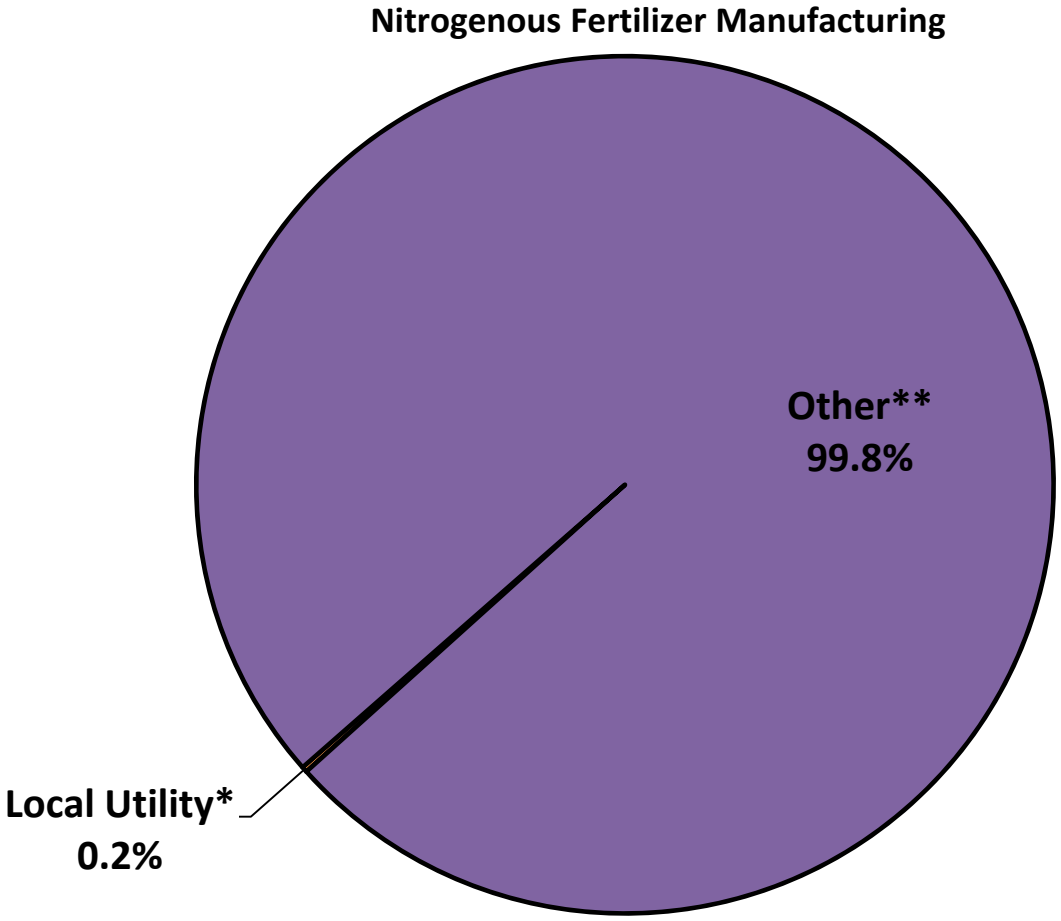
Nitrogenous Fertilizer Manufacturing



*'Local Utility' is an entity that produces and/or delivers a particular energy source
**'Other' includes independent producers, brokers, marketers, and marketing subsidiaries of utilities; for the case of electricity sources, also include small power producers and cogenerators not located at the establishment site.
Source: EIA Manufacturers Energy Consumption Survey - 2002

Where do we get our natural gas?

(fuel and feedstock)



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Source: EIA Manufacturers Energy Consumption Survey - 2002

Costs of Potential Climate Change Legislation to U.S. Fertilizer Manufacturers

Nitrogen Fertilizer production would be impacted in four major ways:

1. Through the direct cost of allowances the industry would need to purchase to offset emissions – estimated cost of $1.02 - 1.43 billion, before free allowances*
2. Through the indirect increase in electricity costs (through suppliers' purchases of emission allowances and through cogeneration of electricity) - potentially covered under current proposed bill
3. The unknown impact of fuel switching which will inevitably raise the price of natural gas – estimated cost of hundreds of millions of dollars

   Nothing in the bill to cover this => A competiveness (survival) issue!
4. 1. – 3. above place the domestic industry at a competitive disadvantage relative to foreign producers from countries with no climate change laws because most foreign producers do not have to deal with these cost increases!

* Computed using 2008 nitrogen production data and a CO_2 cost of $25-$35/ton.

Costs to U.S. Fertilizer Manufacturers - continued

Phosphorous and Potash Producers Will Also Be Impacted:

Phosphorous:

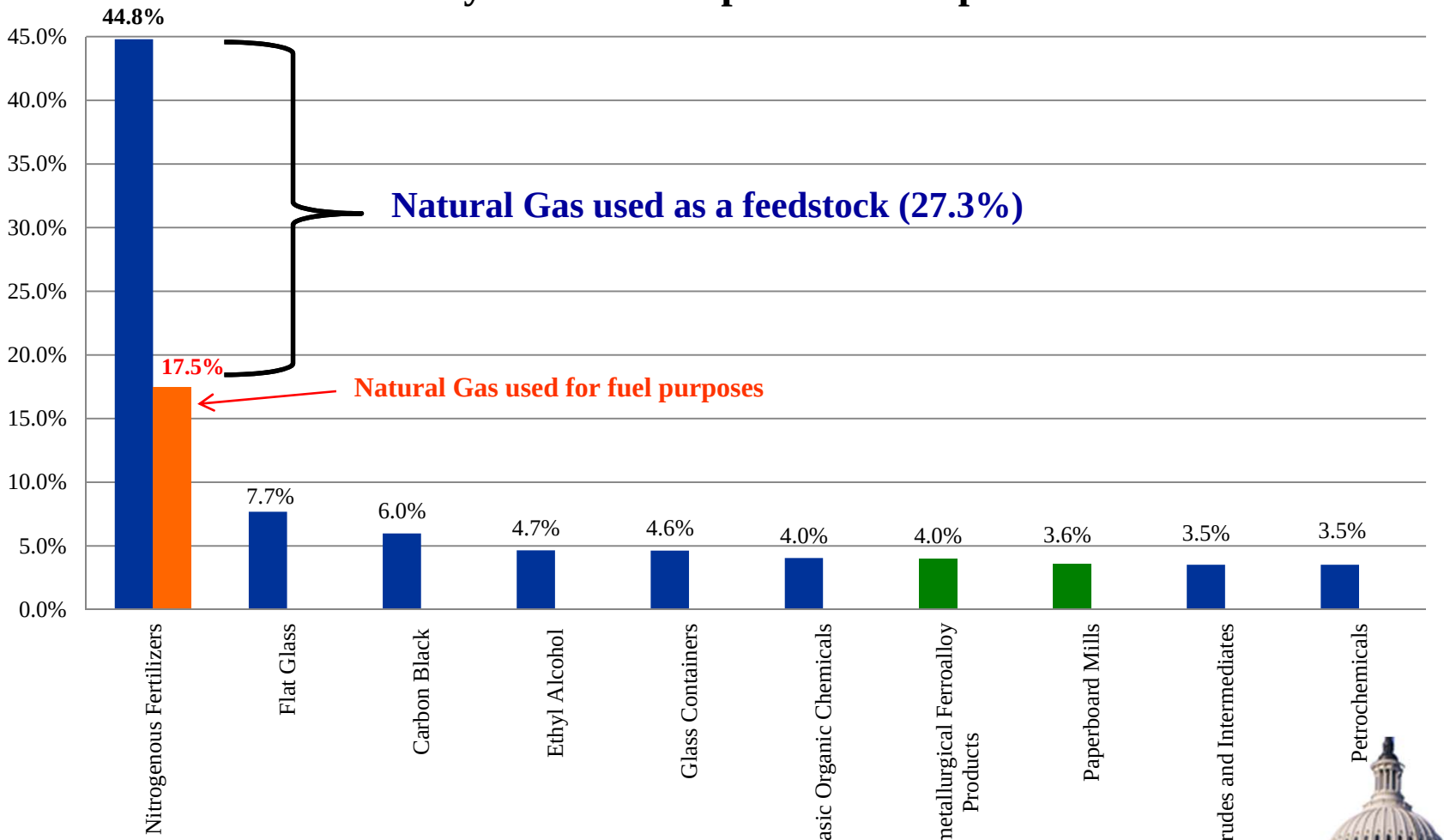
- Through the direct cost of allowances the industry would need to purchase to offset emissions from the production of phosphoric acid;

Potash:

- Through the unknown impact of fuel switching which will inevitably raise the price of natural gas, which is used in the drying process.

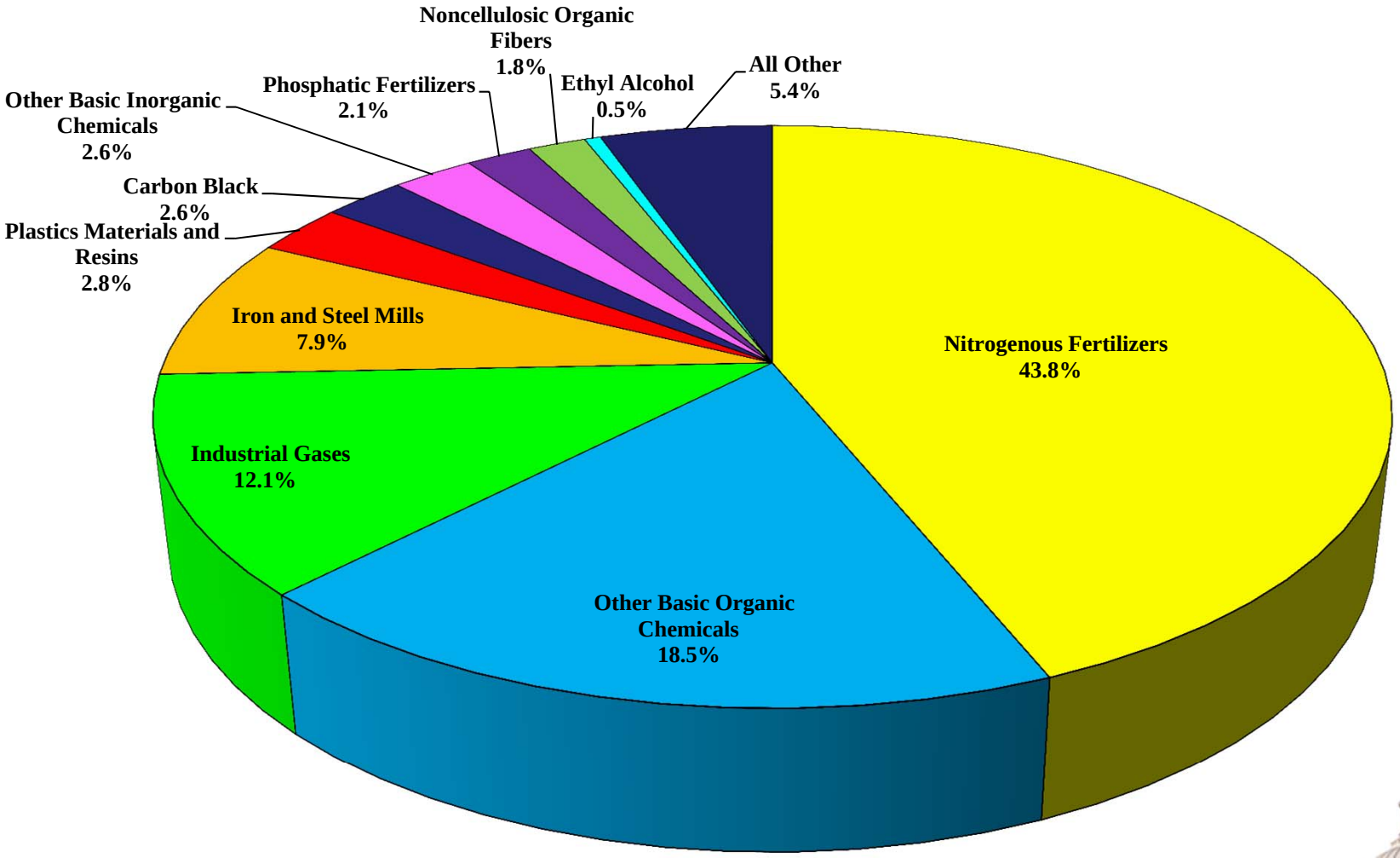
Nothing in current proposed bills to cover ANY of these costs!

Purchased Natural Gas (fuel and non-fuel use) as a percent of industry's value of shipments - Top 10



Source: EIA Manufacturers Energy Consumption Survey - 2002
Formula used: ((natural gas fuel use + natural gas non-fuel use) * Price)/Value of Shipments
Data years used: Prices - 2002 *(latest data available)*
Total fuel use - 2002 *(used to make fair comparison)*
Value of Shipments - 2002 *(used to make fair comparison)*
Note: Green bars represent industries that are not listed in EPA's list of presumptively eligible sectors

Purchased nonfuel (feedstock) Natural Gas - 2006

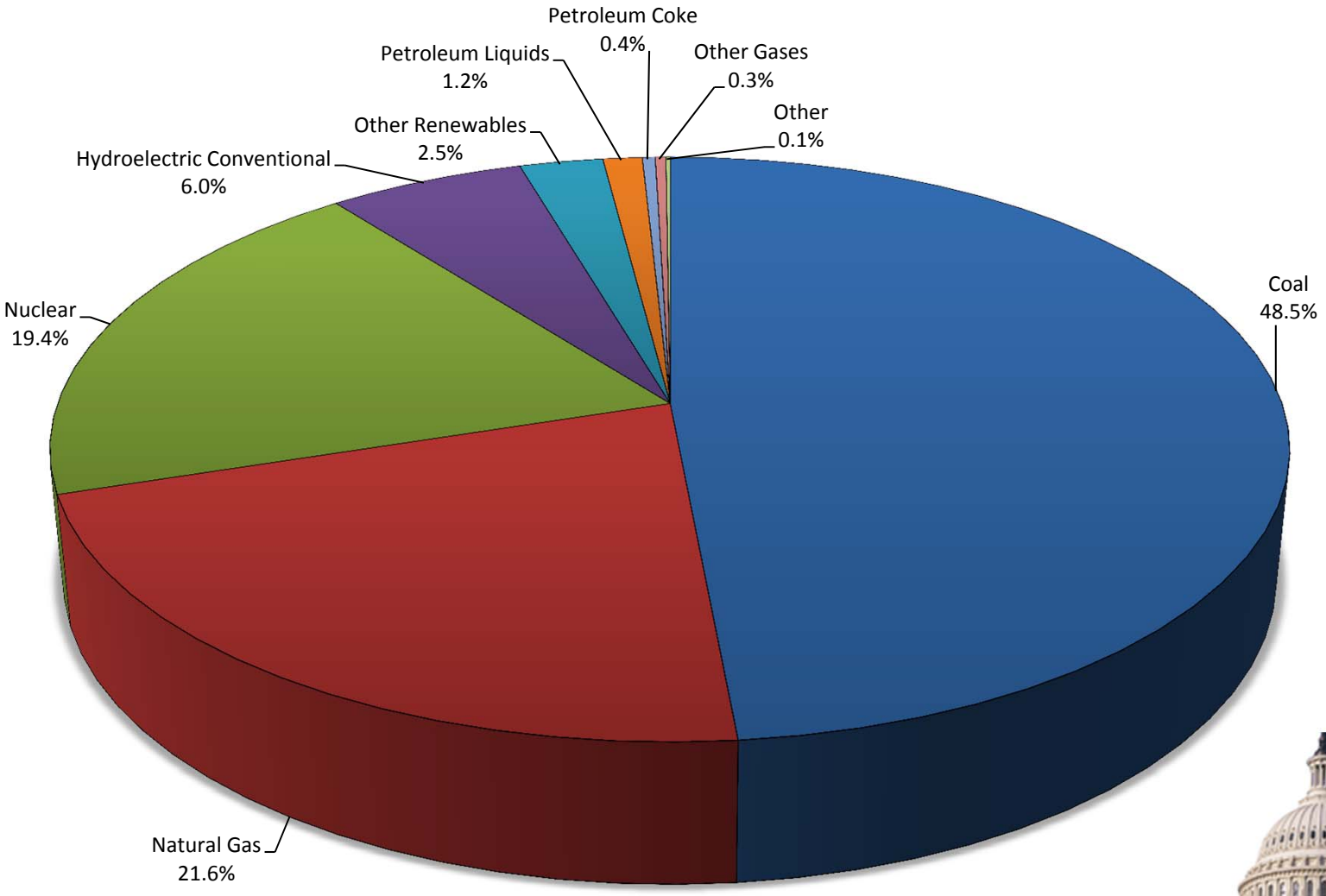


Source: EIA - 2006 Manufacturing Energy Consumption Survey (MECS) *(latest available data)*
Note 1: "All Other" includes: all other industries that are estimated to use less than 0.5TBtu natural gas
Note 2: Industry ranked using 6-digit NAICS code level

Climate Change: Issues for the Fertilizer Industry

- **<u>Fuel Switching</u>** – The Natural Gas Industry is advocating for government subsidies to close old coal fired plants. Natural gas to pick up excess capacity.
- Increased natural gas demand puts upward price pressure on critical feedstock for fertilizer production.
- Higher U.S. natural gas prices increase vulnerability to international nitrogen and phosphate fertilizer competition.

Net Generation of Electricity by Energy Source - 2008



Source: EIA

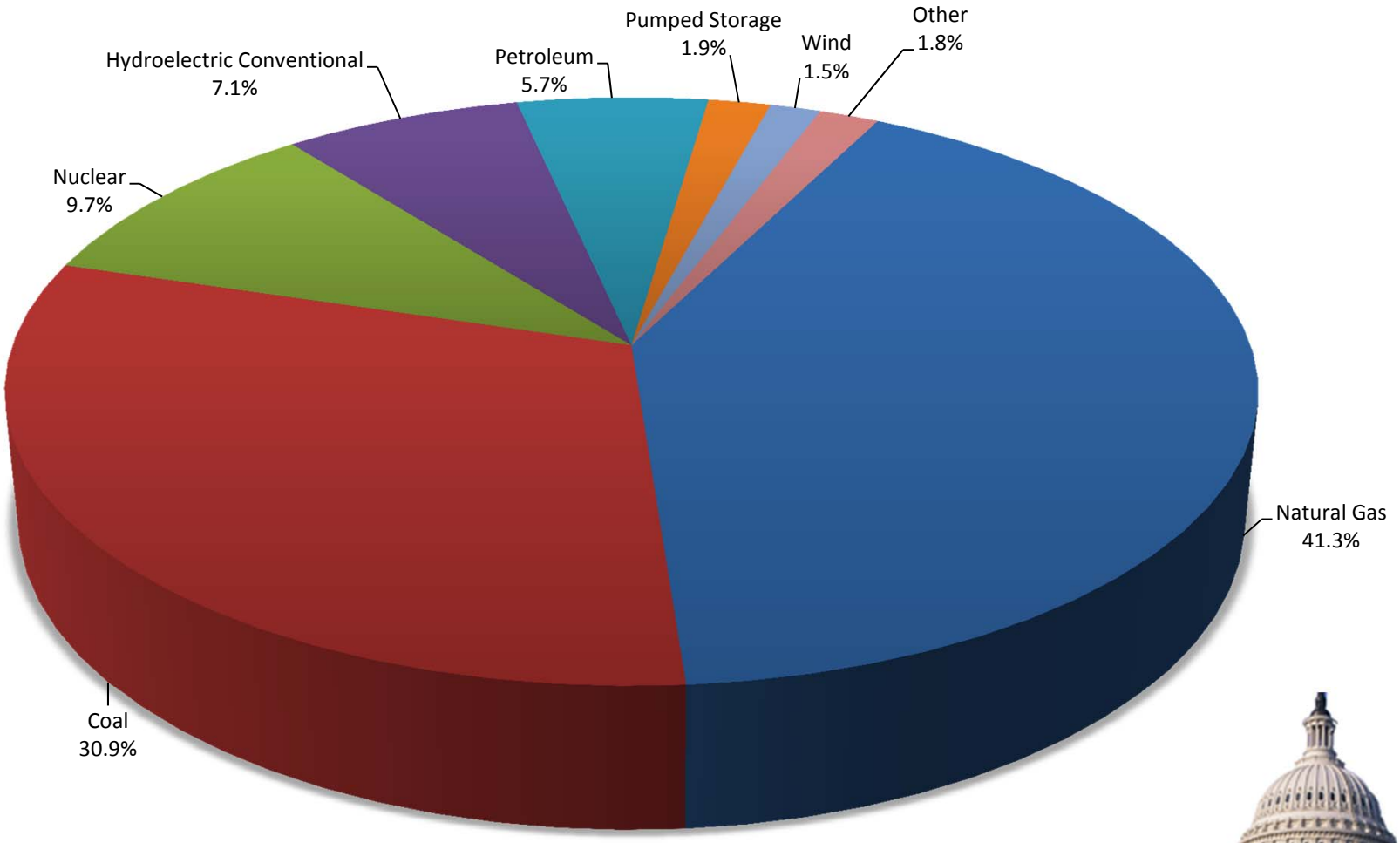
U.S. Natural Gas Demand - 2008

U.S. Natural Gas Consumption by End Use	
(Trillion Cubic Feet)	
	2008
Lease and Plant Fuel	1.28
Lease Fuel	-
Plant Fuel	-
Pipeline & Distribution Use	0.62
Volumes Delivered to Consumers	21.30
Residential	4.87
Commercial	3.12
Industrial	6.62
Vehicle Fuel	0.03
Electric Power	6.66
Total Consumption	**23.21**

Source: EIA

Data

Electricity Generator Nameplate Capacity – 2007



Source: EIA

U.S. Electricity Generation Capacity from Natural Gas

Capacity - 2008

Number of Generators:	5,439
Generator nameplate:	449,389 Megawatts
Net Summer:	392,876 Megawatts
Net Winter:	422,184 Megawatts
Ave. Summer/Winter:	407,530 Megawatts

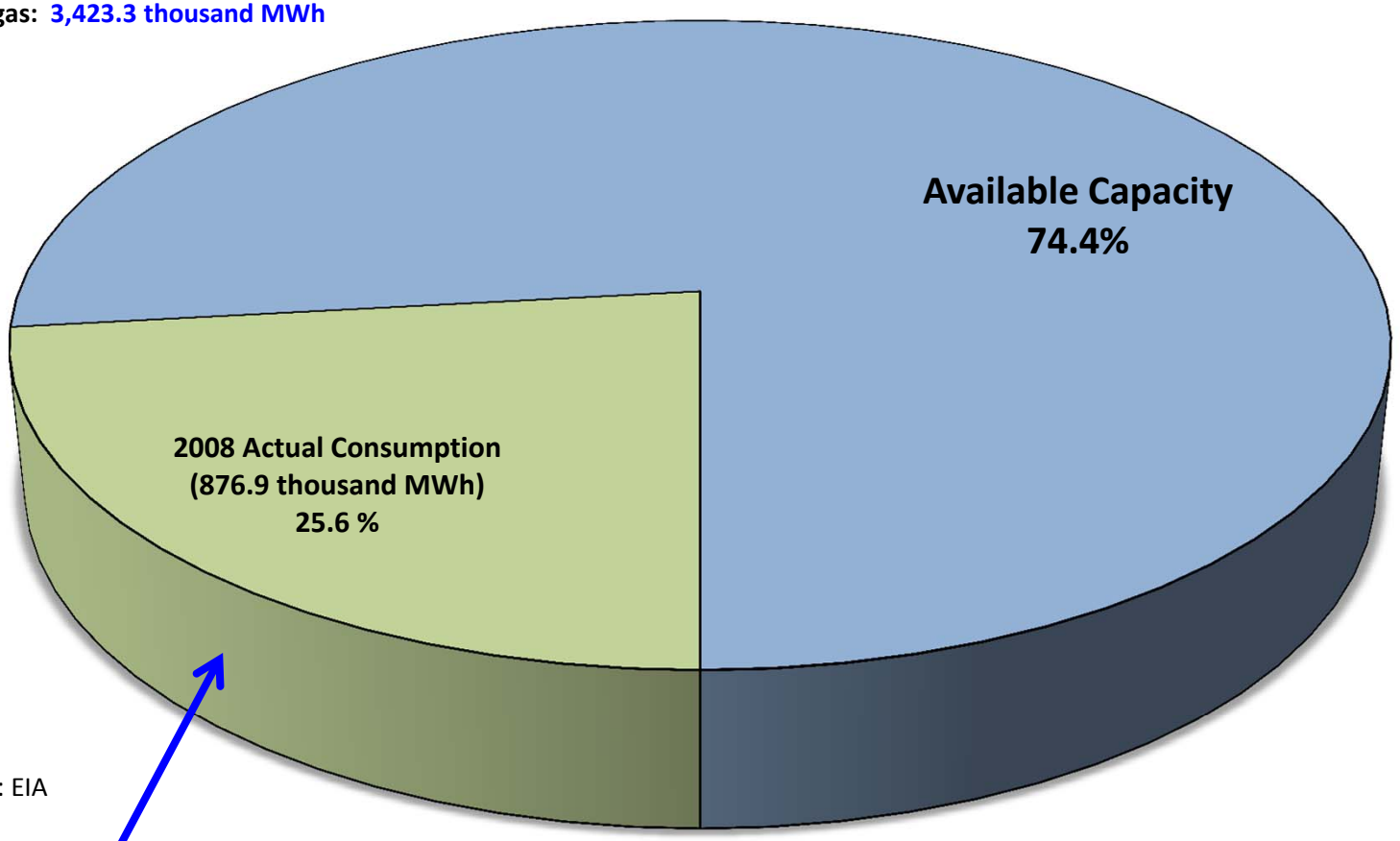
Total capacity: 3,423,252 thousand Megawatt hours

= 407,530 Megawatts * 24 hrs./day * 350 days/yr.

Source: EIA.

U.S. capacity to generate electricity from natural gas
2008 Ave. Net Summer/Winter

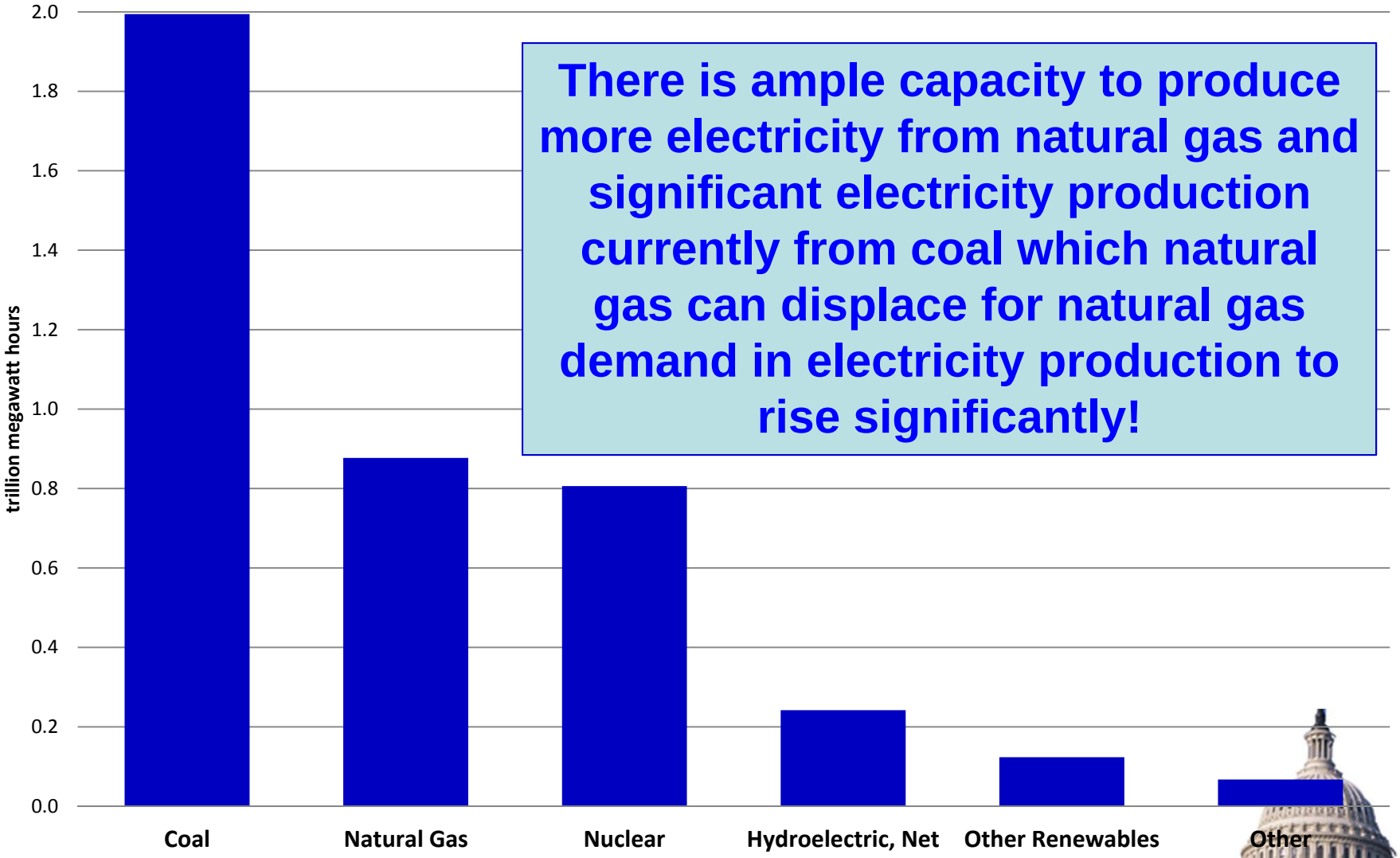
Total electricity generation capacity from natural gas: 3,423.3 thousand MWh



Source: EIA

Required 6.66TCF – 29% of total U.S. – Natural Gas Demand!

Net Generation of Electricity by Energy Source: 2008



There is ample capacity to produce more electricity from natural gas and significant electricity production currently from coal which natural gas can displace for natural gas demand in electricity production to rise significantly!

Source: EIA

Snippets from EIA's Annual Energy Outlook 2009 with projections to 2030

- *"In addition to ongoing uncertainty with respect to future demand growth and the costs of fuel, labor, and new plant construction, it appears that* ***capacity planning decisions*** *for new generating plants already* ***are being affected by the potential impacts of policy changes*** *that could be made to limit or reduce GHG emissions."*
- *"Instead of relying heavily on the construction of new coal-fired plants, the power industry constructs* ***more new natural-gas-fired plants****, which account for the* ***largest share*** *of new power plant* ***additions****, followed by smaller amounts of renewable, coal, and nuclear capacity."*

Stage is already being set for an increase in natural gas demand!

CONCLUSIONS

- Domestic Fertilizer Production Makes a Significant Contribution to U.S. Agriculture and the U.S. economy:
  - Accounts for 40-60 percent of crop production – feed world + Ag. trade surplus;
  - Creates a total of 245 thousand U.S. jobs!
  - Provides a total U.S. economic contribution of over $ 58 Billion!

- Climate Change Legislation Will Significantly Raise Production Costs of the U.S. Fertilizer Industry, Particularly for the Nitrogen Sector:
  - Increases the Uncertainty of running the business - number of free allowances?;
  - What will be the cost of the allowances: $25/ton CO2 ?, $30? , $35?, $40?
  - Increased energy costs – electricity and **especially natural gas, where the rise in price will add hundreds of millions of dollars to production costs!**
  - **Higher costs will significantly impact the international competitiveness of industry!**
  - Will place thousands of productive jobs in rural America at risk!

- The Increase in Fertilizer Production Costs, Energy Prices, and other Farm Input Costs which rise with Energy Prices Will Lead To:
  - Significantly Higher Domestic Crop Production Costs;
  - Significantly Higher Livestock Production Costs;
  - And Significantly Lower Farm Income!

Thank you! Any questions?