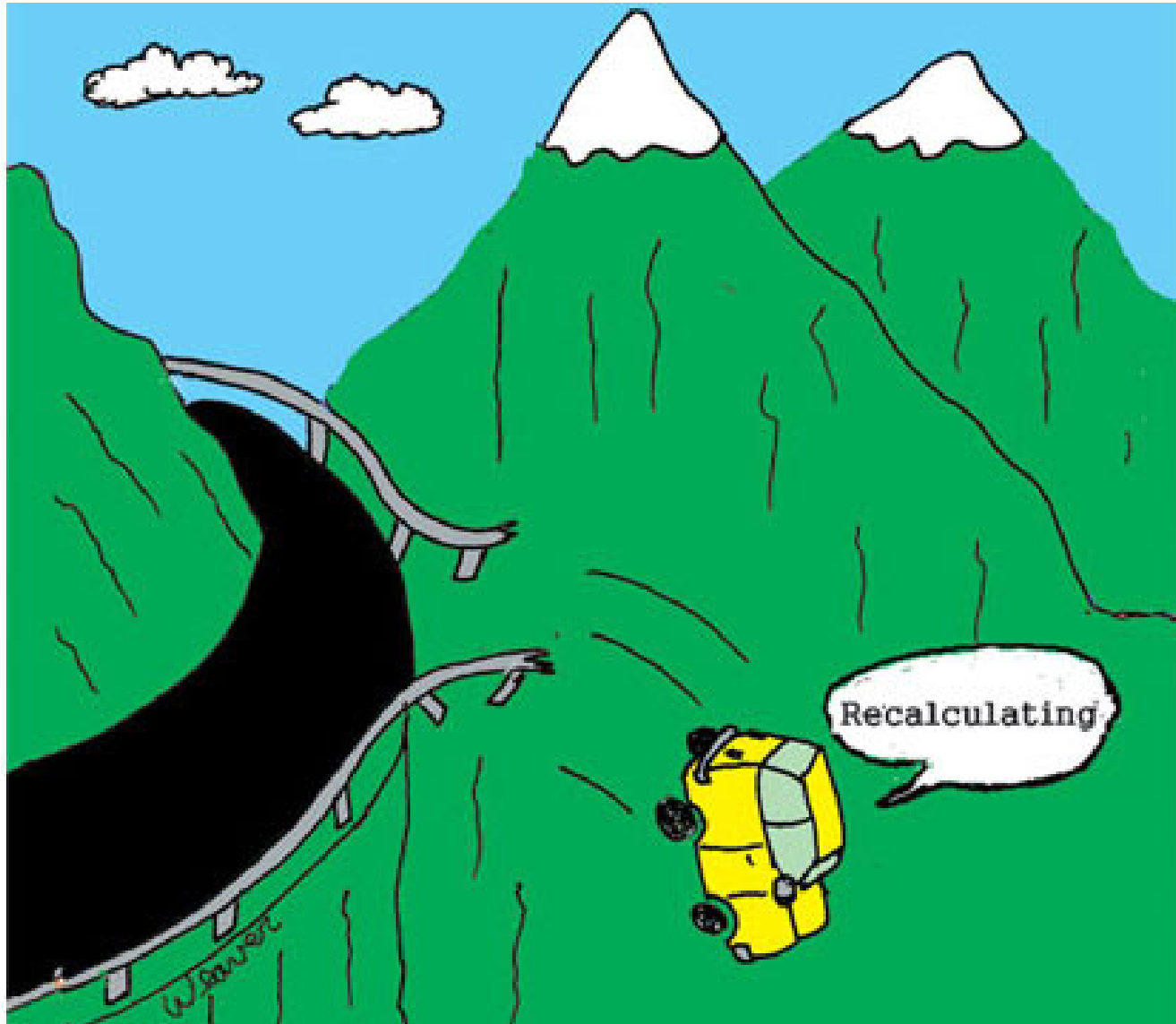


9th Annual NH₃ Fuel Conference

***“Current Challenges Facing the
U.S. Ammonia Market and
Implications for NH₃ Fuel”***

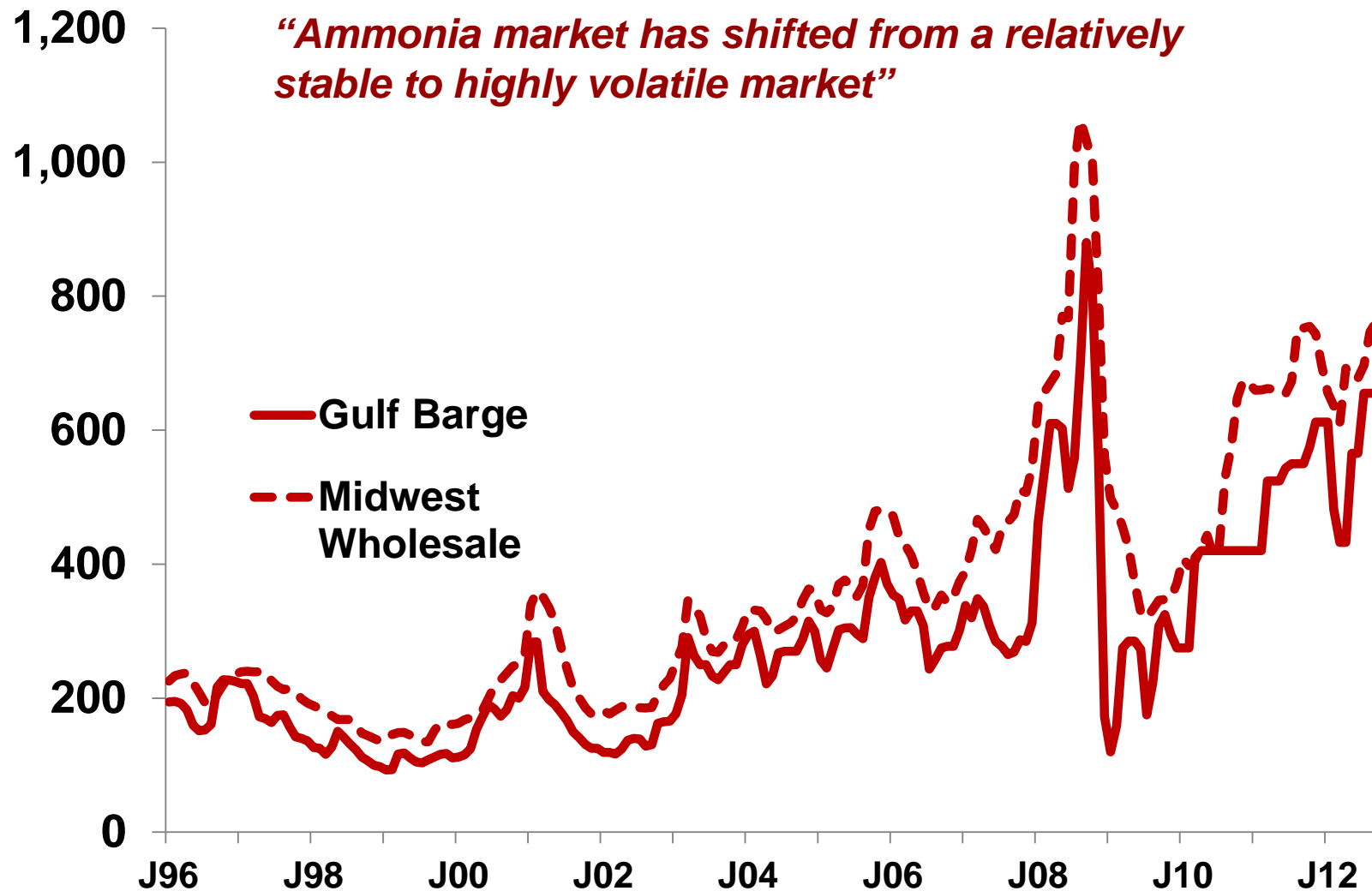
***Glen Buckley
NPK Fertilizer Advisory Service
www.npkfas.com
October 2, 2012***

“Ammonia market has shifted from a relatively stable to highly volatile market”

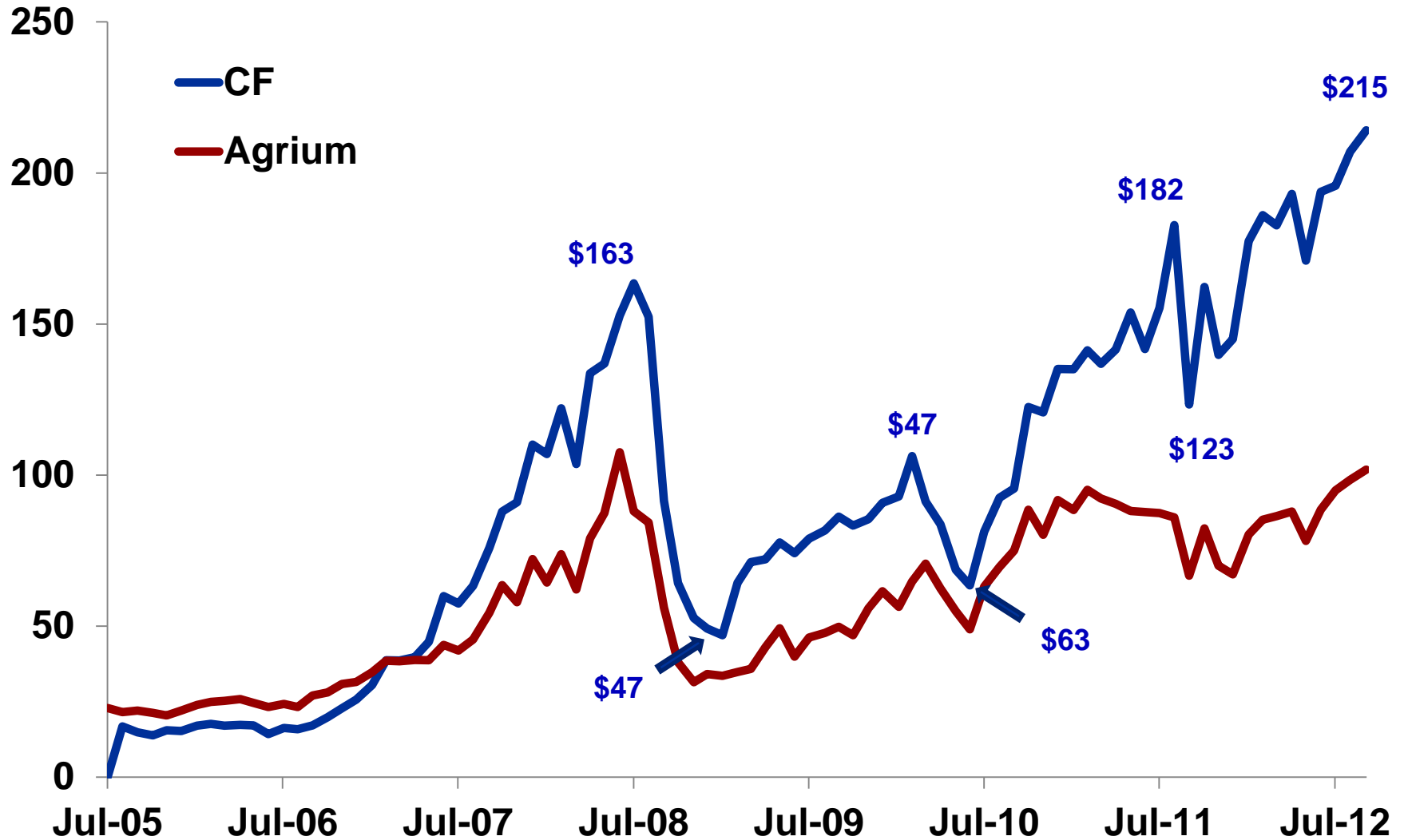


U.S. Ammonia Prices

(\$/Ton)



Fertilizer Stock Prices (\$/share)



Presentation Outline

- ✓ ***Ammonia Fundamentals***
 - ***Supply/Demand***
 - ***Infrastructure***
- ✓ ***Current Market Structure***
- ✓ ***Challenges for NH₃ Fuel***

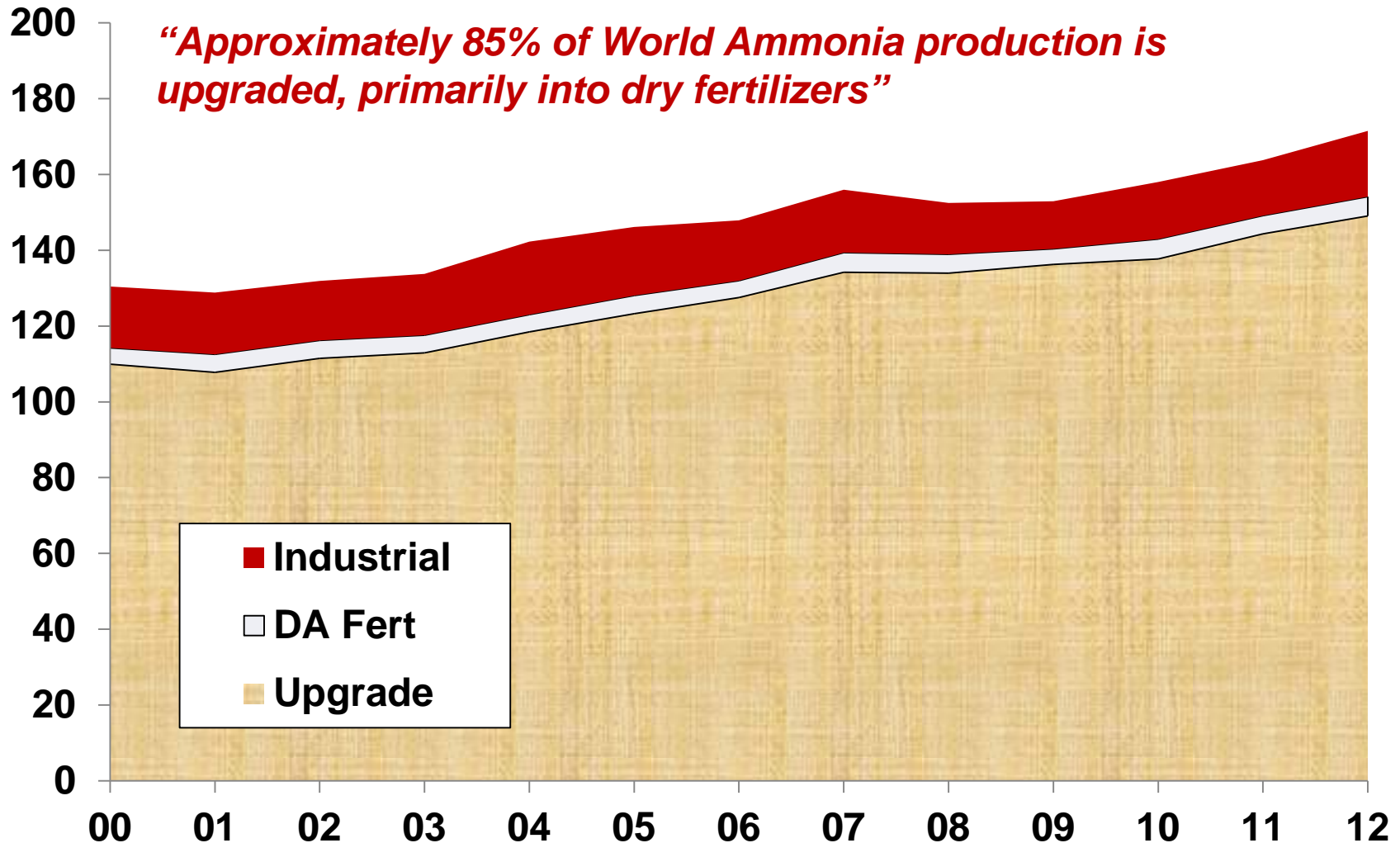
World Ammonia Capacity (MM Tons)

“Growth in World Capacity has been dominated by China and the Middle East”

				Change	% of Cap.	
	1992	2002	2012	92-12	1992	2012
Europe	28.2	22.4	20.6	(7.6)	20%	9%
FSU	26.6	23.2	26.3	(0.3)	19%	12%
Africa	4.3	4.8	10.4	6.1	3%	5%
North America	19.4	20.9	17.0	(2.4)	14%	8%
Latin America	7.6	10.2	12.2	4.6	5%	6%
Middle East	6.0	8.1	16.5	10.5	4%	8%
China	27.5	42.8	85.7	58.2	19%	39%
India	10.2	13.9	14.3	4.2	7%	7%
Rest of Asia	11.0	14.3	12.3	1.3	8%	6%
Oceania	0.7	1.2	2.0	1.3	0%	1%
World Total	141.5	161.7	217.3	75.9	100%	100%

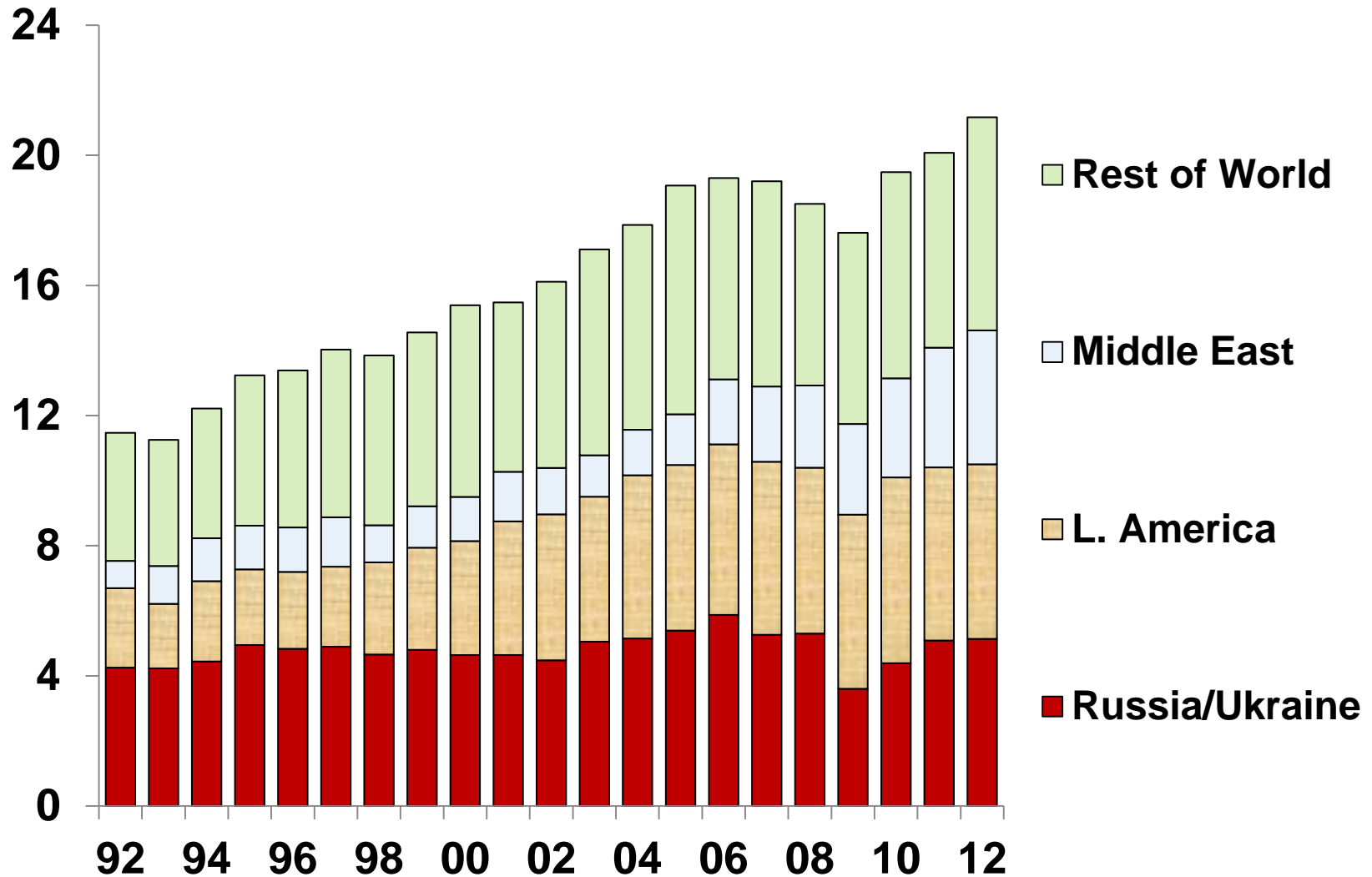
World Ammonia Disappearance

(MM Product Tons)

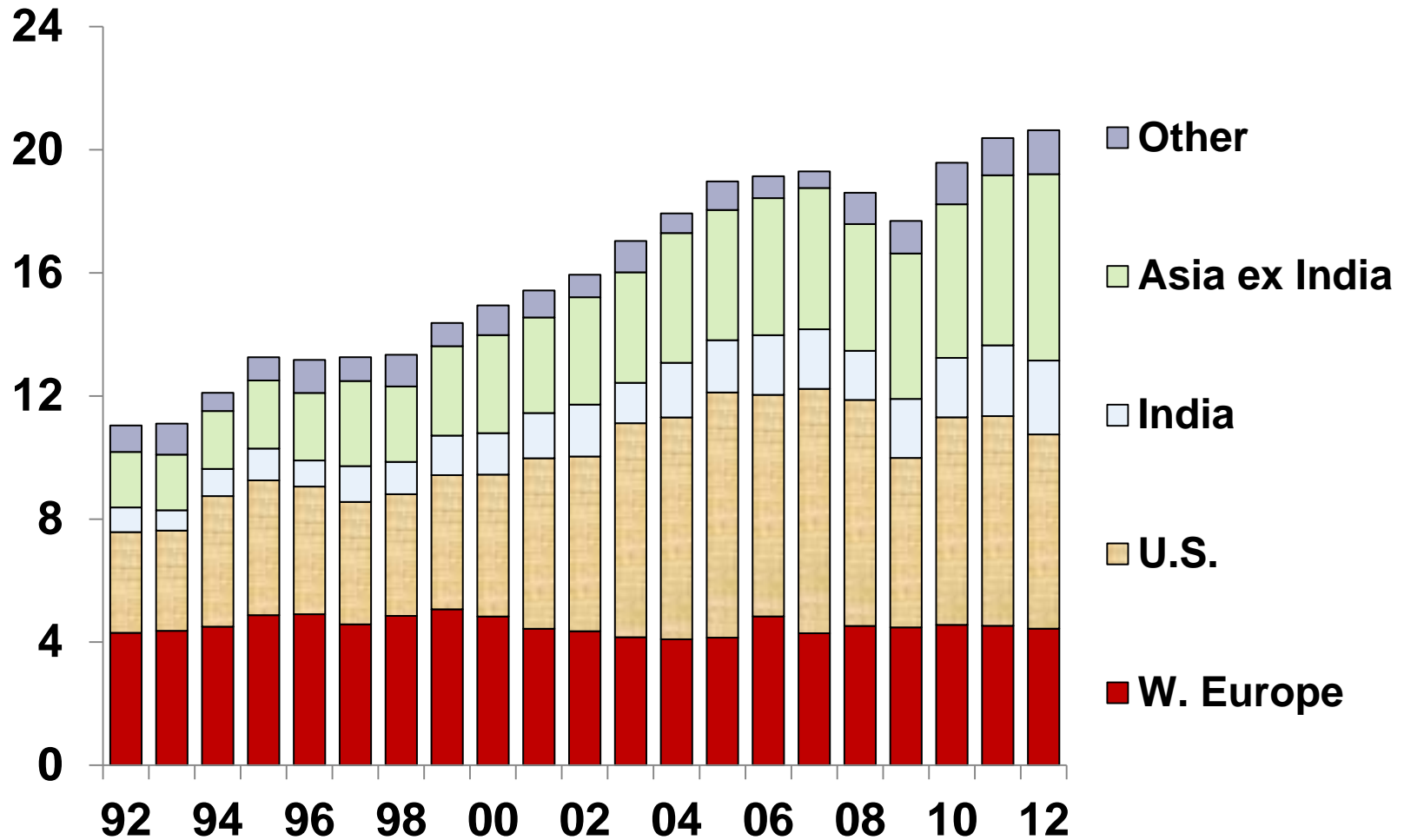


World Ammonia Exports by Source

(MM Tonnes)

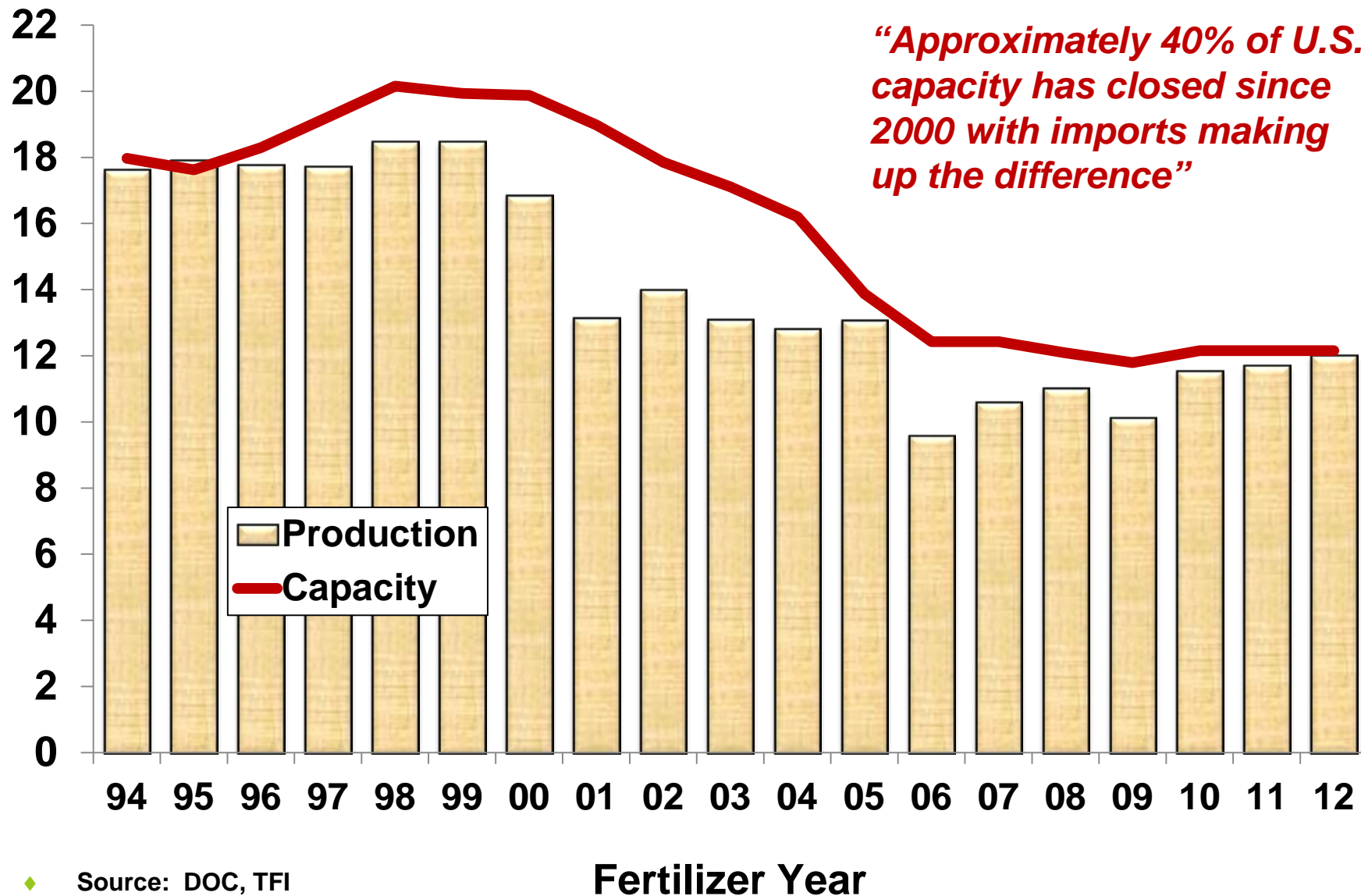


World Ammonia Imports by Source (MM Tonnes)

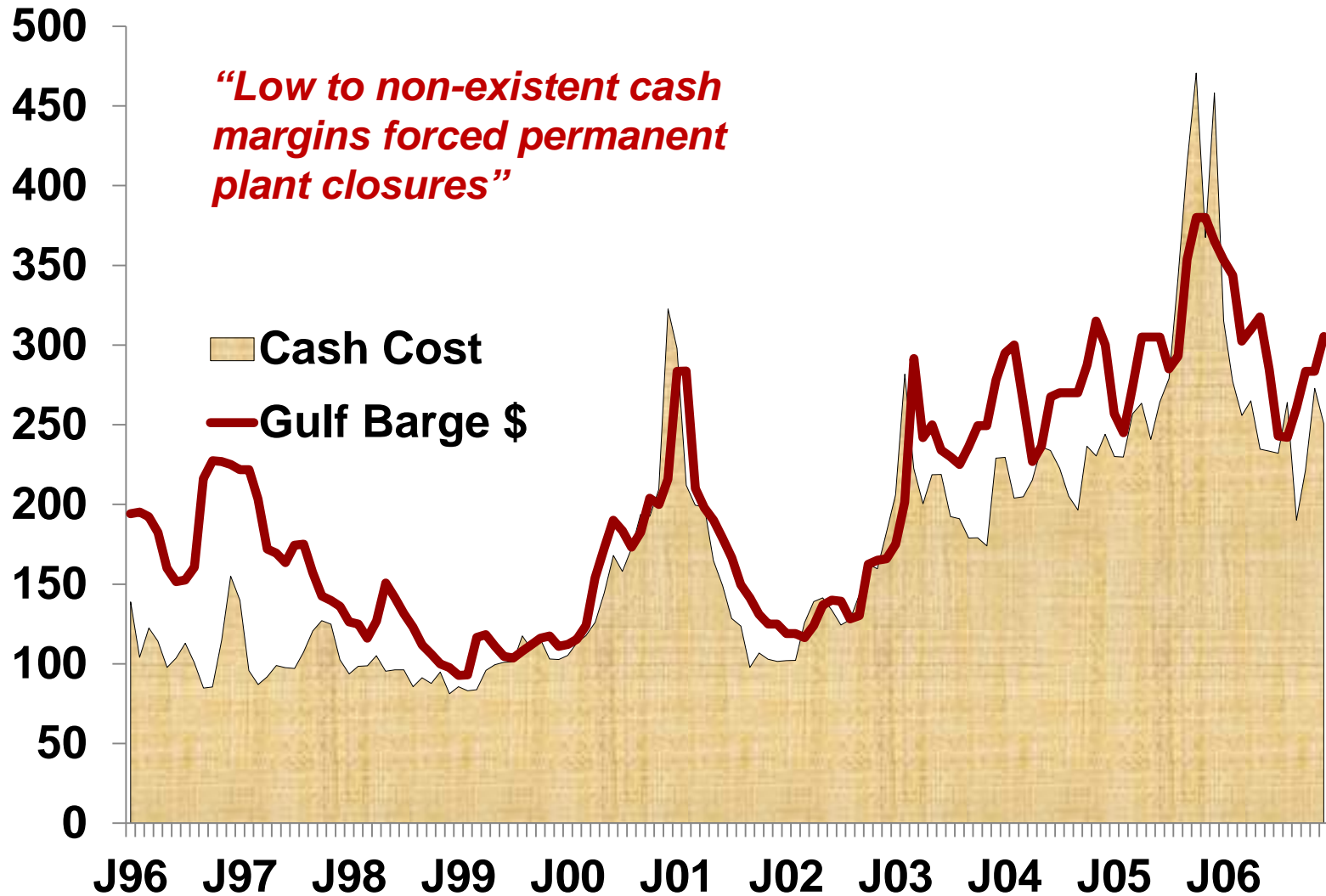


U.S. Ammonia Capacity and Production

(MM Product Tons)

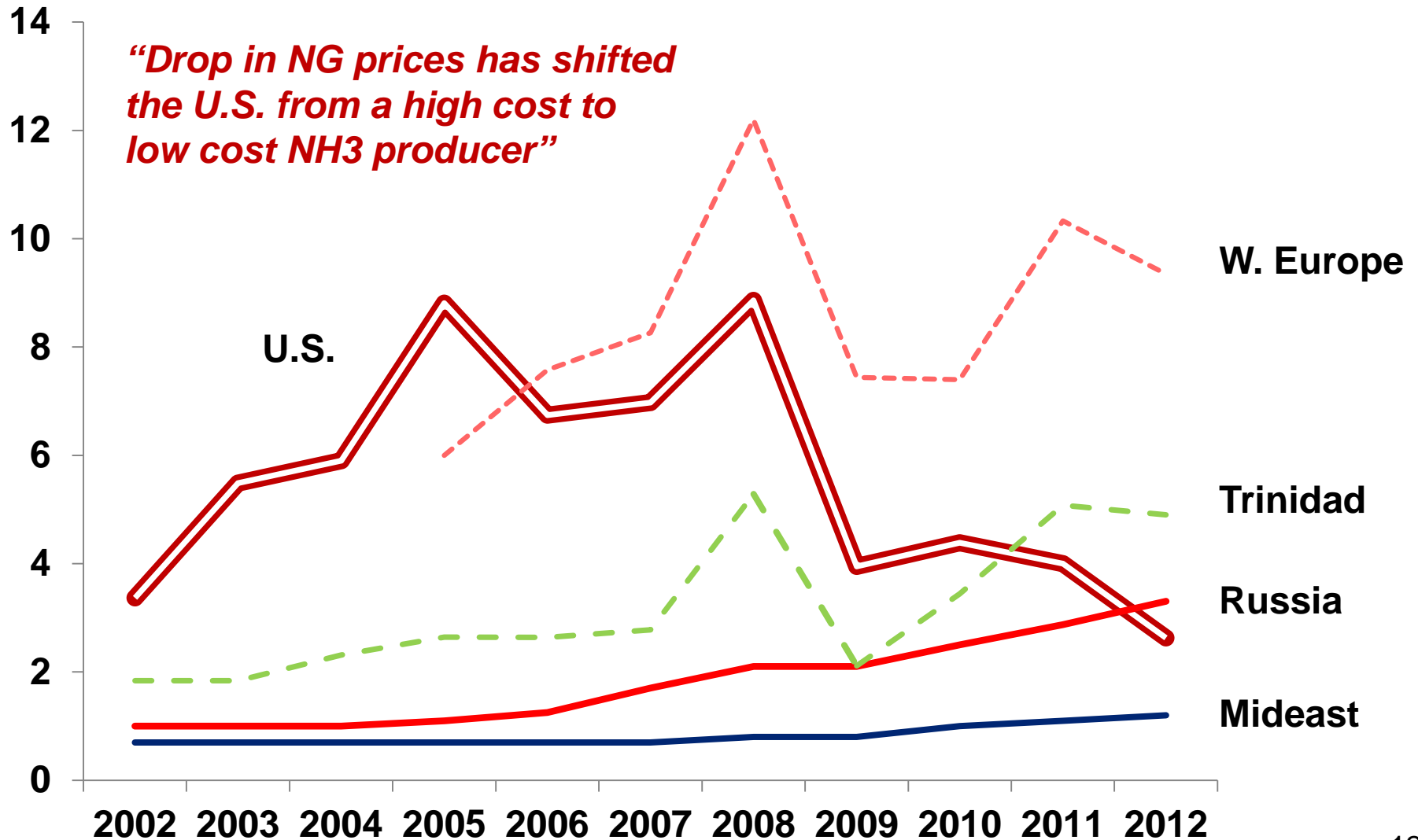


U.S. Gulf Producer Cash Cost vs. Gulf Barge Price – 1996-2006 (\$/Ton)

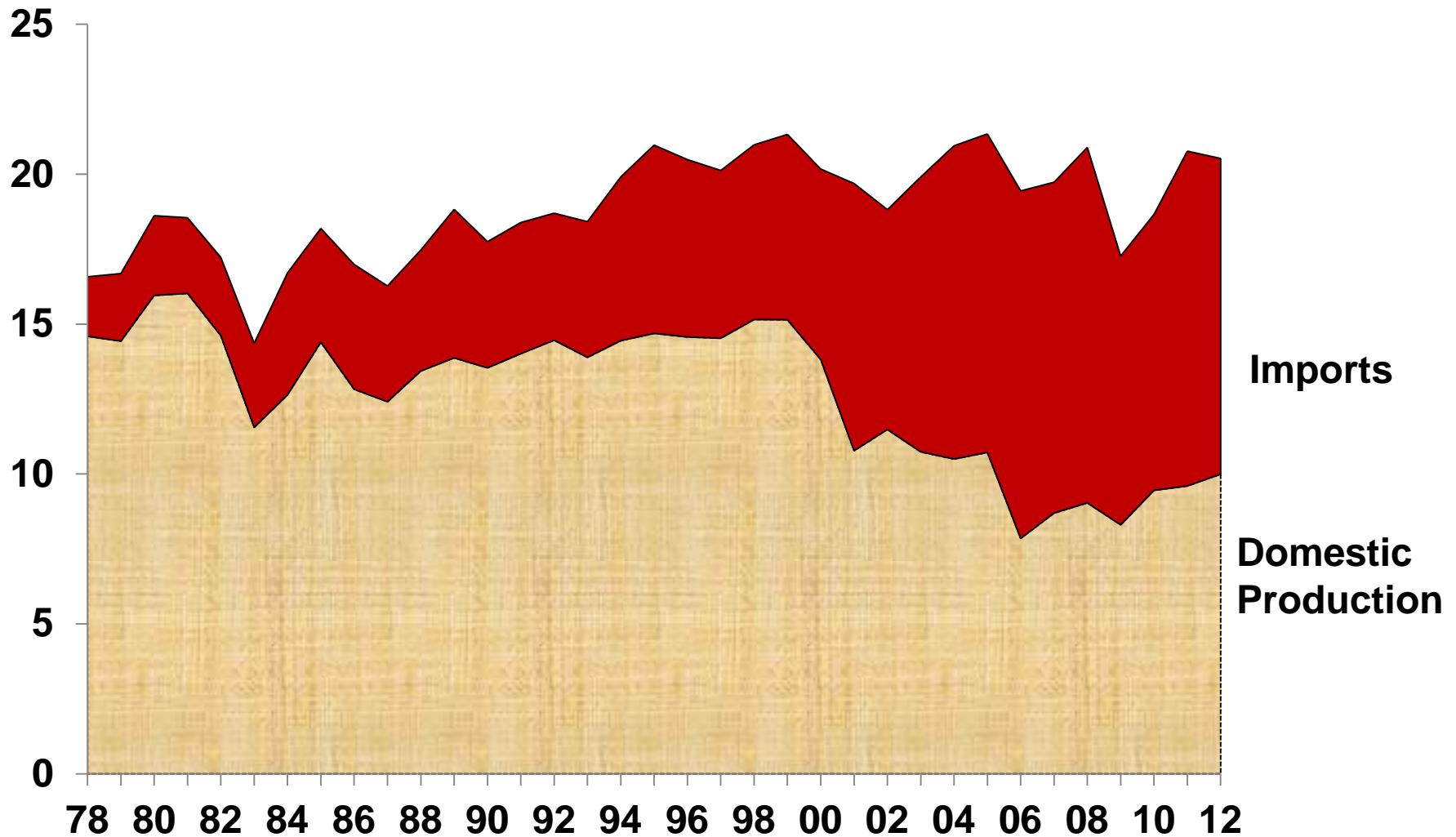


World Natural Gas Prices

(Prices Paid by NH₃ Producers - \$/MMBtu)

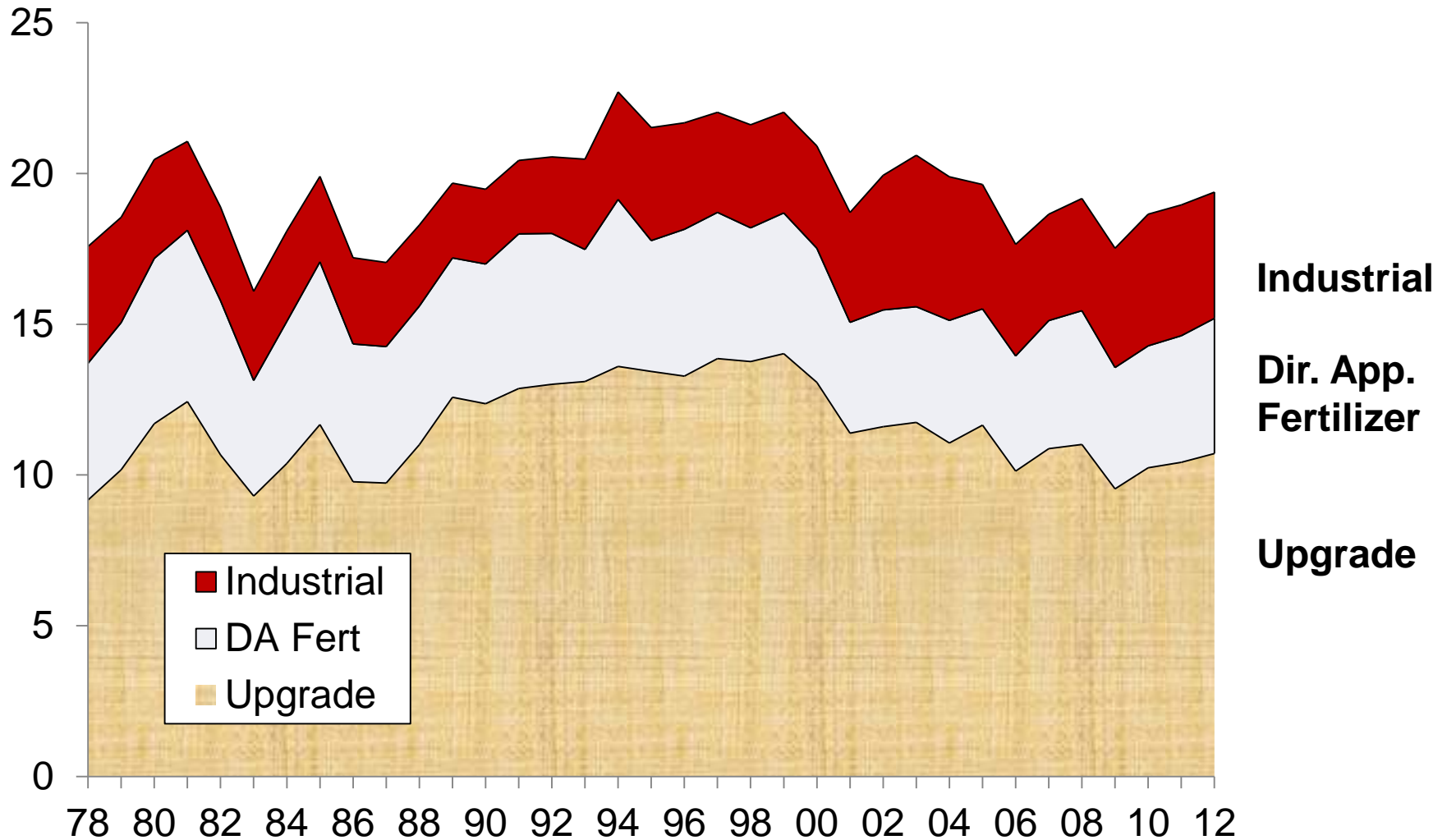


U.S. Ammonia Supply ***(MM Product Tons)***



U.S. Ammonia Disappearance

(MM Product Tons)



U.S. Ammonia Imports

(MM Tons)

“Most of the AG imports are sourced from Canada”

Port Location	Volume	Markets (% of Total)		
		Coastal Industrial	AG	DAP/MAP Production
East Coast	286	100		
UMW	1,007		100	
Gulf Coast				
Tampa	1,992			100
New Orleans	1,757	75	25	
Other GC	2,188	70	5	25
West Coast	277	100		
Total	7,507	45	20	35

Limited Import Ability for U.S. Ag Markets

Limit infrastructure to offload and move imports to the Midwest Ag markets – mostly producer controlled

- **Limited Offloading**
- **Limited distribution system - Port to MW**
- **Limited storage capabilities downstream**

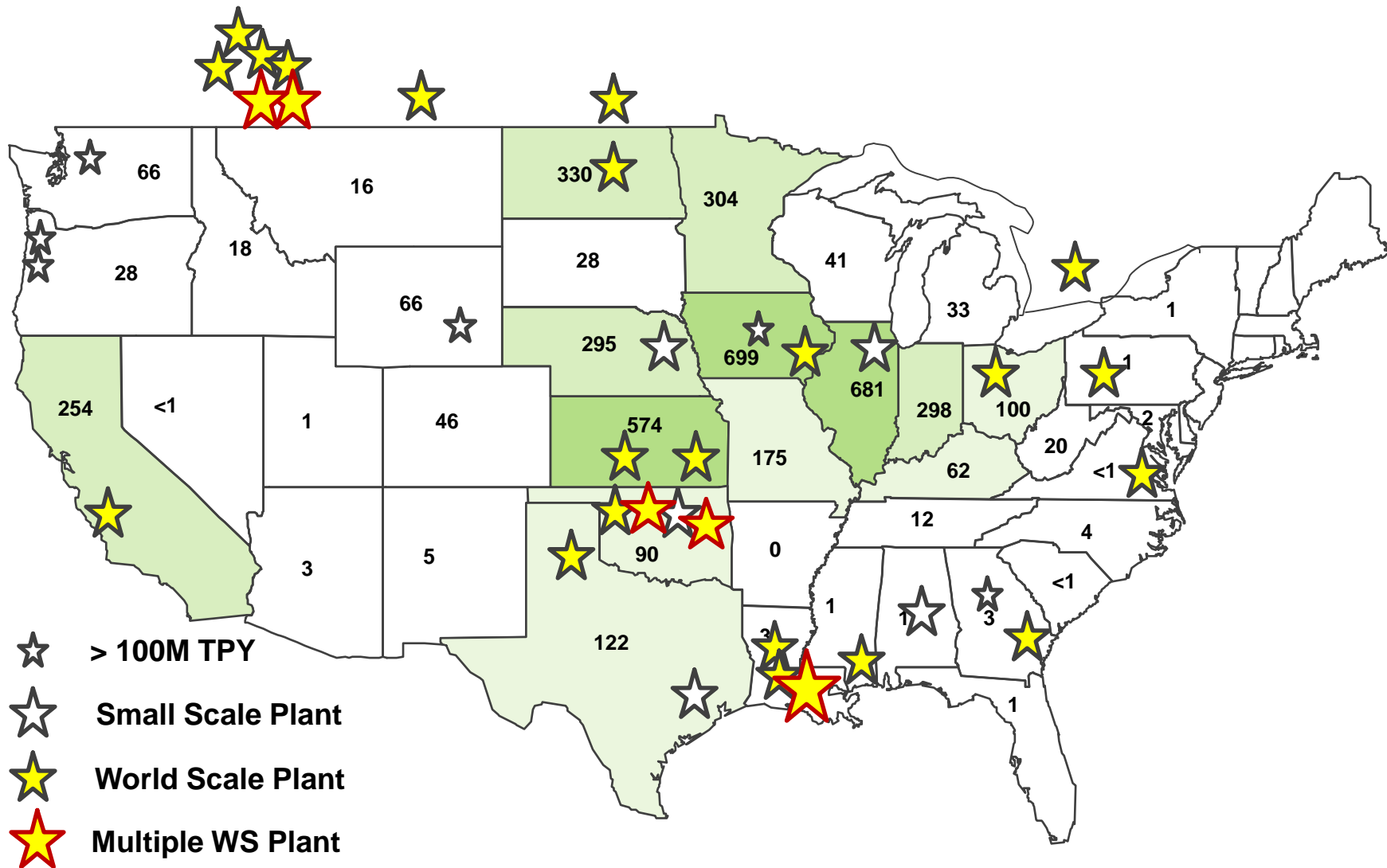
U.S. MW Ammonia supply will continue to be domestically based

Top 5 North American Producers (MM Tons of Ammonia)

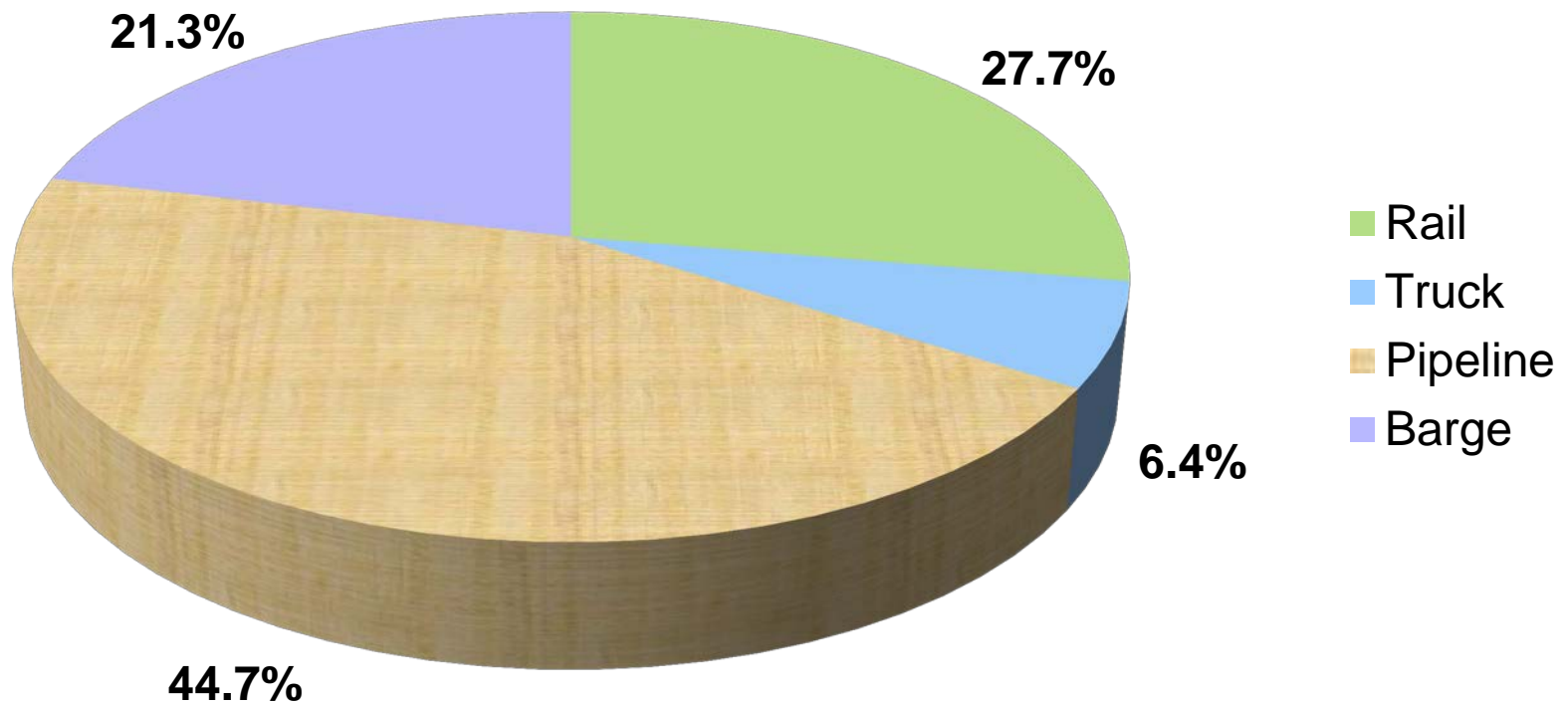
“Industry has become highly concentrated”

	1990		2000		2012	
	Cap	%	Cap	%	Cap	%
Total Capacity	20.8		24.9		18.4	
<u>Company</u>						
Agrium			4.3	17%	3.2	18%
AMC	1.2	6%				
Arcadian	1.5	7%				
CF Industries	1.7	8%	3.1	12%	6.7	36%
Farmland	2.4	11%	3.0	12%		
Koch Nitrogen					2.1	11%
PCS			2.3	9%	1.5	8%
Terra			2.5	10%		
Unocal	1.1	5%				
Yara					0.7	4%
<i>Top Five Producers</i>	7.9	38%	15.3	61%	14.2	77%

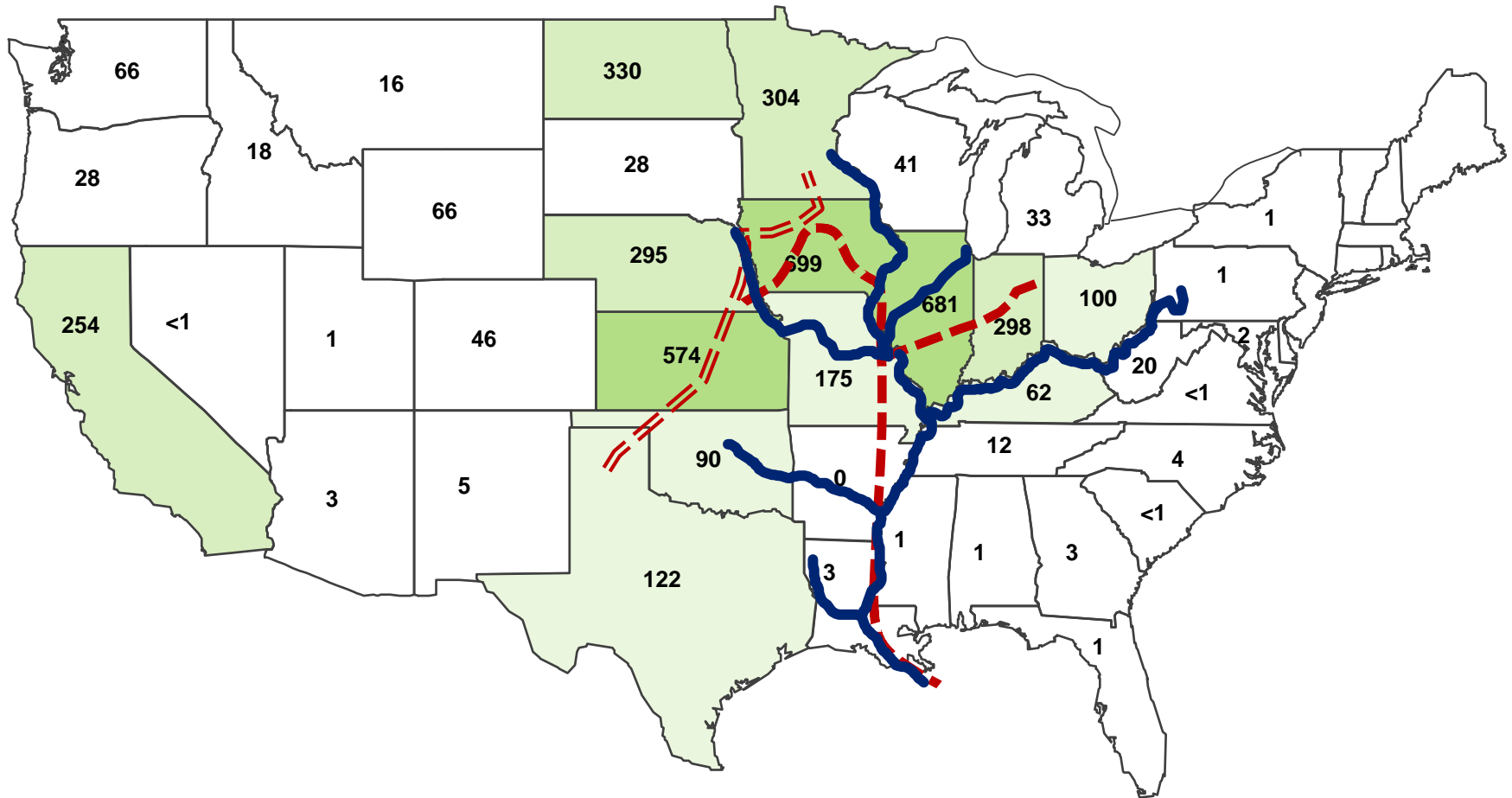
Ammonia Demand and Production Facilities FY 2012 (MM Product Tons)



Ammonia Transportation to Major Distribution Points



Ammonia Fertilizer Consumption FY 2008-10 (MM Product Tons)

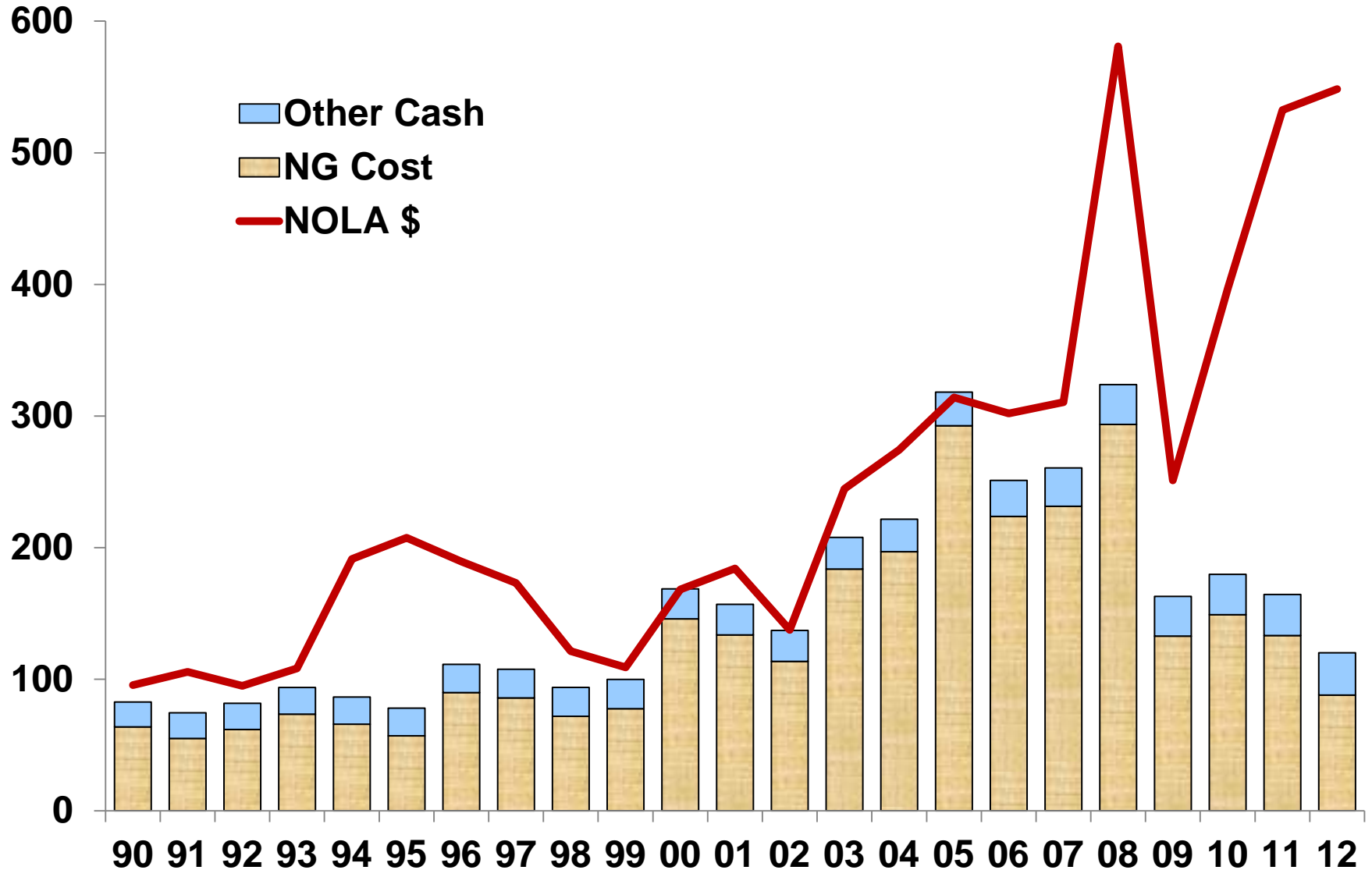


Ammonia Fertilizer Storage Capacity ***(000 Tons)***

“Most of the current ammonia storage distribution system controlled by existing producers”

	<u>Plant Site</u>		<u>Distribution Site</u>		<u>Total</u>	
	Vol.	%	Vol.	%	Vol.	%
CF	279	28%	778	34%	1,057	32%
Agrium	144	14%	413	18%	557	17%
Koch	340	34%	570	25%	910	28%
Rest of Ind.	243	24%	523	23%	766	23%
Total	1,006	100%	2,284	100%	3,290	100%

U.S. Ammonia Production Cost vs. Gulf Barge Price (\$/ton)



Proposed Ammonia Projects and Likely Output (000 Product Tons)

“How many actually move forward is still a major question mark”

		Ammonia	Potential Output		NPKFAS
		Capacity	Output	Upgrade	Likelihood
Orascom	IA	660	100	560	50/50
NDFU/CHS	ND	660	200	460	Less than 50%
Yara	Sask	735	100	635	Probable
OVR	IN	735	275	460	Unlikely
FNA	W. Can.	660	100	560	Unlikely
CF	Unknown	660	100	560	Spec
Agrium	MO	660	100	560	Spec
		4,770	975	3,795	
Existing Capacity		13,338			
% of Capacity		36%			

What does this mean for NH3 Fuels?

- ✓ Ammonia for NH3 Fuel will have to start from scratch***
 - ❑ Current domestic production along with potential new capacity will continue to be mostly upgraded**
 - ❑ Existing distribution system fully utilized and highly concentrated**
 - ❑ Imports possible in coastal markets. However, market is highly volatile, unreliable and will be likely have to be sourced from new supply in the Middle East**

What does this mean for NH3 Fuels?

✓ Domestic Production Alternatives

❑ New world scale, stand-alone ammonia facilities

- High capital cost and will require significant investment in large distribution network
- Rail movement/cost could be a limiting factor

❑ Smaller distributed ammonia plants

- Slightly higher operating and CAPEX cost/ton
- Can be scaled to meet local demand
- Significantly lower distribution requirements Can be scaled to meet local demand

❑ New Technology (Not my area!)

- Wind
- Other new technologies

NH3 Fuel Economics

	<u>Value</u>	<u>Units</u>
U.S. Fuel Consumption	180,000	MM Gal
NH3 Fuel @ 1%	1,800	MM Gal
150 Gallons/Ton of NH3	150	
NH3 Requirments	12	MM tons
World Scale Plant Capacity	0.660	MM tons
# of New Plants	18	
Capitol Requirements		
CAPEX per Plant	800	\$MM
Total CAPEX	14,545	\$MM

Comparative Delivered Cost Distributed vs. World Scale Production

	Small Scale Distributed	Typical Gulf Producer	W Canadian Producer
Nat Gas \$ - 7/20/12	\$2.34	\$2.92	\$2.63
Conversion Ratio	32	32	32
Natural Gas Cost	\$75	\$93	\$84
Other Op Cost	\$64	\$40	\$40
Plant Gate Cost	\$139	\$133	\$124
Distribution Cost	\$15	\$65	\$120
Delivered Cost	\$154	\$198	\$244
Current Price (July-12)	\$740	\$740	\$740
Current Margin / Ton	\$586	\$542	\$496

What does this mean for NH3 Fuels?

- ✓ ***Imports – May make sense in large coastal markets. However,***
 - ❑ **Highly volatile market**
 - ❑ **Likely dominated by low cost natural gas suppliers in the Middle East**
 - ❑ **Will require significant investment in offloading and storage – difficult in highly populated areas**

What will NH3 Fuels Need?

- ✓ ***Significant Capital***

- ❑ **Typical world scale plant 660,000 tpy plant ranges from \$700MM to \$1Billion**
- ❑ **Distribution system (?) – but a lot!**

- ✓ ***Low cost source of energy***

- ✓ ***Advancements in technology***

- ❑ **Improved conversion factors**
- ❑ **New low cost, high volume source of ammonia**

QUESTIONS?

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Free trial at:
www.npkfas.com