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Bureau of Economic Geology, The University of Texas at Austin

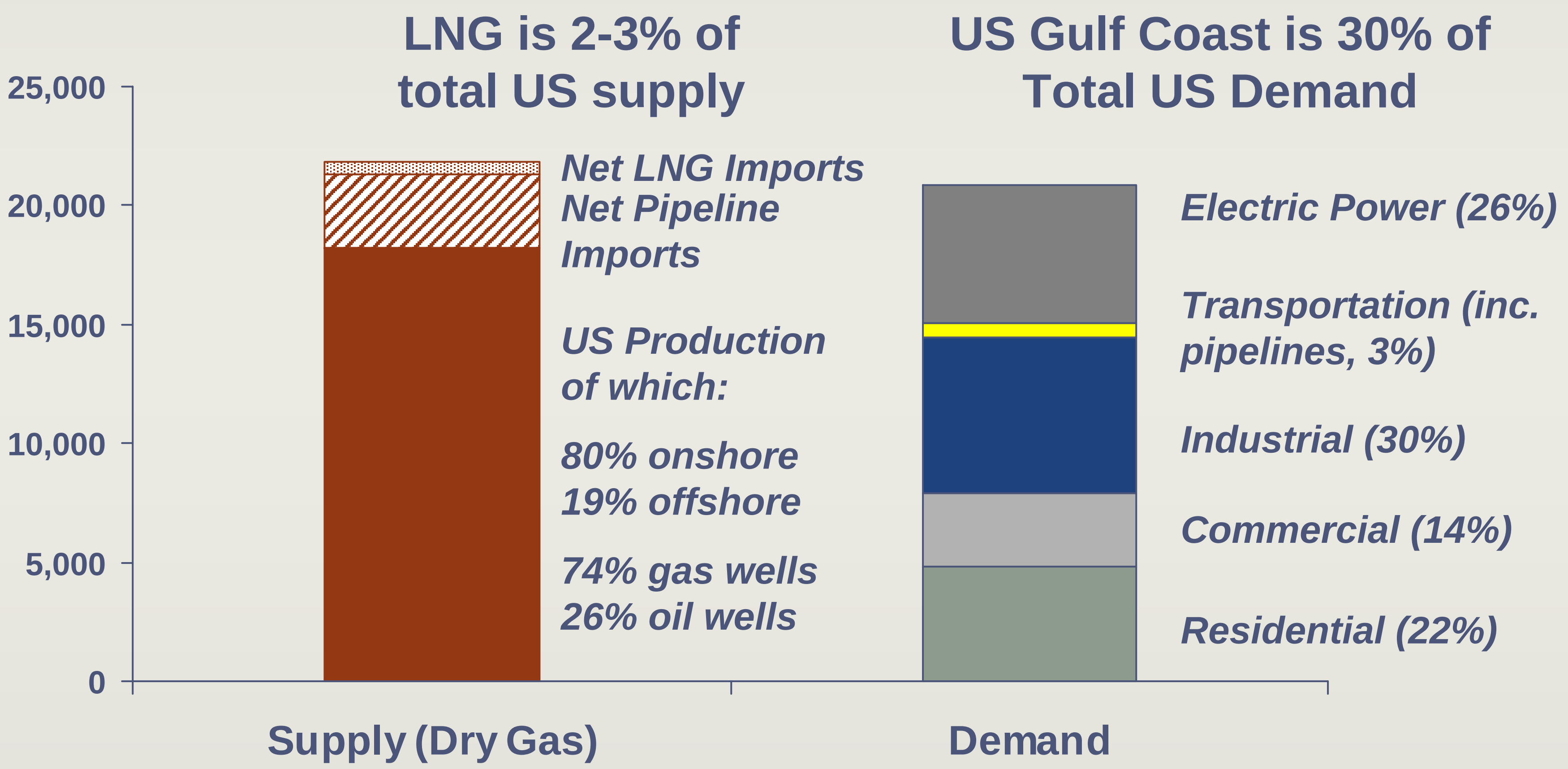
LNG Economics and Net Benefits

Dr. Michelle Michot Foss

Dr. Michelle Michot Foss, CEE, BEG-UT Austin

A Natural Gas Portfolio

(Bcf, 2005)



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Source: U.S. EIA

LNG Value Chain




EXPLORATION & PRODUCTION	LIQUEFACTION	SHIPPING	REGASIFICATION & STORAGE
$0.5-$1.0/MMBtu	$0.8-$1.20/MMBtu	$0.4-$1.0/MMBtu	$0.3-$0.5/MMBtu

TOTAL = $2.00 - $3.70

TOTAL with 30% cost escalation) = $2.60 - $4.80

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Sources: Industry (estimates exclude some O&M and tax costs)

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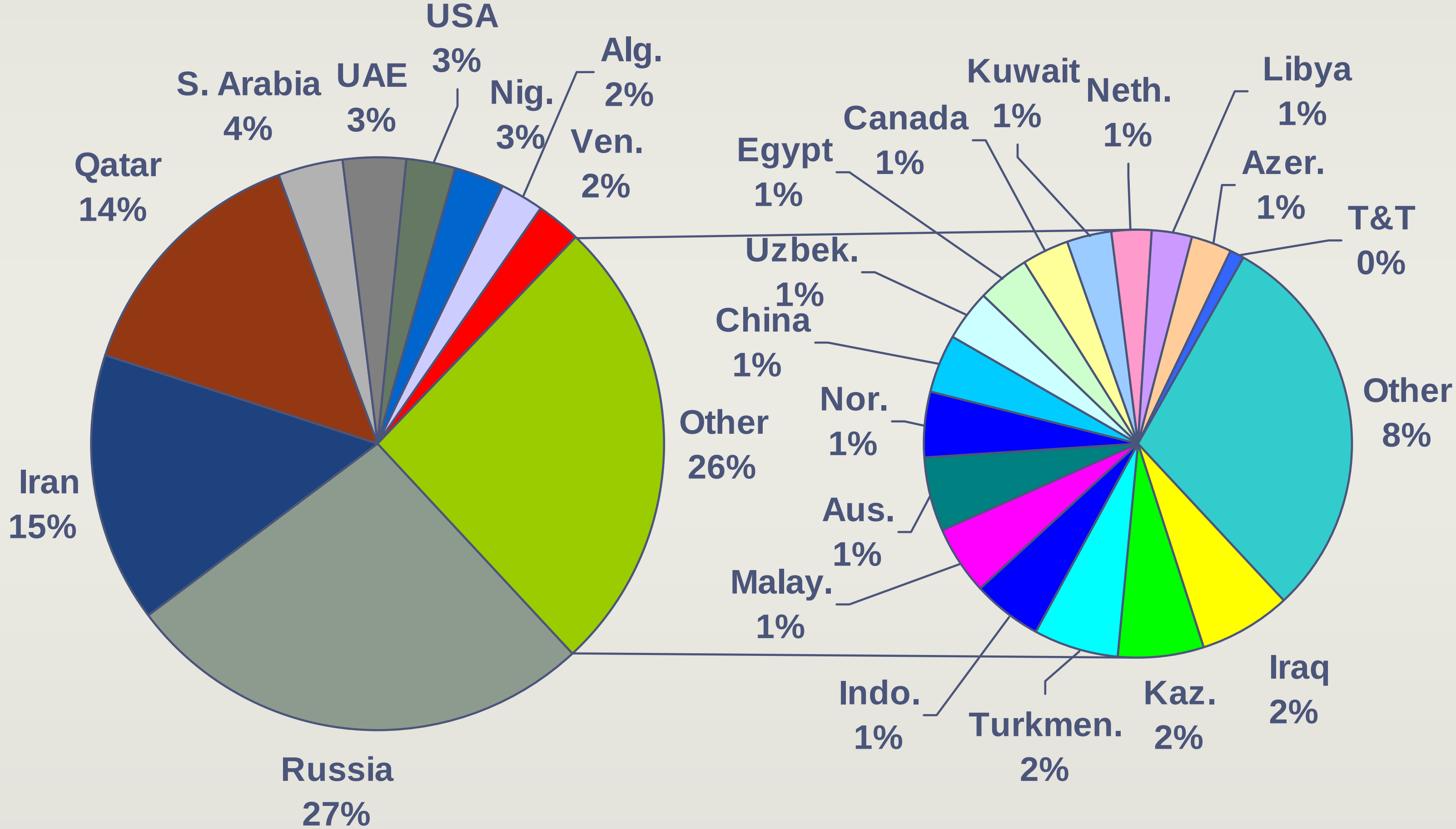
World Natural Gas Reserves

Proved, Year End 2004, 6,337 Tcf



Global Liquefaction

Liquefaction Plant Capacity (mtpa) as of June 2005

Region	Operating	Under Construction	Planned	Total
Pacific Basin	70.8	20.8	75.8	167.4
Middle East	33.6	28.7	67.7	130.0
Atlantic Basin	46.3	32.3	101.0	179.6
TOTAL	**150.7**	**81.8**	**244.5**	**477.0**

Actual production 2004: 132mt

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Shipping

Summary of LNG Ships in Operation & on Order (as of June 2005)

Ship capacity (m^3)	Ships in Operation	Ships on Order	Total
18,000 to 50,000	16	1	17
51,000 to 120,000	15	3	18
>120,000	144	99	243
209,000 to 216	-	8	8
Total	**175**	**111**	**286**

Global Regasification Terminals

Regasification Terminals by Regions (as of Fall 2006)

Region	Terminals in Operation	Terminals Under Construction	Planned Terminals	Total
Asia-Pacific	31	6	20	57
USA/NA	9 (including GOM offshore and Mexico)	6	41+	52+
Europe	12	7	13	32
Total	**50**	**17**	**74+**	**131+**

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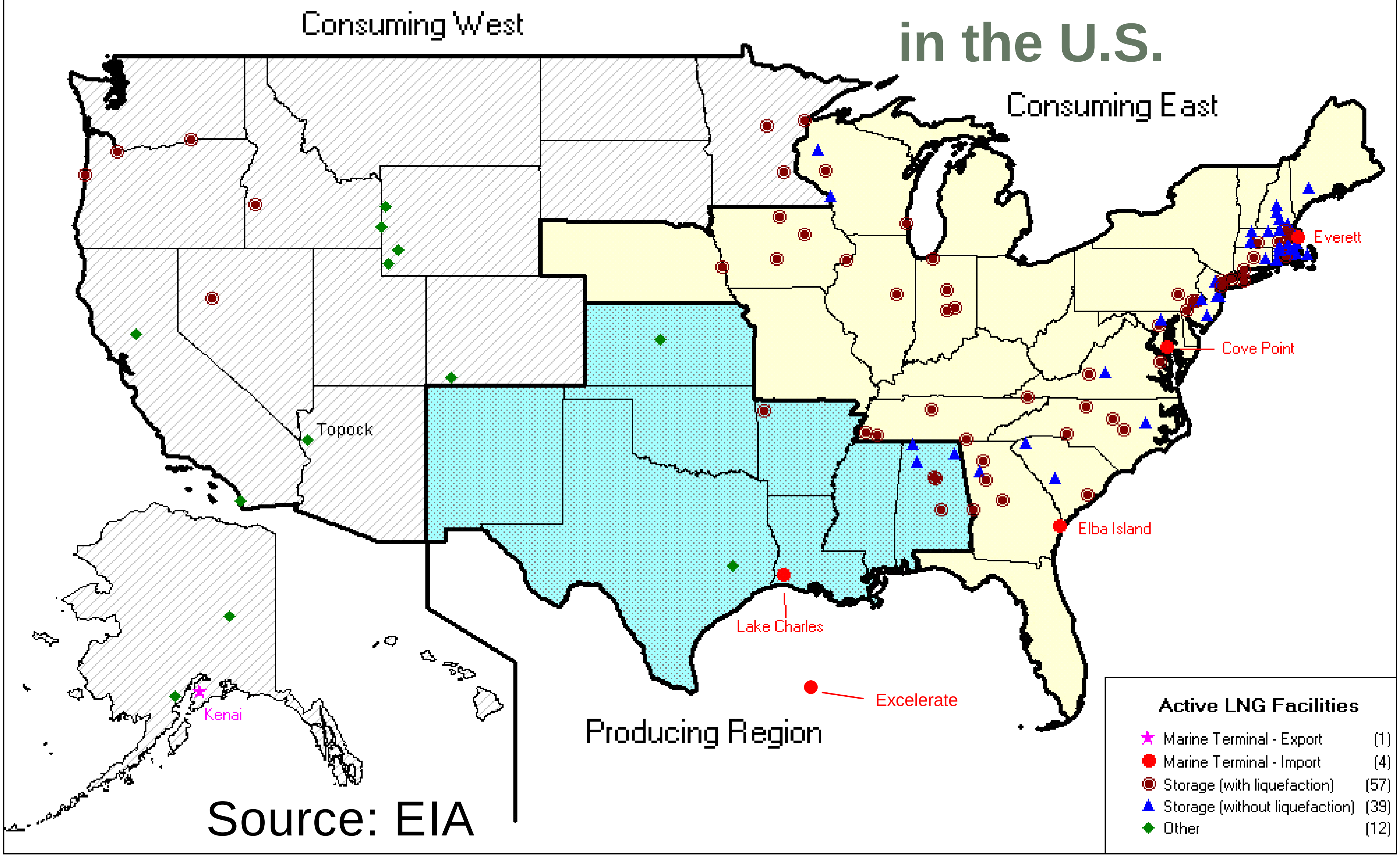
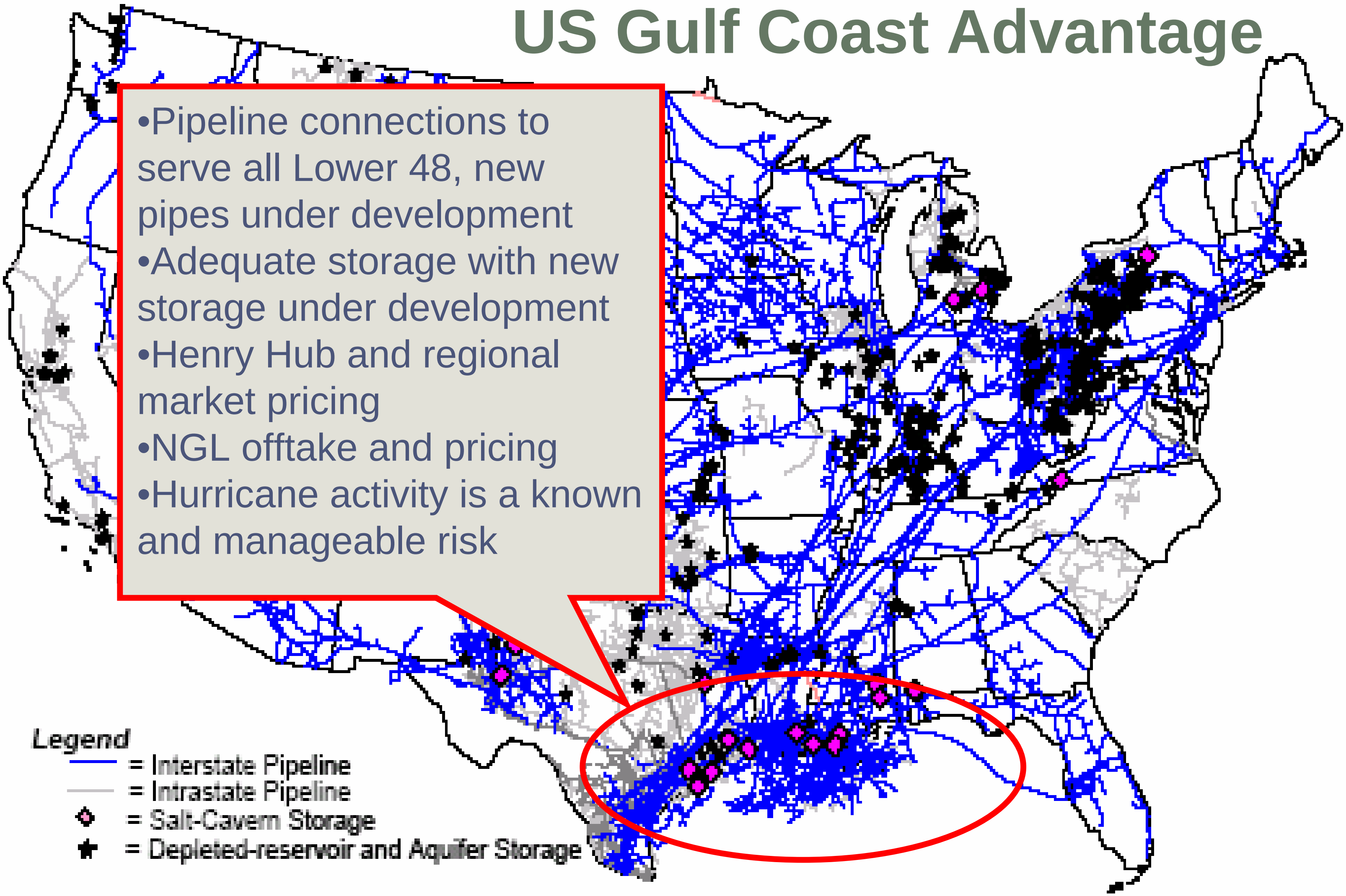
113 Active LNG Facilities in the U.S.

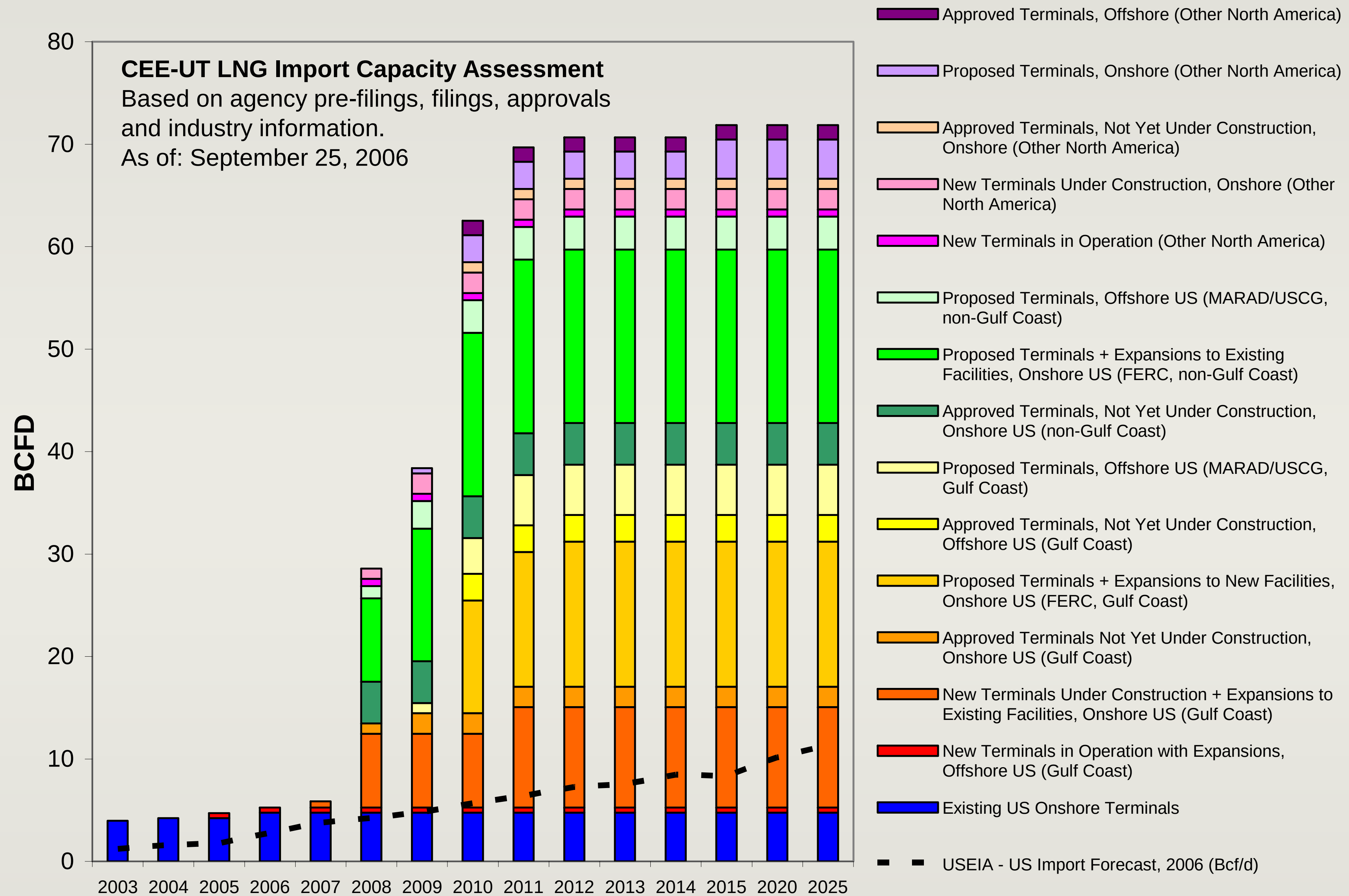


Source: EIA

US Gulf Coast Advantage

- Pipeline connections to serve all Lower 48, new pipes under development
- Adequate storage with new storage under development
- Henry Hub and regional market pricing
- NGL offtake and pricing
- Hurricane activity is a known and manageable risk





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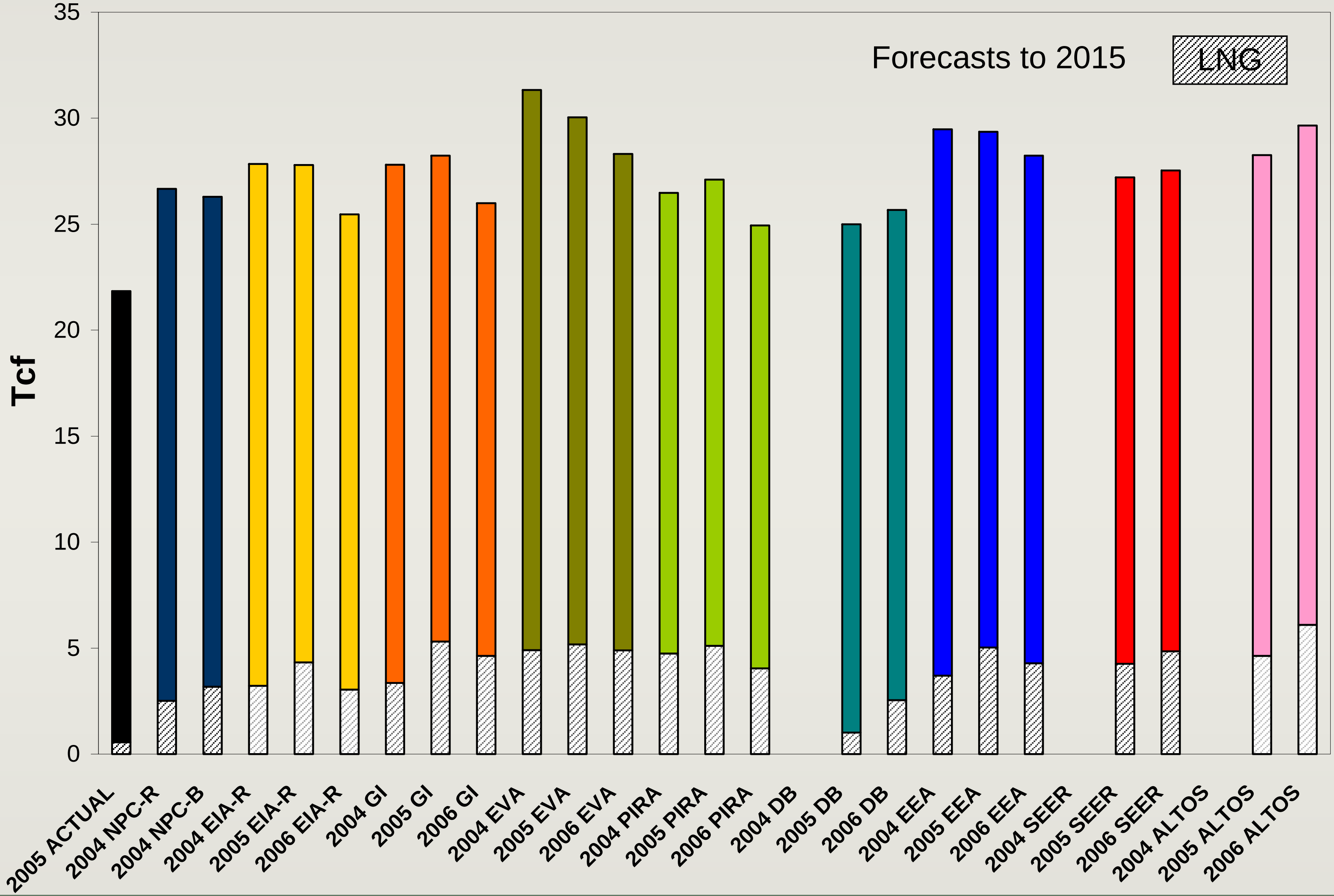
Mixed Views on US Gas Supply



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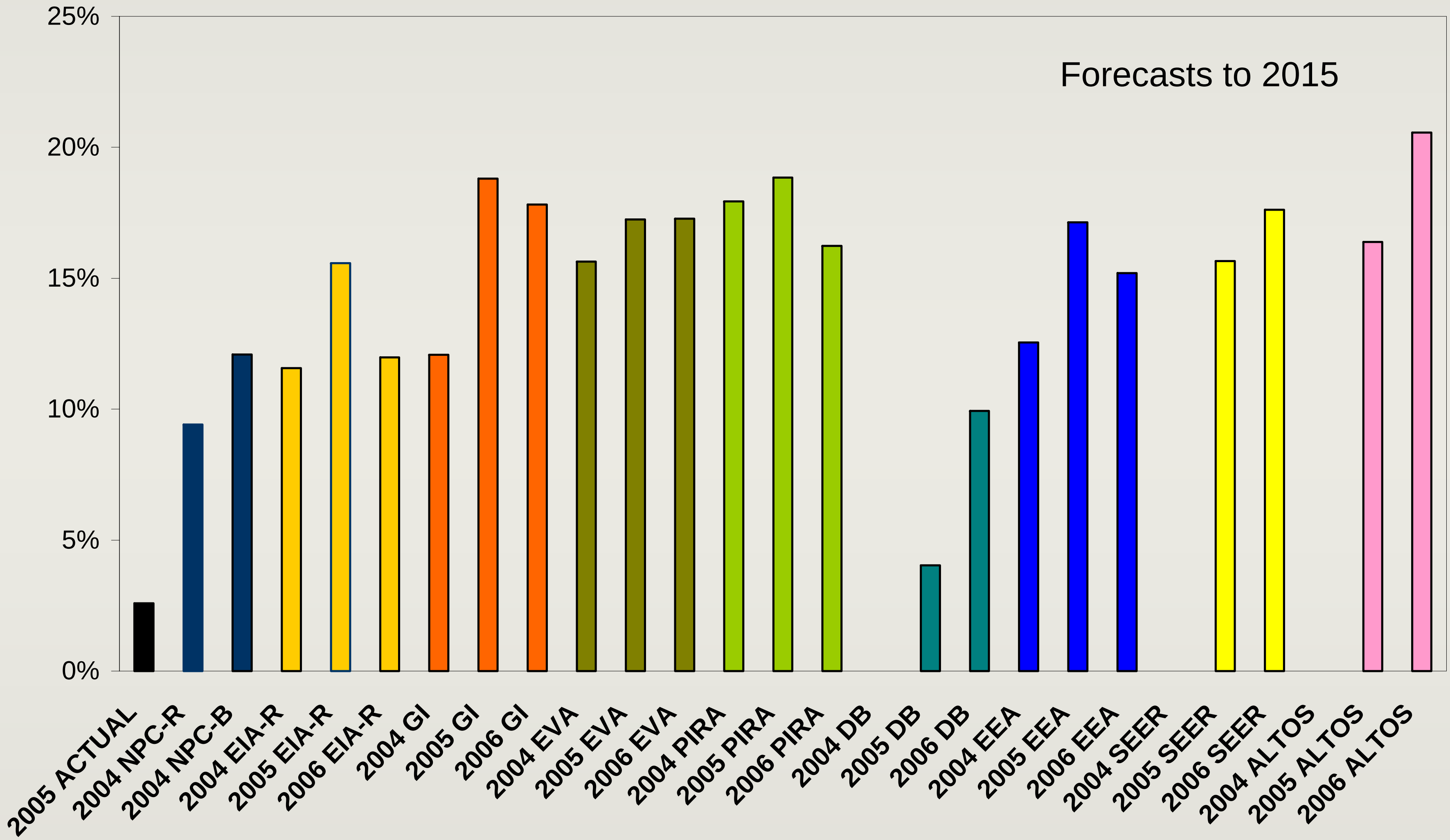
Mixed Views on LNG Share



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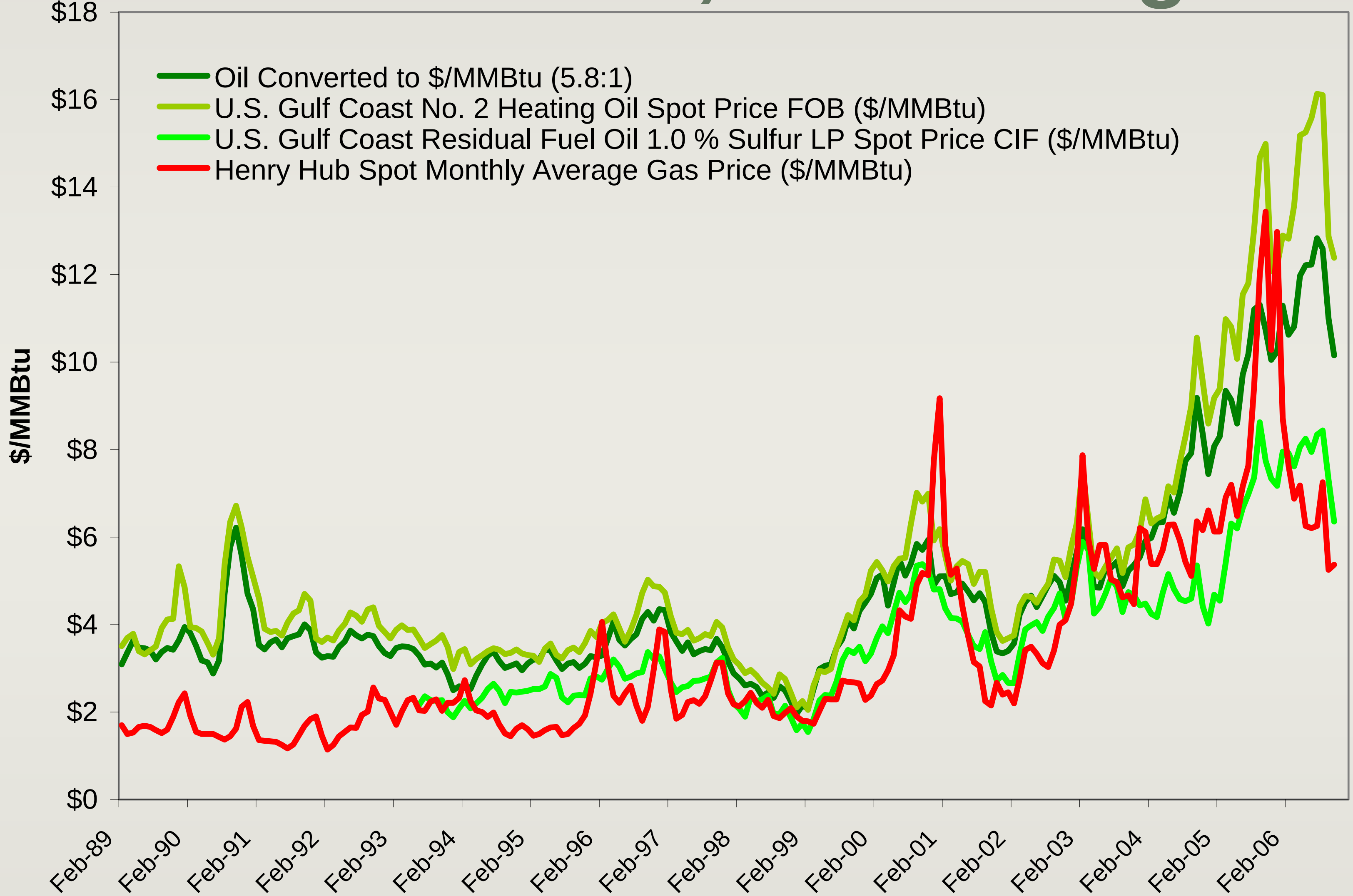
Natural Gas, Oil Pricing



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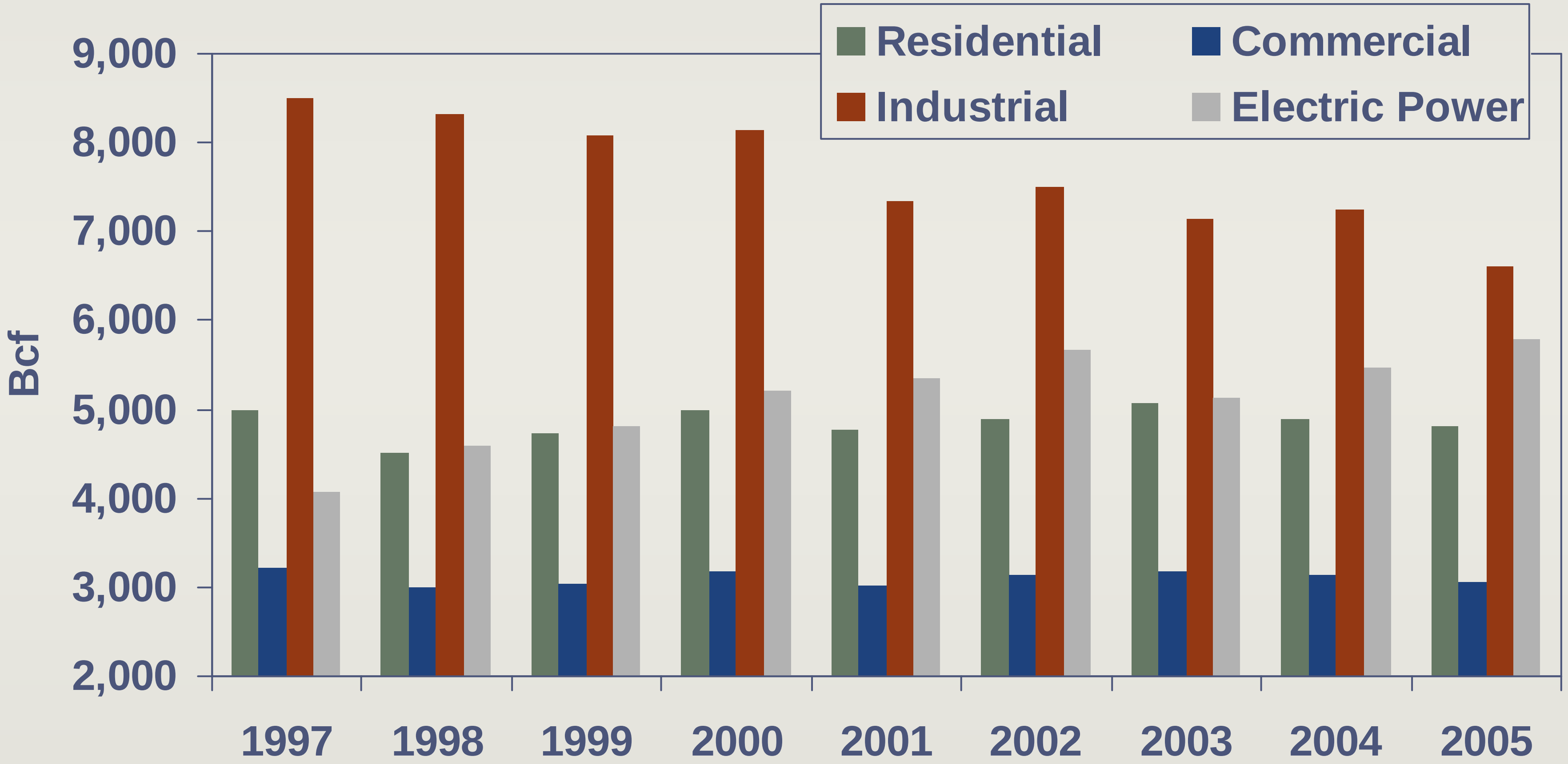
Shifts in US Customer Base



Source: U.S. EIA

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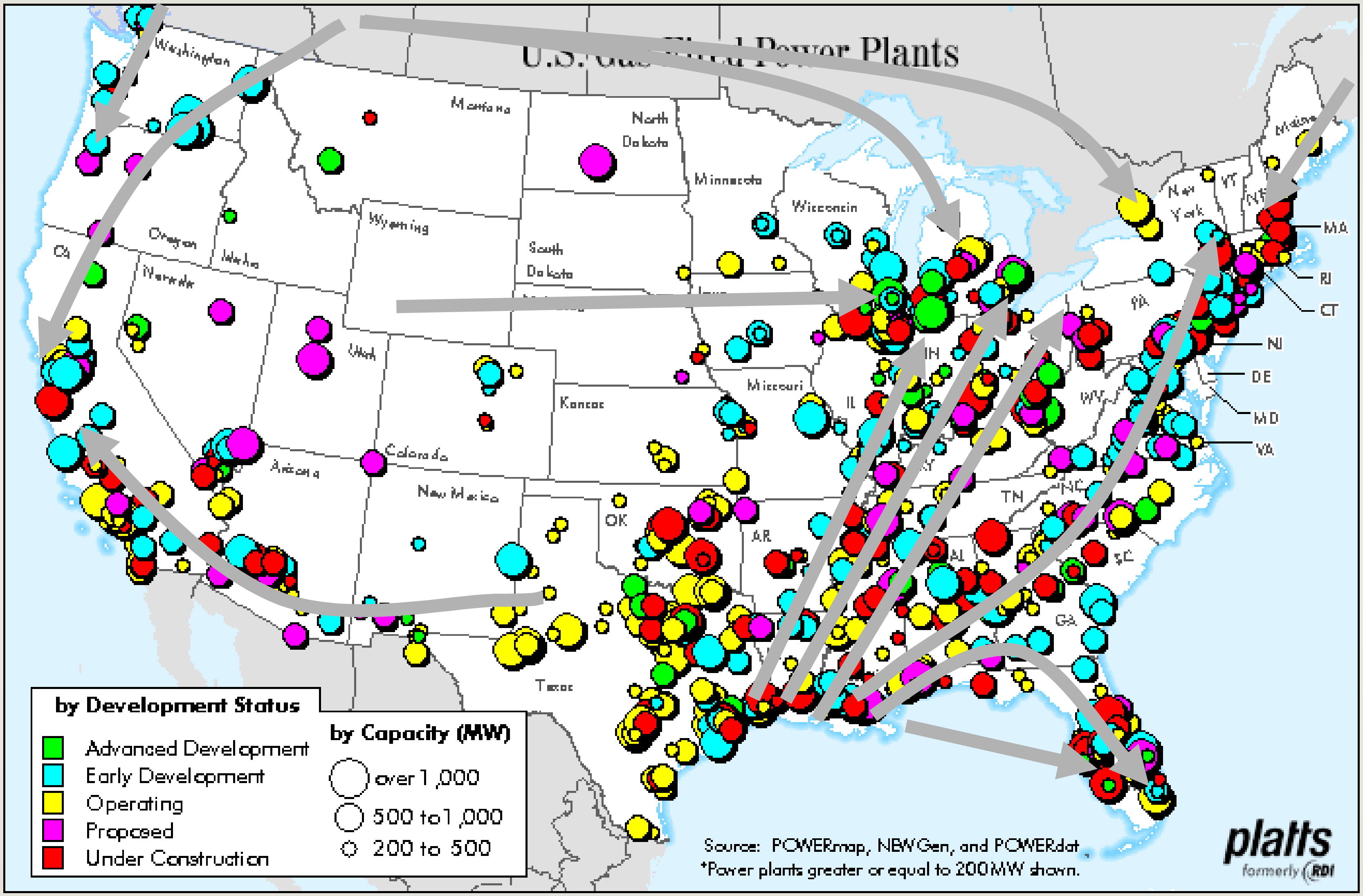
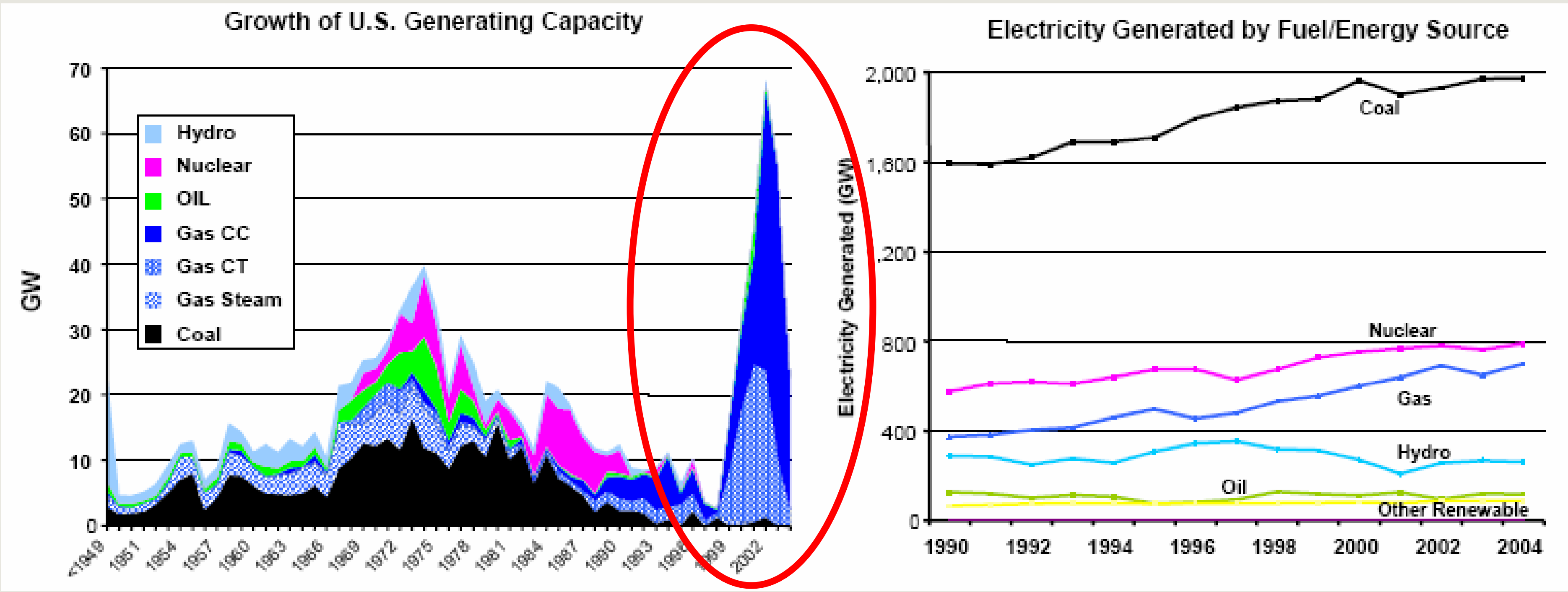
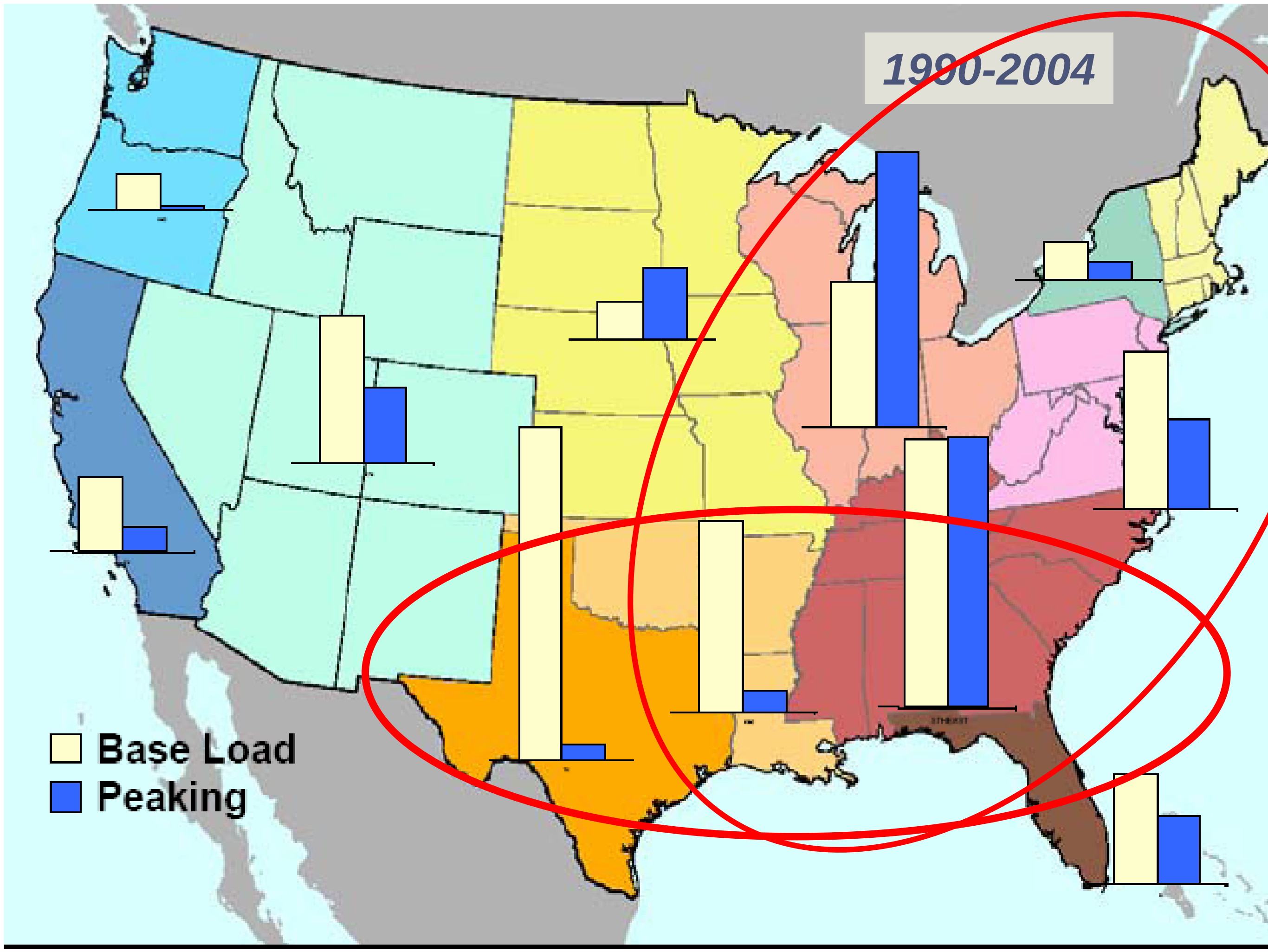
US Gas Fired Plants (2002)



US Power Gen Development



Distribution of New Gas Generation



Global Gas Market Evolution and Arbitrage

Key considerations:
- •Economic regulation of terminals
- •Regulatory approval of LT contacts
- •Pipeline takeaway capacity
- •LNG cargo interchangeability vs. terminal design and pipeline standards
- •Evolution of short term LNG contracting mechanisms
- •Oil vs. natural gas Btu pricing

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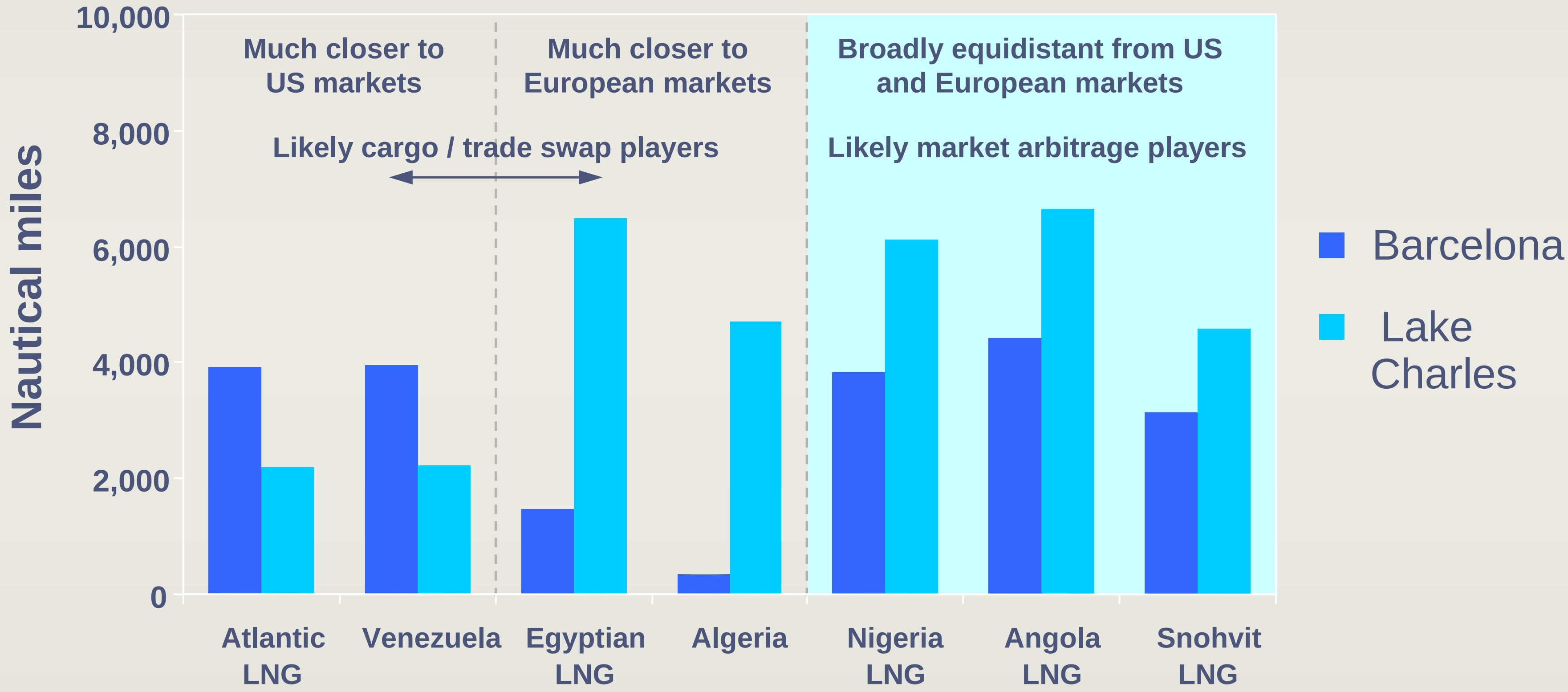
LNG Commercial Strategies

Shipping opportunities



Arbitrage and swap opportunities

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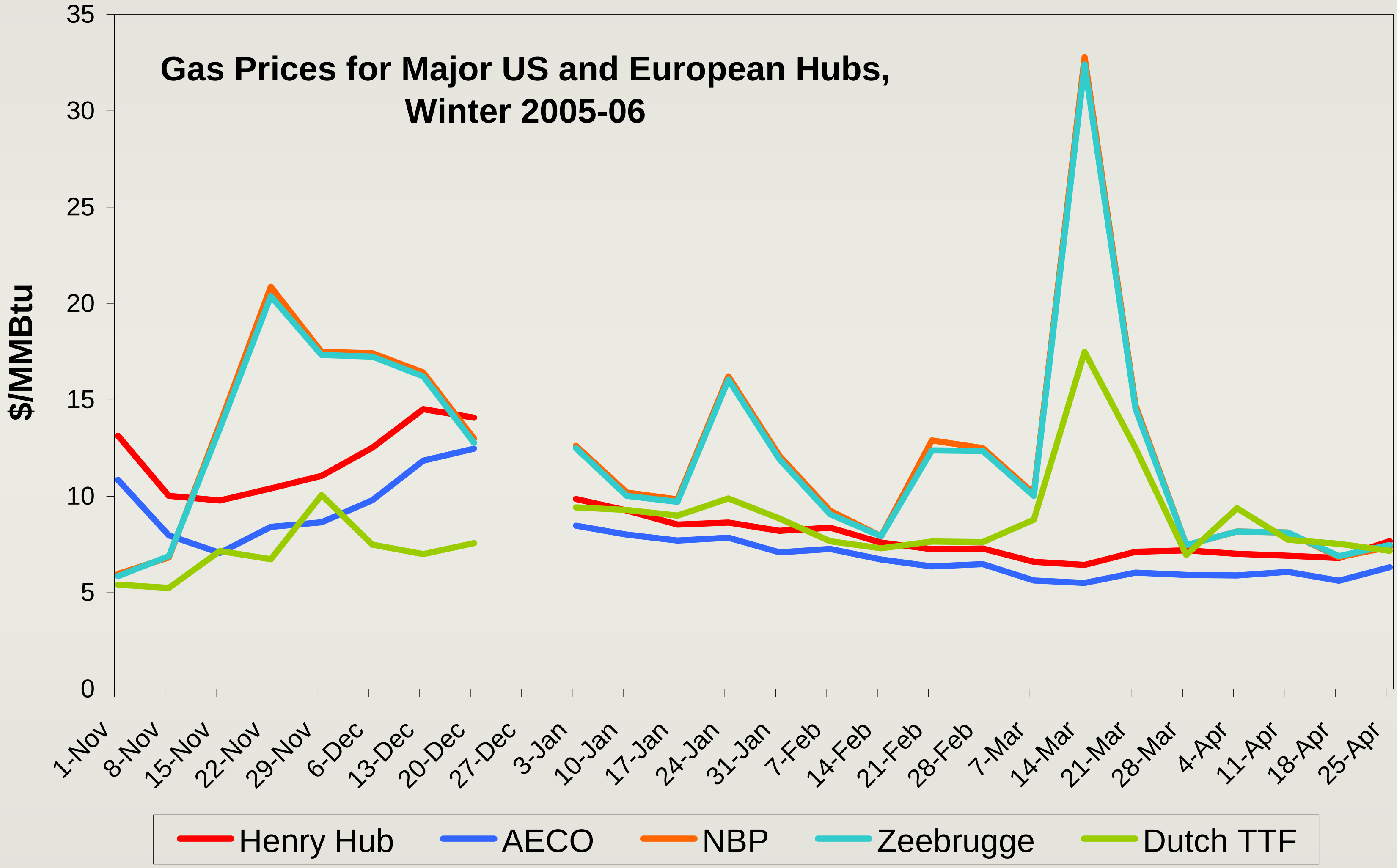
2006-2006 Winter Pricing…



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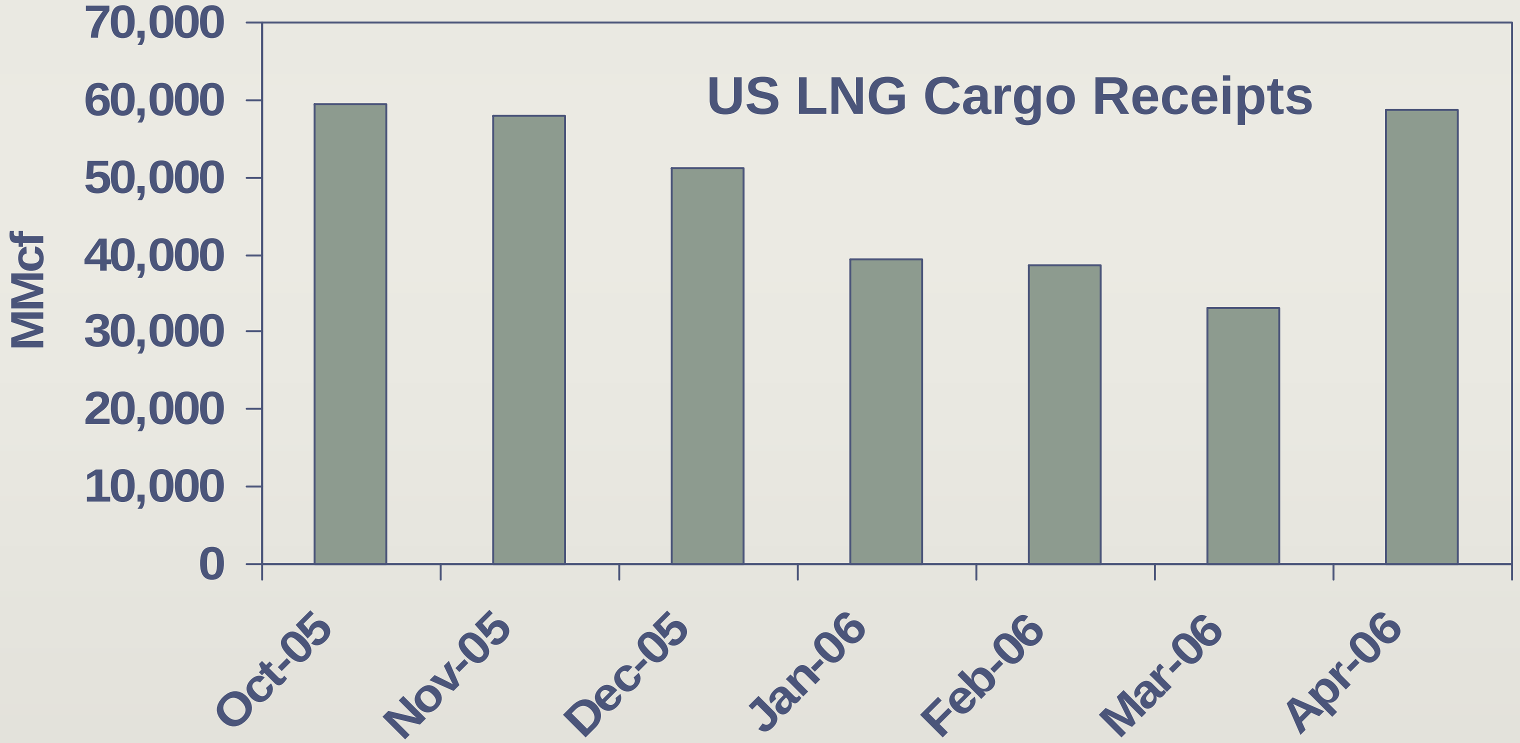
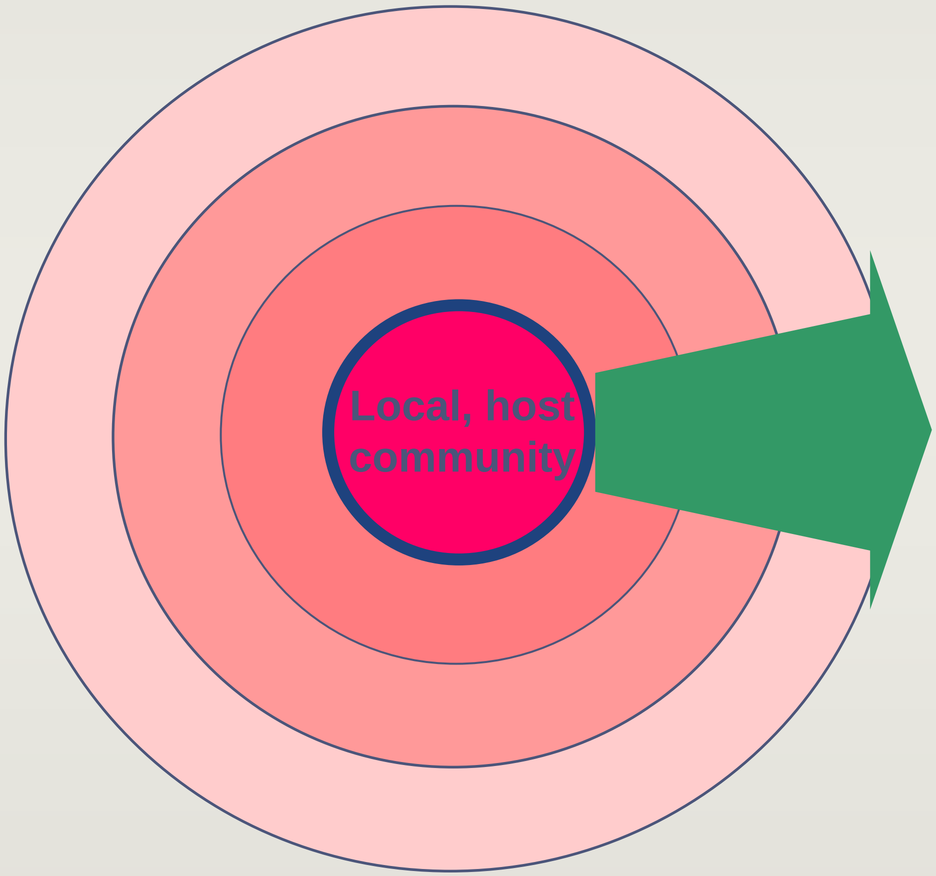
…Coupled With Warm Weather in US Resulted in Cargo Diversions to Europe

- Europe markets paid premiums over Henry Hub
- More rigorous winter conditions in would set stiff Atlantic Basin competition



Facility Siting Risk: Diffuse Benefits, Concentrated Costs

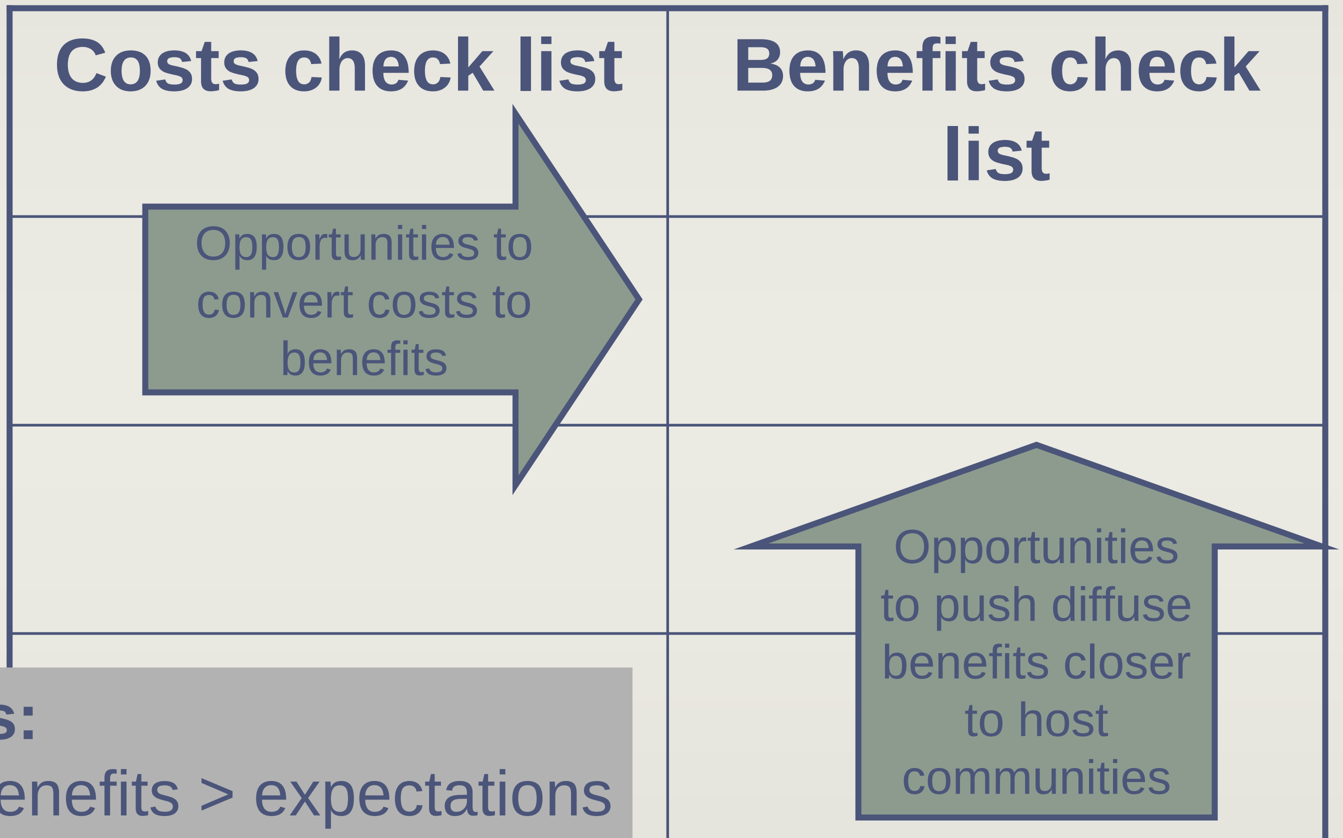


Costs are perceived to be concentrated at the local site and local host community

Benefits of the project are spread across a larger area; local host community may not perceive sufficient benefits to support project

Result: Perception of imbalance; "environmental justice" issue

Re-balance with Better Benefit-Cost Accounting



Results:

∑ net benefits > expectations

Project support > opposition

Conclusions

- The US Gulf Coast leads development of new LNG import receiving capacity and will handle the bulk of receipts for some time to come.
- The industry must continue building public confidence in its ability to construct and maintain safe and secure LNG facilities.
- Proponents and regulators need to do a better job addressing public concerns and establishing credibility and trust.
- Comprehensive stakeholder involvement in the development of LNG facilities is essential.
- More work is needed to define and demonstrate local, regional, national net benefits.

For More Information

- Public education initiatives - examples
  - CEE-UT
    http://www.beg.utexas.edu/energyecon/lng
  - Center for LNG
    http://www.lngfacts.org/
  - The DOE/NARUC LNG partnership
    http://www.naruc.org/programs/lng/
  - Gas Processors Association (GPA) LNG committee
    http://www.gasprocessors.com/lng.html
  - Society of International Gas Tanker & Terminal Operators
    http://www.sigtto.org/