

# INCREASING GLOBAL LNG INVESTMENTS

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# FOR NEARLY TWO DECADES THE PACIFIC BASIN DOMINATED WORLD LNG TRADE

- As Recently as 1994 - 77% World Demand, 73% Supply
- North America and Europe - Local Production and Pipeline-Accessible Supply - Northeast Asia - LNG
- For Most of the Period - Pacific Basin Self-Contained
- In the Late 1990s - That Isolation Began to Change

- North America, Europe - Outgrew Traditional Pipeline Supply Sources, Turned to LNG,
- Stimulated New Atlantic Basin and Middle East Supplies
- New LNG Markets in China and India
- The Former Soviet Union - Began to Look Eastwards as Well as Westwards for Markets - Considered LNG as an Export Option
- The Result - A Global Gas Market - Pipelines and LNG Compete for Markets - LNG Transmits Pricing Signals Around the World

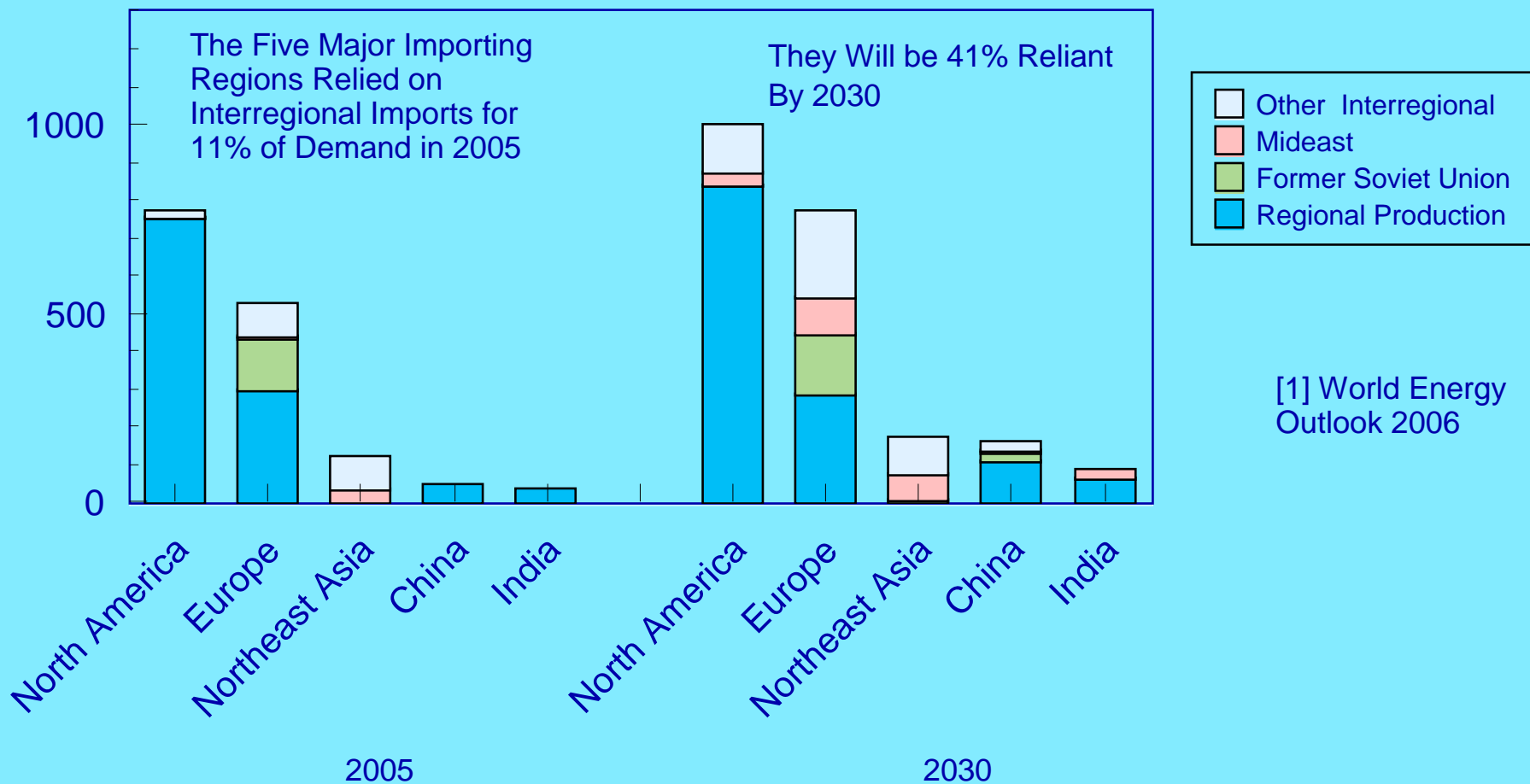
# THE IEA EXPECTS THAT INTERREGIONAL GAS TRADE WILL GROW RAPIDLY

- Interregional Imports - By 2030 - 41% of Supply of the Five Major Importing Regions - Europe, Northeast Asia, North America, China and India - Up From 11% in 2005
- LNG and Pipelines Compete in Europe, China and India - LNG Will Predominate in North America, Northeast Asia
- FSU Exports Largely by Pipeline - Middle East Largely LNG

Figure 1

# THE GROWING RELIANCE ON INTERREGIONAL GAS SUPPLY 2005 AND IEA FORECAST [1] FOR 2030 GAS PRODUCED WITHIN THE FIVE MAJOR IMPORTING REGIONS COMPARED TO THEIR INTERREGIONAL IMPORTS

BCM



# IF ONE CAN GENERALIZE ABOUT PUBLISHED WORLD GAS FORECASTS

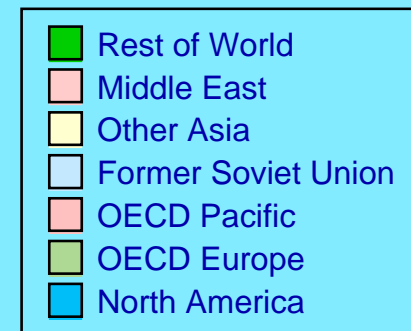
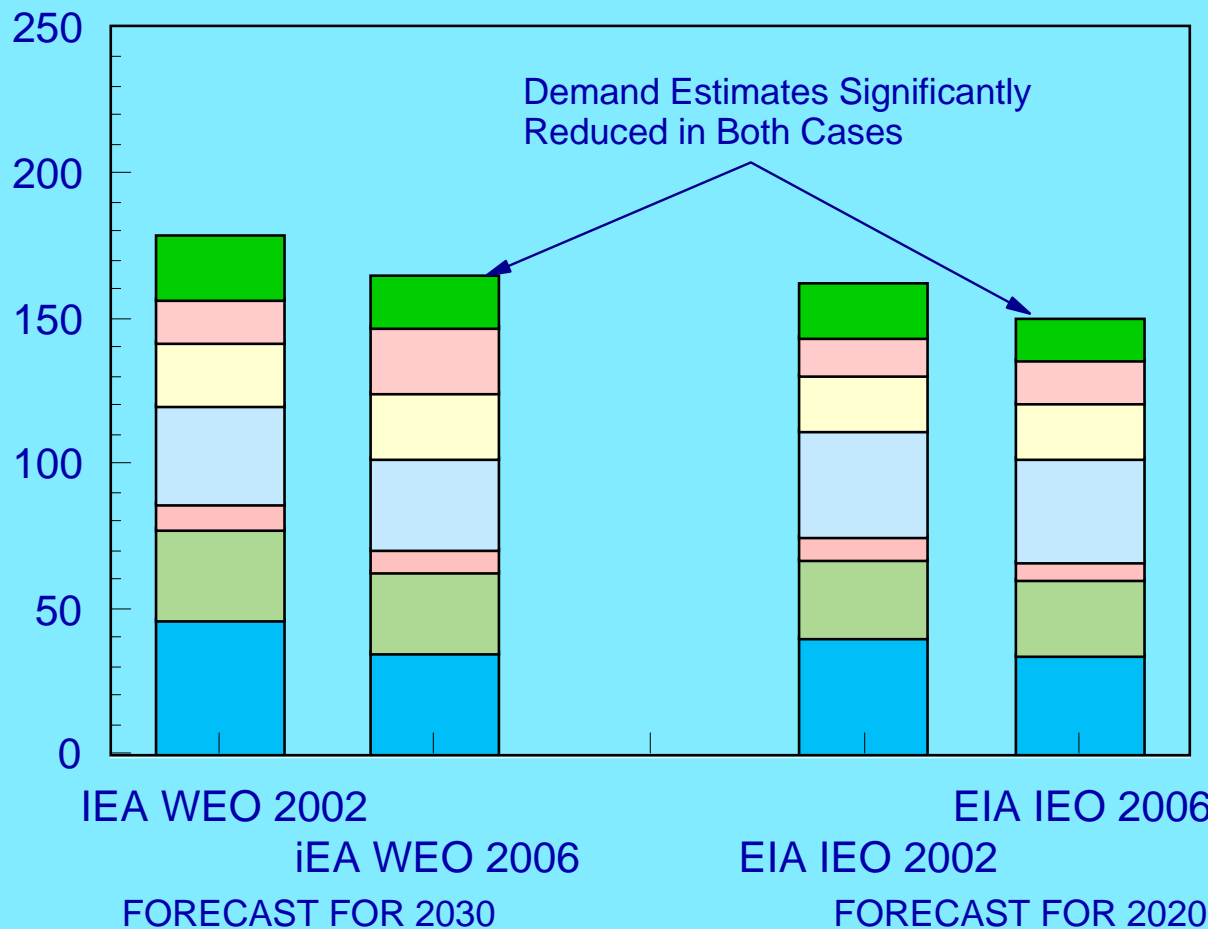
- Optimistic About Demand in the 1990s as Enthusiasm for Gas-Fired Power Generation Took Hold
- Then Supply Problems in North America and the North Sea - Caused a Shift to Greater Emphasis on Imported LNG - Retained Optimism About Demand
- Sharp Increase in Energy Prices - Recognition of LNG Supply Limitations - Now Scaled Back Their Estimates
- EIA and IEA Gas Forecast Comparison

Figure 2

# CHANGES IN FORECAST DEMAND EXPECTATIONS WITH LATER PROJECTIONS

## IEA WEO 2006 FORECAST FOR 2030 [1] COMPARED WITH WEO 2002 EIA IEO 2006 FORECAST FOR 2020 [1] COMPARED WITH IEO 2002

DEMAND IN TCF



[1] IEA Does Not Project 2020 in WEO 2006; EIA Does Not Project 2030 in IEO 2002

# **THE CURRENT OUTLOOK FOR LNG HAS BECOME HIGHLY UNCERTAIN BECAUSE OF**

- Unexpected Sharp Increases in Demand
- Slow Supply Response Because of Construction Lead Time
- Surge in Demand for Plant Construction; Overwhelmed Construction Firms and Equipment Suppliers; Result - Higher Costs and Project Delays



- Sharp Increase in Energy Prices; Effect on Demand Response and Interfuel Competition?
- Political Reaction to Global Warming; Effect on Competition Between Coal and Gas for Power Generation?
- Geopolitical Issues in Supplying Countries
- LNG's Sensitivity to Small Changes in World's Gas Supply/Demand Balance

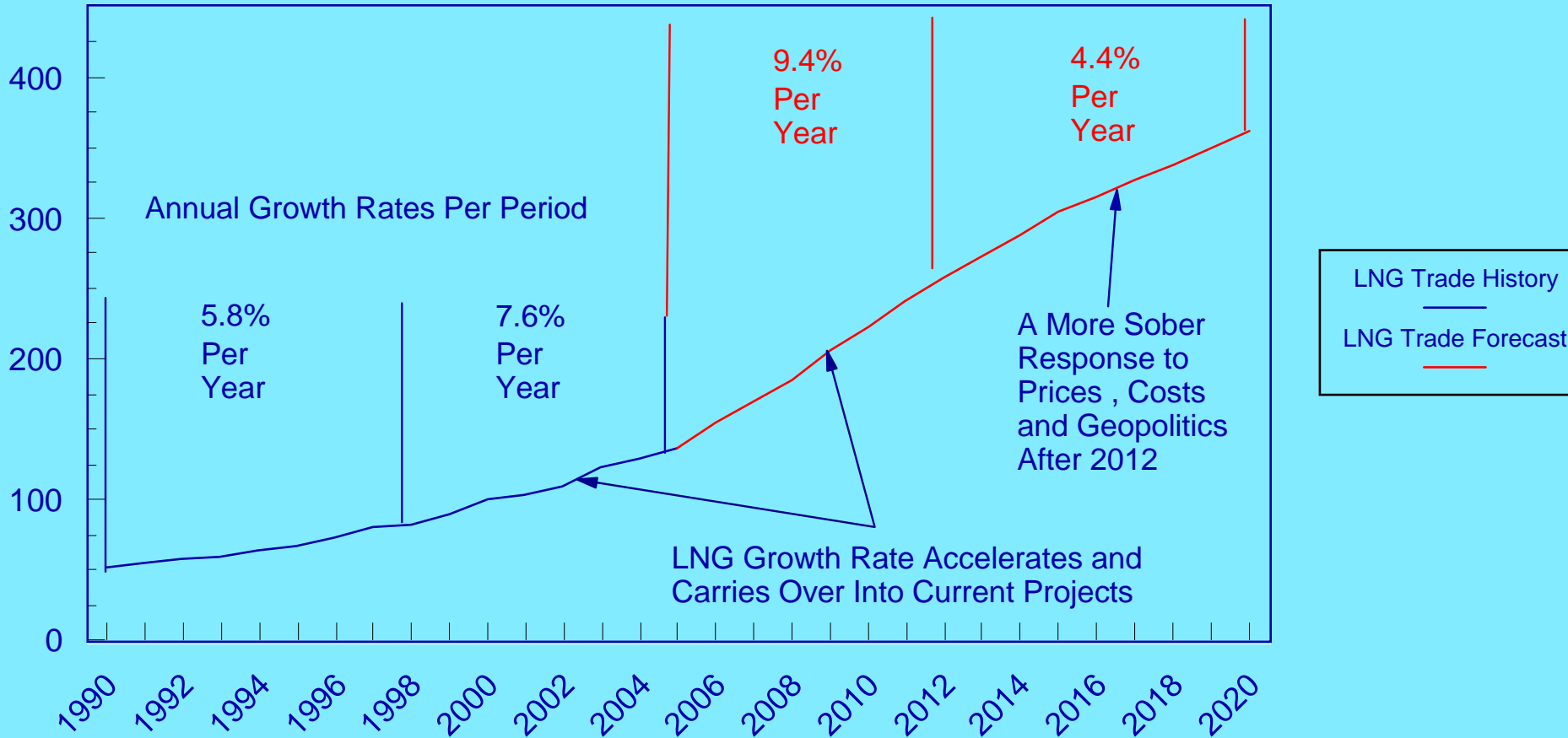
# **IN THIS ENVIRONMENT, IT IS UNLIKELY THAT ANY FORECAST - NO MATTER HOW WELL DONE - WILL GET IT RIGHT**

- However, Jensen Associates Has Just Finished an Analysis of Possible LNG Trade to the Year 2020
- Assumes That High Prices, High Costs and Geopolitical Constraints Will Ultimately Reduce Earlier LNG Growth Expectations
- Assumes That Market Can Absorb Major Near Term Capacity Additions
- But Moderates Growth Rates Beyond 2012

# Figure 3

## ONE PROJECTION OF WORLD LNG TRADE JENSEN ASSOCIATES ESTIMATES

Million Tons



# WHERE WILL THE LNG COME FROM? RESOURCES, TECHNOLOGY AND GEOPOLITICS

- World's Natural Gas Reserves - Very Large; Appear to be Able to Support Gas Trade Far Into the Future
- 56% of the World's Proved Reserves are Uncommitted to Any Application
- But Many Not Readily Available - Constrained by Economic, Technological or Geopolitical Issues

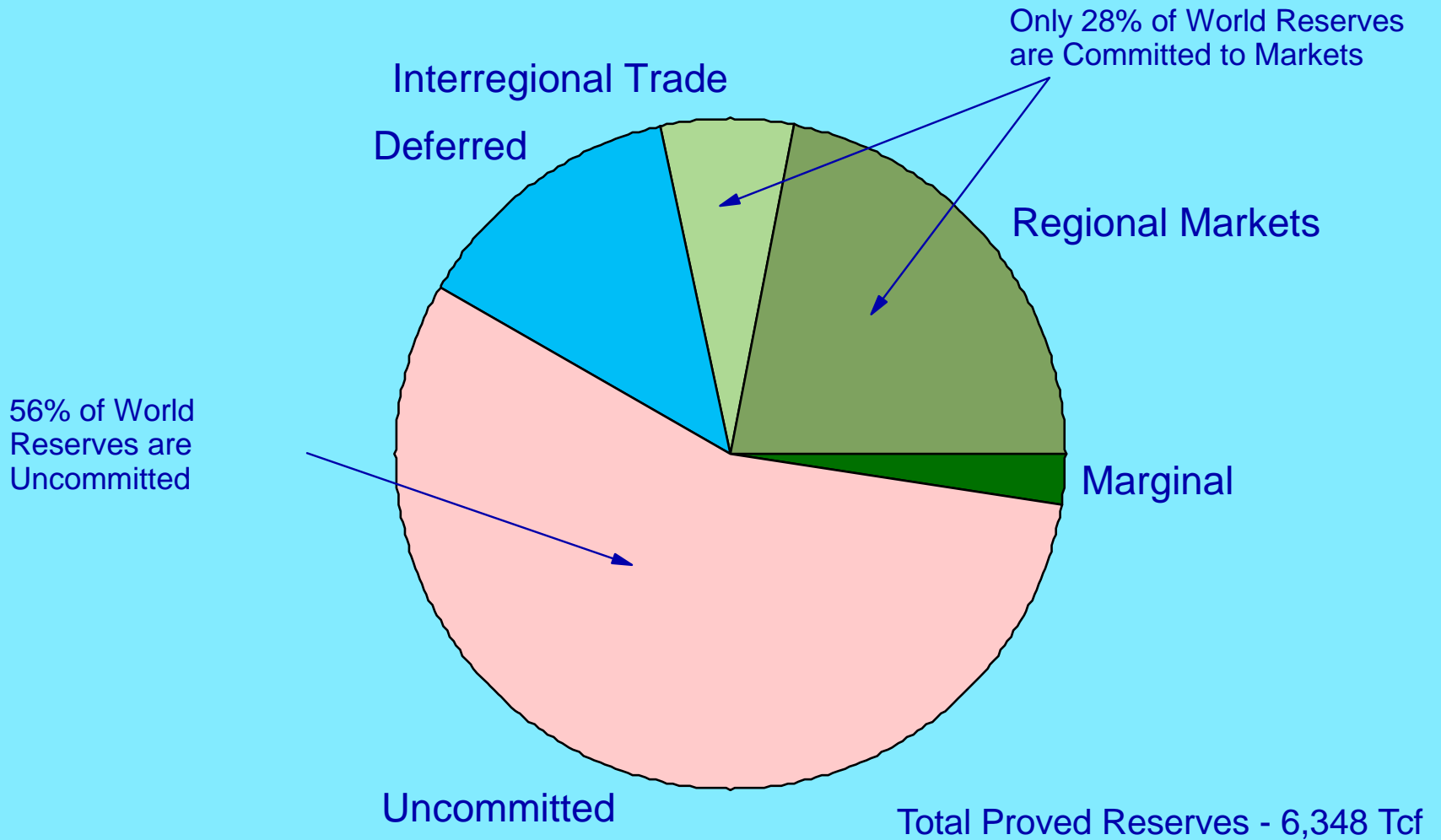
- Projected LNG Supplies Largely From the Uncommitted 56%
- 84% of the Uncommitted Reserves - And Most of the Undiscovered Resource Base - Located in the FSU or the Middle East
- Despite Major Resources Elsewhere, Longer Term LNG Outlook Depends on How Those Regions Respond to World Demand

Figure 4

# THE WORLD'S PROVED GAS RESERVES BY MARKET STATUS (FOCUSSING ON INTERREGIONAL TRADE)

TCF - Year End 2005

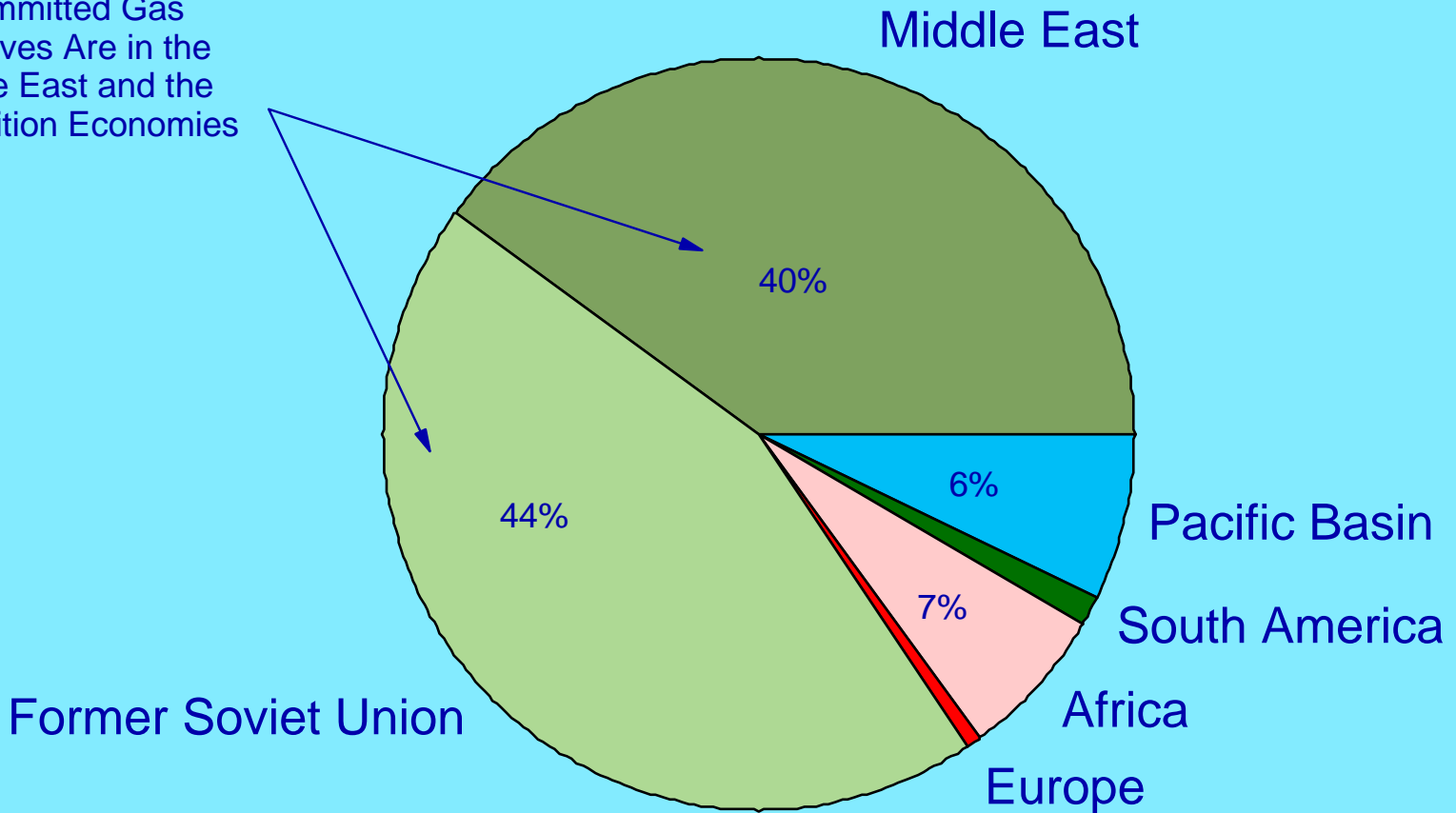
(Source - Jensen Associates Estimates)



**Figure 5**  
**REGIONAL SHARE OF THE WORLD'S UNCOMMITTED GAS**  
**TCF - Year End 2005**

(Source - Jensen Associates Estimates)

84% of the World's  
Uncommitted Gas  
Reserves Are in the  
Middle East and the  
Transition Economies



Total Uncommitted Gas 3,567 Tcf

# **MUCH OF THE WORLD'S LNG WILL COME FROM THE MIDDLE EAST BETWEEN NOW AND 2020**

- 61% of Region's Uncommitted Gas in a Single Gas Field - North Field in Qatar, South Pars in Iran
- With Additional Uncommitted Gas in Iran, Those Two Countries Account for 90% of Middle East's Uncommitted Gas
- U.S. Geological Survey Optimistic About Saudi Arabia's Resource Base - Most of that Gas Still Undiscovered - Saudis Have Shown Little Interest in LNG



- Qatar's Expansion Plans - One Third of the World's Capacity Additions Between Now and 2012 - Country Has Adopted a "Wait and See" Policy on Further Expansion
- Iran Currently Preoccupied With Developing Gas for Domestic Markets, Oil Field Reinjection
- Given its Priorities, Geopolitical Controversy Over International Sanctions, Country Has Yet to Establish Firm Policy on LNG Exports
- Qatar's Caution Plus Iran's Geopolitical Constraints Make It Difficult to Project Quantities and Timing of Additional Middle East LNG Supplies Beyond 2012

Figure 6

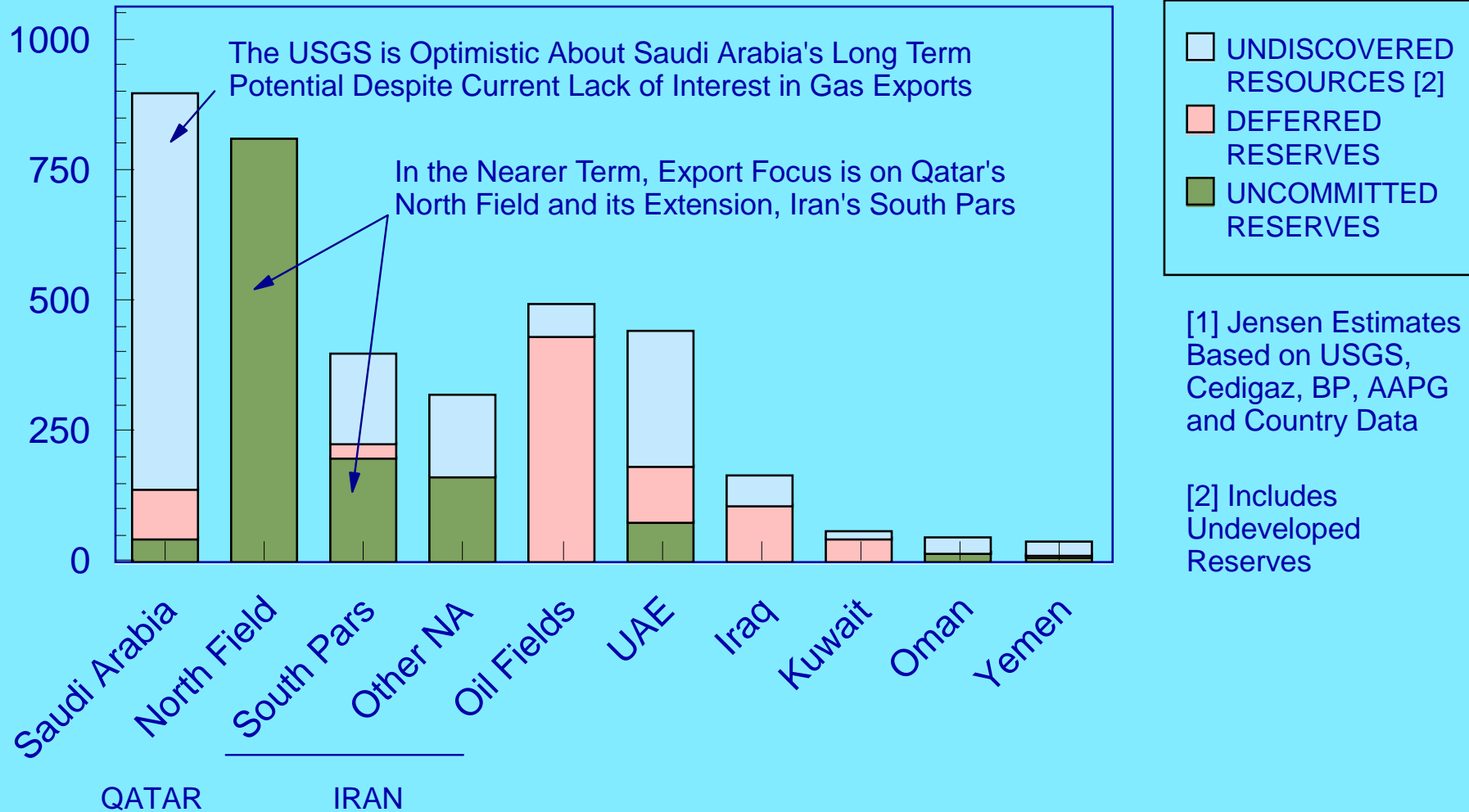
# MAJOR GAS EXPORT SOURCES FOR THE MIDDLE EAST



Figure 7

**UNCOMMITTED MIDDLE EAST NATURAL GAS RESOURCES [1]  
INCLUDES UNCOMMITTED RESERVES, DEFERRED RESERVES  
AND UNDISCOVERED RESOURCES  
TRILLION CUBIC FEET AS OF 12/31/2005**

TCF



# **THE FORMER SOVIET UNION - RUSSIA AND THE CENTRAL ASIAN REPUBLICS - HOLDS THE LARGEST BLOCK OF UNCOMMITTED RESERVES**

- Russia - Traditionally European Pipeline Exporter - Interested in Diversifying Into LNG and into Pacific Basin Markets
- Russia Has Major Policy Issues to be Resolved in Western Siberia and the Offshore Barents Sea - Outcome Will Influence How Russia Approaches LNG and Longer Term Expansion into the Pacific

- Western Siberia's Nadym Pur Taz Region Maturing - Russia Wants to Develop Arctic Reserves - Yamal Peninsula or Offshore Barents Sea (Shtokman)
- Shtokman Appeared to be Leading Candidate for LNG Exports to North America - Russia Now Seems to Have Cooled on the Idea - Is Russia Still Serious About Atlantic LNG?
- Pipelining to Europe From Either Shtokman or Yamal Now Receiving Renewed Attention

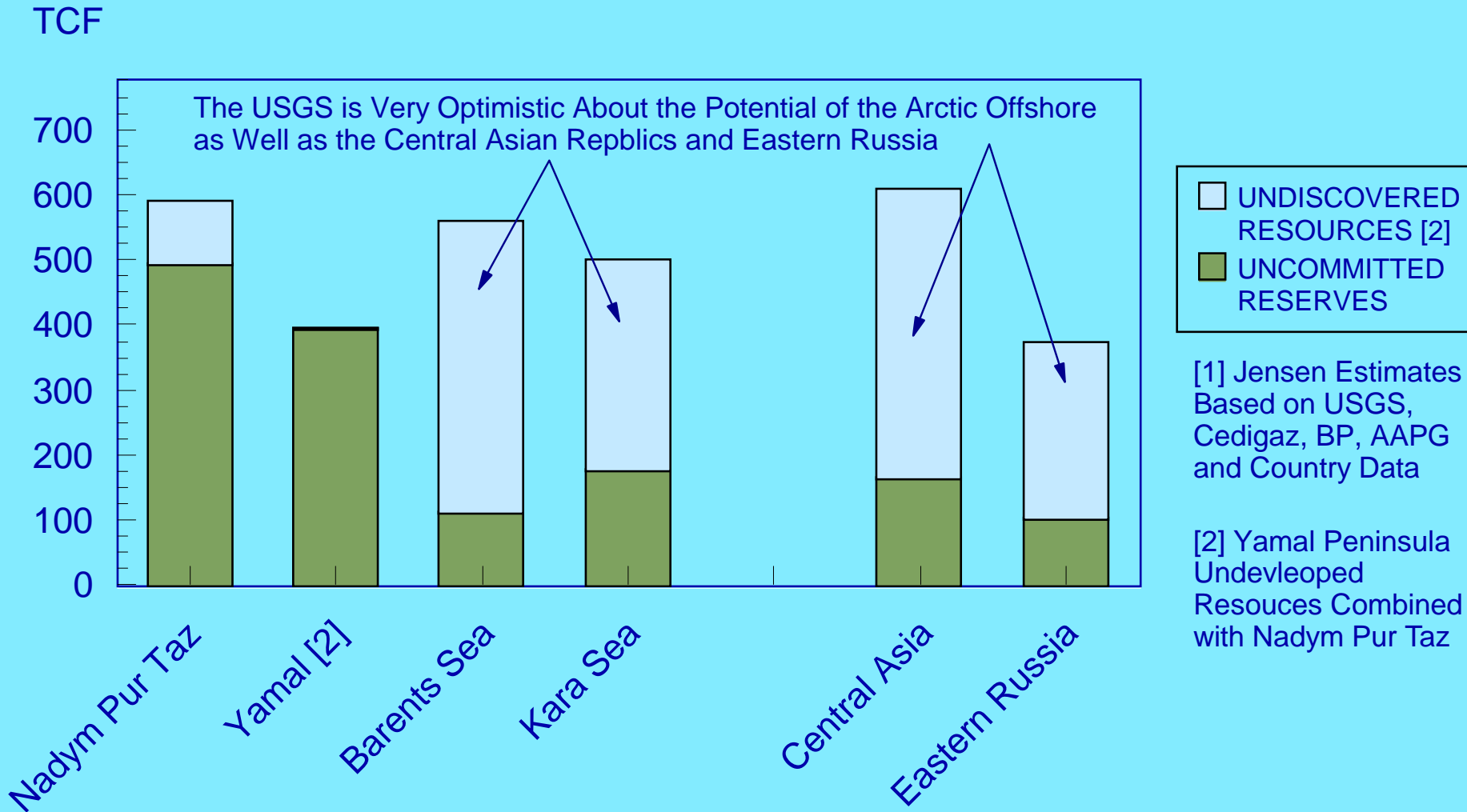
- Russia's Eastern Reserves - Sakhalin and Irkutsk (Kovytko) Destined for Pacific Basin - Particularly China - How Much of Sakhalin Will Ultimately be Developed as LNG?
- International Oil Companies Allowed a Significant Role in Eastern Russia Which They Were Denied in the West
- Russia Appears to be Reasserting Control Over Eastern Exports - Renegotiated Shell's Sakhalin II License (Russia's First LNG Project) - Now Discussing Kovytko with BP
- How This Will Affect Further Development of Pacific Basin Supplies or Russia's Interest in LNG Unclear

**Figure 8**  
**MAJOR GAS EXPORT BASINS FOR**  
**THE FORMER SOVIET UNION**



Figure 9

**MAJOR UNCOMMITTED FSU NATURAL GAS RESOURCES [1]  
INCLUDES UNCOMMITTED RESERVES  
AND UNDISCOVERED RESOURCES  
TRILLION CUBIC FEET AS OF 12/31/2005**



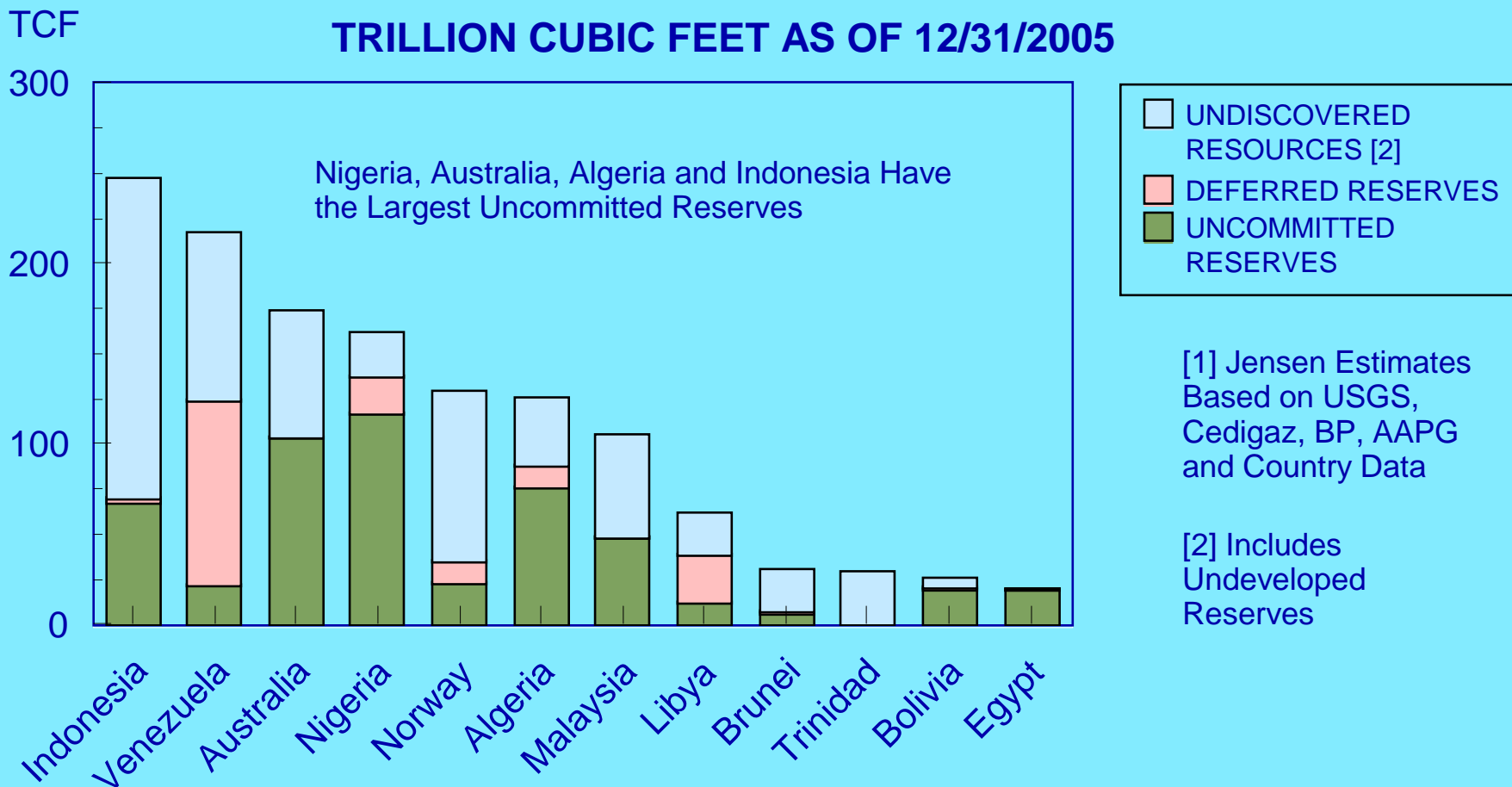


# THERE ARE SUBSTANTIAL GAS RESERVES OUTSIDE THE MIDDLE EAST AND THE FSU FOR EXPORT

- Largest Blocks of Readily Available Uncommitted Reserves with Active Projects in Australia, Nigeria and Algeria
- Also Active Projects in Angola, Egypt, Equatorial Guinea, Peru, Norway and Yemen
- Geopolitical Issues Raise Questions about How Rapidly Reserves in Indonesia, Venezuela, Nigeria and Bolivia Will be Developed

Figure 10

**UNCOMMITTED NATURAL GAS RESOURCES [1]  
SELECTED POTENTIAL EXPORTING COUNTRIES  
INCLUDES UNCOMMITTED RESERVES, DEFERRED RESERVES  
AND UNDISCOVERED RESOURCES  
TRILLION CUBIC FEET AS OF 12/31/2005**



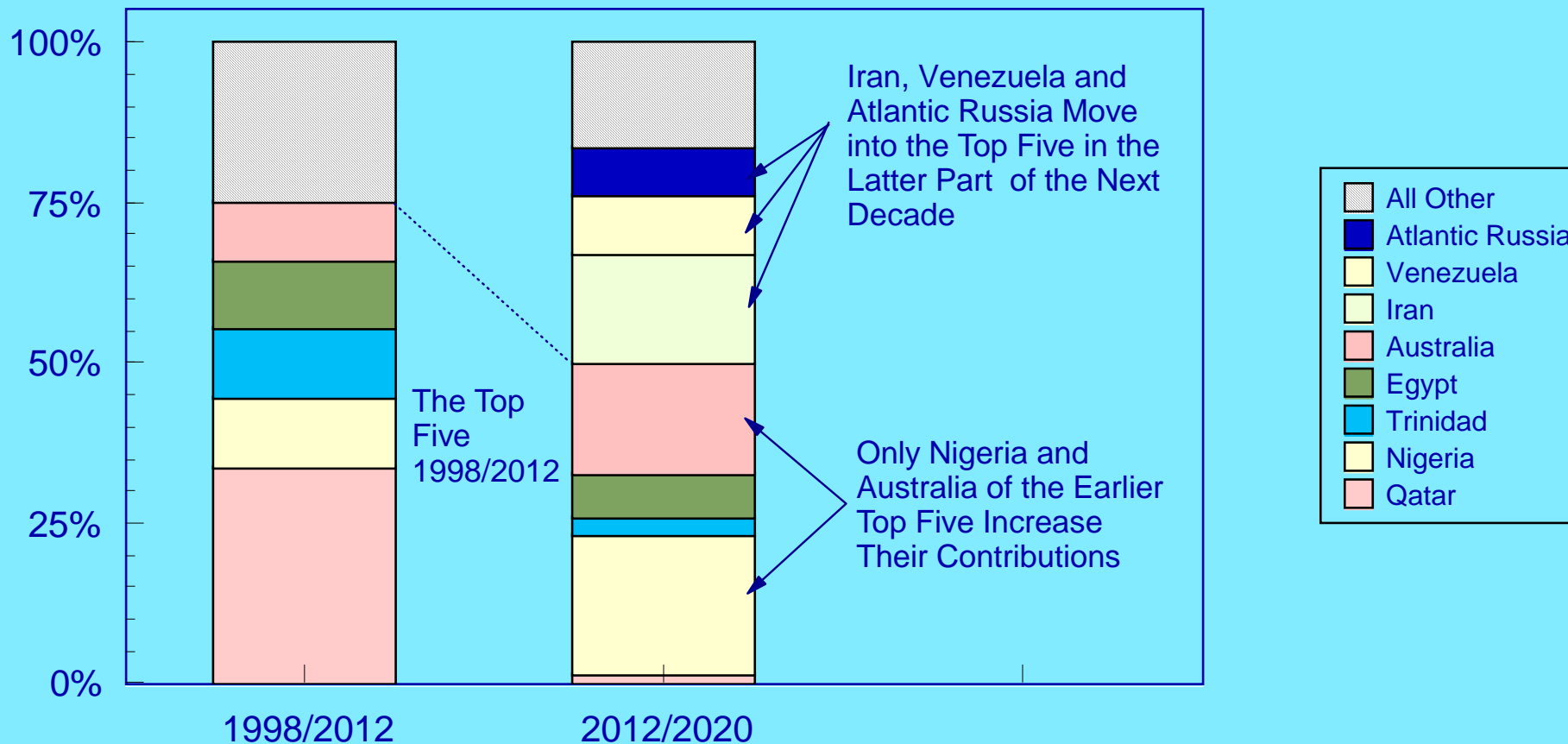
# **BETWEEN 1998, WHEN LNG INTEREST BEGAN TO TAKE OFF, UNTIL 2012, WHEN CURRENT PROJECTS ARE COMPLETED**

- Five Countries - Qatar, Trinidad, Nigeria, Egypt and Australia - Account for 75% of the Capacity Additions
- We Project That Their Contribution Will Drop to 50% for the Period 2012 - 2020
- Only Nigeria and Australia Are Expected to Increase Their Contributions
- The Other Major Suppliers in the Out Years - Iran, Venezuela and Atlantic Russia - All Raise Geopolitical Issues

Figure 11

# THE PERCENTAGE CONTRIBUTION TO LNG CAPACITY ADDITIONS - 1998/2012 AND FORECAST 2012/2020 JENSEN ASSOCIATES ESTIMATES

PERCENT OF PERIOD ADDITIONS



Source: Jensen Estimates

# FOR A TIME, LNG COSTS APPEARED TO BE DECLINING AND IT WAS ASSUMED THAT THE TREND WOULD CONTINUE

- Trend Towards Declining Plant Costs Dashed by Cost Increases from Overloaded Project Construction Industry
- "Hard" Information About What Has Happened to Costs Very Difficult to Obtain
- At the Turn of the Decade, LNG Plant Construction Costs Were Approaching \$200/Ton of Capacity

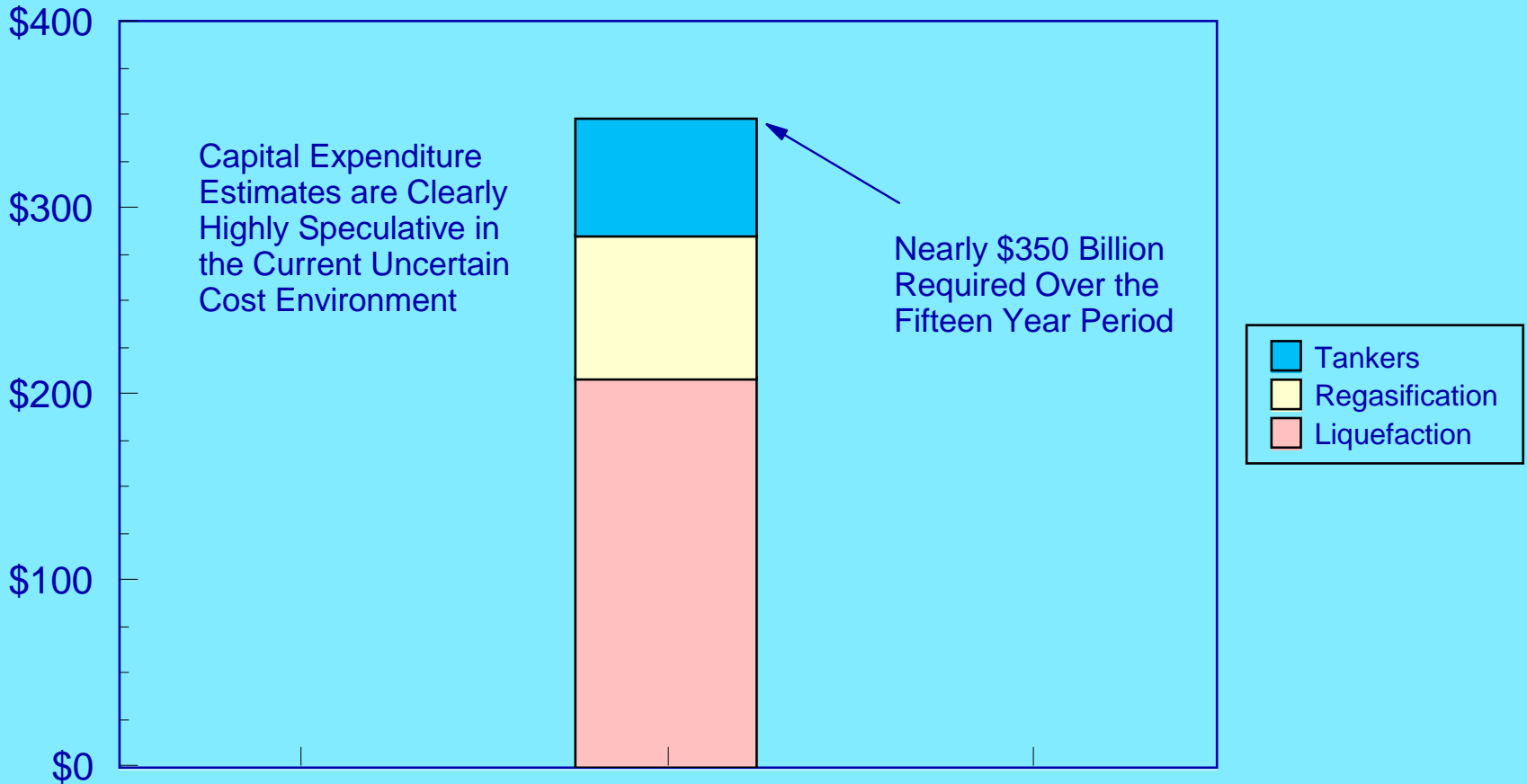
- Current Costs - A Multiple of That Level - Several "Problem Trains" Quoted at \$1,200 and Above
- Key Questions - Are Quotations Just a Temporary Aberation in an Overheated Market? Or Do They Represent Reasonable Estimates for the Future?
- In Such an Uncertain Cost Environment, It is a Challenge to Put Together a Capital Cost Projection for the Industry

# **THE CAPITAL EXPENDITURE ESTIMATES IMPLIED BY OUR LNG FORECAST SUGGESTS A \$350 BILLION OUTLAY FOR LNG FOR THE PERIOD OF 2006 TO 2020**

- Includes Liquefaction, Regasification and Tankers - Does Not Include Upstream Investment in Field Development Nor in Downstream Infrastructure
- Of The Total - Liquefaction \$210 Billion - Regasification Facilities \$75 Billion - Tankers \$65 Billion
- Largest Liquefaction Investments in Middle East and West Africa
- Largest Regas Investments in North America and Northeast Asia

**Figure 12**  
**ESTIMATED TOTAL CAPITAL EXPENDITURES ON LNG**  
**INFRASTRUCTURE - 2006/2020 (EXCLUDES PRODUCTION)**  
**\$ BILLION**

CAPEX \$ BILLION



Source: Jensen Estimates

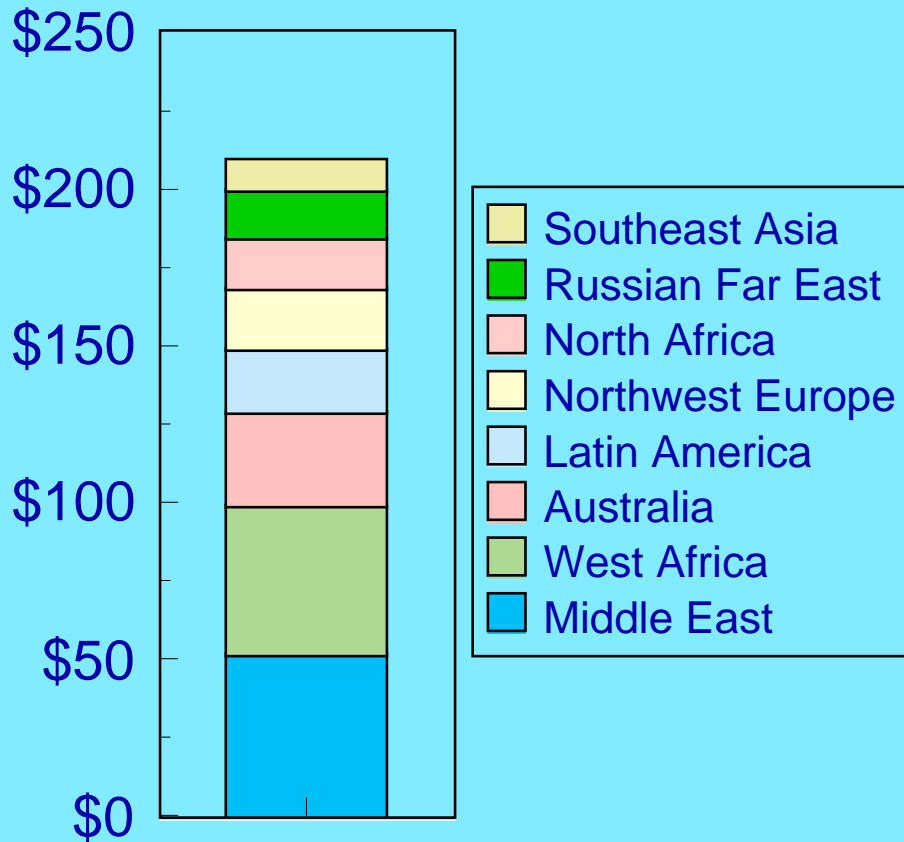


Figure 13

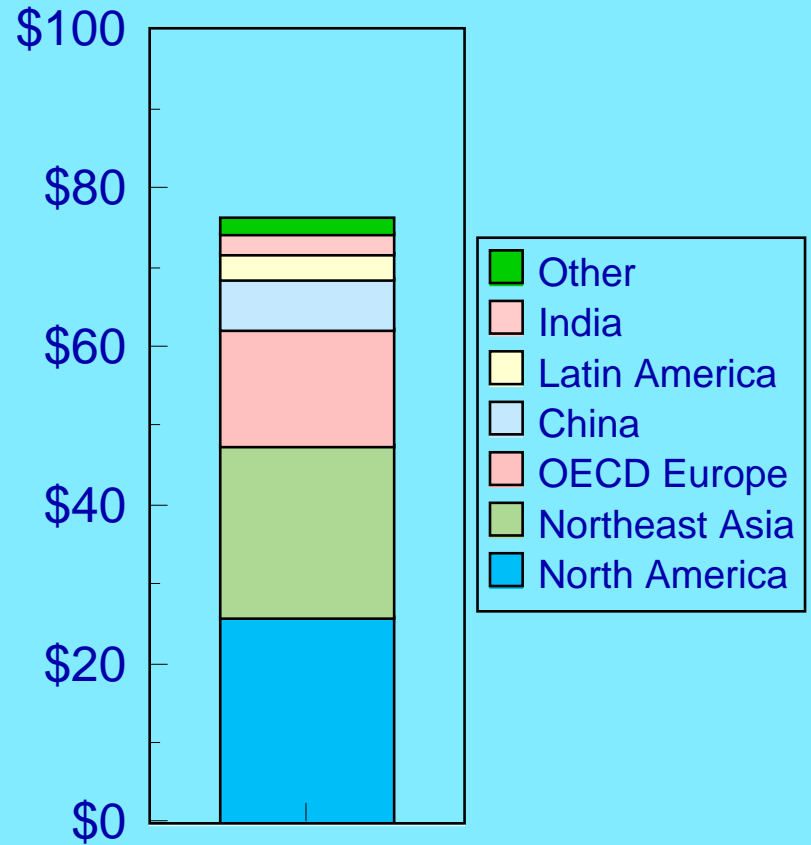
# GEOGRAPHIC DISTRIBUTION OF LIQUEFACTION AND REGASIFICATION CAPEX FOR THE 2005/2020 PERIOD

\$ BILLION

## LIQUEFACTION CAPEX - \$ BN



## REGASIFICATION CAPEX - \$ BN



# IN CONCLUSION

- Despite Unprecedented Uncertainties, a Global Gas Market Has Finally Arrived
- It Will be Based on Increasing Competition Between LNG and Pipelines With LNG Providing Price Signals Among Regions
- It Will Require Very Large Investments, Primarily in the Producing Countries (Field Development Plus Liquefaction) Exposing its Growth to Geopolitics
- How the Market Ultimately Develops Will be Shaped by These Geopolitical Issues Together With Costs and Interfuel Competition at High Price Levels

