

U.S. LNG EXPORTS - AN INTERNATIONAL PERSPECTIVE

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A CONSIDERATION OF THE INTERNATIONAL LNG MARKET OUTLOOK HAS BEEN NOTABLY ABSENT FROM THE LNG EXPORT DIALOGUE

- That is Unfortunate Since LNG Market Constraints Have the Potential to Set Market Boundaries on Some of the Greatest Concerns That Have Been Voiced in the Debate

That the 23 Bcfd of Proposed Export Projects, if Permitted, Would be Tremendously Disruptive to a Supply System Currently Producing 66 Bcfd And That the Upward Pressure on Domestic Prices Will Undermine U.S. Competitiveness

THE FIRST QUESTIONS, "HOW MUCH OF THAT 23 BCFD IS REAL AND AND HOW RAPIDLY MIGHT IT COME ON STREAM?"

- There are a Large Number of U.S. Projects Seeking Approval, But the LNG Industry Has Always Had Far More Proposed Projects Than Will Ever See the Light of Day
- One of the Early Industry Experts Once Likened the Picking of Successful Projects to "Handicapping a Horse Race"
- Handicapping First Requires Surveying the Field - How Many Horses are in the Race?

- We Maintain a Database of Projects That Have Been Proposed, Ranking Them and Including Startup Dates

- We Classify Them as:
 - Operating
 - Firm - Have a "Final Investment Decision" (FID)
 - Probable - We Think an FID is Likely
 - Possible (Scheduled) - Their Efforts are Far Enough Along That They Have a Proposed Startup Date
 - Possible (Unscheduled) - Much More Speculative; Often They Represent an Idea That is Floated to See if Anyone is Interested
 - Remote - Forget It

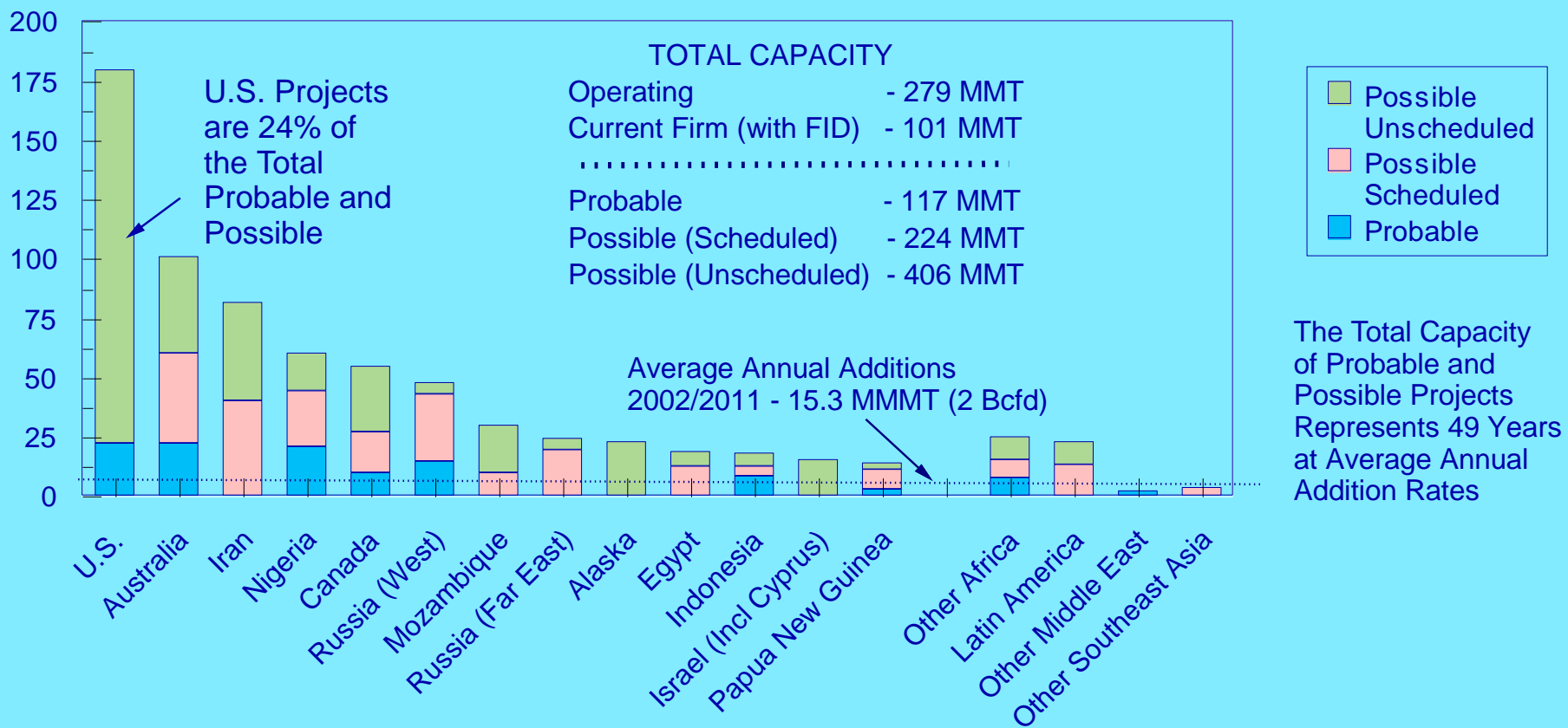
- By These Definitions, the Total Probable and Possible Project Capacity as of Yearend 2012 Was 747 MMT of LNG or 2.7 Times the Industry's Installed Capacity as of That Date

- At the Average Rate at Which Capacity Has Been Added over the Past Decade, it Would Take 49 Years to Work Them All Off - and More are Being Added All the Time
- The U.S. L48 Projects at 175 MMT Represented 24% of the Total Proposed Projects in the Database, or 63% of the World's Total Year End Operating Capacity
- Canada Accounted for Another 7% and Alaska Another 3% of the Proposals
- The Following Figure Shows the Regional Balance of Projects and Their Classification
- Clearly, a Lot of Projects in the Database Won't be Built in the Foreseeable Future if Ever

Figure 1

CAPACITY OF PROPOSED PROBABLE, POSSIBLE (SCHEDULED) AND POSSIBLE (UNSCHEDULED) LIQUEFACTION PLANTS BY COUNTRY (ESTIMATES FROM A JENSEN DATABASE CLASSIFICATION SYSTEM)

Million Tons of LNG



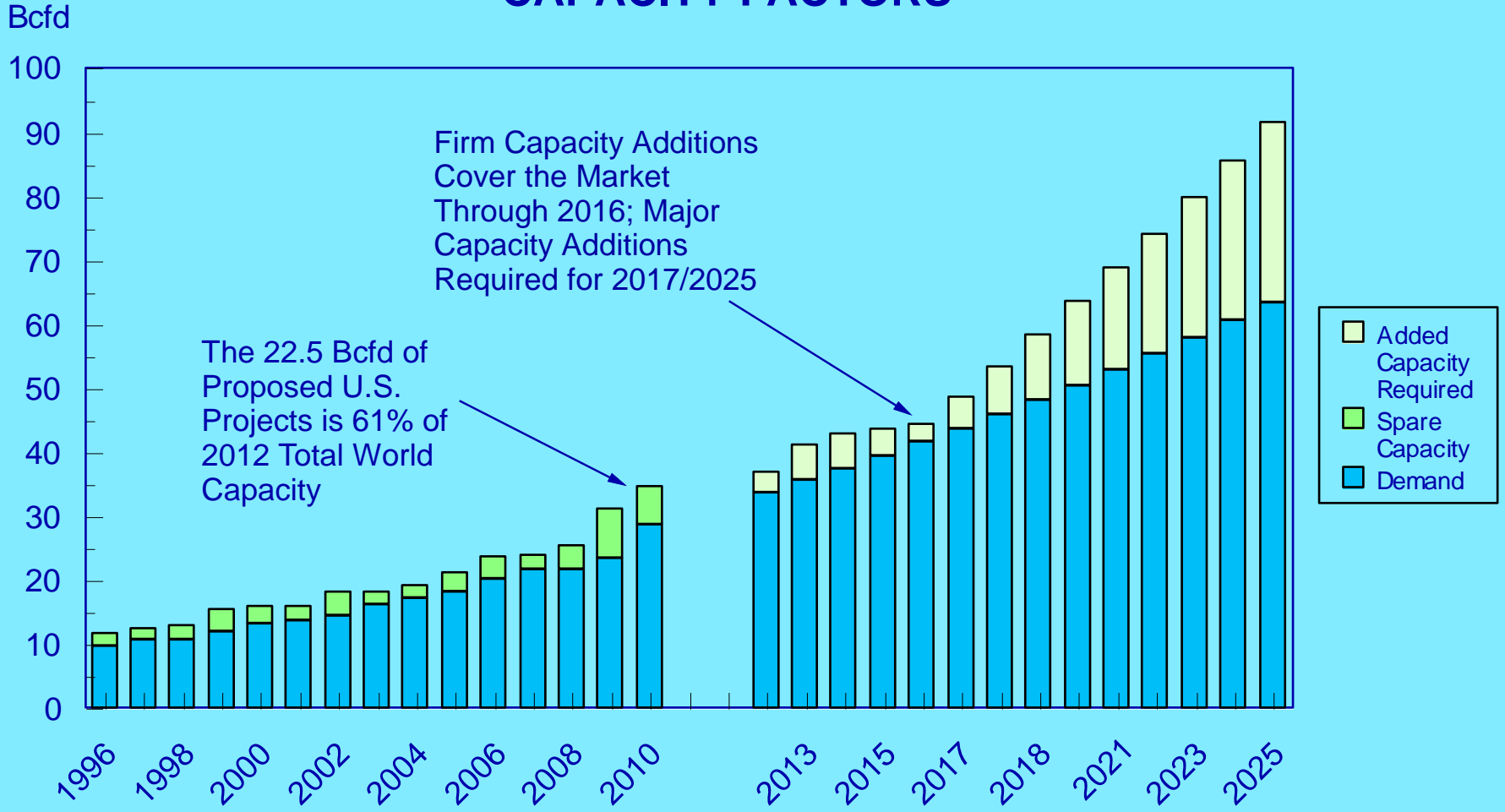
- Because it Takes at Least Four Years from the FID to Project Startup, the Capacity to Meet the Demand Through 2016 is Already Under Construction; Thus Current FID Decisions Apply to 2017 and Beyond
- The Surge Which Qatar Put on the Market in 2008/2010, When Coupled With the Recession and the Collapse of the U.S. LNG Market, Created a Large Surplus With Severe Price Competition
- One Effect Was That Many of the Projects Which Should Have Been Approved in 2009/2011 Were Not, Creating the Expectation of a Nearer Term Tight Market
- Using Some Reasonable Assumptions, it is Possible to Estimate How Much U.S. Capacity the Market is Likely to Accept to Cover Demand To the Year 2025; This is Boundary Estimate, Not a Forecast

- We Have Assumed that LNG Demand Out to That Year Will Grow at the Rate of 5%; This is Somewhat Generous Compared With Several Proprietary Estimates of Which We Are Aware
- The Estimate is Based on Averaging Four Projected Estimates of Total World Gas Demand - EIA, IEA, ExxonMobil and BP and Then Applying a Growing LNG Share of the World Gas Market
- The Share of Imported Gas of World Gas Demand Has Been Rising and LNG Has Been Taking a Larger Share of Imports; We Have Assumed a Continuation of Those Trends

- The Share That LNG Will Take is a Difficult Assumption Because Large Pipeline Projects Can Upset the Shares; For Example, Gazprom's Proposed West Siberian Pipeline Link to China is the Equivalent of Half the LNG that Qatar Put on the Market in 2008/2010
- The Resulting Projection of Total Required LNG Capacity is Shown in the Following Figure
- The Next Step is to Apply a Market Share for the U.S. Projects; We Have Assumed 24%, the U.S. Share of the Total Projects
- One Can Argue That The Total List Contains a Lot of Questionable Entries and the U.S. Share Should be Higher, But the List is not Static; Additions are Made All the Time

Figure 2

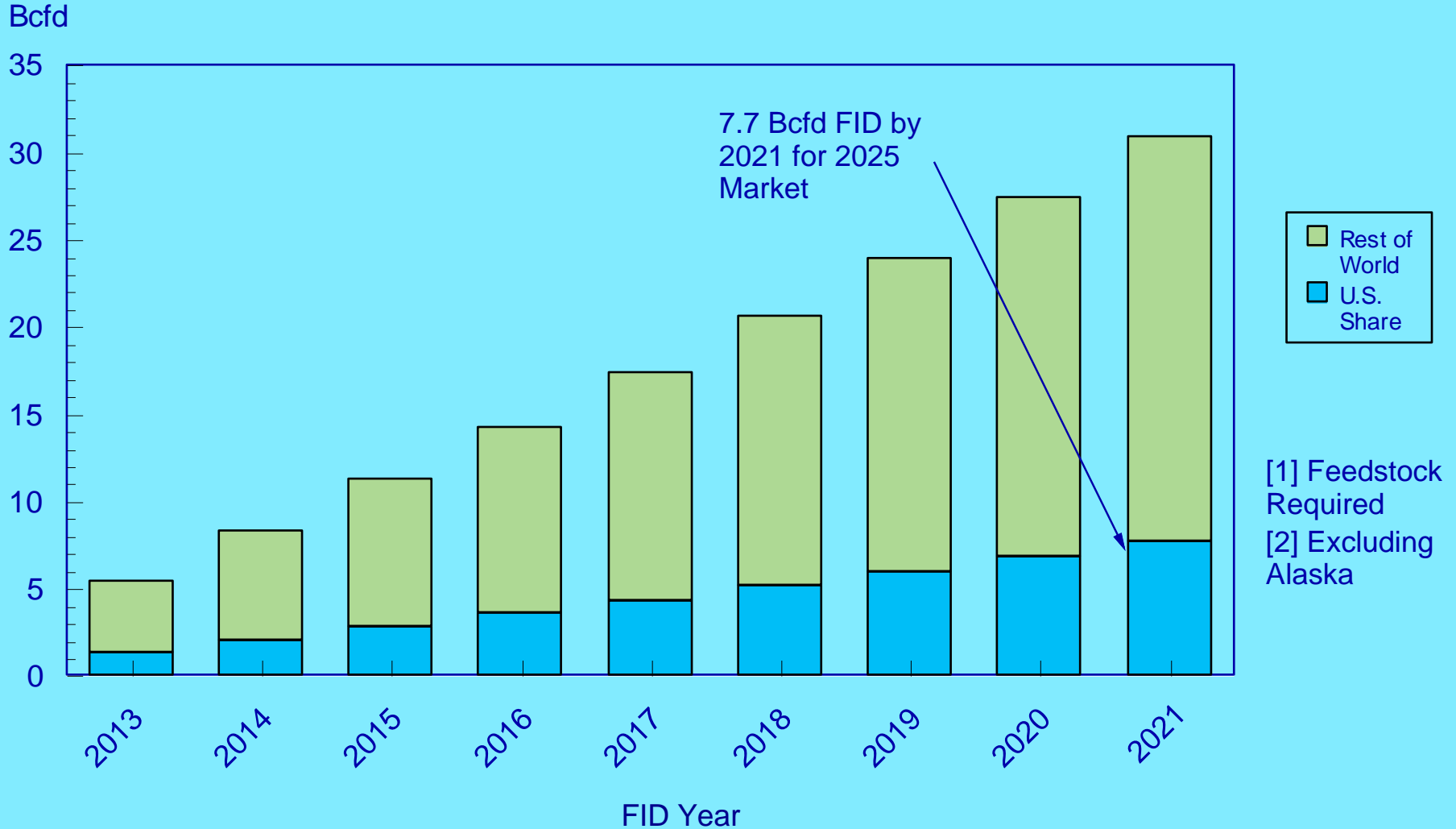
GROWTH IN WORLD LNG CAPACITY AND DEMAND TOGETHER WITH CAPACITY ADDITIONS REQUIRED TO OPERATE AT HISTORIC CAPACITY FACTORS



- Although Figure 2 Shows the Growing Need for Capacity Beginning in 2017, the Four Year Lead Time Requirement Means That the Relevant Decision Years are 2013 to 2021
- Figure 3 Utilizes the 24% Assumption to Show the Potential Market for U.S. Projects (We Have Not Included Alaska in This Estimate)
- The Result is a Slow Buildup in the Need for Capacity; The Estimate Starts at 1.4 Bcfd This Year (Sabine Pass Alone is Nearly Twice That) Rising to 7.7 Bcfd by 2021 (The 2021 Decisions Are For Projects Starting Up in 2025)
- It is Possible, Given the Current Tight Market and Customer Interest in Acquiring U.S. LNG, That Demand Could Balloon in the Early Years But That Would Only Concentrate the Competition in Later Years

Figure 3

**CAPACITY [1] AVAILABLE TO U.S. PROJECTS [2] ASSUMING THEY TAKE
A 24% SHARE OF THE PROJECTED CAPACITY ADDITIONS
YEARS ARE FOR THE NECESSARY FINAL INVESTMENT DECISION
RECOGNISING THE FOUR YEAR LEAD TIME REQUIRED**



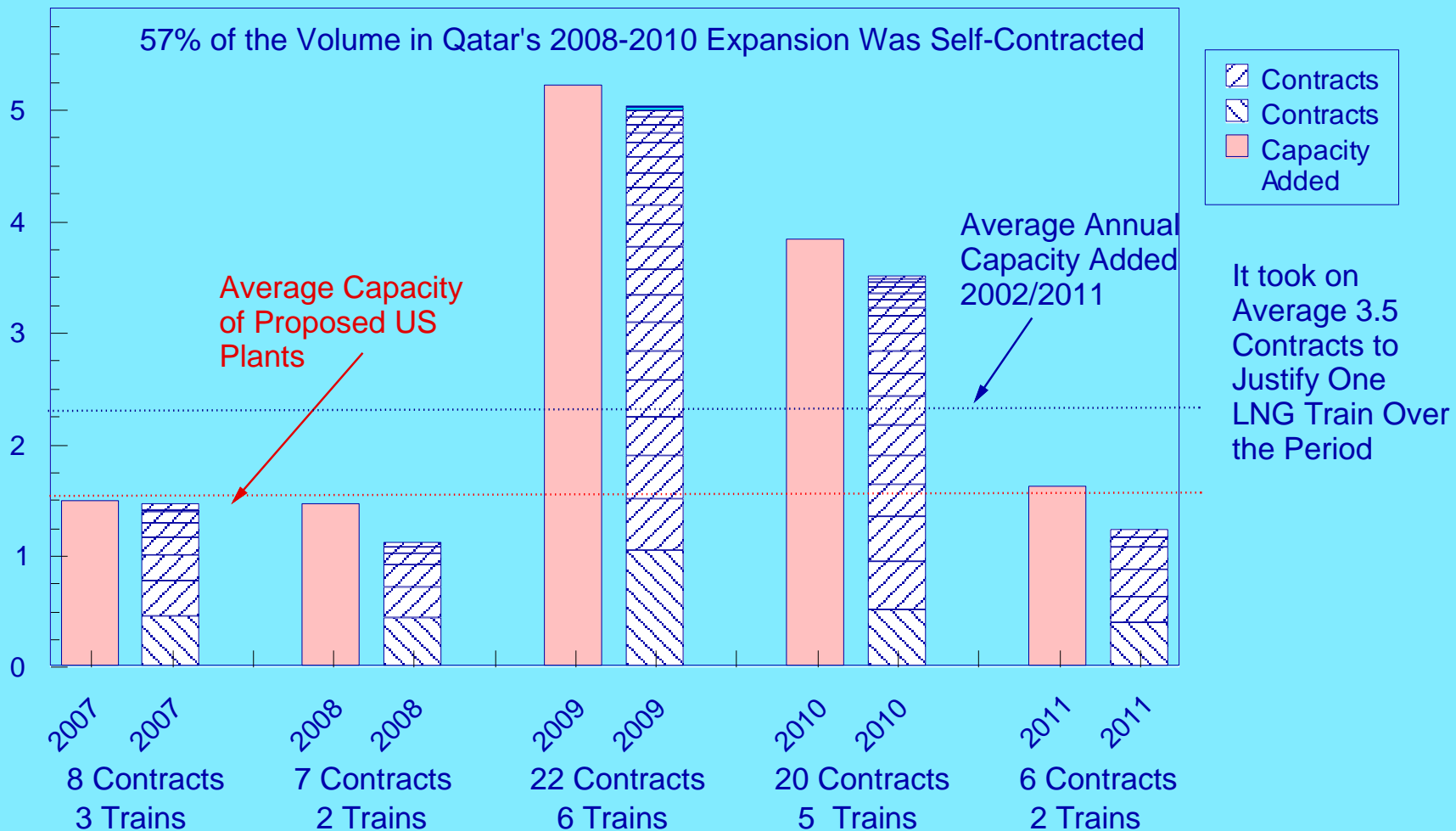
IN ORDER TO FINANCE A PROJECT, DEVELOPERS NEED TO HAVE SIGNED CONTRACTS IN HAND

- For Nearly All Projects, It Takes a Number of Contracts With Different Buyers to Get the Necessary Coverage
- Over the Span of 2007/2011 Eighteen LNG Trains Started Up; On the Average They Required 3.5 Contracts per Train; Thus a Two Train Greenfield Project Would Require 7 Contracts
- Most of These Will be Sales Contracts for Buyers Who Will Import the LNG Into Their Own Markets; But Some Will be Newer "Portfolio" Contracts (Self-Contracting), in Which the Buyer Assumes the Debt Service Obligation But Has the Destination Flexibility to Sell Wherever He Can Get the Best Return

Figure 4

LONG-TERM CONTRACTS REQUIRED TO SUPPORT LNG PROJECTS STARTING UP IN YEARS 2007/2011

Bcfd

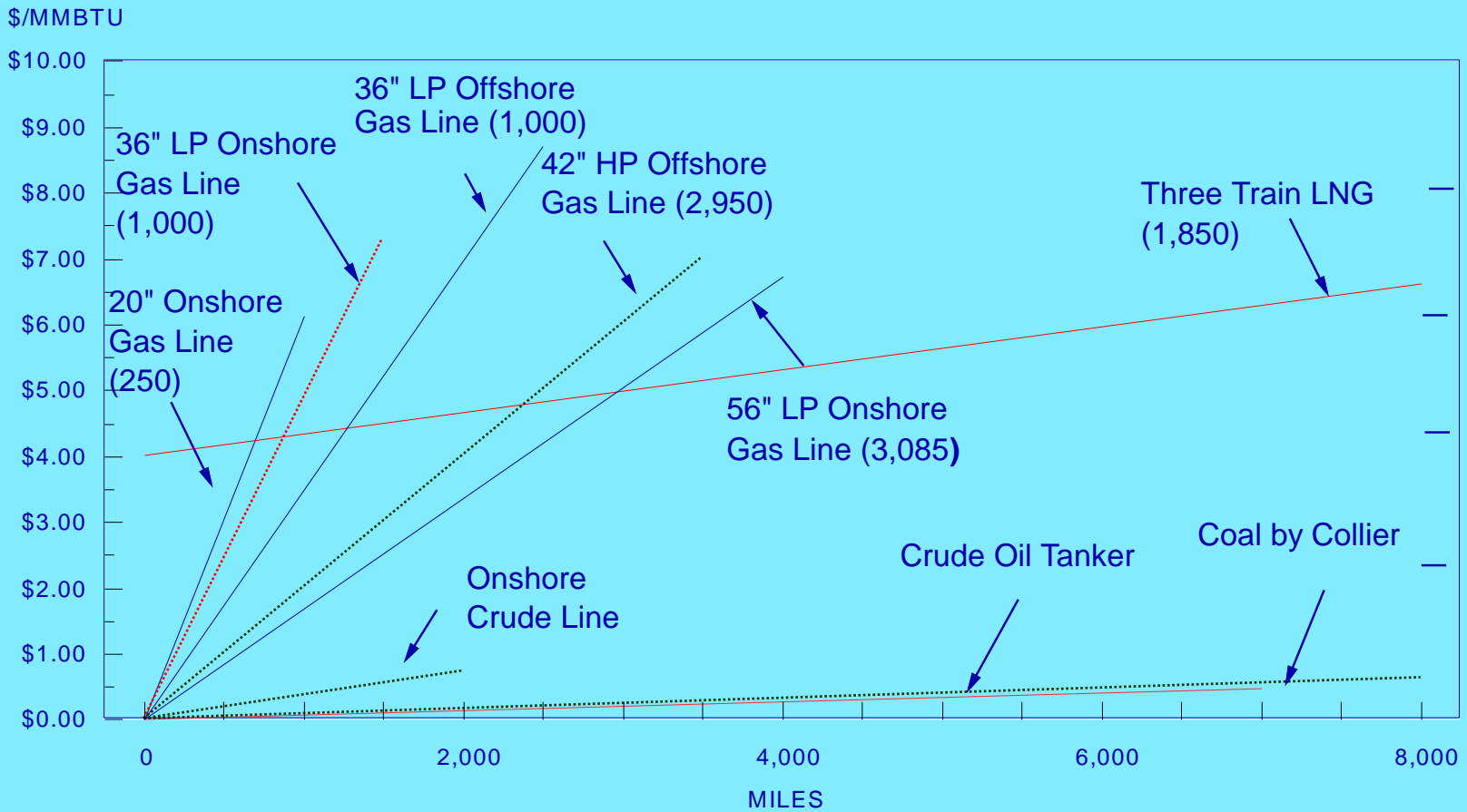


- Of the Contracts for Sabine Pass, the BG Contract is a Portfolio Contract; The Rest are All the More Typical Fixed Destination Contracts and They Will Probably Predominate for the Other Projects
- An Interesting Question - "How Many Different Customers are There Out There Who Are Interested in Signing a Contract?"
- Acquiring the Necessary Contracts Will be a Challenge, Since Most of the Projects are Being Sponsored by Companies Without International LNG Marketing Experience
- Thus, Although the DOE Might Choose to Approve a Larger Number of Export Permits, the Competitive International Market Will Prove to be a Stern Disciplinarian

THE SECOND QUESTION, "HOW GREAT IS THE THREAT THAT THE EXPORT-DRIVEN PRESSURE ON PRICES WILL UNDERMINE U.S. INDUSTRIAL COMPETITIVENESS?"

- It is Possible to Talk of "World Oil Prices" Because the Costs of Marine Oil Transportation are Relatively Low; The Same is True for Coal
- But One Cannot Talk About "World Gas Prices" Because Gas, Like Those Legendary Local French Wines "Does Not Travel Well"
- Thus LNG Exporting Countries Will Always Have Much Lower Commodity Prices Than LNG Importing Countries

Figure 5
ILLUSTRATIVE 2011 COSTS OF GAS, OIL
AND COAL TRANSPORTATION
SHOWING GAS'S HIGHER COSTS AND THE EFFECT OF SCALE
(Gas Delivery Capability in MMCFD)



MUCH OF THE INTEREST IN U.S. LNG IS BASED ON THE HUGE DISEQUILIBRIUM BETWEEN U.S. COMMODITY PRICES AND EUROPEAN AND ASIAN CONTRACT PRICES

- For Example Prices in 2012 - U.S. Henry Hub - \$2.74; Dutch TTF Hub - \$9.26; Russian Contract Prices to Germany - \$12.54; and Japanese LNG ex Ship as Liquid - \$16.66
- Some of That Difference is Based on the Different Ways the Europeans and Asians Calculate Oil Linkage, Some is Based on Northwestern European Price Competition with LNG and, for the Japanese, Some on the Disruptive Effect of Post-Fukushima Nuclear Replacement
- But Some of the Difference is Due to the High Costs of Transporting LNG to Importing Markets - a "Basis Differential" - and Should Remain as Long as LNG Costs do not Change

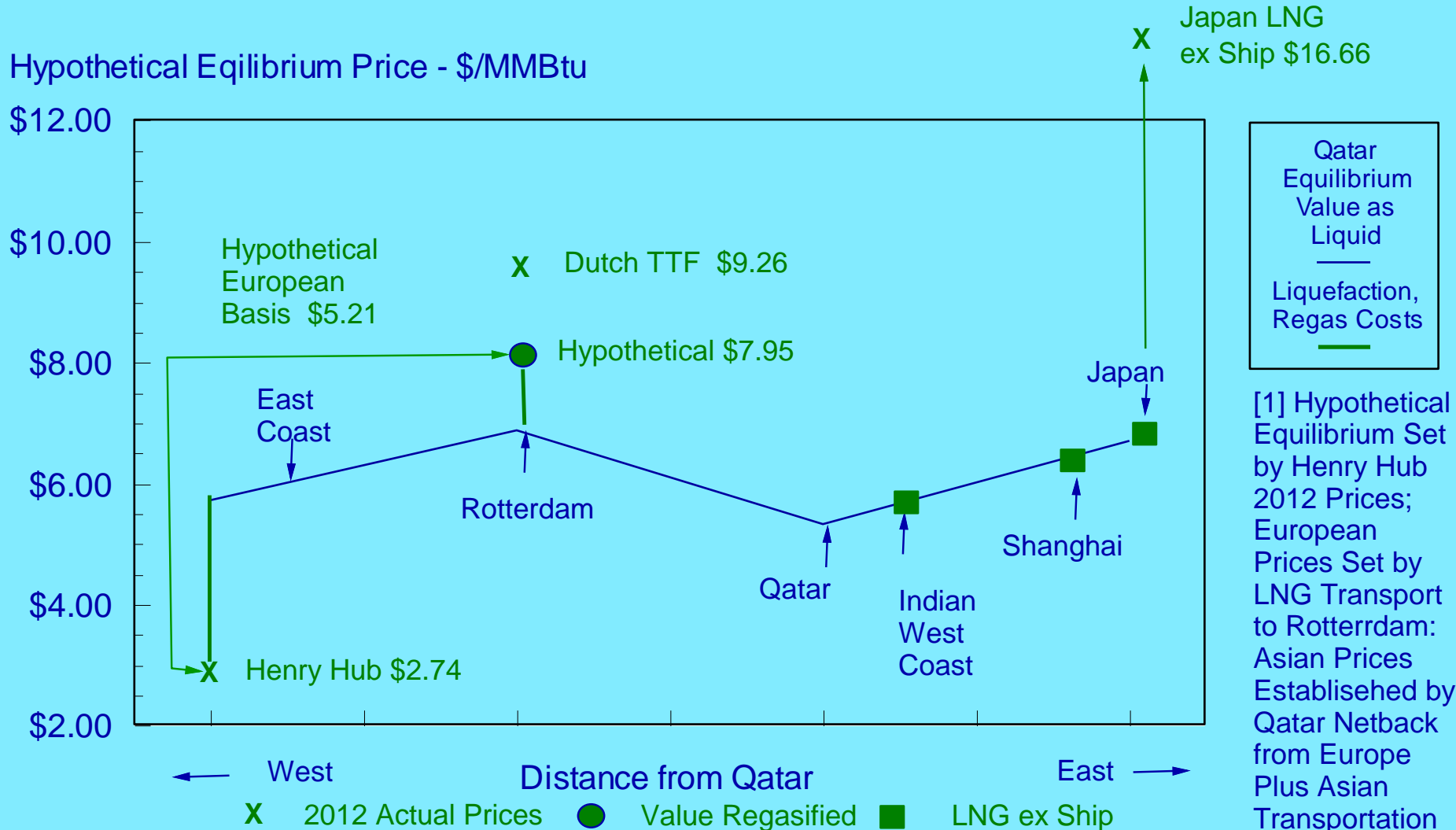
ONE CAN DEVISE AN "EQUILIBRIUM" SET OF BASIS DIFFERENTIALS BETWEEN MARKETS BY ASSUMING THAT TRANSPORTATION ALONE SETS THE PRICE DIFFERENCES

- Alone Among the Major LNG Trading Partners, North America Has a Truly Gas-to-Gas Competitive Commodity Market; While the U.K Also Has a Competitive Commodity Market, It Tends to be Influenced by Continental Oil-Linkage When LNG Markets are Tight
- The "Equilibrium" Pricing System Thus Might be Based on Henry Hub Pricing: And Although it Lacks the Liquidity and Transparency of Henry Hub, Qatar Plays a Similar "Hub" Role in LNG, Since it Can Arbitrage Atlantic Basin and Pacific Basin Prices

- The Pricing System Might First Export U.S. Gulf Coast Prices to Europe; Then Those Prices Might be Netted Back to Qatar Where They Would in Turn Establish Asian "Equilibrium" Prices
- The Following Figure is Just Such an Estimate; The Equilibrium Differential Between U.S. and Europe is \$5.21 and Between U.S. and Japan \$3.97 ex Ship (Before Regasification)
- In This Case \$5.21 Out of the Total \$6.52 Margin Between the U.S. (Henry Hub) and Europe (TTF) Represents the Underlying Transportation "Basis Differential"; Only \$1.31 is the Disequilibrium Between the U.S.'s Fully Competitive Commodity Market and Northwest Europe's Mixed Commodity/Contract Market

Figure 6

HYPOTHETICAL WORLD LNG PRICE STRUCTURE [1] ASSUMING MARKETS ARE IN EQUILIBRIUM WITH U.S. COMMODITY PRICES, TRANSPORT COSTS TO EUROPE SET EUROPEAN PRICES AND EUROPEAN NETBACKS FROM EUROPE TO QATAR SET ASIAN PRICES



THE ASIAN PRICING SITUATION IS MUCH DIFFERENT FROM THE EUROPEAN ONE

- European Price Clauses Typically Link the Price to a Mix of Oil Products; One Set of Terms are Known as "Pass Through Factors" Which Divide the Price Changes Between Buyer and Seller; Discounting is Usually Done by Reducing the Pass Through Factors
- Northeast Asia and China Have Largely Adopted the Japanese Approach to Oil-Linkage
- It Utilizes a Simple Formula Which is Linked to the Japanese Customs Cleared Price for Crude Oil - JCC or the "Japanese Crude Cocktail"

- It is in the Form of:
$$P=C+S*JCC$$

- Where P is the Price in \$/MMBtu, C is a Constant Expressed in \$/MMBtu and S is the "Slope", a Dimensionless Number
- Discounting is Most Often Done by Changing the Slope Although Sometimes Also the Constant
- How Different the Two Markets Are is Shown by the Price Relationships
- In 2012, TTF Price Was Equivalent to 48% of Brent Crude; The Japanese Price Was 86% of Brent and Allowing for a Regasification Margin, it Was Probably 91% as Gas

ALTHOUGH MUCH OF THE DIFFERENCE BETWEEN TTF AND THE JAPANESE PRICE IS DUE TO THE FORMULAS THEMSELVES,

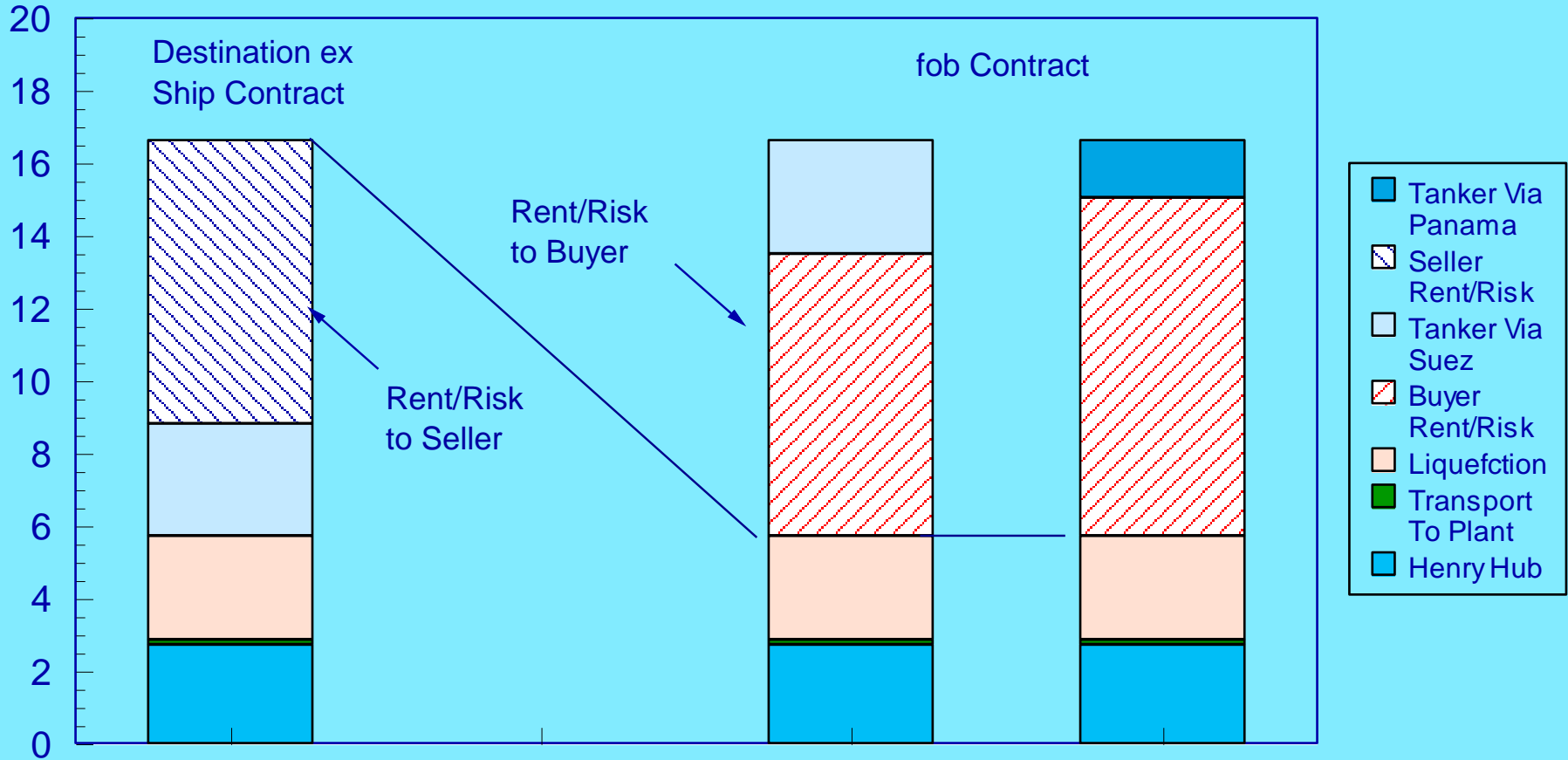
- Northwest Europe Has Benefitted from the Price Competition That Was Unleashed by the LNG Surge in 2009/2010
- There LNG Arbitrage Together With North Sea Commodity Competition Exported Weak North American Prices to the Continent Through the Open Access EU Pipeline System; In 2008, TTF Had Been 68% of Brent
- No Similar Price Competition Has Been Possible in Asia Because There Is No Access to Commodity Gas; This Has Been a Powerful Driving Force Behind the Asian Interest in U.S. Exports Since it Gives Asia a Source of Gas-to-Gas Competitive Commodity Supply Similar to That Which Has Already Benefitted Europe

- The Most Common Type of LNG Contract is the Destination ex Ship (DES) Contract in Which the Seller Delivers to the Buyer's Receipt Terminal; The Price Clause is Based on Destination Market Conditions
- Less Common is the fob Contract in Which the Delivery is Made at the Outlet of the Liquefaction Plant; But the Pricing is Commonly Based on Destination Pricing and Adjusted for Tanker Transportation
- All of the U.S. Export Contracts so Far are fob Contracts, But They are Unique in That Their Pricing Clauses are Based on Origin Pricing - Keyed to the North American Commodity Price at Henry Hub
- Thus Unlike Traditional Clauses, the Economic Rent - and the Market Risk - Go to the Buyer, Not the Seller
- That is Their Appeal to Oil-Linked Contract Buyers

Figure 7

WHO GETS THE RENT AND TAKES THE RISK BETWEEN THE 2012 JAPANESE PRICE AND HENRY HUB PRICE (INCLUDES THE 2014 PANAMA OPTION)

\$/MMBtu



ANOTHER QUESTION - "HOW GREAT IS THAT MARKET RISK?"

- U.S. Commodity Prices are Volatile; There is a Common View That Present Prices Reflect Surplus and are Well Below Long-Run Marginal Cost
- And Increasing Exports Will Put Further Upward Pressure on Prices; Thus There is Certainly a Significant Supply Price Risk for any Buyer
- But Prices in Northwest Europe - the "Combat Zone" Where Where North Sea Pipelines and LNG Terminals Quickly Transmit Commodity Price Signals - are Also Volatile
- This Suggests That There is Substantial Price Risk for Both Supply and Demand for This Part of Europe

- But There is Less Risk in the European "Periphery", Such as Spain, Where Competitive Commodity Gas is Less Available
- And Asia, Where Competitive Commodity Gas is Not Available at All and Competitive Supply Costs are High, Remains a Much Less Risky Target Market
- Much of the New LNG for Asia is Coming from Australia, Where Costs are Proving to be Very High; These Have Tended to Put a Floor on Regional LNG Offerings
- China also Has the Option of Pipeline Supply from the Caspian and from Russia
- But These Pipelines are Long and - Assuming that the Sellers are Willing to Take the Same Netback from China That They Get From Europe - Will Also Result in High Delivered Costs

Figure 8

ILLUSTRATIVE ECONOMICS OF EXPORTING U.S. GULF COAST GAS TO EUROPE AND ASIA IN 2020 USING 2011 COSTS [1], EIA AEO 2011 AND IEA WEO 2011 PROJECTED PRICES FOR THE U.S. AND IEA WEO 2011 PRICES FOR EUROPE AND JAPAN [2]

\$/MMBtu

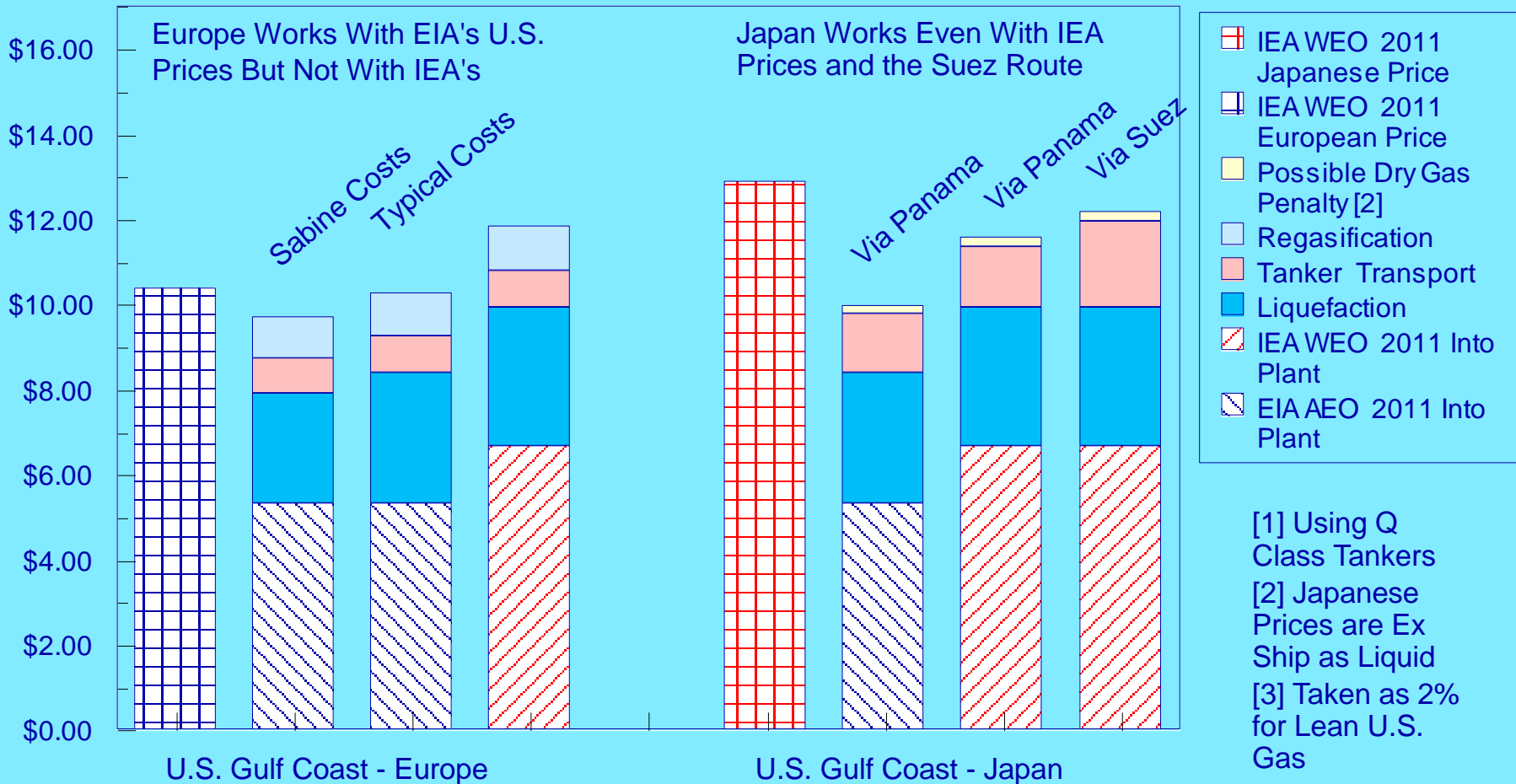


Figure 9

ILLUSTRATIVE COSTS OF DELIVERING LNG TO JAPAN IN 2020 ASSUMING 2011 COSTS AND PROJECTED 2020 PRICES (IEA WEO 2011 FOR JAPAN, EIA AEO 2011 FOR U.S.)

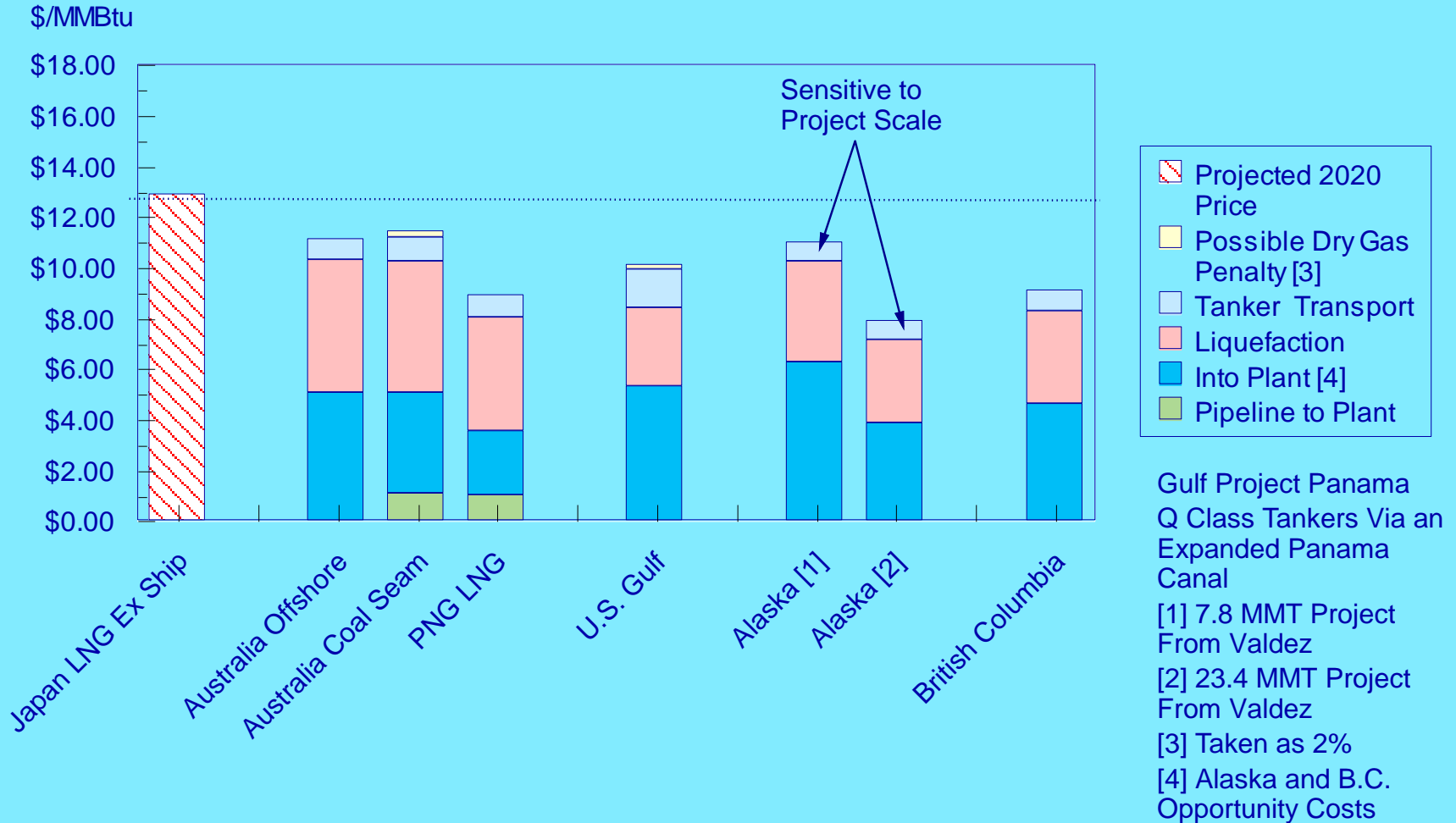
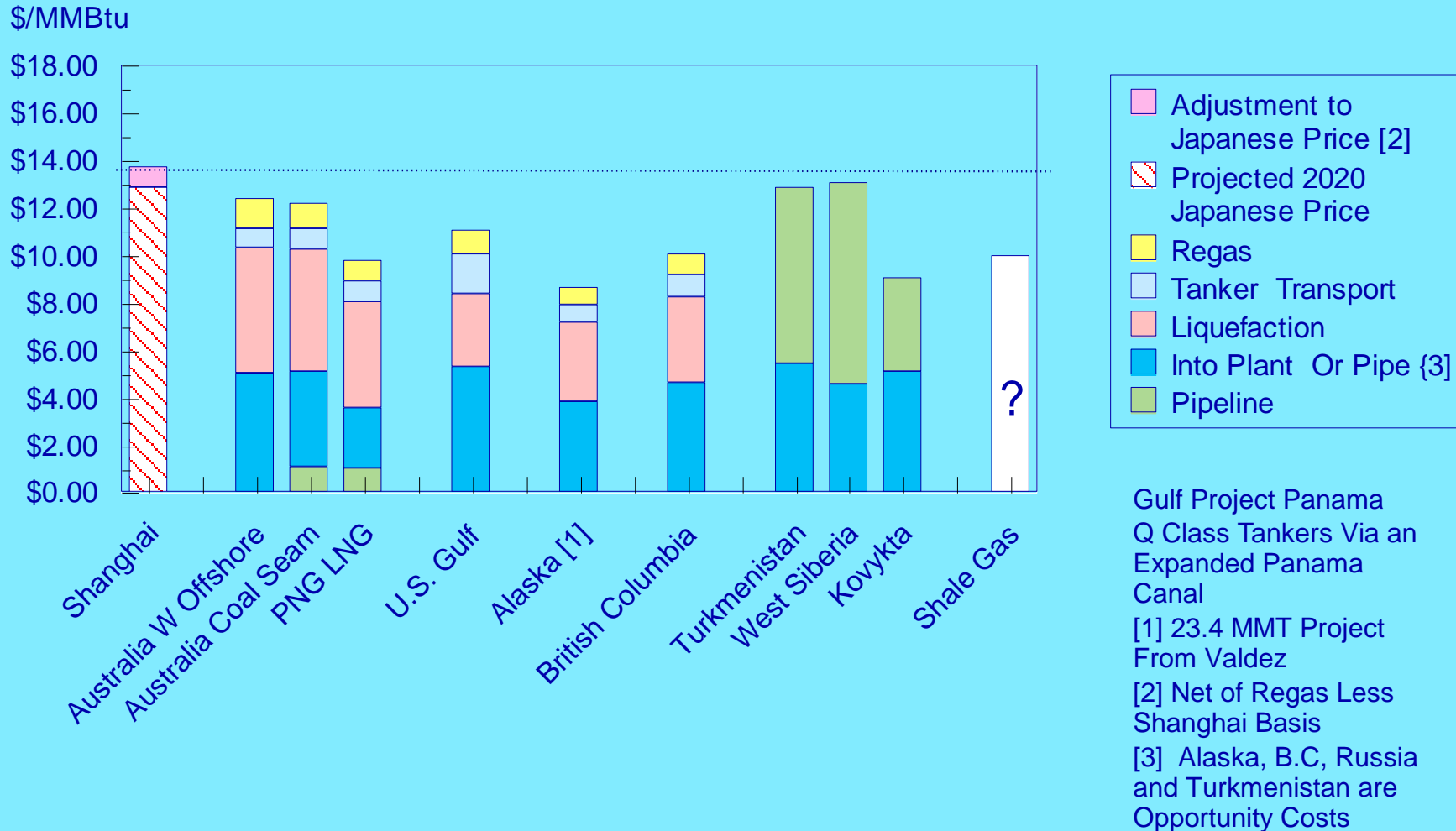


Figure 10

ILLUSTRATIVE COSTS OF DELIVERING NATURAL GAS TO SHANGHAI IN 2020 ASSUMING 2011 COSTS AND PROJECTED 2020 PRICES (IEA WEO 2011 FOR JAPAN AND EUROPE, EIA AEO 2011 FOR U.S.)



IN CONCLUSION

- International LNG Market Competition is Likely to Place a Significant Limit on the Amount of LNG the U.S. Will Actually Export
- The Concept That LNG Exports Might Drive U.S. Gas Prices Up to the Point Where They Threaten Our Competitive Energy Prices Ignores the Substantial LNG Transportation Costs That Will Inevitably Keep U.S. LNG Exporters Prices Below Those of European or Asian LNG Importers
- And Asia, With its Current LNG Contract Pricing Practices, is Probably a Better Market Than Europe, Particularly Since Asian Competitive Supply Alternatives Tend to Be Costly

