

NATURAL GAS - THE PROBLEM CHILD OF ENERGY TRANSPORT AND TRADE

Preliminary Draft

a Presentation to

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INTERSECTION OF TRADE, ENERGY AND THE ENVIRONMENT
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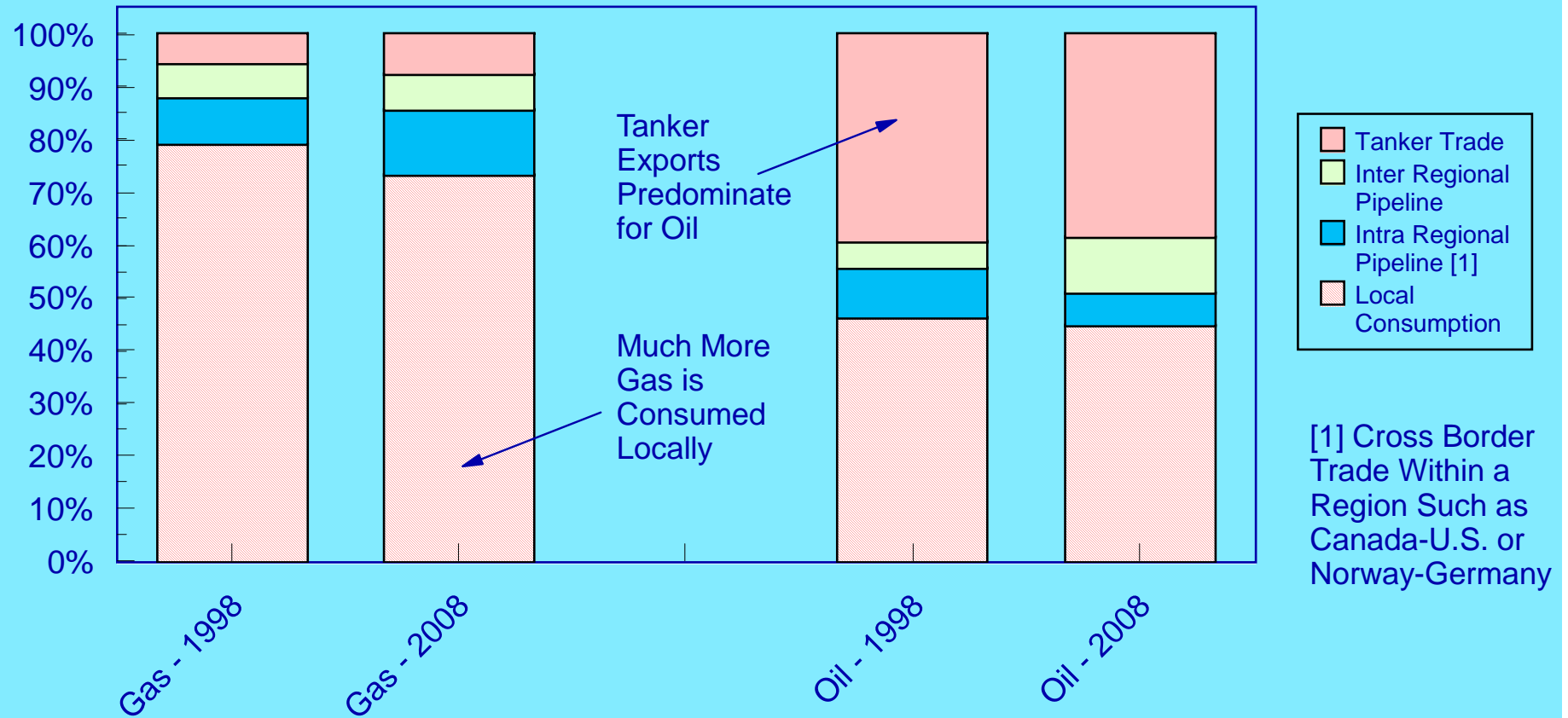
THE LOW DENSITY OF NATURAL GAS MAKES IT MORE DIFFICULT TO CONTAIN AND TO TRANSPORT THAN OIL

- As a Result, the Proportion of World Gas Production Traded Internationally is Far Lower Than That for Oil
- Prior to the Development of LNG, Gas Transportation Was Limited to Pipeline Transmission
- Thus Gas Was Unable to Utilize That Mainstay of International Oil Trade - Marine Transportation
- But LNG Has Changed All That and Made Gas an Internationally Traded Commodity

Figure 1

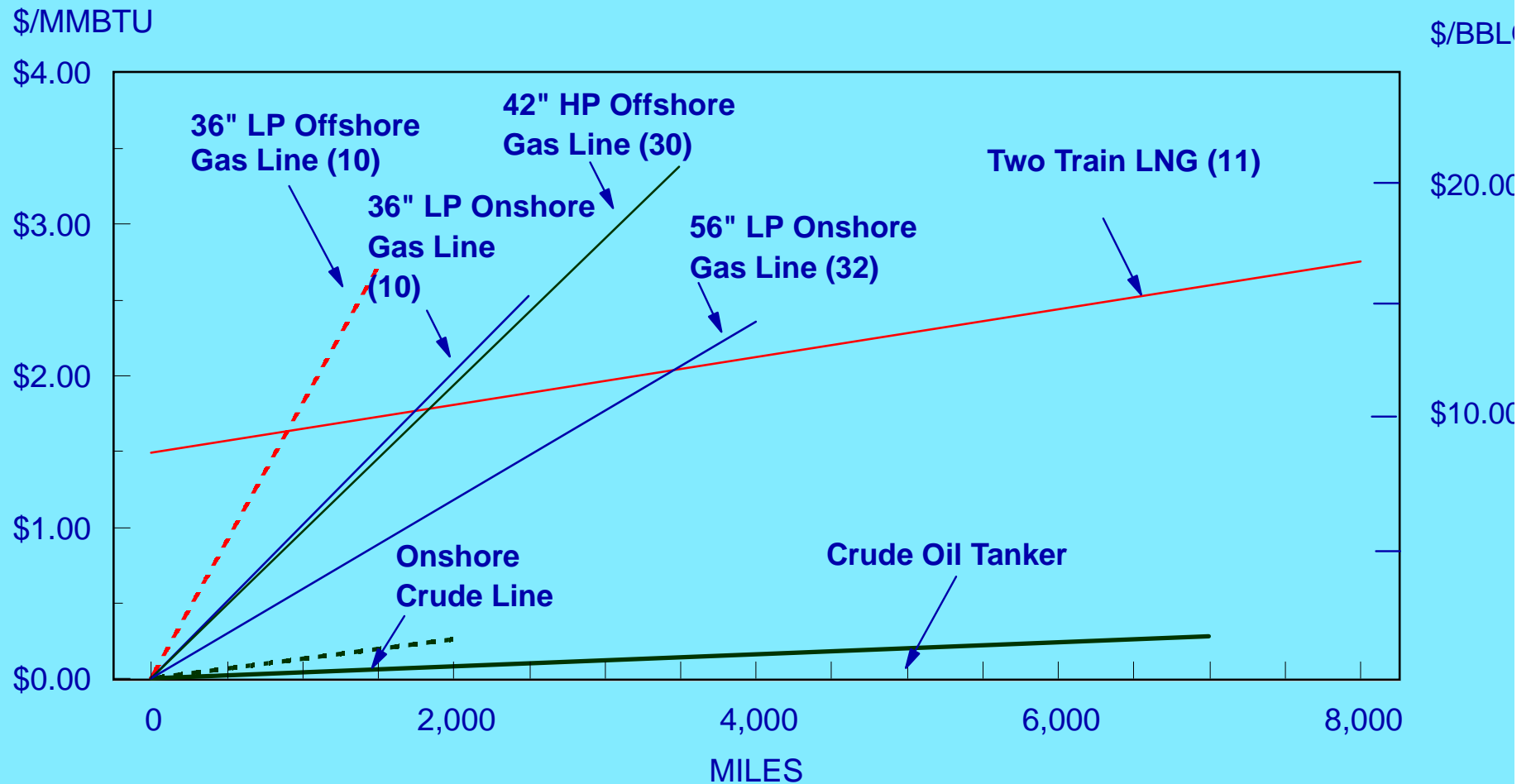
PROPORTION OF REGIONAL OIL AND GAS PRODUCTION CONSUMED LOCALLY OR EXPORTED

Percent of Production



- While it is Almost Always Cheaper to Transport Oil in Tankers Than by Pipeline, Gas Transportation Economics are Much More Complex
- Long Distance Gas Pipelining is Very Costly and Sensitive to Economies of Scale
- But Over Longer Distances Where Marine Movements are Feasible, LNG Tanker Transport is More Economic
- And While LNG Tanker Movements Are Becoming Increasingly Destination-Flexible, the Pipeline Links Between Gas Sources and Markets Are Often Inflexible

Figure 2
ILLUSTRATIVE COSTS (2002 PERSPECTIVE) OF
GAS AND OIL TRANSPORTATION
SHOWING GAS'S HIGHER COSTS AND THE EFFECT OF SCALE
(Gas Delivery Capability in BCM)



FOR GAS, TRANSPORTATION INFLEXIBILITY POSES SUPPLY RISKS

- Once This Was a Problem for Both LNG and Pipelines, Often Inhibiting the Development of Cost-Effective Gas Transportation Systems
- For LNG, It Was a Product of the Traditional Long-Term Contract Which Rigidly Linked Specific Buyers and Sellers
- When Disputes Arose Between Algeria and the U.S. in the 1970s, Trade Ceased for a Time and Two of the Four U.S. Receipt Terminals Did Not Operate for More than Twenty Years
- But Now With the Increasing Liberalization of Gas Markets, Supply is Much More Flexible and Customers Can Replace Interrupted Supplies

- When an Explosion Destroyed Three LNG Trains in Algeria in 2005 or Indonesia Was Recently Unable to Deliver on Contract Commitments, LNG Supplies from Elsewhere Offset the Losses
- LNG Has Largely Solved its Problems But the Pipelines Are Still Often Destination-Inflexible
- One of the Classic Pipeline Examples Was an Early Attempt to Move Middle East Gas to Europe
- In 1970, Russia was Considering Supplementing Declining Supplies in the Caucasus with Gas from West Siberia
- Instead it Negotiated a Deal with Iran for Deliveries of Iranian Oil Well Gas to the Caucasus via the Iranian Gas Transport System (IGAT1)

- Since This Enabled Russia to Divert the West Siberian Supply to Europe, It Was Effectively a Delivery of Iranian Gas to Europe via Exchange
- This Was Not Lost on European Customers
- In 1975, Germany, France and Austria Signed Contracts Directly with Iran For Deliveries by Displacement Through the Soviet Union Via a New IGAT 2 System
- In the Fall of 1978, Iranian Oilfield Workers Went on Strike Signalling the Start of the Revolution
- Gas Production Plummeted and the Caucasus, Unable to Offset the Losses, Had a Very Difficult Winter
- Thus the Concept of Middle East Supply to Europe via Displacement Effectively Died

WHILE SOME SIMPLE CROSSBORDER PIPELINE ISSUES DO OCCUR, SUCH AS:

- To Diversify Risk, Spain Has Limited Imports from Any One Country (Algeria)
- Argentina Has Curtailed Supplies to Chile
- And Iran Has Reduced Deliveries to Turkey

THE PRIMARY PROBLEMS INVOLVE TRANSIT COUNTRY ISSUES

- Transit Countries Usually Have a Monopoly on the Least Costly Pipeline Route
- They May Also be Less Concerned About Supply Than the Destination Country
- They Thus Have a Strong Bargaining Position in Negotiations Over Transit Rights

THE PRINCIPAL TRANSIT PROBLEM ISSUES

- Geopolitical Issues with Neighboring Countries
- Transit Fees
- Transit Pipeline Tariffs
- Offtake Problems

GEOPOLITICAL ISSUES WITH NEIGHBORING COUNTRIES

- Often Neighboring Countries Have Political Problems with One Another
- In Some Cases, These Have Thwarted Proposed Pipelines
- Problem Examples
 - India/Pakistan
 - Russia/Ukraine 1990s, 2006, 2009
 - Bolivia/Chile (A Proposed LNG Plant on the Chilean Coast)
 - China/Mongolia

TRANSIT FEES FOR GOVERNMENTS - CAN BE VERY DIFFICULT TO NEGOTIATE

- Payment for Transit Rights - Can be in Cash or in Kind
- If in Kind and at Buyer's Option, They May Complicate Supply Planning
- Are Often Fixed But Sellers May Want Tie to Gas Prices
- But There Are Often Significant Differences in Levels
- Examples:
 - Our "Default" Assumption - \$0.02/MMBtu/100Km
 - 2008 - India Bid - \$0.013, Pakistan Offer - \$0.051
 - 2009 - Russia (Ukraine) Charge - \$0.043, 2010 - Russia Proposed - \$0.073/\$0.076

TRANSIT TARIFFS FOR PIPELINES

- Tariffs are Fees Paid to the Pipeline for Transportation
- They are Commonly Set on a "Cost-of-Service" Basis - Permitting Recovery of Costs Plus a Reasonable Return
- Different Styles - Postage Stamp, Distance Related, Zonal, Point to Point or Entry/Exit
- Costs Vary by Size of Line and by Date of Construction
- Since They All Aggregate Costs Distributing Them Among Customers, the Potential for Discrimination is Large
- A Goal of the Energy Charter Treaty (ECT) is to Prevent Discrimination Favoring Local Markets Over Transit

- Because of the Complexity of Tariff Design and the Potential for Discrimination, it is a Difficult Task
- In a Recent Study, The ECT Found Many Examples of Transit Tariffs That Were Higher Than Domestic Tariffs
- Some of the Examples Included:
 - Austria
 - Belgium
 - Germany
 - Poland
 - Slovakia
 - Russia

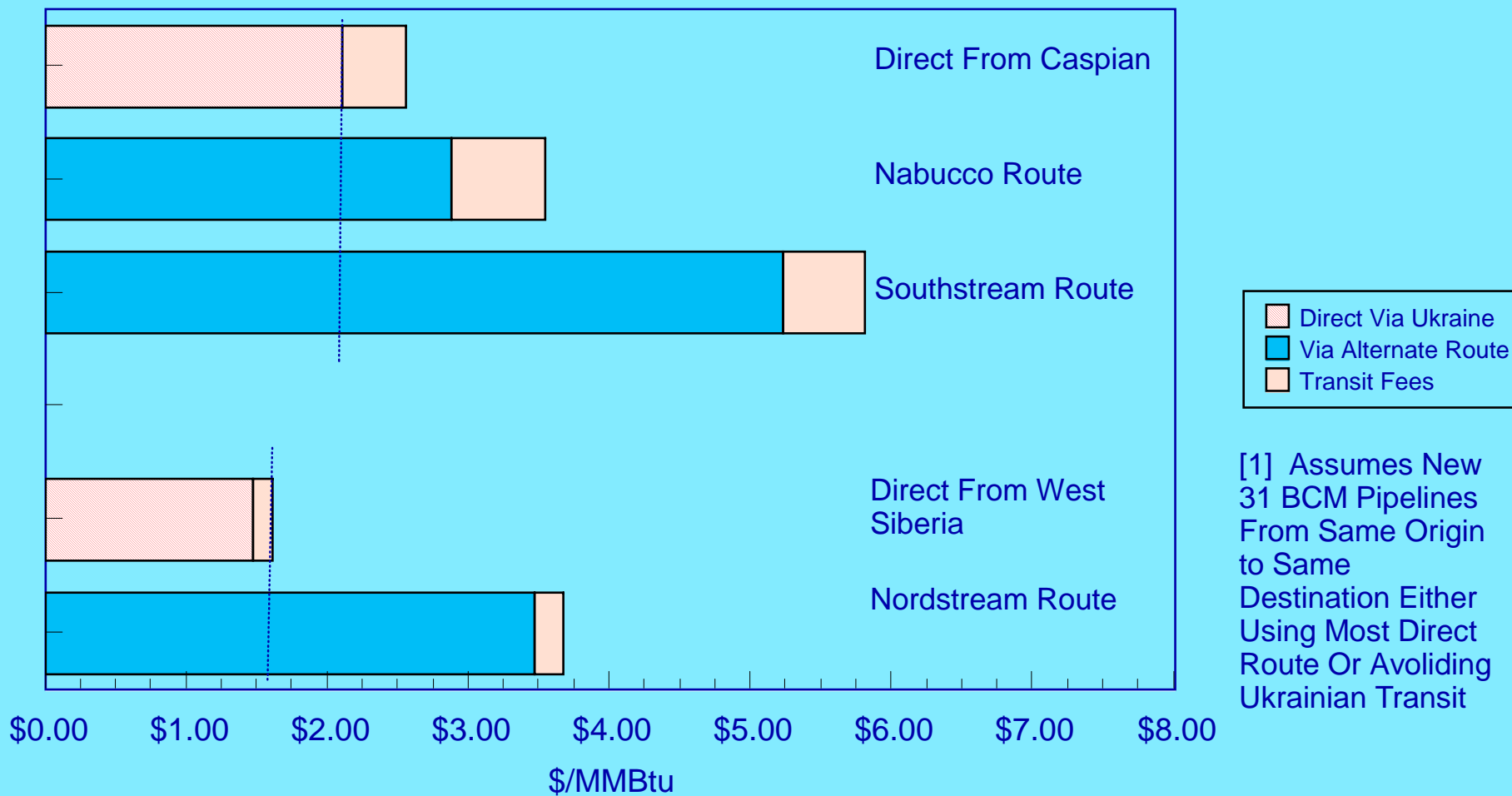
TRANSIT COUNTRY OFFTAKE ISSUES

- Possible Preemption of Flows (Russia/Ukraine)
- Russia Has Pricing Issues with the Ukraine, It Has Attempted to Resolve the Issue by Cutoffs; Ukraine Has Preempted Volumes Destined for Others - There Were Severe Problems in Romania and Bulgaria Last Winter
- "First in Line" Supply Claim (Turkey/Nabucco Pipeline)
- Turkey Wants Gas for Growth, But Nabucco Has Problems Assembling Enough Supply to Make Pipeline Economic

ONE OF THE MOST DIFFICULT TRANSIT ISSUES HAS BEEN THE PERIODIC DISPUTE BETWEEN RUSSIA AND THE UKRAINE

- Periodic Russian Delivery Curtailment to the Ukraine Has Disrupted Deliveries to Other European Customers
- To Bypass the Ukraine, Russia Built the Yamal Line Through Poland in 1997, and Has Proposed Two New Lines - Nordstream from West Siberia via the Baltic and Southstream From the Caspian via the Black Sea
- Both Are High Pressure, Marine Lines (Southstream a Deep Water Line) and Thus Expensive Alternatives to Direct Ukrainian Transit
- Southstream Also Competes with Nabucco, the EU's Favorite Route from the Caspian

Figure 3
THE COST OF TRANSIT AVOIDANCE
COMPARISON OF HYPOTHETICAL [1] EUROPEAN PROJECTS
TRANSITING OR AVOIDING THE UKRAINE

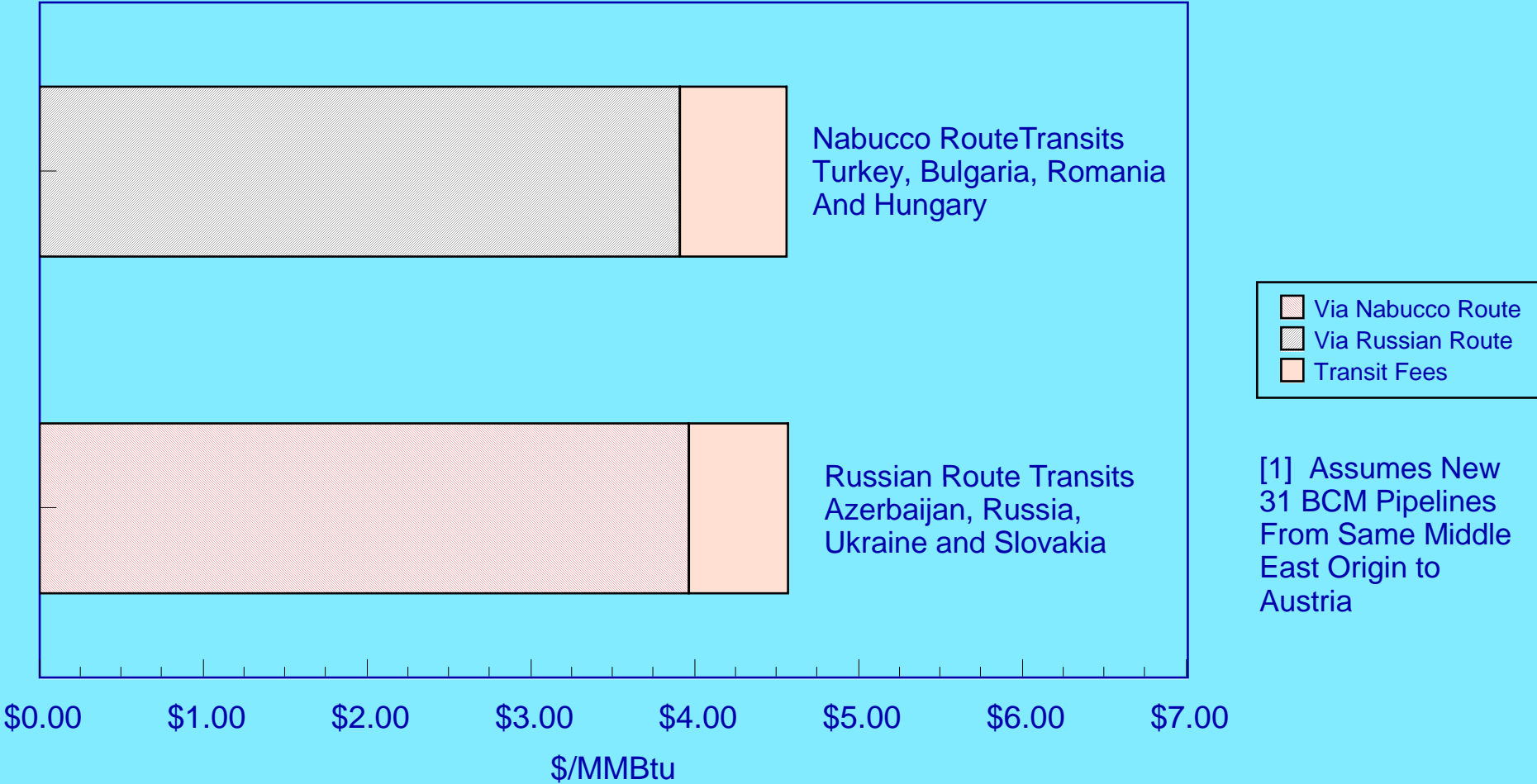


THE POSSIBILITY OF EUROPEAN PIPELINE ACCESS TO THE MIDDLE EAST REMAINS ELUSIVE

- It Still Involves Transit of Many Countries, Some of Which Pose Significant Geopolitical Problems
- And the Costs Are High, Emphasizing the Value of Cost-Effective Pipeline Routing

Figure 4

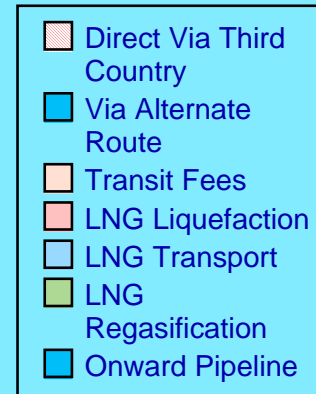
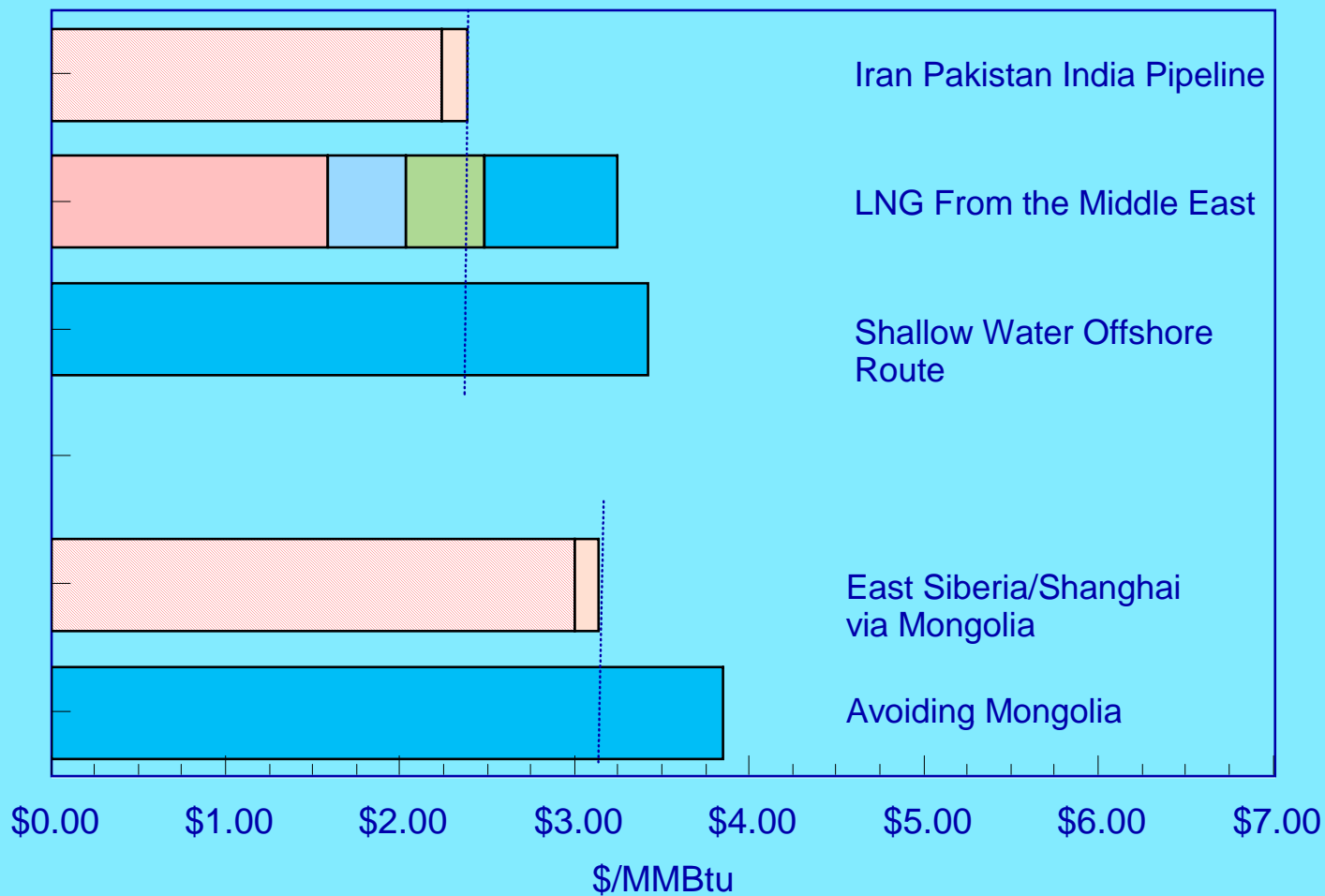
COMPARISON OF THE COST OF MOVING MIDDLE EAST GAS TO EUROPE VIA TWO HYPOTHETICAL [1] PROJECTS USING EITHER NABUCCO OR RUSSIAN ROUTES



EUROPE IS NOT THE ONLY REGION WITH TRANSIT ISSUES THAT POTENTIALLY INCREASE THE COSTS OF DELIVERY TO DESTINATION COUNTRIES

- The Proposed Iran-Pakistan-India Pipeline Was Close to Conclusion at One Point, But It is Now Inactive
- Although There Have Been Deep Water and Shallow Water Lines That Would Bypass Pakistan, India Has Recently Favored LNG
- And a Direct Line From Irkutsk (Kovykta) in Eastern Siberia to Shanghai Transiting Mongolia Has Been Shelved in Favor of an All Russia/China Alternative

Figure 5
THE COST OF TRANSIT AVOIDANCE
COMPARISON OF HYPOTHETICAL [1] PROJECTS
TRANSITING OR AVOIDING A THIRD COUNTRY



[1] Assumes New 31 BCM Pipelines From Same Origin to Same Destination Either Using Most Direct Route Or Avoiding Third Country Transit

CONCLUSION

- The Problem of Negotiating Third Country Pipeline Transit Has Slowed the Growth of Pipeline Trade and at Times Fostered More-Flexible LNG Alternatives
- It Has Also At Times Led to More Costly Gas Transportation Systems
- One Agency Tackling the Problem Has Been the Energy Charter Treaty Secretariat, But the Issue Remains Challenging
- It Would Also Appear to be a Natural Role for the World Trade Organization, Given its Charter to Foster World Trade, and a Membership That Includes a Diverse Group of Countries

