CEE CENTER FOR ENERGY ECONOMICS

Bureau of Economic Geology, The University of Texas at Austin



Energy Policy and Opportunities in North America

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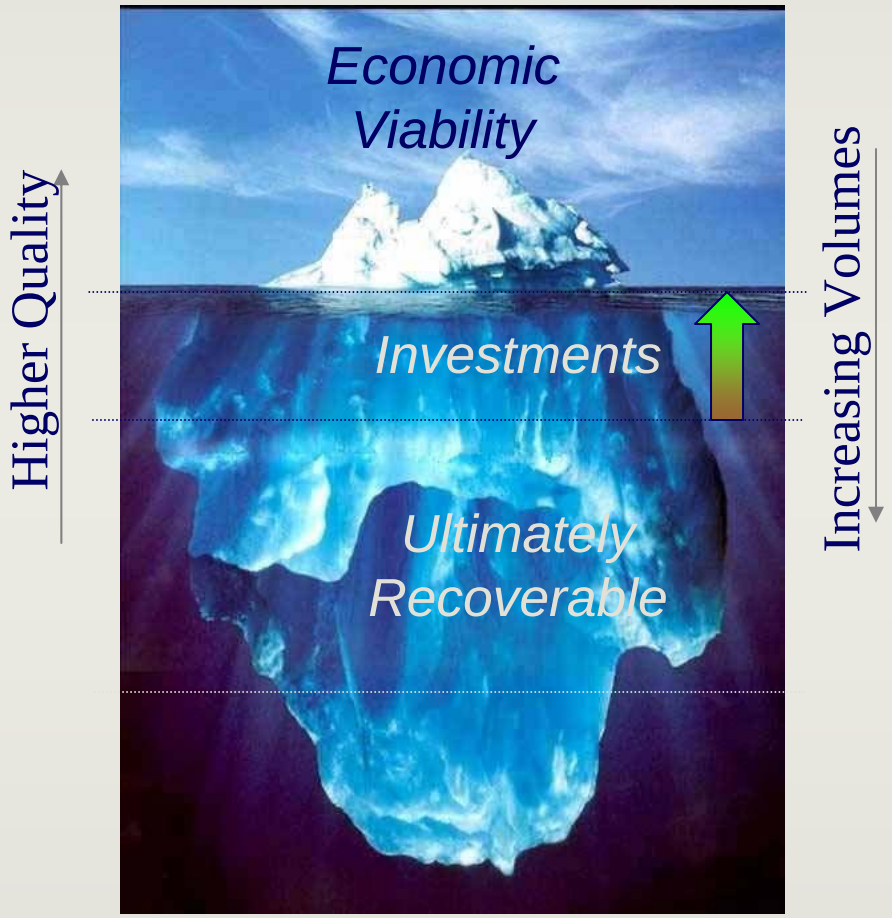
Outline

- The North American Energy Picture
- Issues
- Changing times and the path forward

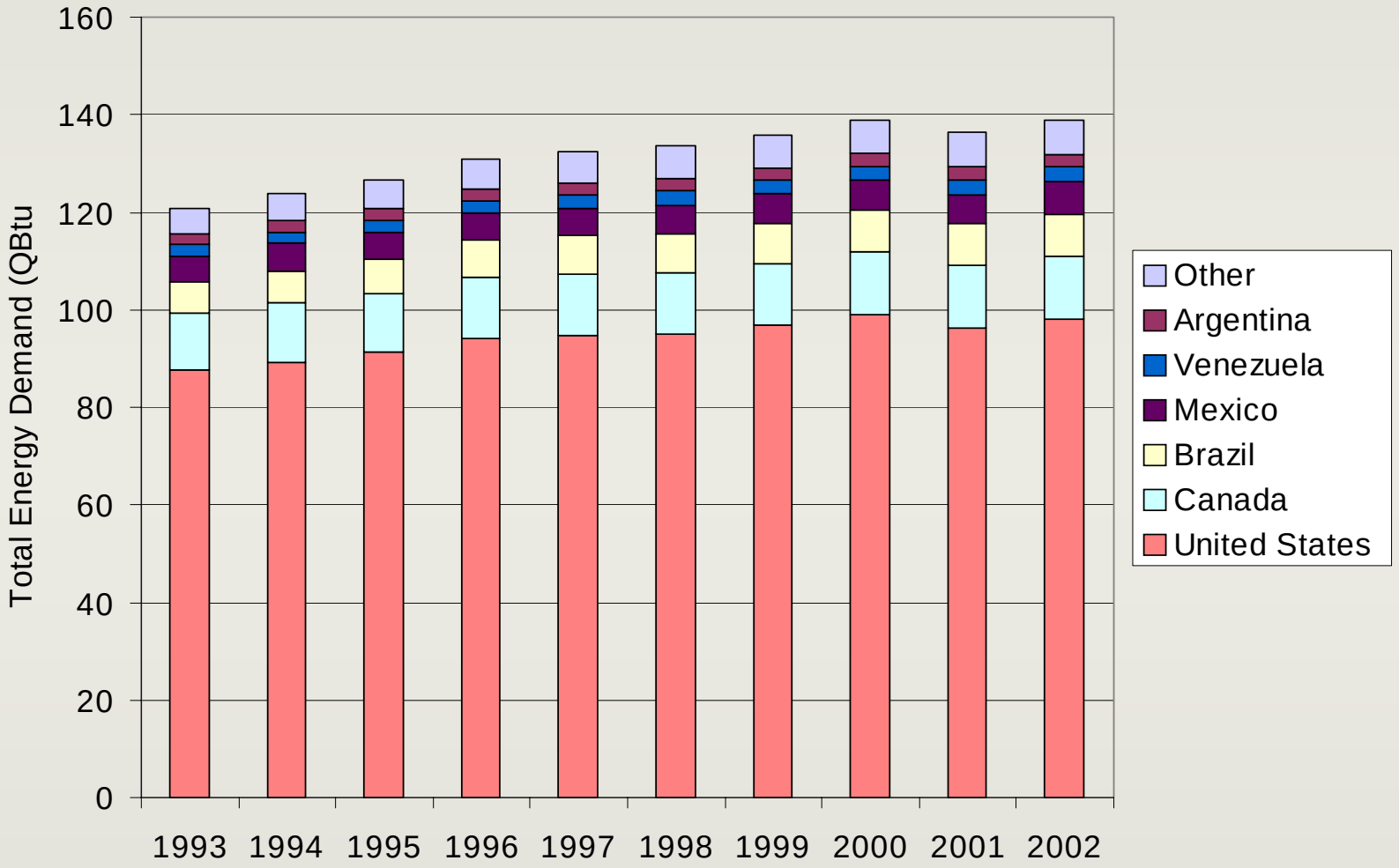
Resource to Markets

- Basic economic arguments explain why “higher quality” resources are tapped first: usually lower cost to market.
- Gradually more challenging projects are undertaken.
- New components of the resource become viable as new technologies become available and when appropriate commercial frameworks are in place.
- The role of investments in infrastructure is to connect resources to markets. One role of new technology is to change which resources are economically viable and ultimately recoverable.
- Each new resource type can be viewed as another iceberg, with different elements being economically viable (above water).



Based on the USGS resource pyramid

Total Energy Demand



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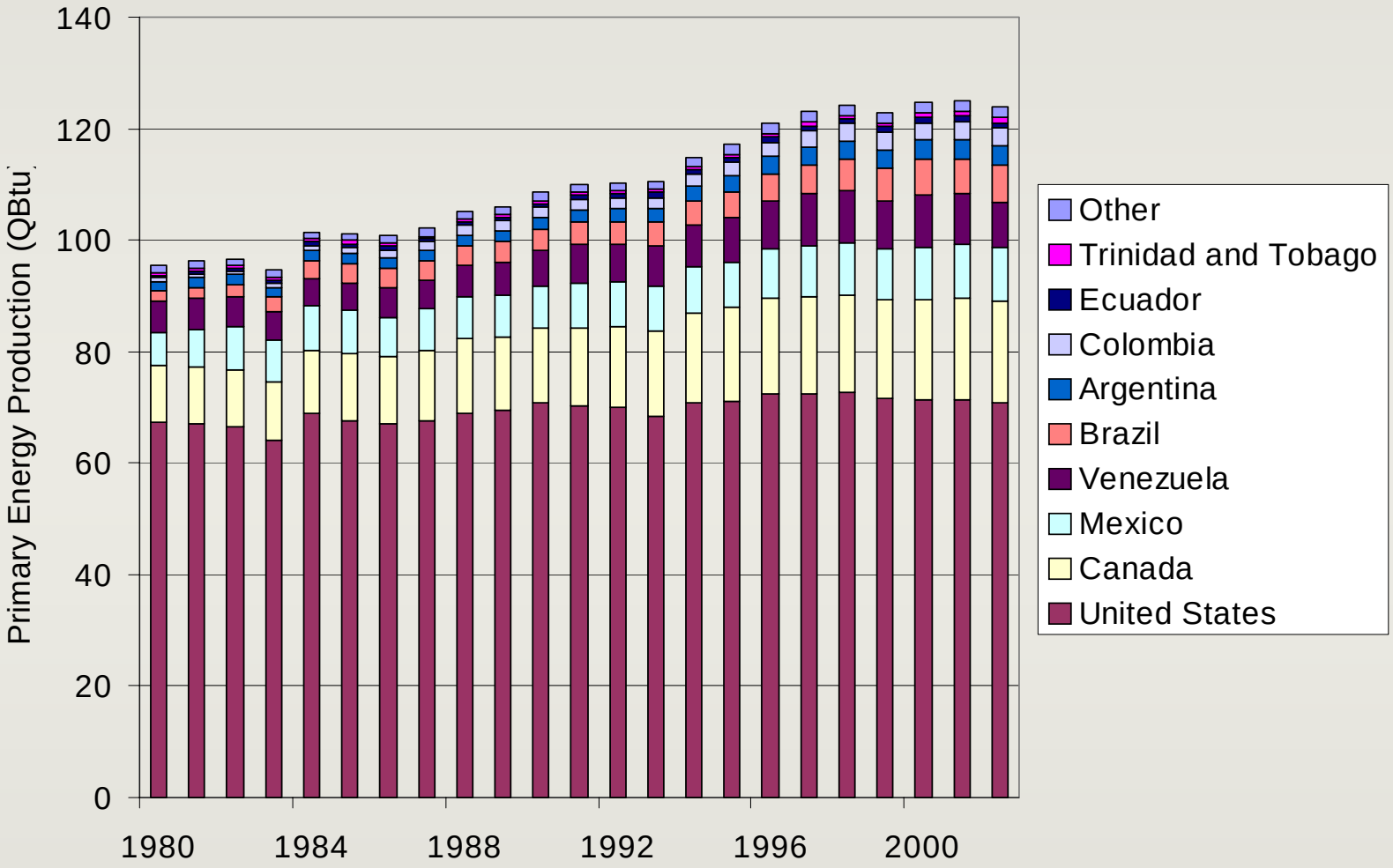
Primary Energy Production



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US: Energy Use

Figure 2. Delivered energy consumption by sector, 1980-2030 (quadrillion Btu)

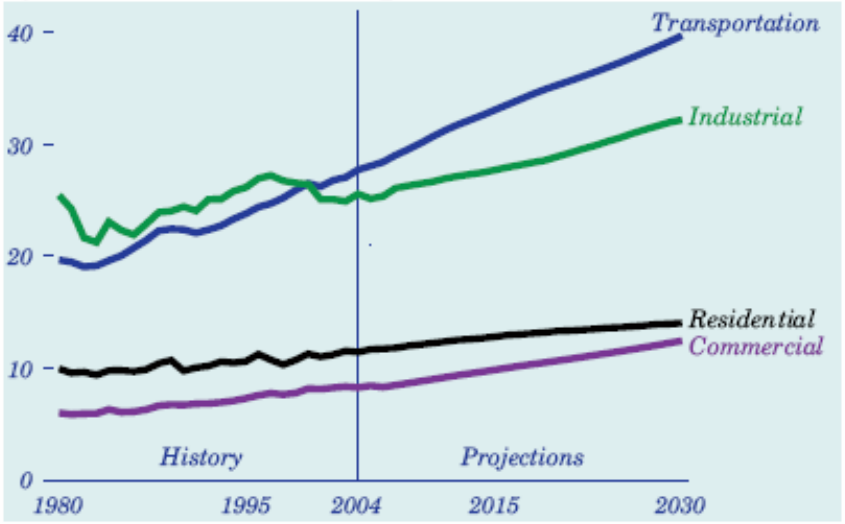
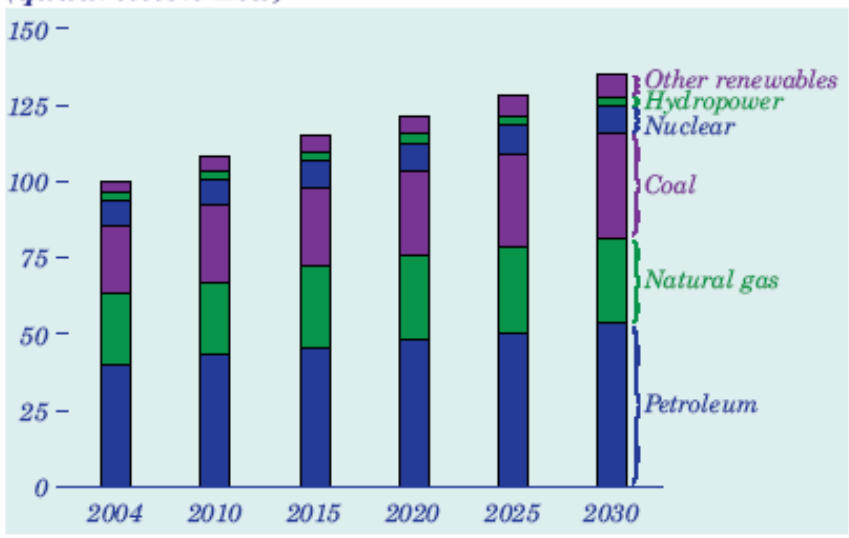
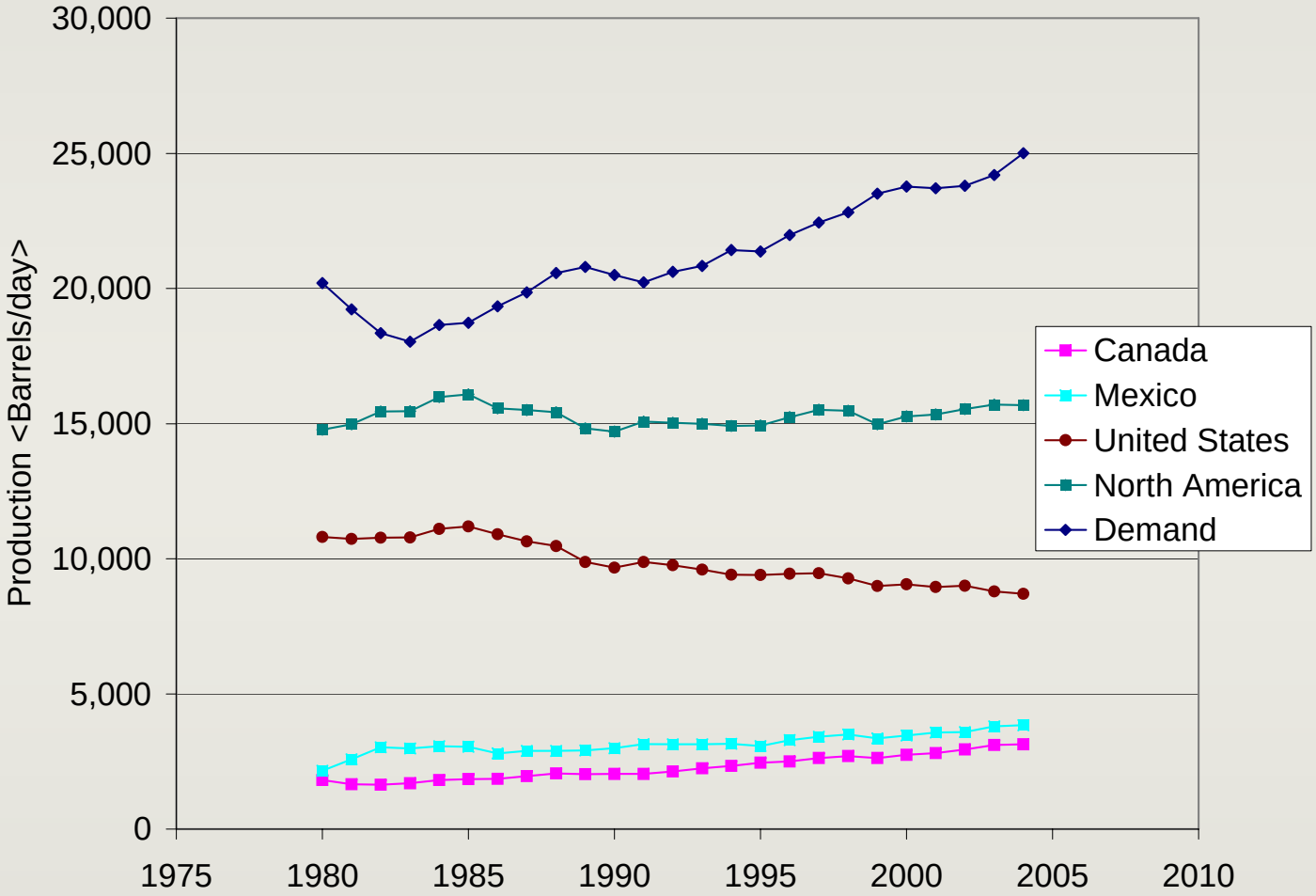


Figure 32. Primary energy use by fuel, 2004-2030 (quadrillion Btu)



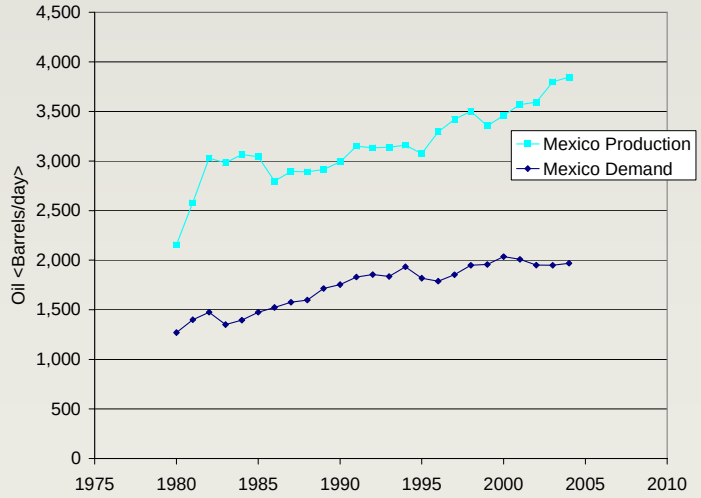
Liquid Hydrocarbons

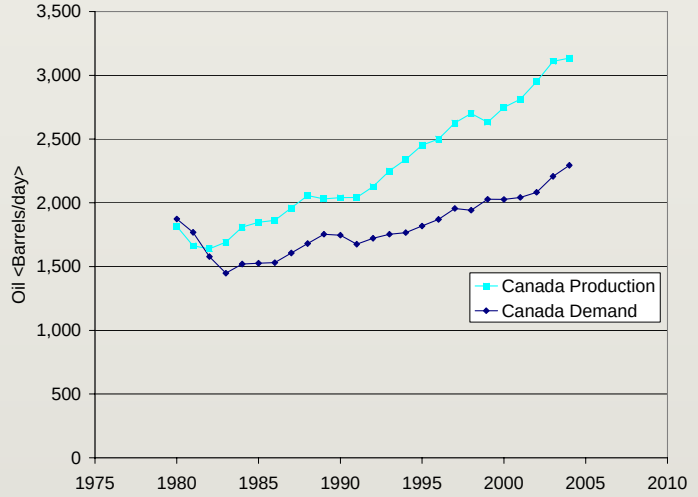


Source: Energy Information Administration

Liquid Hydrocarbons

- Steady increase in production and related income
- Unlike most exporters, Mexico and Canada have large internal markets

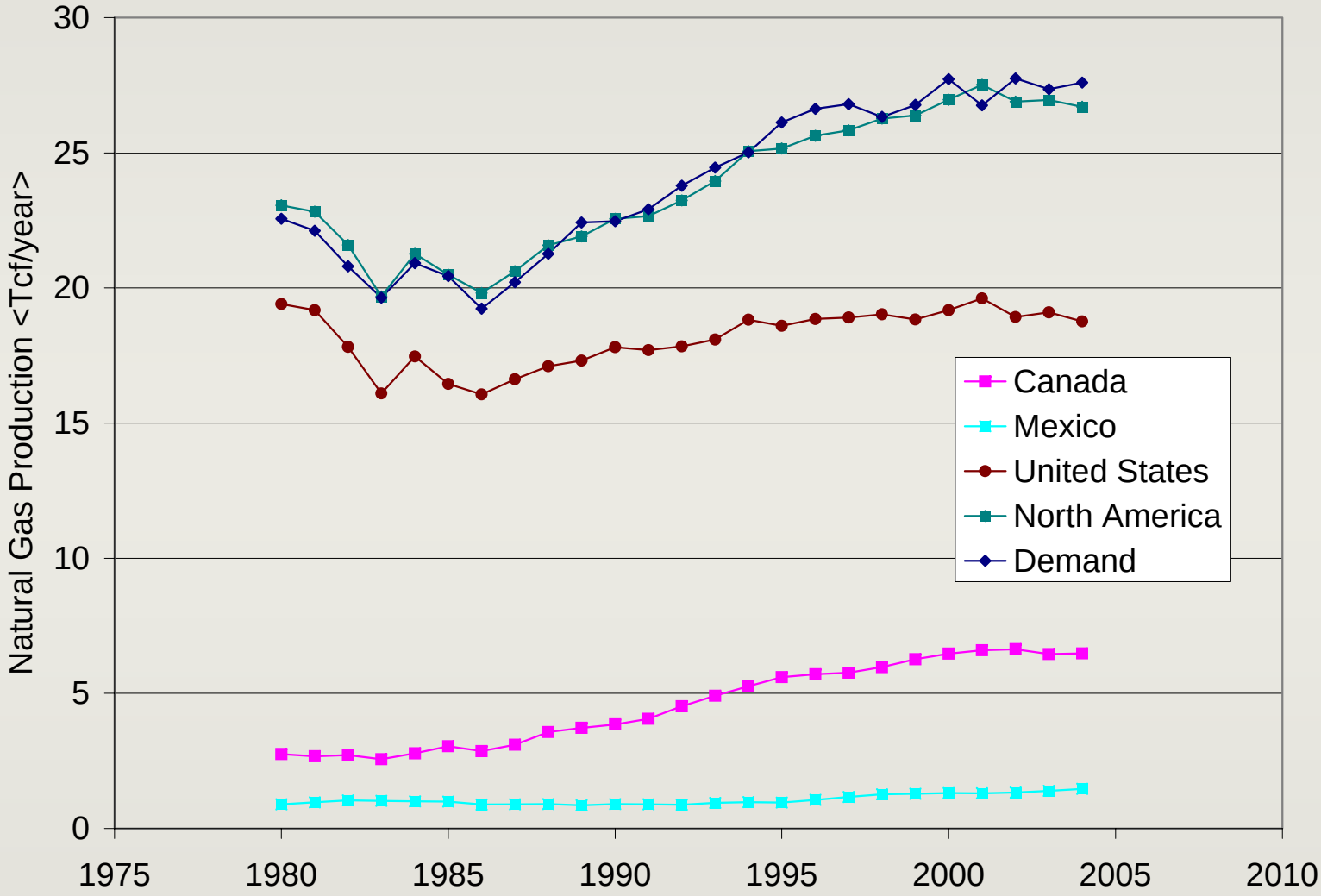




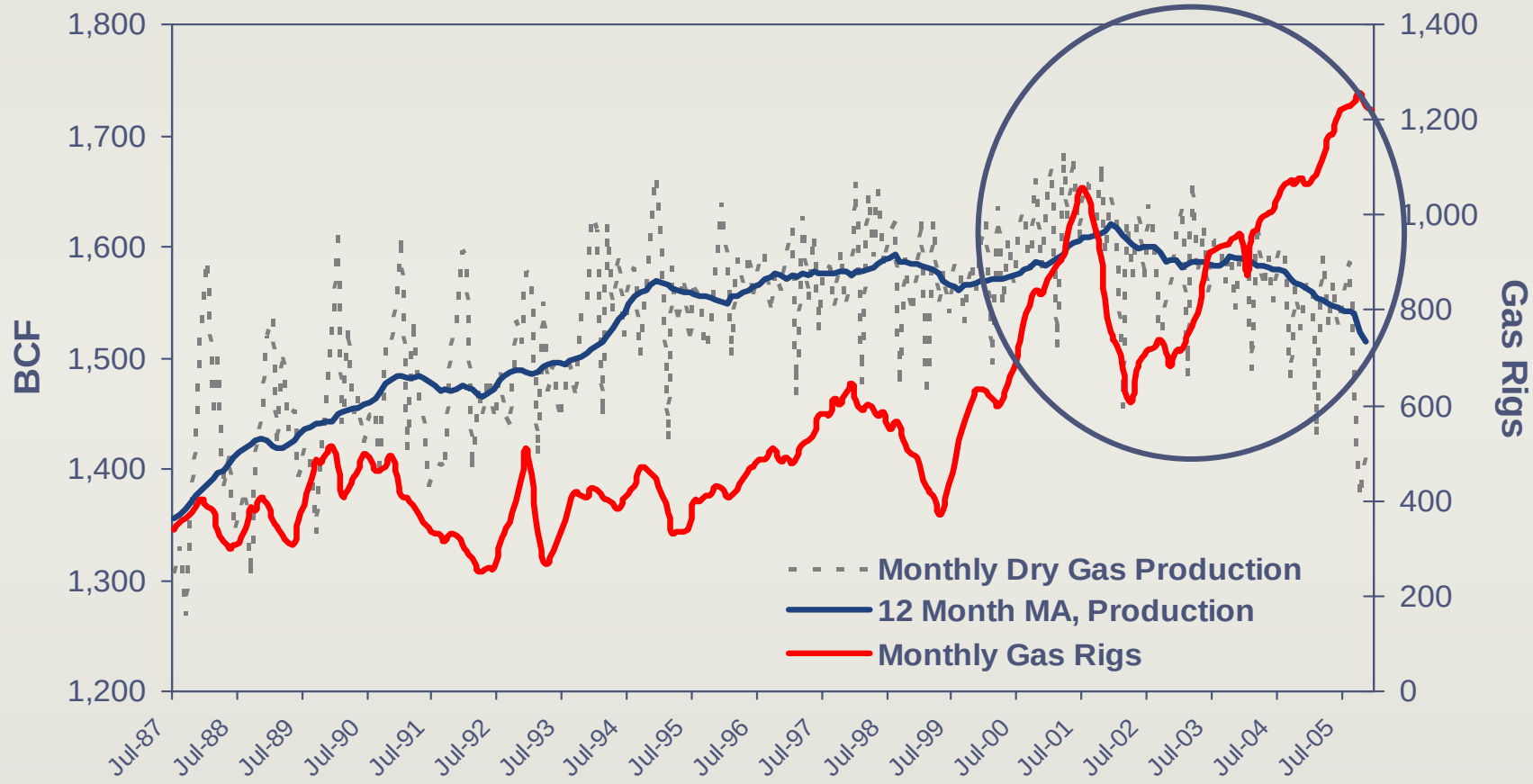
Liquid Hydrocarbons: Issues

- Mexico:
  - Budget constraints
    - Limited exploration budget
    - Growing need for new refineries
    - Production trending heavier than current Maya
    - Natural decline of reservoirs (opportunities for CO2)
  - Increasing domestic consumption
- Canada
  - Cost escalation in Fort McMurray: is there a slowdown coming?
  - Availability of diluent and natural gas
  - Opportunities for nuclear power

Dry Natural Gas



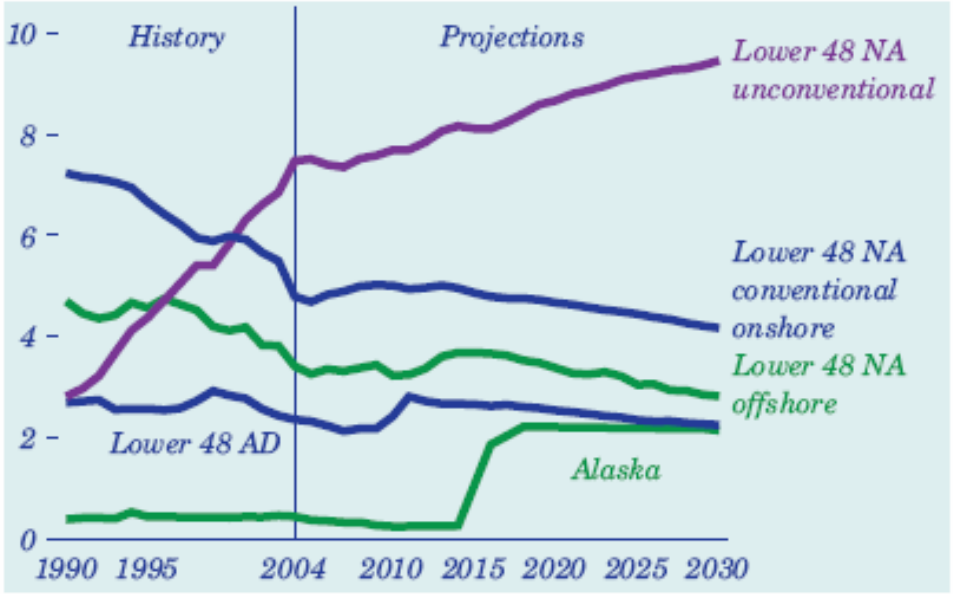
U.S. Gas Production: towards unconventional



Source: U.S. EIA, Baker Hughes

Natural Gas Demand Outlook

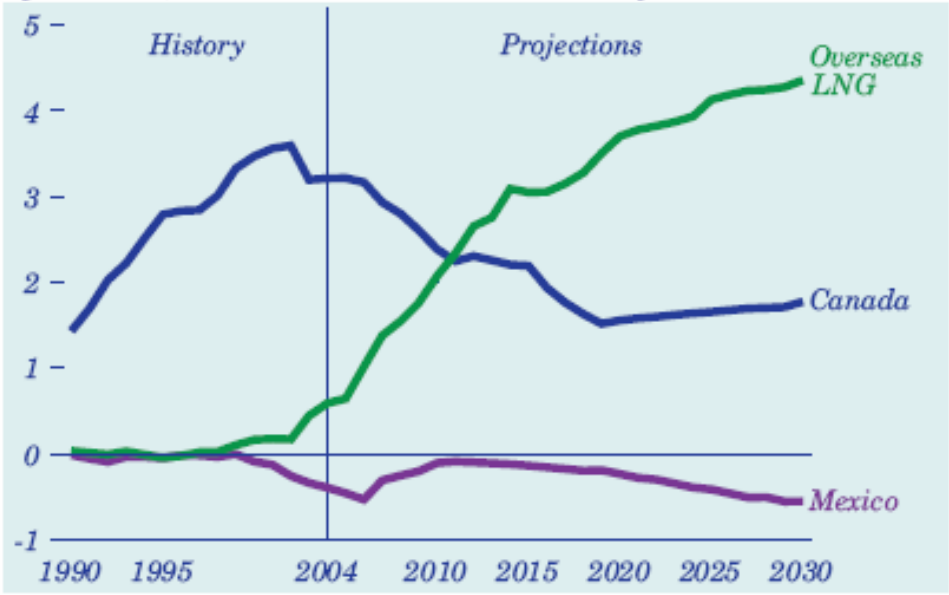
Figure 73. Natural gas production by source, 1990-2030 (trillion cubic feet)



- *Growing role of shale gas and tight sands*
- *Alaska NS and MacKenzie Delta,*
- *Continued growth in LNG imports*

Source: Energy Information Administration Energy Outlook 2006

Figure 74. Net U.S. imports of natural gas by source, 1990-2030 (trillion cubic feet)



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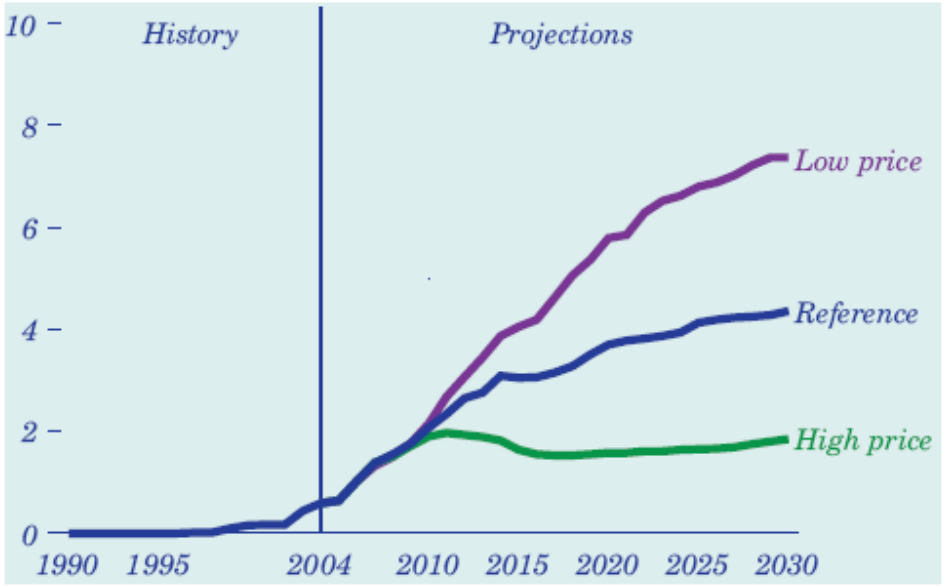
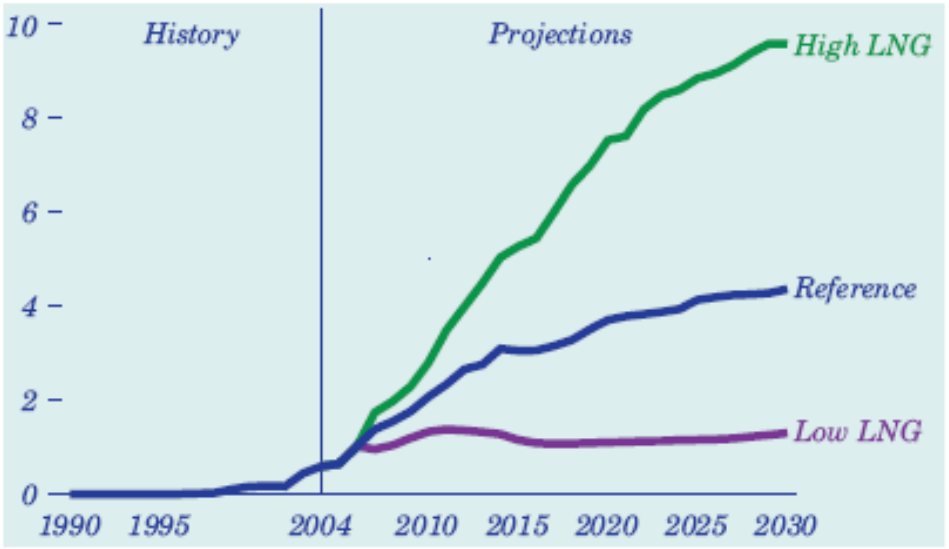
LNG Imports: what does the future hold?

Figure 80. Net imports of liquefied natural gas in three price cases, 1990-2030 (trillion cubic feet)



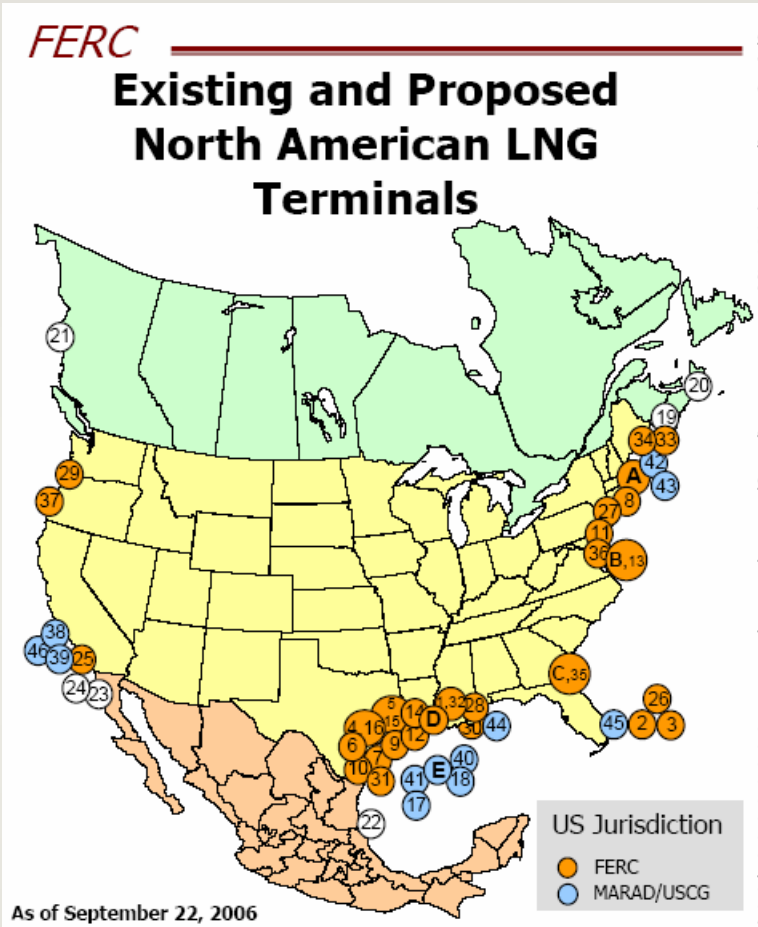
Source: Energy Information Administration Energy Outlook 2006

Figure 81. Net imports of liquefied natural gas in three LNG supply cases, 1990-2030 (trillion cubic feet)



- *Outlook dominated by uncertainty:*
  - *Alaska and MacKenzie Gas*
  - *Demand destruction in the US*
  - *Role of coal*
  - *Availability of LNG supplies*
  - *Infrastructure readiness*

LNG Receiving Terminals



CONSTRUCTED
A. Everett, MA : 1.035 Bcfd (SUEZ/Tractebel - DOMAC)
B. Cove Point, MD : 1.0 Bcfd (Dominion - Cove Point LNG)
C. Elba Island, GA : 1.2 Bcfd (El Paso - Southern LNG)
D. Lake Charles, LA : 2.1 Bcfd (Southern Union - Trunkline LNG)
E. Gulf of Mexico: 0.5 Bcfd (Gulf Gateway Energy Bridge - Excelerate Energy)

APPROVED BY FERC
1. Hackberry, LA : 1.5 Bcfd (Cameron LNG - Sempra Energy)
2. Bahamas : 0.84 Bcfd (AES Ocean Express)*
3. Bahamas : 0.83 Bcfd (Calypso Tractebel)*
4. Freeport, TX : 1.5 Bcfd (Cheniere/Freeport LNG Dev.)
5. Sabine, LA : 2.6 Bcfd (Sabine Pass Cheniere LNG)
6. Corpus Christi, TX: 2.6 Bcfd (Cheniere LNG)
7. Corpus Christi, TX : 1.1 Bcfd (Vista Del Sol - ExxonMobil)
8. Fall River, MA : 0.8 Bcfd (Weaver's Cove Energy/Hess LNG)
9. Sabine, TX : 2.0 Bcfd (Golden Pass - ExxonMobil)
10. Corpus Christi, TX: 1.0 Bcfd (Ingleside Energy - Occidental Energy Ventures)
11. Logan Township, NJ : 1.2 Bcfd (Crown Landing LNG - BP)
12. Port Arthur, TX: 3.0 Bcfd (Sempra)
13. Cove Point, MD : 0.8 Bcfd (Dominion)
14. Cameron, LA: 3.3 Bcfd (Creole Trail LNG - Cheniere LNG)
15. Sabine, LA: 1.4 Bcfd (Sabine Pass Cheniere LNG - Expansion)
16. Freeport, TX: 2.5 Bcfd (Cheniere/Freeport LNG Dev. - Expansion)

APPROVED BY MARAD/COAST GUARD
17. Port Pelican: 1.6 Bcfd (Chevron Texaco)
18. Louisiana Offshore : 1.0 Bcfd (Gulf Landing - Shell)

CANADIAN APPROVED TERMINALS
19. St. John, NB : 1.0 Bcfd (Canaport - Irving Oil)
20. Point Tupper, NS 1.0 Bcf/d (Bear Head LNG - Anadarko)
21. Kitimat, BC: 0.61 Bcfd (Galveston LNG)

MEXICAN APPROVED TERMINALS
22. Altamira, Tamulipas : 0.7 Bcfd (Shell/Total/Mitsui)
23. Baja California, MX : 1.0 Bcfd (Energy Costa Azul - Sempra)
24. Baja California - Offshore : 1.4 Bcfd (Chevron Texaco)

PROPOSED TO FERC
25. Long Beach, CA : 0.7 Bcfd, (Mitsubishi/ConocoPhillips - Sound Energy Solutions)
26. Bahamas : 1.0 Bcfd, (Seafarer - El Paso/FPL)
27. LI Sound, NY: 1.0 Bcfd (Broadwater Energy - TransCanada/Shell)
28. Pascagoula, MS: 1.5 Bcfd (Gulf LNG Energy LLC)
29. Bradwood, OR: 1.0 Bcfd (Northern Star LNG - Northern Star Natural Gas LLC)
30. Pascagoula, MS: 1.3 Bcfd (Casotte Landing - ChevronTexaco)
31. Port Lavaca, TX: 1.0 Bcfd (Calhoun LNG - Gulf Coast LNG Partners)
32. Hackberry, LA : 1.15 Bcfd (Cameron LNG - Sempra Energy - Expansion)
33. Pleasant Point, ME : 2.0 Bcfd (Quoddy Bay, LLC)
34. Robbinston, ME: 0.5 Bcfd (Downeast LNG - Kestrel Energy)
35. Elba Island, GA: 0.9 Bcfd (El Paso - Southern LNG)
36. Baltimore, MD: 1.5 Bcfd (AES Sparrows Point – AES Corp.)
37. Coos Bay, OR: 1.0 Bcfd (Jordan Cove Energy Project)

PROPOSED TO MARAD/COAST GUARD
38. Offshore California : 1.5 Bcfd (Cabrillo Port - BHP Billiton)
39. Offshore California : 0.5 Bcfd, (Clearwater Port LLC - NorthernStar NG LLC)
40. Offshore Louisiana : 1.0 Bcfd (Main Pass McMoRan Exp.)
41. Gulf of Mexico: 1.5 Bcfd (Beacon Port Clean Energy Terminal - ConocoPhillips)
42. Offshore Boston: 0.4 Bcfd (Neptune LNG - SUEZ LNG)
43. Offshore Boston: 0.8 Bcfd (Northeast Gateway - Excelerate Energy)
44. Gulf of Mexico: 1.4 Bcfd (Bienville Offshore Energy Terminal - TORP)
45. Offshore Florida: ? Bcfd (SUEZ Calypso - SUEZ LNG)
46. Offshore California: 1.2 Bcfd (OceanWay - Woodside Natural Gas)

- *More than 10BCFD of new capacity is being considered for the east coast!*

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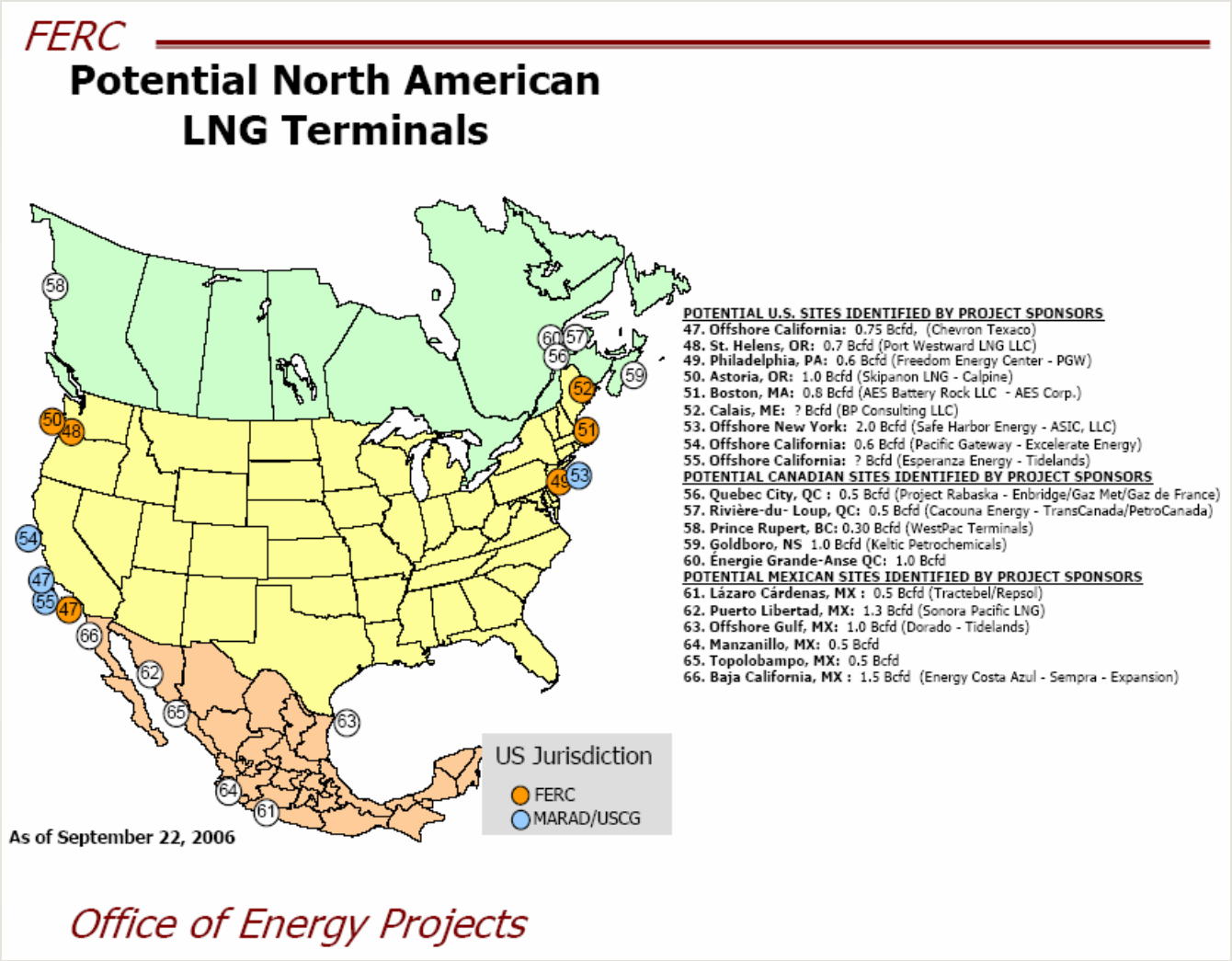
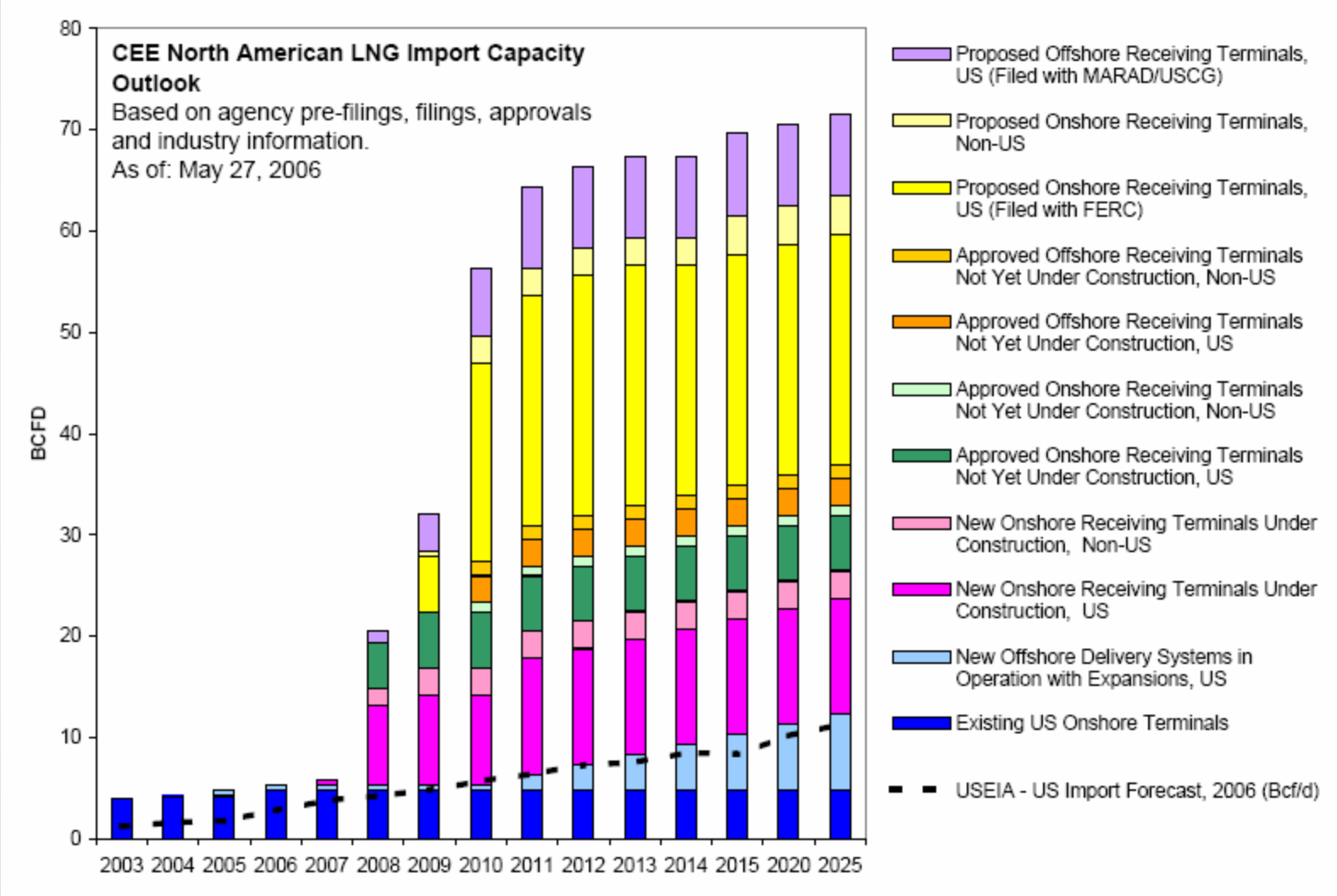
LNG Receiving Terminals



How much capacity? or real options?



North American Energy Picture

- Continued and increasing imports of liquid hydrocarbons
- Increasing imports of natural gas
- Decreasing industrial energy consumption in the US

Issues

- Energy Security Concerns
- Economic impact of higher energy prices
- Can North American supply keep up with demand within an appropriate timeframe? Role of unconventional resources such as the Oil Sands and tight gas.
- LNG and natural gas trade
- Technology and incentives: Coal, nuclear, renewable energy (ethanol, bio-diesel, biomass to power, biomass to hydrogen, geothermal…).
- Green House Gas Emissions: CO2 sequestration, California Initiative, Large Final Emitters program

Mexico: Economic Climate

- Inflation under control
- Large foreign exchange reserves
  - Grew from $40 to $70 billion in the last 6 years
- Foreign debt is seen as low risk
- Closely follows economic growth of US

Mexico: Political Climate

- President Elect Felipe Calderón is perceived to have the weakest mandate in México's modern history.
- The PRD and AMLO have mobilized a large segment of Mexican society in a fight against "privilege" which could devolve into a political and social confrontation.
- This mobilization has also shown the geographic and political divide in Mexico which is showing up in other countries as well (e.g. Bolivia, Brasil).

Mexico: Political Climate

- The PAN and PRI will have to enter into agreements in order to move any legislative agenda forward.
- Additionally, moves to incorporate smaller parties will prove easier due to the radicalization of the PRD.
- Elements of PRD's message will likely fill the public debate though energy sector reform will likely move forward under the radar at a slow pace. Calderon will likely move to tackle social issues as the initial focus of the new administration. This will also help appease AMLO supporters.
- Energy sector reform will likely not be part of any big public push. Too many issues need to be resolved for any comprehensive energy sector reform.
- However, the health of the energy sector is key!

Mexico: Possibilities

- Deep water GOM is one area where the "Strategic Alliances" could be developed first through the unitization of cross-border reservoirs.

Contrast with Canada

- Is Canada special?
  - Extraordinary policy and regulatory stability since mid-80's
  - Public acceptance of market functioning in the NAFTA context
  - Good prices! In-place oil has been bought for as low as 1 cent/barrel
  - Tax regime is a good fit for large industrial investments
- Where else can you grow and have access to a large resource?
  - OPEC doors are closed
  - FSU is having some issues

Canada: Liquid Hydrocarbons

- Growth concentrates on oil sands
  - Limited exploration risk
  - High capital costs and payout periods
  - Current mining projects are different from future in-situ projects
  - Opportunities for nuclear power
- No large discoveries offshore
  - Rather, attempts at developing old discoveries

Canada: Natural Gas

- Mackenzie Gas Project (MGP) trying to move forward
- Other new discoveries in Northern Territories indicate additional potential including oil
- Competition with the Alaska pipeline which is also in limbo
- Domestic use of natural gas will likely reduce exports to US

Canada: Issues

- Western Basin activity might be overheating
- Minor rumblings to capture rents from oil sand projects
- Will all the investment take place? Looks quite likely though they depend on costs and markets
- CO2 limitations could hinder development, but not in the short term.

Canada: and the other sectors?

- Natural gas and electricity reforms require much in the form of revisions and further deregulation
- The political environment is not ready for this

Final Comment

- The Canadian oil sector should continue its growth in investment and production in the coming decades
- The Mexican energy sector in general, and the oil sector more specifically, is poised to embark on a period of great private investment. Unfortunately, this impending private investment cycle will take some time to develop. On the other hand, minor reforms could allow PEMEX to pickup investment.

Note

- If not indicated, the data source is the US EIA