



MUSE
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NATURAL GAS LIQUIDS, IN-STATE GAS PROCESSING, AND PETROCHEMICAL FACILITIES

Prepared for

STATE OF ALASKA

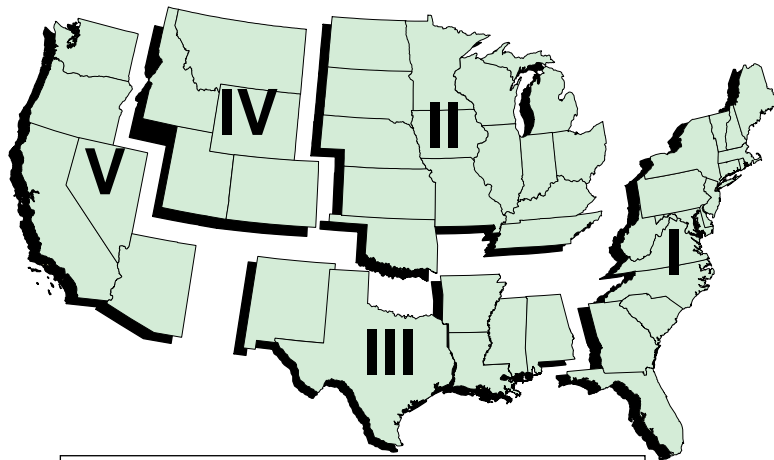
DEPARTMENT OF REVENUE

September 2004

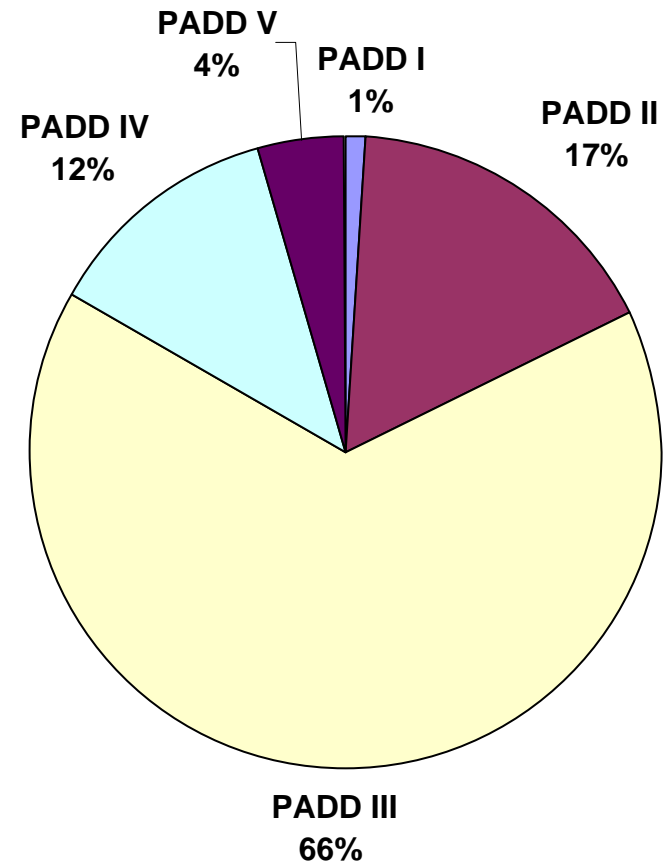
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U.S. NATURAL GAS LIQUID PRODUCTION – 2003



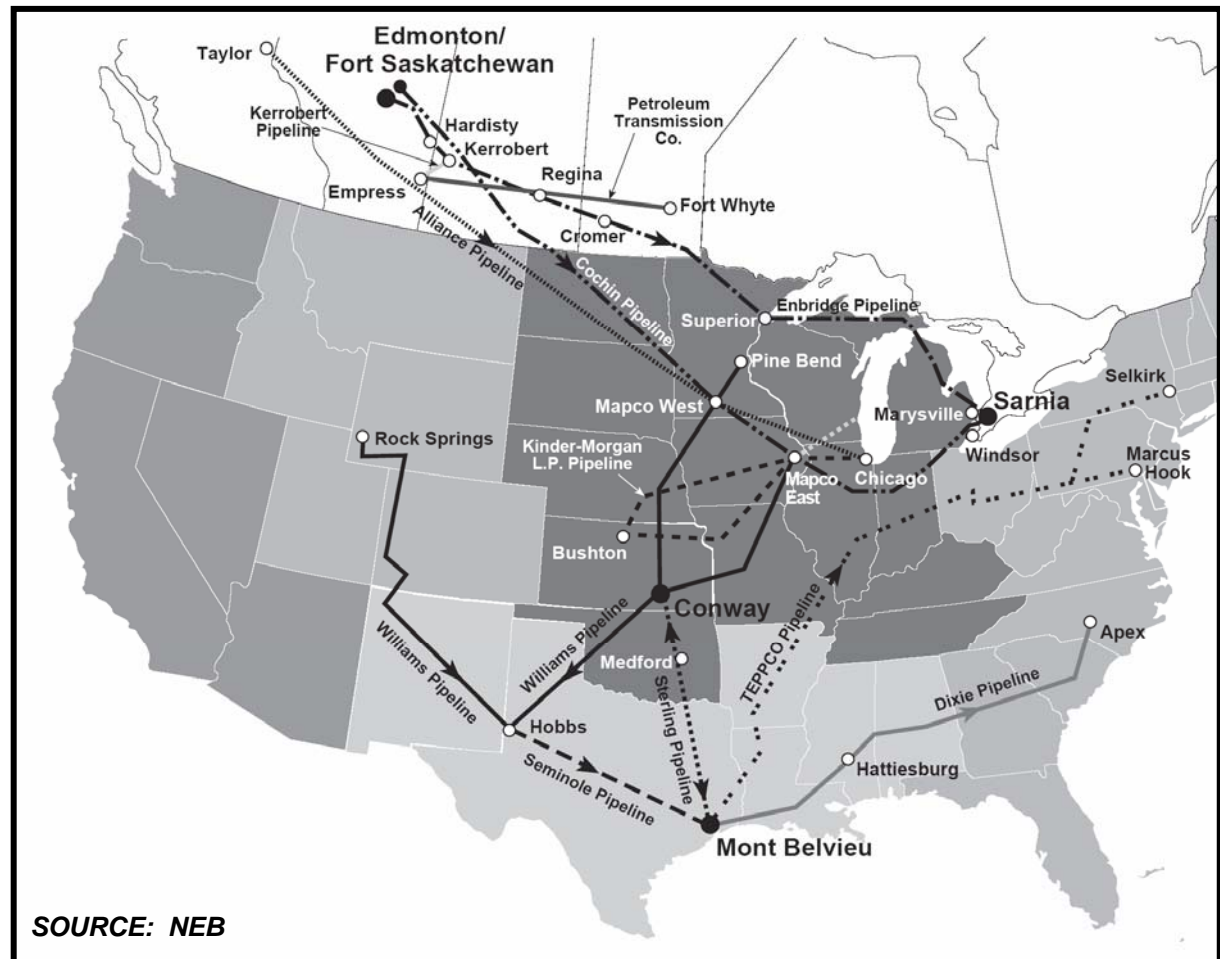
(Mb/d)	
Ethane	625
Propane	505
Normal Butane	130
Isobutane	182
Natural Gasoline	275
Total	1,717



- Overall U.S. demand averaging about 2 million barrels per day (MMb/d)
- 2003 U.S. net imports of natural gas liquids averaged approximately 166,000 barrels per day (Mb/d)

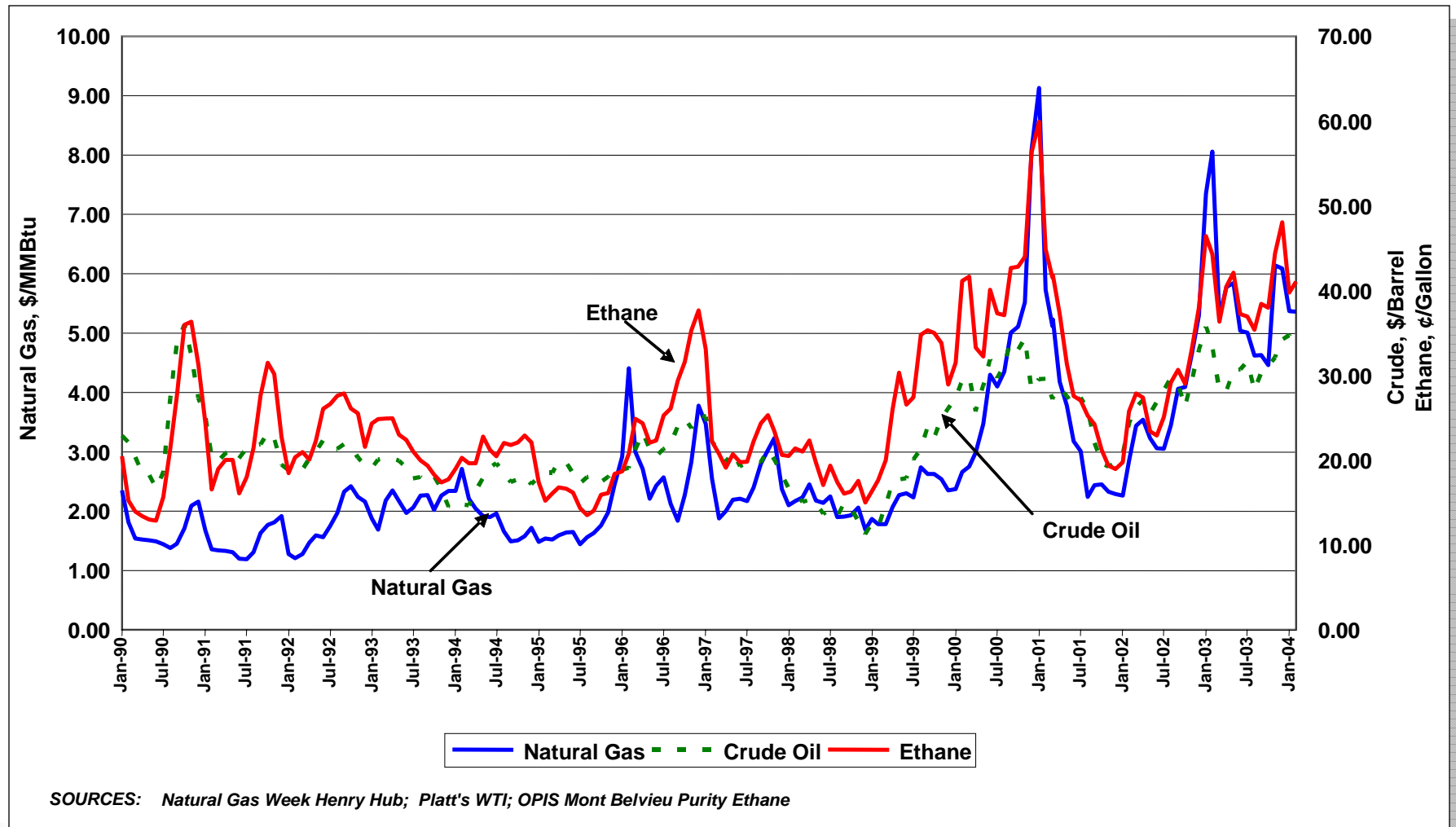
NGL TRADING HUBS

- Mont Belvieu market is the “price setter” or “NGL price reference point” for North American NGL markets
 - Canadian NGL exports represent about 10 percent of U.S. demand
- In the Lower 48, regional market centers are associated with significant NGL fractionation assets
 - Sarnia, Ontario
 - Conway, Kansas
 - Edmonton, Alberta
- Sales to local markets
 - Via truck and/or barge transport
 - “Bottled Gas” distribution



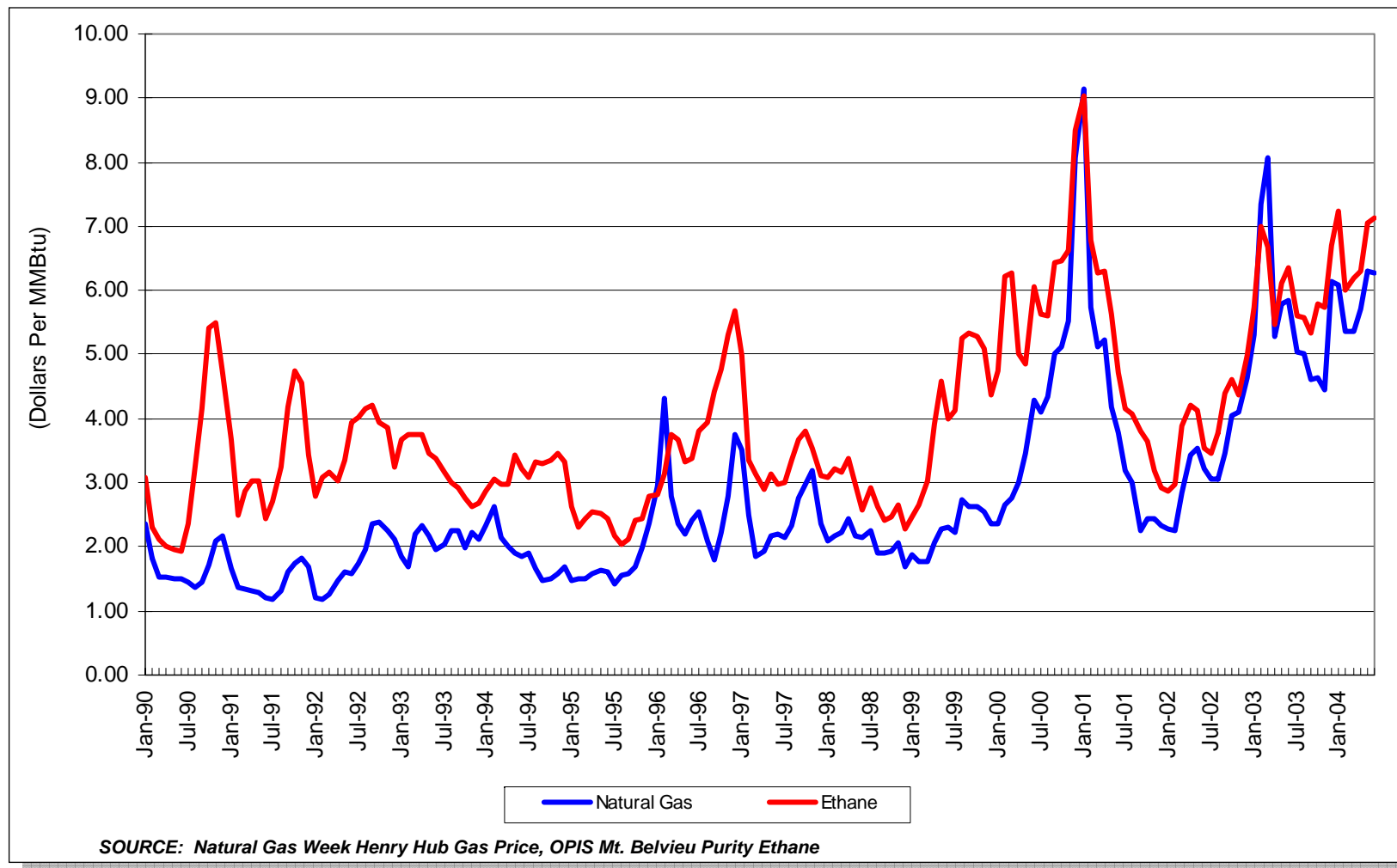
PRODUCT PRICE TRENDS

- In general, ethane tracks natural gas price; propane and butane track crude oil price



COMPARISON OF NATURAL GAS AND ETHANE VALUES

- Although prices for both natural gas and ethane have increased, the difference between the prices for these products has narrowed significantly since late 2000



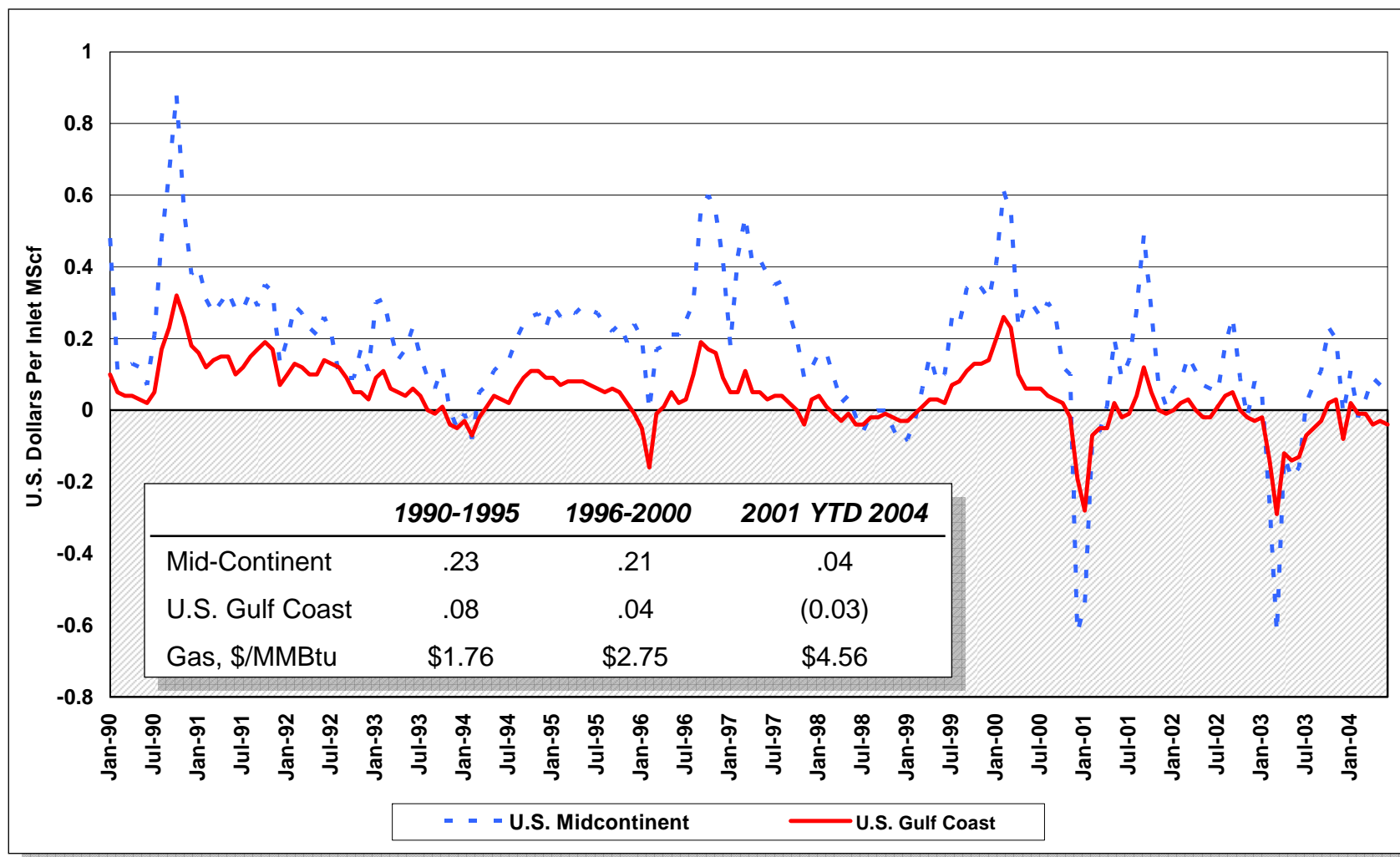
NGL PRICING

- *Energy Information Administration (EIA)* is forecasting that NGL prices will remain essentially flat on a real basis in the long term

- Specific netback pricing for Alaska Gas Pipeline (AGP) delivered supplies will be a function of the total cost to extract the NGL and to transport the products to end-user markets

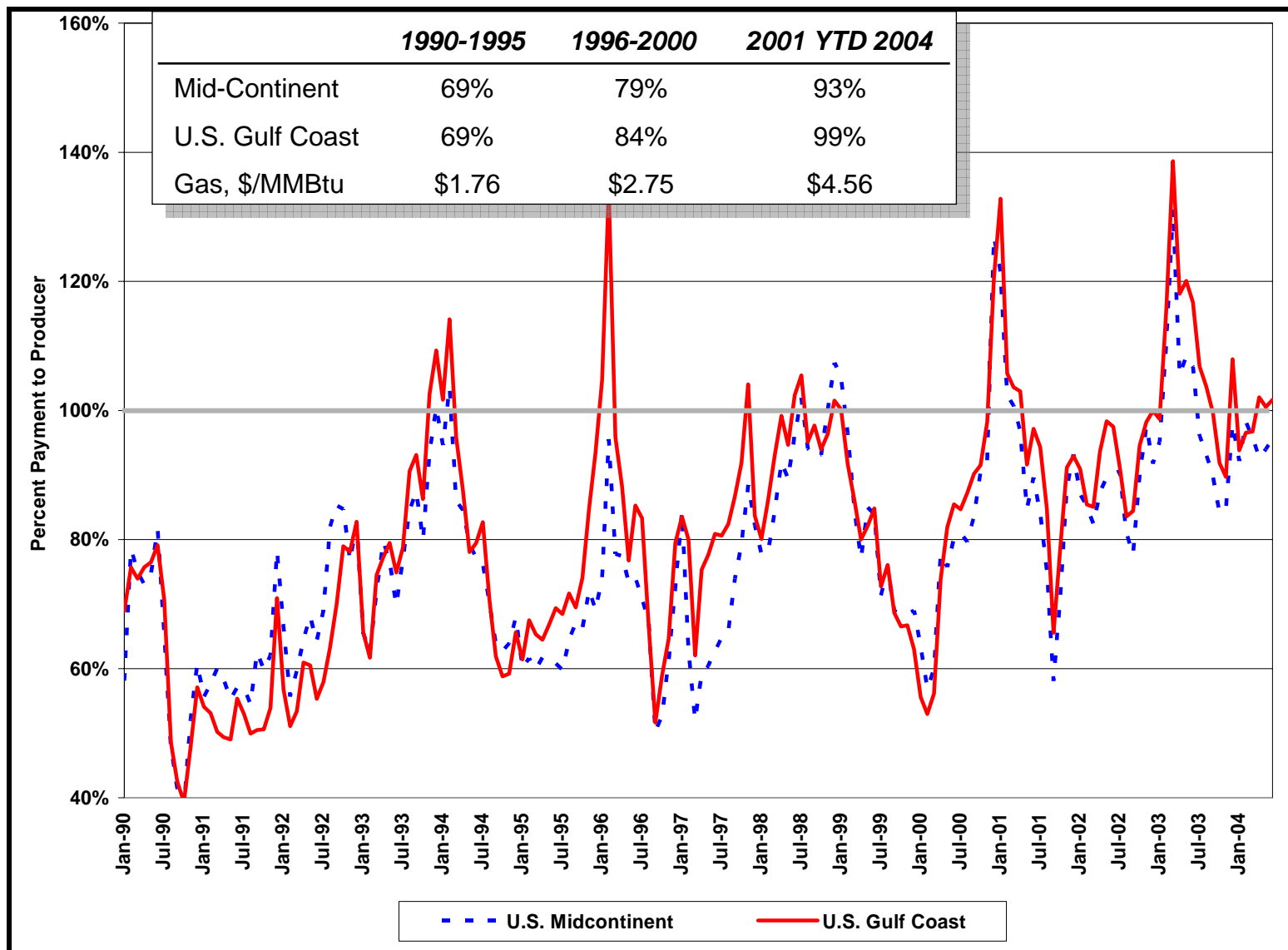
- End-use markets may not develop uniformly for all NGL components and will be dependent on local demand in the geographic location or locations selected for NGL extraction
 - NGL extracted from AGP will be primarily ethane, with significantly lesser amounts of propane and heavier products
 - NGL composition from AGP is expected to be much different than typical Lower 48 NGL mixtures

HISTORICAL NET NGL EXTRACTION MARGIN



**Net Operating Margin = Processing Upgrade Less Plant Operating Expenses
(Excludes Overhead, Capital Expenditures, and Return on Capital)**

PRODUCER'S BREAKEVEN PERCENT OF EXTRACTED NGLs

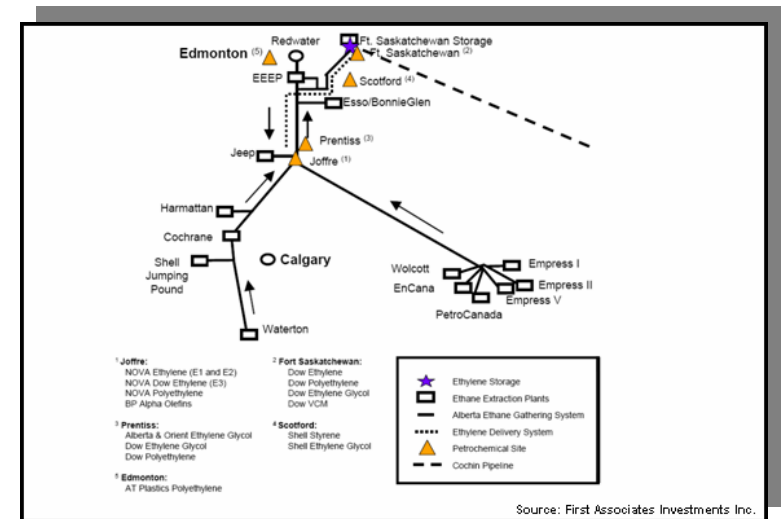


NOTE: Assumes producer stands fuel, shrink, and transportation and fractionation, and no return on capital

ALTERNATIVE DISPOSITIONS FOR AGP THROUGHPUT

➤ Extraction and Petrochemical Manufacturing Outside of Alaska

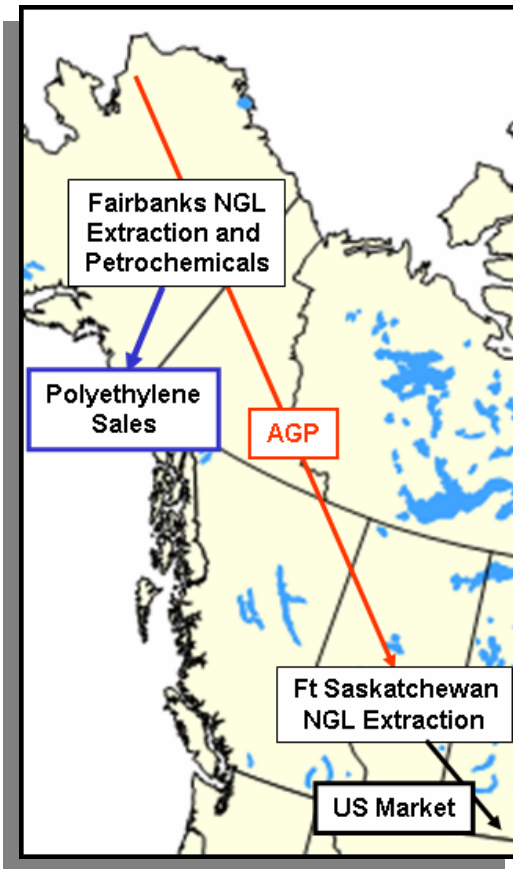
- U.S. Gulf Coast is the largest petrochemical center with 80 percent of existing U.S./Canadian ethylene production capacity
- Other petrochemical centers include:
 - Alberta (primarily near Edmonton) – 12 percent
 - Sarnia, Ontario – 3 percent
 - Various locations within the U.S. Midwest – 3 percent
 - U.S. East Coast – 1 percent
- The nearest existing infrastructure of plausible size is located in Alberta
 - Canada is currently supplying internal demand for NGL and exports excess supply to the U.S. Midwest
 - New gas processing and petrochemical manufacturing capacity or NGL pipeline export capacity may have to be added in Alberta to absorb Alaskan NGL's, depending on the timing of AGP start-up relative to the decline of existing Canadian gas production and development of new sources of Canadian gas, such as the Mackenzie Delta project



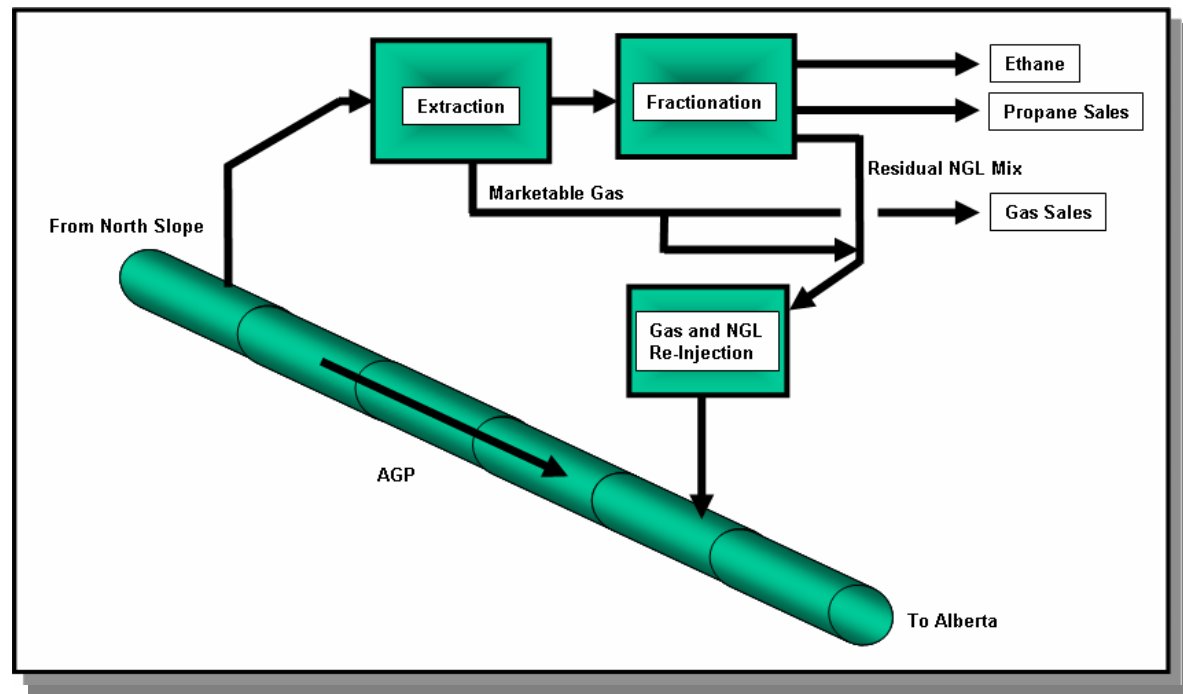
➤ Extraction in Alaska

- Would not likely support economic development of second pipeline to Canada/Lower 48 for NGL only
- Would therefore require development of complete NGL extraction, petrochemical manufacturing, and support system infrastructure
- May also require transportation infrastructure expansions that have not yet been defined

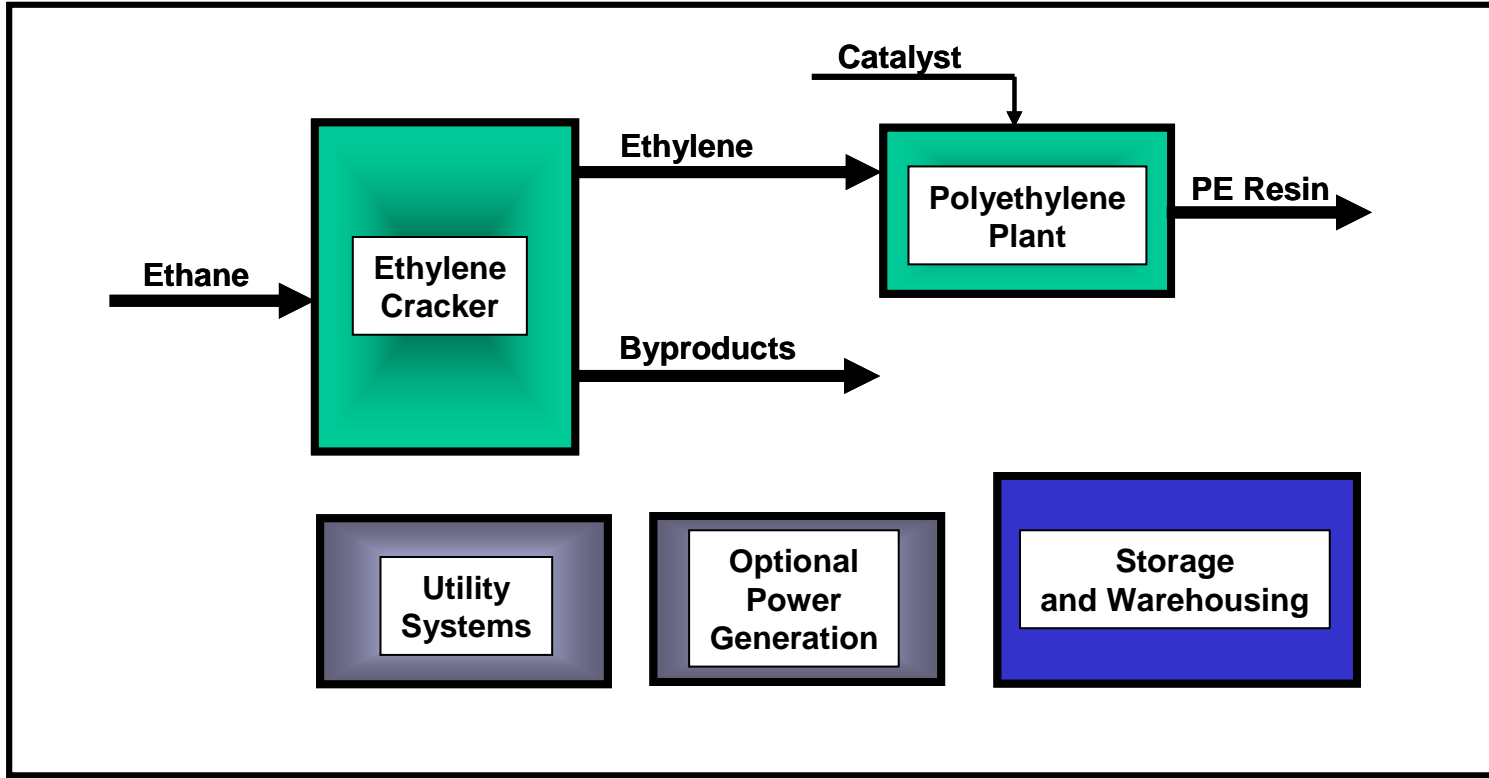
IN-STATE EXTRACTION OF ALASKAN NGL'S



- Fairbanks Extraction Facility to handle up to 1.4 Bcfd of AGP throughput
- Extraction of approximately 40,000 b/d of ethane to feed petrochemical complex and 1,000 b/d of propane for local consumption
- Availability of commercial-quality natural gas for local distribution
- Residue gas (over 1 Bcfd) and excess NGL re-injected into AGP
- Would be required in addition to NGL extraction facilities or access to NGL extraction capacity at AGP terminus



ALASKAN PETROCHEMICAL COMPLEX



- All of the ethane extracted is utilized in the production of ethylene that is subsequently converted to polyethylene (PE) resin
- Cracker to produce 1.5 billion pounds per year of ethylene
- Includes on-site power generation to support facility operations and optionally could generate excess power for local distribution
- Assumes that the PE resin will move on existing rail infrastructure and be exported to the U.S. West Coast by marine vessel out of Whittier

SUMMARY OF FINDINGS

➤ **Advantages of Fairbanks Petrochemical Development**

- Availability of attractively priced feedstock extracted from AGP
- Waterborne access to California market
- Synergy with other potential energy developments
 - Provides pipeline quality natural gas to Fairbanks
 - Could develop gas pipeline to Anchorage (supplement Cook Inlet gas)
 - Possible cogeneration plant tied into regional power grid
 - Off-set Cook Inlet gas decline and power generation

➤ **Disadvantages of Fairbanks Petrochemical Development**

- Variability in gas composition over time
 - Non-optimal sizing and operation of Fairbanks extraction and fractionation plant
- Inherent inefficiency of processing a large portion of the gas twice; first at Fairbanks, then again at pipeline terminus
- Non-optimal sizing of AGP downstream of Fairbanks
- Considerably higher capital cost than other locations
- Higher fixed operating cost than other locations
- Lack of supporting infrastructure
- Lack of market for byproducts

SUMMARY OF FINDINGS (CONTINUED)

➤ Preliminary Economics

- High level analysis indicates that the production of ethylene in Fairbanks is economically less attractive than in either Alberta or the U.S. Gulf Coast
- Advantages of:
 - Lower feedstock price (ethane)
 - Lower variable operating cost advantage, driven mainly by lower gas price
- More than offset by:
 - Higher fixed operating cost due to higher labor and maintenance costs
 - Lower product value due to downgrading byproducts to fuel
- Significantly higher capital costs also a disincentive to invest
- Using recent U.S. Gulf Coast historical benchmarks, and assuming a Fairbanks location could achieve the same operating cash margin, due to the higher investment cost, a Fairbanks ethylene plant would generate a much less attractive rate of return
 - Returns shown below are expressed as capital recovery factor (CRF)

	Return on Capital		
	Annual Revenue \$MM	CRF	
		U.S. Gulf Coast	Fairbanks
2004 YTD	158.5	11.3%	7.1%
2003 avg.	125.0	8.9%	5.6%
2002 avg.	127.0	9.1%	5.7%
2001 avg.	153.6	11.0%	6.8%