The Impact of Higher Energy Prices on Agriculture

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Topics

- An overview of energy markets
- Why energy prices have increased and fluctuated
- Outlook
- Coping with higher energy costs

U.S. Demand for Petroleum Products, 2003

	Million Barrels per Day	Percentage
Gasoline	8.9	50.0%
Distillate Fuel Oil	3.9	21.9%
Jet Fuel	1.6	9.0%
Other Products	3.4	19.1%
Total	17.8	-----

Although 96% of refined petroleum product demand was produced domestically, about 60% of the crude oil refined in the U.S. was imported from other nations.

Source: The National Petrochemical & Refiners Association

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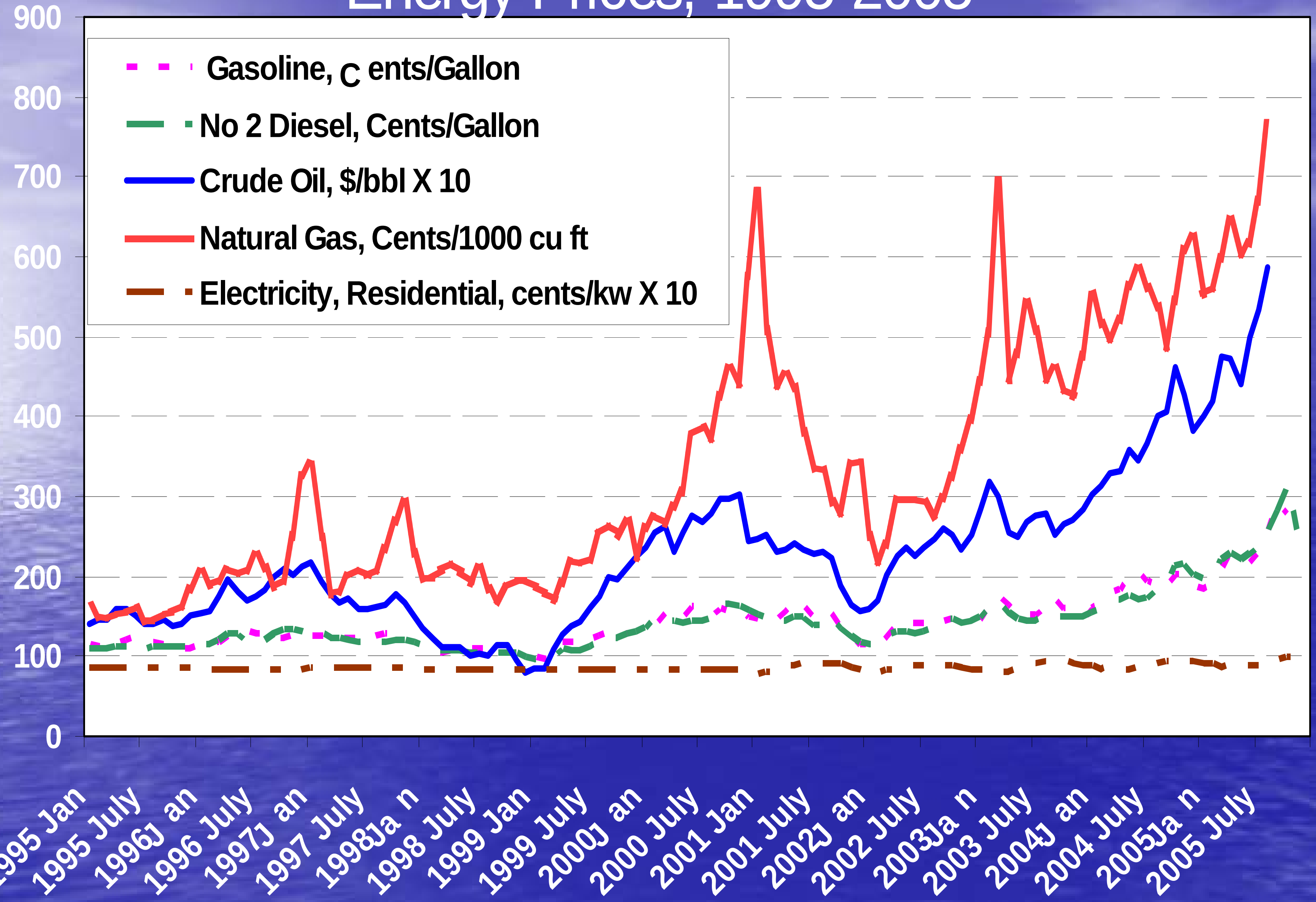
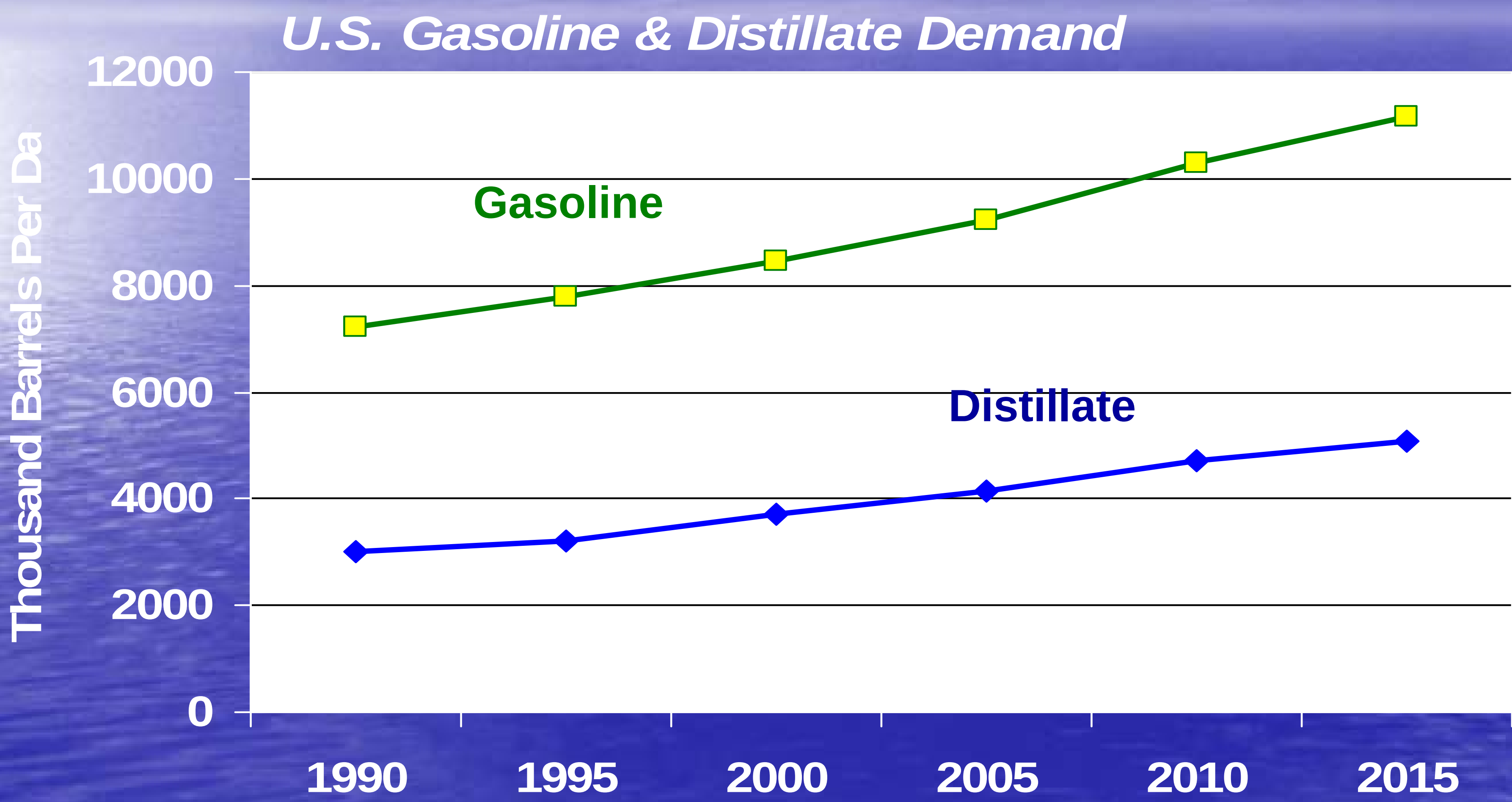
Energy Prices, 1995-2005



Data Source: EIA-USDoE

U.S. Demand Growing for Both Gasoline and Distillates



Source: EIA, USDoE, Annual Energy Outlook 2005

Total Energy Consumed on U.S. Farms in 2002

- Total Use = 1.7 Quadrillion BTU's
  - ✓Fertilizers = 28%
  - ✓Diesel = 27%
  - ✓Electricity = 21%
  - ✓Gasoline = 9%
  - ✓Pesticides = 6%
  - ✓LP Gas = 5%
  - ✓Natural Gas = 4%

Source: Miranowski, USDA Ag Outlook Forum, 2005

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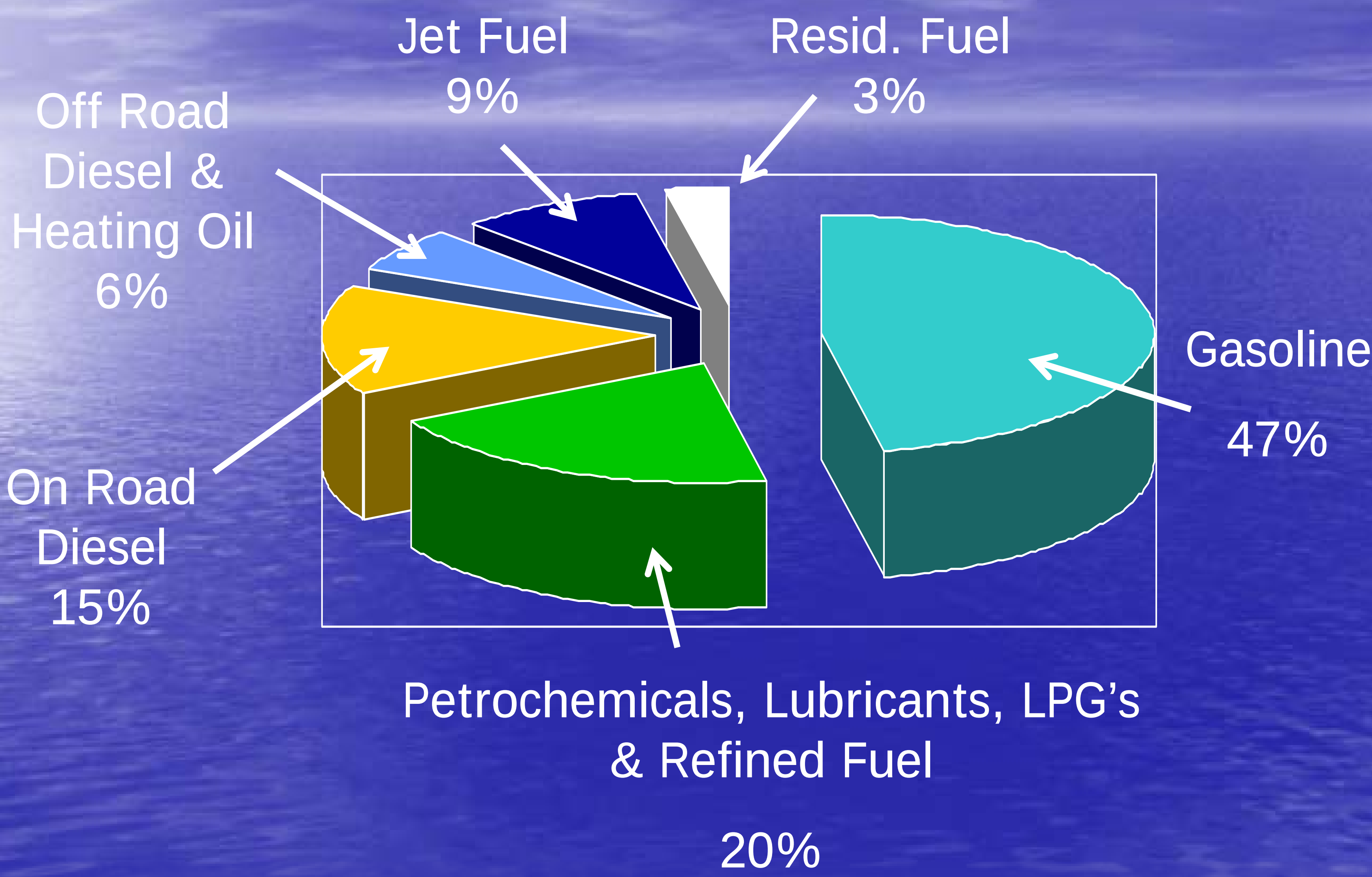
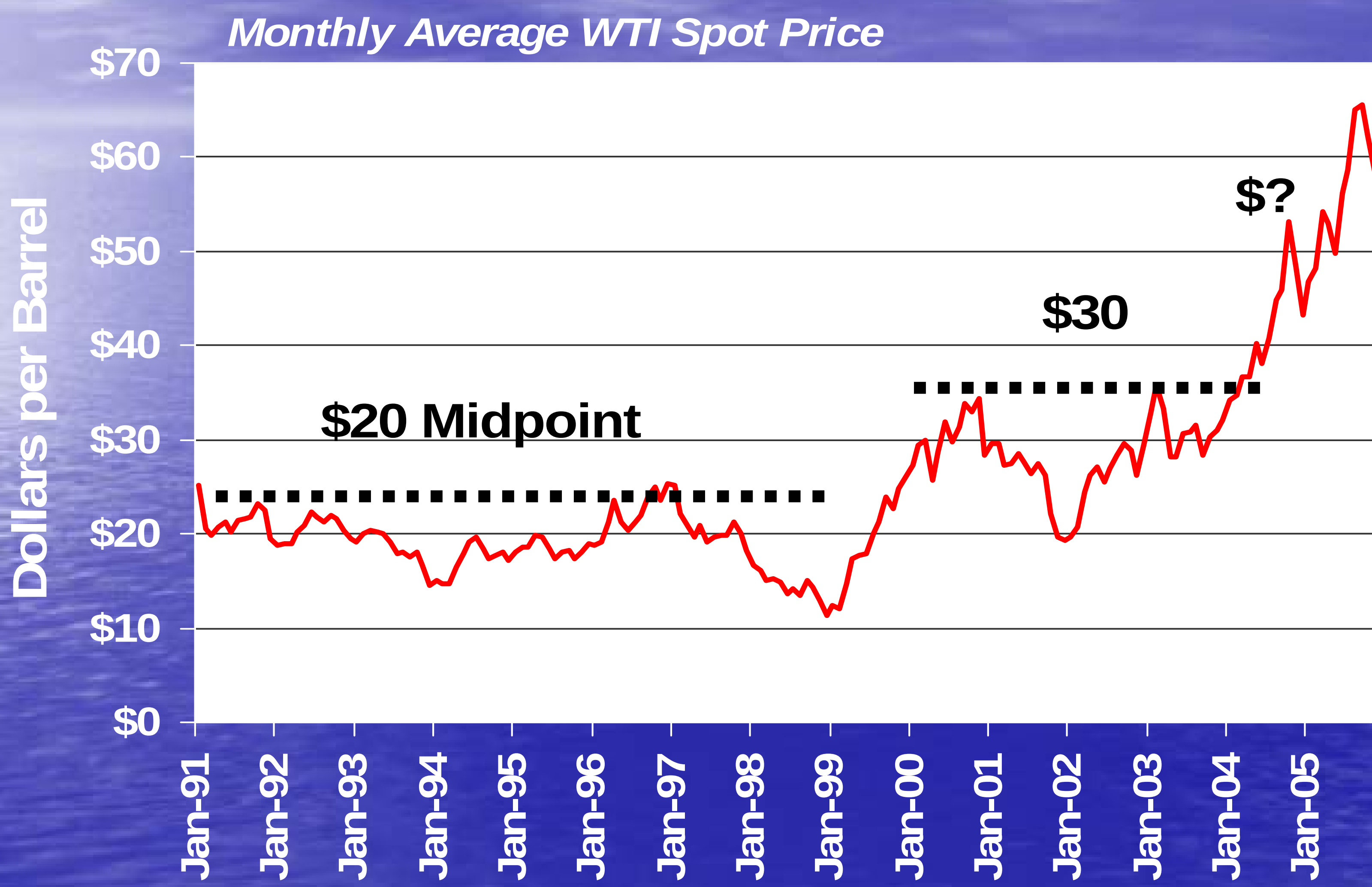
TYPICAL REFINERY PRODUCTION IN 2002



Source: EIA-USDoE

Crude Oil Prices, 1991-2005



Source: Reuters

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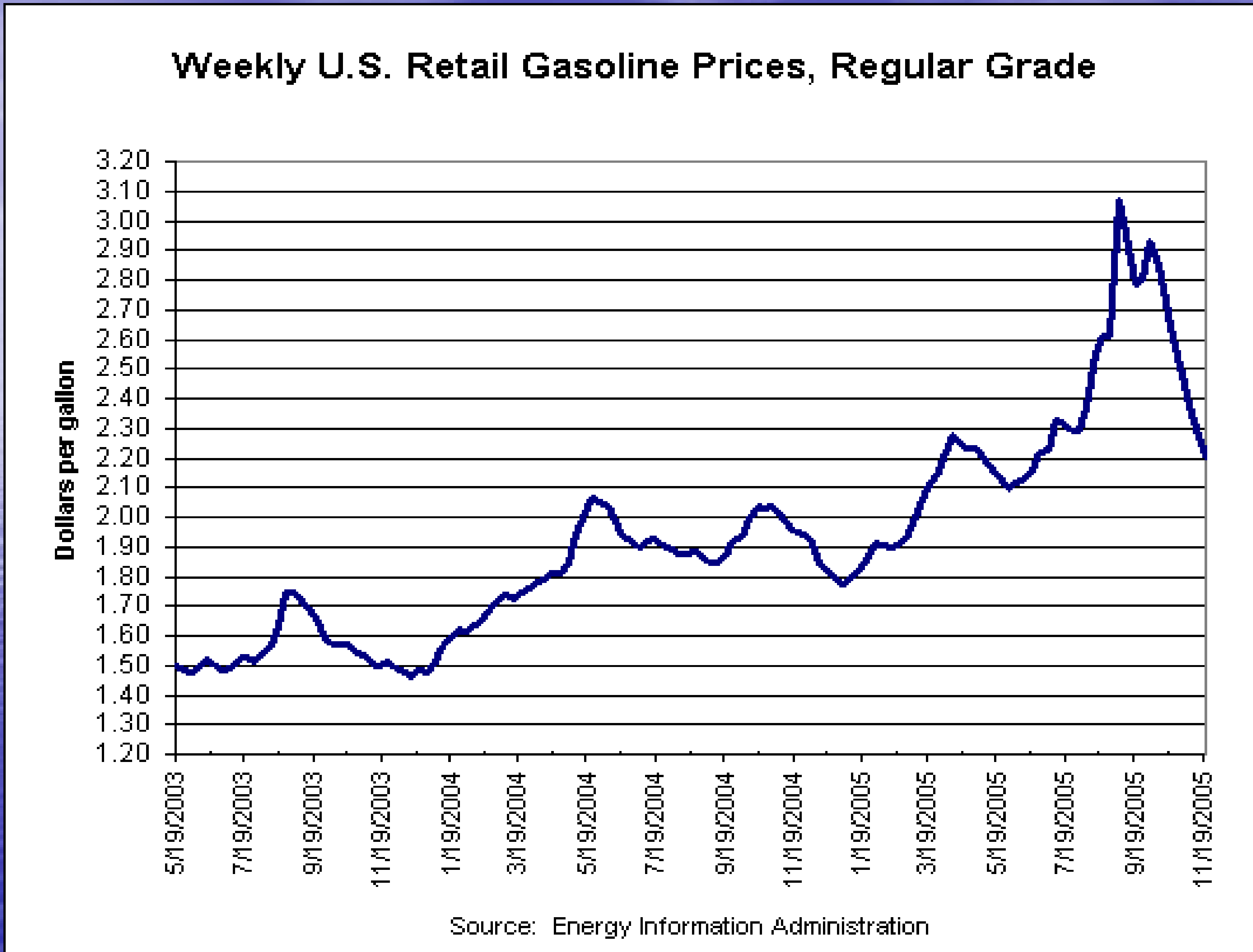

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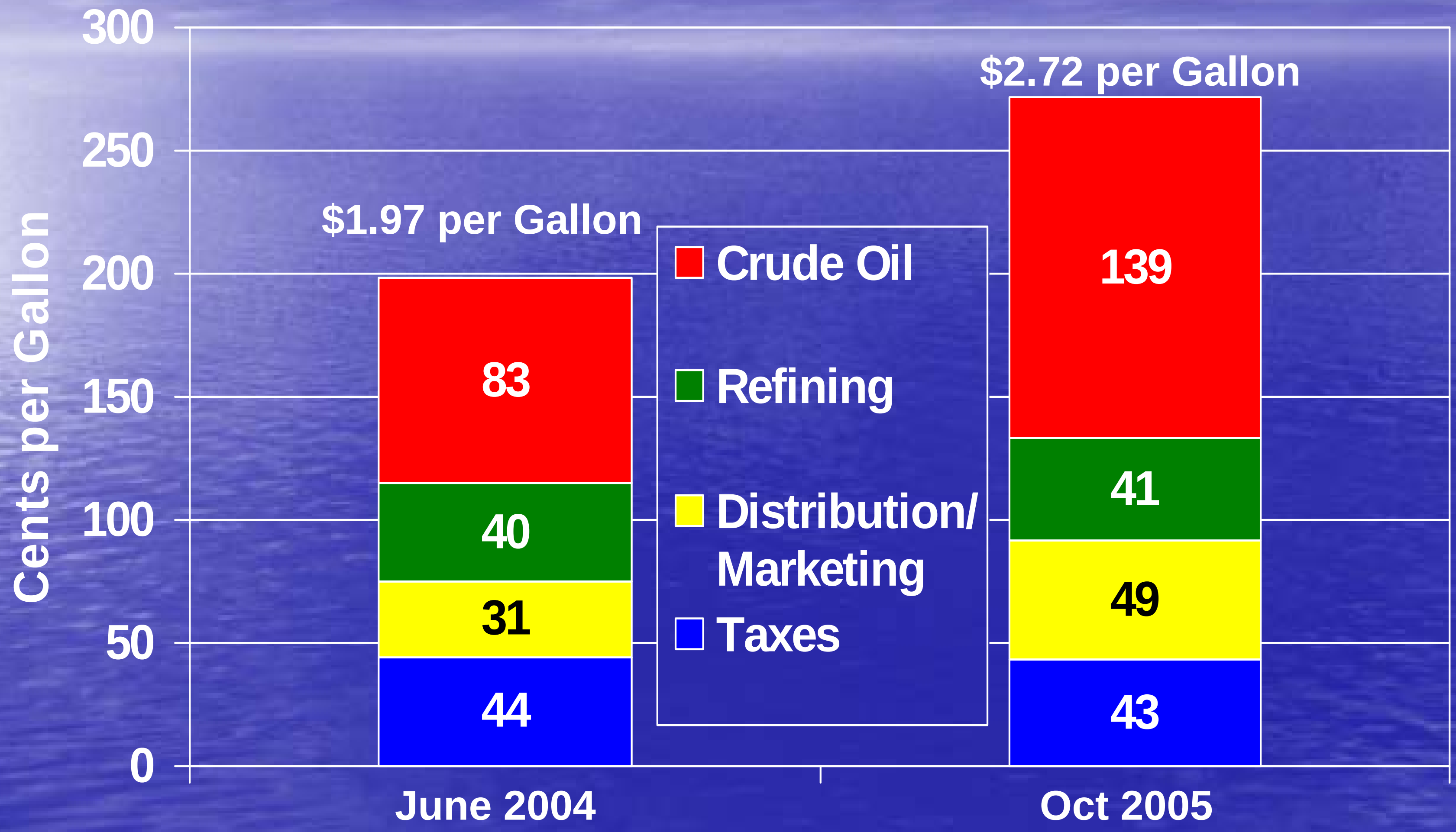
Components of Retail Gasoline Prices U.S. Average, ¢/Gal



Source: EIA, USDoE

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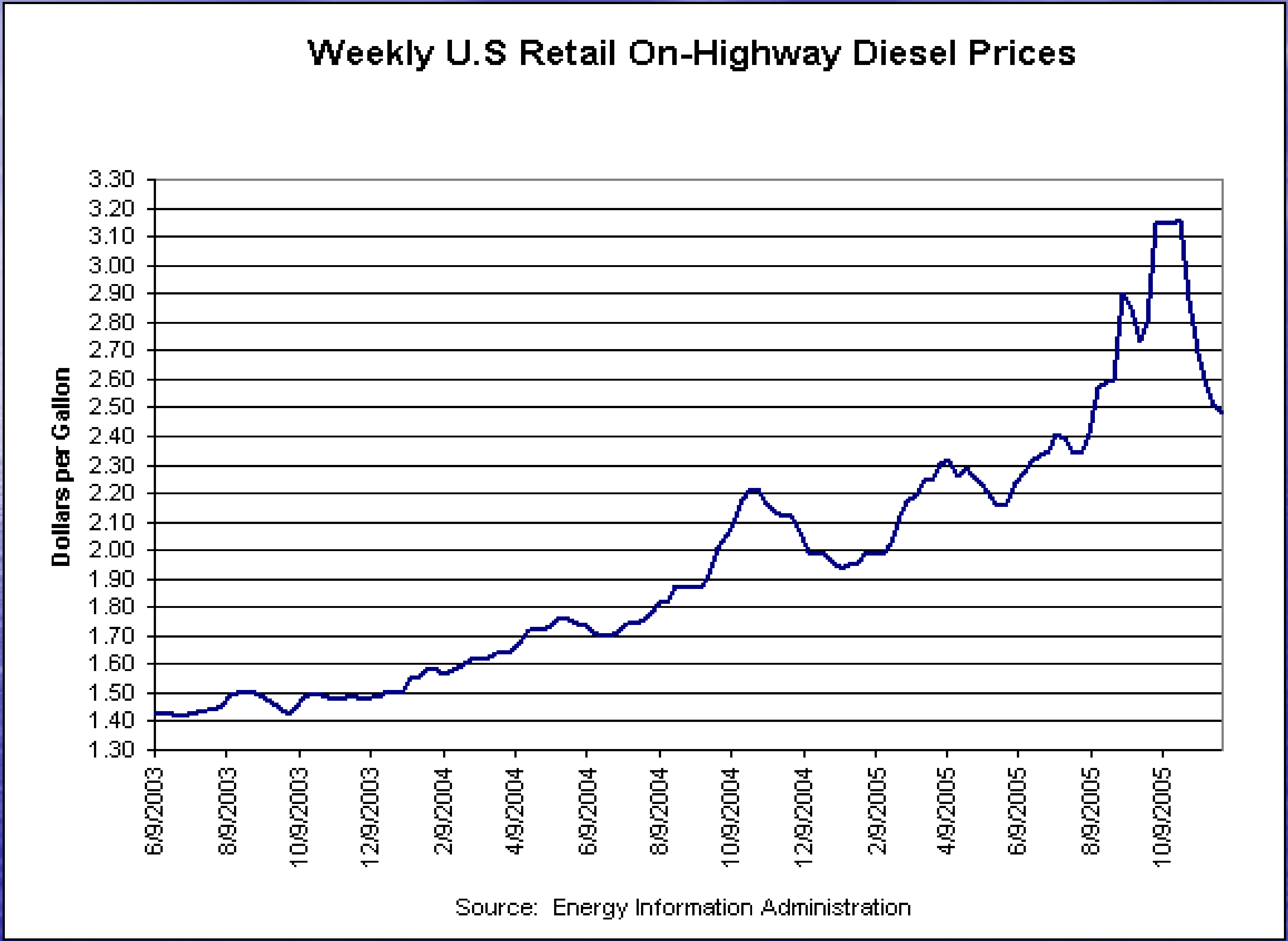
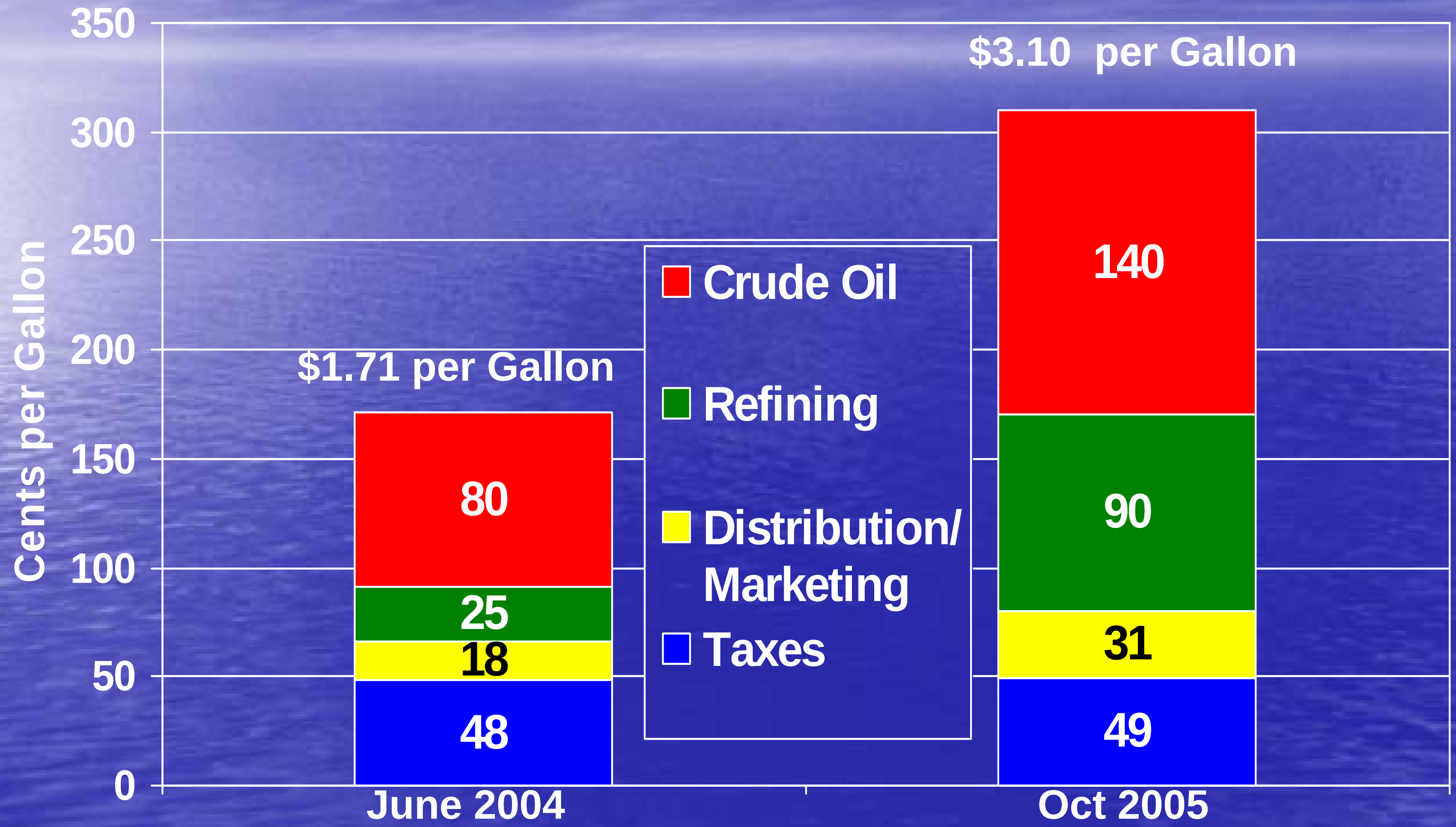


Components of Retail Diesel Prices U.S. Average, ¢/Gal.



Source: EIA, USDoE

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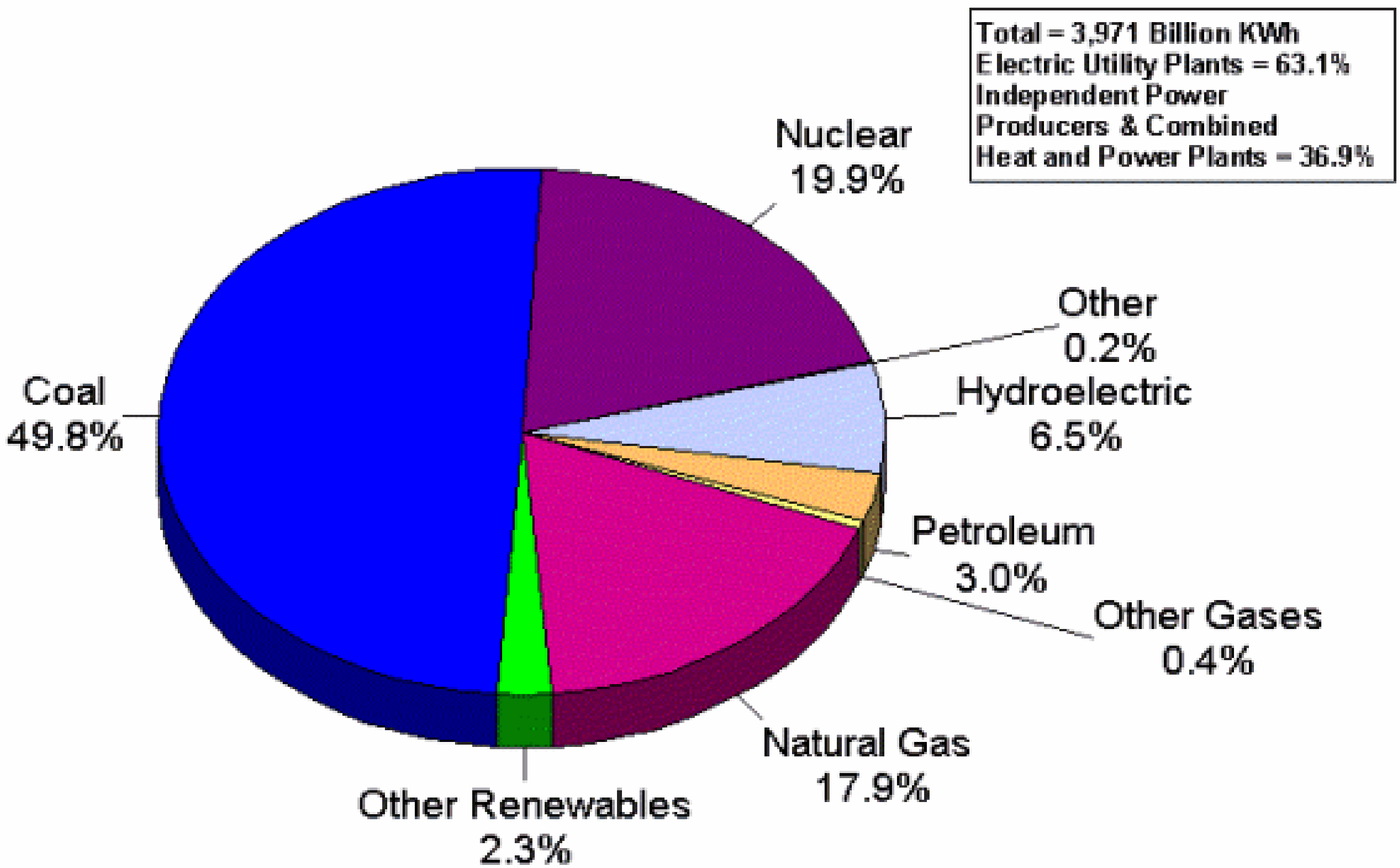
Federal and N.C. Excise Taxes

- Federal (as of 7/18/2005)
  - ✓ Gasoline = 18.4 ¢/gal
  - ✓ Diesel = 24.4 ¢/gal
- North Carolina (as of 7/1/05)
  - ✓ Gasoline = 27.1 ¢/gal
    - ➔ 8th highest gas excise tax in the U.S.
  - ✓ Diesel = 27.1 ¢/gal
    - ➔ 9th highest diesel excise tax in the U.S.

Electricity



Note: Conventional hydroelectric power and hydroelectric pumped storage facility production minus energy used for pumping.

Source: EIA-USDoE

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Causes of higher and volatile oil prices

The “Usual” Suspects

1. Oil demand
2. Oil supply disruptions
3. Environmental concerns
   a. MTBE banned in 6-8 states & replaced with Ethanol
   b. Cleaner refineries
4. Seasonal factors
   a. Higher demand for gas in the summer
   b. Gas prices typically increase by 10 to 15 ¢/gal from January to the summer

Oil Demand

1. China
   - A decade ago, China exported more oil than it imported. In 2004, it passed Japan to become the second largest importer after the U.S.
   - It's inefficient economy consumes three times as much energy per dollar as the world average
2. India
   - Demand has increased due to economic growth

Oil Demand...

3. United States
   - U.S. petroleum demand in 2004 grew at its strongest rate in five years, despite high and volatile prices. (American Petroleum Institute)
   - Total energy demand in 2005 is expected to be flat but petroleum products demand is expected to be down 0.5%, mostly in the last quarter of the year because of supply disruptions and sharply higher prices -- 4^{th} Qtr 2005 demand down 1.8% from 2004

Oil Supply Disruptions

1. Hurricanes Katrina and Rita
2. Geopolitical Events: OPEC accounts for about 39% of the world's production of crude oil and members control more than half the estimated oil reserves
   - Iraq war
   - Unrest in Saudi Arabia, Nigeria, Venezuela
   - Iranian nuclear situation
3. Terrorists Acts
4. Pipeline Outages: Suspected rebels attacks in eastern India

Oil Supply Disruptions

4. Refinery outages
   - Planned & unplanned maintenance
   - Fires &/or explosions – String of refinery fires in the summer of 2005 left oil traders nervous even though supplies were not severely diminished

5. Refinery Capacity
   - The last refinery was built in 1976
   - Little increase in refinery capacity in the last 3 years
     - ✓ 1981: 324 refineries w/ capacity = 18.6 mil barrels per day
     - ✓ 2005: 149 refineries (-117%) w/ capacity = 16.8 million barrels per day (-9.7%)

Oil Supply Disruptions

Hurricanes

- The 2004 and 2005 hurricane seasons in the Gulf of Mexico caused recording-breaking surges in oil and gas related energy prices
- Hurricanes Katrina and Rita damaged, set adrift, or sunk 192 oil and natural gas drilling rigs and producing platforms

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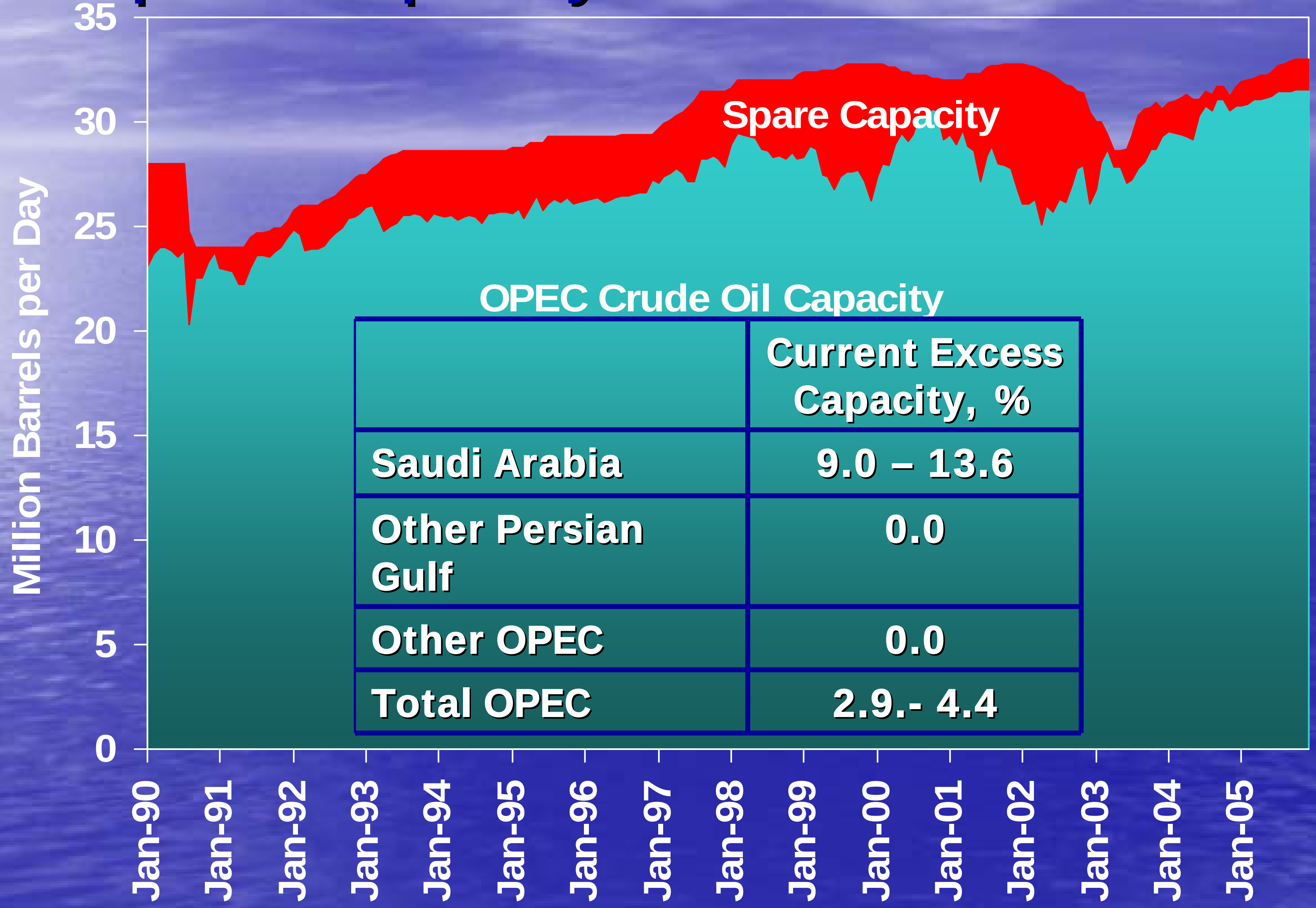
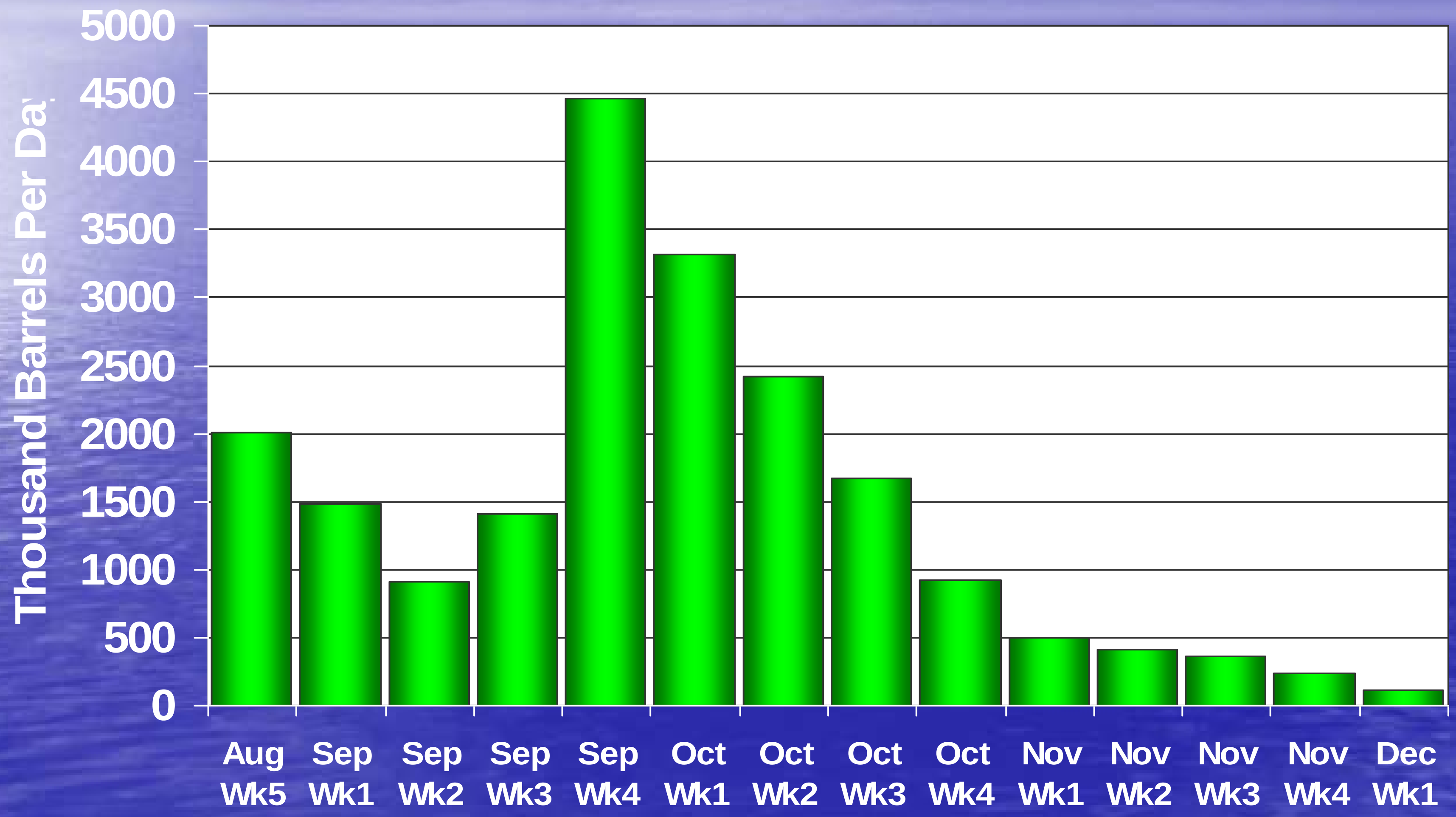
OPEC Spare Capacity Is Limited



	Current Excess Capacity, %
Saudi Arabia	9.0 – 13.6
Other Persian Gulf	0.0
Other OPEC	0.0
Total OPEC	2.9.- 4.4

Source: EIA, USDoE

Estimated Lost Crude Refinery Input Volumes from Katrina & Rita



Factors Affecting Natural Gas Prices

1. High Oil Prices: Some large-volume customers, primarily industrial consumers and electricity generators, can switch between natural gas and other fuels, such as petroleum products, depending on the relative prices of each.
2. Inventories: Natural gas in storage in July were above the 5-year average but hurricanes reduced production and disrupted distribution systems

Factors Affecting Natural Gas Prices

3. Weak production: The second highest number of gas wells in a single year were drilled in 2003, however production has not increased proportionally.
4. Net imports:
   - ✓ 6.6% decrease in 2003 relative to 2002
   - ✓ 3% increase 2004 relative to 2003
   - ✓ Net imports had not reached 2002 levels as of August 1, 2005

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Fertilizers

- Typically, the *most energy-intensive farm input*, accounting for 28% of the total energy consumed in farm production in 2002

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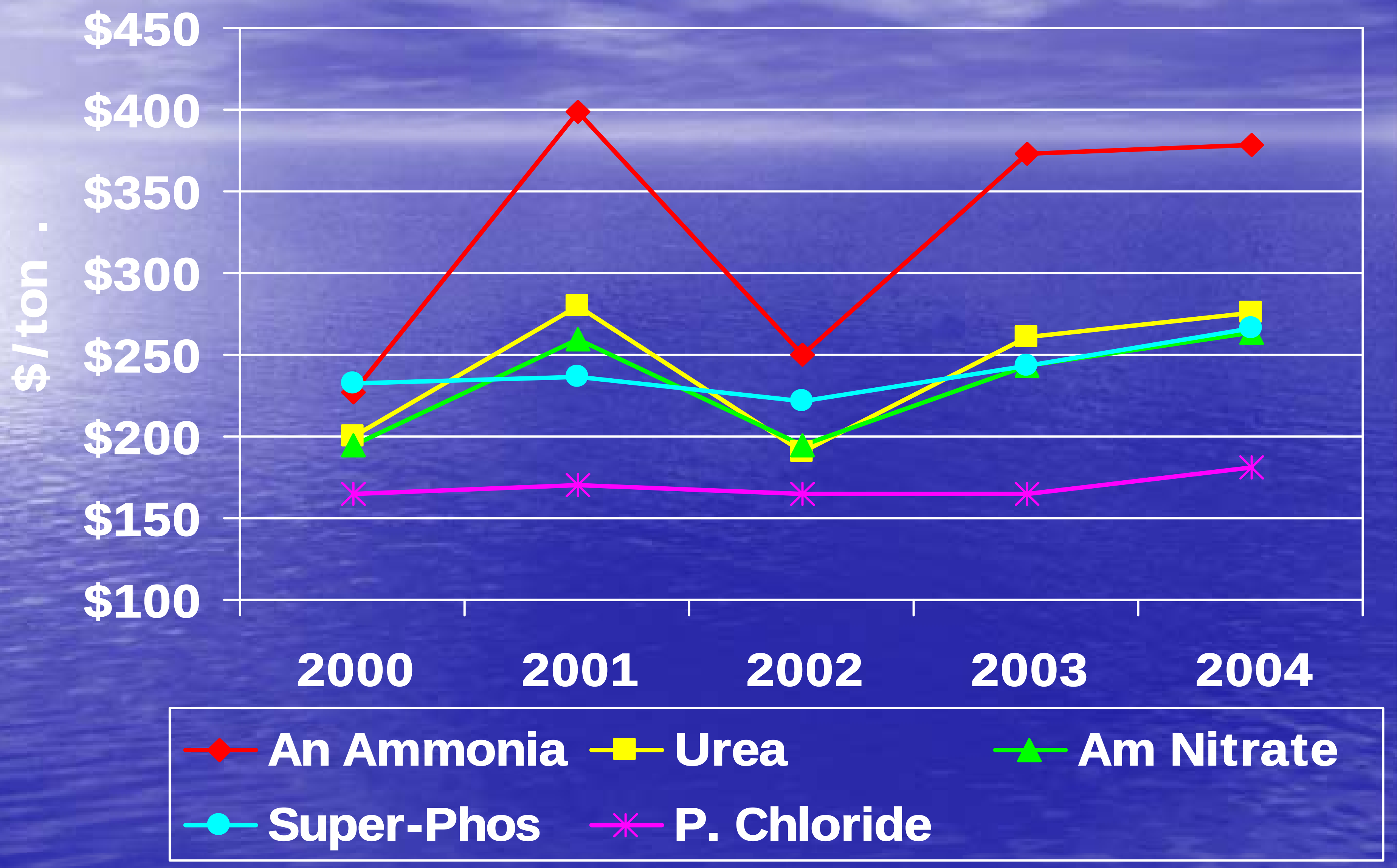
Average Farm Prices for Selected Fertilizers



Source: NASS, USDA

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Prices Paid for Selected Fertilizers

Item	April 2003	April 2004	April 2005	%△ 2003-05
Amm. Nitrate	$243/T	$263/T	$292/T	+ 21%
Urea	$261/T	$276/T	$332/T	+ 27%
Nitrogen Solutions				
28%N	$166/T	$179/T	$218/T	+ 31%
30%N	$161/T	$178/T	$215/T	+ 34%
32%N	$184/T	$197/T	$243/T	+ 32%
Super-phosphate	$243/T	$266/T	$299/T	+ 23%
Muriate of Potash	$165/T	$181/T	$245/T	+ 48%

Source: Ag. Prices, NASS, Apr. 29, 2005

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Nitrogen:

- Natural gas is the feedstock for most nitrogen fertilizer and the US price has risen sharply
- 15 U.S. nitrogen plants have closed permanently since 1998 and 5 were idle in 2005 due to higher production costs &/or plant inefficiencies
- 90% of the new electricity generation in the U.S. has been driven by natural gas and it has become the heating fuel of choice

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Nitrogen:

- U.S. ammonia production has dropped from 17.85 million tons in 1998/99 to 11.7 million tons in 2003/04
- Imports account for over 50% of supply -- N imports have increased from 6.11 million tons to 10.36 million tons from 1998/99 to 2003/04
- Until recently there has not been an incentive to develop new sources of natural gas due to the low prices and three mild winters in a row

Phosphate

- Tighter world markets have caused phosphate fertilizer prices to increase starting in 2001
- Current prices are expected to stimulate higher production but it will take 2-3 years
- Energy cost is a factor in production and transportation costs for P fertilizers

Sources: International Fertilizer Industry Assoc & Ken Nyiri

Potash

- The price of potash increased 75% in the last two years because global capacity is extremely tight and demand remains strong
- US imports K2O -- Canada and Russia account for 2/3's of the world capacity
- Current prices are expected to stimulate higher production but it will take 3-4 years before the market situation eases

Pesticides

- In recent years, major manufacturers have increased production efficiencies, limited inventory, merged, hedged, downsized and pitted suppliers against each other to keep retail prices competitive with no-frills generics and biotech options
- Now they say they are running out of ways to cushion farmers from higher costs.
- But the good news is that prices likely won't take as big of a leap for chemicals as they have for other energy-based inputs

Source: Article by Forrest Laws, November 2005

Plastics

- Petroleum based -- Dramatic increase in prices late in 2005 as oil costs soared
- This followed a period of decreasing prices for polyethylene and polypropylene during the first half of 2005
- Contributing Factors to declining price:
  - Lower demand
  - PVC exports to China decreased due to unexpected increase in China's production (production capacity increased from 1.7 billion lbs in 2004 to 4.7 billon lbs in 2005).

Outlook

"Prediction is very difficult, especially if it's about the future."

Nils Bohr,

Nobel laureate in Physics

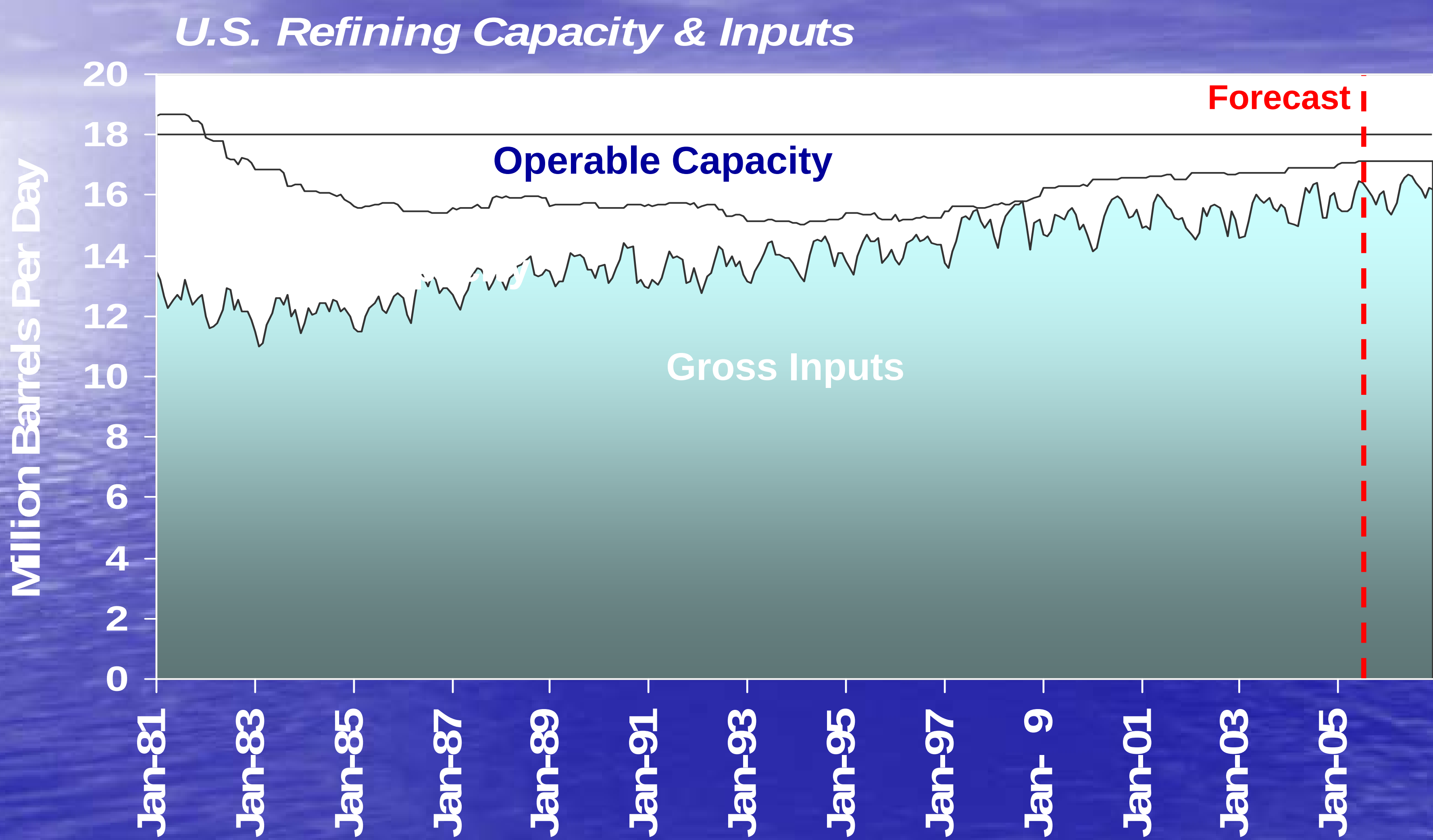
Oil Supply

- Supply-risk concerns focus on six nations that currently provide 45% of U.S. oil imports
  - OPEC Members:
    - Iraq
    - Venezuela
    - Nigeria
  - Mexico
  - Angola
  - Russia

Oil Supply

- There is almost no spare crude capacity in the world; perhaps 1.4 to 1.5 million barrels with nearly all of it in Saudi Arabia
- Will Saudi Arabia have a sharp decline in their output in the future?
  - View not supported by DoE experts
- Russia has yet to seriously pursue their Siberian oil supplies
- U.S. oil refineries are currently running at or near full capacity

US Refining Capacity



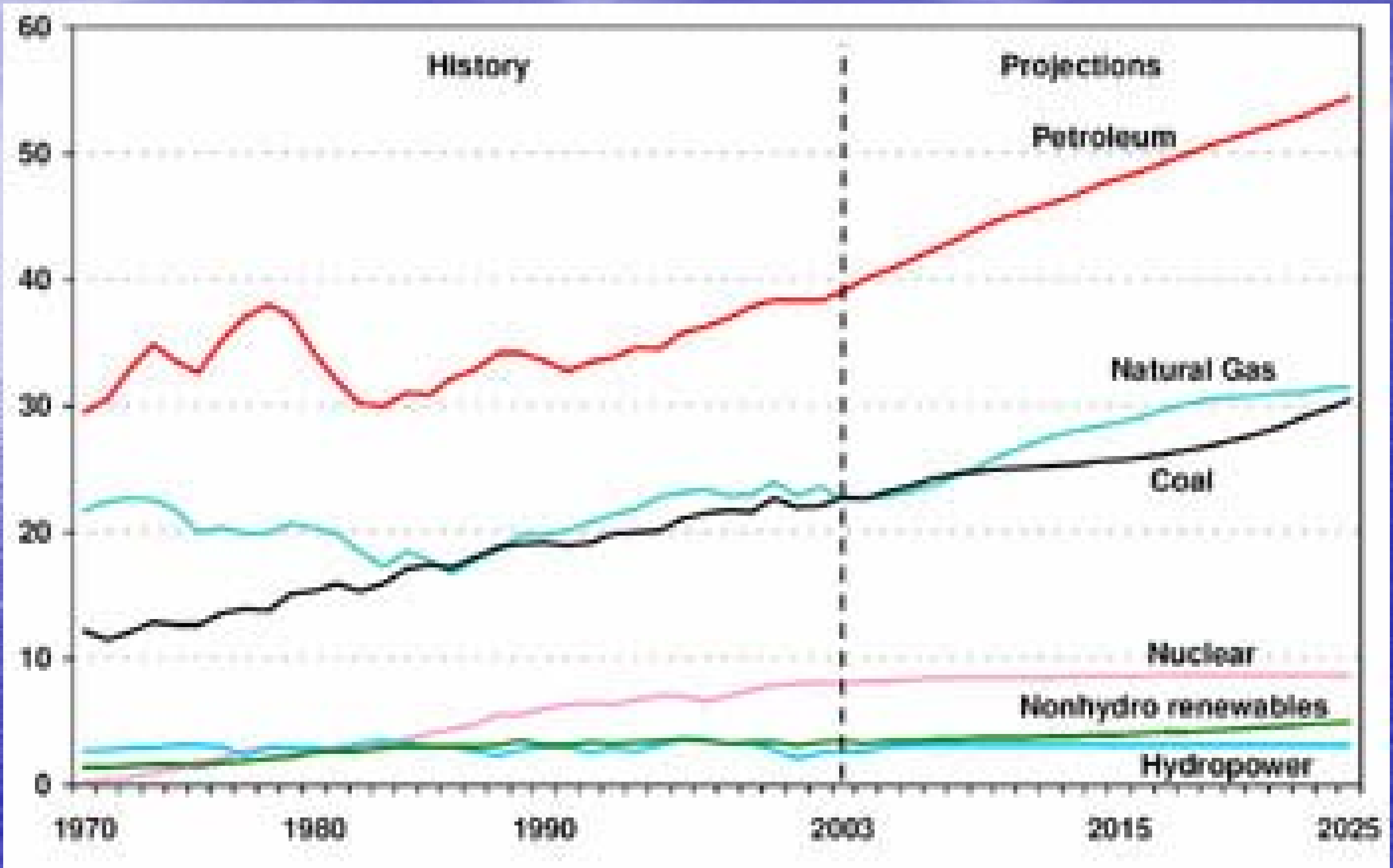
Source: EIA, USDoE

Oil Demand and Prices

- With China and India's booming economic growth, oil demand will likely continue to rise.
- The U.S. economy remains "robust" - the 3rd quarter GDP recorded a growth rate of 4.3%
- Oil will likely stay high unless there is a major slowdown in economic growth in the U.S., China, or collectively in a number of smaller countries

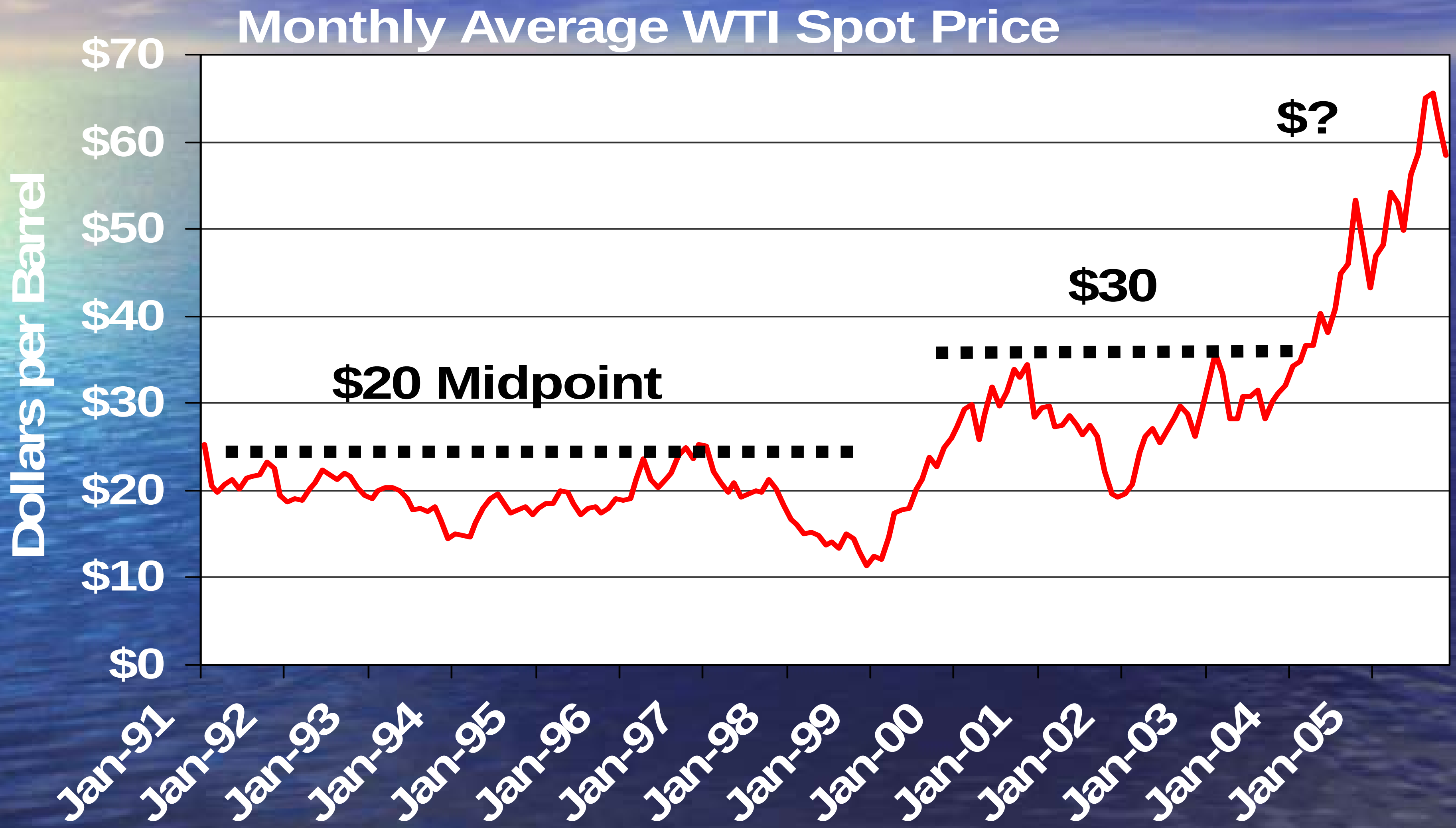
Sources: BEA, USDoC and Jason Schenker, Wachovia Economist

US Energy Use, Actual and Forecast



Source: EIA,USDoE

How High Will Crude Oil Prices Rise Before Demand Growth Slows Substantially?



Source: Reuters

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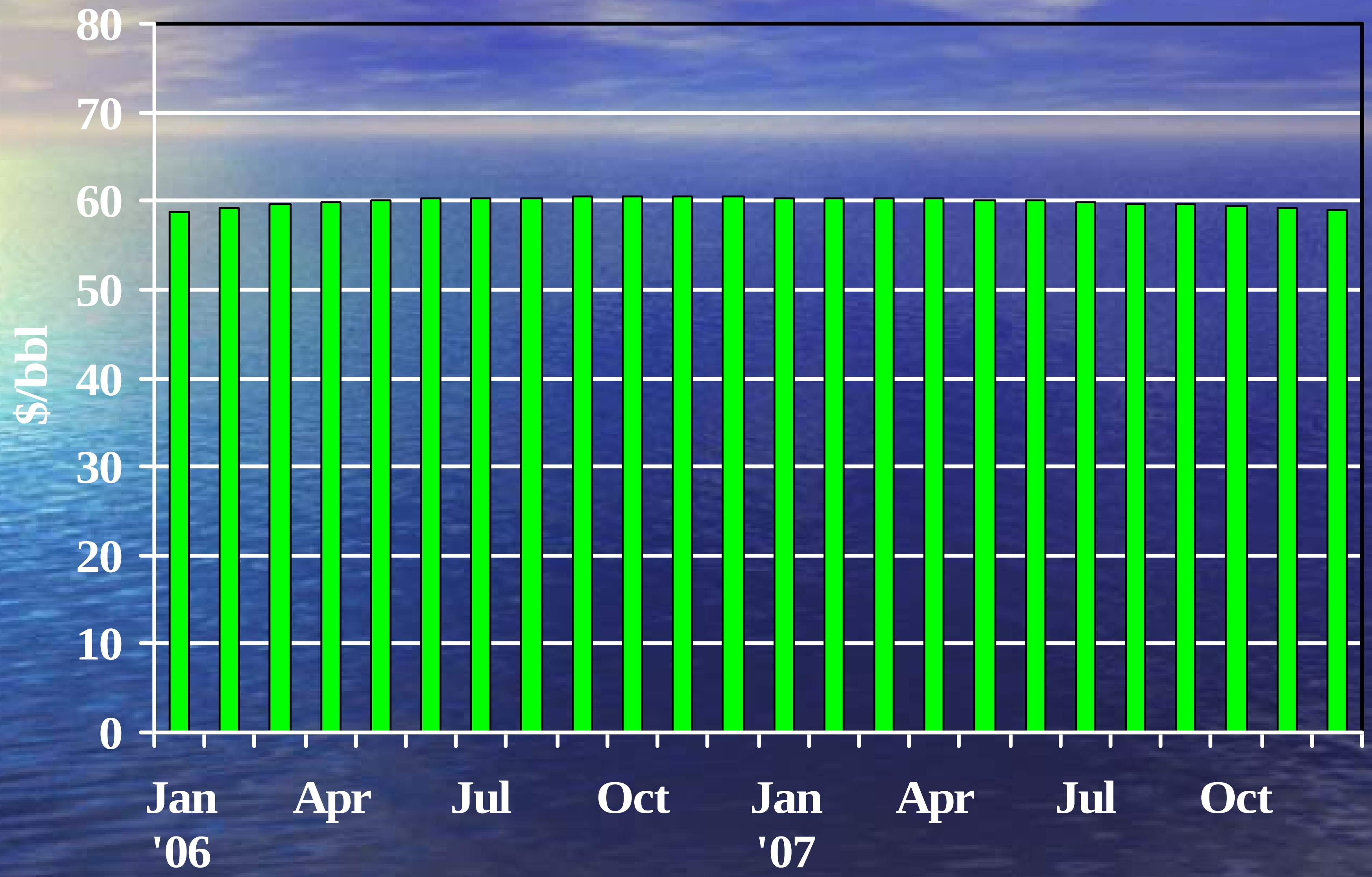
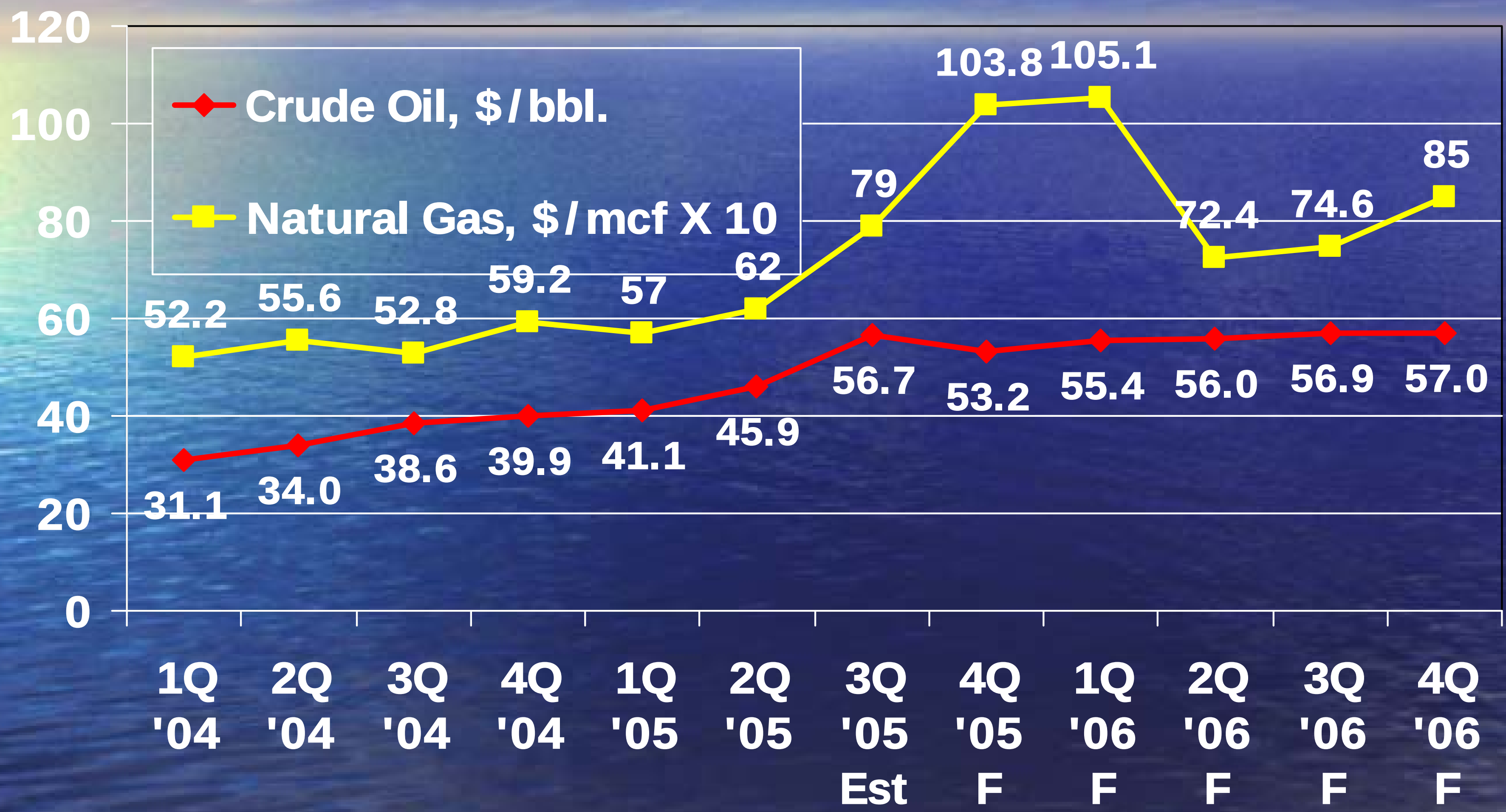
Oil Futures, $/bbl, 11/29/05



Oil & Gas Prices with Forecasts



Source: EIA, USDoE

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Energy Outlook

- Electricity
- Diesel
- Fertilizers
- Chemicals

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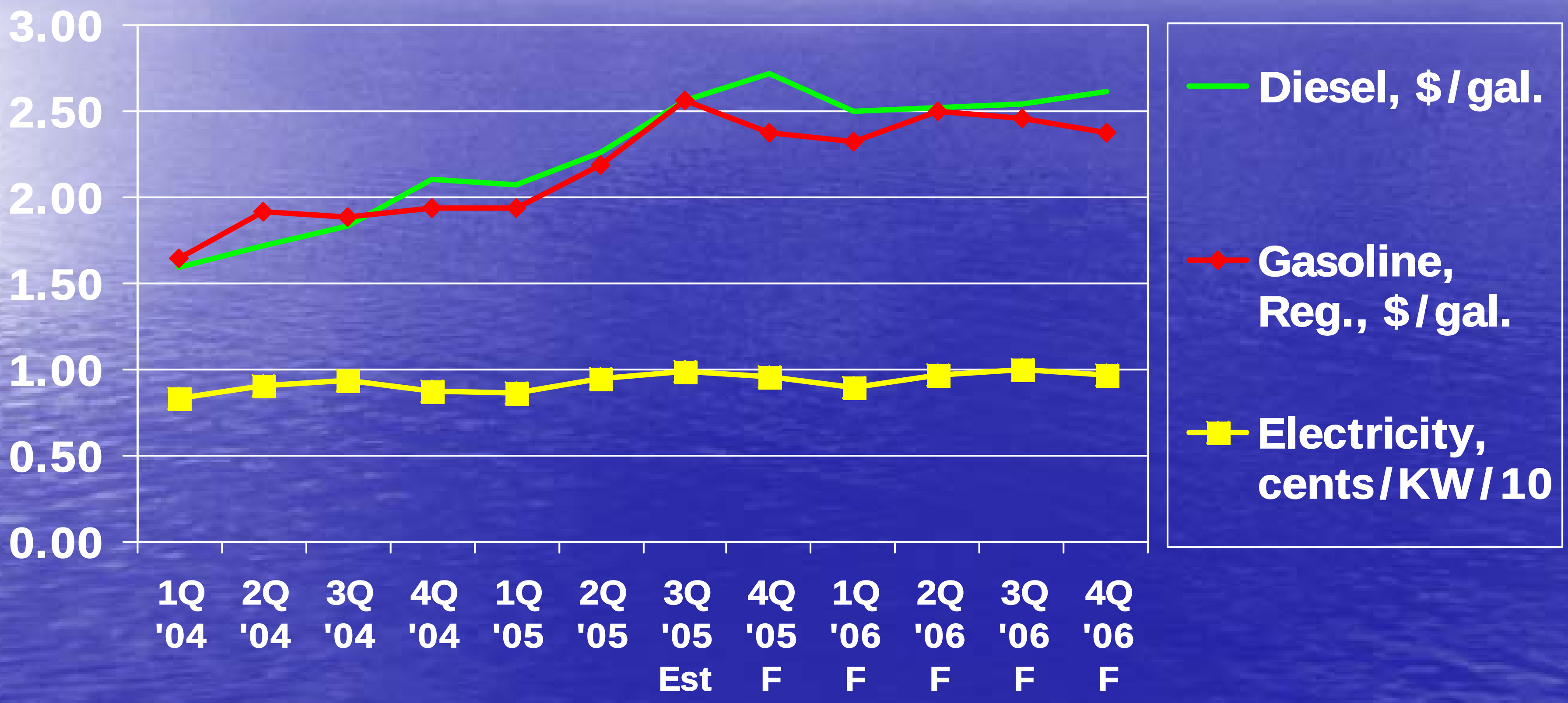
Fuel & Electricity Prices with Forecasts



Source: EIA, USDoE

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Futures-Based Price Forecasts for Diesel Fuel as of December 1, 2005, by Kevin Dhuyvetter, KSU

Price Change From Previous Year			
Month/Year	% Change	Month/Year	% Change
Sep-05	+57.7%	Apr-06	-1.0%
Oct-05	+67.5%	May-06	+6.9%
Nov-05	+35.2%	Jun-06	-0.2%
Dec-05	+15.6%	Jul-06	-4.6%
Jan-06	+23.0%	Aug-06	+3.6%
Feb-06	+21.7%	Sep-06	-21.4%
Mar-06	+6.2%	Oct-06	-33.5%

Based on Nov 30, 2005 futures contract closing prices for crude oil, as traded on the New York Mercantile Exchange

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Futures-Based Price Forecasts for Anhydrous Ammonia as of Dec. 1, 2005, by K. Dhuyvetter, KSU

Price Change From Previous Year			
Month/Year	% Change	Month/Year	% Change
Sep-05	+35.1%	Apr-06	+33.3%
Oct-05	+33.2%	May-06	+12.3%
Nov-05	+28.7%	Jun-06	+22.9%
Dec-05	+35.5%	Jul-06	+28.2%
Jan-06	+59.8%	Aug-06	+22.2%
Feb-06	+67.7%	Sep-06	+0.8%
Mar-06	+43.1%	Oct-06	-2.8%

Based on Nov. 30, 2005 futures contract closing prices for natural gas, as traded on the New York Mercantile Exchange

Other Inputs

- Phosphate and Potash fertilizer costs will be somewhat higher in 2006 because of continued tight markets and higher energy and transportation costs
- Pesticide prices will also rise to reflect the higher cost of the energy component

How will you cope with the projected higher prices for energy and related products?

There are no easy answers or "silver bullets".

Implications

- Nitrogen fertilizer
  - It is not usually cost effective to reduce N applications below recommended rates for field crops
  - Shop around and compare sources and prices on a per pound of N basis and
    - Ammonia – Anhydrous = 82-0-0, Ammonium Nitrate = 34-0-0, Ammonium Sulfate =21-0-0
    - Liquid N solutions
    - Urea – (46-0-0)
    - Animal wastes, litter, composts, byproducts
  - Consider application costs, agronomic and safety characteristics
  - Make sure other nutrients and pH are not limiting factors for crop development – soil test

Implications...

Fuel consumption

- Estimate fuel use for tractors and self-propelled equipment @ 0.044 gals per hour per rated HP to evaluate fuel use
- Economize on use by changing field operations – less tillage, combining field trip operations
- Maintain engines as recommended by the manufacturer, e.g., oil and filter changes, type of oil

Implications...

- Evaluate individual crops and crop mix
  - Match crops to soil type and productivity
  - Assess the effects of higher energy costs on total production costs
  - Assess the price outlook, government price and income programs, and yield history to project net returns from individual crops
  - Estimate the combined effects on overall farm income and cash flow. If necessary, evaluate alternative strategies for maintaining the financial viability of the farm and make contingency plans

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Implications...

- Forage crops for on-farm use
  – Consider using legumes or adding legumes to grass mixtures as a replacement N source
  – Modify fertilizer and grazing management practices to optimize grazing and reduce mechanical harvesting costs
    -- Rotational grazing
    -- Stockpiling
  -- Buy hay to replace home-grown hay
  -- Buy by-product feeds with higher fiber content as forage extenders

Summary

- Nitrogen fertilizer, diesel fuel and electricity are the main types of energy used in agriculture
- N fertilizer prices are driven by natural gas prices; diesel prices depend on crude oil prices; electricity is generated form multiple sources and prices have been stable
- Hurricanes Katrina and Rita disrupted Gulf production, refining and supplies of oil, fuels and natural gas causing a sharp but temporary price spike
- Higher energy prices are expected to persist through 2006 because of tight oil and natural gas markets
- US dependence on imports of crude oil and little excess refining capacity creates risks of supply disruptions and price spikes

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Summary

- Farmers should evaluate the likely impact of higher nitrogen fertilizer and diesel fuel prices on the profitability of individual crops and farming practices
- At best, adjustments to farming operations will reduce but not eliminate the effects of higher energy prices
- It would be prudent to develop a plan for managing farm and family finances if farm income is reduced significantly in 2006

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Internet Resources

- US Department of Energy, Energy Information Administration at http://www.eia.doe.gov/
- Futures prices at http://www.daily futures.com/energies
- Kansas State University, Department of Agricultural Economics, AgManager Program at http://www.agmanager.info/
- US Department of Agriculture,
  - Economic Research Service, for farm income and cost of production information at http://www.ers.usda.gov/Briefing/FarmIncome/
  - Energy initiative and tools at **http://www.usda.gov/energy**
- Farm enterprise budgets:
  - NCSU at http://www.ag-econ.ncsu.edu/extension/Ag_budgets.html
  - National searchable data base at http://www.agrisk.umn.edu/Budgets/

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