Why were the prices so high for Gasoline in 2005

- World demand is nearly exceeding supply.
- Hurricanes took out 25% of U.S. crude production and 10-15% of U.S. refinery capacity. After Hurricane Katrina, Saudi Arabia offered to increase capacity by 500,000 barrels a day. U.S. refineries rejected their oil because they can’t handle “sour” crude oil.
- Seasonal demand – Summer is usually 5% higher than the rest of the year.
- The result - Price of a barrel oil ($80.42)
Where the U.S. Oil Comes From

- Other Regions: 14%
- Western Hemisphere: 50%
- Africa: 19%
- Persian Gulf: 17%

How it gets to the Gas Stations

http://www.nevtahoilsands.com

www.eia.gov
The Prices of Crude Oil

There are 161 different internationally traded crude oils. They vary in terms of characteristics, quality, and market penetration.

**West Texas Intermediate (WTI) API 39.6°, 0.24% Sulfur** - Very high quality, generally priced at about a $5-6/barrel premium to the OPEC Basket and about $1-2/barrel premium to Brent.

**Brent API 38.3°, 0.38% Sulfur** - Brent Blend is a combination of crude oil from 15 different oil fields located in the North Sea. Brent blend is generally priced at about a $4/barrel to the OPEC Basket or about a $1-2/barrel discount to WTI.

**OPEC** collects pricing data on a "basket" of 7 crude oils - Algeria's Saharan Blend, Indonesia's Minas, Nigeria's Bonny Light, Saudi Arabia's Arab Light, Dubai's Fateh, Venezuela's Tia Juana Light, and Mexico's Isthmus (a non-OPEC crude oil).

Lansing-Kansas City API 33° (aver.)
Morrowan Ave API 31° (aver.)
Mississippian Ave. API 34 ° (aver.)

On average, crude oils are made of Carbon - 84%
Hydrogen - 14%
Sulfur – 0.1 to 3%
  Less than .05% - ‘Sweet’
  Greater than .05% - ‘Sour’ (max 1.99%)
Nitrogen - less than 1%
Oxygen - less than 1%
Metals - less than 1%
Salts - less than 1%
Refining Crude Oil

1. Fractional Distillation – separates the components
2. Conversion – chemically converts gas oil into fuels
3. Treatment and Blending – remove impurities

Chevron Richmond Facility

- Gasoline of various grades, with or without additives
- Lubricating oils of various weights and grades
- Kerosene of various grades
- Jet fuel
- Diesel fuel
- Heating oil
- Chemicals of various grades for making plastics and other polymers
The number of refineries in the U.S. has decreased in the last 20 years. Total production capacity is **17.4 million barrels/day**. Because of reduced capacity and increasing demand, U.S. refineries are operating at **91%** capacity. 1.3 million barrels/day of gasoline is imported.
What’s Left

• 40% of the world’s current crude output is “Sweet”. (sulfur content of <0.5%)
• 75%+ of proven crude oil reserves in the ground is “Sour”. (higher sulfur content)
• Refineries could be upgraded to handle sour crude oil – for a price.
• Sour Crude varies from $4-$16/barrel less than Sweet.
• Heavy oil makes up about 15% of the world’s remaining oil reserves.
**Oil Sand**

- Oil sands are a combination of clay, sand, water, and **bitumen**. Oil sands can be mined and processed to extract the oil-rich bitumen, which is then refined into oil.
- Oil sands are found in about 70 countries.
- Alberta, Canada has the only large-scale mining operation. (production costs: $10/barrel 3x more than regular production costs)

**Oil Shale**

Although the U.S. has the largest potential reserves, only Brazil, Estonia and Australia has recovered oil (1999)
The cost of a gallon of Unleaded Gasoline

<table>
<thead>
<tr>
<th>Year</th>
<th>Retail Price (average)</th>
<th>% of Crude Oil</th>
<th>% of Federal &amp; State Taxes</th>
<th>% of Refining Costs &amp; Profits</th>
<th>% of Distribution &amp; Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>$1.85/gallon</td>
<td>47%</td>
<td>23%</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>2005</td>
<td>$2.27/gallon</td>
<td>53%</td>
<td>19%</td>
<td>19%</td>
<td>9%</td>
</tr>
<tr>
<td>2006 (July)</td>
<td>$2.98</td>
<td>52%</td>
<td>15%</td>
<td>26%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Source: Energy Information Administration, Washington, DC
Why do Gasoline prices differ from state to state

1. Proximity of supply
2. Supply disruptions
3. Competition
4. Environmental programs
5. State and local taxes
**What can you do about it?**

**Trade for a more efficient car**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Model</th>
<th>MPGe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Honda Insight Hybrid</td>
<td>60/66</td>
</tr>
<tr>
<td>2.</td>
<td>Toyota Prius Hybrid</td>
<td>60/51</td>
</tr>
<tr>
<td>3.</td>
<td>Honda Civic Hybrid</td>
<td>49/51</td>
</tr>
<tr>
<td>4.</td>
<td>Volkswagen New Beetle &amp; Volkswagen Golf TDI</td>
<td>37/44</td>
</tr>
<tr>
<td>5.</td>
<td>Volkswagen Jetta TDI</td>
<td>36/41</td>
</tr>
<tr>
<td>6.</td>
<td>Ford Escape Hybrid FWD</td>
<td>36/31</td>
</tr>
<tr>
<td>7.</td>
<td>Toyota Corolla</td>
<td>32/41</td>
</tr>
<tr>
<td>8.</td>
<td>Scion xA</td>
<td>32/37</td>
</tr>
<tr>
<td>9.</td>
<td>Hyundai Accent</td>
<td>32/35</td>
</tr>
<tr>
<td>10.</td>
<td>Honda Civic</td>
<td>30/40</td>
</tr>
</tbody>
</table>
You say Hybrids are nice but…?

1. Say you have a 1999 Ford Explorer with 79,000 miles. You can expect to get about $3,700 in trade-in. (a 2003 Ford Expedition would get you $8,500)

2. That Toyota Prius is going to cost you about $25,000. (sticker plus).

3. For that difference in cost, you could get about 7,100 gallons of gas (@$3/gal) and at 15 mpg you could go about 106,500 miles.

Of course if you want to trade in you 8 mpg Ferrari for a hybrid, then….
If not a hybrid, then what about...

• **Fuel Cell cars** — Where’s that Hydrogen Fueling Station in Kansas again?

• **Biodiesel** — A good alternative, assuming the price for used cooking oil remains low.

• **E85, E70** — Fine if you want to pay more for less mpg and you’ll probably need to buy a new car as well. And if you can find a gas station that carries it. (E70 is required in winter months)

• **Electric Cars** — If you can build it, go ahead, the car makers won’t help you.

• **Walking, Biking, Mass Transit, Horse...**
Gas Saving Tips

- Drive Sensibly - Aggressive driving (speeding, rapid acceleration and braking) wastes gas.
- Observe the Speed Limit
  - gas mileage decreases rapidly at speeds above 60 mph.
  - As a rule of thumb, you can assume that each 5 mph you drive over 60 mph is like paying an additional $0.20 per gallon for gas (based on $2.91/gal)

www.fueleconomy.gov
More tips

• **Remove Excess Weight**
  – An extra 100 pounds in your vehicle could reduce your MPG by up to 2%.

• **Avoid Excessive Idling**
  – Idling gets 0 miles per gallon.
  – However, don’t turn off your engine at stoplights. This will consume more fuel than you would be saving.

• **Use Cruise Control at proper times**
  – Using cruise control on the highway helps you maintain a constant speed and, in most cases, will save gas.
  – If you're in hilly terrain, cruise control can use more gas.

• **Use Overdrive Gears**
  – When you use overdrive gearing, your car's engine speed goes down. This saves gas and reduces engine wear.
Keep your vehicle in shape

- Keep your engine properly tuned.
  - 4% savings

- Check & Replace Air Filters Regularly
  - Up to 10% savings

- Keep Tires Properly Inflated
  - Under-inflated tires can lower gas mileage by 0.4 percent for every 1 psi drop in pressure of all four tires.
  - Up to 3% savings

- Use the Recommended Grade of Motor Oil
  - For example, using 10W-30 motor oil in an engine designed to use 5W-30 can lower your gas mileage by 1-2%.
Plan and Combine Trips

- **Combining** errands into one trip saves you time and money. Short trips taken from a cold start can use twice as much fuel as a longer multipurpose trip when the engine is warm.

- **Traveling** - A roof rack or carrier provides additional cargo space and may allow you to meet your needs with a smaller car. However, a loaded roof rack can decrease your fuel economy by 5%. Reduce aerodynamic drag and improve your fuel economy by placing items inside the trunk whenever possible.
Radical Tips for Saving Gas

• When possible drive 60mph on Interstates, Divided Highways, etc..
  – Unless you are going to Denver, 70mph isn’t going to save you much time.
  – For example if you are driving from Topeka to Lawrence the 22 miles at 70mph will take you about 20 minutes. If you go 60mph it will take you 2 minutes longer but save you about $0.40.

• In the summer, use the air conditioning sparingly.
  – 5-25% savings
  – Don’t however roll down the windows as drag will increase along with more fuel used.

• Coast when possible
Why are prices for Gasoline going to be higher in 2006 and Beyond

1. World demand is nearly exceeding supply.
2. Oil industry still hasn’t fully recovered from Hurricane Katrina (12% oil and 9% natural gas production still off line).
3. Hurricane season can threaten U.S. crude production and refineries.
4. Tensions around the world (Iraq, Iran, Middle East, North Korea, Nigeria, etc.)
5. Oil Infrastructure –pipelines, refineries, etc.
6. Seasonal demand
Electricity Costs

- **Capital Costs** – Financing/Interest on Loans, Land Acquisition, Design, Construction, Interconnection to Grid
- **Fuel** – Price, Availability
- **Operation and maintenance** – Personnel, Reliability, Environmental monitoring, Unit lifetime.
• Demand is usually highest in the afternoon and early evening (on-peak).
• Summer has highest usage.
• Baseload Power plants are most efficient generating electricity at an even, consistent level.
• Peaking plants are expensive to operate, high fuel cost, (Hydroelectric power plants can operate in base and/or peaking mode).
Pumped Storage Plants

- A relatively small amount of electricity is generated.
- They pump water from a river or reservoir up into reservoirs located above hydroelectric turbines.

Dinorwig plant in Wales
The Upper Reservoir has a capacity of 4,350 acre-feet. The upper reservoir is 800 feet above the hydroelectric plant. The two are connected by a 7,000 ft tunnel through the mountain. The first filling of the Upper Reservoir was in July 1963.

1. Water is pumped up at night
2. Water is released during peak times to pass through the generator
On December 14, 2005

The reservoir’s berm was overtopped when one of two pumps failed to shutdown due to pressure transducers became detached from their supports. The breach allowed a 20’ wall of water to flow down the Black River.
Secondary cause of the breach was the marginally stable dumped “dirty” rockfill embankment and associated parapet wall that could not tolerate additional pore pressures and erosive effects of the overtopping water flowing down the 1.3:1 slope.
Back to Electricity Costs


U.S. Electric Power Industry Net Generation, 2004

Ways to reduce your electric bill

• Turn off lights and appliances when they are not being used.
• Add weather insulation to doors and windows.
• Buy more efficient lights and appliances.
• Some utilities offer demand management programs to encourage major electricity uses off-peak, including “time-of-use” rates.
• Average your annual bill over 12 months to lessen the shock of seasonally high bills.
Heating Costs using Natural Gas

Breakdown of natural gas price paid by residential customers during the heating season
Factors That Affect Prices

- **Weak production** – decreased by 0.6 percent in 2004, reaching the lowest production level since 1999.
- **Rising net imports** – Net imports increased by almost 3 percent in 2004.
- **High Demand** – blame the strong economy. Also, Additionally, high temperatures last summer have increased the need for home cooling, which adds to natural gas demand used by electric power generators.
- **Hurricane Activity** – major service disruptions and production, resulting in record high prices of natural gas.
Heating Costs Savings

- Reduce thermostat settings, change furnace filter monthly, have furnace cleaned and tuned annually.
- Obtain a home energy audit to identify ways to conserve energy.
- Participate in a yearly budget plan to spread gas costs evenly throughout the year.
- Check and replace weather stripping on doors and windows, close storm windows and doors.
- Operate kitchen and bath vents minimally.
- Lower the thermostat set point on your water heater to about 120 degrees, install a water heater blanket, reduce hot water use.
- New Furnace? 20 year old furnaces waste 40% heating.