

# Energy & Biofuels Situation and Outlook

Southern Dairy Outlook Conference  
January 31, 2007

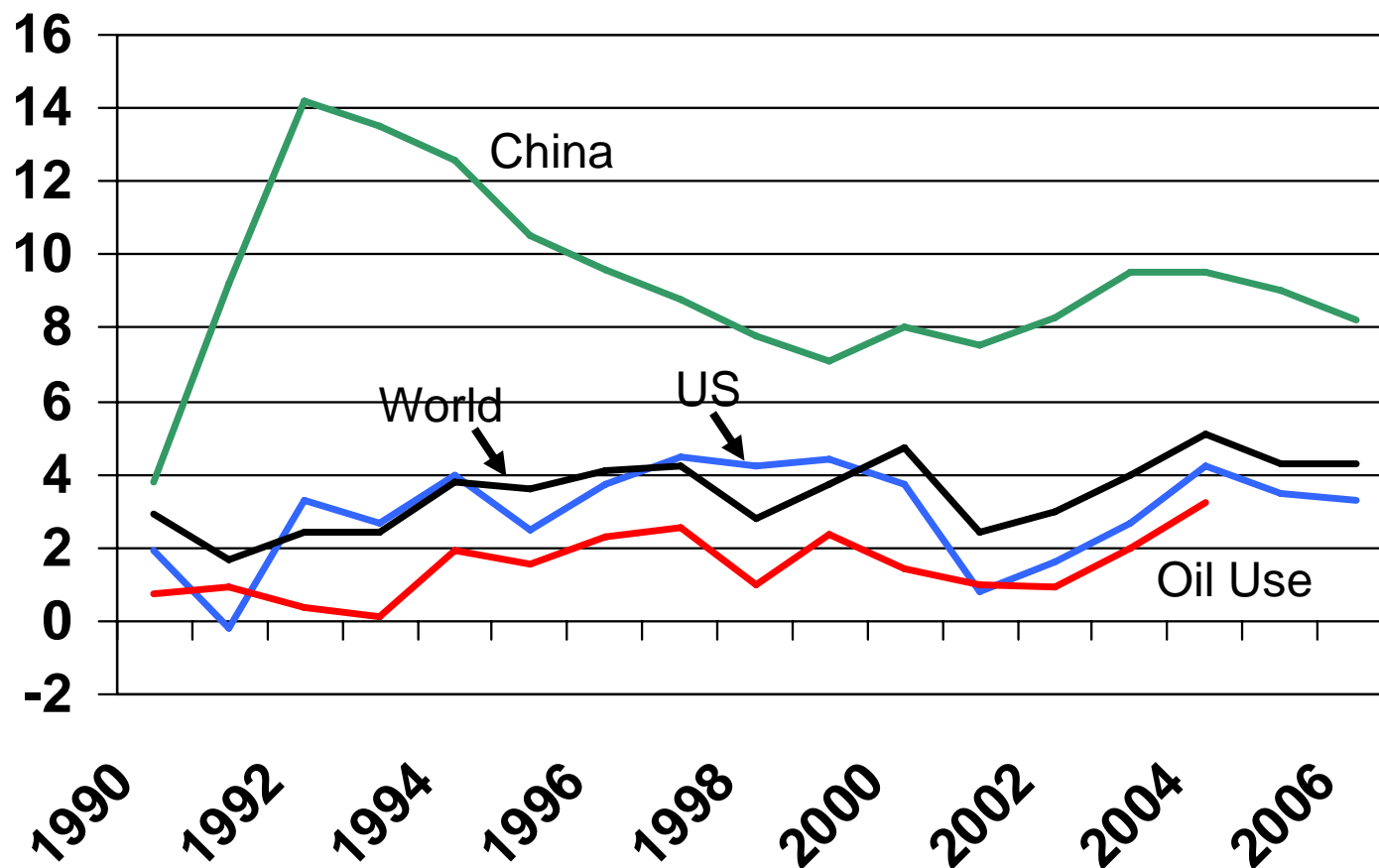
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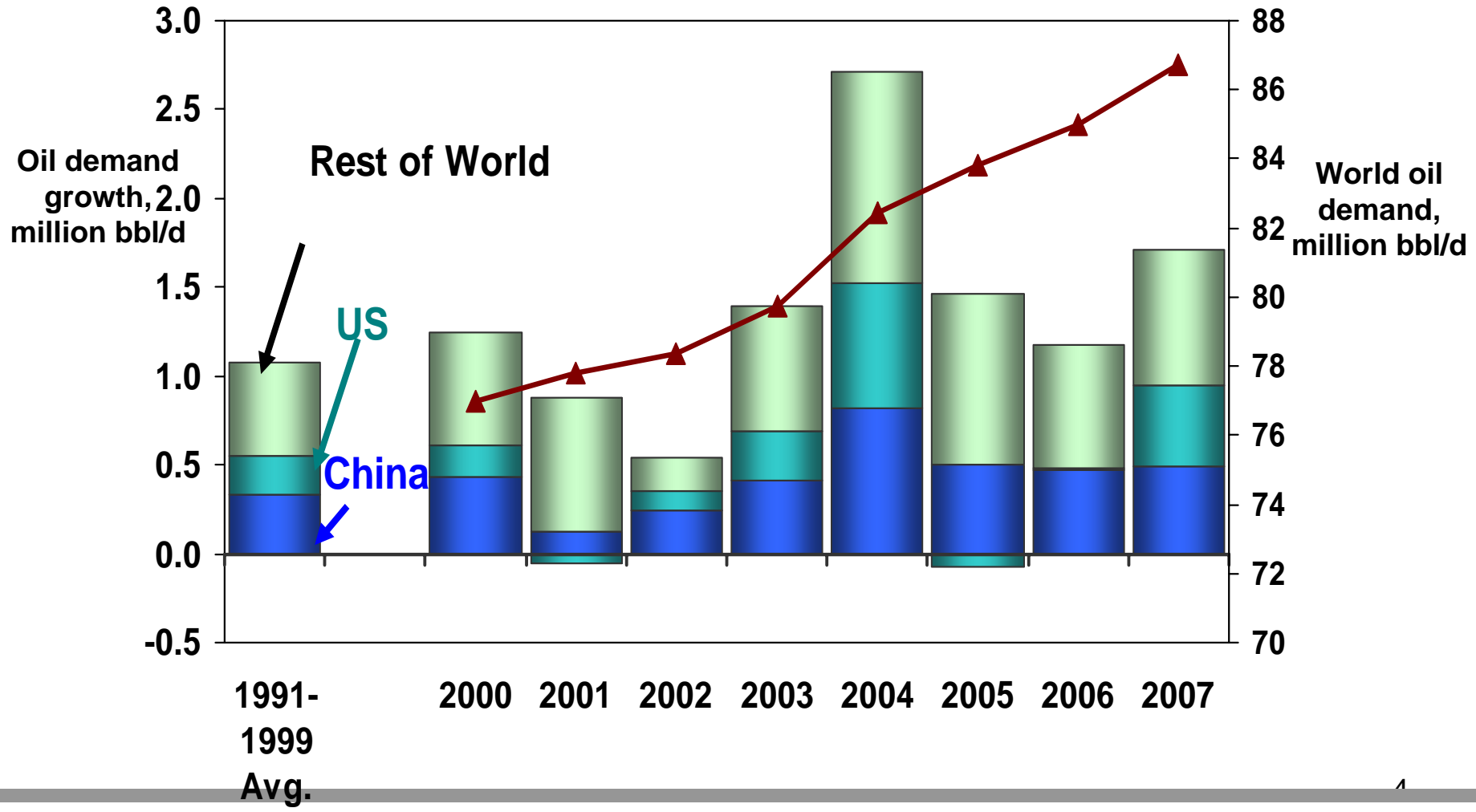
# Overview

- Crude Oil
  - Gasoline Markets
  - Diesel Markets
- Natural Gas
- Biofuels

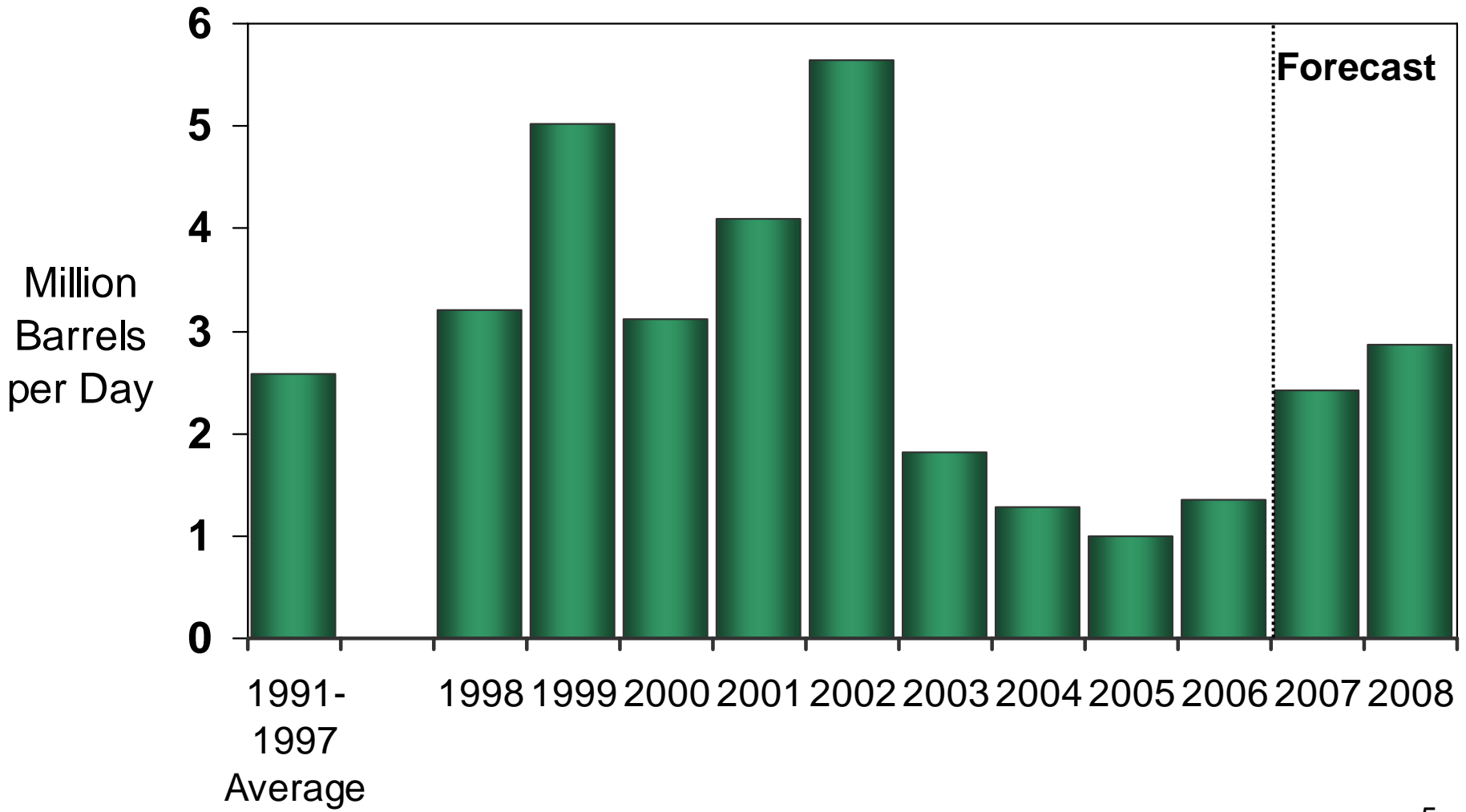
# Global Economic Growth, 1990-2005



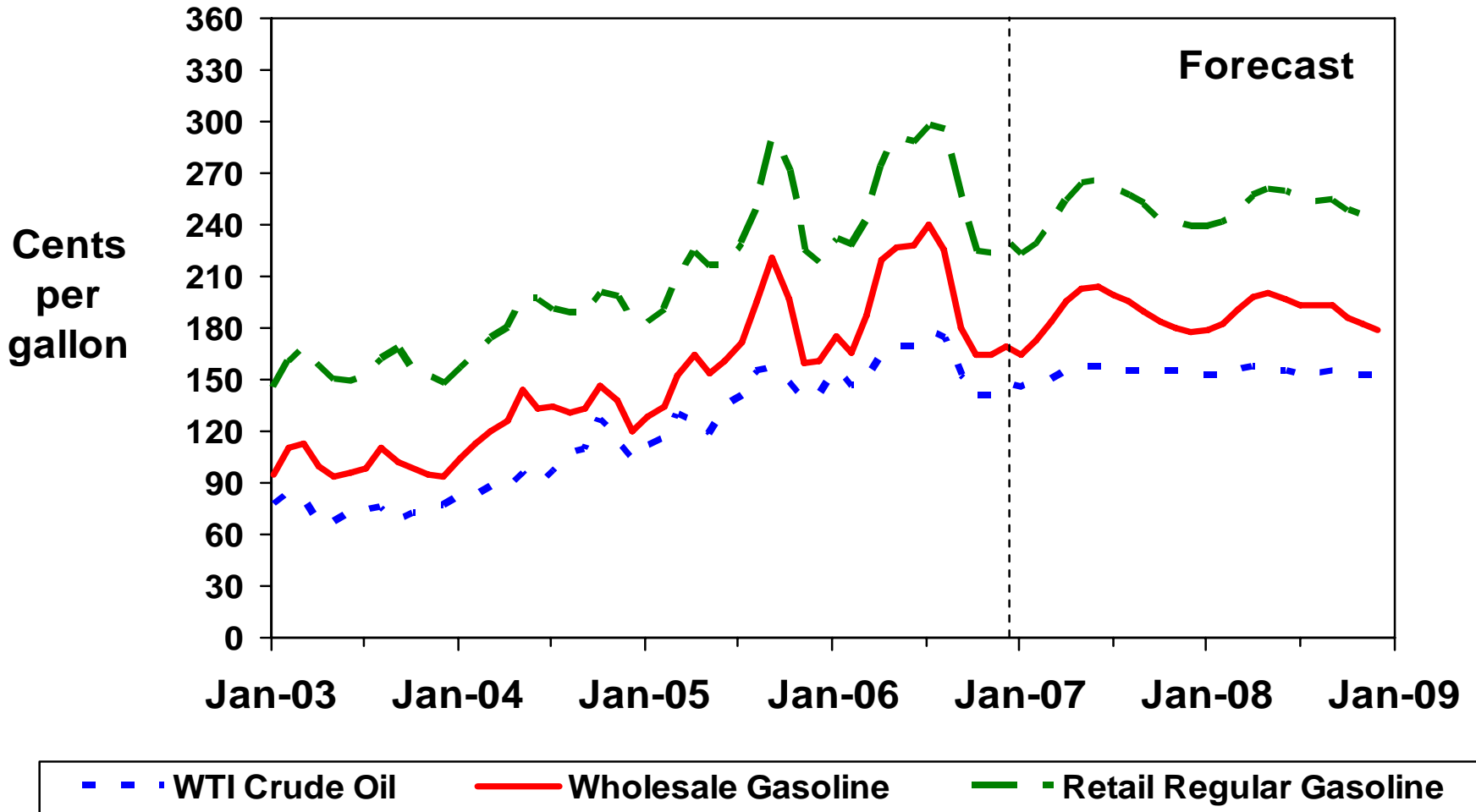
# World Oil Consumption Growth



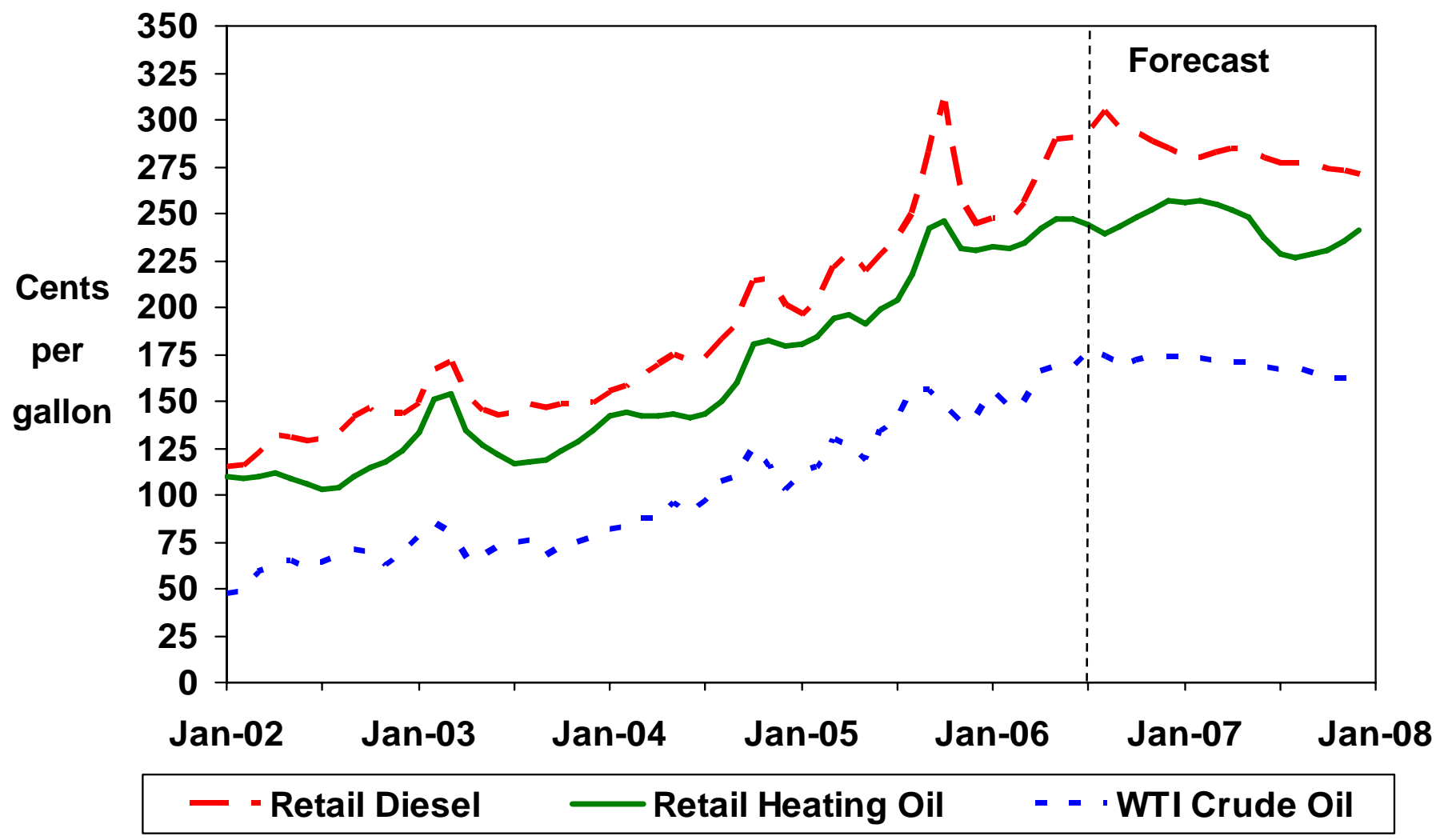
# World Oil Spare Production Capacity



### Gasoline and Crude Oil Prices



### U.S. Distillate Fuel Prices



# Crude Oil Short-Run Outlook

- Prices have gone from ~\$80/bbl to ~\$50/bbl & back to \$55 since August 7.
  - Less concern about Iran
  - No hurricane threats
  - Steady Nigerian production
  - Iraqi production climbing
  - Prudhoe Bay not as bad as feared
  - Extremely warm winter
- \$55-\$60 range is 'comfortable'

# Crude Oil Intermediate Outlook

- OPEC's Quandry:
  - Do we have surplus capacity or not?
  - Have high prices affected longer-term demand?
- Going forward, oil prices will be determined by supply disruptions and fear of them:
  - OPEC production
  - Gulf Coast
  - Nigeria
  - Iran
  - Iraq

# Crude Oil Long Term Outlook

- Two factors pushed prices up, only they can push them down in the long term:
  - Weaker global growth—but is this a good thing?
  - Stronger USD—will only exacerbate trade deficit.
- Additional production is beginning to enter the market,
  - Non-OPEC production up over past year
  - US remains below pre-Katrina levels

# Short-Run Natural Gas Outlook

- Inventories are high...
  - Cool Summer
  - Warm Winter
    - Very Low Usage
- Production outstripping demand in US.

# Long-Run Natural Gas Outlook

- Consumption is growing ~2%/year
  - Peak power plants will continue to be built w/ NG
  - But in 2006, it appears industrial use softening somewhat
  - How about all that ethanol?
- Production is growing ~1%/year
  - Additional reserves in Alaska & Canada, but pipelines must be built—5-7 years lag.
  - DOE projects higher imports to close the gap
    - LNG costly to transport. Lots of NIMBY
    - Will need to build many more import terminals.
- Good News: Globally, lots of extra NG.
- Bad News: It's expensive to move around.

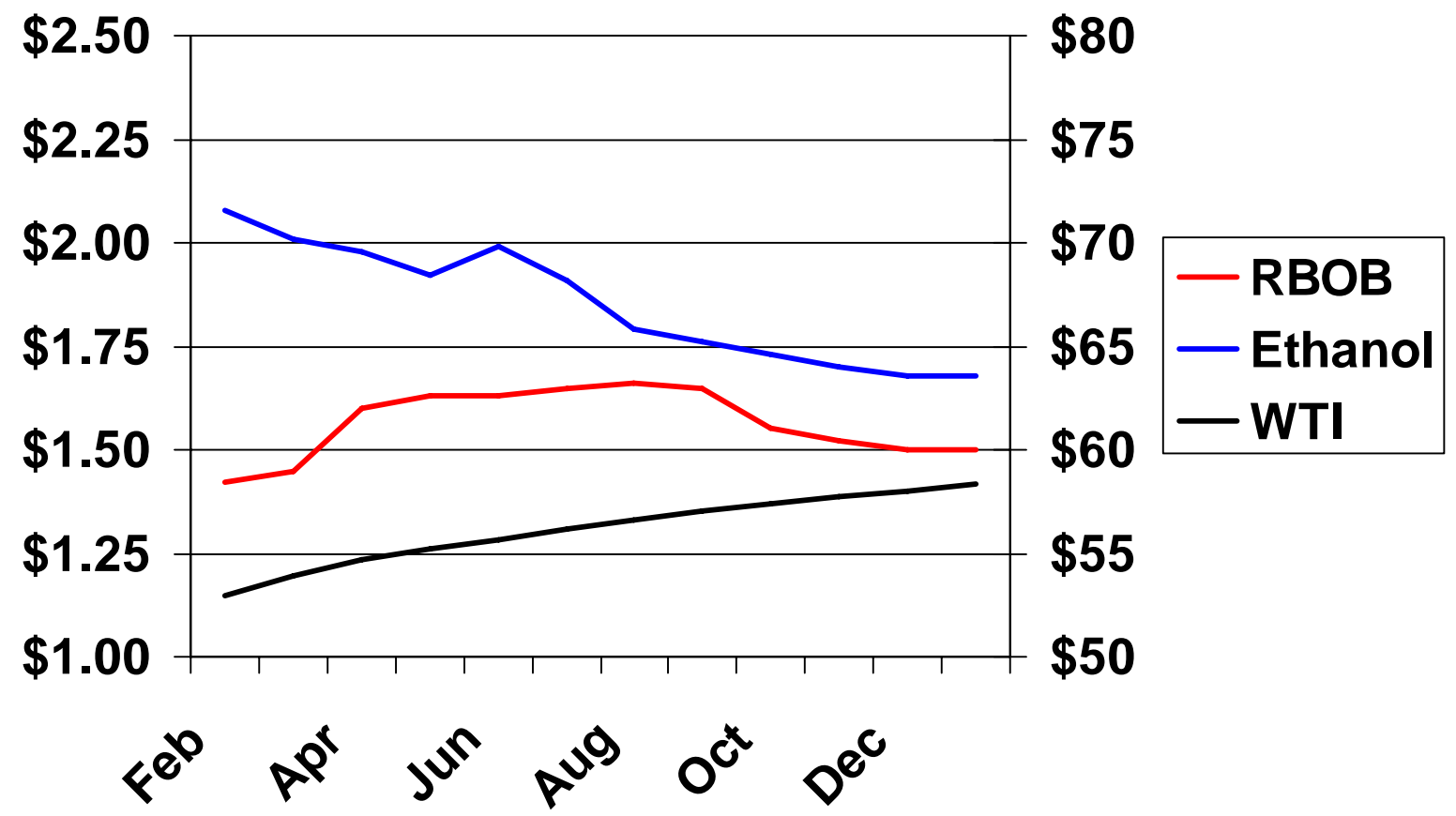
# Some Energy Statistics

- In 2005, the US
  - consumed 139.9bn gallons of gasoline. (EIA)
  - produced 3.9bn gallons of ethanol. (RFA)
  - consumed 43.2bn gallons of diesel.
  - produced 75m gallons of biodiesel.
  - imported 65% of all petroleum.

# Some Biofuels Statistics

- 1 bushel corn = 2.7 gallons undenatured ethanol
- 7.5lbs soybean oil = 1 gallon B100
- Ethanol has 1.33 energy ratio
- B100 has a 3.2 energy ratio

# Ethanol Drivers: Gasoline Prices

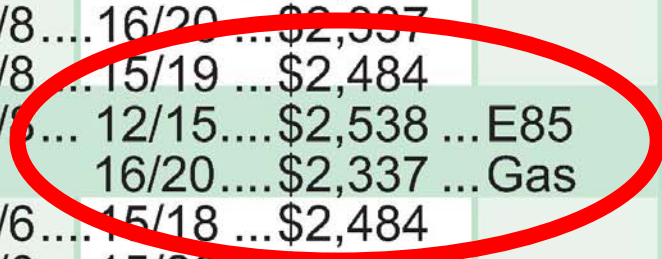


Source: 20 October Closing Prices, NYMEX, CBOT

# STANDARD PICKUP TRUCKS 4WD

## CHEVROLET

Colorado 4WD .....	A-4	2.9/4	16/23	\$2,091	
.....	M-5	2.9/4	18/24	\$1,988	
.....	A-4	3.7/5	16/22	\$2,091	
Colorado Cab Chassis Inc 4WD..	A-4				\$2.25 E85
Colorado Crew 4WD.....	A-4				
K15 Silverado 4WD .....	A-4				\$2.65 Gasoline
.....	A-4	4.8/8	15/19	\$2,484	
.....	A-4	5.3/8	16/20	\$2,337	
.....	A-4	6.0/8	15/19	\$2,484	
K15 Silverado 4WD FFV .....	A-4	5.3/8	12/15	\$2,538	E85
			16/20	\$2,337	Gas
K1500 Silverado Classic 4WD.....	A-4	4.3/6	15/18	\$2,484	
.....	M-5	4.3/6	15/20	\$2,337	
.....	A-4	4.8/8	15/19	\$2,337	
.....	A-4	5.3/8	15/19	\$2,484	
.....	A-4	6.0/8	14/17	\$2,851	P
K1500 Silverado Classic FFV.....	A-4	5.3/8	11/14	\$2,749	E85
			15/19	\$2,484	Gas
K15 Silverado Classic Hybrid 4WD.	A-4	5.3/8	17/19	\$2,210	HEV



**Ethanol is 33% cheaper than unleaded**

**Current ethanol prices are quite high to Brazilian Consumers!**



## Ethanol Drivers: Economic Profits

Wholesale Ethanol		0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
BTU-equiv Ret. Gas		1.21	1.56	1.92	2.27	2.63	2.98	3.34	3.69
BTU-equiv Whl. Gas		0.71	1.06	1.42	1.77	2.13	2.48	2.84	3.19
Corn Price	2.00	-20%	-3%	13%	30%	47%	63%	80%	97%
	2.50	-31%	-14%	3%	19%	36%	53%	69%	86%
	3.00	-41%	-24%	-7%	9%	26%	43%	59%	76%
	3.50	-51%	-34%	-17%	-1%	16%	33%	49%	66%
	4.00	-62%	-45%	-29%	-12%	5%	21%	38%	55%
	4.50	-73%	-56%	-39%	-23%	-6%	11%	27%	44%
	5.00	-83%	-67%	-50%	-33%	-17%	0%	17%	33%

### Assumptions:

- 75mgpy Plant
- DGS \$80/t
- 10c/g Ethanol Transport Cost
- \$1.50/gpy Construction Cost
- \$8/Dtherm NG
- Ethanol has 70% BTUs of Gas
- 7% Interest Rate
- 3g/bushel

Source: 'ethanolsuccess.xls' spreadsheet model by Doug Tiffany, available at: <http://www.agmrc.org/agmrc/commodity/energy/ethanol/ethanol.htm>

# Ethanol Drivers: Shutdown Point

per gallon

Wholesale Ethanol		0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
BTU-equiv Ret. Gas		1.21	1.56	1.92	2.27	2.63	2.98	3.34	3.69
BTU-equiv Whl. Gas		0.71	1.06	1.42	1.77	2.13	2.48	2.84	3.19
Corn Price	2.00	-0.15	0.10	0.35	0.60	0.85	1.10	1.35	1.60
	2.50	-0.31	-0.06	0.19	0.44	0.69	0.94	1.19	1.44
	3.00	-0.46	-0.21	0.04	0.29	0.54	0.79	1.04	1.29
	3.50	-0.61	-0.36	-0.11	0.14	0.39	0.64	0.89	1.14
	4.00	-0.78	-0.53	-0.28	-0.03	0.22	0.47	0.72	0.97
	4.50	-0.94	-0.69	-0.44	-0.19	0.06	0.31	0.56	0.81
	5.00	-1.1	-0.85	-0.6	-0.35	-0.1	0.15	0.4	0.65
	5.50	-1.25	-1	-0.75	-0.5	-0.25	0	0.25	0.5
	6.00	-1.41	-1.16	-0.91	-0.66	-0.41	-0.16	0.09	0.34
	6.50	-1.57	-1.32	-1.07	-0.82	-0.57	-0.32	-0.07	0.18
7.00	-1.73	-1.48	-1.23	-0.98	-0.73	-0.48	-0.23	0.03	

# Ethanol Drivers: Policy

- In the past 5 years, MTBE displacement has been biggest driver.
- New Energy Bill ends RFG, now has RFS
  - Mandates total RF usage of 7.5bn g by 2012.
  - RF is ethanol or biodiesel
- We will exceed 7.5bn g by '08!
- State-level RFS matter more
- Loose Political Coalition Against Ethanol is Forming:  
Livestock+Antipoverty+Oil

# Ethanol Risks: Public Opinion

- Consumer Perception of Value:
  - Consumer Reports Article
- \$3bn+ spent on VEETC for an industry earning 30%?

# Ethanol Outlook

- Biggest Dangers:
  - **BTU-based pricing**
    - Slowing of RFS momentum
    - Rapid Plant Expansion
  - Lower oil prices
  - DGS price collapse
    - Degermination
    - Cofiring DGS
- Expect market to continue expanding...
  - But much more slowly
- When was the last time a bubble like this ended happily?

# Acreage Needed For Ethanol

					<i>100% Productivity</i>			<i>90% Productivity</i>		
	Ethanol	Corn to	E(Yld)	Total	Harv Ac	Plant Ac	Add'l to	Harv Ac	Plant Ac	Add'l to
Year	bgpy	Ethanol	bu/ac	Use	Needed	Needed	06/07	Needed	Needed	05/06
07/08	9.00	3.21	152.65	12.41	81.33	87.45	<b>9.15</b>	81.36	89.41	<b>11.11</b>
08/09	11.00	3.93	155.22	13.13	84.58	90.95	<b>12.65</b>	84.98	93.38	<b>15.08</b>
09/10	12.50	4.46	157.85	13.66	86.57	93.08	<b>14.78</b>	87.18	95.81	<b>17.51</b>
10/11	13.50	4.82	160.51	14.02	87.36	93.93	<b>15.63</b>	88.06	96.77	<b>18.47</b>
11/12	14.25	5.09	163.22	14.29	87.55	94.14	<b>15.84</b>	88.27	97.00	<b>18.70</b>
12/13	15.00	5.36	165.97	14.56	87.71	94.31	<b>16.01</b>	88.45	97.20	<b>18.90</b>

- Where does the DGS go?
  - Degerming prior to distillation.
- Where do we get all of these acres?
- Where will get all of this N & P?
- When does cellulosic matter?

# Biodiesel Dangers

- Lack of standardization
  - ASTM 6751: Biodiesel ‘Blendstock’ *not* fuel.
    - Much less stringent than...
  - ASTM 975: Diesel fuel
    - This is *the* diesel fuel standard; and it is very, very strict.
    - B2: 2% ASTM 6751 + 98% ASTM 975
      - It *might* still meet ASTM 975,
      - It might not.

# Biodiesel

						100% Yld		90% Yld	
	B100	%	Reqd	Total	Trend	Plant Ac	Acres vs.	Plant Ac	Acres vs.
Year	m gal	Soy	bn lbs	Use	Yld	Reqd	05/06	Reqd	05/06
2006	150	91%	1.02	2.99	41.39	73.22	<b>1.12</b>	73.32	<b>1.22</b>
2007	225	90%	1.52	3.08	41.93	74.31	<b>2.21</b>	74.53	<b>2.43</b>
2008	259	89%	1.73	3.14	42.48	74.80	<b>2.70</b>	75.08	<b>2.98</b>
2009	298	89%	1.98	3.20	43.04	75.35	<b>3.25</b>	75.69	<b>3.59</b>
2010	342	88%	2.25	3.27	43.60	75.97	<b>3.87</b>	76.37	<b>4.27</b>
2011	394	87%	2.57	3.34	44.17	76.66	<b>4.56</b>	77.14	<b>5.04</b>
2012	453	86%	2.93	3.42	44.75	77.43	<b>5.33</b>	78.00	<b>5.90</b>

- SBO has much more competition
- Major substitutes:
  - Corn Oil (reduces DGS volume.)
  - White/Yellow Grease
- Future of relative value of SM vs. SO?

# Biodiesel: Dangers

- Alternative Feedstocks
  - Yellow Grease
  - Rapeseed/Canola
  - Poultry Fats
  - Animal Fats
  - Corn oil
- Higher Price Elasticity of Demand?
- Trailback: only rack-blended.

# Biodiesel Outlook

- Much better energy balance than ethanol.
- Smaller, more dispersed plants.
- Higher feedstock costs as %age of input.
- Less fuel spec certainty & research than ethanol.
- Probably 1-3 yrs behind ethanol in consumer acceptance.

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