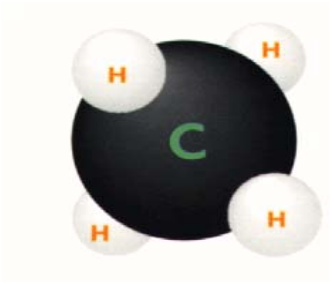

Light at the End of the Tunnel?
Or Is That an Oncoming Train

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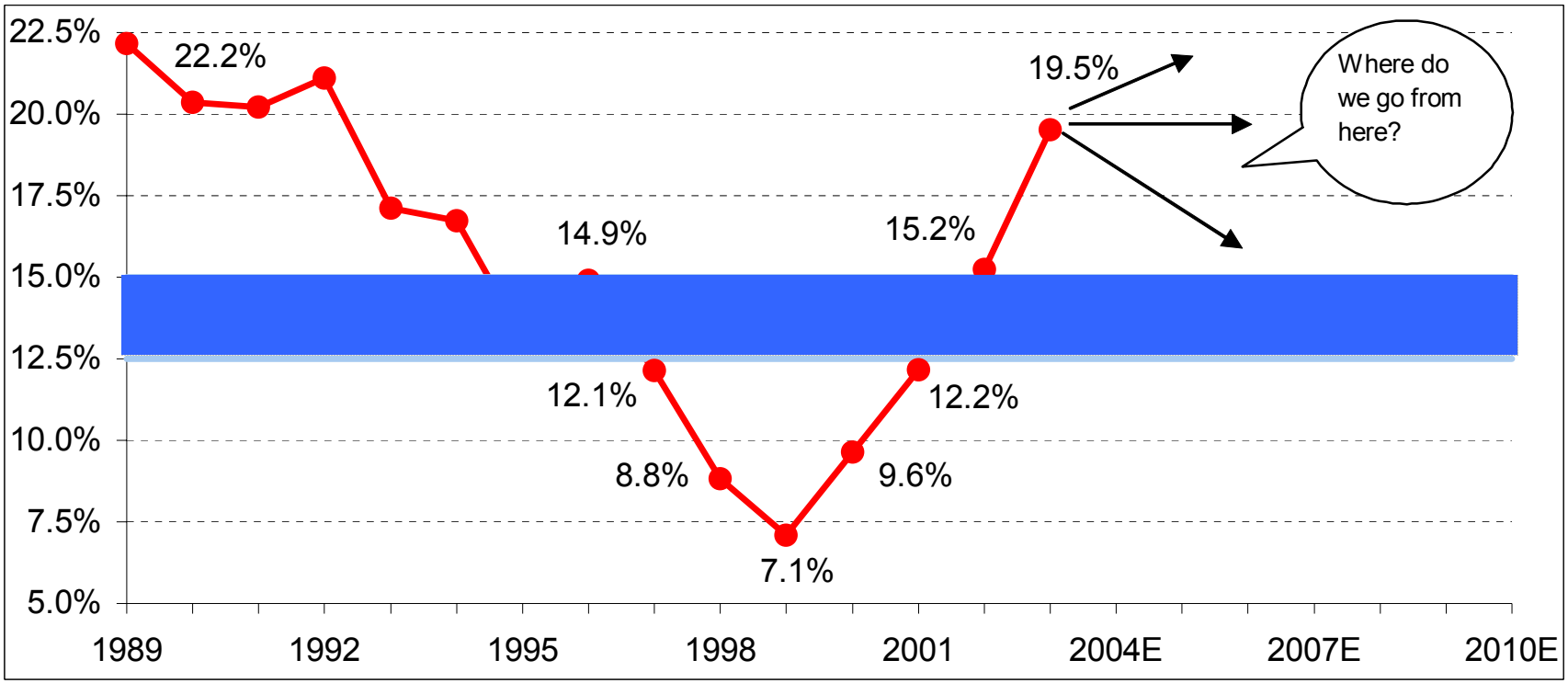
February 10, 2004

U.S. Peak Capacity Margins – When & If



Active Development Backlog Peaked in Fall 2001, But is Significantly Lower Today

	Proposed	Oper.	Retirements	Construction	Adv. Dev.	ED/Proposed	Cancelled	Tabled	Total
1999	9,280	9,280	-	-	-	-	-	-	9,280
2000	29,801	26,558	(45)	-	-	-	2,828	460	29,801
2001	52,167	42,559	(474)	-	-	-	7,363	2,719	52,167
2002	74,902	61,827	(3,933)	-	-	-	12,318	4,690	74,902
2003	101,804	5,915	(1,227)	50,888	1,858	2,592	21,522	20,256	101,804
2004	91,419	-	(854)	15,005	5,121	11,664	30,724	29,759	91,419
2005	96,179	-	(4,457)	5,969	17,826	39,395	14,449	22,998	96,180
2006	56,317	-	(181)	750	6,614	33,871	5,451	9,812	56,317
2007	24,318	-	(1,186)	1,280	-	15,046	5,247	3,931	24,318
2008	12,987	-	(1,201)	-	530	8,608	4,550	500	12,987
2009	(628)	-	(3,168)	-	-	2,540	-	-	(628)
2010	(1,955)	-	(2,016)	-	30	31	-	-	(1,955)
2011	1,075	-	(975)	-	-	2,050	-	-	1,075
2012	(2,867)	-	(2,867)	-	-	-	-	-	(2,867)
'99-'12	**544,799**	**146,139**	**(22,584)**	**73,892**	**31,979**	**115,797**	**104,452**	**95,125**	**544,799**

Source: RDI (April 2003)

The Big Story is Natural Gas…

- Cracks in the gas market have appeared
- Bad policy reduced supply, induced new demand
- Gas prices could be sustainable at $4-5 indefinitely
- High gas prices sustainable due to long-term supply shortage
- Production weak, demand destruction not complete answer
- Destroys american industry
- Infrastructure strained

…Due to New Generation

	New Generation		Running Totals			Installed MW	Tcf Consumed
	CCGT	CT	CCGT	CT	Total		
						51,030	2.800
1999	2,656	5,388	2,656	5,388	8,044	59,074	2.969
2000	10,244	15,357	12,900	20,745	33,645	84,675	3.575
2001	18,005	21,930	30,905	42,675	73,580	124,610	4.406
2002	40,117	18,215	71,022	60,890	131,912	182,942	5.462
2003	47,112	9,650	118,134	70,540	188,674	239,704	6.307
2004	14,098	2,921	132,232	73,461	205,693	256,723	6.706
2005	13,561	-395	145,793	73,066	218,859	269,889	8.037
2006	1,675	-165	147,468	72,901	220,369	271,399	8.545
2007	-361	128	147,107	73,029	220,136	271,166	9.111
2008	1,045	-96	148,152	72,933	221,085	272,115	9.489
2009	0	375	148,152	73,308	221,460	272,490	9.600
2010	0	-10	148,152	73,298	221,450	272,480	9.800
			66.9%	33.1%		**4.6x**	**3.3x**
					Increase	**361%**	**230%**
					Chg. Heat Rate	**-34.5%**	
							63.7%

The Potential Gas Demand is Staggering

	2006
Plant Capacity (MW)	
Total	**220,369**
CCGT Capacity	147,468
CT Capacity	72,901
Plant Utilization	
Overall Capacity Factor	**41.81%**
CCGT Capacity Factor	60.00%
CT Capacity Factor	5.00%
Production (kWh)	
Total Production	807,022,446,000
CCGT Production	775,091,808,000
CT Production	31,930,638,000
Plant Heat Rate	**7,119**
CCGT Heat Rate	7,000
CT Heat Rate	10,000
Fuel Consumption	
MMBtu	5,744,949,036
Mcf/Day	15,739,586
Mcf/Week	110,177,105
Bcf/Week	110.2
Bcf/Year	5,744.9
Tcf/Year	5.745
Increase in Gas Market from 21 Tcf	27.4%

The Potential Gas Supply is Not

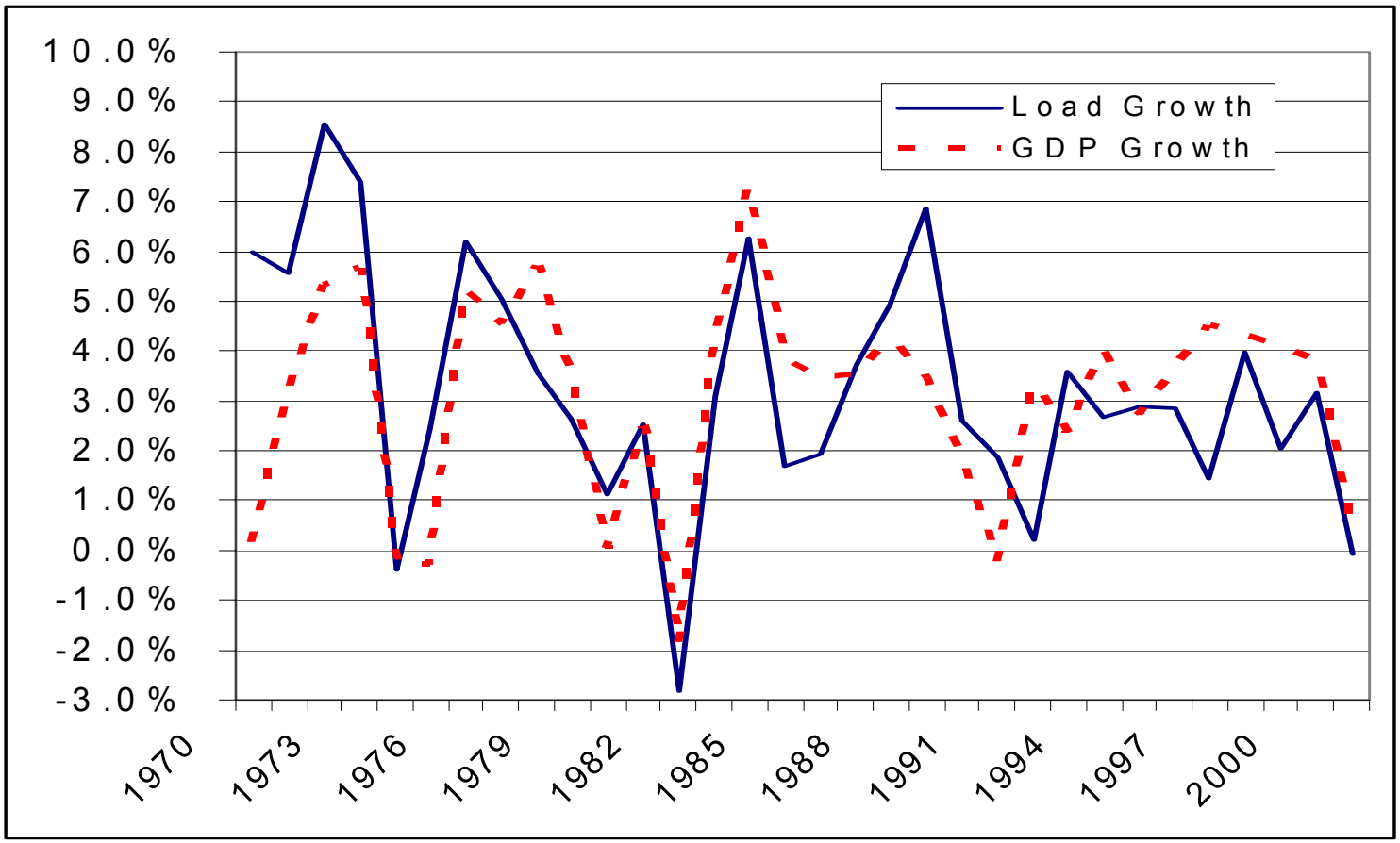
	U.S. Gross Gas Withdrawals (Bcf)	U.S. Wet Gas Production (Bcf)	Extraction Loss	U.S. Dry Gas Production (Bcf)	U.S. Wet Gas Yr/yr % Chg.	U.S. Dry Gas Yr/yr % Chg.
1990	21,522.62	18,593.79	784.12	17,809.67	2.8%	2.9%
1991	21,750.11	18,532.44	834.64	17,697.80	-0.3%	-0.6%
1992	22,132.25	18,711.81	871.91	17,839.90	1.0%	0.8%
1993	22,725.64	18,981.91	886.46	18,095.46	1.4%	1.4%
1994	23,580.71	19,709.52	888.50	18,821.02	3.8%	4.0%
1995	23,743.63	19,506.47	907.80	18,598.68	-1.0%	-1.2%
1996	24,113.54	19,812.24	958.18	18,854.06	1.6%	1.4%
1997	24,212.68	19,866.09	963.70	18,902.39	0.3%	0.3%
1998	24,108.13	19,961.35	937.78	19,023.56	0.5%	0.6%
1999	23,822.71	19,804.85	972.62	18,832.23	-0.8%	-1.0%
2000	24,173.88	20,197.51	1,015.53	19,181.98	2.0%	1.9%
2001	24,475.97	20,630.41	953.98	19,676.43	2.1%	2.6%
2002	24,129.76	19,968.89	922.16	19,046.72	-3.2%	-3.2%
2003E				19,427.66		
2010E				22,316.27		
40 Yr. CAGR	**1.0%**	**0.9%**	**1.0%**	**0.9%**	**1.1%**	**1.1%**
30 Yr. CAGR	**0.0%**	**-0.4%**	**0.1%**	**-0.4%**	**-0.3%**	**-0.3%**
20 Yr. CAGR	**0.9%**	**0.4%**	**1.0%**	**0.3%**	**0.1%**	**0.0%**
10 Yr. CAGR	**0.9%**	**0.7%**	**0.6%**	**0.7%**	**0.7%**	**0.7%**
5 Yr. CAGR	**-0.1%**	**0.1%**	**-0.9%**	**0.2%**	**0.1%**	**0.2%**

The Wall of Worry

- Solid long-term power & natural gas load growth
- Near-term electricity capacity margins of 19-20% are temporary
- Natural gas production problem (Down 3.2% in 2002)
- Key energy infrastructure is severely constrained
  - Transmission, Storage, Delivery
- Supply/Demand imbalances likely

Long-Term Electricity Load Growth Follows GDP

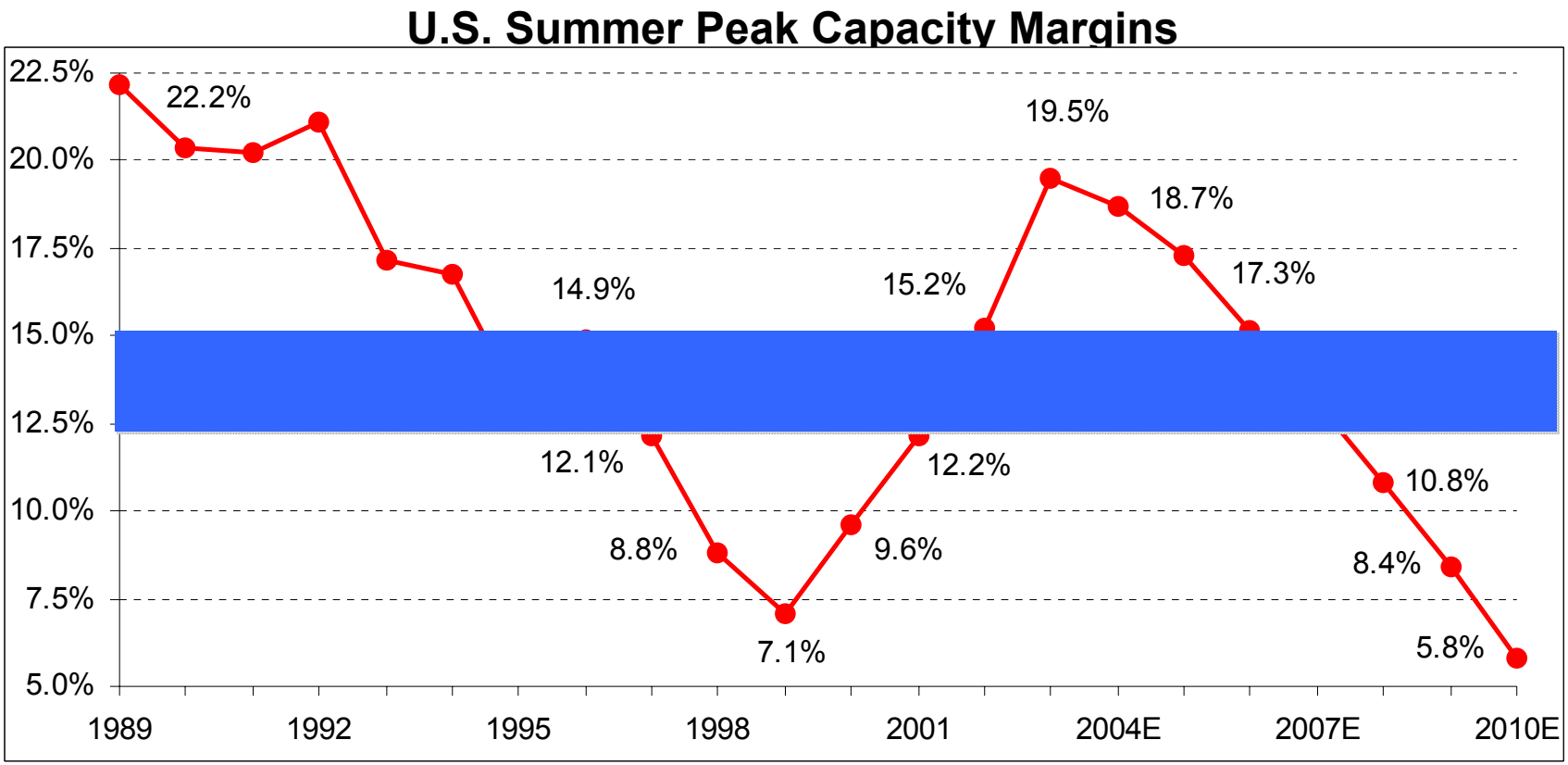
U.S. Electricity Load Growth and GDP Growth (1970 to 2001)



2.5-3.0% Peak Power Load Growth Supports 300,000 MW of New Capacity Additions

	2.9% Peak Load Growth	Required Gen. Capacity	Capacity Margin	Required Gen. Capacity	Capacity Margin	Required Gen. Capacity	Capacity Margin
1999	681,449	733,481	7.1%				
2000	678,413	750,771	9.6%				
2001	688,503	783,741	12.2%				
2002	712,161	845,568	15.8%				
2003	721,063	801,181	10.0%	824,072	12.5%	848,309	15.0%
2004	741,974	824,415	10.0%	847,970	12.5%	872,910	15.0%
2005	763,491	848,323	10.0%	872,561	12.5%	898,225	15.0%
2006	785,632	872,925	10.0%	897,866	12.5%	**924,273**	15.0%
2007	808,416	898,240	10.0%	**923,904**	12.5%	951,077	15.0%
2008	831,860	**924,289**	10.0%	950,697	12.5%	978,658	15.0%
2009	855,984	951,093	10.0%	978,267	12.5%	1,007,040	15.0%
2010	880,807	978,675	10.0%	1,006,637	12.5%	1,036,244	15.0%
2011	906,351	1,007,056	10.0%	1,035,829	12.5%	1,066,295	15.0%
2012	932,635	1,036,261	10.0%	1,065,868	12.5%	1,097,217	15.0%
Total Add	**251,186**	**302,780**		**332,387**		**363,736**	
	199,358	245,194		273,156		302,763	
'99-'12							
Average	19,322						
Median	22,783						
CAGR	**2.4%**						

Electricity Capacity Margin Recovery



Worry About Long-Term Energy Supply

- Electricity load growth will be surprisingly strong - recovery by 2007
- Natural gas demand potentially up 2% CAGR 2000-2010
- 11% CAGR in consumption from generation (+5-6 Tcf ‘00-’10)
  - potential total gas market 25-26 Tcf in 2010 (+20-25%)
- Demand destruction/new production cannot supply it all
- LNG - political and strategic issues
- Natural gas supply issues ultimately constrain electricity supply
- High prices/volatility for both commodities likely

Gas=Electricity=Gas=Electricity

- The commodities are inextricably linked now
- Gas supply constraints limit nameplate generation capacity
  - unlikely to meet demands of generation growth
- Electricity reserve margins reduced below apparent levels
  - expect low capacity factors on gas plants
- Ultimate generating capacity excess of 75,000 MW may not be real
- If gas supply constrained, so is electricity supply
- Implications for new coal plants

This is Still a Long-Term Risk