



Potential Impacts of Federal Greenhouse Gas Legislation on Louisiana Industry

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David E. Dismukes
Center for Energy Studies
Louisiana State University

- Considerable national and international attention has been given to this issue.
- The current increase in energy prices and challenges in supply capabilities confound climate change issues and approaches.
- GHG regulation also raises considerable questions about market organization and structure in restructured energy markets.
- Uncertainty and “policy volatility” creates challenges for the high levels of expensive investment considered needed to address this issue.
- Policies are likely to result in the most dramatic restructuring of energy markets to date.

- Significant increases in the cost (price) of all forms of energy.
- Significant redistribution of wealth between sectors, income classes, and even various regions and countries around the world.
- High near and intermediate term reliance on natural gas particularly for power generation.
- Very large increases in the price of electricity.
- Policies are outpacing technological and institutional capabilities.
- Ability to meet goals (at projected timetable) is questionable.

Market Mechanisms For Affecting Climate Change

Policy Type	Definition
Carbon Tax	Places a fixed tax on end-user energy usage.
Cap and Trade (Downstream, Emissions Type)	Would require certain emitting sectors to acquire emission credits for fuel burned in production processes.
Standards	Would change the efficiency (emissions) standards of appliances, motors, equipment, automobiles, etc.

Federal Proposals

Renewable Electricity Standards

- Requires 6% of electricity to come from renewables by 2012; and 20% by 2020.
- Up to 5% can come from efficiency improvements.

Emission cuts

- Caps emissions of greenhouse gases starting in 2012.
- Covers 85% of economy (including electricity producers, oil refineries, natural gas suppliers and energy-intensive industries like iron, steel and cement manufacturing).
- Goals for U.S. emissions reductions, below 2005 levels:
 - 3% by 2012;
 - 17% by 2020;
 - 42% by 2030; and
 - > 80% by 2050.
- Cap and trade program completely phased in by 2016.

Emission permits

- Regulated industries must acquire permits for their emissions.
- About 85% of permits are given away at start of program, with percentage decreasing over time.
- About 15% of permits are auctioned off at start of program, with percentage increasing over time.
- A permit to emit one ton of CO₂ would be worth \$11 to \$15 in 2012 and \$22 to \$28 in 2025 (EPA estimate).
- The value of all permits would be about \$60 billion in 2012 and roughly \$113 billion in 2025.

Greenhouse Gas Reduction

- Requires EPA to establish standards for new heavy-duty vehicles and engines.
- Promotes studies into and approaches to permitting geological sequestration sites.
- Establishes policy of promoting safe and clean nuclear industry.

Energy Efficiency and Renewable Energy

- Directs EPA to establish program to provide grants and other assistance to renewable projects in states with mandatory renewable portfolio standards.
- Directs EPA to establish a program to provide grants for research and development of advanced biofuels.
- Requires national goal for improvement in building energy efficiency.

Global Warming Pollution

- Goals for U.S. emissions reductions, below 2005 levels:
 - 3% by 2012;
 - 20% by 2020;
 - 42% by 2030; and
 - 83% by 2050.

Allowances

- Establishes annual tonnage limit on emissions. Allowances are equal to the tonnage limit for each year (one allowance represents permission to emit one ton of CO₂E).
- Does not restrict purchase, sale or transactions involving allowances.
- Includes a “Market Stability Reserve” that will be auctioned at minimum set price (\$28/ton in 2012) that increases annually. This is to help contain costs and minimize price fluctuations.

Renewable Electricity Standards

- ACES creates a RES or 20% by 2020.
- CEJAPA has no federal RES. Instead, it includes a provision to empower the EPA to give grants and other assistance to help states meet their own RES.

Emission cuts

- Both bills seek to cut emissions; CEJAPA starts by requiring a similar 3% cut by 2012 but requires a sharper cut of 20% by 2020.

Emission permits

- ACES requires regulated industries to acquire permits for their emissions.
- CEJAPA creates a similar system of tradeable credits.
- Difference: CEJAPA would set a ceiling price (“soft collar”) of \$28, adjusted for inflation.

Permit revenues

- ACES has a detailed description of how give-aways will be distributed.
- It is still unknown how CEJAPA will handle this.

Offsets

- With ACES, carbon emitters can buy into offsets. The bill has outlined explanations for tradeoffs.
- CEJAPA also has opportunity for offsets, but has less precise instructions as to what qualifies.

Investing in Renewables

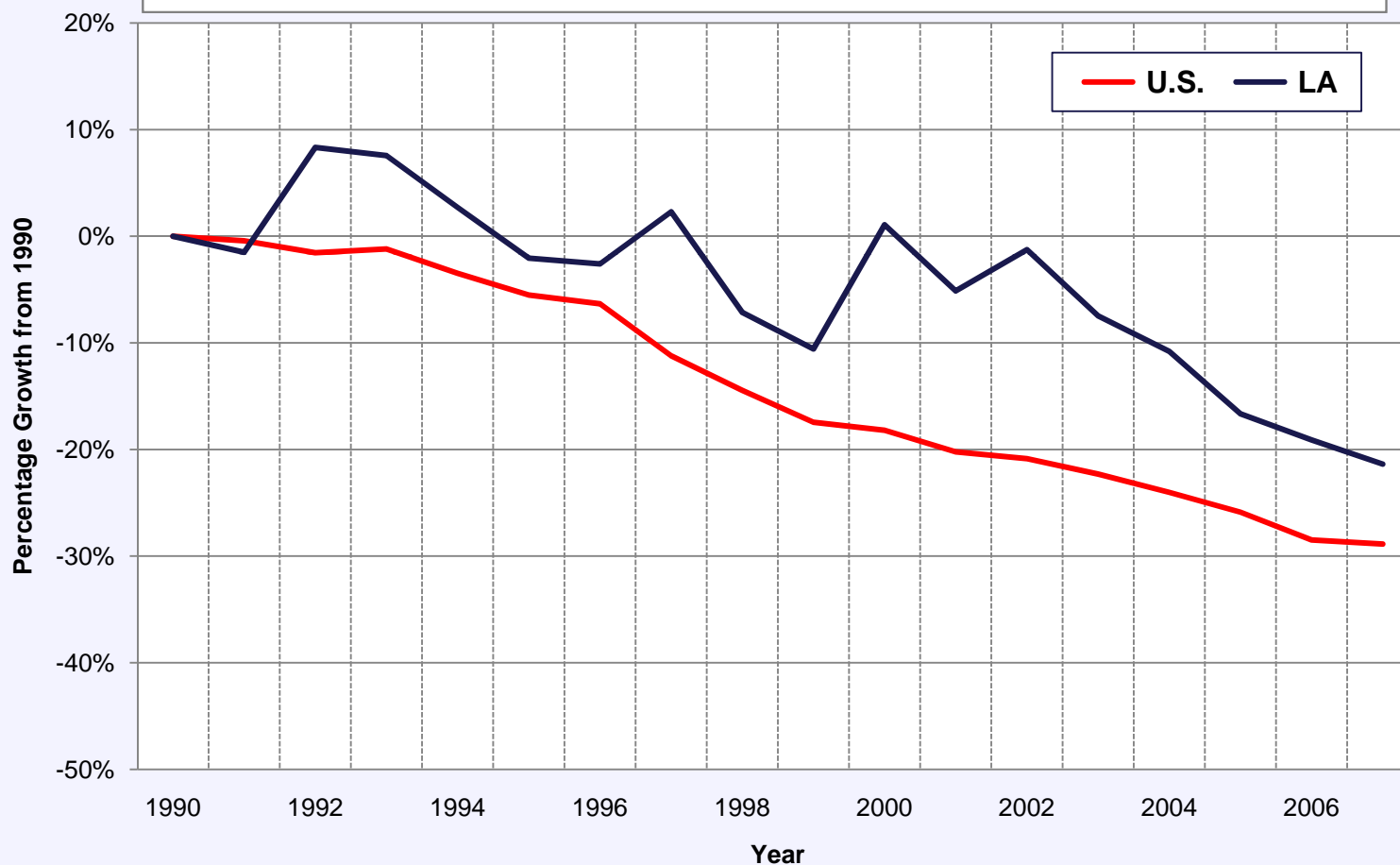
- ACES includes money for investment in renewable energy – as much as \$190 billion by 20205.
- CEJAPA is just the “climate” side. It’s partner bill (“ACELA”) is the energy half and its provisions are still being penciled in.

Compliance Alternatives

Method	Description	Challenges
Credits & Offsets	Initially allocated/auctioned credits and new offsets developed from mitigation projects	Efficiency of system (credits). Monitoring and verification of offsets.
Capital Investment	Carbon capture and storage	Expensive, uncertain, large supporting infrastructure and institutional support.
Fuel Switching	Nuclear, IGCC, natural gas	Expensive, longer-term investments, questionable development realization (cost, scope, reliability).
Renewables	Biomass, wind, solar, geothermal, hydro	Expensive, varying reliability, uncertainty (cost recovery)
Efficiency Improvements	Automotive Appliances Building measures Demand-Side Mgt. Demand Response	Good short run opportunities, significant, but limited in scope. Also require investment to reach pay-back.

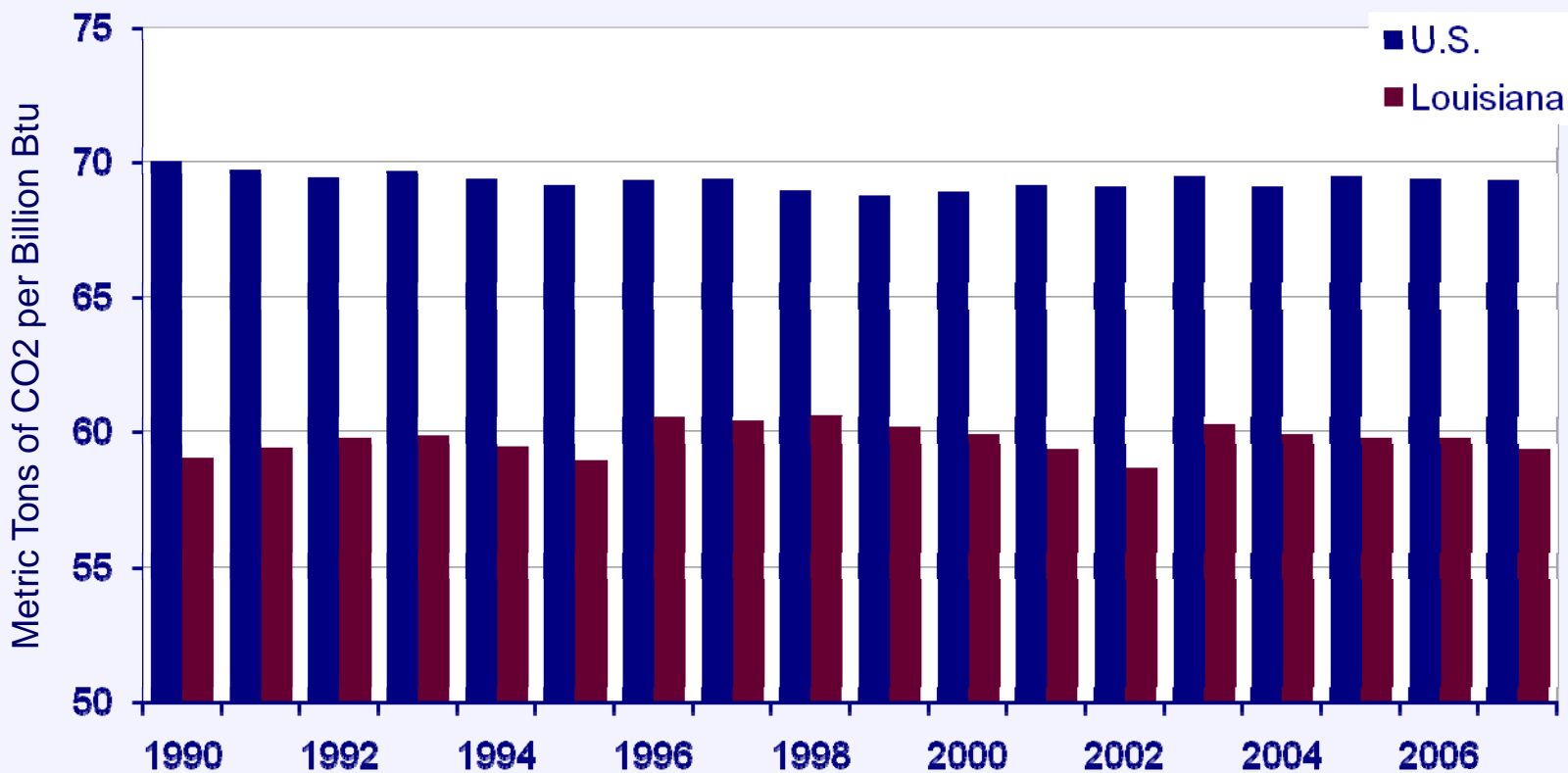
Louisiana CO2 Emission Trends

Louisiana has been following emissions reduction trends similar to overall U.S. since 1990.



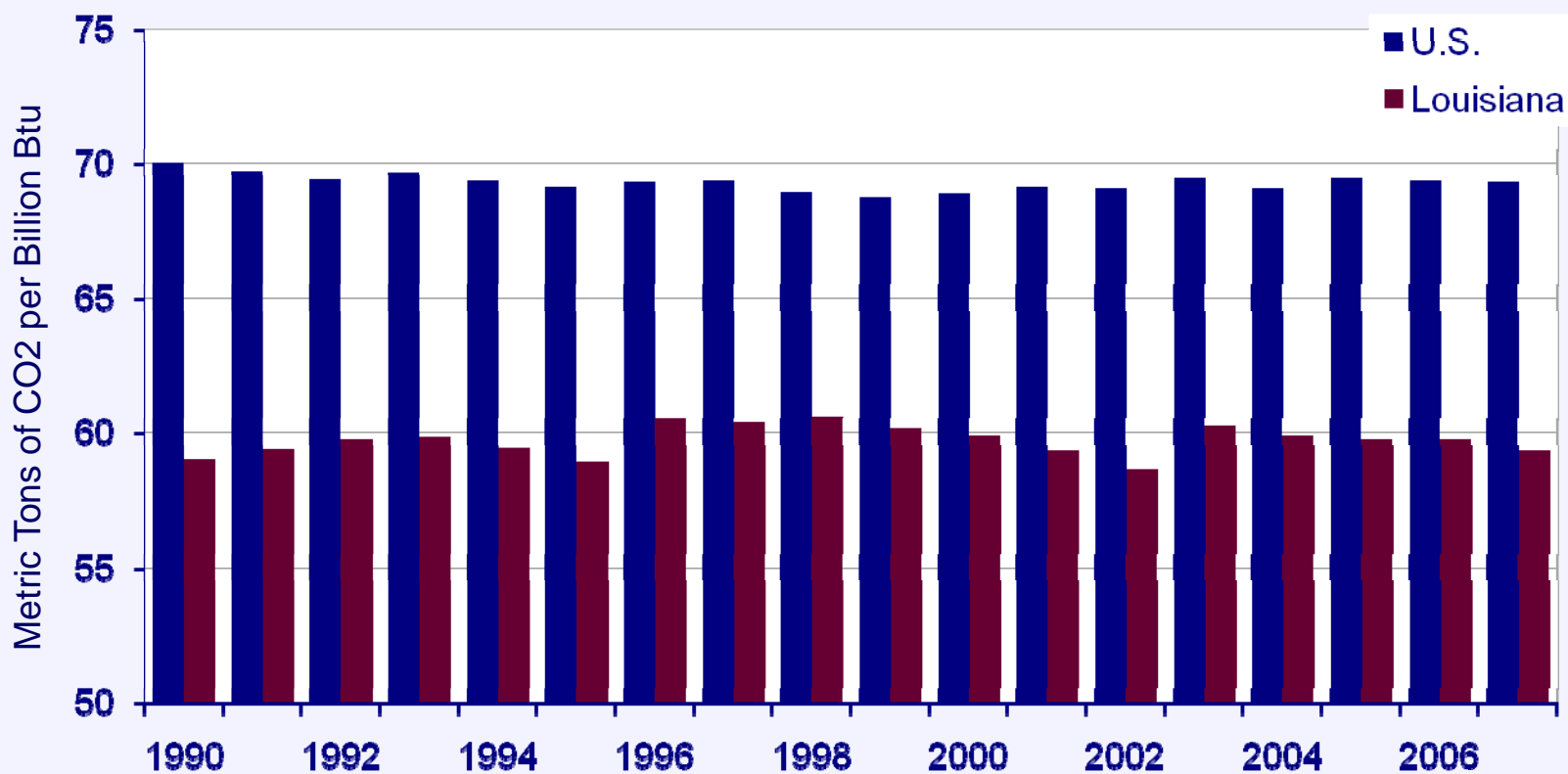
CO₂ E per Btu of Fossil Fuel Consumption Louisiana and U.S.

Louisiana tends to be more efficient, however, in emissions per unit of energy consumed.



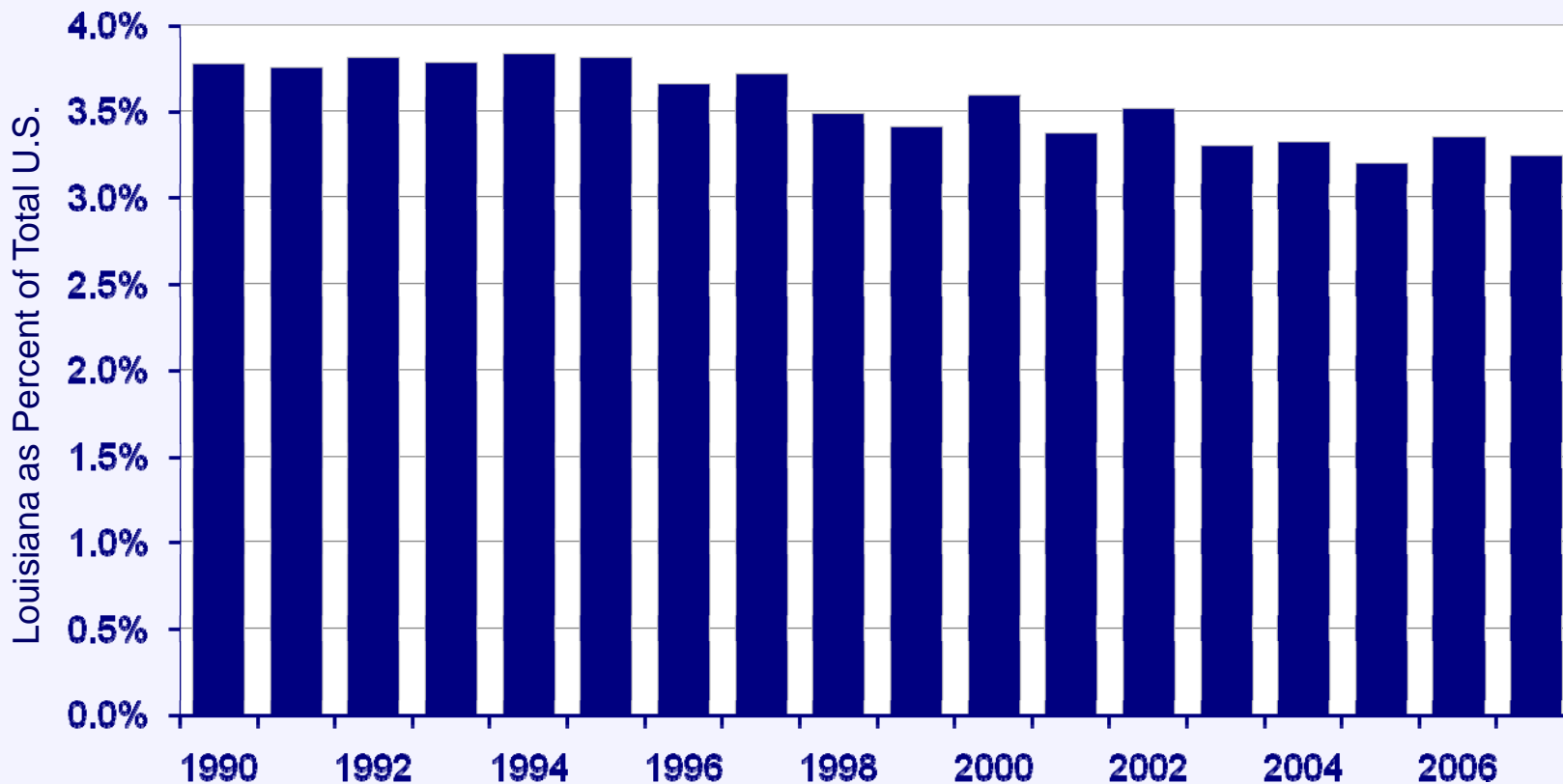
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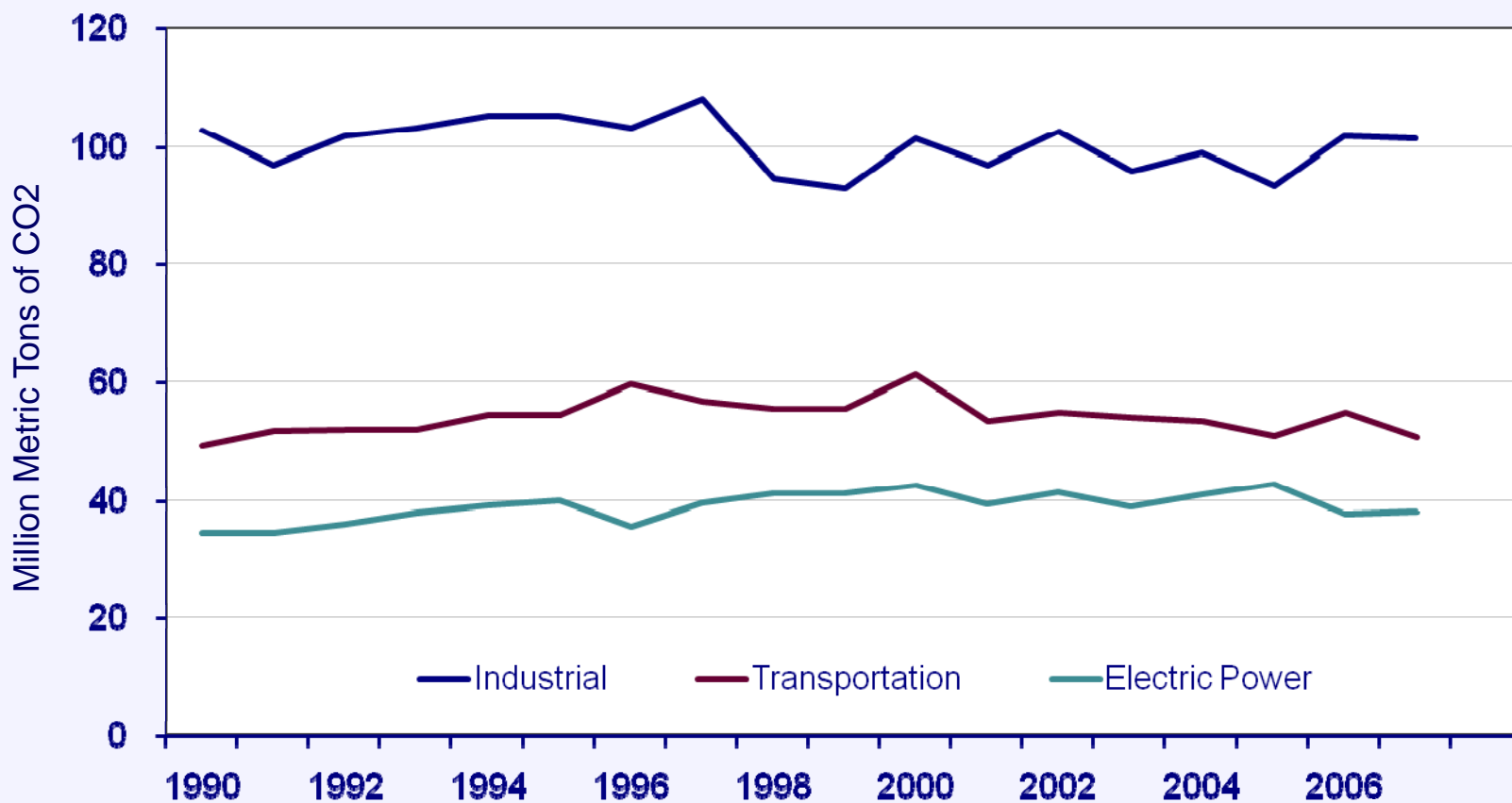


Louisiana Share of Total U.S. CO2 Emissions

Louisiana's share of U.S. CO2 emissions has been between 3 and 4 percent, but has been falling in recent years.



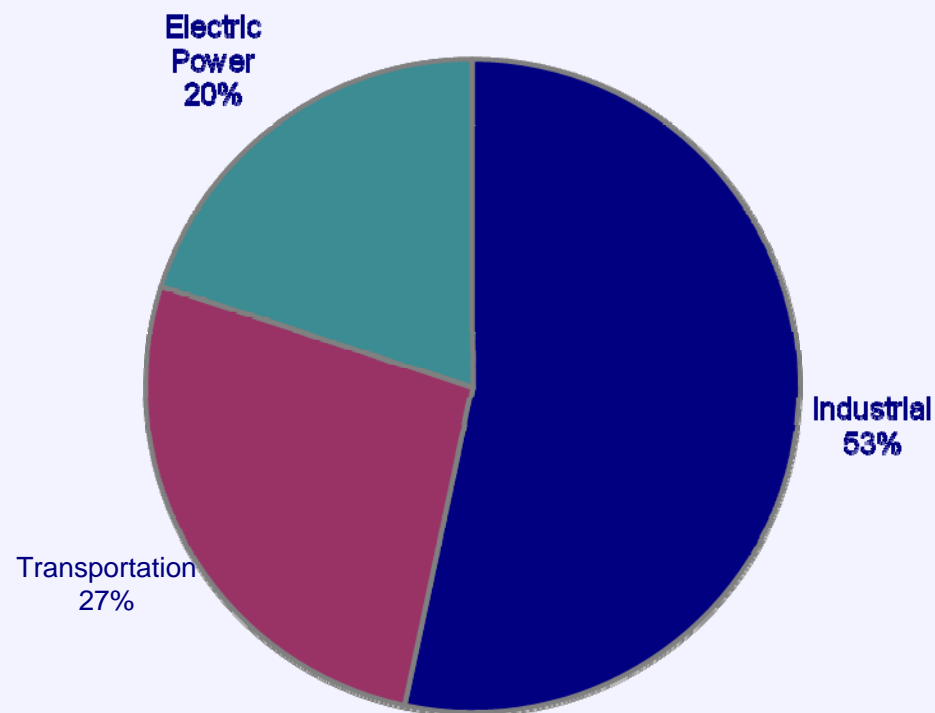
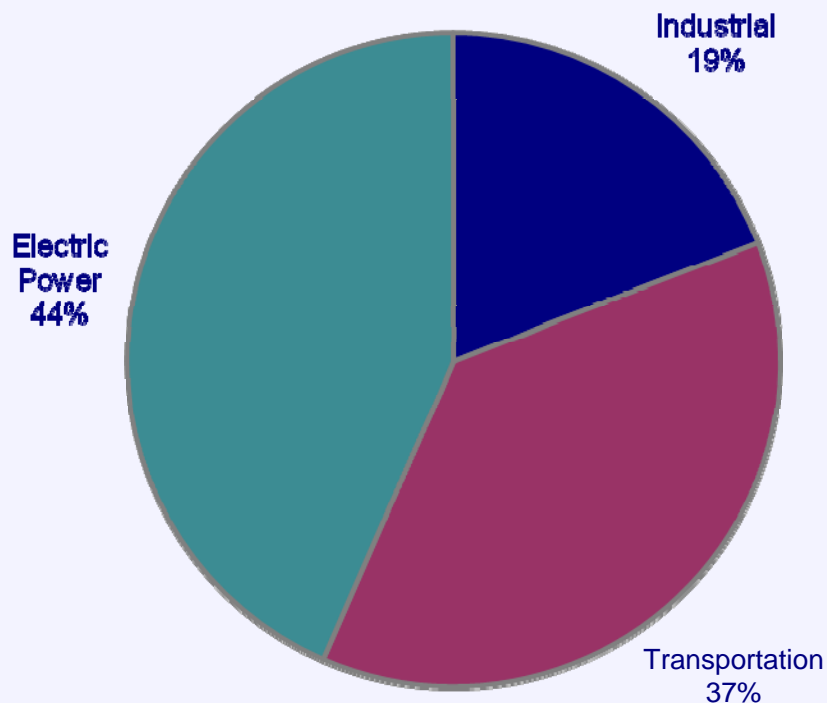
Louisiana carbon emissions have been driven primarily by moderate amounts of growth in transportation and electric power generation sectors.



U.S. and Louisiana CO2 Emissions per Sector 2007

**In the U.S., power generation
comprises about 44 percent of
overall national emissions.**

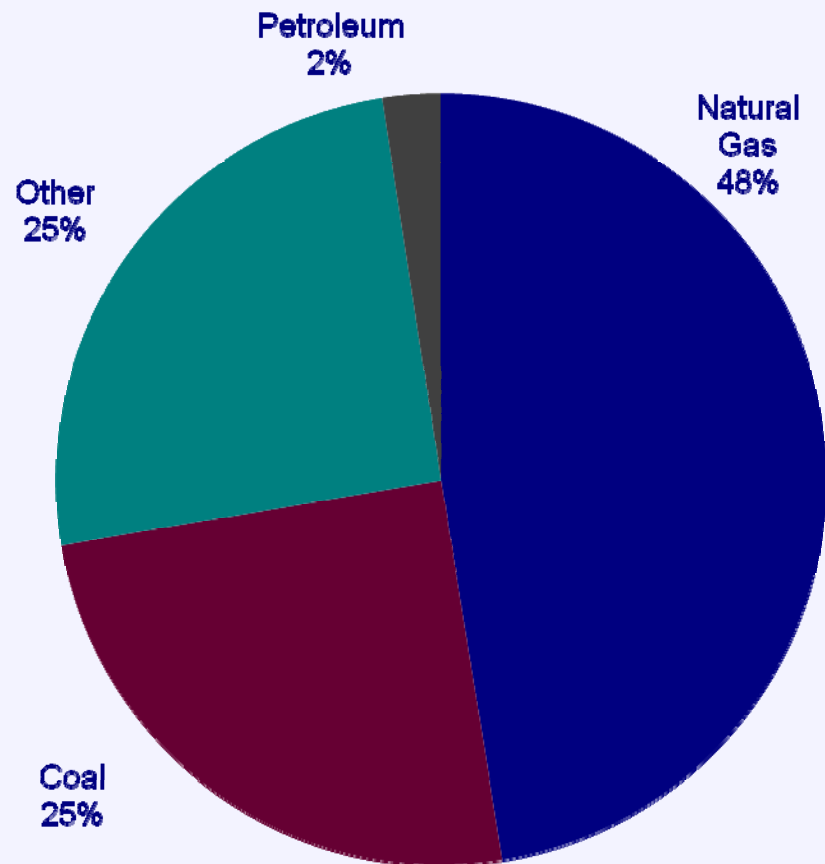
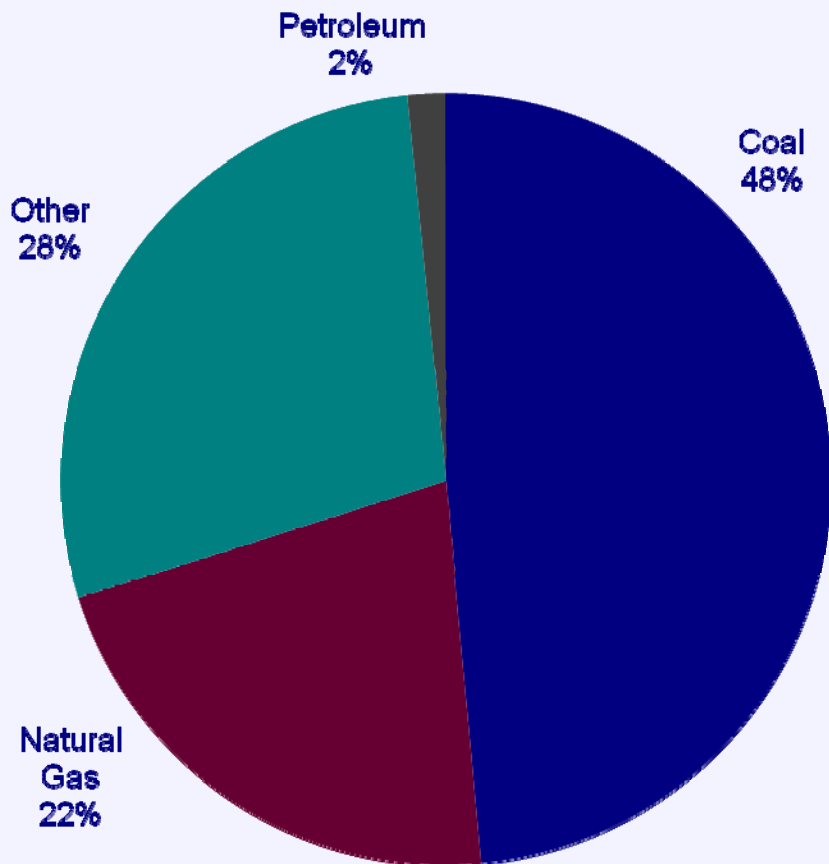
**In Louisiana, power generation
comprises about 20 percent of
overall state emissions.**



Louisiana and U.S. Electric Power Fuel Mix

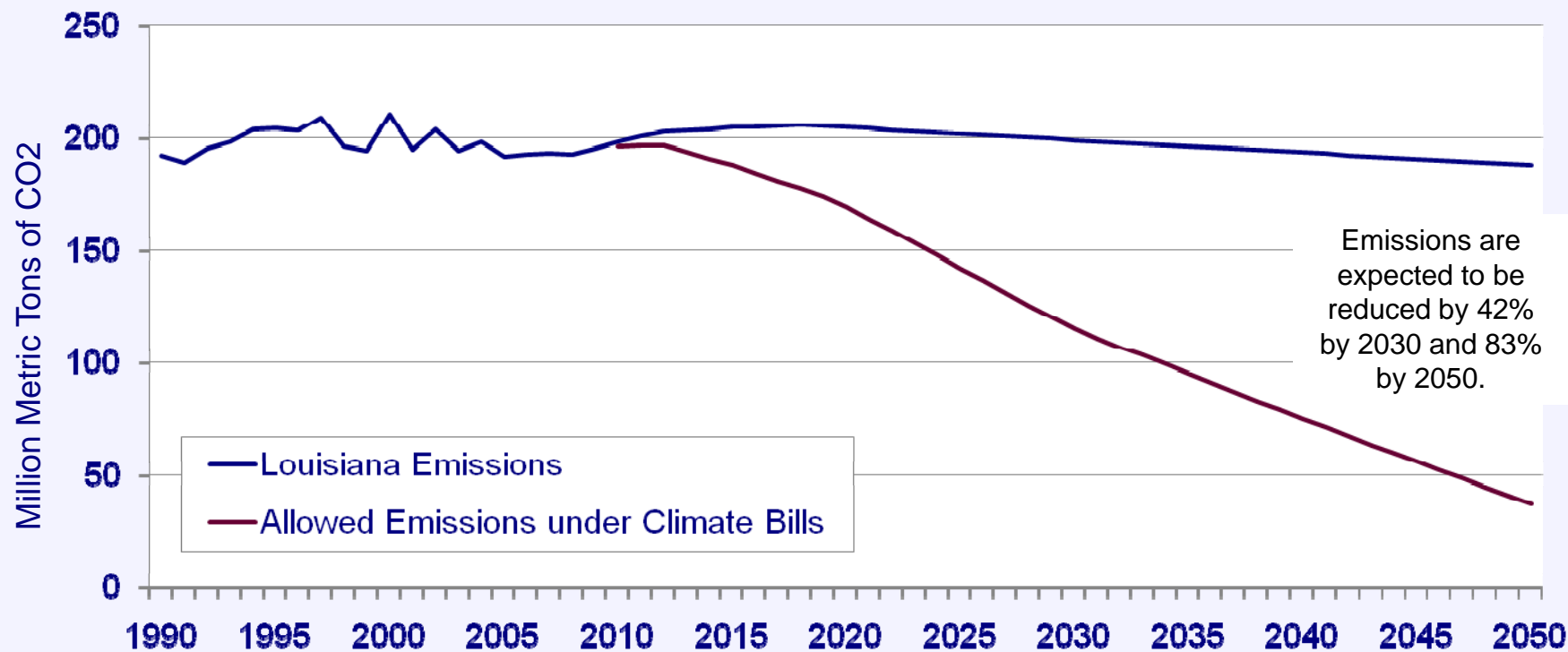
In the U.S., coal represents 48 percent of the electric power fuel mix (capacity basis).

In Louisiana, almost half of the electric power generation is fueled by natural gas. Coal only represents 25 percent of the electric power fuel mix (capacity basis).



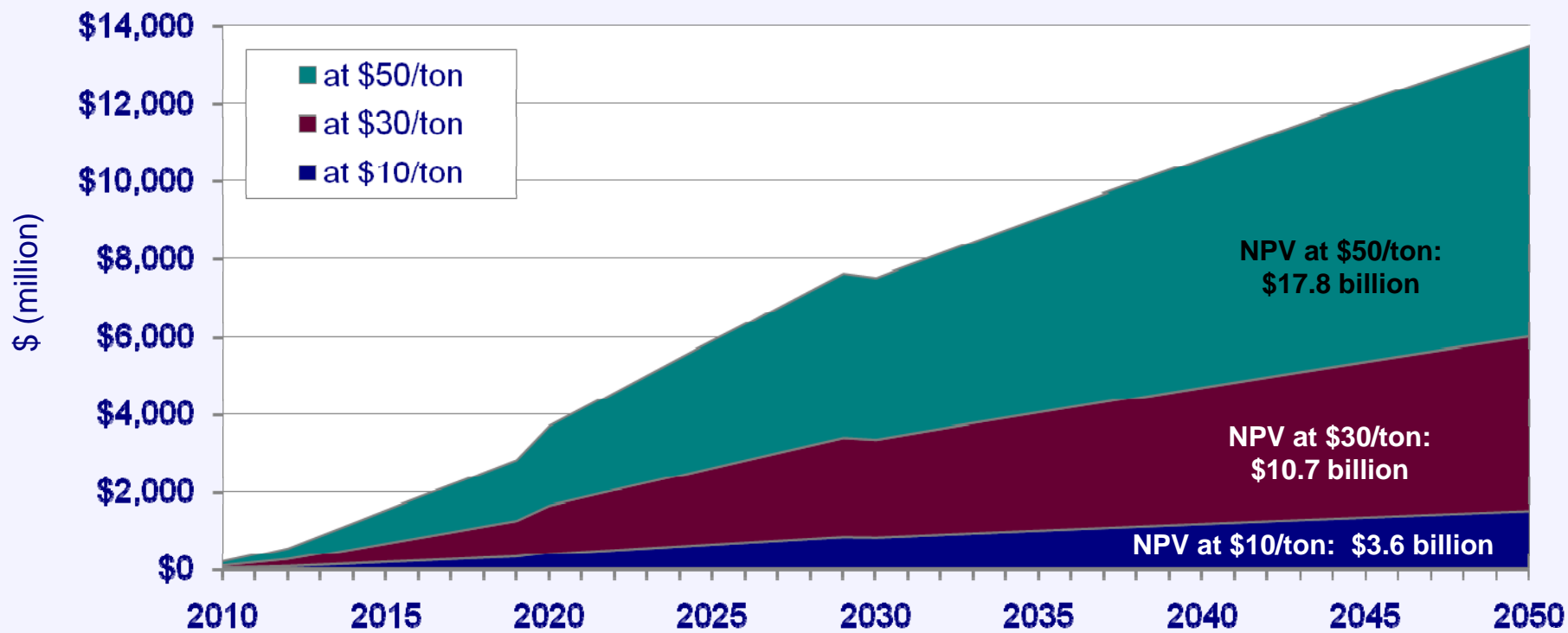
Potential Costs To Louisiana

Historic and Projected Louisiana Emissions



Preliminary and Not for Citation

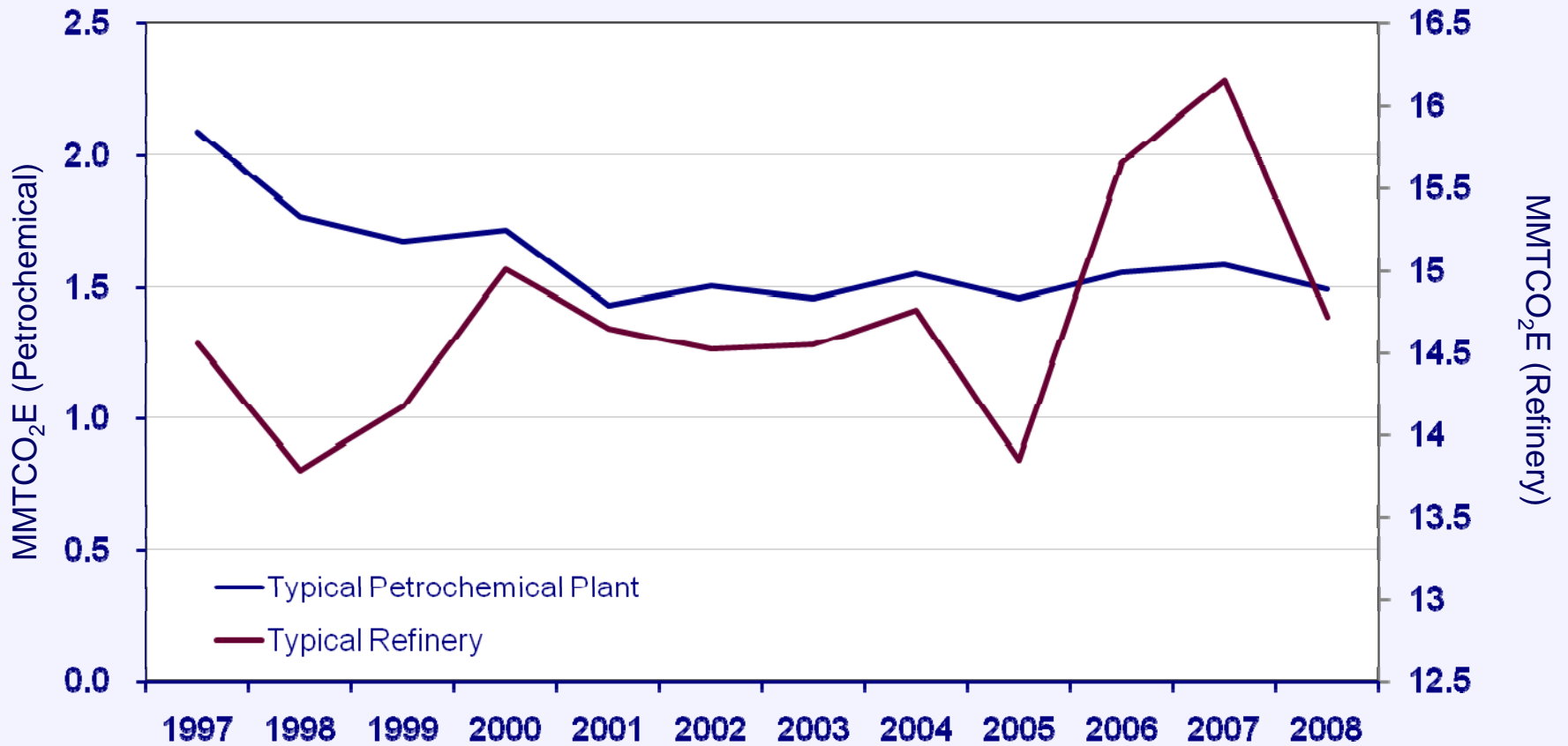
Estimated Cost of Emission Credit Deficits Louisiana Total



Preliminary and Not for Citation

Historic CO2 Emissions "Typical" Facilities

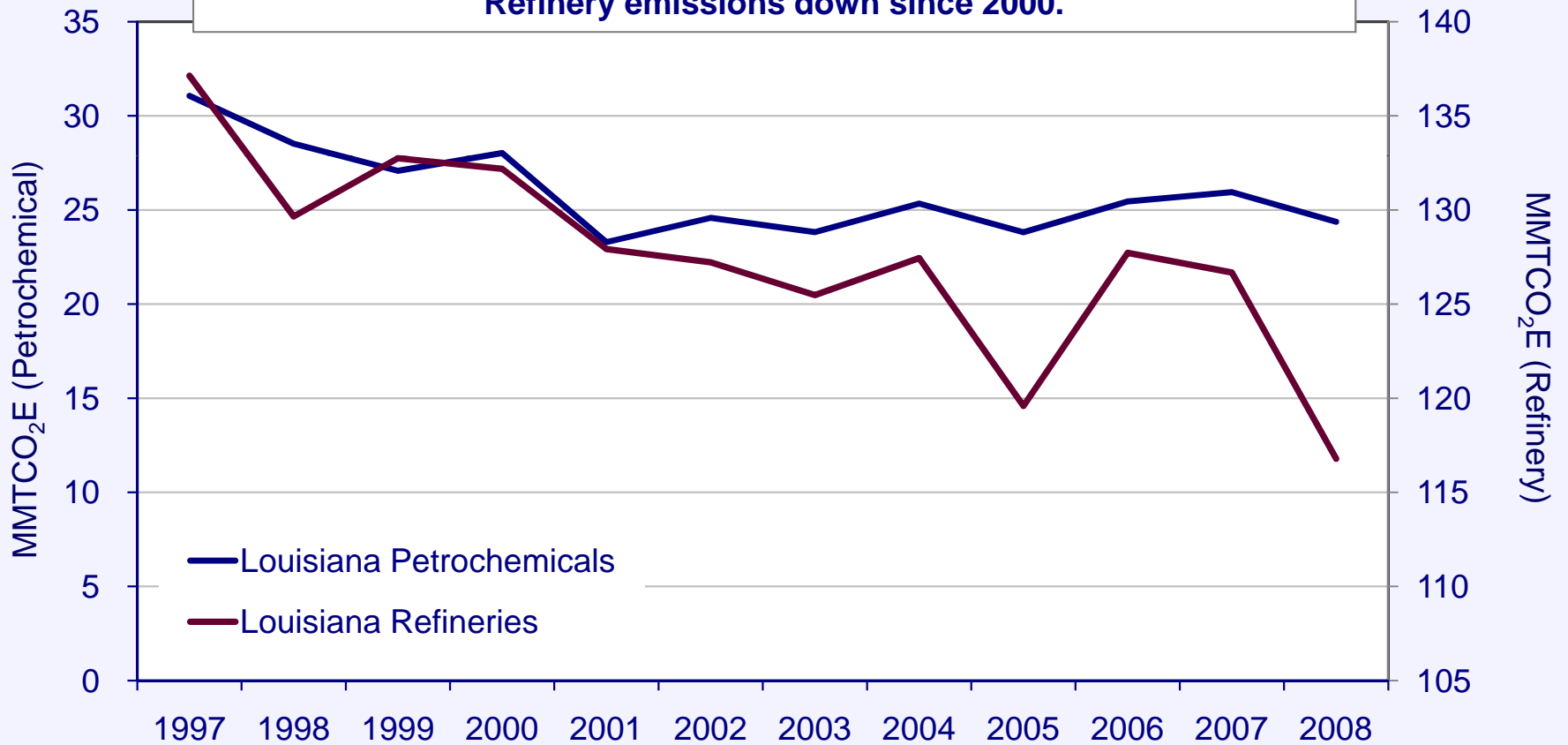
Typical petrochemical facilities and refineries have seen relatively stable trends in recent emissions. Exceptions would be the post-2005 increases for a "typical" refinery.



Preliminary and Not for Citation

Total emissions from both petrochemical facilities and refineries are down considerably from the mid-1990s.

Petrochem emissions relative constant since 2000.
Refinery emissions down since 2000.

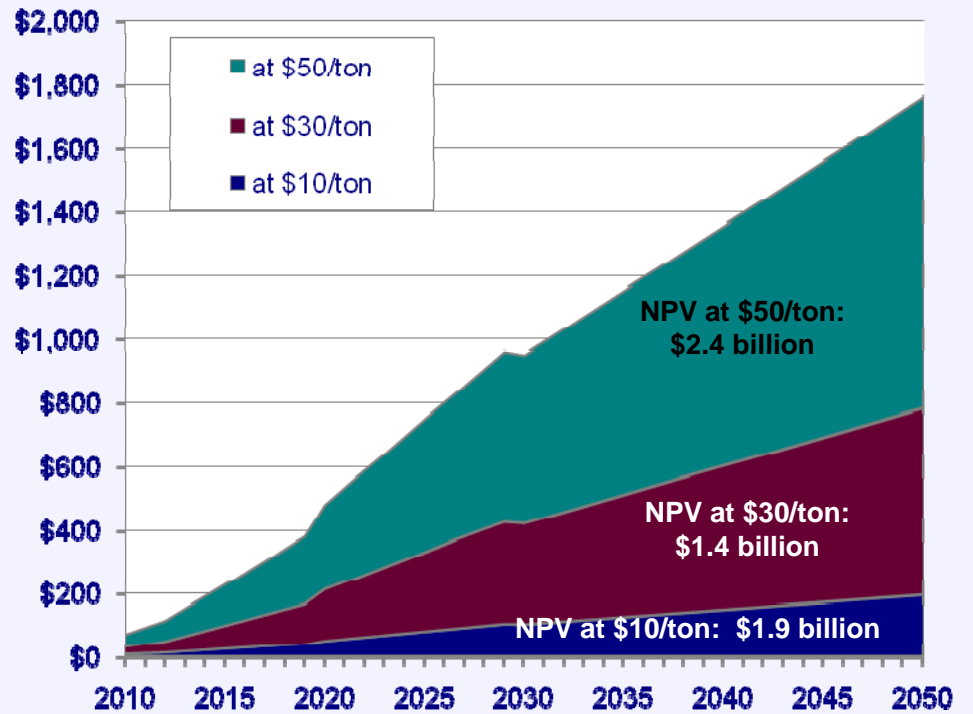
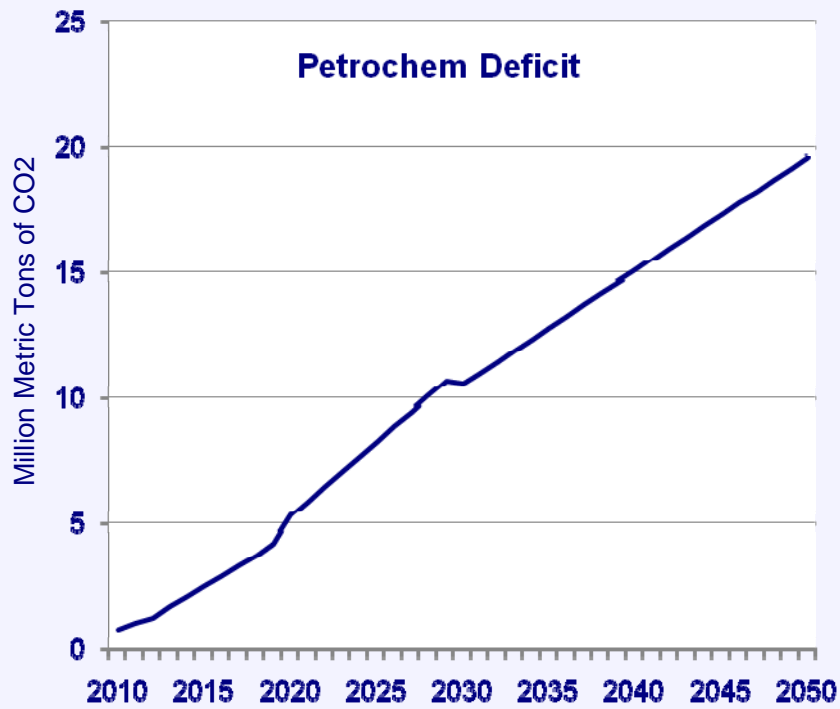


Preliminary and Not for Citation

Projected Cost to Louisiana Petrochemical Plants

Business as usual projections suggest dramatically increasing emission deficits for Louisiana petrochemical companies. The NPV cost of compliance for this sector is estimated to be \$1.4 billion at \$30/ton emissions price.

Preliminary estimate, typical facility (@ \$25/ton):
2010-2020: \$0 to \$20 million per year
2020-2050: \$20 to \$50 million per year.



Preliminary and Not for Citation

Note: assumes petrochemical emissions stay constant at 2008 levels.

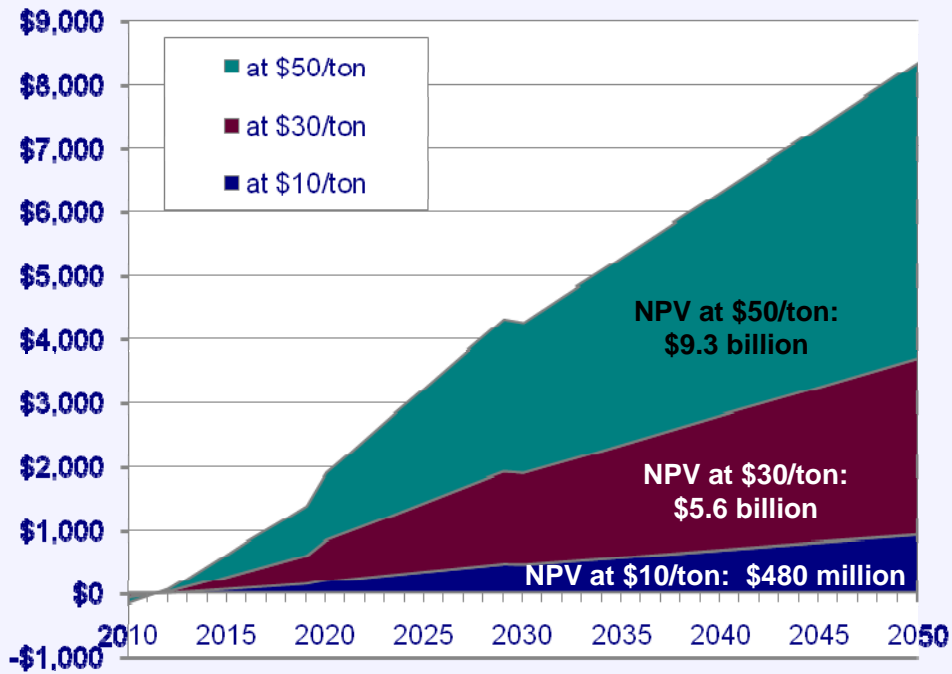
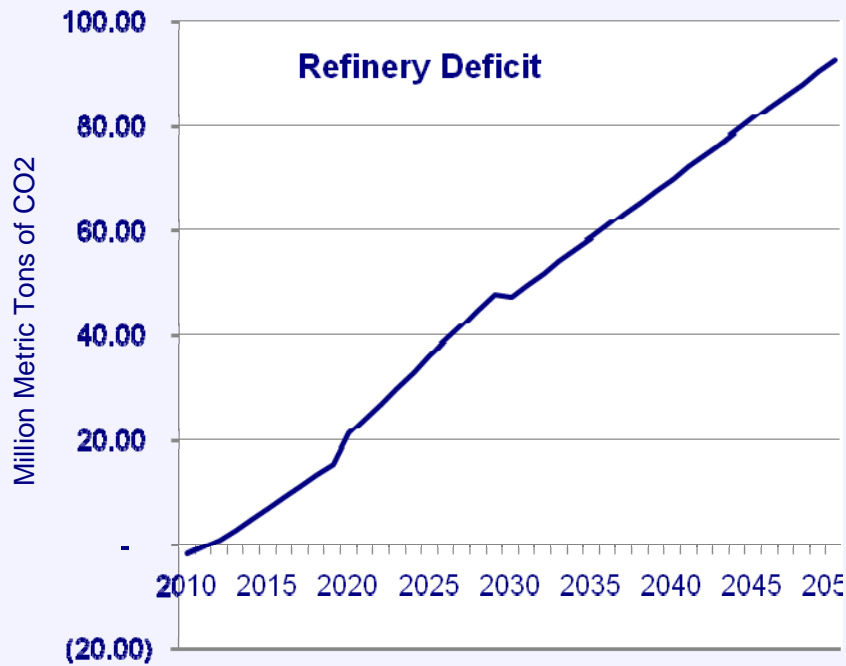
Projected Cost to Louisiana Refinery Plants

Business as usual projections suggest dramatically increasing emission deficits for Louisiana refineries. The NPV cost of compliance for this sector is estimated to be \$5.6 billion at \$30/ton emissions price.

Preliminary estimate, typical facility(@ \$25/ton):

2010-2020: \$0 to \$100 million per year

2020-2050: \$100 million to \$1 billion per year.



Preliminary and Not for Citation

Note: assumes refinery emissions stay constant at 2008 levels.

Total CO2 Surplus/Deficit by Year and Utility Growth Case

	Annual CO2 Surplus or Deficit by Utility									
	ELI	ENO	EGSI	CLECO	SWEPCO	MUNI	COGEN	IPP-COAL	IPP-GAS	STATE TOTAL
	----- (tons) -----									
2012	(500,441)	(102,878)	(535,624)	(580,615)	(195,601)	(184,388)	(734,628)	(1,393,920)	(160,005)	(4,388,099)
2015	(892,090)	(185,188)	(964,167)	(1,045,157)	(354,882)	(331,913)	(1,422,166)	(2,397,477)	(281,320)	(7,874,361)
2020	(2,234,168)	(364,525)	(1,873,688)	(2,028,156)	(1,117,499)	(651,937)	(2,615,415)	(4,358,474)	(537,728)	(15,781,589)
2025	(2,827,940)	(871,174)	(2,606,150)	(2,831,478)	(1,462,209)	(867,874)	(3,342,109)	(5,387,710)	(707,380)	(20,904,024)
2030	(3,895,585)	(1,162,784)	(3,131,540)	(3,777,193)	(1,778,270)	(1,036,213)	(4,035,466)	(6,279,190)	(876,104)	(25,972,345)
2035	(4,675,083)	(1,406,812)	(3,504,733)	(4,277,071)	(2,019,842)	(1,146,626)	(4,880,040)	(6,880,813)	(997,824)	(29,788,844)
2040	(5,427,784)	(1,685,363)	(3,872,278)	(4,806,203)	(2,856,581)	(1,253,471)	(5,364,271)	(7,466,141)	(1,127,964)	(33,860,056)
2045	(5,857,677)	(1,860,762)	(3,991,927)	(5,026,263)	(3,017,210)	(1,299,380)	(5,608,672)	(7,696,836)	(1,214,330)	(35,573,057)
2050	(6,046,280)	(1,907,695)	(4,052,490)	(5,102,519)	(3,144,094)	(1,326,228)	(5,781,919)	(7,813,607)	(1,290,491)	(36,465,323)

Preliminary and Not for Citation

Total CO2 Cost by Year and Utility Growth Case

	Annual Abatement Costs									
	ELI	ENO	EGSI	CLECO	SWEPCO	MUNI	COGEN	IPP-COAL	IPP-GAS	STATE TOTAL
	----- (million \$) -----									
2012	\$ 103.0	\$ 21.2	\$ 110.2	\$ 119.5	\$ 40.3	\$ 37.9	\$ 151.2	\$ 286.9	\$ 32.9	\$903.10
2015	\$ 114.9	\$ 23.8	\$ 124.1	\$ 134.6	\$ 45.7	\$ 42.7	\$ 183.1	\$ 308.7	\$ 36.2	\$1,013.87
2020	\$ 178.1	\$ 29.1	\$ 149.4	\$ 161.7	\$ 89.1	\$ 52.0	\$ 208.5	\$ 347.5	\$ 42.9	\$1,258.36
2025	\$ 201.4	\$ 62.0	\$ 185.6	\$ 201.7	\$ 104.1	\$ 61.8	\$ 238.0	\$ 383.7	\$ 50.4	\$1,488.73
2030	\$ 262.8	\$ 78.4	\$ 211.3	\$ 254.8	\$ 120.0	\$ 69.9	\$ 272.3	\$ 423.6	\$ 59.1	\$1,752.26
2035	\$ 317.8	\$ 95.6	\$ 238.2	\$ 290.7	\$ 137.3	\$ 77.9	\$ 331.7	\$ 467.7	\$ 67.8	\$2,024.91
2040	\$ 375.4	\$ 116.6	\$ 267.8	\$ 332.4	\$ 197.6	\$ 86.7	\$ 371.0	\$ 516.4	\$ 78.0	\$2,341.98
2045	\$ 433.9	\$ 137.8	\$ 295.7	\$ 372.3	\$ 223.5	\$ 96.3	\$ 415.5	\$ 570.2	\$ 90.0	\$2,635.13
2050	\$ 487.1	\$ 153.7	\$ 326.5	\$ 411.1	\$ 253.3	\$ 106.8	\$ 465.8	\$ 629.5	\$ 104.0	\$2,937.80
NPV:	\$1,404.19	\$395.16	\$1,121.34	\$1,320.04	\$677.51	\$373.20	\$1,546.10	\$2,364.10	\$327.57	\$9,529.21

Preliminary and Not for Citation

Note: Assumes credit cost of \$15/ton (escalated by 2% per year).

	Annual Average Ratepayer Impacts (Bill Impact)									
	ELI	ENO	EGSI	CLECO	SWEPCO	MUNI	COGEN	IPP-COAL	IPP-GAS	STATE AVG
	----- (\$/bill) -----									
2012	\$56.99	\$46.12	\$90.82	\$207.73	\$111.34	\$124.90	n.a.	\$577.16	n.a.	\$177.61
2015	\$63.58	\$51.78	\$102.28	\$233.98	\$126.26	\$140.72	n.a.	\$621.02	n.a.	\$199.38
2020	\$98.55	\$63.31	\$123.13	\$281.08	\$246.16	\$171.37	n.a.	\$699.07	n.a.	\$247.47
2025	\$111.44	\$134.88	\$152.96	\$350.62	\$287.61	\$203.67	n.a.	\$771.90	n.a.	\$292.78
2030	\$145.41	\$170.55	\$174.14	\$442.92	\$331.53	\$230.36	n.a.	\$852.16	n.a.	\$344.60
2035	\$175.84	\$207.97	\$196.31	\$505.33	\$379.33	\$256.73	n.a.	\$940.88	n.a.	\$398.19
2040	\$207.71	\$253.66	\$220.71	\$577.81	\$545.93	\$285.73	n.a.	\$1,038.85	n.a.	\$460.57
2045	\$240.08	\$299.77	\$243.70	\$647.17	\$617.48	\$317.36	n.a.	\$1,147.08	n.a.	\$518.26
2050	\$269.52	\$334.36	\$269.08	\$714.62	\$699.81	\$351.97	n.a.	\$1,266.38	n.a.	\$577.77
Percent Increase on a Typical Bill										
2015	3.8%	3.1%	6.1%	13.8%	7.4%	8.3%	n.a.	38.5%	n.a.	11.8%
2020	4.2%	3.4%	6.7%	15.3%	8.3%	9.2%	n.a.	40.6%	n.a.	13.0%
2025	6.3%	4.1%	7.9%	18.0%	15.8%	11.0%	n.a.	44.8%	n.a.	15.9%
2030	7.0%	8.5%	9.6%	22.0%	18.1%	12.8%	n.a.	48.5%	n.a.	18.4%
2035	9.0%	10.5%	10.7%	27.3%	20.4%	14.2%	n.a.	52.5%	n.a.	21.2%
2040	10.6%	12.6%	11.9%	30.5%	22.9%	15.5%	n.a.	56.8%	n.a.	24.0%
2045	12.3%	15.0%	13.1%	34.2%	32.3%	16.9%	n.a.	61.5%	n.a.	27.3%
2050	13.9%	17.4%	14.1%	37.6%	35.8%	18.4%	n.a.	66.6%	n.a.	30.1%

Note: Assumes credit cost of \$15/ton (escalated by 2% per year). Assumes a typical bill is \$1,500 per year (escalated by 2% per year)

Preliminary and Not for Citation

	Annual Average Ratepayer Impacts (Bill Impact)									
	ELI	ENO	EGSI	CLECO	SWEPCO	MUNI	COGEN	IPP-COAL	IPP-GAS	STATE AVG
	----- (\$/bill) -----									
2012	\$5,042	\$1,273	\$10,338	\$52,090	\$2,957	\$111	n.a.	\$10,519	n.a.	\$11,761
2015	\$5,299	\$1,351	\$10,970	\$55,278	\$3,163	\$118	n.a.	\$10,666	n.a.	\$12,407
2020	\$7,443	\$1,492	\$11,958	\$60,168	\$5,586	\$130	n.a.	\$10,876	n.a.	\$13,950
2025	\$7,622	\$2,885	\$13,455	\$67,952	\$5,913	\$140	n.a.	\$10,876	n.a.	\$15,549
2030	\$9,008	\$3,304	\$13,872	\$77,779	\$6,170	\$144	n.a.	\$10,876	n.a.	\$17,308
2035	\$9,866	\$3,647	\$14,168	\$80,372	\$6,396	\$145	n.a.	\$10,876	n.a.	\$17,924
2040	\$10,556	\$4,027	\$14,427	\$83,234	\$8,336	\$146	n.a.	\$10,876	n.a.	\$18,800
2045	\$11,051	\$4,313	\$14,427	\$84,436	\$8,541	\$147	n.a.	\$10,876	n.a.	\$19,113
2050	\$11,236	\$4,356	\$14,427	\$84,436	\$8,767	\$148	n.a.	\$10,876	n.a.	\$19,178

Preliminary and Not for Citation

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2050	\$11,236	\$4,356	\$14,427	\$84,436	\$8,767	\$148	n.a.	\$10,876	n.a.	\$19,178
Percent Increase on a Typical Bill										
2012	5.0%	1.3%	10.3%	52.1%	3.0%	0.1%	n.a.	10.5%	n.a.	11.8%
2015	5.2%	1.3%	10.8%	54.2%	3.1%	0.1%	n.a.	10.5%	n.a.	12.2%
2020	7.2%	1.4%	11.5%	57.8%	5.4%	0.1%	n.a.	10.5%	n.a.	13.4%
2025	7.2%	2.7%	12.7%	64.0%	5.6%	0.1%	n.a.	10.2%	n.a.	14.7%
2030	8.3%	3.1%	12.8%	71.9%	5.7%	0.1%	n.a.	10.0%	n.a.	16.0%
2035	8.9%	3.3%	12.8%	72.8%	5.8%	0.1%	n.a.	9.9%	n.a.	16.2%
2040	9.4%	3.6%	12.8%	73.9%	7.4%	0.1%	n.a.	9.7%	n.a.	16.7%
2045	9.6%	3.8%	12.6%	73.5%	7.4%	0.1%	n.a.	9.5%	n.a.	16.6%
2050	9.6%	3.7%	12.3%	72.1%	7.5%	0.1%	n.a.	9.3%	n.a.	16.4%

Note: Assumes credit cost of \$15/ton (escalated by 2% per year). Assumes a typical bill is \$100,000 per year (escalated by 2% per year)

Preliminary and Not for Citation

Conclusions

- Policy proposals associated with climate change are likely to be the biggest form of energy market restructuring ever experienced.
- Credibility, M&V, volatility, and confusion are likely to be experienced early in this process. Policy is outpacing the technology and institutional capabilities.
- The combination of climate, energy efficiency, and renewables are likely to have unanticipated consequences.
- Significant redistribution of wealth between sectors, income classes, and even various regions and countries around the world.
- High near and intermediate term reliance on natural gas particularly for power generation.

Questions & Comments

dismukes@lsu.edu

www.enrg.lsu.edu