LSU Center for Energy Studies







The Impacts of Greenhouse Gas Regulation on the Louisiana Economy

David E. Dismukes, Christopher P. Peters, Michael D. McDaniel, Kathryn R. Perry, and Lauren L. Stuart

November 2, 2011

LSU CENTER FOR ENERGY STUDIES

Acknowledgments

Project Funding

This project was financially supported by the Louisiana Department of Economic Development ("LED") with supplemental funding provided by the CES Industry Associates Advisory Council.

Project Advisory Team

A Project Advisory Team ("PAT"), representing a variety of stakeholder groups, was assembled for this project and provided valuable direction and input to the research team. PAT members include:

- Brian Bond, AEP-SWEPCO
- David Castille, Louisiana Department of Economic Development
- Jason El Koubi, Louisiana Department of Economic Development
- Mike French, Louisiana Department of Natural Resources
- Karen Gautreaux, The Nature Conservancy
- Henry Graham, Louisiana Chemical Association
- Richard Metcalf, Louisiana Mid-Continent Oil and Gas Association
- Paul Miller, Louisiana Department of Environmental Quality
- Will Perkins, Georgia-Pacific
- Terry Rider, Consultant-Government Affiars
- Emily Stich, Louisiana Association of Business and Industry
- Daniel Thomas, Ph.D., LSU AgCenter
- Robert Berg, Exxon Mobil

Study Purpose

This report is a high-level assessment of the impacts of the most likely federal greenhouse gas regulatory schemes on Louisiana's economy. This report is the product of the third task of an overall effort to quantify and understand potential impacts. The report focuses on the potential economic impacts that may arise from a federally-mandated greenhouse gas cap & trade regulatory scheme.

Multiple scenarios are analyzed as part of this report, covering the state's primary industries including natural gas and petroleum extraction, petroleum refining, petrochemical manufacturing, electrical generation, and a multitude of industrial activities.

This report was produced with the input of a project advisory team ("PAT") of stakeholders listed on the acknowledgement page.

This high-level assessment of potential GHG regulatory impacts on Louisiana's economy is both qualitative and quantitative in nature. The report provides the foundation for understanding how federal GHG regulation may affect the Louisiana economy.

Executive Summary

Louisiana's share of total United States CO_2 emissions, a greenhouse gas, has declined over the past two decades from a high of 3.5 percent of all U.S. carbon emissions, to a level that now accounts for less than 3 percent of all U.S. carbon emissions. Reliance on relatively cleaner burning natural gas puts Louisiana in the position of emitting fewer GHG emissions per unit of energy consumed than the U.S. average.

This report estimates the potential impacts of federal GHG regulation on the Louisiana economy. Annual Louisiana emissions compliance costs ("ECCs" – or the "direct economic impacts" of GHG regulation) are estimated to reach about $320 million by 2020, or 0.14 percent of forecasted baseline state economic activity. Direct ECC impacts are estimated to reach $846 million per year, or 0.32 percent of baseline state economic activity, by 2030. The cumulative cost to the state by 2030 is estimated to be about $7.4 billion. The southeast region of the state will bear 58 percent of cumulative compliance costs through 2030.

The refining sector is estimated to bear a significant share of the direct economic impacts associated with GHG regulation (44 percent). The petrochemical sector is anticipated to bear 10 percent of the direct compliance cost associated with GHG regulation, while the remaining industries in the state (non-petrochemical and non-refining) are estimated to bear 15 percent of the direct compliance costs.

Executive Summary, continued

A number of important assumptions were used to estimate the ECCs. These assumptions include the calculation of current baseline GHG emissions and the development of a forecast of baseline GHG emissions. Other important assumptions include forecasted energy prices, and assumed price and income elasticities of demand for fossil fuels, and assumed structural changes in end-use efficiencies as measure through energy use per customer ("UPC").

Baseline economic data were also forecasted for income and employment growth.

As previously noted, the impacts contained within this report model a federally-mandated greenhouse gas cap & trade regulatory scheme. Under such a system the federally-mandated cap would be lowered through time and create a market for greenhouse gas emissions allowances. The price of allowances are an important assumption for the estimation of ECCs. Large industrial sectors are assumed to experience economies of scale and a broader portfolio of compliance options for mitigating emissions, and are assumed to purchase allowances from a lower portion of the marginal abatement cost curve than other sectors.

Since indirect, and induced effects are a product of ECCs, these assumptions should be taken into account when reading and drawing conclusions from this report.

Executive Summary, continued.

While electric utilities are estimated to incur significant direct compliance costs, the historic trend of increased natural gas utilization, as well as increased generation fuel use efficiencies, will reduce the forward-looking burden to around 1 percent of statewide 2030 compliance costs.

GHG regulation will also lead to a number of secondary economic impacts often referred to as "indirect" and "induced" economic impacts. These indirect and induced economic impacts are estimated to reach about -$142 million annually by the year 2020, or 0.06 percent of projected baseline state economic output. By 2030 these indirect and induced economic impacts are estimated to reach about -$350 million annually, or about 0.13 percent of projected Louisiana baseline economic output.

Total economic impacts, which include the direct ECCs, as well as the indirect and induced economic impacts, are estimated to reach about -$463 million annually by the year 2020. The total economic impact of complying with federal GHG regulation is anticipated to be about 0.20 percent of overall Louisiana baseline economic output. By year 2030, total economic impacts are estimated to reach about -$1.2 billion annually, or 0.45 percent of Louisiana baseline economic output. The southeast region will bear the largest share of total impacts, with a share of about 60 percent of total impacts to the state each year.

Executive Summary, continued.

The total annual employment losses associated with federal GHG regulation are estimated to reach about 3,700 jobs annually by the year 2020 and a loss of about 7,700 jobs annually by the year 2030.

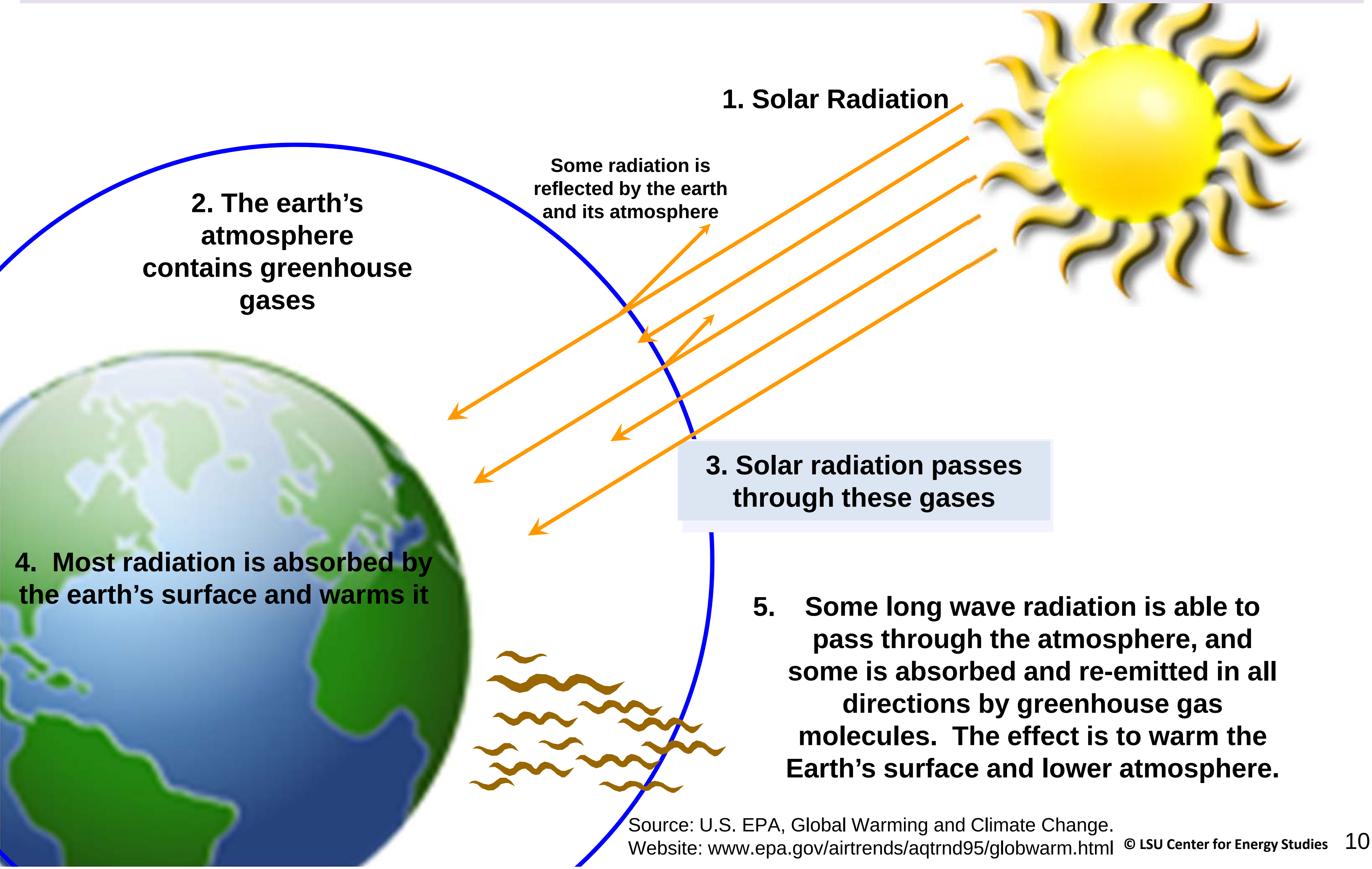
The southwest region is estimated to bear about 16 percent of the economic burden of GHG regulation, even though it represents about 20 percent of Louisiana baseline economic output. This means that the relative burden to the Southwest will be less than in other regions of the state such as the Southeast and Northwest.

The Southeastern area of the state will incur about 60 percent of the overall cost of GHG regulation and comprises about 57.5 percent of the overall baseline Louisiana economy. The Northwest section of the state will bear a larger proportionate share of the cost of GHG regulation incurrent some 19 percent of the estimated cost despite only contributing 17 percent to the Louisiana economy. The Northeast's estimated burden is equal to its estimated share of the Louisiana economy, at about 6 percent.

Table of Contents

Introduction

The Greenhouse Effect – the Source of the Climate Change Problem



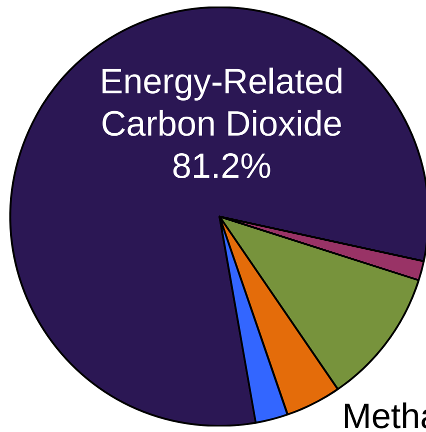
Source: U.S. EPA, Global Warming and Climate Change.
Website: www.epa.gov/airtrends/aqtrnd95/globwarm.html

Greenhouse Gas Emissions

Carbon dioxide (CO_2) enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). Carbon dioxide is also removed from the atmosphere (or “sequestered”) when it is absorbed by plants as part of the biological carbon cycle.

Methane (CH_4) is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.

Total U.S. Greenhouse Gas Emissions, 2008 (CO_2 eq.)
(naturally-occurring and anthropogenic sources)



Nitrous Oxide (N_2O) is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

High Global Warming Potential Gases (or High-GWP Gases) are significantly stronger than CO_2 in terms of their ability to trap heat in the atmosphere. These gases include hydrochlorofluorocarbons (HCFCs), perfluorocarbons (PFCs) and sulfur hexafluoride. These are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes and are associated with their use as alternatives to ozone-depleting substances.

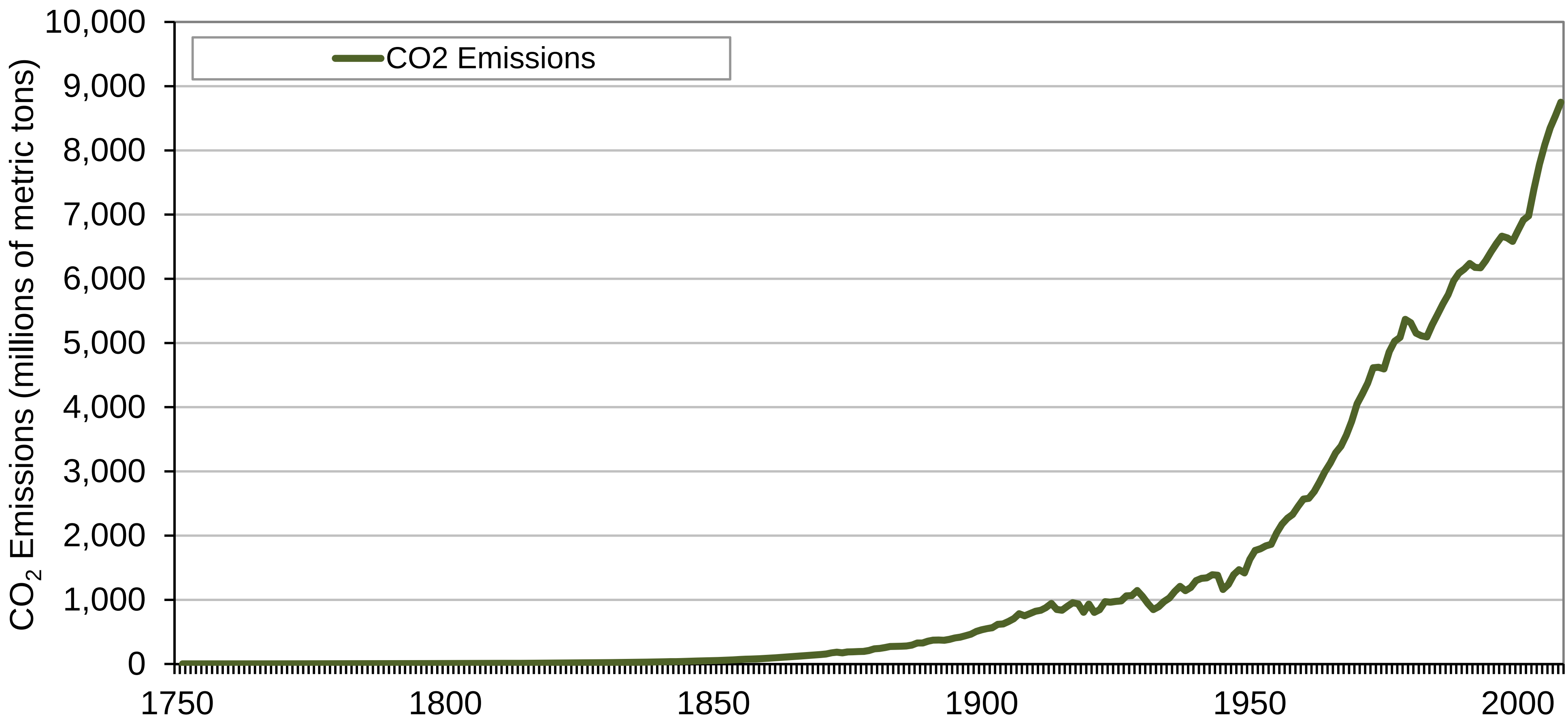
Beyond human-caused sources, U.S greenhouse gas emissions are partially caused by naturally occurring sources that emit carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3).

In addition to natural causes of greenhouse gas emissions, natural systems found in oceans, and living biomass absorb billions of tons of carbon in the form of CO_2.

Source: U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2009. April 2011*

Global CO_2 Atmospheric Concentration and Emissions

Anthropogenic CO_2 emissions are estimated to have increased significantly after World War II, and have shown only a slight departure from that extreme increase in recent decades.

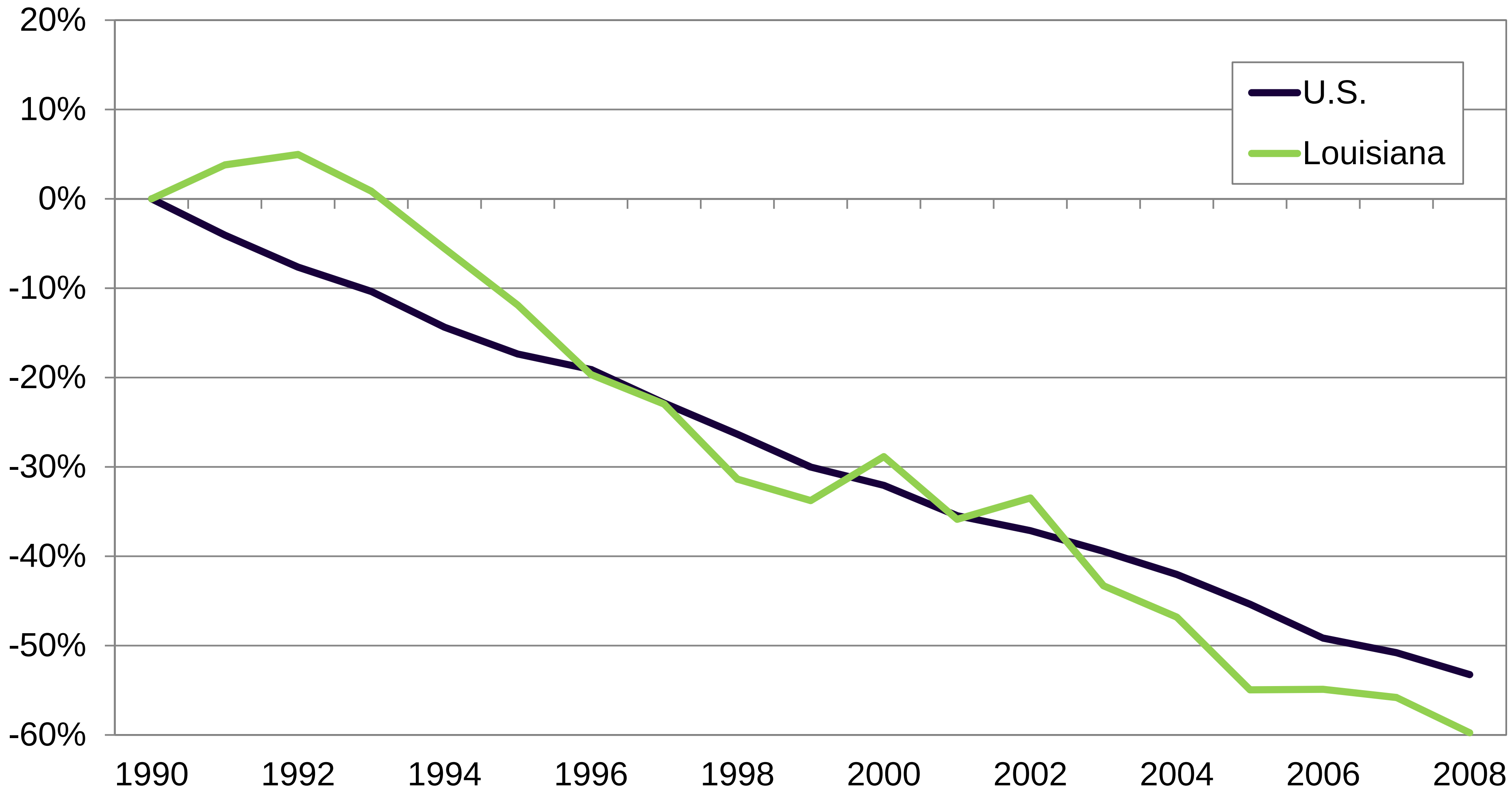


Source: Oak Ridge National Laboratory. Accessed June 3rd, 2011. Website: cdiac.ornl.gov/ftp/ndp030/CSV-FILES/

Louisiana CO_2 Emission Trends

Gross CO2E per GDP and GSP, U.S. and Louisiana

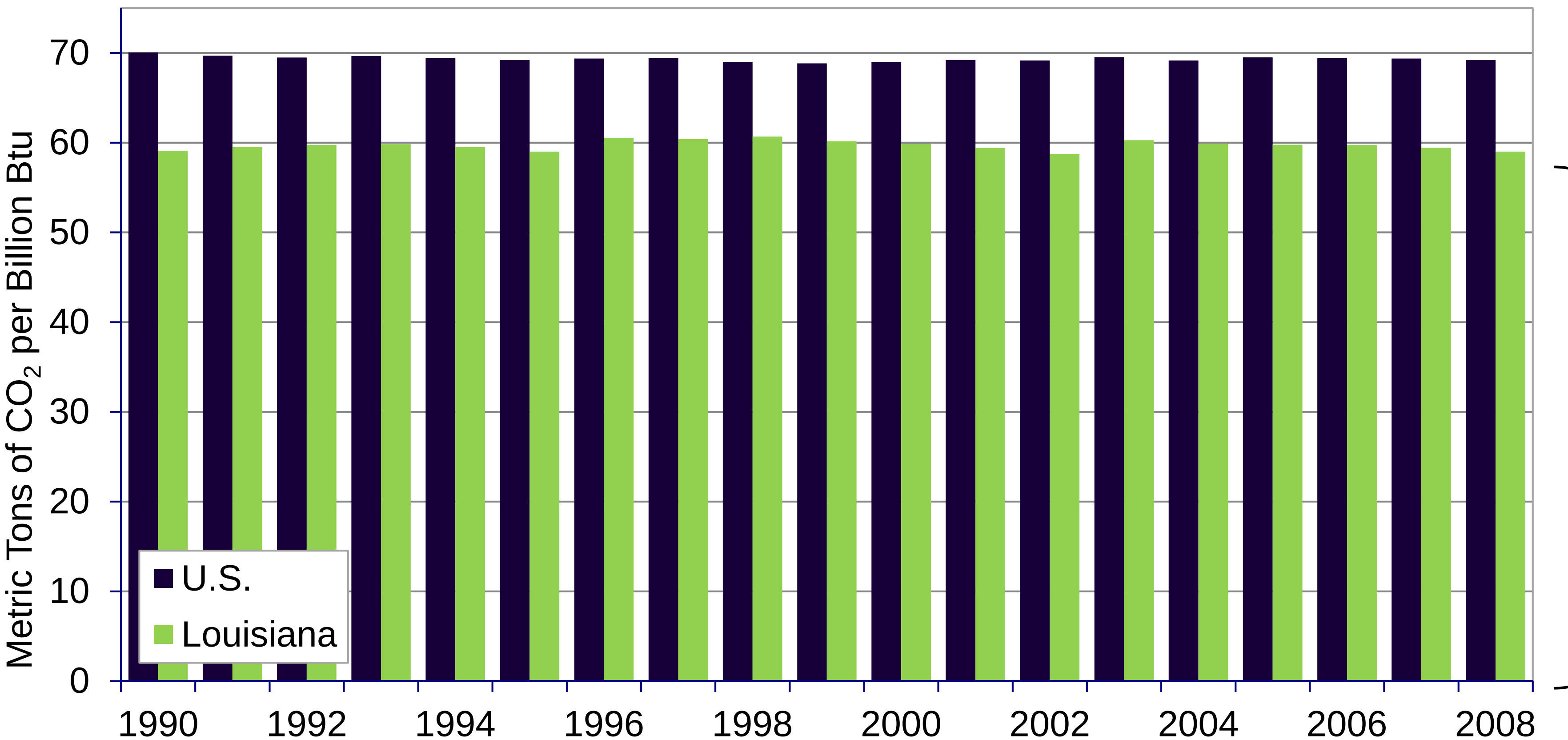
Historic Louisiana CO_2 emissions trends per unit of economic output have fallen faster than the U.S. average since 2002.



Source: Energy Information Administration, U.S. Department of Energy; and Bureau of Economic Analysis, U.S. Department of Commerce.

CO2E per Btu of Fossil Fuel Consumption, U.S. and Louisiana

Louisiana also tends to be significantly more efficient in emissions per unit of energy consumed. Louisiana's high reliance on relatively clean-burning natural gas is one of the primary sources of this competitive emissions advantages.

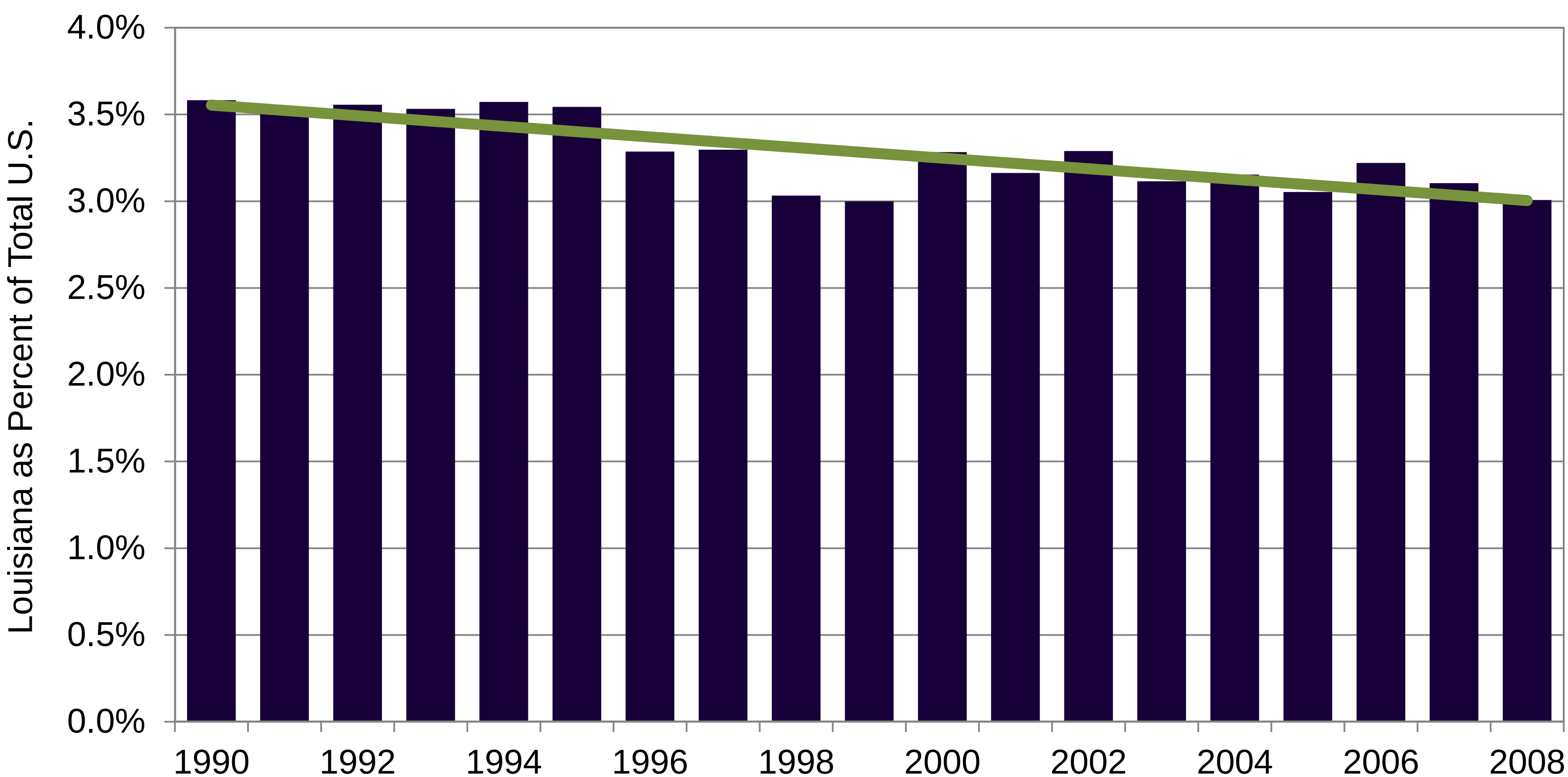


Louisiana produces 0.85 times fewer emissions per unit of combustion than U.S. average.

Source: U.S. Environmental Protection Agency; and U.S. Department of Energy, Energy Information Administration.

Louisiana Share of Total U.S. CO2 Emissions

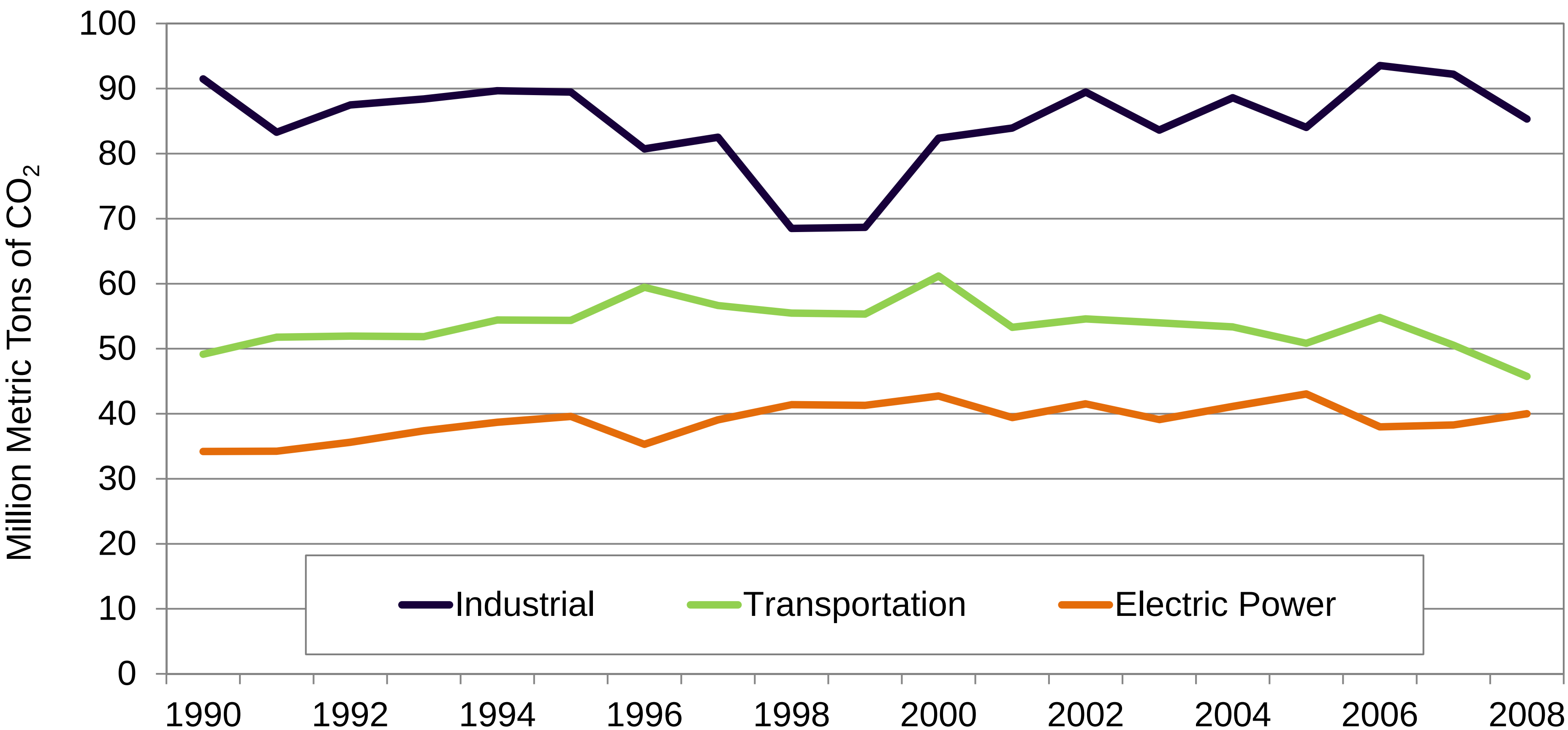
Louisiana's share of total U.S. CO_2 emissions has been between three to four percent, but has been falling in recent years. Louisiana now accounts for 3 percent of all U.S. carbon emissions down one-half percent from 1990 levels.



Source: U.S. Environmental Protection Agency.

Louisiana CO_2 Emissions per Sector

Louisiana carbon emissions have been dominated by industrial and power generation sectors. Interestingly, transportation-related emissions are down significantly relative to 2000 levels.

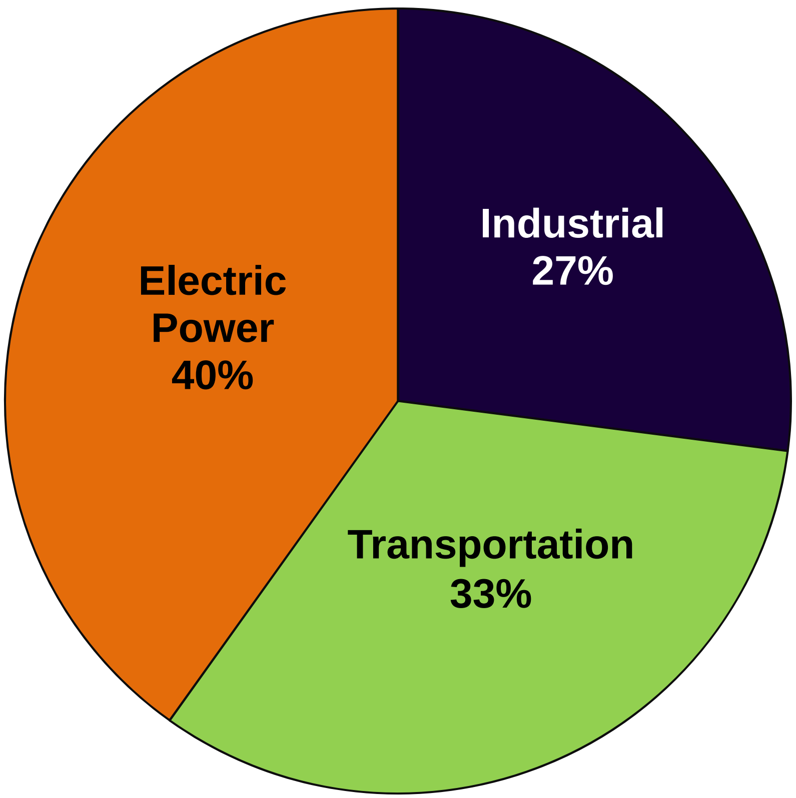


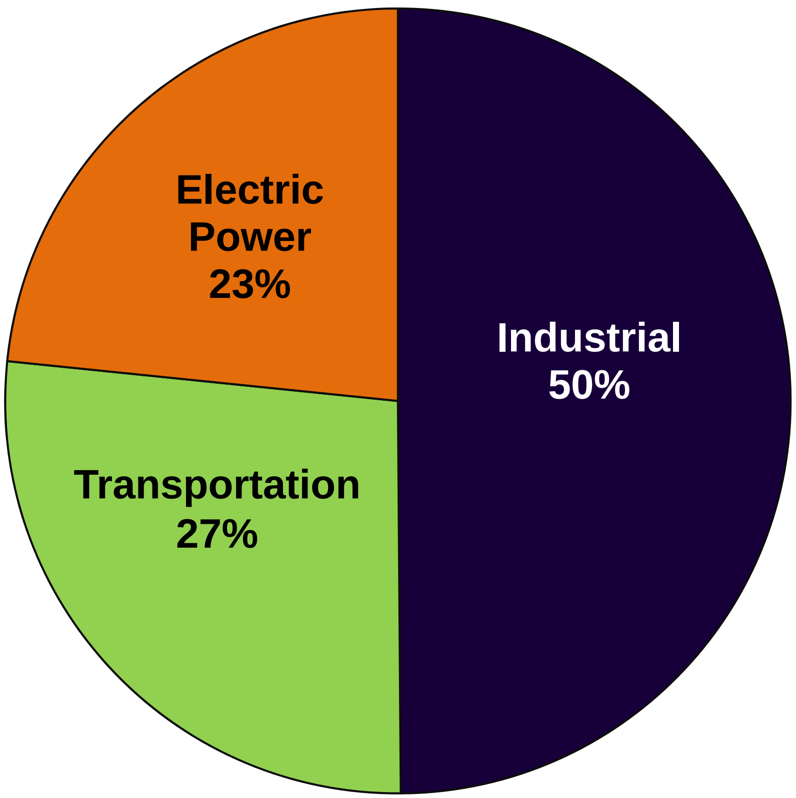
Source: U.S. Environmental Protection Agency.

U.S. and Louisiana CO_2 Emissions per Sector, 2008

In the U.S., power generation comprises about 40 percent of overall national CO_2 emissions.

In Louisiana, power generation comprises about 23 percent of overall state emissions. Louisiana's primary source of CO_2 emissions comes from industry.



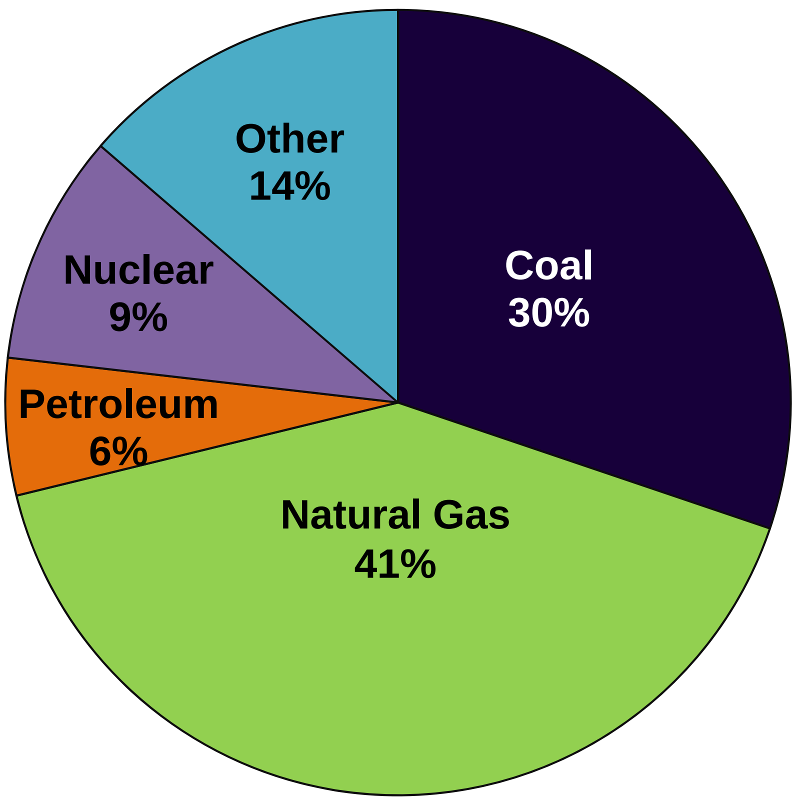


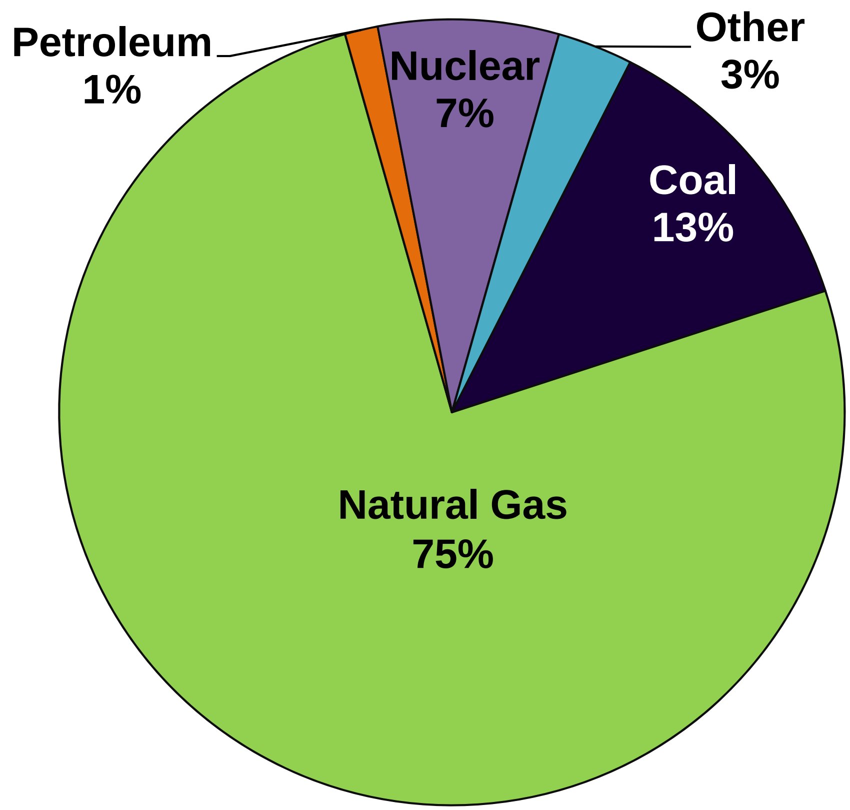
Source: Energy Information Administration, U.S. Department of Energy, *AEO 2009*

U.S. and Louisiana Electric Power Fuel Mix

In the U.S., coal represents 30 percent of the electric power fuel mix (capacity basis).

In Louisiana, most of the electric power generation is fueled by natural gas. Coal only represents 13 percent of the electric power fuel mix (capacity basis). This reliance on natural gas serves as an important source of Louisiana's relative emissions advantage

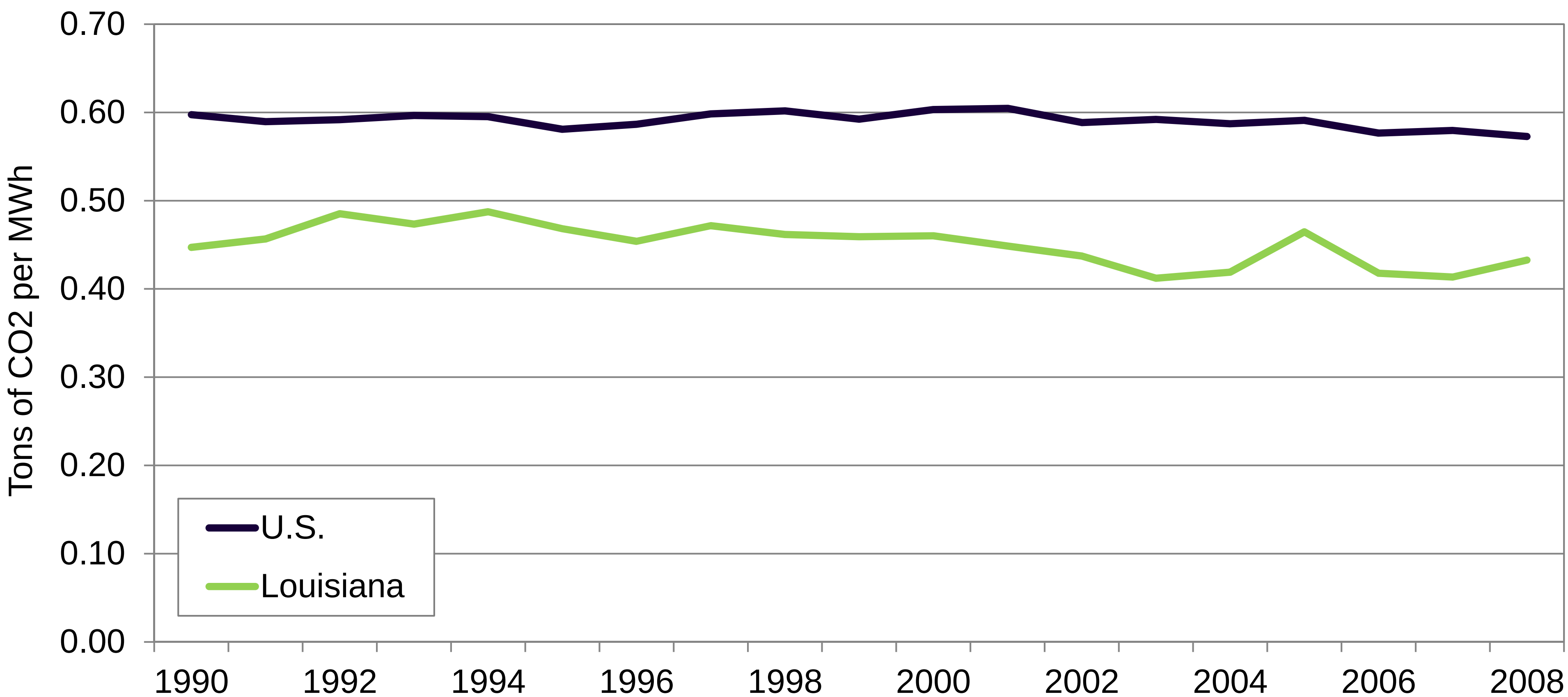




Source: Energy Information Administration, U.S. Department of Energy, *AEO 2009*

U.S. and Louisiana Electric Power Emissions Efficiency

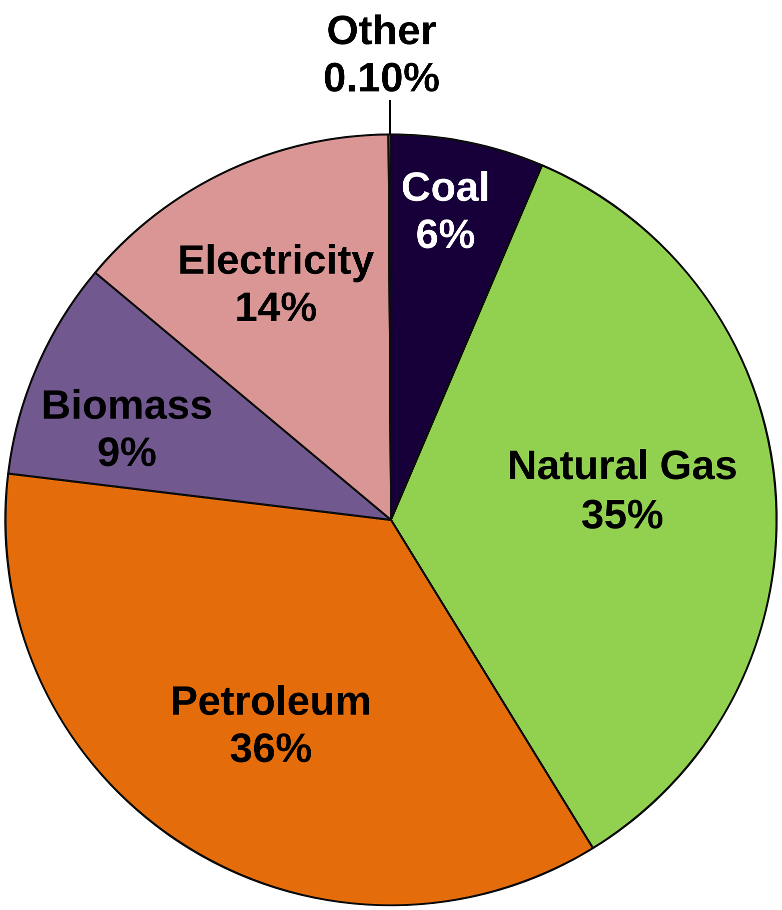
Louisiana power generation relies very heavily on natural gas capacity, which serves as primary source of its relative state-level emissions advantage. Louisiana has also developed more efficient combined cycle natural gas generation since the late 1990s that accounts for additional decreases in power generation-related CO_2 emissions.



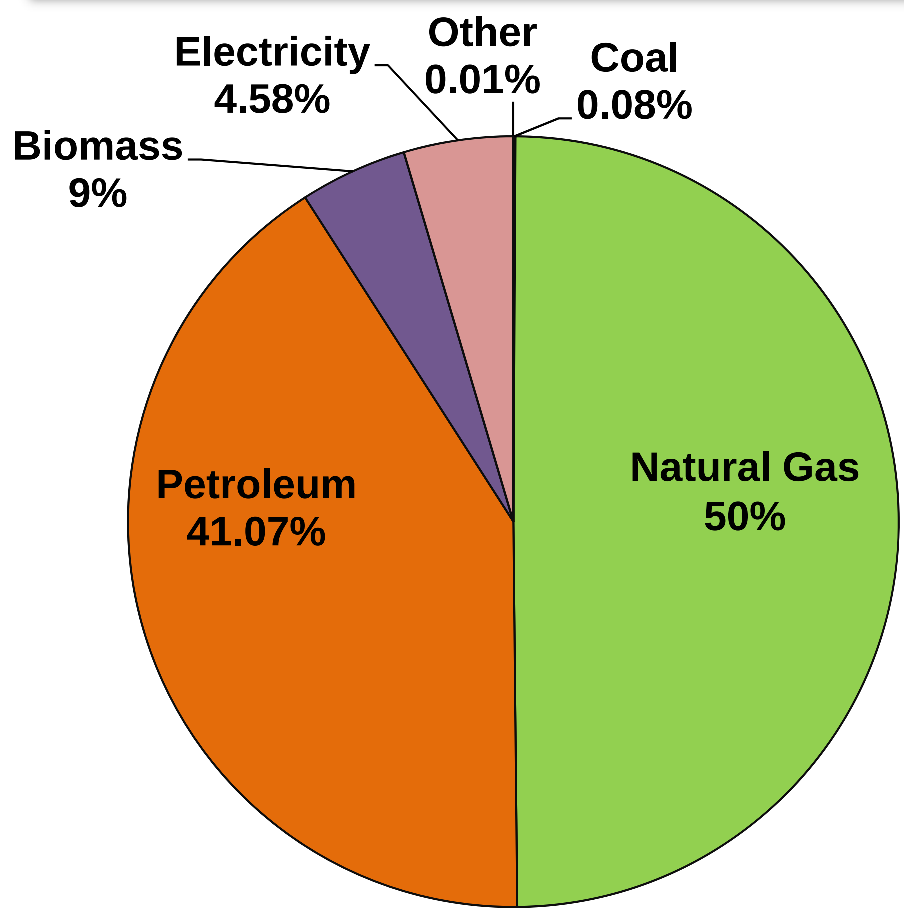
Source: Energy Information Administration, U.S. Department of Energy.

U.S. and Louisiana Industrial Sector Fuel Mix

In the U.S., natural gas represents 35 percent of the industrial sector fuel mix (usage basis).



In Louisiana, half of industrial sector combustion is fueled by natural gas. Coal only represents 6 percent of the industrial sector fuel mix (usage basis). Louisiana's reliance on natural gas serves as an important source of its relative emissions advantage



Source: Energy Information Administration, U.S. Department of Energy.

GHG Compliance Methods and Issues

Policy Frameworks

There are a wide range of policy options that can be employed to change incentives for emitting carbon. All are based upon a premise that carbon emissions are currently "unvalued" in the competitive marketplace. Each policy, in its own way, attempts to capture (or internalize) the cost of emitting carbon. It is highly likely that several, and not one policy will be used on forward-going basis.

Policy Type	Definition
Carbon Tax	Places a fixed tax on end-user energy usage.
Cap and Trade (Upstream, Carbon Content)	Would require upstream producers of energy resources to acquire credits based upon the carbon content of the fuel mined or produced.
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.

Carbon Policy Tradeoffs (former slide 20)

Each policy option that can be utilized to potentially reduce CO_2 emissions has its own unique costs and benefits. Policy to date tends to preference those mechanisms based upon market-oriented principles, like cap and trade, over policy and administratively determined approaches like standards and taxes.

Policies / Criteria	Carbon Tax	Cap & Trade -Upstream- (carbon content)	Cap & Trade -Downstream- (source emissions)	Standards (Vehicles, Appliances, Buildings)
Economic Efficiency	High to Medium – but depends on (1) coverage (2) rate (3) reallocation of tax revenues. Exemptions reduces efficiency.	High to Medium -- depends on potential exemptions, fuel quality issues and adjustments, liquidity. Administrative costs can be lower than downstream C&T.	Medium to Low – addressing transportation is difficult and administratively complex. Sector exemption greatly reduces efficiency. Substitutes and alternatives likely challenged.	Medium to Low – highly dependent upon standards design, timing and implementation.
Applicability and Uniformity	High - without exemptions	Medium to High - Subject to allocations	Medium to Low – depends on sector coverage.	Low – some sectors (residential and commercial) would bear bigger burden.
Gaming Potential	Low	Medium to High – property right is "commoditized." Regulation of commodity will be an issue.	Medium to High – property right is "commoditized." Regulation of commodity will be an issue	Medium
Simplicity	High	Medium to Low	Low	Medium to low (from administrative perspective).
Cost Predictability	High	Low, but slightly better with "safety value."	Low, but slightly better with safety value	High after identification and locked/ramped for fixed period.
Cost Transparency	High	Low	Low	Low
Political Feasibility	Low	Low	High	High

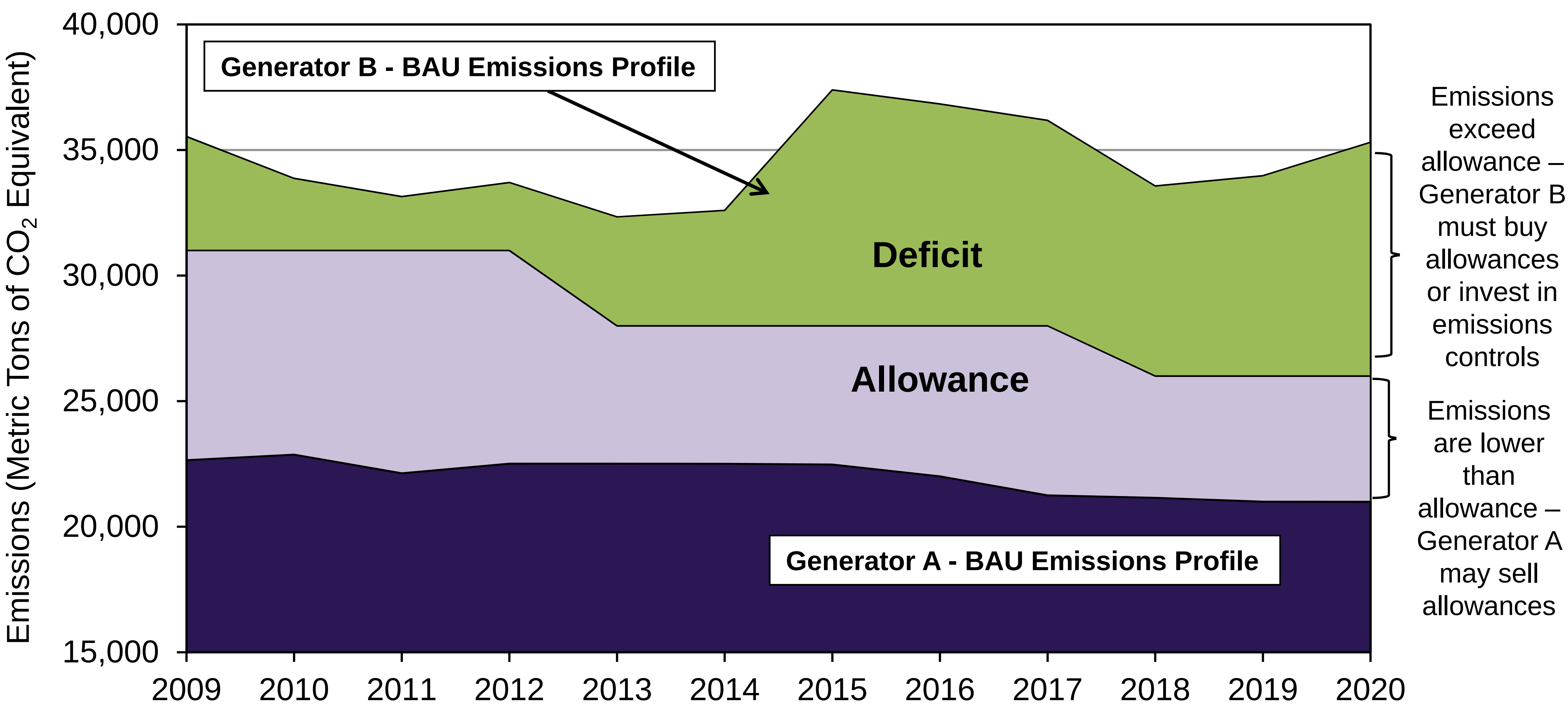
Anticipated Forms of Mitigation

There are a variety of means by which households, businesses, and industries are anticipated to use in order to mitigate, or come into compliance with, future CO_2 emission regulations. Like policies, each sector of the economy will likely adopt several, not just one, of the potential mitigation/compliance options listed below. As noted in the table, each has its unique costs and benefits.

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 Management; Demand Response	Good short run opportunities, significant, but limited in scope. Also require investment to reach pay-back.

How Does Cap & Trade Work?

The following hypothetical example uses two different power generators: one (generator A) that emits less than the allowed level and one that emits more than the allowed level (generator B). In this example generator A can trade its credits to generator B if the costs of emissions controls are greater than the amount generator A is willing to sell his credits.



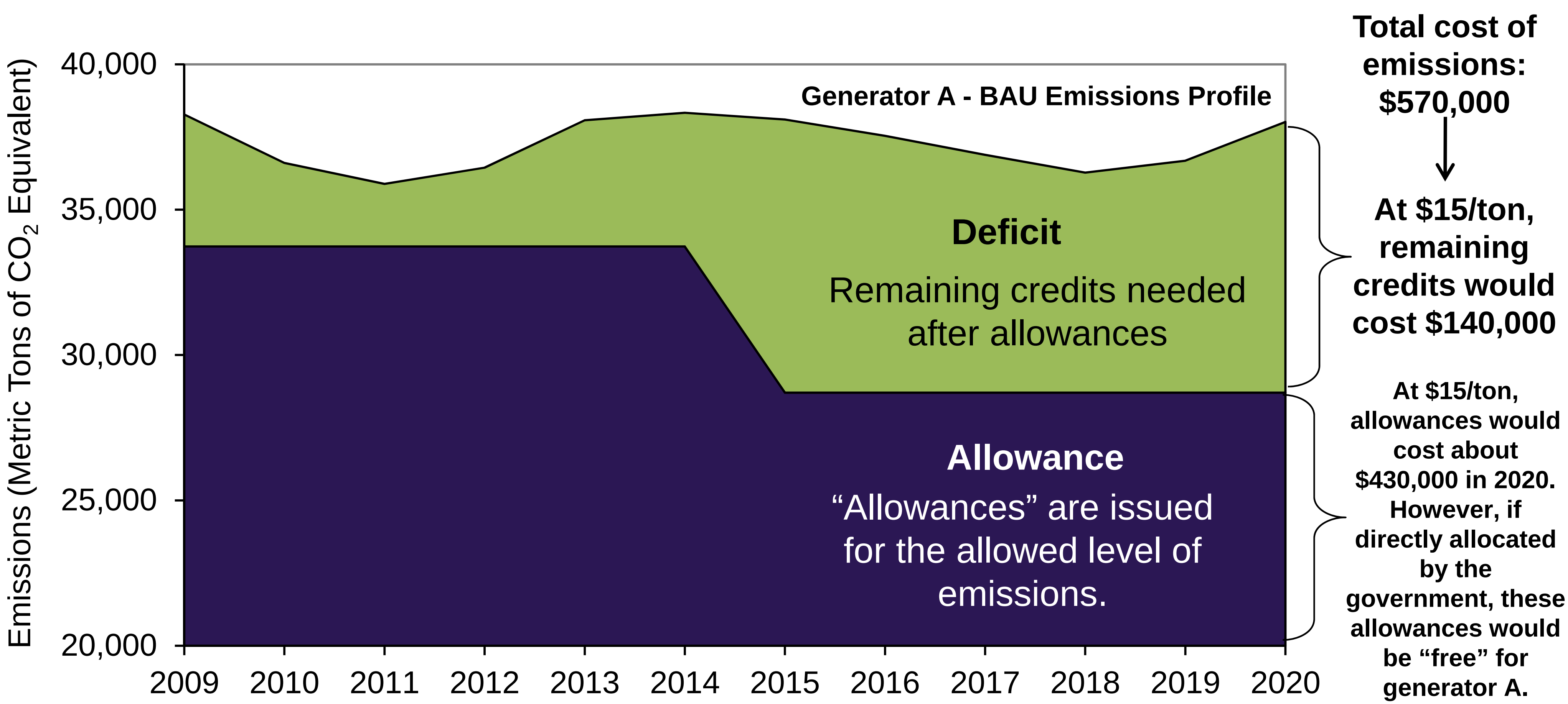
Allowances/Credits

Allowances or credits are commonly allocated to market participants in a cap and trade system under two methods that can be based upon a direct assignment (allocated) or auctioned to the highest bidder in a market transaction.

Allocated	Auction
Regulator makes an administrative determination of who gets allowances.	Market makes the decision about who gets the allowances.
Allocations made on a wide range of considerations and metrics including: Metric (Heat Input, Output) Baselines (Year, Updates) Growth Pool Set-Asides	Periodic auction (think "eBay") for the credits. Can be done in a variety of methods, but general approach is to allocate credits to those with the highest willingness to pay. There is an important issue associated with what to do with "auction proceeds." Who gets those?

Auction vs. Allowance

Under an auction-based system, market participants would be required to purchase all of their emission credits. An allocation-based approach would give market participant a free "base" level of credits, and require them to purchase any needed above the legally required emissions level on the open market. An auction-based system could be the more expensive of the two alternatives since it requires a higher level of emission credits.



Credits vs. Allowances vs. Offsets

<u>Credits (or "certificates"):</u> the legal property rights that can be traded in the market to establish a value for a fixed amount of emissions (in tons). Trades can occur in commodity markets or bilaterally between a willing buyer and seller.

<u>Allowances:</u> the free issuances of credits established by some policy, rule, or both. States can often be given an allowance, which in turn are allocated (in some fashion) to market participants. In the process of auctions, allowances are offered to the market to discover value and collect revenues, which in turn, are invested (in theory) in mitigation technologies or other social goals.

<u>Offsets:</u> another form of credit created by (1) a qualifying reduction in emissions (over compliance) or (2) by a qualifying investment in a technology certified to reduce (or serve as sink) for emissions. Offsets can be purchased or sold in mandatory and voluntary markets and allows a developer to monetize (and profit from) over-compliance. Offsets help to increase the supply of available credits (liquidity).

Regulatory Issues

- **The use of an auction or allocation rests with a balancing of stakeholder interests**
  - Allocation approaches based upon emission factors can preference coal users over more efficient natural gas users.
  - Allocations on output-based measures will preference efficient energy users.
  - Auctions preference large players (like utilities) over smaller ones that do not have resources to purchase and hold large credit balances that can securitize purchases with regulated customers.

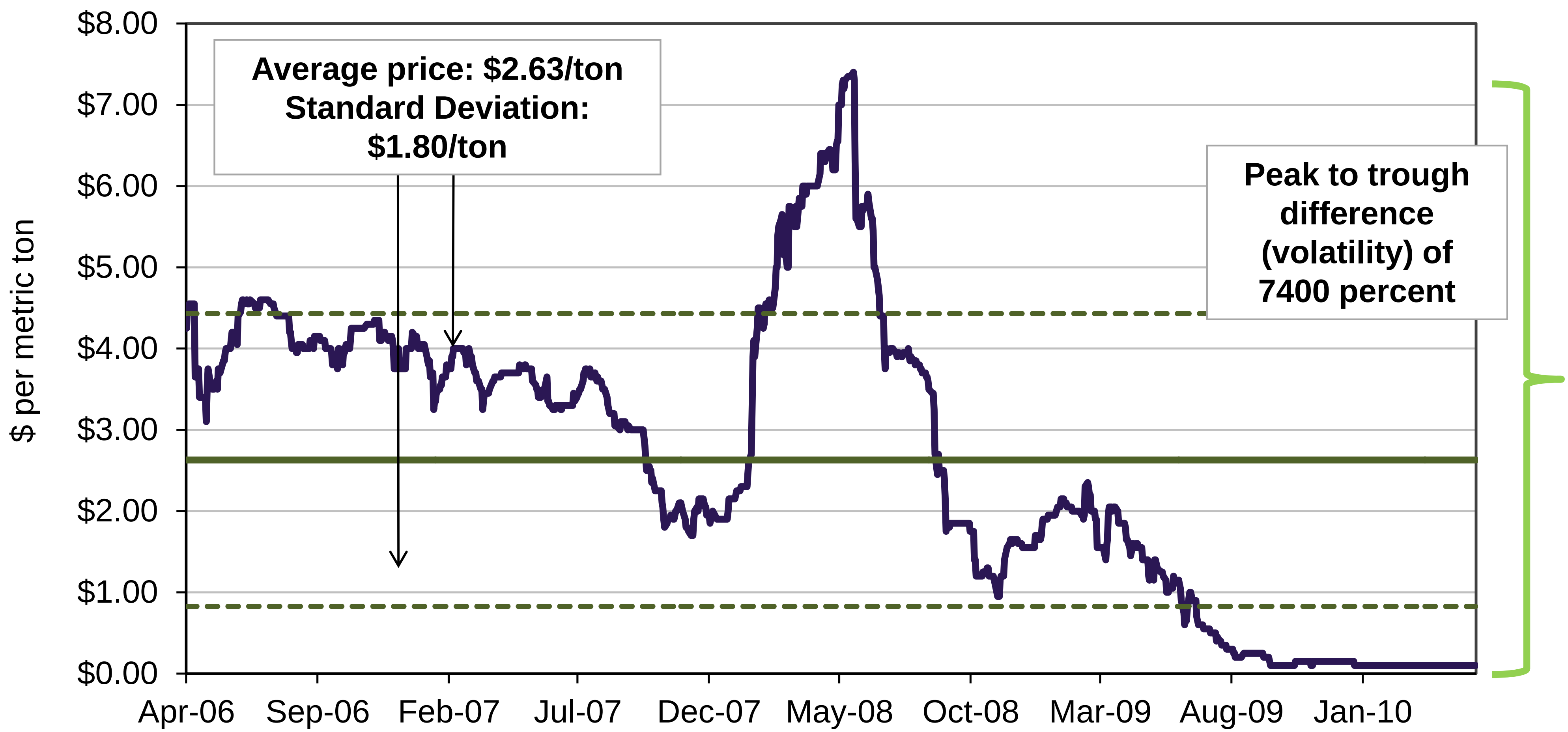
- **Who gets rewards for "good" pre-regulation decisions and who gets penalized for following the rules when the rules get suddenly changed?**
  - Will this ultimately create prudence issues down in the future?
  - Does this create competitive distortions in wholesale markets? (i.e., utility v. IPP)

- **How does regulator incent credit management? (hoarding, PGA-FAC-type incentives, PBR)**

- **Auction revenues: who gets the money? Options:**
  - Offsets to rate case increases government general fund revenues
  - Climate related programs (renewables, education, research)
  - Non-climate related programs (low-income or economic development)

Chicago Climate Exchange, Daily Closing Prices – Volatility of Market Prices

Prior to May 2008, CO_2 markets actively traded credits with the belief that a national cap and trade market, which would grandfather prior-acquired credits, was likely. The demise of the primary federal legislative proposal (i.e. the Waxman-Markey bill) resulted in a crash of the Chicago climate change market, ultimately leading to the end of trading on December 31, 2010.



Source: Chicago Climate Exchange.

Economic Impact Methodology

Methodology Overview

The economic impact of GHG regulation is based upon the following steps:

1. **Identification and categorization of major emissions sectors of economic interest. Reconciliation of emission sectors from the EPA Phase 1 modeling tool to economic sectors for impact analysis.**

2. **Quantification of baseline emissions for the state and each major economic sector.**

3. **Development of a framework and assumptions for mapping various potential greenhouse gas regulation schemes to baseline emissions.**

4. **Development of a framework for mapping emissions deficits to emissions compliance costs ("ECC").**

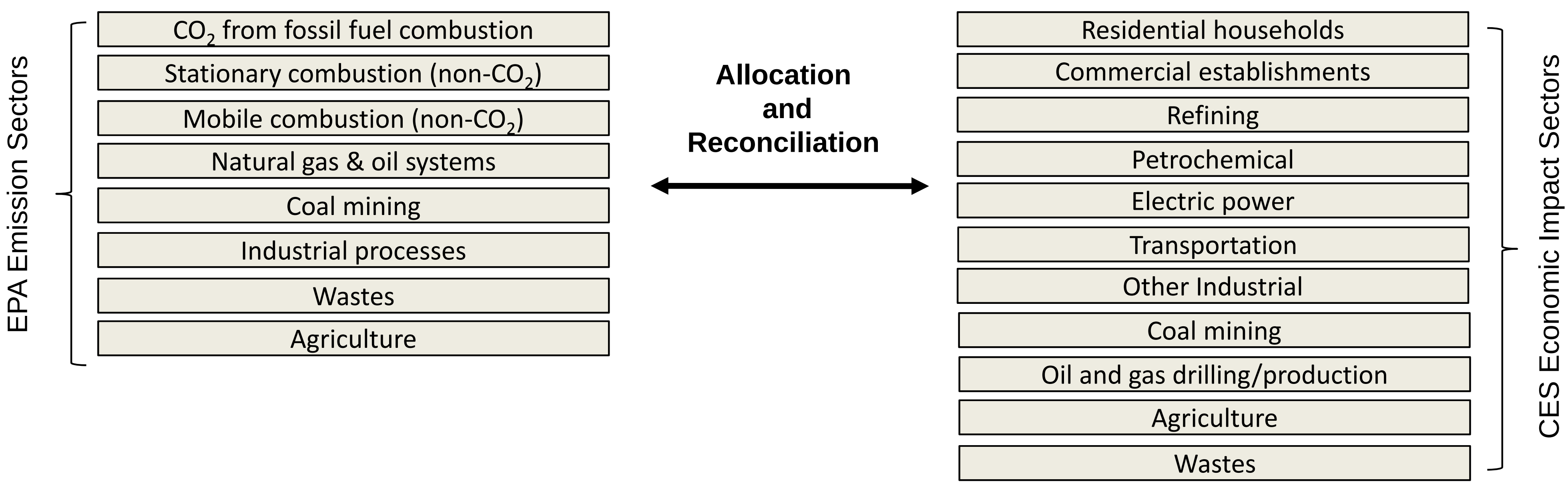
5. **Allocation of ECC to each economic sector, and model the impacts to Louisiana through an input-output post-processing model: A. Economic output; B. Employment; and C. Income and wages.**

EPA State Inventory Tool

Phase 1 of this research project used the Environmental Protection Agency's ("EPA") baseline emissions modeling tool to establish a baseline estimate of Louisiana GHG emissions. The tool allows users to apply state-specific data or use default data pre-loaded for each state, and is updated periodically to account for changes in annual energy usage. The default data used in the EPA tool is based upon government information sources and covers fossil fuels, agriculture, forestry, waste management and industrial processes. Phase 1 utilized the EPA baseline modeling tool with several modifications. While this tool is satisfactory for developing baseline emissions, it can be problematic for estimating economic impacts. This is because the individual modules (or sectors) utilized in the EPA tool are based upon a particular emission type or energy usage type, not by a unique economic sector. Thus the first step in this analysis was to reconcile EPA "emission sectors" with "economic sectors" for impact estimation purposes.

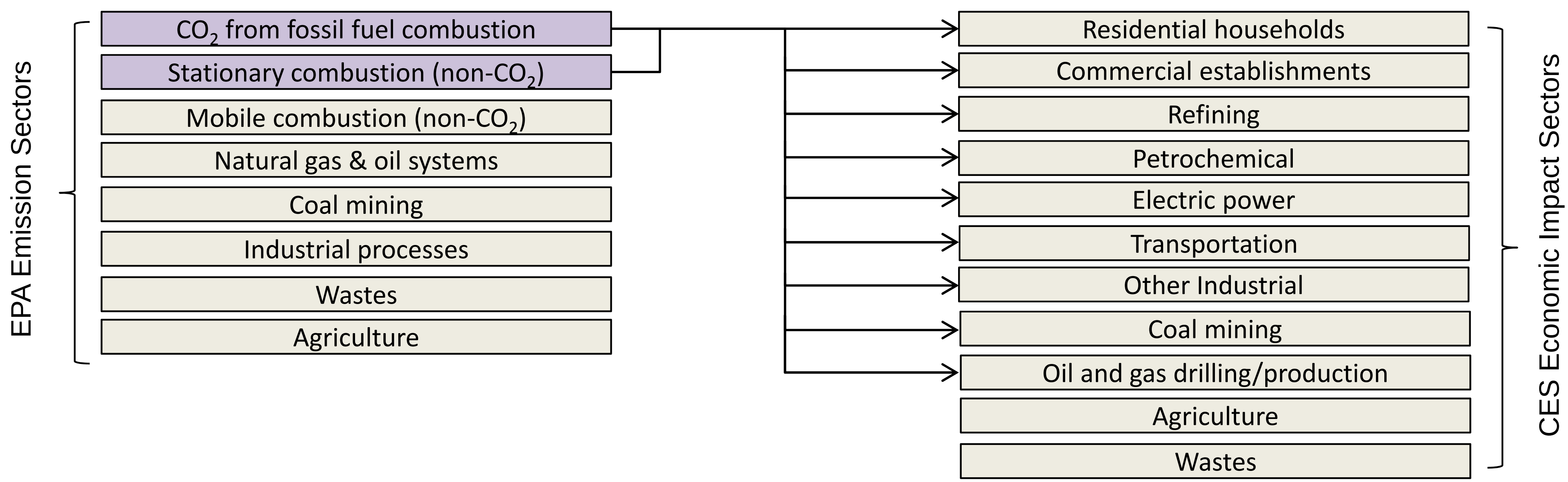
Sector Definitions, Allocations and Reconciliations – EPA State Inventory Tool vs. Economic Sectors

The first step in the process was to reconcile EPA "emission sectors" with standard "economic impact sectors." Emissions factors for each EPA emissions sector were compiled as well as non-default emissions factors used in Phase 1. Then, economic sectors of importance for Louisiana were identified and pared with corresponding emissions factors. In certain areas, non-default emissions factors were used to improve estimation accuracy and generate more robust and flexible estimates of emissions factors. The total emissions allocated from the EPA modeling tool were reconciled with the total emissions allocated to the economic sectors. Differences between the two approaches are generally restricted to modifications of emission factors, energy use, and feedstock uses not included in the EPA modeling tool but included here.



Sector Allocation

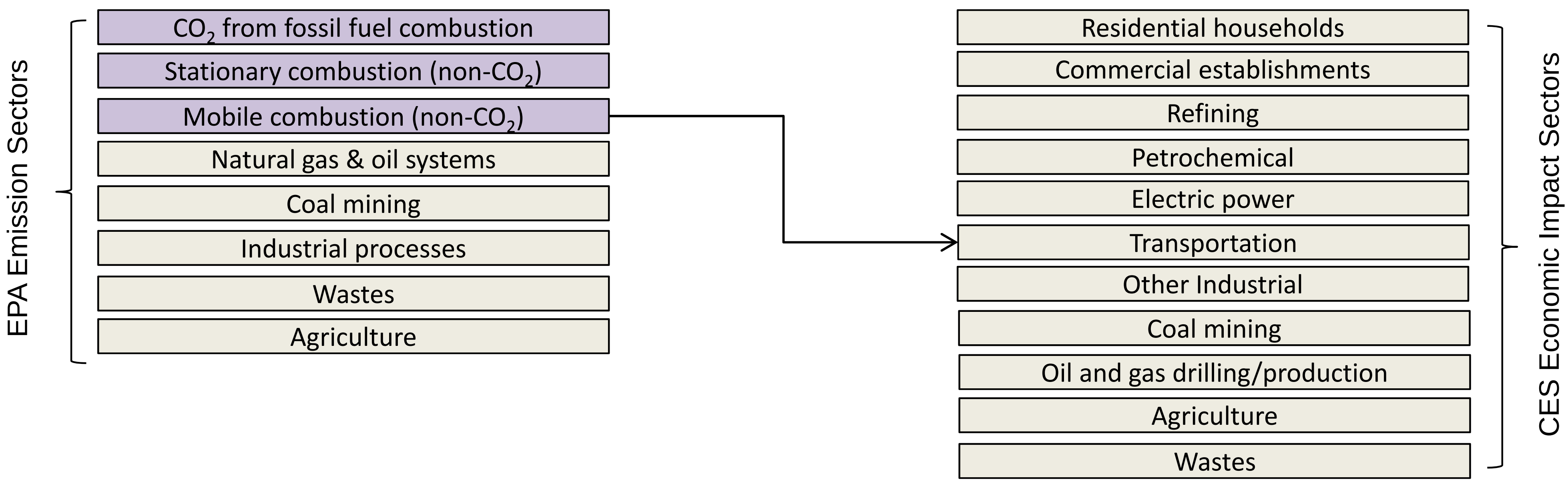
Virtually every economic sector emits GHGs through either a combustion or non-combustion industrial processes (e.g. GHG released during industrial processes such as chemical production not associated with combustion). These combustion and production-related emissions were allocated into economic sectors in order to estimate how GHG regulation may impact Louisiana's economy.



Sector Allocation

The mobile combustion emissions sector of the EPA emissions tool was directly mapped to the transportation sector. This sector contains emissions from highway vehicles, airplanes, boats and marine vessels, locomotives, as well as other non-highway sources of emissions. Non-highway sources include tractors and other farm equipment.

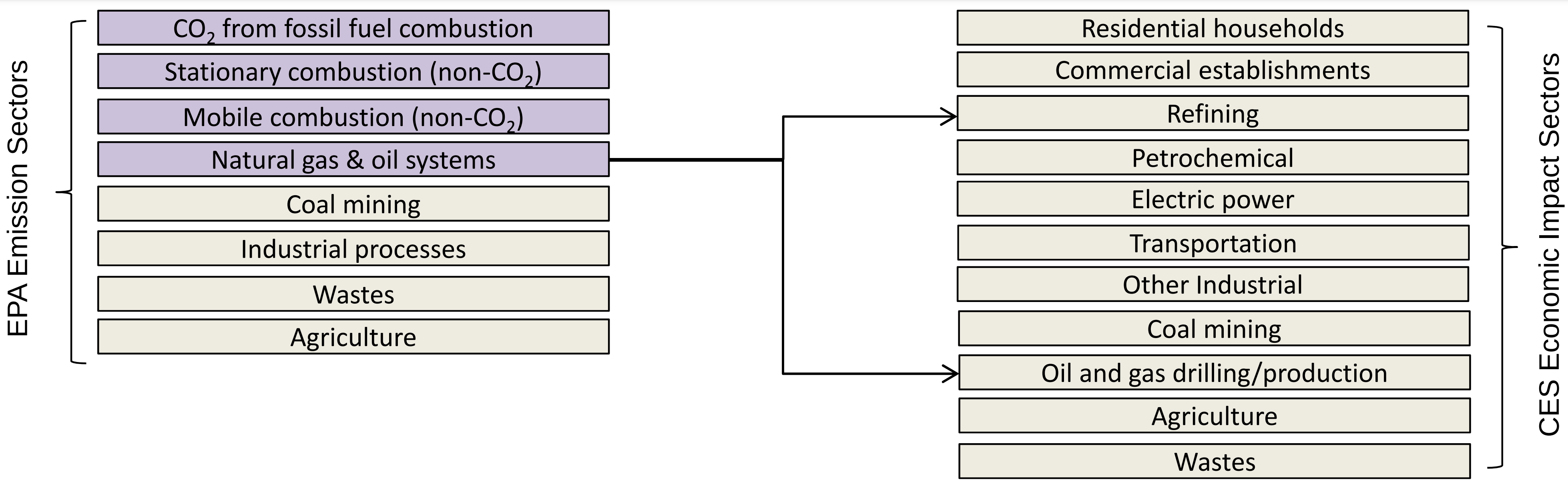
This report treats mobile emissions as its own sector. It should be noted that refining emissions and therefore economic impacts do not include transportation (mobile) combustion emissions.



Sector Allocation

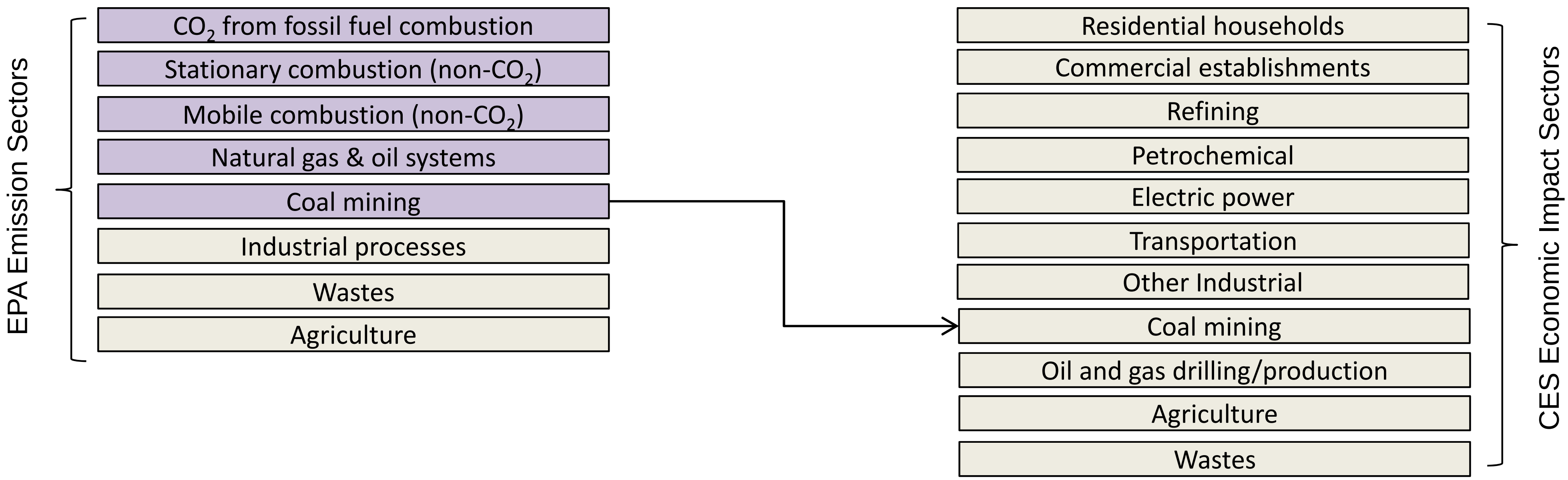
Oil and gas systems have a number of unique emissions including methane releases or venting that can occur during the course of oil and gas production activities or during the distillation and fractionation process at a petroleum refinery. The reconciliation process separates drilling and production emissions from refinery emissions and allocates each of the respective emissions to two economic sectors that include (a) oil and gas drilling and production and (b) petroleum refining.

It should be noted that refining emissions and therefore economic impacts do not include transportation (mobile) combustion emissions.



Sector Allocation

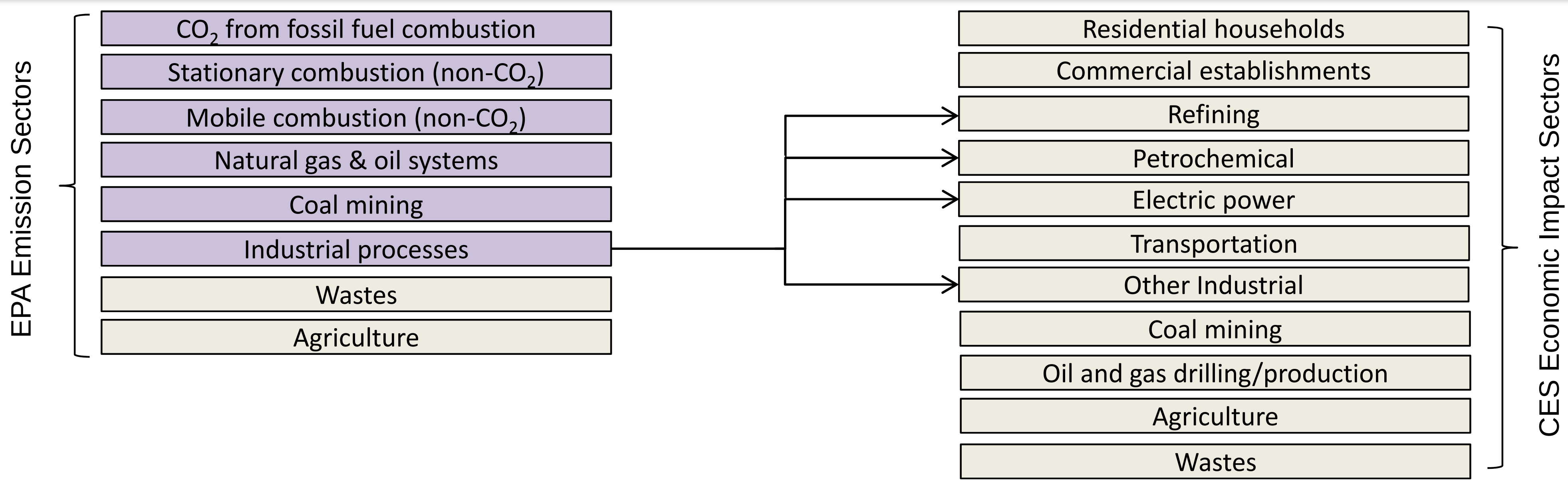
Coal mining (lignite) can release a number of GHGs during the extraction process and were directly mapped to the coal mining sector. Coal mining emissions typically come from a combination of the combustion of heavy machinery use as well as direct methane emissions. The emissions factor for CO_2 emission from lignite coal, the type of coal mined in Louisiana, is about 213.5 pounds of carbon dioxide per MMBTU. Lignite coal mining produces slightly more CO_2 emissions per MMBTU than bituminous coal (205.3 lb CO_2/MMBTU) or sub-bituminous coal (211.9), but less than anthracite coal mining (227.4).



Sector Allocation

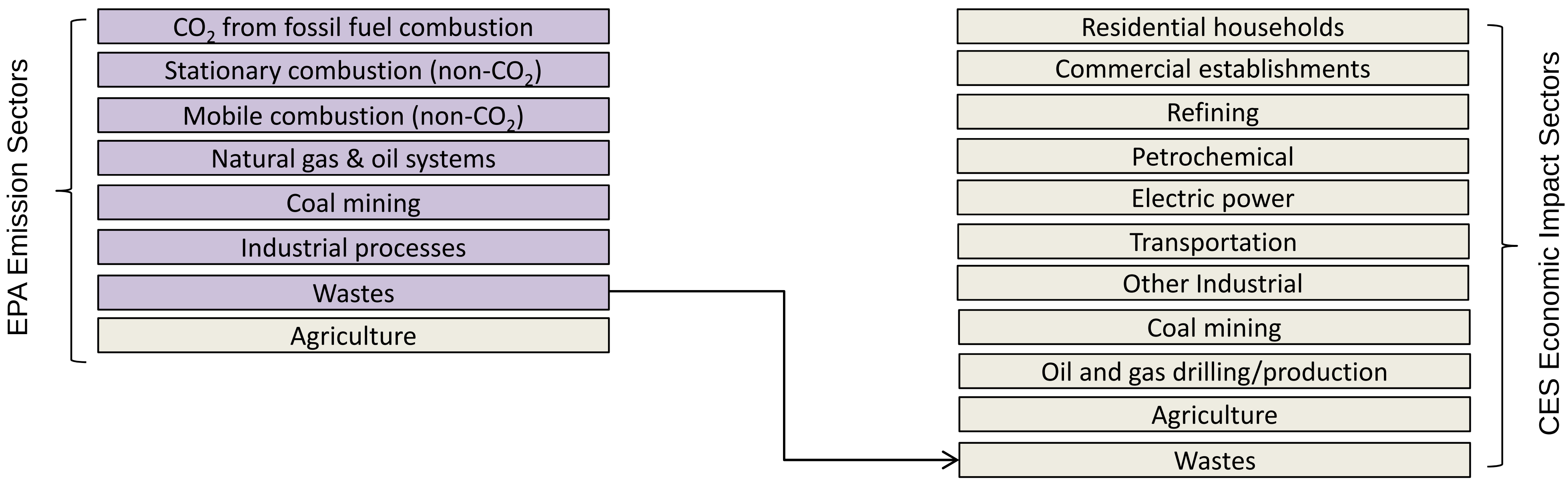
Standard industrial production processes lead to a variety of non-combustion releases of GHGs. Industrial process emissions are directly associated and allocated to the industrial sectors most important to Louisiana including refining, petrochemical production, and power generation. Remaining industrial emissions are aggregated into an "other" category.

EPA module emissions factors were used to estimate industrial sector emissions. CES estimates of natural gas and petroleum feedstock and combustion energy use at refineries, petrochemical plants and other industries were incorporated into the model.



Sector Allocation

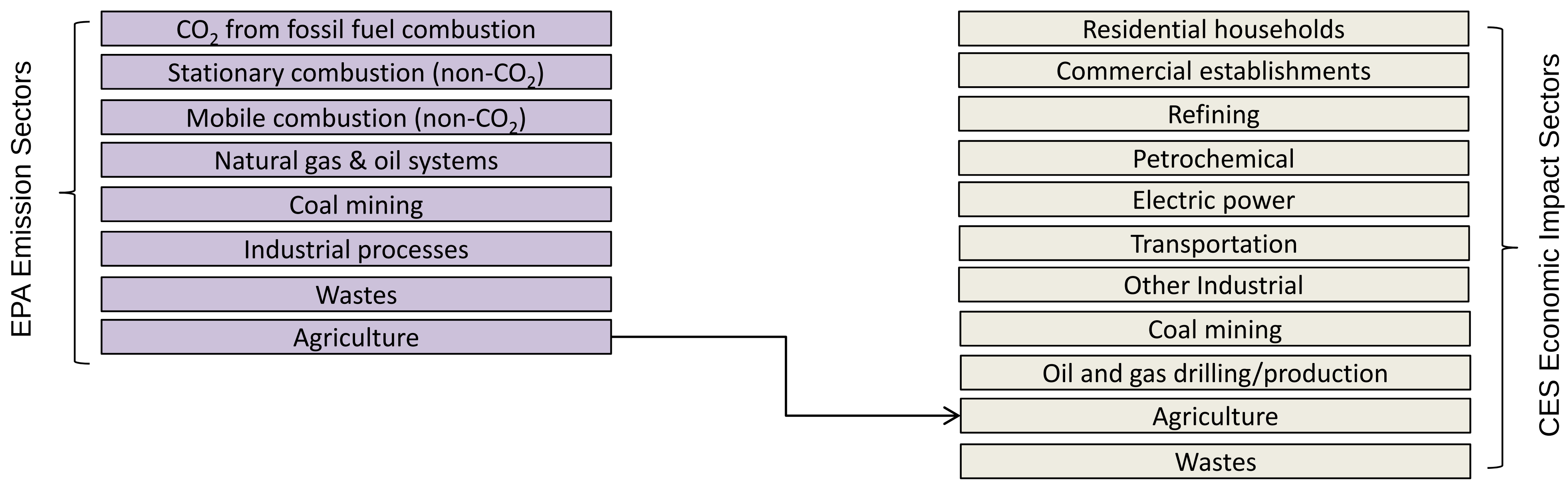
Waste-related emissions (e.g. landfills, wastewater treatment) are allocated directly to the waste treatment economic sector. Methane (CH_4), carbon-dioxide (CO_2) and nitrous oxide (N_2O) emissions from landfilling of municipal solid waste are included in the model. In landfills and at wastewater treatment plants, methane gas is produced from anaerobic decomposition of organic matter by bacteria. CH_4 is a specific byproduct of the bacteria that decompose landfill and wastewater material. CO_2 is emitted directly from decomposing organic matter. NO_2 is emitted as a by product of methane combustion as oxygen combines with nitrogen found in the waste or in the air.



Source: USEPA. 2010. *State Inventory and Projection Tool: Solid Waste User's Guide.*

Sector Allocation

Agricultural emissions and land use forestry are allocated directly to the agricultural sector. Agricultural emissions in the state primarily come from rice cultivation and agricultural soils. Nitrogen is added to agricultural soils during farming. Eventually the nitrogen makes its way into the atmosphere, contributing to Louisiana's GHG emissions.



Sector Emissions Modifications

Phase 1 estimated baseline emissions using the EPA module default parameters. In some instances, the EPA modeling tool was supplemented with Louisiana-specific information. The economic impact estimation, Phase 3 of this project, modifies and improves upon the original EPA modeling tool assumptions in four important economic sectors including:

1. **Natural gas & oil systems**
2. **Petrochemical and refining sectors**
3. **Electric power**
4. **Coal mining sector**

Sector Emissions Modifications – Natural Gas and Oil Systems

The Phase 1 baseline GHG emissions estimation defined the "Natural Gas and Oil Systems" ("NG&O") sector as an amalgamation of natural gas production, transmission, distribution, vented and flared gas, oil production, oil refining and oil transportation. For purposes of estimating economic impacts, oil refining and oil transportation were allocated to the refining sector, leaving the remaining truly production-related emissions in the NG&O economic sector.

The EPA emissions estimation tool did provide baseline estimates and drivers for production-related emissions. These drivers, however, are inappropriately based upon the number of <u>wells</u> and not the specific volume of <u>production</u>. Emissions are directly related to production, and as production increases, emissions increase and *vice versa*.

A number of sources were used to obtain accurate oil and gas emissions factors based upon the type of well, well depths, and more importantly, production volumes.

Sector Emissions Modifications – Petrochemical and Refining Sectors

In the Phase 1 baseline emissions estimation process, petrochemical industry emissions were estimated in both the industrial processes and stationary combustion EPA tool sectors. Petrochemical emissions are consolidated into one economic impact sector given the industry's importance to Louisiana. Emissions factors from Phase 1 continued to be used in the Phase 3 economic impact analysis. The Phase 3 economic impact analysis did incorporated one difference that directly estimated feedstock fuel use quantities and fuel used for combustion purposes (primarily cogeneration) at each industrial facility.

As noted earlier, oil refining was included in the "Natural Gas & Oil System" sector for Phase 1 baseline emissions estimation. This sector was examined separately in the economic impact analysis given the industry's unique importance to Louisiana.

Sector Emissions Modifications – Electric Power Sector

In Phase 1, baseline GHG emissions for the power generation sector were estimated on an aggregate basis (from end-user electric consumption data) rather than on a generator level up.

In Phase 3, CH_4 and N_2O emissions associated with the electric power sector were removed from the "Stationary Combustion" sector and re-estimated separately from the generator level up using a combination of information sources including Form EIA-861 ("Annual Electric Power Industry Report") and the EIA's acid rain database.

Future retirements were assumed to occur after 35 years with all new generation assumed to be natural gas-fired with units of a capacity comparable to a retired plant. New units are assumed to be natural gas fired, combined cycle generation, operating at a 6,700 Btu/kWh heat rate.

Sector Emissions Modifications – Coal Mining Sector

In Phase 1, the EPA modeling tool estimated emissions based on surface mining-type extraction. The economic impact analysis here in Phase 3 developed alternative surface mining emission factors unique to Louisiana-based lignite mining.

Lignite production data was obtained from the EIA and since lignite production and its associated emissions in Louisiana have changed relatively little over the past 25 years, the baseline of coal emissions was kept constant, so long as mining activities were assumed to continue.

Sector Emissions Modifications/Estimation

The economic impact modeling process is based on four tasks:

The first task takes the original (Phase 1) baseline emissions estimates and re-allocates those into specific economic sectors of the Louisiana economy. As discussed earlier, some revisions to the baseline emissions were conducted to make them more consistent with Louisiana industrial processes.

The second task estimates the "emissions deficit," or required emissions reductions, for each economic sector.

The third task estimates the direct cost (or benefit) of mitigation by sector given a set of assumed mitigation costs.

The fourth task estimates emissions compliance costs ("ECCs") which form the main direct costs, or negative economic impact, of GHG regulation.

Emissions Compliance Costs or “ECCs”

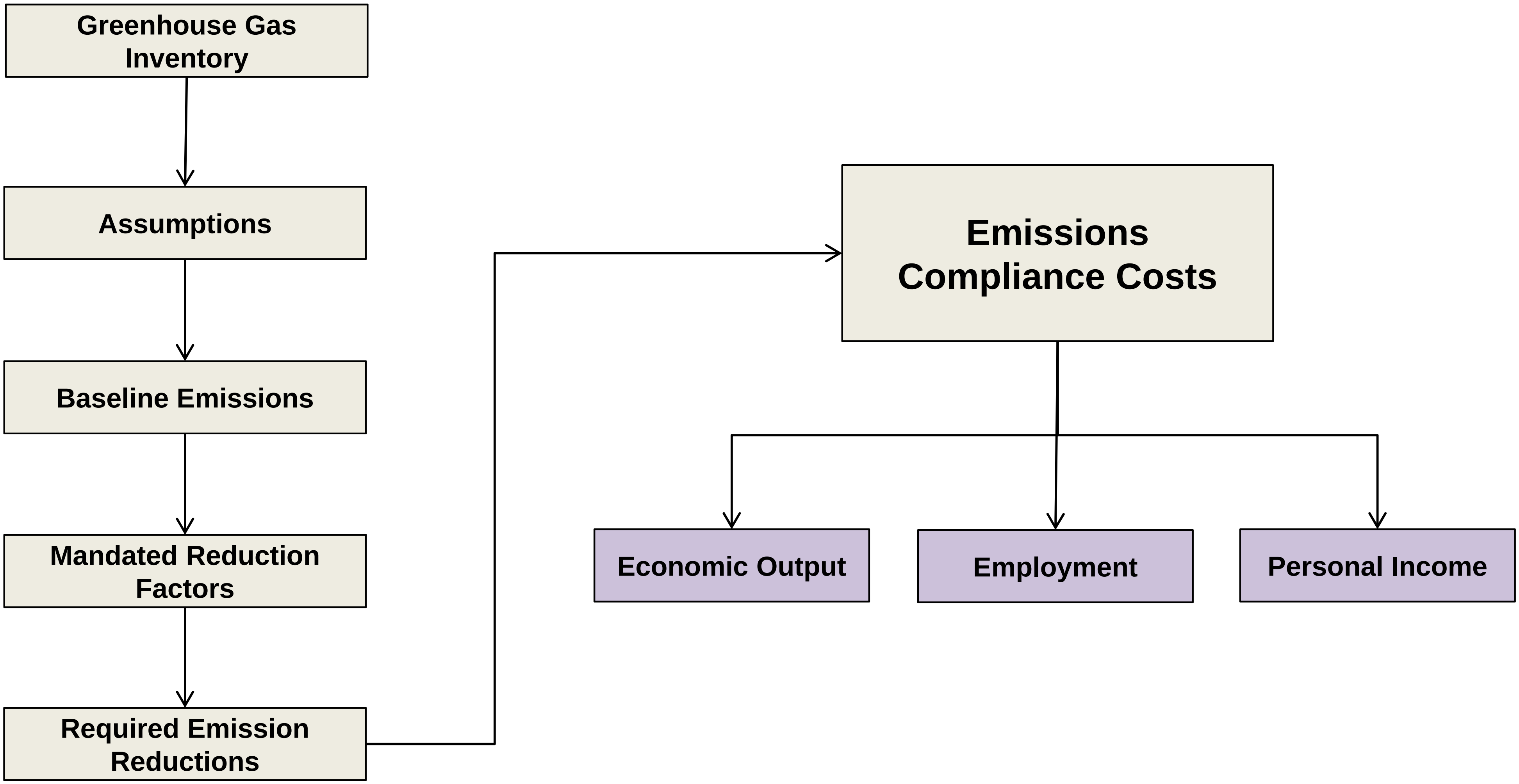
ECCs can take a number of different forms, but can be generalized as the cost of meeting new GHG regulations. These ECCs are impacted, and can vary by, the type of GHG regulation adopted.

For instance, the ECCs associated with a GHG regulatory policy based strictly on appliance and equipment emission standards would result in higher-cost appliances and equipment.

An energy tax based approach to GHG regulation would likely see ECCs being primarily comprised of an increase in per unit energy costs.

A “cap and trade” mechanism would lead to a set of ECCs based on physical mitigation investments (i.e., CCS, renewables) and carbon credit/offset purchases. Phase 3 models the impact of a “cap and trade” approach to GHG regulation.

The Translation of ECCs to Economic Impacts



Baseline Emissions Reconciliation

Phase 3 estimates a lower level of Louisiana baseline CO_2 emissions of some 66.10 million metric tons. The primary reason for the lower level of emissions is based upon the EPA tool's heavy reliance upon asset or capacity-based measures of emissions rather than production or output-based emissions. Capacity based measures can overestimate emissions if assets are either operating at a level lower than its maximum capability (i.e. refining, petrochemical) or has a declining resource base (i.e. depleting oil and gas reserves for completed well).

Reconciliation of Task 3 Emissions Baseline to Task 1 Emissions Baseline
2005 Emissions (MMTCO2eq.)

	Phase 1	Phase 3	Difference	
Residential Buildings	2.554	2.73	(0.18)	Note (1)
Commercial Buildings	2.034	2.12	(0.09)	Note (1)
Refining	12.91	6.60	6.30	Note (2)
Petrochemical	41.34	21.15	20.19	Note (2)
Other Industrial & International Bunker Fuels	56.77	29.05	27.73	Note (2)
Electric Power (2011)	39.143	38.19	0.95	Note (2)
Natural Gas and Oil	13.38	2.69	10.69	Note (3)
Coal	0.04	0.00	0.04	Note (4)
Transportation	51.9	51.52	0.38	Note (5)
Ag soils, rice cultivation, etc.	6.44	6.43	0.01	Note (6)
Solid Waste & Wastewater	1.15	1.07	0.08	Note (7)
Other		0	-	
Total Gross CO2	**227.67**	**161.57**	**66.10**	

Notes:
(1) The residential and commercial sectors make up the stationary combustion sector. These sectors were estimated using a bottom-up approach in Phase 3. In comparison Phase 1 used a top-down approach by using EPA modules (STI ICF modules). EPA emissions factors were used.
(2) Phase 3 fossil fuel combustion is an amalgamation of the petrochemical, refining, industrial, bunker fuels, electric power and transportation sectors. The petrochemical, refining, and electric power sectors were estimated from a bottom-up process that was based on feedstock usage. EPA emissions factors were used.
(3) The natural gas and oil sector in Phase 1 was largely generated from default data from the EPA modules (the majority of emissions). The EPA modules were driven by the number of wells / platforms. In Phase 3, we improved the methodology by calculating emissions on a production-basis. Emissions factors were gathered from a number of sources documented in the "NG Summary - State Total" tab.
(4) The difference, 0.04 MMTCO2eq., is not a significant difference.
(5) The difference, 0.38 MMTCO2eq., is not a significant difference.
(6) The difference, 0.01 MMTCO2eq., is not a significant difference.
(7) The difference, 0.08 MMTCO2eq., is not a significant difference.

Modeling Goals: Overview

1. **Model flexibility**
   - **Able to handle widely varying assumptions:**
     1. i. Exogenous growth
     2. ii. Inflation
     3. iii. Elasticities (endogenous feedback effects)
     4. iv. Emissions factors
     5. v. Plant life expectancies and new generation

2. **Data disaggregation**
   - Marginal compliance costs
   - Geographic distribution of impacts
     - i. Electric power
     - ii. Oil and natural gas
     - iii. Residential and commercial sectors

3. **Development of meaningful outputs measuring wide range of impacts**
   - Employment, output, wages impacts
   - Utility bill impacts
   - Per sector impacts
   - Per household impacts
   - Localized economic impacts
   - Major industrial plant impacts
   - Major electric generator impacts
   - Regional oil and gas production impacts

Economic Impact Modeling Goals

Modeling Goals: Flexibility

Exogenous growth assumptions

- **Population** – population growth assumptions are important since they drive the estimated number of households and impact overall emissions levels.

- **Customers** – energy usage growth is a function of customers, which, in turn, are driven by population forecasts.

- **Energy use per customer** (efficiency effects) – baseline and forecasted UPC assumptions are important in understanding the future energy usage trends and the role of efficiency on energy use and emissions.

- **Income** – economic growth determines wealth, which in turn establishes the degree to which energy is consumed given the well-recognized positive relationship between energy and economic growth.

- **Inflation** – for ease of interpretation, all dollar-valued economic impacts that result from the model are shown in 2010 inflation-adjusted dollars.

Modeling Goals: Flexibility (continued)

Elasticities (feedback effects)

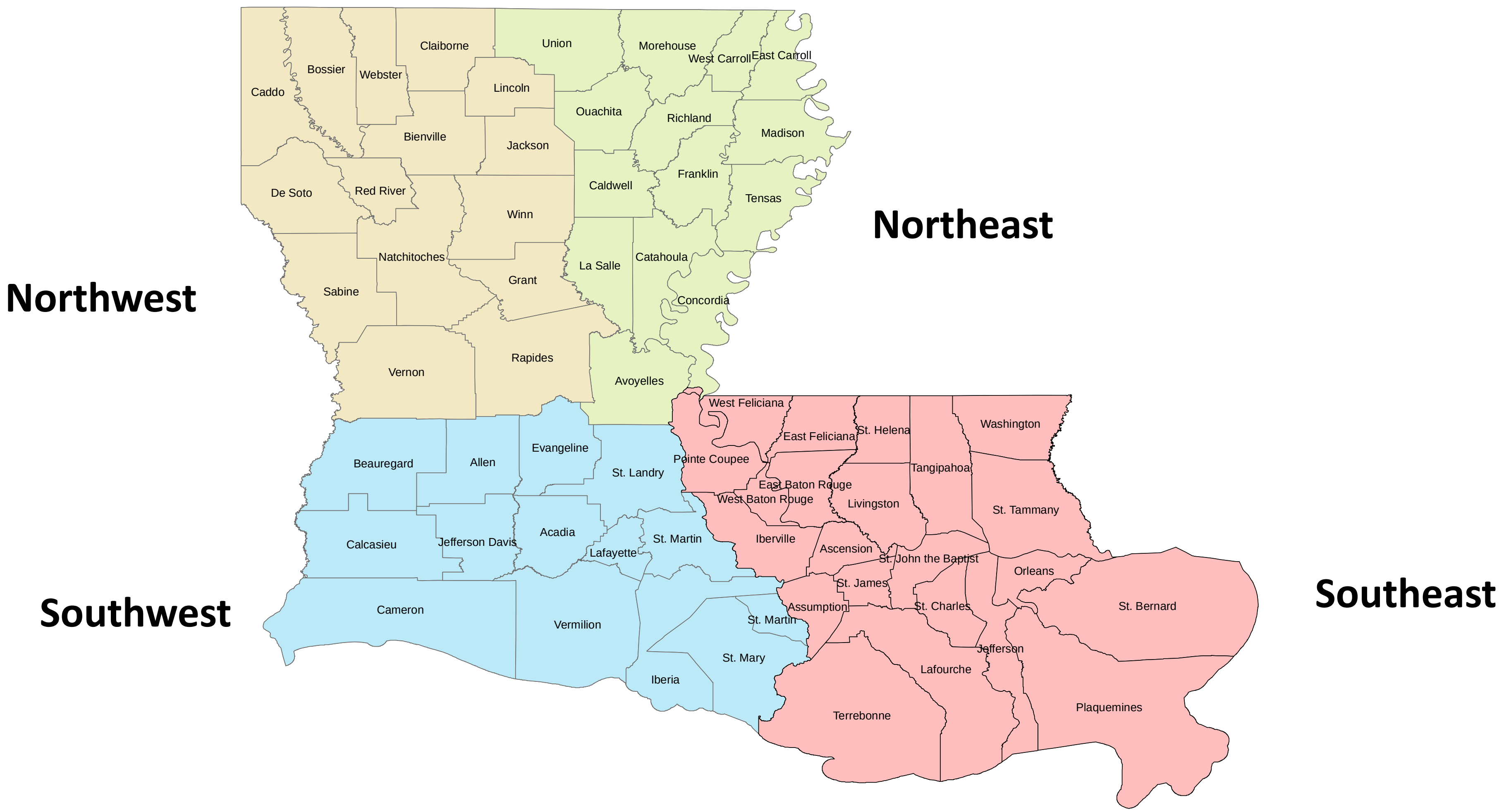
- *Price Elasticities* – Price-related usage sensitivity is measured by the price elasticities of demand. Long-run price elasticities of demand were used in this analysis..

- *Income Elasticities* – The degree to which energy usage increases with changes in income is measured by income elasticities. Long run income elasticities of demand were used in this analysis.

Emissions factors – emissions factors define the relationships between combustion and non-combustion processes and GHG emissions. Since nitrogen oxide (NO_X), methane (CH_4) and a number of other gases released by Louisiana economic activities release GHGs, emissions factors convert the consequence of economic activities to energy use which in turn define combustion levels and emissions. Emissions are commonly referred to in CO_2 equivalence terms, since some gases lead to differing greenhouse effects.

Modeling Goals: Data Disaggregation

The modeling process also allocates emissions and economic sectors to unique geographic regions allowing for a more detailed understanding of how each part of the state may be impacted by GHG regulation.



Modeling Goals: Data Disaggregation

Geographic sub-units

- **The residential, commercial, electric power, transportation, agriculture and waste sector impacts are allocated on a parish-level basis. Residential, commercial, transportation and waste sector impacts are allocated to each parish on the basis of population. Electric power emissions impacts are allocated on a parish-level basis using household data as proxy for electric customers.**

- **The following sectors' economic impacts are considered to be broader than any one economic unit or parish and are allocated on a regional (quadrant) basis.**

  - **Refining**
  - **Petrochemical**
  - **Other industrial and bunker fuels**
  - **Natural gas and oil**
  - **Coal**

Modeling Goals: Meaningful Outputs

The economic impact model was developed in a fashion that can yield a variety of important impact information that includes:

- **Employment, output, wages impacts**
- **Utility bill impacts**
- **Per sector impacts**
- **Per household impacts**
- **Localized economic impacts**
- **Major industrial plant impacts**
- **Major electric generator impacts**
- **Regional oil and gas production impacts**

Modeling Assumptions

Emissions, Economic, and Demographic Assumptions

Annual growth rates for emissions, gross state product, employment and personal income are important drivers for the economic impact model. The 2.1 percent annual decrease in emissions corresponds with an 80 percent reduction over 39 years (2011 through 2050), and is the assumed emissions policy goal for modeling purposes.

The fifteen year long-run averages of gross state product and employment are the basis for the growth assumptions.

Personal income growth is based on most recent 5-year average.

Annual Growth Rates		Comparative Historical Averages		
	Baseline	5-yr	10-yr	15-yr
Emissions	-2.1%			
Gross State Product (2009$)	0.8%	-0.2%	0.8%	0.8%
Employment	0.7%	-0.2%	0.0%	0.7%
Personal Income	5.0%	5.0%	(NA)	(NA)

Population Forecasts	2015	2030	2050
Official State Estimates	4,477,860	4,813,950	4,775,842
Woods & Poole	4,609,381	5,243,270	5,617,282
Average	4,543,621	5,028,610	5,196,562

Note: Official state estimates for population growth were used in modeling assumptions. An annual reduction of 2.0513 percent will place 2050 at 20 percent of projected 2011 emissions.
Source: Louisiana State Census Data Center, Woods & Poole

Energy Price Inflation Assumptions

Energy prices impact energy demand, which in turn impacts combustion and emissions. Energy price assumptions are from the EIA's 2009 & 2010 Annual Energy Outlook (AEO). The AEO 2009 predicts that average annual electricity prices (2009 dollars) will fall six percent from 2009 through 2035, about a 0.23 percent annual decline. However, the AEO 2010 predicts electricity prices will rise about 0.75 percent annually. Electricity prices in this analysis are assumed to remain constant in the face of moderate but uncertain future price projections. All other price growth assumptions are based on AEO 2010.

Energy Price Inflation Assumptions	Residential	Commercial	Industrial
Energy Price Growth Assumptions			
Coal	0.10%	0.10%	0.10%
Distillate	1.60%	1.80%	1.70%
Kerosene	1.60%	1.80%	1.70%
LPG	1.40%	1.50%	1.30%
Motor Gasoline	1.80%	1.80%	1.80%
Residual Fuel Oil	1.70%	1.70%	1.70%
Natural Gas	0.50%	0.50%	0.50%
Electricity	0.00%	0.00%	0.00%

Source: U.S. Department of Energy, Energy Information Administration, AEO 2009 & 2010

Price and Income Elasticity Assumptions

Price elasticity of demand measures the price responsiveness of consumer demand while the income elasticity of demand measures changes in energy demand arising from changes in income.

Energy elasticities have been estimated by many researchers and vary widely. The values used in this model attempt to choose the most conservative estimates.

Energy Elasticity Assumptions

	Residential	Commercial	Industrial
Energy Price Elasticity Assumptions			
Coal	-0.70	-0.80	-0.90
Distillate	-0.50	-0.60	-0.75
Kerosene	-0.50	-0.60	-0.75
LPG	-0.50	-0.60	-0.75
Motor Gasoline	-0.40	-0.50	-0.60
Residual Fuel Oil	-0.50	-0.60	-0.75
Natural Gas	-0.20	-0.25	-0.30
Electricity	-1.00	-1.10	-1.25
Energy Income Elasticity Assumptions			
Coal	0.80	0.90	0.95
Distillate	0.80	0.90	0.95
Kerosene	0.80	0.90	0.95
LPG	0.80	0.90	0.95
Motor Gasoline	0.80	0.90	0.95
Residual Fuel Oil	0.80	0.90	0.95
Natural Gas	0.80	0.90	0.95
Electricity	0.80	0.90	0.95

Source: All income elasticities and price elasticities for distillate, kerosene, LPG, and residential fuel oil: Dahl (1993); Electricity and Natural Gas: Bernstein and Griffen (2006); Electricity: Taylor (1975); Additional Support from: Li and Maddala (1999); Bohi (1981); Bohi (1984).

Usage and Customer Growth Assumptions

Emissions are a function of combustion from energy usage. Since energy usage increases when the number of customers using energy increases, assumptions about the expected growth rate of energy customers are necessary.

The quantity of energy used per customer ("UPC") measures the intensity of use and will affect the quantity of greenhouse gas emissions. Changes in UPC are conservatively assumed to be zero for all types of fuel and across sectors. That is, the model reflects the current UPC today with no efficiency improvements.

Since price, customer, and energy use growth is factored separately into the model. UPC strictly controls efficiency changes regarding energy usage in the model.

Customers and Use per Customer

	Residential	Commercial	Industrial
Customer Growth (%)			
Coal	0.32%	0.32%	0.00%
Distillate	0.32%	0.32%	0.00%
Kerosene	0.32%	0.32%	0.00%
LPG	0.32%	0.32%	0.00%
Motor Gasoline	0.32%	0.32%	0.00%
Residual Fuel Oil	0.32%	0.32%	0.00%
Natural Gas	0.32%	0.32%	0.00%
Electricity	0.32%	0.32%	0.00%
Change in Use Per Customer (Efficiency)			
Coal	0.00%	0.00%	0.00%
Distillate	0.00%	0.00%	0.00%
Kerosene	0.00%	0.00%	0.00%
LPG	0.00%	0.00%	0.00%
Motor Gasoline	0.00%	0.00%	0.00%
Residual Fuel Oil	0.00%	0.00%	0.00%
Natural Gas	0.00%	0.00%	0.00%
Electricity	0.00%	0.00%	0.00%
Energy Use Growth (%)			
Coal	1.23%	1.34%	1.37%
Distillate	0.48%	0.32%	0.17%
Kerosene	0.48%	0.32%	0.17%
LPG	0.58%	0.50%	0.47%
Motor Gasoline	0.38%	0.32%	0.09%
Residual Fuel Oil	0.43%	0.38%	0.17%
Natural Gas	1.25%	1.37%	1.41%
Electricity	1.28%	1.40%	1.44%

Note: Residential and commercial customer growth is assumed to equal to the expected 50 year population growth rate: 0.32 percent. Change in Use per Customer (Efficiency) shown for illustrative purposes, 0 percent was assumed as a working assumption. A 1:1 relationship was assumed between customer growth and energy usage. Use per customer was implicitly calculated in the formation of the model, Change in UPC factors can be used explicitly.

Emissions and Conversion Factor Assumptions

Emissions factors define the relationship between energy usage and the quantity of GHG emitted into the environment. The emissions factors used in this model are from the Environmental Protection Agency's ("EPA") State Inventory Tool.

Emissions Factors and Energy per Barrel

	Residential	Commercial	Industrial
Emissions Factors (Metric Tons of CO2 eq. / Billion BTU)			
Coal	0.10	0.10	0.09
Distillate	0.07	0.07	0.07
Kerosene	0.07	0.07	0.07
LPG	0.06	0.06	0.06
Motor Gasoline	0.06	0.07	0.07
Residual Fuel Oil	0.06	0.08	0.08
Natural Gas	0.05	0.05	0.05

Source: U.S. Environmental Protection Agency, 2007 GHG Emissions Modules, (Emissions Factors)

Geographic Allocation Factors

The economic model for this project allocates emissions, ECCs, and economic impacts across four quadrants in Louisiana (northeast, southeast, southwest, and northwest). For example population figures drive emissions from residential houses and transportation by quadrant. The locations of individual industrial plants define the geographic distribution of emissions for the petrochemical, refining, and electric power sectors. The geographic distribution of oil and natural gas production are used to assign emissions to each quadrant. The wastewater sector is geographically distributed by a combined population/arable land-weighted basis since emissions due to wastewater are generated both by city sewage and farmland runoff.

Variable	Allocation Factor
Residential Buildings	Population
Commercial Buildings	Commercial Institutions driving via Population
Refining	Refinery Locations
Petrochemical	Plant Locations
Other Industrial	Plant Locations
International Bunker Fuels	Plant Locations
Electric Power	Plant Locations
Natural Gas and Oil	Crude Natural Gas and Oil production
Coal	Northwest Quadrant
Transportation	Population
Ag soils, rice cultivation, etc.	Arable Land
Wastewater	Population / Arable Land

New Generator Assumptions

The current average age of electric generators in Louisiana is 28 years. Regardless of any potential GHG regulations, electric generators in Louisiana may be replaced once they reach a given age. Generators are assumed to have a 35-year life for modeling purposes.

New generators are assumed to be natural gas combined cycle units with a nameplate capacity of 560 MW and a heat rate of 6,700 Btu/kWh. The assumed details of the generator are based on assumptions used in the Energy Information Administration ("EIA") Annual Energy Outlook 2010.

Costs associated with new generators are not included in the model because existing generators are assumed to be retired based on lifespan, not due to emissions.

Characteristics of New Generators		
Fuel:	Natural Gas	
Prime Mover:	Combined Cycle	
Generator Size	560	(MW)
Capacity Factor	85%	
Heat Rate	6,719	(Btu / kWh)
Net Capacity	476	(MW)
Annual Nameplate Capacity	4,905,600	(MWh)
Annual Gross Capacity	4,169,760	(MWh)
Emissions Factors		
NOx	0.060471	(lbs/MWh)
CO2	333	(Metric Tons/MWh)

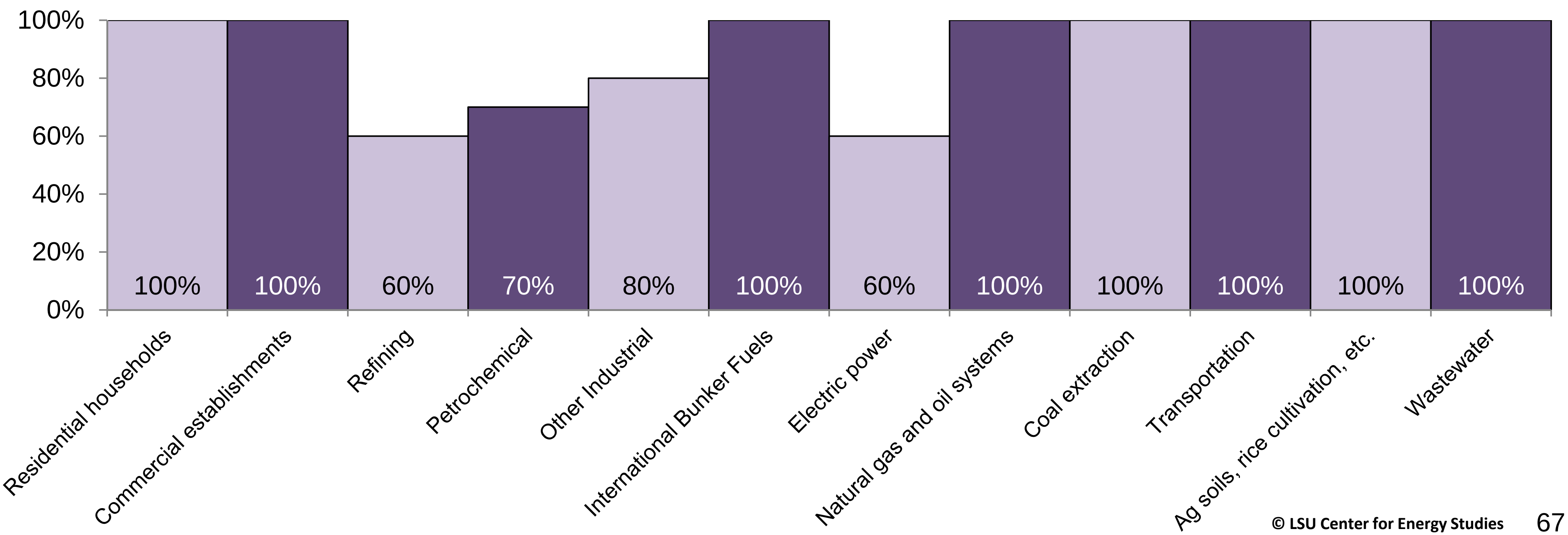
Note: Existing generators were assumed to have a lifespan of 35 years.
New generator costs are not included in the model and thus are not included in the results shown later.
New generators are part of an assumed natural gas combined cycle plant setup.

Source: U.S. Department of Energy, Energy Information Administration, AEO 2010

Economic Impact Results

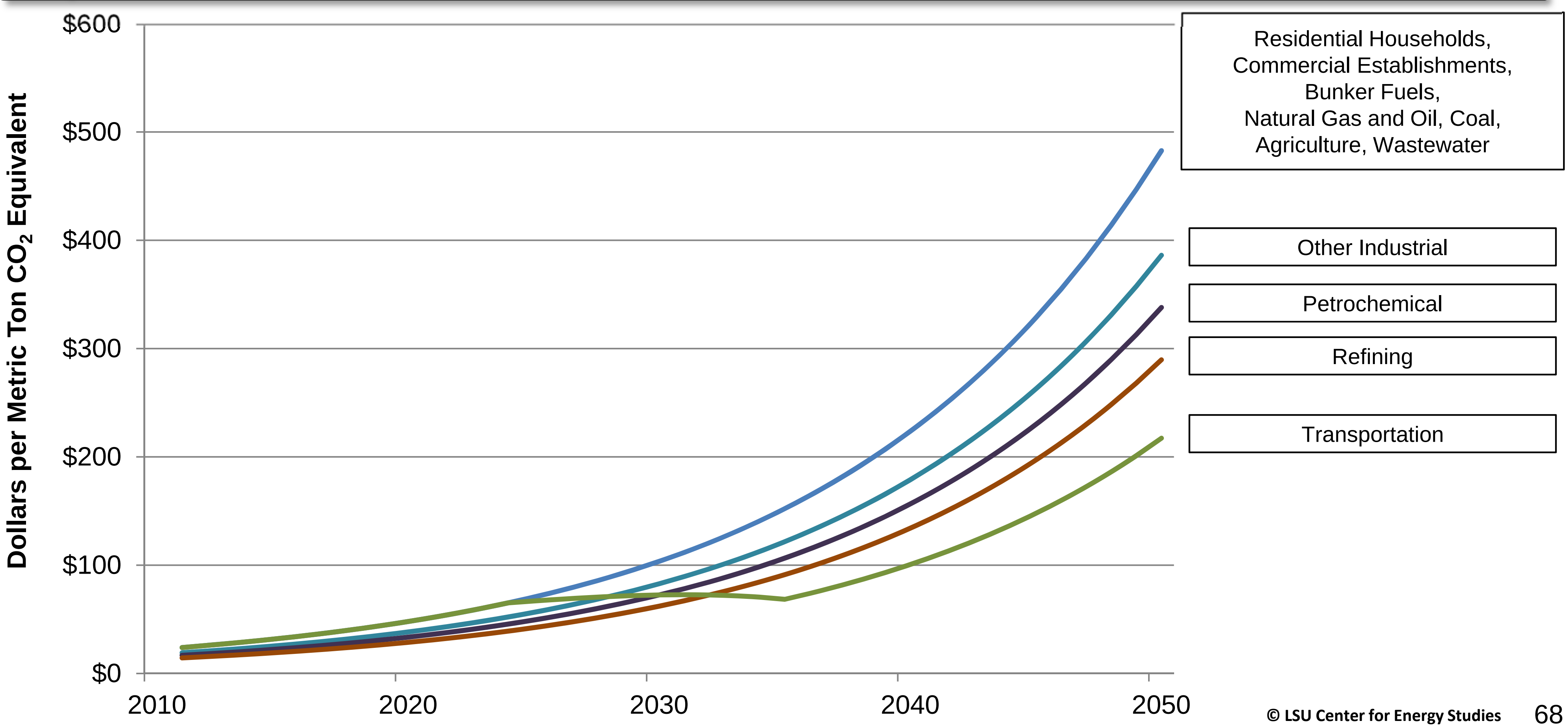
Estimation of ECCs

Firms and other entities subject to GHG regulations will have different opportunities to mitigate GHG emissions. Mitigation will be easier for some than for others, with many sectors paying different prices per ton of mitigated GHG emissions. Economies of scale could play a role in the differentiation of ECCs. Refineries and electric power companies are likely to have the lowest ECCs due to potential economies of scale and access to multiple mitigation options. Households and businesses will likely have relatively fewer mitigation options. Theoretically, each economic sector will mitigate GHGs up to the point that it becomes cheaper to buy an allowance than physically invest in mitigation. Therefore the aggregate allowance price is a function of all market participants. Below is a graph showing each sector's assumed marginal ECC relative to the aggregate marginal ECC in the market.



ECC Forecast by Sector

The cost of mitigating GHG emissions will vary by sector and such factors as economies of scale, and technology availability. Larger and more consolidated sectors are assumed to have more opportunities to reduce emissions and hence face lower compliance cost curve than other market participants. The transportation sector is assumed to have the lowest marginal cost curve of compliance due to economies of scale, and the irregular mitigation time horizon that industry is expected to have due to CAFE standards.



ECCs by Quadrant

ECCs are shown for 2011 and each decade through 2050. Figures are shown in millions of 2010 dollars.

Annual costs for the state are expected to range from $321 million in 2020 to just over $3.8 billion in 2050.

Cumulative costs are the sum of annual costs for the current and previous years. Estimated ECCs show that southeast LA will likely bear the majority of direct impacts from an aggregate compliance cost perspective.

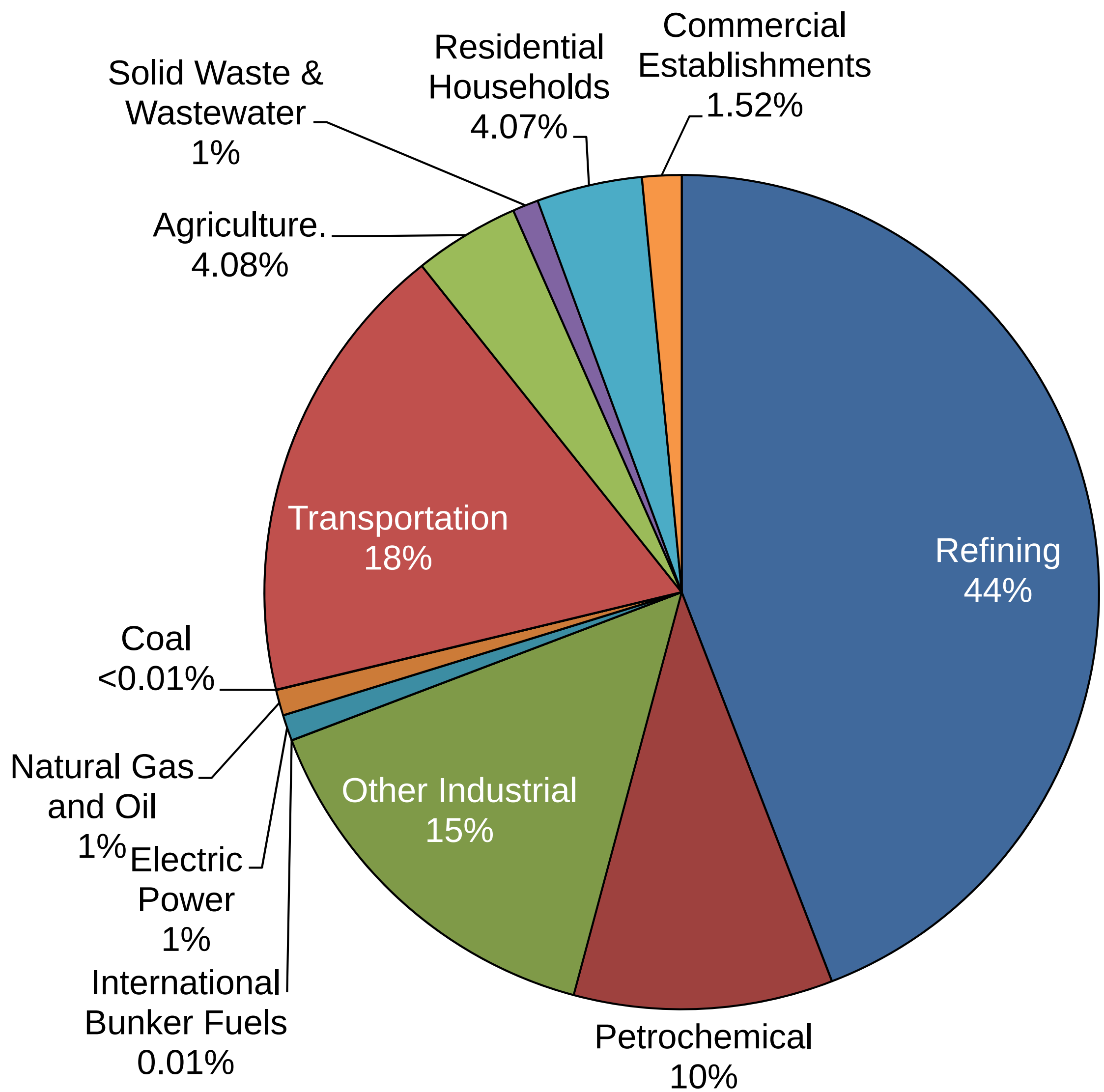
On a relative basis as a function of each quadrant's respective share of GSP, the northeast region will have an impact similar to the southwest region.

Estimated Compliance Costs (Direct Impacts)
(2010 $ Millions)

Year	Northeast	Northwest	Southeast	Southwest	State
Annual Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 17.64	$ 67.99	$ 181.05	$ 54.60	$ 321.28
2030	$ 54.59	$ 169.21	$ 476.84	$ 145.47	$ 846.10
2040	$ 113.76	$ 467.99	$ 1,055.04	$ 310.89	$ 1,947.68
2050	$ 282.53	$ 572.55	$ 2,392.25	$ 573.39	$ 3,820.71
Cumulative Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 93.43	$ 318.02	$ 1,087.80	$ 309.92	$ 1,809.18
2030	$ 442.62	$ 1,382.25	$ 4,286.54	$ 1,260.80	$ 7,372.20
2040	$ 1,346.47	$ 4,552.20	$ 12,139.01	$ 3,666.42	$ 21,704.10
2050	$ 3,334.98	$ 9,859.04	$ 29,507.63	$ 8,178.39	$ 50,880.04
Annual Cost as a Percentage of Forecasted Quadrant Gross Product					
2011	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.13%	0.17%	0.13%	0.12%	0.14%
2030	0.36%	0.37%	0.31%	0.27%	0.32%
2040	0.66%	0.92%	0.61%	0.52%	0.65%
2050	1.46%	1.00%	1.22%	0.85%	1.12%

Note: All figures are negative unless otherwise noted. All dollars shown in 2010 million dollars.

Distribution of Direct Economic Output Impacts (ECC Impacts)



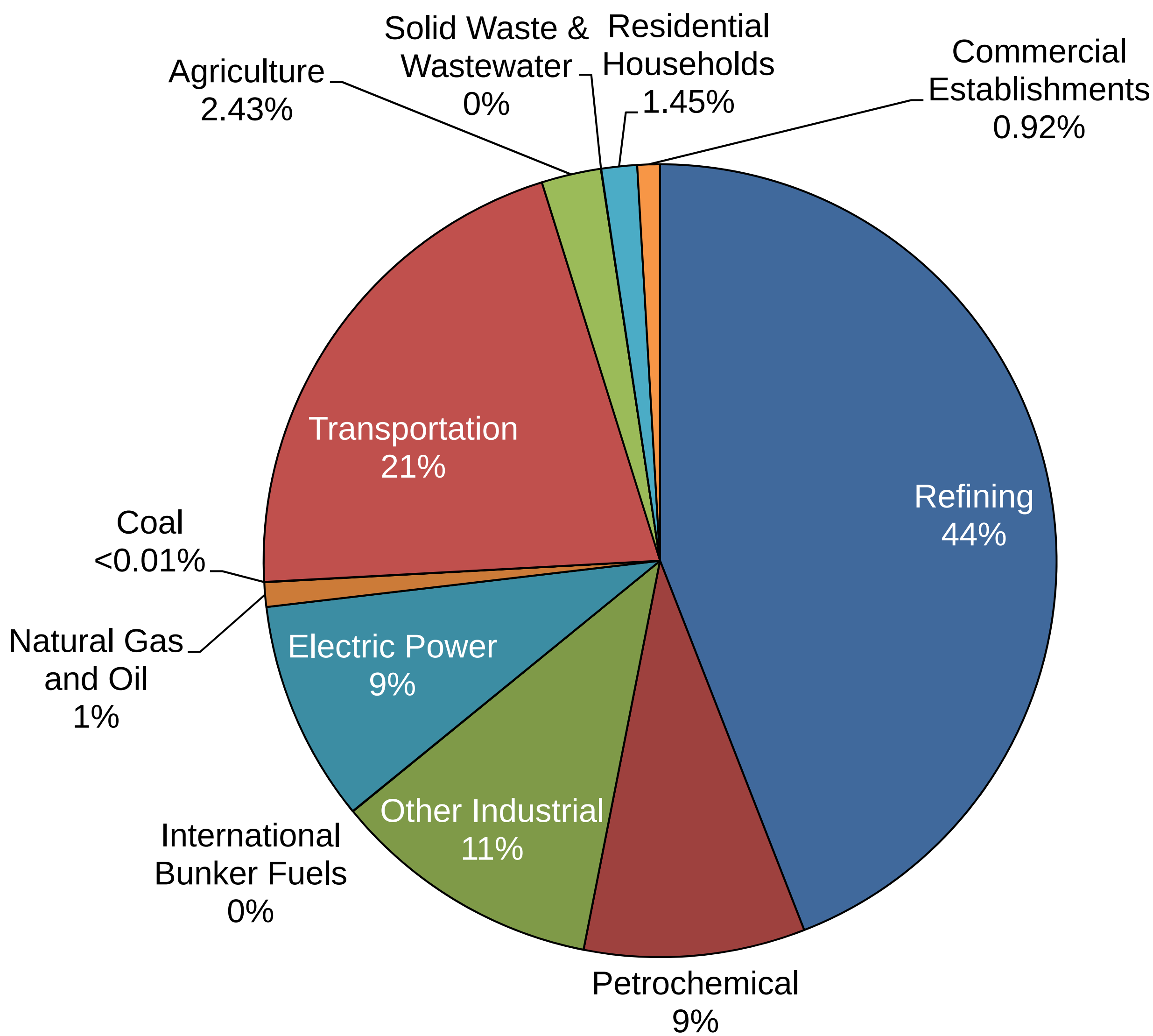
The electric power emissions appear to be a small part of the sector distribution of impacts. However utilities will likely trade among themselves leading to a lower net impact.

Other industries combined with petrochemical do not have as many trading opportunities and therefore, see much higher costs by relying more on physical mitigation investments.

Residential households, given their limited mitigation options, also bear a share of ECCs that are significantly greater than their share of emissions.

The relative shares of ECCs and total emissions are linked by the historical behavior of each sector. For example, if a sector had been precipitously lowering emissions as a trend, its forecasted future emissions would fall well below its baseline emissions minus mandated reduction. This would cause an economic impact share that is much smaller than its emissions share.

Distribution of Cumulative Greenhouse Gas Emissions



The electric power industry bears only one percent of the total ECCs, while contributing nine percent to total emissions. The relative difference between these shares is due to the increasing use of natural gas in the electric power industry, a move that has decreased GHG emissions. Further, newly built power plants are exclusively natural gas-fueled and are cleaner than the average plant that Louisiana currently dispatches.

However, the 'Other Industrial' sector has a higher share of ECCs relative to overall emissions. This is due primarily to historically stable levels of energy use and usage per energy consumer. While historical data does not show large increases of energy consumption, stable levels of consumption and emissions will likely create significant pressure in future years as the cap decreases.

Estimated Indirect and Induced Economic Output Impacts by Quadrant

Direct impacts occur in the form of ECCs for industries, businesses, and households. These ECCs withdraw resources from the economy to reduce emissions and have "multiplier" impacts elsewhere. Input/output modeling techniques estimate multiplier impacts.

The impacts do not account for any potential positive economic impacts due to ECC spending. This type of spending, especially at large scale, is not yet well understood and is the subject of a separate study being conducted by the LA Workforce Commission and the LSU Division of Economic Development and Forecasting ("Green Jobs Study").

As expected, the southeast region bears the largest secondary impacts in gross terms. However in terms of quadrant gross product, the northern parts of the state bear the largest secondary impacts on a relative basis.

Estimated Indirect and Induced Impacts by Quadrant
(2010 $ Millions)

Year	Northeast	Northwest	Southeast	Southwest	State
Annual Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 10.68	$ 7.33	$ 103.78	$ 20.43	$ 142.22
2030	$ 22.85	$ 53.60	$ 222.68	$ 48.26	$ 347.40
2040	$ 65.70	$ 62.02	$ 514.48	$ 128.77	$ 770.97
2050	$ 60.37	$ 447.16	$ 691.74	$ 265.36	$ 1,464.64
Cumulative Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 47.76	$ 162.31	$ 619.86	$ 146.91	$ 976.84
2030	$ 227.52	$ 708.94	$ 2,461.57	$ 605.93	$ 4,003.96
2040	$ 693.31	$ 2,345.12	$ 6,960.09	$ 1,774.57	$ 11,773.08
2050	$ 1,717.94	$ 5,079.70	$ 16,894.59	$ 3,943.87	$ 27,636.10
Annual Cost as a Percentage of Forecasted Quadrant Gross Product					
2011	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.08%	0.02%	0.08%	0.04%	0.06%
2030	0.15%	0.12%	0.14%	0.09%	0.13%
2040	0.38%	0.12%	0.30%	0.22%	0.26%
2050	0.31%	0.78%	0.35%	0.39%	0.43%

Note: All figures are negative unless otherwise noted. All dollars shown in 2010 million dollars.

Estimated Total Economic Output Impacts by Quadrant

Total economic impacts are the summation of ECCs (direct impacts) and the indirect and induced economic impacts.

During the years 2020 through 2040, total economic impacts remain below 1 percent of forecasted GSP.

Looking at costs relative to income on a quadrant basis shows that the northern portions of the state will bear a relatively higher burden due to GHG regulation.

In absolute terms, the state is estimated to incur a total economic impact of about $463 million annually by the year 2020. By the year 2030, this impact will jump to close to $1.2 billion dollars per year.

The southeast region will bear about 60 percent of the absolute impact to the state each year.

Estimated Total Impacts by Quadrant
(2010 $ Millions)

Year	Northeast	Northwest	Southeast	Southwest	State
Annual Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 28.32	$ 75.32	$ 284.83	$ 75.03	$ 463.50
2030	$ 77.44	$ 222.81	$ 699.52	$ 193.73	$ 1,193.50
2040	$ 179.46	$ 530.01	$ 1,569.52	$ 439.66	$ 2,718.65
2050	$ 342.90	$ 1,019.71	$ 3,083.99	$ 838.75	$ 5,285.35
Cumulative Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 141.19	$ 480.34	$ 1,707.66	$ 456.83	$ 2,786.02
2030	$ 670.13	$ 2,091.19	$ 6,748.11	$ 1,866.74	$ 11,376.17
2040	$ 2,039.78	$ 6,897.31	$ 19,099.10	$ 5,440.99	$ 33,477.18
2050	$ 5,052.92	$ 14,938.74	$ 46,402.22	$ 12,122.26	$ 78,516.14
Annual Cost as a Percentage of Forecasted Quadrant Gross Product					
2011	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.21%	0.19%	0.21%	0.16%	0.20%
2030	0.51%	0.49%	0.45%	0.36%	0.45%
2040	1.04%	1.04%	0.90%	0.73%	0.90%
2050	1.77%	1.78%	1.58%	1.24%	1.56%

Note: All figures are negative unless otherwise noted. All dollars shown in 2010 million dollars.

Per Capita Annual Cost of Emissions Abatement by Quadrant

Per capita costs are likely to be higher in the southeastern region of the state, followed by the northeastern region. Southwest Louisiana is estimated to have the lowest per capita emissions cost of any region in the state.

Per Capita Annual Cost of Emissions Abatement by Quadrant
(2010 $)

Year	Northeast	Northwest	Southeast	Southwest	State
Annual Cost Per Capita					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 81	$ 130	$ 119	$ 91	$ 113
2030	$ 243	$ 310	$ 277	$ 226	$ 270
2040	$ 490	$ 826	$ 575	$ 459	$ 588
2050	$ 1,196	$ 1,006	$ 1,285	$ 831	$ 1,142

Estimated Employment Impacts by Quadrant

Annual employment losses by quadrant are shown as "job-years". One unit of job-years is defined as one job over one year. Five job-years, for illustration, can define one job over five years, or five jobs over one year.

The southeast region is estimated to be the most impacted quadrant in terms of employment, with the northeast region being the least impacted region.

The southeast region will have an estimated 1,300 fewer jobs due to cap and trade in Louisiana by year 2020. Compared to about 1.176 million jobs estimated in the southeast region that year, 1,300 jobs will represent about 1.1 percent of all jobs that year.

Total Annual Employment Losses by Quadrant
(Job-years)

Year	Northeast	Northwest	Southeast	Southwest	State
Energy-Related					
Direct Employment Impacts (losses)					
2011	-	-	-	-	-
2020	182	408	1,304	462	2,356
2030	387	894	2,722	969	4,972
2040	818	1,910	5,694	2,022	10,444
2050	1,537	3,553	10,684	3,776	19,550
Indirect and Induced Employment Impacts (losses)					
2011	-	-	-	-	-
2020	107	232	771	273	1,383
2030	212	480	1,550	548	2,790
2040	436	990	3,156	1,112	5,694
2050	795	1,779	5,741	2,009	10,324
Total Employment Impacts (losses)					
2011	-	-	-	-	-
2020	286	641	2,074	736	3,737
2030	600	1,373	4,274	1,516	7,763
2040	1,250	2,899	8,848	3,130	16,127
2050	2,333	5,331	16,424	5,787	29,875

Note: All figures are negative unless otherwise noted. Positive figures indicate less job-years.

Estimated Direct Value Added Impacts by Quadrant

In addition to economic output and employment, impacts due to potential GHG regulation show up in value-added components of the economy.

Value-added is defined as employee compensation, proprietary income, and property-type income. Employee compensation includes total payroll costs including benefits. Proprietary income consists of payments received by self-employed individuals as income. Property-type income includes payments from rents, royalties and dividends.

Direct Value Added Impacts by Quadrant

Year	Northeast	Northwest	Southeast	Southwest	State
(2010 $ Million)					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 3.28	$ 7.20	$ 26.91	$ 8.03	$ 38.51
2030	$ 5.49	$ 11.82	$ 50.60	$ 14.09	$ 69.07
2040	$ 9.63	$ 19.85	$ 96.00	$ 25.48	$ 126.51
2050	$ 14.89	$ 26.28	$ 158.22	$ 40.05	$ 199.25
(2010 $ Per Capita)					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 9.11	$ 8.65	$ 10.56	$ 8.34	$ 33.56
2030	$ 15.44	$ 13.87	$ 17.93	$ 14.12	$ 56.10
2040	$ 26.66	$ 22.73	$ 32.47	$ 24.64	$ 97.04
2050	$ 41.30	$ 30.19	$ 53.89	$ 38.90	$ 148.73
Percentage of Forecasted Direct Value Added by Quadrant					
2011	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.02%	0.01%	0.02%	0.01%	0.02%
2030	0.02%	0.01%	0.02%	0.02%	0.02%
2040	0.02%	0.02%	0.02%	0.02%	0.02%
2050	0.02%	0.02%	0.02%	0.02%	0.02%

Note: Note that personal income impacts are relatively modest compared to total personal income, this is mostly due to the assumption that value added is growing at 5 percent annually.

All figures are negative unless otherwise noted.

Estimated Indirect and Induced Value Added Impacts by Quadrant

Direct impacts occur in the form of reduced employee compensation, proprietary income, and property-type income for industries, businesses, and households.

Indirect and induced impacts occur as a secondary and tertiary result of reduced employee compensation, proprietary income, and property-type income.

The Southeast region bears the highest value added impact in absolute terms.

On a relative basis, the impacts remain a very small percentage of forecasted indirect and induced value added by quadrant.

Indirect and Induced Value Added Impacts by Quadrant

Year	Northeast	Northwest	Southeast	Southwest	State
(2010 $ Million)					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 1.51	$ 2.65	$ 16.66	$ 3.60	$ 31.34
2030	$ 2.47	$ 4.18	$ 31.69	$ 6.25	$ 57.54
2040	$ 4.26	$ 6.65	$ 61.34	$ 11.12	$ 107.83
2050	$ 6.21	$ 7.32	$ 108.09	$ 16.72	$ 178.52
(2010 $ Per Capita)					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 4.18	$ 3.19	$ 6.54	$ 3.74	$ (18.71)
2030	$ 6.96	$ 4.91	$ 11.23	$ 6.26	$ (30.92)
2040	$ 11.79	$ 7.62	$ 20.75	$ 10.75	$ (52.20)
2050	$ 17.22	$ 8.41	$ 36.82	$ 16.24	$ (76.03)
Percentage of Forecasted Ind. and Ind. Value Added by Quadrant					
2011	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.02%	0.01%	0.01%	0.01%	0.01%
2030	0.02%	0.01%	0.02%	0.01%	0.01%
2040	0.02%	0.01%	0.02%	0.02%	0.02%
2050	0.02%	0.01%	0.02%	0.02%	0.02%

Note: Note that personal income impacts are relatively modest compared to total personal income, this is mostly due to the assumption that value added is growing at 5 percent annually.

All figures are negative unless otherwise noted.

Estimated Total Value Added Impacts by Quadrant

Significant value added impacts occur in later years, with the southeast region bearing the largest brunt in absolute terms. Still the anticipated effects to value added remain relatively small compared to the total value added separately by each quadrant.

Total Value Added Impacts by Quadrant

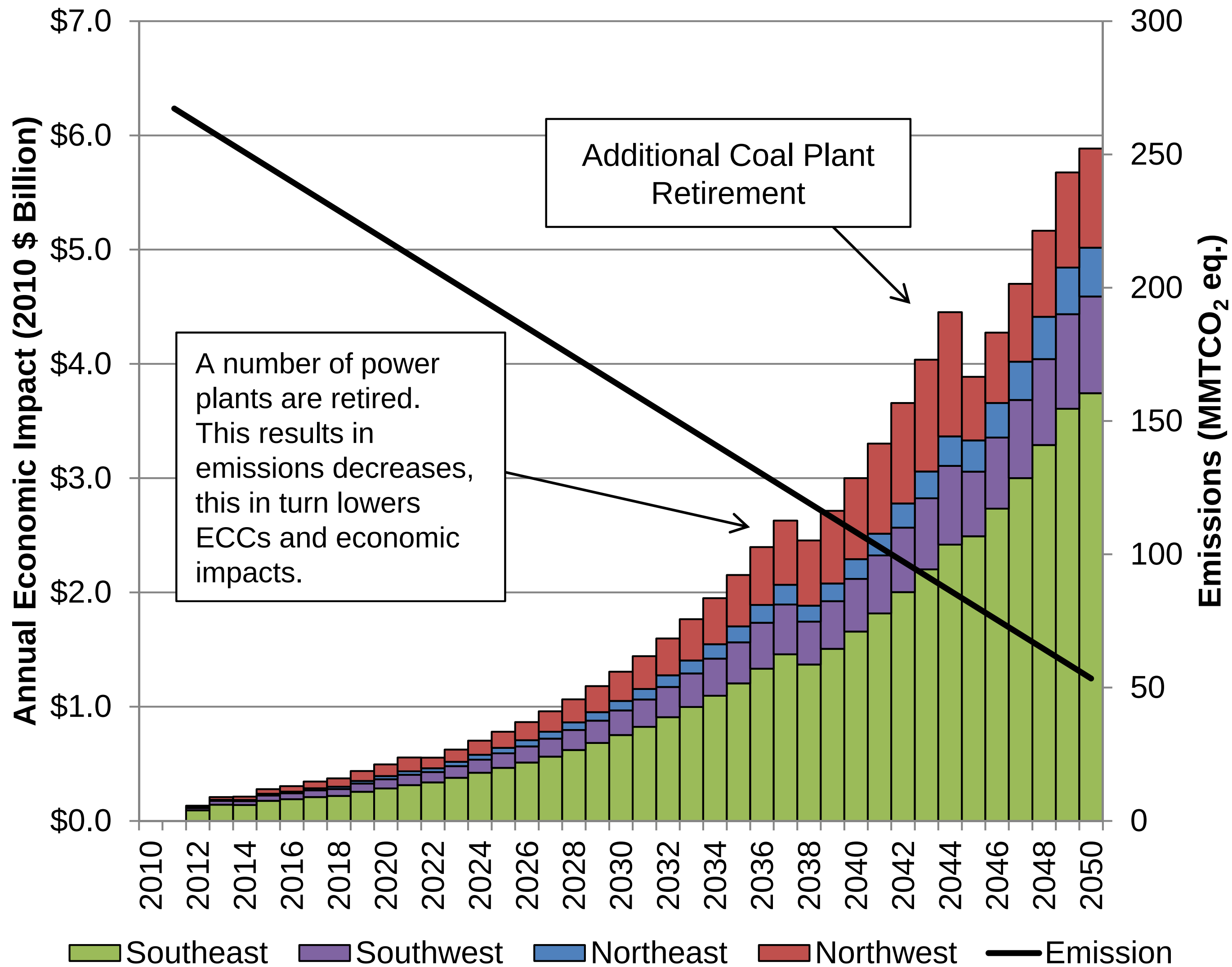
Year	Northeast	Northwest	Southeast	Southwest	State
(2010 $ Million)					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 4.79	$ 9.86	$ 43.57	$ 11.63	$ 69.85
2030	$ 7.97	$ 16.00	$ 82.30	$ 20.34	$ 126.61
2040	$ 13.89	$ 26.50	$ 157.34	$ 36.60	$ 234.34
2050	$ 21.11	$ 33.60	$ 266.30	$ 56.76	$ 377.77
(2010 $ Per Capita)					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 13.29	$ 11.84	$ 17.10	$ 12.08	$ 14.85
2030	$ 22.41	$ 18.78	$ 29.15	$ 20.38	$ 25.18
2040	$ 38.45	$ 30.35	$ 53.21	$ 35.39	$ 44.84
2050	$ 58.52	$ 38.60	$ 90.70	$ 55.13	$ 72.70
Percentage of Forecasted Total Value Added by Quadrant					
2011	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.03%	0.02%	0.03%	0.02%	0.03%
2030	0.03%	0.02%	0.04%	0.02%	0.03%
2040	0.03%	0.02%	0.05%	0.03%	0.04%
2050	0.03%	0.02%	0.05%	0.03%	0.04%

Note: Note that personal income impacts are relatively modest compared to total personal income, this is mostly due to the assumption that value added is growing at 5 percent annually.

All figures are negative unless otherwise noted.

Annual Economic Impacts

The annual economic impacts of compliance are expected to increase steadily. Plant unit retirements in 2038 and 2045 will result in emissions decreases which will lower ECCs and economic impacts in those years.



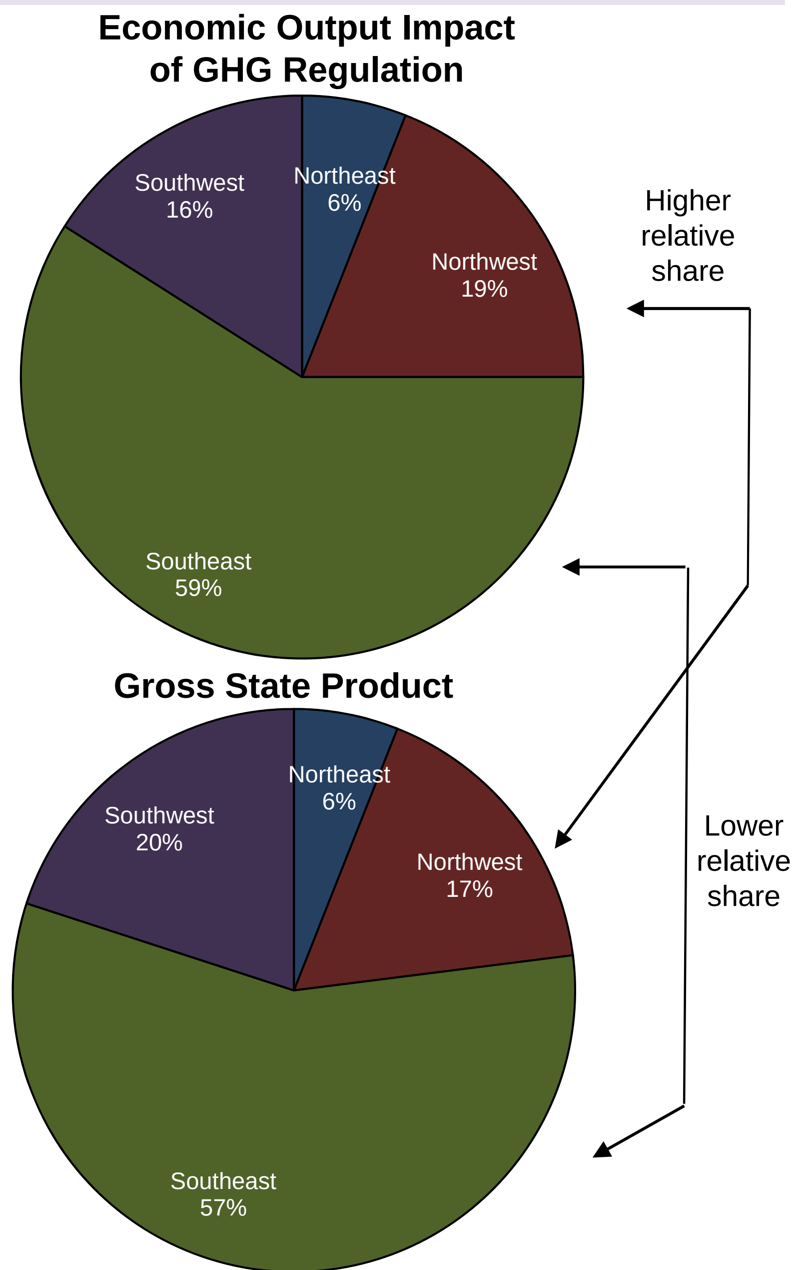
Note: Rodemacher Unit II Unit, owned by Cleco, is assumed to retire in 2045. A number of other plants are assumed to retire in 2038, though none have as large an individual impact as the Rodemacher II Unit. Units such as NRG's Big Cajun 1 are assumed to go offline at that time.

Geographic Distribution of Cumulative Economic Output Impacts

A comparison of the geographic distribution of the estimated economic output impacts due to an assumed cap and trade system to the gross state product shows the relative burden of these potential regulatory air emissions requirements on Louisiana.

The relative impact in south Louisiana is estimated to be less than those quadrants' contribution to gross state product. This is because refineries and petrochemical plants are concentrated in the southern portion of the state, and these sectors are assumed to have lower marginal costs associated with mitigating emissions.

North and especially northwestern Louisiana have higher relative marginal costs associated with mitigating emissions. Accordingly, the geographic distribution of impacts (costs) associated with these quadrants is higher than their relative contribution to GSP.

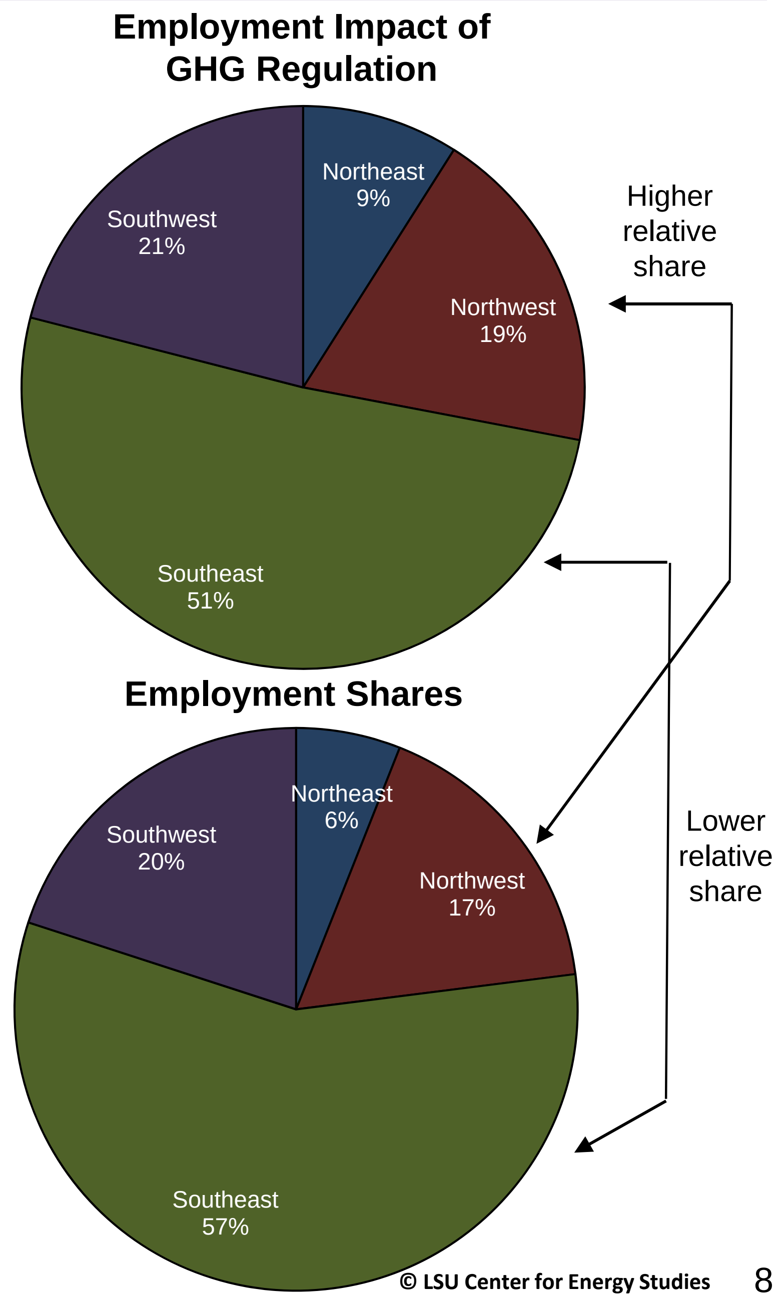


Geographic Distribution of Cumulative Employment Impacts

The estimated employment impacts due to GHG regulation are non-uniform, since industries within each of the four quadrants are assumed to face different marginal costs of mitigation.

In addition to unequal marginal costs, different lines of economic activity require differing labor input intensities. Since economic activity and industry-types are unevenly distributed geographically around Louisiana, it makes sense that employment impacts due to GHG regulation are also not perfectly distributed by employment.

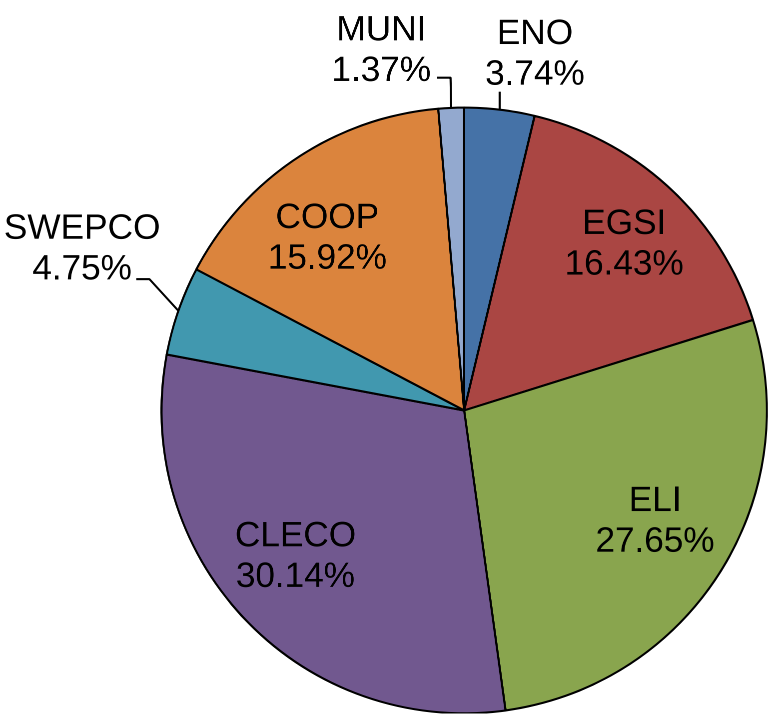
The northwest, and especially northeast have higher estimated employment impacts compared to their shares of employment in Louisiana. This is because these regions tend to have industries that are more labor-intensive compared to south Louisiana where economic activity is more capital intensive.



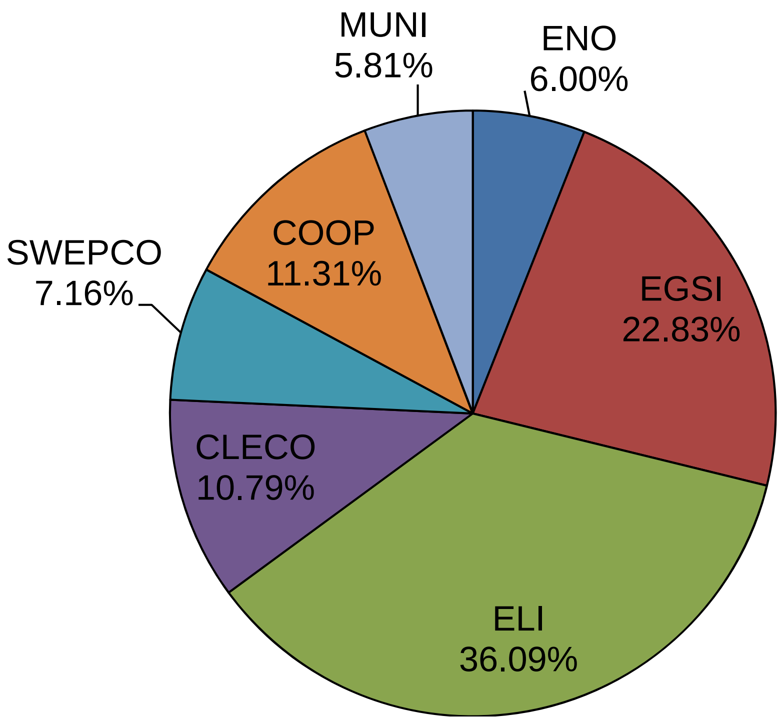
Electric Power Sector Compliance Costs

The distribution of ECCs depends on the share of electricity sold as well as the fuel mix composition of each utility. Utilities with relatively more coal generating units tend to have higher ECCs than utilities that rely more on natural gas and nuclear to generate power. For example, NRG and Cleco utilities generate a larger share of electricity from coal than their counterparts. Therefore, those utilities are estimated to bear a larger share of ECCs than other utilities. On the other hand, Entergy tends to generate a larger than average share of electricity from natural gas and nuclear, and has a corresponding lower share of ECCs.

Estimated Compliance Cost Shares



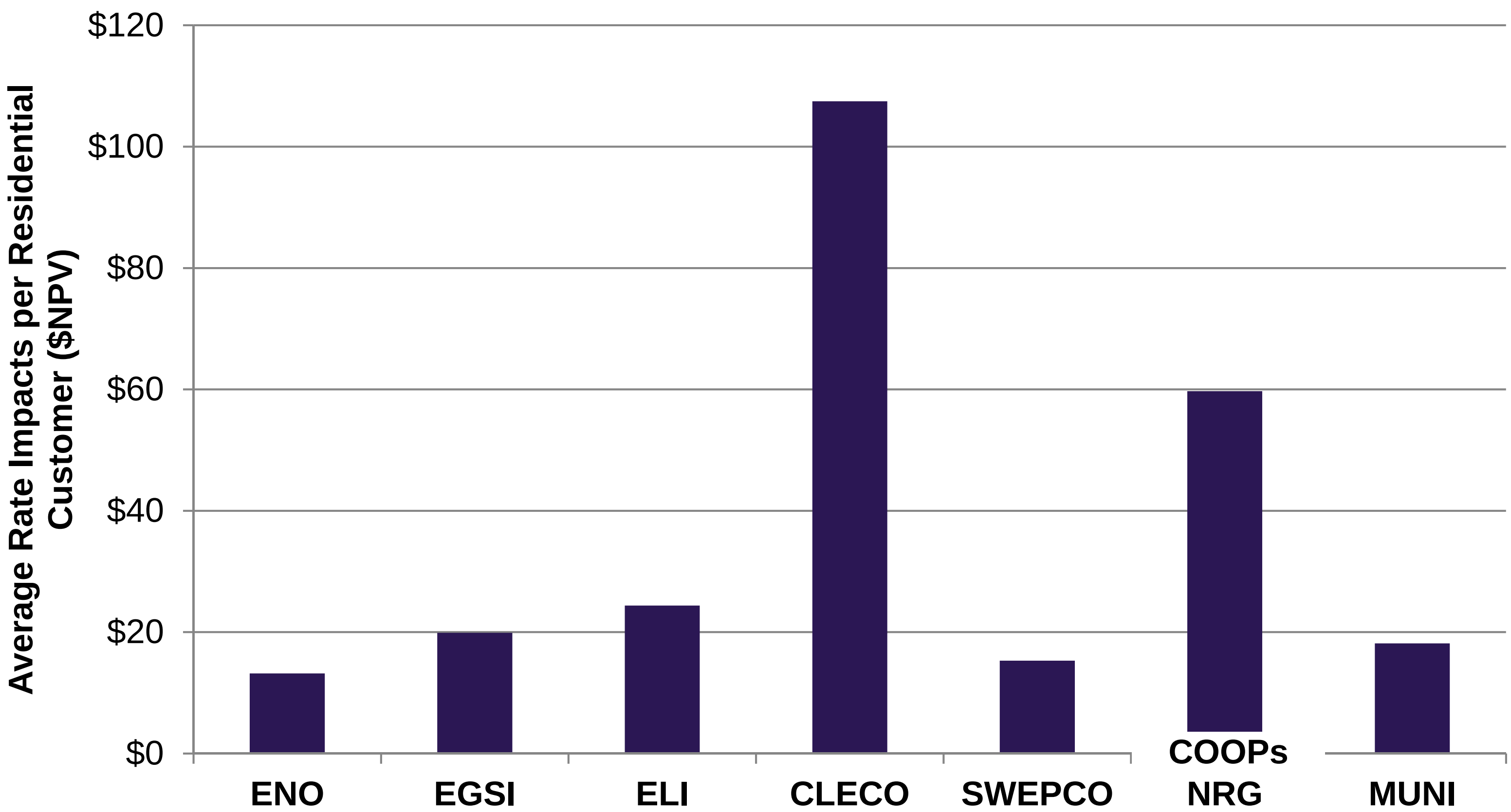
Electricity Sales by Utility



Note: The COOPs category includes: Southwest Louisiana EMC, Beauregard Electric Coop, Jeff David Coop, DEMCO, Panola-Harrison, Concordia Electric, Northeast Louisiana Power Coop, Pointe Coupee Electric Member Corp, Claiborne Electric Coop, South Louisiana Electric Coop, Valley Electric Member Coop. The MUNI category includes: City of Rayne, Town of Vinton, City of Plaquemine, City of Ruston, City of Natchitoches, City of New Roads, Town of Boyce, City of Morgan City, City of St. Martinville, City of Kaplan, Town of Gueydan, City of Minden, City of Winnfield.

Average Annual Rate Impacts: Residential Electricity Customers ($ 2010)

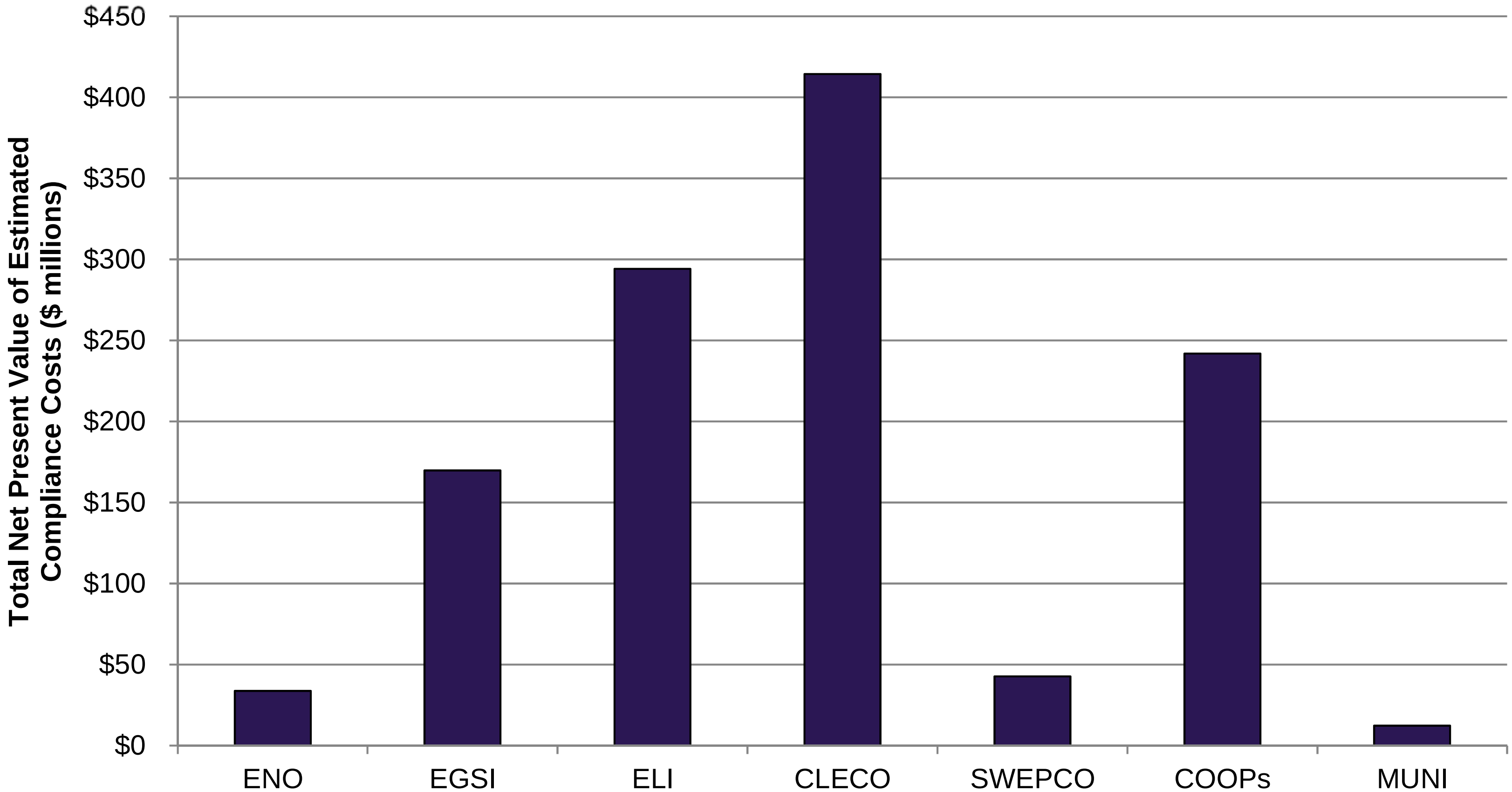
Utilities whose fuel mix tends more towards coal, such as NRG (coops) and Cleco, have higher estimated average monthly rate impacts. Utilities whose fuel mix is mostly made up of natural gas and nuclear generation tend to have lower average monthly rate impacts per customer.



Note: The COOPs category includes: Southwest Louisiana EMC, Beauregard Electric Coop, Jeff David Coop, DEMCO, Panola-Harrison, Concordia Electric, Northeast Louisiana Power Coop, Pointe Coupee Electric Member Corp, Claiborne Electric Coop, South Louisiana Electric Coop, Valley Electric Member Coop. The MUNI category includes: City of Rayne, Town of Vinton, City of Plaquemine, City of Ruston, City of Natchitoches, City of New Roads, Town of Boyce, City of Morgan City, City of St. Martinville, City of Kaplan, Town of Gueydan, City of Minden, City of Winnfield. Assumes 10 percent discount rate.

Total Required Emission Reductions by Utility and Total NPV ECC by Utility

The NPV value of Cleco's ECCs are around $400 million. In other words, if Cleco were to pay its entire anticipated liability off today, in today's dollars, it would have to make a payment of $400 million. ELI has the next highest NPV estimated costs at around $300 million.



Note: The COOPs category includes: Southwest Louisiana EMC, Beauregard Electric Coop, Jeff David Coop, DEMCO, Panola-Harrison, Concordia Electric, Northeast Louisiana Power Coop, Pointe Coupee Electric Member Corp, Claiborne Electric Coop, South Louisiana Electric Coop, Valley Electric Member Coop. The MUNI category includes: City of Rayne, Town of Vinton, City of Plaquemine, City of Ruston, City of Natchitoches, City of New Roads, Town of Boyce, City of Morgan City, City of St. Martinville, City of Kaplan, Town of Gueydan, City of Minden, City of Winnfield. Assumes 10 percent discount rate.

Direct Impact Summaries – State

Direct Economic Impacts Total State		Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Est. Compliance Costs	**($ Millions)**											
	2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	2020	$ 4.99	$ 2.94	$ 67.04	$ 15.87	$ 22.63	$ 144.21	$ 3.29	$ 0.00	$ 53.10	$ 5.98	$ 1.07
	2030	$ 11.83	$ 6.39	$ 141.42	$ 32.80	$ 48.83	$ 503.86	$ 4.89	$ 0.00	$ 80.24	$ 13.20	$ 2.30
	2040	$ 28.32	$ 11.81	$ 305.37	$ 70.80	$ 105.50	$ 1,269.83	$ 10.54	$ 0.00	$ 111.36	$ 28.50	$ 4.97
	2050	$ 68.36	$ 20.48	$ 659.28	$ 152.86	$ 227.91	$ 2,563.80	$ 22.75	$ 0.00	$ 31.56	$ 61.53	$ 10.73
Employment Impacts	**(Jobs)**											
	2011	-	-	-	-	-	-	-	-	-	-	-
	2020	899	13	9	63	90	252	9	-	942	67	13
	2030	2,125	29	20	131	194	856	13	-	1,428	147	27
	2040	5,073	53	43	282	420	2,180	29	-	1,986	318	57
	2050	12,238	92	93	609	907	4,177	62	-	563	686	123
Value Added Impacts	**($ Millions)**											
	2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	2020	$ 5.89	$ 1.69	$ 7.38	$ 4.42	$ 8.40	$ 169.58	$ 1.20	$ 0.00	$ 26.30	$ 2.29	$ 0.80
	2030	$ 13.98	$ 3.68	$ 15.57	$ 9.14	$ 18.13	$ 593.66	$ 1.78	$ 0.00	$ 39.77	$ 5.07	$ 1.71
	2040	$ 33.49	$ 6.80	$ 33.61	$ 19.73	$ 39.17	$ 1,495.44	$ 3.83	$ 0.00	$ 55.22	$ 10.93	$ 3.66
	2050	$ 80.83	$ 11.79	$ 72.57	$ 42.60	$ 84.63	$ 3,029.96	$ 8.26	$ 0.00	$ 15.65	$ 23.60	$ 7.89

Indirect & Induced Impact Summaries – State

Indirect & Induced Economic Impacts Total State	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 2.85	$ 1.84	$ 24.12	$ 10.96	$ 13.05	$ 48.86	$ 1.60	$ 0.00	$ 35.30	$ 2.94	$ 0.88
2030	$ 6.78	$ 4.02	$ 50.89	$ 22.66	$ 28.16	$ 170.72	$ 2.38	$ 0.00	$ 53.77	$ 6.48	$ 1.85
2040	$ 16.26	$ 7.45	$ 109.88	$ 48.92	$ 60.83	$ 430.24	$ 5.12	$ 0.00	$ 75.01	$ 13.99	$ 3.95
2050	$ 39.27	$ 12.91	$ 237.23	$ 105.62	$ 131.41	$ 868.66	$ 11.06	$ 0.00	$ 21.28	$ 30.19	$ 8.49
Employment Impacts (Jobs)											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	513	9	4	44	52	86	4	-	627	32	10
2030	1,217	18	7	90	112	290	7	-	957	73	21
2040	2,913	34	16	195	242	738	13	-	1,338	156	46
2050	7,029	58	34	421	523	1,415	30	-	380	337	98
Value Added Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 3.36	$ 1.06	$ 2.66	$ 3.06	$ 4.84	$ 57.46	$ 0.58	$ 0.00	$ 17.49	$ 1.13	$ 0.66
2030	$ 8.01	$ 2.32	$ 5.60	$ 6.32	$ 10.46	$ 201.14	$ 0.86	$ 0.00	$ 26.65	$ 2.49	$ 1.37
2040	$ 19.23	$ 4.29	$ 12.10	$ 13.63	$ 22.59	$ 506.68	$ 1.86	$ 0.00	$ 37.20	$ 5.36	$ 2.91
2050	$ 46.43	$ 7.43	$ 26.11	$ 29.44	$ 48.80	$ 1,026.60	$ 4.02	$ 0.00	$ 10.55	$ 11.58	$ 6.24

Note: Impacts are associated increased compliance costs for each sector, but occur in many secondary sectors.

Total Impact Summaries – State

Total Economic Impacts Total State	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 7.83	$ 4.78	$ 91.16	$ 26.83	$ 35.68	$ 193.07	$ 4.89	$ 0.00	$ 88.40	$ 8.92	$ 1.94
2030	$ 18.61	$ 10.42	$ 192.31	$ 55.45	$ 76.99	$ 674.57	$ 7.27	$ 0.00	$ 134.00	$ 19.68	$ 4.16
2040	$ 44.58	$ 19.26	$ 415.25	$ 119.72	$ 166.33	$ 1,700.07	$ 15.66	$ 0.00	$ 186.37	$ 42.49	$ 8.92
2050	$ 107.63	$ 33.39	$ 896.51	$ 258.48	$ 359.33	$ 3,432.46	$ 33.81	$ 0.00	$ 52.83	$ 91.72	$ 19.22
Employment Impacts **(Jobs)**											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	1,412	22	13	107	142	338	13	-	1,569	99	23
2030	3,342	47	27	221	306	1,146	20	-	2,385	220	48
2040	7,986	87	59	477	662	2,918	42	-	3,324	474	103
2050	19,267	150	127	1,030	1,430	5,592	92	-	943	1,023	221
Value Added Impacts **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 9.25	$ 2.74	$ 10.04	$ 7.48	$ 13.25	$ 227.03	$ 1.78	$ 0.00	$ 43.79	$ 3.42	$ 1.46
2030	$ 22.00	$ 5.99	$ 21.17	$ 15.46	$ 28.59	$ 794.80	$ 2.64	$ 0.00	$ 66.42	$ 7.55	$ 3.08
2040	$ 52.71	$ 11.09	$ 45.71	$ 33.37	$ 61.76	$ 2,002.12	$ 5.69	$ 0.00	$ 92.42	$ 16.30	$ 6.57
2050	$ 127.26	$ 19.23	$ 98.69	$ 72.04	$ 133.42	$ 4,056.56	$ 12.28	$ 0.00	$ 26.20	$ 35.19	$ 14.13

Note: Total Impacts include increased direct compliance costs, as wells as indirect and induced impacts that occur in many sectors.

Direct Impact Summaries – Northeast Quadrant

Direct Economic Impacts Northeast Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Est. Compliance Costs **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.36	$ 0.21	$ 0.17	$ 0.21	$ 0.30	$ 11.68	$ 0.66	$ -	$ 3.87	$ 1.96	$ 0.19
2030	$ 0.84	$ 0.45	$ 0.36	$ 0.44	$ 0.65	$ 40.82	$ 0.99	$ -	$ 5.85	$ 4.33	$ 0.42
2040	$ 2.02	$ 0.84	$ 0.78	$ 0.94	$ 1.41	$ 102.89	$ 2.13	$ -	$ 8.12	$ 9.34	$ 0.90
2050	$ 4.87	$ 1.45	$ 1.68	$ 2.04	$ 3.04	$ 207.73	$ 4.59	$ -	$ 2.30	$ 20.16	$ 1.95
Employment Impacts **(Jobs)**											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	64	1	-	1	1	20	2	-	69	22	2
2030	151	2	-	2	3	69	3	-	104	48	5
2040	362	4	-	4	6	177	6	-	145	104	10
2050	872	7	-	8	12	338	12	-	41	225	22
Value Added Impacts **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.42	$ 0.12	$ 0.02	$ 0.06	$ 0.11	$ 13.74	$ 0.24	$ -	$ 1.92	$ 0.75	$ 0.15
2030	$ 1.00	$ 0.26	$ 0.04	$ 0.12	$ 0.24	$ 48.10	$ 0.36	$ -	$ 2.90	$ 1.66	$ 0.31
2040	$ 2.39	$ 0.48	$ 0.09	$ 0.26	$ 0.52	$ 121.17	$ 0.77	$ -	$ 4.03	$ 3.58	$ 0.67
2050	$ 5.76	$ 0.83	$ 0.19	$ 0.57	$ 1.13	$ 245.50	$ 1.67	$ -	$ 1.14	$ 7.74	$ 1.44

Indirect & Induced Impact Summaries – Northeast Quadrant

Indirect & Induced Economic Impacts Northeast Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.20	$ 0.13	$ 0.06	$ 0.15	$ 0.17	$ 3.96	$ 0.32	$ -	$ 2.57	$ 0.96	$ 0.16
2030	$ 0.48	$ 0.28	$ 0.13	$ 0.30	$ 0.38	$ 13.83	$ 0.48	$ -	$ 3.92	$ 2.12	$ 0.34
2040	$ 1.16	$ 0.53	$ 0.28	$ 0.65	$ 0.81	$ 34.86	$ 1.03	$ -	$ 5.47	$ 4.58	$ 0.72
2050	$ 2.80	$ 0.91	$ 0.61	$ 1.41	$ 1.75	$ 70.38	$ 2.23	$ -	$ 1.55	$ 9.89	$ 1.55
Employment Impacts (Jobs)											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	37	1	-	1	1	7	1	-	46	11	2
2030	87	1	-	1	1	23	1	-	70	24	4
2040	208	2	-	3	3	60	3	-	98	51	8
2050	501	4	-	6	7	115	6	-	28	110	18
Value Added Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.24	$ 0.07	$ 0.01	$ 0.04	$ 0.06	$ 4.66	$ 0.12	$ -	$ 1.27	$ 0.37	$ 0.12
2030	$ 0.57	$ 0.16	$ 0.01	$ 0.08	$ 0.14	$ 16.30	$ 0.17	$ -	$ 1.94	$ 0.81	$ 0.25
2040	$ 1.37	$ 0.30	$ 0.03	$ 0.18	$ 0.30	$ 41.05	$ 0.38	$ -	$ 2.71	$ 1.76	$ 0.53
2050	$ 3.31	$ 0.53	$ 0.07	$ 0.39	$ 0.65	$ 83.18	$ 0.81	$ -	$ 0.77	$ 3.80	$ 1.14

Note: Impacts are associated increased compliance costs for each sector, but occur in many secondary sectors.

Total Impact Summaries – Northeast Quadrant

Total Economic Impacts Northeast Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.56	$ 0.34	$ 0.23	$ 0.36	$ 0.48	$ 15.64	$ 0.99	$ -	$ 6.45	$ 2.92	$ 0.35
2030	$ 1.33	$ 0.74	$ 0.49	$ 0.74	$ 1.03	$ 54.66	$ 1.47	$ -	$ 9.77	$ 6.45	$ 0.76
2040	$ 3.18	$ 1.36	$ 1.06	$ 1.60	$ 2.22	$ 137.75	$ 3.16	$ -	$ 13.59	$ 13.92	$ 1.62
2050	$ 7.67	$ 2.36	$ 2.29	$ 3.45	$ 4.79	$ 278.11	$ 6.82	$ -	$ 3.85	$ 30.06	$ 3.50
Employment Impacts (Jobs)											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	101	2	-	1	2	27	3	-	114	32	4
2030	238	3	-	3	4	93	4	-	174	72	9
2040	569	6	-	6	9	236	8	-	242	155	19
2050	1,373	11	-	14	19	453	19	-	69	335	40
Value Added Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.66	$ 0.19	$ 0.03	$ 0.10	$ 0.18	$ 18.39	$ 0.36	$ -	$ 3.19	$ 1.12	$ 0.26
2030	$ 1.57	$ 0.42	$ 0.05	$ 0.21	$ 0.38	$ 64.40	$ 0.53	$ -	$ 4.84	$ 2.47	$ 0.56
2040	$ 3.76	$ 0.78	$ 0.12	$ 0.44	$ 0.82	$ 162.22	$ 1.15	$ -	$ 6.74	$ 5.34	$ 1.20
2050	$ 9.07	$ 1.36	$ 0.25	$ 0.96	$ 1.78	$ 328.68	$ 2.48	$ -	$ 1.91	$ 11.53	$ 2.57

Note: Total Impacts include increased direct compliance costs, as wells as indirect and induced impacts that occur in many sectors.

Direct Impact Summaries – Northwest Quadrant

Direct Economic Impacts Northwest Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Est. Compliance Costs ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.85	$ 0.50	$ -	$ 0.56	$ 0.80	$ 39.36	$ 0.66	$ -	$ 9.14	$ 1.15	$ 0.19
2030	$ 2.01	$ 1.08	$ -	$ 1.17	$ 1.74	$ 137.53	$ 0.99	$ -	$ 13.81	$ 2.53	$ 0.41
2040	$ 4.81	$ 2.00	$ -	$ 2.52	$ 3.75	$ 346.59	$ 2.13	$ -	$ 19.16	$ 5.47	$ 0.89
2050	$ 11.62	$ 3.47	$ -	$ 5.43	$ 8.10	$ 699.78	$ 4.59	$ -	$ 5.43	$ 11.80	$ 1.93
Employment Impacts (Jobs)											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	153	2	-	2	3	69	2	-	162	13	2
2030	361	5	-	5	7	234	3	-	246	28	5
2040	862	9	-	10	15	595	6	-	342	61	10
2050	2,080	16	-	22	32	1,140	12	-	97	132	22
Value Added Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 1.00	$ 0.29	$ -	$ 0.16	$ 0.30	$ 46.28	$ 0.24	$ -	$ 4.53	$ 0.44	$ 0.14
2030	$ 2.38	$ 0.62	$ -	$ 0.32	$ 0.64	$ 162.04	$ 0.36	$ -	$ 6.84	$ 0.97	$ 0.31
2040	$ 5.69	$ 1.15	$ -	$ 0.70	$ 1.39	$ 408.17	$ 0.77	$ -	$ 9.50	$ 2.10	$ 0.66
2050	$ 13.74	$ 2.00	$ -	$ 1.51	$ 3.01	$ 827.01	$ 1.67	$ -	$ 2.69	$ 4.53	$ 1.42

Indirect & Induced Impact Summaries – Northwest Quadrant

Indirect & Induced Economic Impacts Northwest Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.48	$ 0.31	$ -	$ 0.39	$ 0.46	$ 13.34	$ 0.32	$ -	$ 6.07	$ 0.56	$ 0.16
2030	$ 1.15	$ 0.68	$ -	$ 0.81	$ 1.00	$ 46.60	$ 0.48	$ -	$ 9.25	$ 1.24	$ 0.33
2040	$ 2.76	$ 1.26	$ -	$ 1.74	$ 2.16	$ 117.43	$ 1.03	$ -	$ 12.91	$ 2.68	$ 0.71
2050	$ 6.67	$ 2.19	$ -	$ 3.75	$ 4.67	$ 237.10	$ 2.23	$ -	$ 3.66	$ 5.79	$ 1.52
Employment Impacts **(Jobs)**											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	87	1	-	2	2	23	1	-	108	6	2
2030	207	3	-	3	4	79	1	-	165	14	4
2040	495	6	-	7	9	202	3	-	230	30	8
2050	1,195	10	-	15	19	386	6	-	65	65	18
Value Added Impacts **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.57	$ 0.18	$ -	$ 0.11	$ 0.17	$ 15.68	$ 0.12	$ -	$ 3.01	$ 0.22	$ 0.12
2030	$ 1.36	$ 0.39	$ -	$ 0.22	$ 0.37	$ 54.90	$ 0.17	$ -	$ 4.59	$ 0.48	$ 0.25
2040	$ 3.27	$ 0.73	$ -	$ 0.48	$ 0.80	$ 138.30	$ 0.38	$ -	$ 6.40	$ 1.03	$ 0.52
2050	$ 7.89	$ 1.26	$ -	$ 1.05	$ 1.73	$ 280.21	$ 0.81	$ -	$ 1.82	$ 2.22	$ 1.12

Note: Impacts are associated increased compliance costs for each sector, but occur in many secondary sectors.

Total Impact Summaries – Northwest Quadrant

Total Economic Impacts Northwest Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 1.33	$ 0.81	$ -	$ 0.95	$ 1.27	$ 52.70	$ 0.99	$ -	$ 15.21	$ 1.71	$ 0.35
2030	$ 3.16	$ 1.76	$ -	$ 1.97	$ 2.74	$ 184.12	$ 1.47	$ -	$ 23.06	$ 3.78	$ 0.75
2040	$ 7.58	$ 3.26	$ -	$ 4.25	$ 5.91	$ 464.03	$ 3.16	$ -	$ 32.07	$ 8.15	$ 1.60
2050	$ 18.29	$ 5.65	$ -	$ 9.18	$ 12.77	$ 936.87	$ 6.82	$ -	$ 9.09	$ 17.59	$ 3.45
Employment Impacts (Jobs)											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	240	4	-	4	5	92	3	-	270	19	4
2030	568	8	-	8	11	313	4	-	410	42	9
2040	1,357	15	-	17	24	796	8	-	572	91	19
2050	3,275	25	-	37	51	1,526	19	-	162	196	40
Value Added Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 1.57	$ 0.46	$ -	$ 0.27	$ 0.47	$ 61.97	$ 0.36	$ -	$ 7.53	$ 0.66	$ 0.26
2030	$ 3.74	$ 1.01	$ -	$ 0.55	$ 1.02	$ 216.94	$ 0.53	$ -	$ 11.43	$ 1.45	$ 0.55
2040	$ 8.96	$ 1.88	$ -	$ 1.19	$ 2.19	$ 546.47	$ 1.15	$ -	$ 15.90	$ 3.13	$ 1.18
2050	$ 21.63	$ 3.25	$ -	$ 2.56	$ 4.74	$ 1,107.22	$ 2.48	$ -	$ 4.51	$ 6.75	$ 2.54

Note: Total Impacts include increased direct compliance costs, as wells as indirect and induced impacts that occur in many sectors.

Direct Impact Summaries – Southeast Quadrant

Direct Economic Impacts Southeast Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Est. Compliance Costs ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 2.79	$ 1.65	$ 60.97	$ 12.76	$ 18.19	$ 68.40	$ 1.15	$ -	$ 29.42	$ 1.06	$ 0.42
2030	$ 6.62	$ 3.58	$ 128.61	$ 26.37	$ 39.26	$ 238.99	$ 1.71	$ -	$ 44.45	$ 2.35	$ 0.91
2040	$ 15.84	$ 6.62	$ 277.70	$ 56.92	$ 84.82	$ 602.31	$ 3.69	$ -	$ 61.69	$ 5.07	$ 1.96
2050	$ 38.22	$ 11.49	$ 599.55	$ 122.90	$ 183.24	$ 1,216.07	$ 7.97	$ -	$ 17.48	$ 10.95	$ 4.23
Employment Impacts (Jobs)											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	503	7	9	51	72	120	3	-	522	12	5
2030	1,188	16	18	105	156	406	5	-	791	26	11
2040	2,836	30	39	227	338	1,034	10	-	1,100	57	23
2050	6,842	52	85	490	729	1,981	22	-	312	122	49
Value Added Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 3.29	$ 0.95	$ 6.71	$ 3.56	$ 6.76	$ 80.43	$ 0.42	$ -	$ 14.57	$ 0.41	$ 0.31
2030	$ 7.82	$ 2.06	$ 14.16	$ 7.35	$ 14.58	$ 281.59	$ 0.62	$ -	$ 22.03	$ 0.90	$ 0.67
2040	$ 18.72	$ 3.81	$ 30.57	$ 15.86	$ 31.49	$ 709.32	$ 1.34	$ -	$ 30.59	$ 1.95	$ 1.44
2050	$ 45.19	$ 6.61	$ 66.00	$ 34.25	$ 68.04	$ 1,437.18	$ 2.89	$ -	$ 8.67	$ 4.20	$ 3.11

Indirect & Induced Impact Summaries – Southeast Quadrant

Indirect & Induced Economic Impacts Southeast Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 1.59	$ 1.03	$ 21.94	$ 8.81	$ 10.49	$ 23.18	$ 0.56	$ -	$ 19.56	$ 0.52	$ 0.35
2030	$ 3.79	$ 2.26	$ 46.28	$ 18.22	$ 22.64	$ 80.97	$ 0.83	$ -	$ 29.79	$ 1.15	$ 0.73
2040	$ 9.09	$ 4.18	$ 99.92	$ 39.33	$ 48.90	$ 204.07	$ 1.80	$ -	$ 41.55	$ 2.49	$ 1.56
2050	$ 21.95	$ 7.24	$ 215.73	$ 84.91	$ 105.65	$ 412.03	$ 3.88	$ -	$ 11.79	$ 5.37	$ 3.35
Employment Impacts **(Jobs)**											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	287	5	3	35	42	41	1	-	347	6	4
2030	680	10	6	73	90	138	2	-	530	13	8
2040	1,629	19	14	157	195	350	5	-	741	28	18
2050	3,930	32	31	338	420	671	11	-	210	60	38
Value Added Impacts **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 1.88	$ 0.59	$ 2.41	$ 2.46	$ 3.89	$ 27.25	$ 0.20	$ -	$ 9.69	$ 0.20	$ 0.26
2030	$ 4.48	$ 1.30	$ 5.09	$ 5.08	$ 8.41	$ 95.41	$ 0.30	$ -	$ 14.76	$ 0.44	$ 0.54
2040	$ 10.75	$ 2.41	$ 11.00	$ 10.96	$ 18.16	$ 240.33	$ 0.65	$ -	$ 20.61	$ 0.95	$ 1.15
2050	$ 25.96	$ 4.17	$ 23.75	$ 23.67	$ 39.23	$ 486.94	$ 1.41	$ -	$ 5.85	$ 2.06	$ 2.46

Note: Impacts are associated increased compliance costs for each sector, but occur in many secondary sectors.

Total Impact Summaries – Southeast Quadrant

Total Economic Impacts Southeast Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 4.38	$ 2.68	$ 82.90	$ 21.57	$ 28.68	$ 91.58	$ 1.71	$ -	$ 48.97	$ 1.59	$ 0.77
2030	$ 10.41	$ 5.84	$ 174.89	$ 44.58	$ 61.90	$ 319.97	$ 2.55	$ -	$ 74.24	$ 3.50	$ 1.64
2040	$ 24.93	$ 10.80	$ 377.62	$ 96.25	$ 133.72	$ 806.39	$ 5.49	$ -	$ 103.25	$ 7.56	$ 3.51
2050	$ 60.17	$ 18.73	$ 815.28	$ 207.81	$ 288.89	$ 1,628.10	$ 11.85	$ -	$ 29.27	$ 16.32	$ 7.57
Employment Impacts (Jobs)											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	789	12	12	86	114	160	5	-	869	18	9
2030	1,869	26	25	178	246	544	7	-	1,321	39	19
2040	4,465	49	54	383	532	1,384	15	-	1,841	84	41
2050	10,772	84	115	828	1,150	2,652	32	-	522	182	87
Value Added Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 5.17	$ 1.54	$ 9.13	$ 6.01	$ 10.65	$ 107.69	$ 0.62	$ -	$ 24.26	$ 0.61	$ 0.57
2030	$ 12.30	$ 3.36	$ 19.25	$ 12.43	$ 22.98	$ 376.99	$ 0.93	$ -	$ 36.80	$ 1.34	$ 1.21
2040	$ 29.47	$ 6.22	$ 41.57	$ 26.83	$ 49.65	$ 949.65	$ 1.99	$ -	$ 51.20	$ 2.90	$ 2.59
2050	$ 71.15	$ 10.78	$ 89.74	$ 57.92	$ 107.27	$ 1,924.13	$ 4.30	$ -	$ 14.52	$ 6.26	$ 5.57

Note: Total Impacts include increased direct compliance costs, as wells as indirect and induced impacts that occur in many sectors.

Direct Impact Summaries – Southwest Quadrant

Direct Economic Impacts Southwest Quad.		Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Est. Compliance Costs	**($ Millions)**											
	2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	2020	$ 1.00	$ 0.59	$ 5.90	$ 2.34	$ 3.33	$ 24.76	$ 0.81	$ -	$ 10.67	$ 1.81	$ 0.26
	2030	$ 2.36	$ 1.27	$ 12.45	$ 4.83	$ 7.19	$ 86.52	$ 1.20	$ -	$ 16.13	$ 3.99	$ 0.56
	2040	$ 5.65	$ 2.35	$ 26.89	$ 10.42	$ 15.52	$ 218.04	$ 2.59	$ -	$ 22.39	$ 8.62	$ 1.21
	2050	$ 13.65	$ 4.08	$ 58.05	$ 22.49	$ 33.54	$ 440.22	$ 5.59	$ -	$ 6.34	$ 18.62	$ 2.62
Employment Impacts	**(Jobs)**											
	2011	-	-	-	-	-	-	-	-	-	-	-
	2020	179	3	1	9	13	43	2	-	189	20	3
	2030	424	6	2	19	29	147	3	-	287	45	7
	2040	1,013	11	4	42	62	374	7	-	399	96	14
	2050	2,443	18	8	90	134	717	15	-	113	208	30
Value Added Impacts	**($ Millions)**											
	2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	2020	$ 1.18	$ 0.34	$ 0.65	$ 0.65	$ 1.24	$ 29.12	$ 0.29	$ -	$ 5.29	$ 0.69	$ 0.19
	2030	$ 2.79	$ 0.73	$ 1.37	$ 1.35	$ 2.67	$ 101.93	$ 0.44	$ -	$ 8.00	$ 1.53	$ 0.42
	2040	$ 6.69	$ 1.36	$ 2.96	$ 2.90	$ 5.76	$ 256.78	$ 0.94	$ -	$ 11.10	$ 3.31	$ 0.89
	2050	$ 16.14	$ 2.35	$ 6.39	$ 6.27	$ 12.45	$ 520.26	$ 2.03	$ -	$ 3.15	$ 7.14	$ 1.93

Indirect & Induced Impact Summaries – Southwest Quadrant

Indirect & Induced Economic Impacts Southwest Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.57	$ 0.37	$ 2.12	$ 1.61	$ 1.92	$ 8.39	$ 0.39	$ -	$ 7.10	$ 0.89	$ 0.21
2030	$ 1.35	$ 0.80	$ 4.48	$ 3.33	$ 4.14	$ 29.31	$ 0.58	$ -	$ 10.81	$ 1.96	$ 0.45
2040	$ 3.25	$ 1.48	$ 9.68	$ 7.20	$ 8.95	$ 73.88	$ 1.26	$ -	$ 15.08	$ 4.23	$ 0.96
2050	$ 7.84	$ 2.57	$ 20.89	$ 15.54	$ 19.34	$ 149.16	$ 2.72	$ -	$ 4.28	$ 9.13	$ 2.07
Employment Impacts (Jobs)											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	102	2	-	6	8	15	1	-	126	10	3
2030	243	4	1	13	16	50	2	-	192	22	5
2040	582	7	1	29	36	127	3	-	269	47	11
2050	1,403	12	3	62	77	243	7	-	76	102	24
Value Added Impacts ($ Millions)											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 0.67	$ 0.21	$ 0.23	$ 0.45	$ 0.71	$ 9.87	$ 0.14	$ -	$ 3.52	$ 0.34	$ 0.16
2030	$ 1.60	$ 0.46	$ 0.49	$ 0.93	$ 1.54	$ 34.54	$ 0.21	$ -	$ 5.36	$ 0.75	$ 0.34
2040	$ 3.84	$ 0.85	$ 1.07	$ 2.01	$ 3.32	$ 87.00	$ 0.46	$ -	$ 7.48	$ 1.62	$ 0.71
2050	$ 9.27	$ 1.48	$ 2.30	$ 4.33	$ 7.18	$ 176.28	$ 0.99	$ -	$ 2.12	$ 3.50	$ 1.52

Note: Impacts are associated increased compliance costs for each sector, but occur in many secondary sectors.

Total Impact Summaries – Southwest Quadrant

Total Economic Impacts Southwest Quad.	Res. HH.	Comm. Est.	Refining	Petrochem.	Other Ind. & Intn't Bunker Fuels	Electric Power	NG & Oil	Coal	Transport.	Ag soils, etc.	Solid waste and waste-water
Output Impacts **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 1.56	$ 0.95	$ 8.03	$ 3.95	$ 5.25	$ 33.15	$ 1.20	$ -	$ 17.77	$ 2.70	$ 0.47
2030	$ 3.72	$ 2.07	$ 16.93	$ 8.16	$ 11.33	$ 115.83	$ 1.79	$ -	$ 26.94	$ 5.95	$ 1.01
2040	$ 8.90	$ 3.84	$ 36.56	$ 17.62	$ 24.48	$ 291.91	$ 3.85	$ -	$ 37.47	$ 12.85	$ 2.18
2050	$ 21.49	$ 6.65	$ 78.94	$ 38.04	$ 52.88	$ 589.38	$ 8.31	$ -	$ 10.62	$ 27.75	$ 4.69
Employment Impacts **(Jobs)**											
2011	-	-	-	-	-	-	-	-	-	-	-
2020	282	4	1	16	21	58	3	-	315	30	6
2030	667	9	2	33	45	197	5	-	479	67	12
2040	1,594	17	5	70	97	501	10	-	668	143	25
2050	3,847	30	11	152	210	960	23	-	190	310	54
Value Added Impacts **($ Millions)**											
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 1.85	$ 0.55	$ 0.88	$ 1.10	$ 1.95	$ 38.98	$ 0.44	$ -	$ 8.80	$ 1.03	$ 0.36
2030	$ 4.39	$ 1.19	$ 1.86	$ 2.27	$ 4.21	$ 136.47	$ 0.65	$ -	$ 13.35	$ 2.28	$ 0.75
2040	$ 10.52	$ 2.21	$ 4.02	$ 4.91	$ 9.09	$ 343.78	$ 1.40	$ -	$ 18.58	$ 4.93	$ 1.60
2050	$ 25.41	$ 3.83	$ 8.69	$ 10.60	$ 19.63	$ 696.54	$ 3.02	$ -	$ 5.27	$ 10.65	$ 3.45

Note: Total Impacts include increased direct compliance costs, as wells as indirect and induced impacts that occur in many sectors.

Scenario Analysis

Comparison of Analyses

Cumulative Economic Output Impact ($ Million)	Assumed Reduction by 2020	Assumed Reduction by 2030	Assumed Carbon Allowance Prices 2020	Assumed Carbon Allowance Prices 2030	2020	2030
Center for Energy Studies						
Analysis (Louisiana)	82%	61%	$ 47.98	$ 103.58	$ 3,021	$ 12,067
American Council for Capital Formation (ACCF)						
Dr. Margo Thorning, Ph.D						
High Case (Louisiana)	86%	60%	$ 61.00	$ 159.00	$ 830	$ 6,943
Low Case (Louisiana)	86%	60%	$ 48.00	$ 123.00	$ 483	$ 5,089
Heritage Foundation (Louisiana)	*86%	*60%				$ 4,945

Notes: * Heritage Foundation analysis used Waxman-Markey mandated reduction factors (estimated by ACCF)

Two other studies have estimated economic impacts to Louisiana due to potential greenhouse gas regulation. The two major inputs common to all models are the assumed reduction of greenhouse gases ("GHGs") and the marginal price of GHG mitigation (assumed carbon allowance prices). Comparing the results from these other studies to the results found here, shows that the results of this study are roughly double the estimate of the Heritage Foundation, and the "low case" of the ACCF model.

While the results of this study are larger, it is likely the result of the use of more Louisiana-specific assumptions, data, and information. These differences in study results, however, are very small when examining on a percent of GSP.

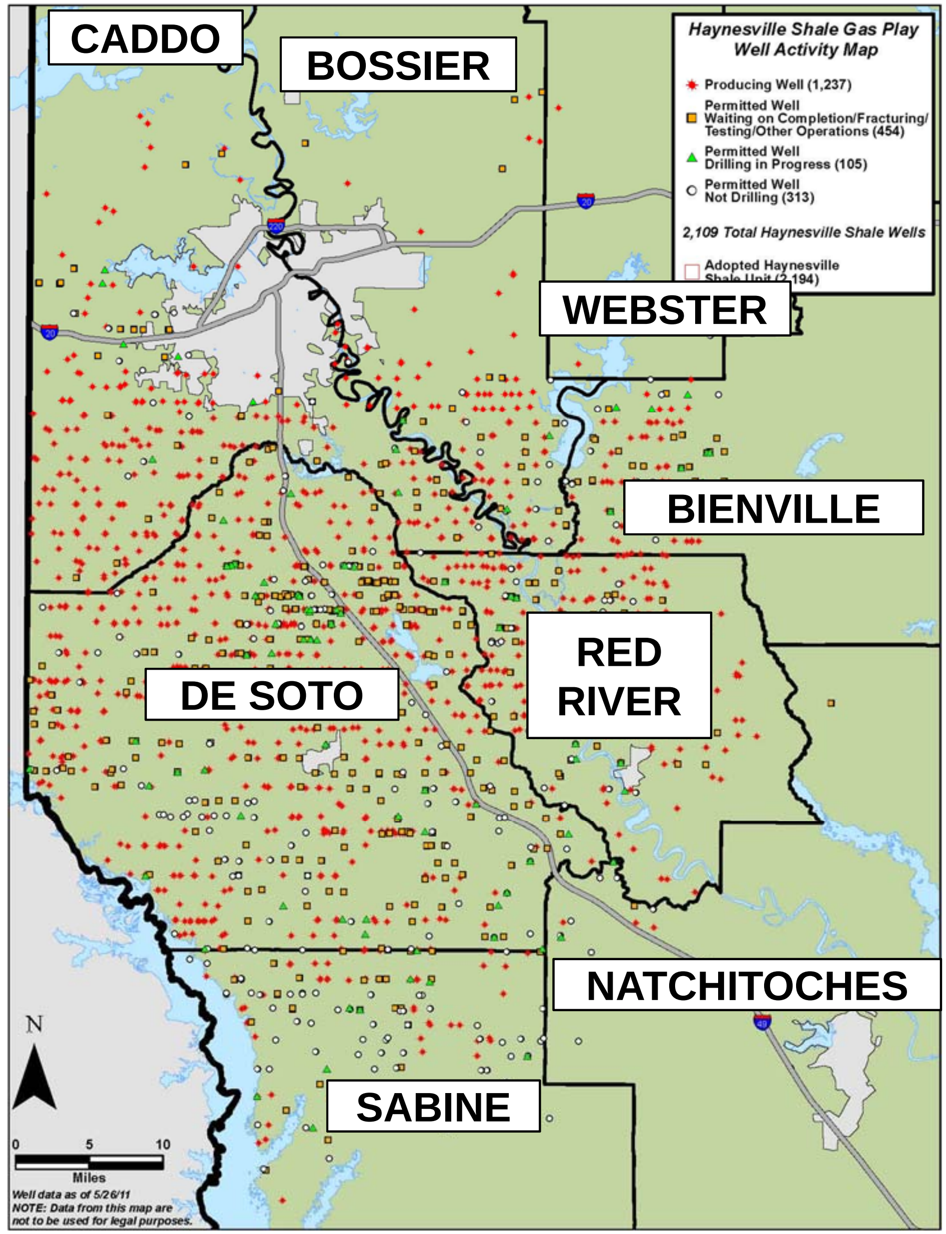
Haynesville Shale

Since cap and trade relies heavily on baseline emissions, it is important to analyze the way that increasing development of the Haynesville Shale in Northwest Louisiana may fare under GHG regulation.

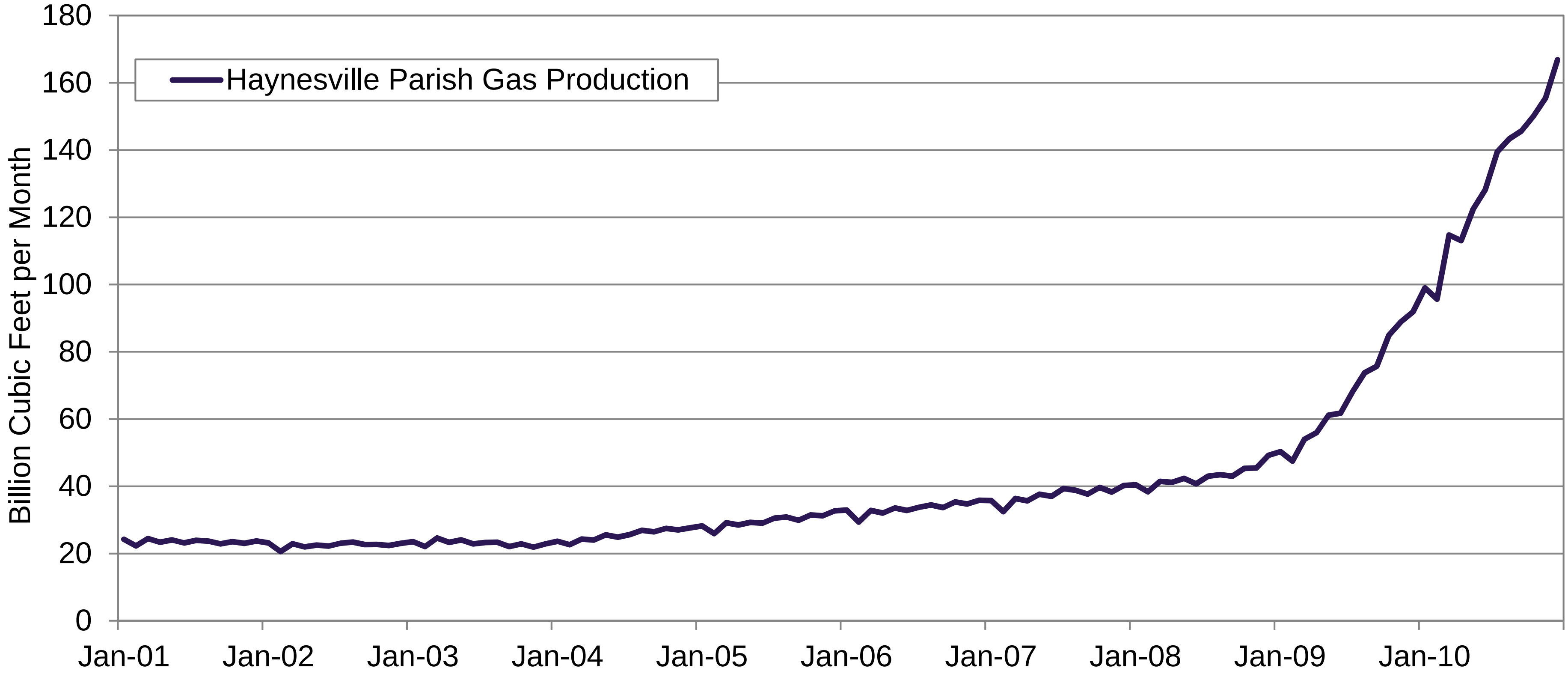
Since the Haynesville Shale development is new development in a previously considered mature field, increases in emissions from drilling, well completion, and production will not be significantly offset from declines in existing oil and natural gas production.

If a baseline is set for the Haynesville Shale without taking into account its dramatic growth potential, producers will be required to install expensive mitigation equipment or purchase a significant amount of allowances on the open market.

Assuming that natural gas producers around the country are treated the same, the competitiveness of Louisiana natural gas may not suffer relative to other shale plays nationwide. All U.S. produced natural gas, however, would likely be disadvantaged relative to foreign imports in the form of liquefied natural gas (assuming no GHG regulation in the source country for the natural gas).

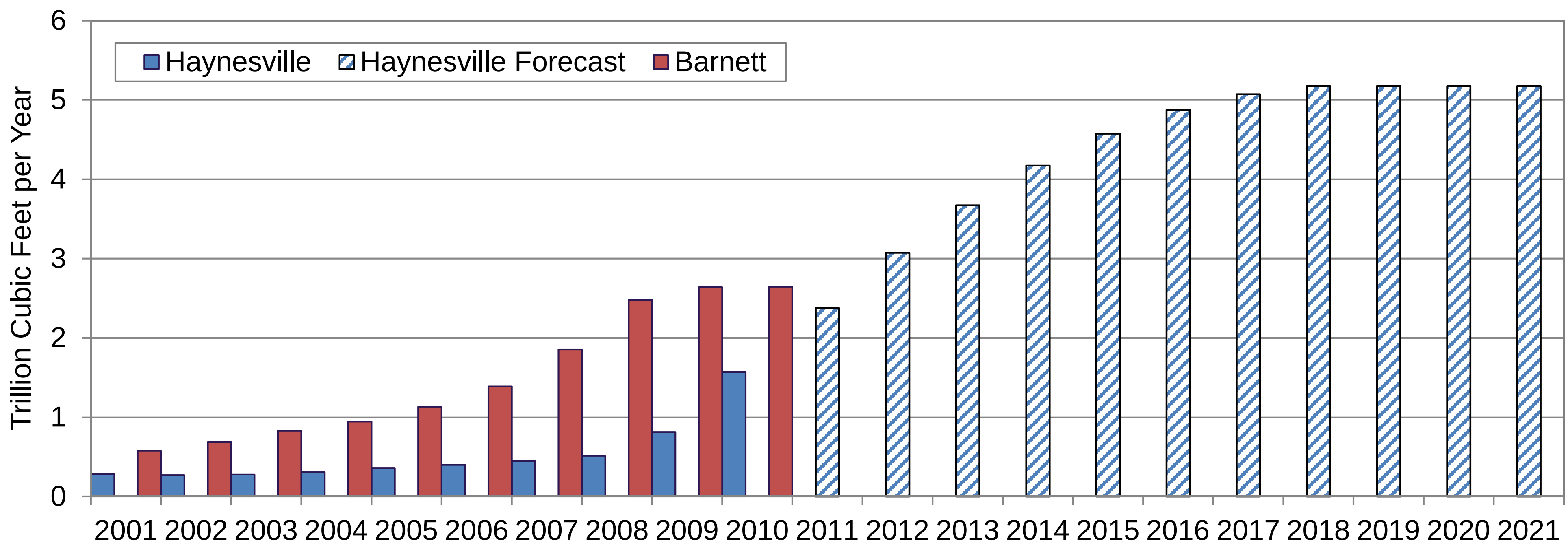


Haynesville Shale Production and Forecast



Natural gas production from the parishes associated with the Haynesville shale held relatively stable at about 20 Bcf/month until about January 2005 when it slowly because to increase to levels encroaching 40 Bcf/m. In January 2009, production from the region grew exponentially. The long run production outlook for the play is difficult to model given a number of difficult to forecast geological, engineering, and economic factors. Therefore, a series of three scenarios were developed to examine a possible range of impacts.

Scenario 1 - Haynesville Shale Production and Forecast



The first scenario of development is based on a comparison to the Barnett Shale play in Northeast Texas. The Barnett shale has a history of development that pre-dates Haynesville and may serve as a useful future development guide.

Estimates by the U.S. Potential Gas Committee place Gulf Coast natural gas resources at 506 trillion cubic feet ("tcf"). The Gulf Coast region as defined by the Committee includes the Barnett, Haynesville, Eagle Ford and Tuscaloosa shale plays. Current estimates place technically recoverable resources of the Haynesville Shale at 251 tcf. The following scenario assumes that the rate of extraction shown in 2021 (5.07 tcf extracted per year) continues through 2050. In this case 203 tcf is ultimately recovered from Haynesville.

Source: Actual figures: Louisiana Department of Natural Resources, *SONRIS*.

Scenario 1 - Impacts

In the original model, natural gas and oil production and emissions associated with that activity were based on historical production figures. Due to the quick pace of development in the Haynesville Shale, these historical figures may not paint an accurate picture of what could happen with the play.

Total impacts associated with the Scenario 1 model increase the annual impacts for the Northwest quadrant from about $108 million dollars per year through 2020 to $550 million dollars per year. By 2030 impacts increase in the scenario to about $1.2 billion annually, compared to about $264 million annually in the original model.

Annual cost as a percentage of forecasted northwest gross product increases to 1.37 percent compared to 0.27 percent in the original model by 2020. Later, by 2030, this statistic reaches 2.70 percent for Scenario 1, compared to 0.58 percent in the original model.

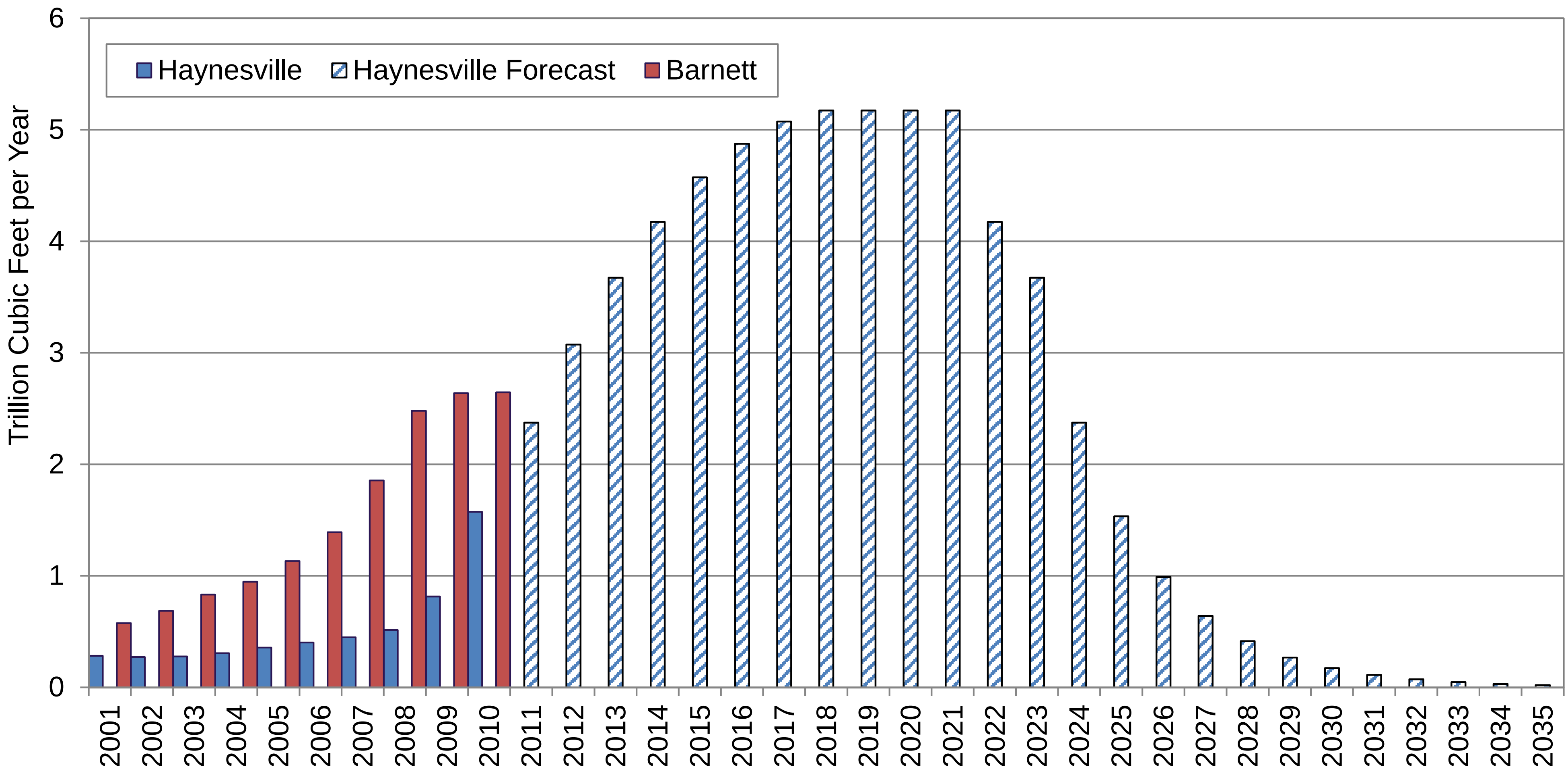
It is important to note that gross product by quadrant is forecasted using assumptions that do not include significant Haynesville Shale development. GSP for that region would certainly grow with development of the play. The result would likely be much lower mitigation impacts per unit of quadrant gross product.

Estimated Total Impacts by Quadrant
(2010 $ Millions)

Year	Northeast	Northwest	Southeast	Southwest	State
Annual Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 29.04	$ 550.92	$ 225.58	$ 80.60	$ 886.14
2030	$ 85.76	$ 1,219.39	$ 615.05	$ 211.24	$ 2,131.44
2040	$ 176.04	$ 2,782.81	$ 1,343.05	$ 443.77	$ 4,745.67
2050	$ 429.17	$ 4,225.95	$ 3,000.23	$ 788.98	$ 8,444.33
Cumulative Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 157.86	$ 2,966.86	$ 1,337.28	$ 459.14	$ 4,921.15
2030	$ 716.08	$ 11,572.38	$ 5,441.80	$ 1,852.37	$ 19,582.62
2040	$ 2,116.26	$ 31,408.98	$ 15,536.57	$ 5,307.90	$ 54,369.71
2050	$ 5,180.83	$ 70,767.39	$ 37,860.46	$ 11,696.24	$ 125,504.93
Annual Cost as a Percentage of Forecasted Quadrant Gross Product					
2011	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.21%	1.37%	0.16%	0.17%	0.37%
2030	0.56%	2.70%	0.40%	0.40%	0.80%
2040	1.02%	5.46%	0.77%	0.74%	1.57%
2050	2.21%	7.36%	1.53%	1.17%	2.48%

Haynesville Shale Wells Drilled and Forecast – Scenario 2

Scenario 2 assumes a much quicker increase and decline of Haynesville production with total recovery around 68 Tcf through the year 2050.



Source: Actual figures: Louisiana Department of Natural Resources, *SONRIS*.

Scenario 2 - Impacts

Total economic impacts associated with the Scenario 2 model decrease the annual negative economic impacts for the Northwest quadrant from about $108 million dollars per year through 2020 to $65 million dollars per year. By 2030 impacts decrease in the scenario to about $104 billion annually, compared to about $264 million annually in the original model.

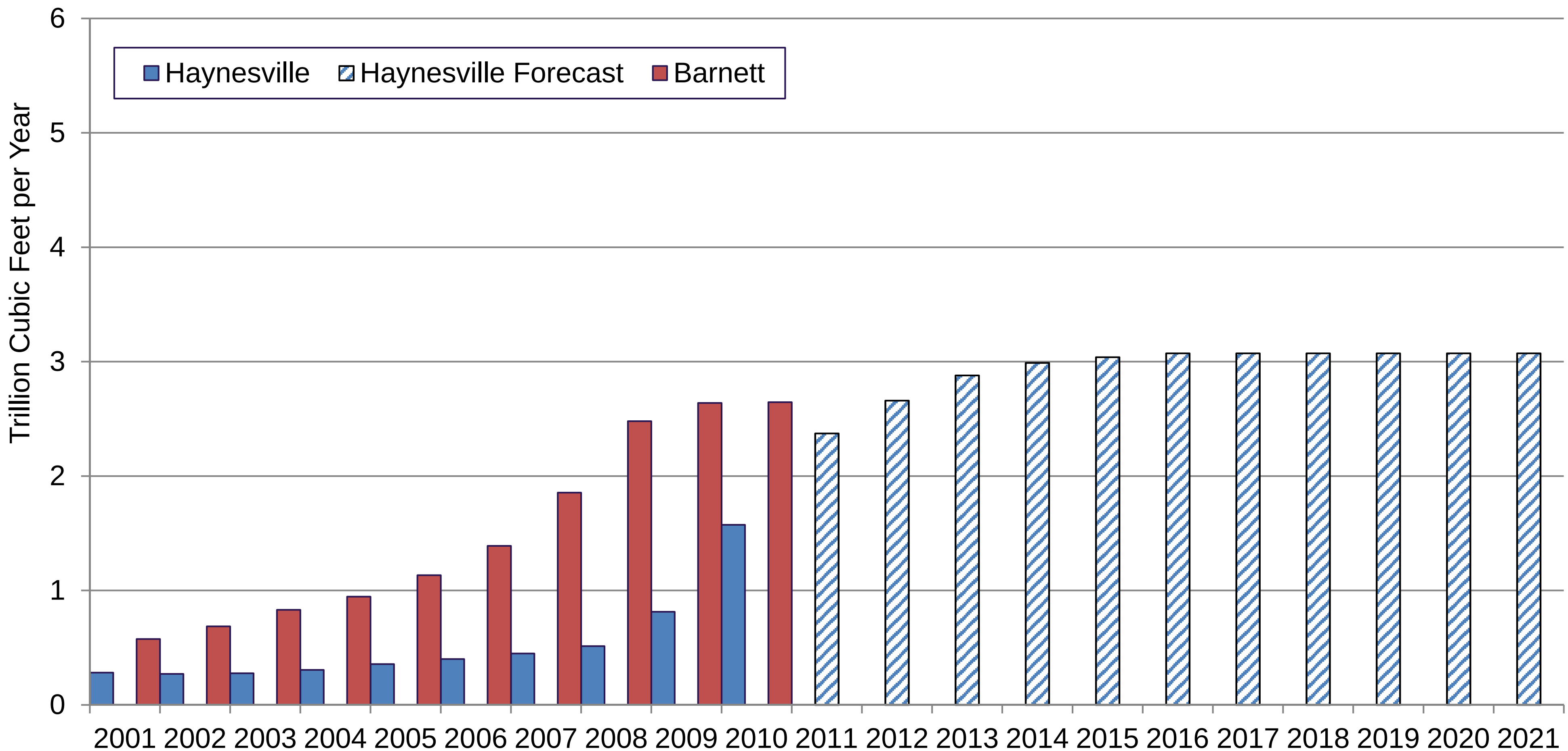
Annual cost as a percentage of forecasted northwest gross product decreases to 0.16 percent compared to 0.27 percent in the original model by 2020. Later, by 2030, this statistic reaches 0.23 percent for Scenario 1, compared to 0.58 percent in the original model.

Estimated Total Impacts by Quadrant
(2010 $ Millions)

Year	Northeast	Northwest	Southeast	Southwest	State
Annual Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 29.05	$ 550.92	$ 225.61	$ 80.60	$ 1,076.43
2030	$ 85.67	$ 67.73	$ 614.88	$ 211.24	$ 979.41
2040	$ 176.09	$ 5.26	$ 1,343.13	$ 443.77	$ 2,145.07
2050	$ 429.27	$ (291.23)	$ 3,000.43	$ 788.98	$ 3,927.58
Cumulative Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 157.86	$ 2,966.86	$ 1,337.28	$ 459.14	$ 5,812.17
2030	$ 716.08	$ 3,450.05	$ 5,441.80	$ 1,852.37	$ 15,320.24
2040	$ 2,116.26	$ 3,762.40	$ 15,536.57	$ 5,307.90	$ 30,583.46
2050	$ 5,180.83	$ 2,029.55	$ 37,860.46	$ 11,696.24	$ 60,880.88
Annual Cost as a Percentage of Forecasted Quadrant Gross Product					
2011	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.21%	1.37%	0.17%	0.17%	0.45%
2030	0.56%	0.44%	0.40%	0.40%	0.37%
2040	1.02%	0.03%	0.77%	0.74%	0.71%
2050	2.21%	-1.49%	1.53%	1.17%	1.16%

Haynesville Shale Production and Forecast – Scenario 3

Scenario 3 assumes that Haynesville does not peak quickly and maintains production through 2050 at levels only slightly higher than current Barnett Shale levels.



Source: Actual figures: Louisiana Department of Natural Resources, *SONRIS*.

Scenario 3 - Impacts

Total impacts associated with the Scenario 3 model increase the annual impacts for the Northwest quadrant from about $108 million dollars per year through 2020 to $373 million dollars per year. By 2030 impacts increase in the scenario to about $830 million annually, compared to about $264 million annually in the original model.

Annual cost as a percentage of forecasted northwest gross product increases to 0.93 percent compared to 0.27 percent in the original model by 2020. Later, by 2030, this statistic reaches 1.85 percent for Scenario 3, compared to 0.58 percent in the original model.

It is important to note that gross product by quadrant is forecasted using assumptions that do not include significant Haynesville Shale development. Such a forecast would be speculation at best. The point being that gross product of the northwest quadrant would certainly grow with development of the play. The result would likely be much lower mitigation impacts per unit of quadrant gross product.

Estimated Total Impacts by Quadrant
(2010 $ Millions)

Year	Northeast	Northwest	Southeast	Southwest	State
Annual Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 29.04	$ 373.99	$ 225.58	$ 80.60	$ 709.21
2030	$ 85.76	$ 837.43	$ 615.05	$ 211.24	$ 1,749.48
2040	$ 176.04	$ 1,958.18	$ 1,343.05	$ 443.77	$ 3,921.04
2050	$ 429.17	$ 2,973.50	$ 3,000.23	$ 788.98	$ 7,191.88
Cumulative Cost					
2011	$ -	$ -	$ -	$ -	$ -
2020	$ 157.86	$ 1,988.64	$ 1,337.28	$ 459.14	$ 3,942.93
2030	$ 716.08	$ 7,826.11	$ 5,441.80	$ 1,852.37	$ 15,836.36
2040	$ 2,116.26	$ 21,686.70	$ 15,536.57	$ 5,307.90	$ 44,647.43
2050	$ 5,180.83	$ 48,860.15	$ 37,860.46	$ 11,696.24	$ 103,597.68
Annual Cost as a Percentage of Forecasted Quadrant Gross Product					
2011	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.21%	0.93%	0.16%	0.17%	0.30%
2030	0.56%	1.85%	0.40%	0.40%	0.65%
2040	1.02%	3.84%	0.77%	0.74%	1.30%
2050	2.21%	5.18%	1.53%	1.17%	2.12%

Estimated Compliance Costs for Louisiana Industries

Compliance costs vary between industries based on factors such as energy intensity, chemical processes, combustion, and fuel and feedstock types. Sensitivity in these industries was conducting examining changes in "typical facilities" costs for: steel milling; pulp and paper milling; petrochemical processing; and the refining of petroleum products.

Actual plant-level data was used to model the average Louisiana petrochemical and refining facilities. Steel and pulp and paper milling facility-level models were created by extrapolation from regional data.

Typical facility for steel milling was based upon electric arc furnace ("EAF") configured as a "mini-mill" that recycles existing steel. Minimills accounted for 10 percent of the national steel production in 1970, increasing to about 60 percent in 2007. Minimills apply graphite electrodes directly to scrap steel and pass an electric current through the material to melt it. CO_2 emissions are generated by oxidation as the graphite electrodes are used. Emissions are also expelled from the scrap metal itself. EAF mills also generate emissions through combustion in boilers, process heaters, soaking pits, reheat furnaces, and other industrial processes. The assumed facility produces about 1 million short tons of recycled steel per year, it is an average facility for the southeast U.S. region. It has reached about 75 percent of its cumulative capacity.

The pulp and paper scenario is modeled using regional feedstock characteristics. Various feedstocks, including black liquor, and woody biomass were calculated to create a model of the average pulp and paper mill. No_x, CH_4, and CO_2 emissions, all in CO_2 equivalent were paired up with the various assumed feedstock types and levels for a typical facility.

Source: U.S. EPA, "Technical Support Document for the Iron and Steel Sector: Proposed Rule for Mandatory Reporting of Greenhouse Gases," Office of Air and Radiation. August 28, 2009.

International Energy Agency, "Iron and Steel," Energy Technology System Analysis Program. November 2009.

Estimated Compliance Costs for Louisiana Industries

Estimated Compliance Costs
Louisiana Industries
Annually per the Average Facility
($ 2010 million)

Year	Steel Mill	Pulp and Paper Mill	Petrochemical Facility	Refinery Facility
2011	$ -	$ -	$ -	$ -
2015	$ 1.42	$ 1.85	$ 5.03	$ 23.23
2020	$ 4.68	$ 6.10	$ 16.62	$ 76.80
2025	$ 10.70	$ 13.95	$ 37.99	$ 175.54
2030	$ 21.34	$ 27.81	$ 75.76	$ 350.05

ECCs are illustrative when broken down to the facility level. The ECCs remain low in the initial years for most typical facilities, but grow significant in the out years. In 2015 ECCs for an average electric arc furnace steel mill in the southeast region are estimated to be about $1.42 million annually. By 2020, these costs are expected to grow to about $6 million per year for a typical facility. ECCs for a typical pulp and paper mill are similar to those of an average steel mill. Petrochemical facilities and refineries are estimated to have higher ECCs, with $5.03 million and $23.23 million expected by 2015, respectively. By 2020, ECCs for petrochemical facilities and refineries are expected to increase to about $16 million and $76 million, respectively.

Conclusions and Policy Options

Louisiana Options for Addressing GHG Regulations

There are a number of policy options that are available to Louisiana that may position the state to address any future federal GHG regulations. These policy options include but are not limited to:

(1) Environmental and energy education.

(2) Regional accords and agreements.

(3) Alternative/renewable energy.

(4) Energy efficiency

(5) Carbon capture and storage development

(6) Offset development.

Energy and Environmental Education Policies

GHG emissions arise primarily from the combustion process associated with the use of fossil fuels. Energy education can be one policy mechanism that can be used to teach customers about the potential carbon emission impacts associated with their energy consumption decisions.

The educational process can be broad, and can include providing information and resources for households, business and industries regarding energy efficiency, providing workforce training, and support for research and development.

To date, there are a number of Louisiana programs in place that perform many of these energy and environmental educational functions.

Louisiana Energy and Environmental Education Programs

Louisiana energy education programs include but are not limited to:

Louisiana Home and Landscape Resource Center ("LaHouse"): a research-based showcase of solutions and educational outreach for residential and commercial energy efficiency, renewable and clean energy building and construction technologies and best practices. The program is run by the LSU AgCenter.

EnvironMentors: a national-based college access initiative that prepares high school students from under-represented backgrounds for college degree programs in energy, environmental and science educational disciplines. The program is run through the LSU School of the Coast and Environment.

Baton Rouge Clean Air Coalition: a coalition of local governments, businesses, educational institutions, civic, and environmental organizations committed to improving air quality in the Baton Rouge area.

National Energy Education Development project ("NEED"): promotes an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs. Existing Louisiana-based programs have been sponsored in Lake Charles and New Orleans.

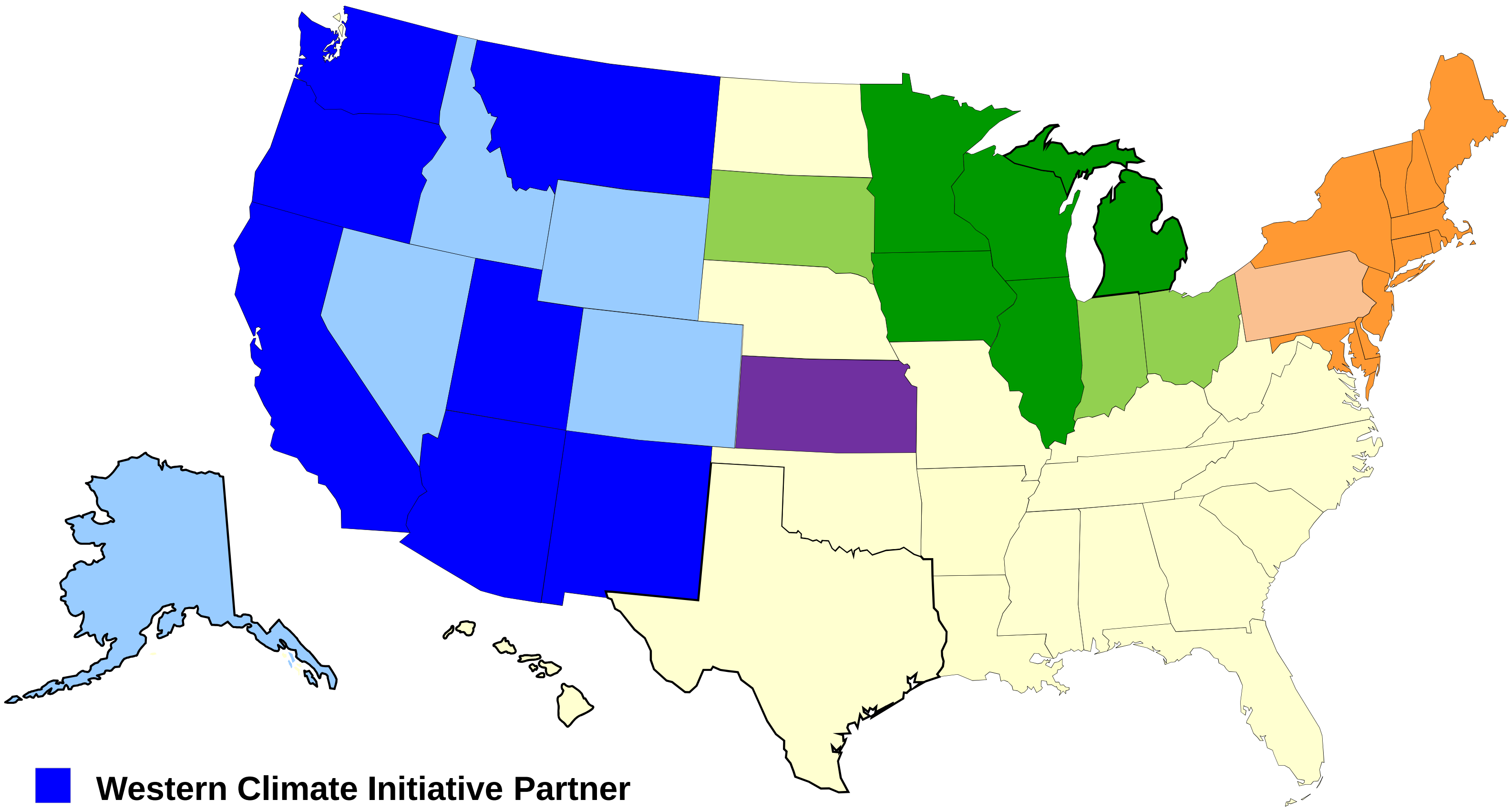
Regional Energy and Environmental Air Emissions Actions

Air emissions regulation can be complicated by the concern that potential pollutants are not always restricted to one state alone. As a result, several states have attempted to address carbon emission concerns through regional agreements, accords, or other actions.

Most of these regional actions have arisen in the northeastern, mid-western, and western regions of the U.S. States vary in their participation of these programs from being very active members to simply observers. Most, however, are based upon cap-and-trade models that are similar to past mechanism proposed at the federal level.

To date, Louisiana, nor any other state in the southeastern U.S., has opted to move forward with any regional accord. Developing an in-state, Louisiana-only, cap and trade market alone would likely not be productive since it would lack the scale and liquidity needed to facilitate effective trading between market participants.

Regional Energy and Environmental Agreements



- Western Climate Initiative Partner
- Western Climate Initiative Observer
- Midwest GHG Reduction Accord Member
- Midwest GHG Reduction Accord Observer
- Midwest GHG Reduction Accord Member & WCI Observer
- Regional GHG Initiative Participant
- Regional GHG Initiative Observer

Renewable and Alternative Energy Development Policies

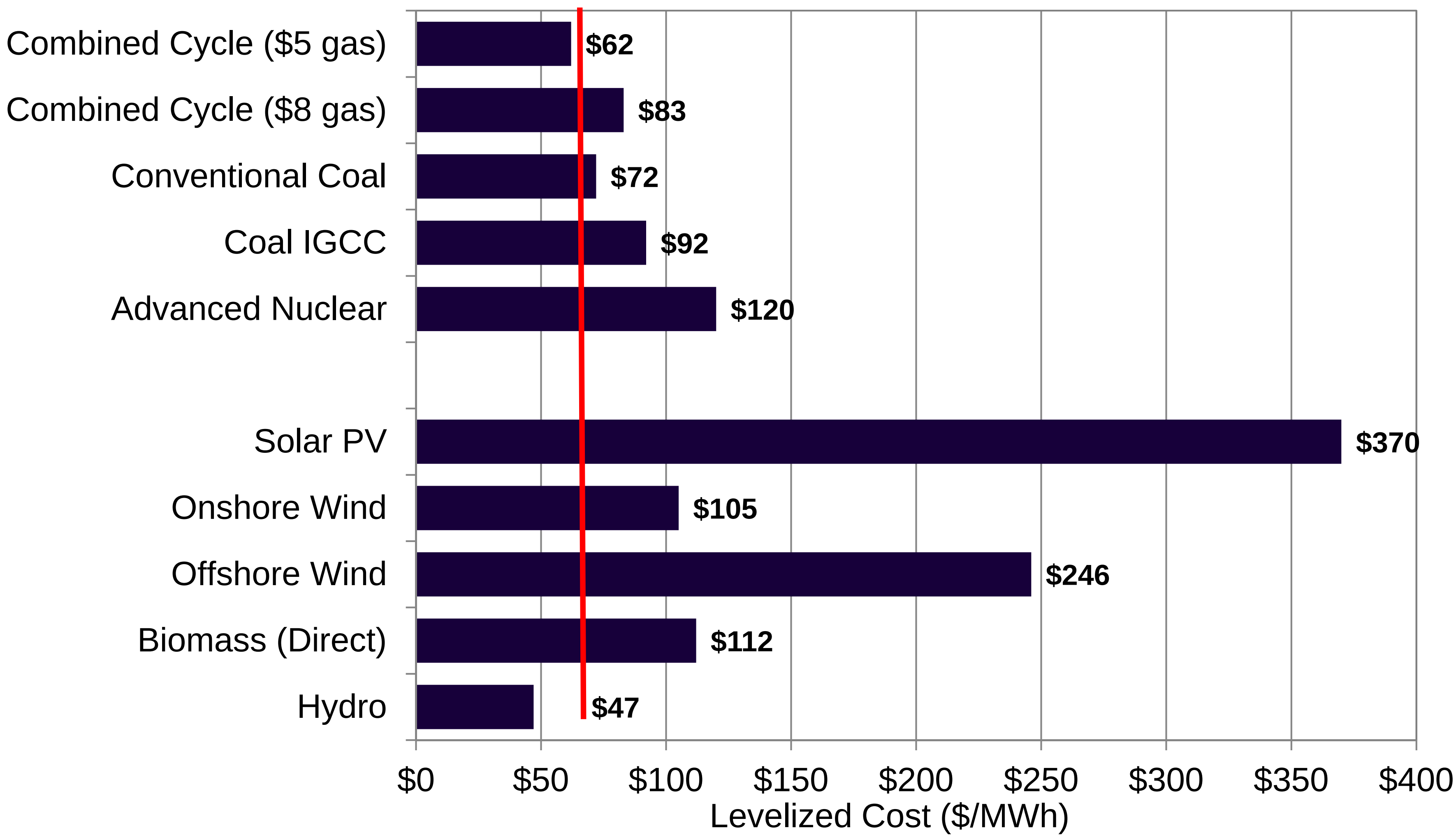
Investments in alternative and renewable energy are often cited as a means of mitigating carbon emissions from traditional fossil fuel fired power generation. These renewable and alternative resources can include wind (onshore, offshore), solar, geothermal, biomass, wave, hydrokinetic and other sources of energy and waste heat.

One of the considerable policy challenges associated with developing renewable energy rests with creating financial support mechanisms that can compensate renewable projects for the share of their investments that are above current market costs.

Rebates, tax credits, loans and other mechanisms are common financial support mechanisms used to support the high cost of renewable energy. A renewable portfolio standard (or "RPS"), however, is the most common policy tool used by states to provide financial support for renewables.

Levelized Cost of Electricity Generation

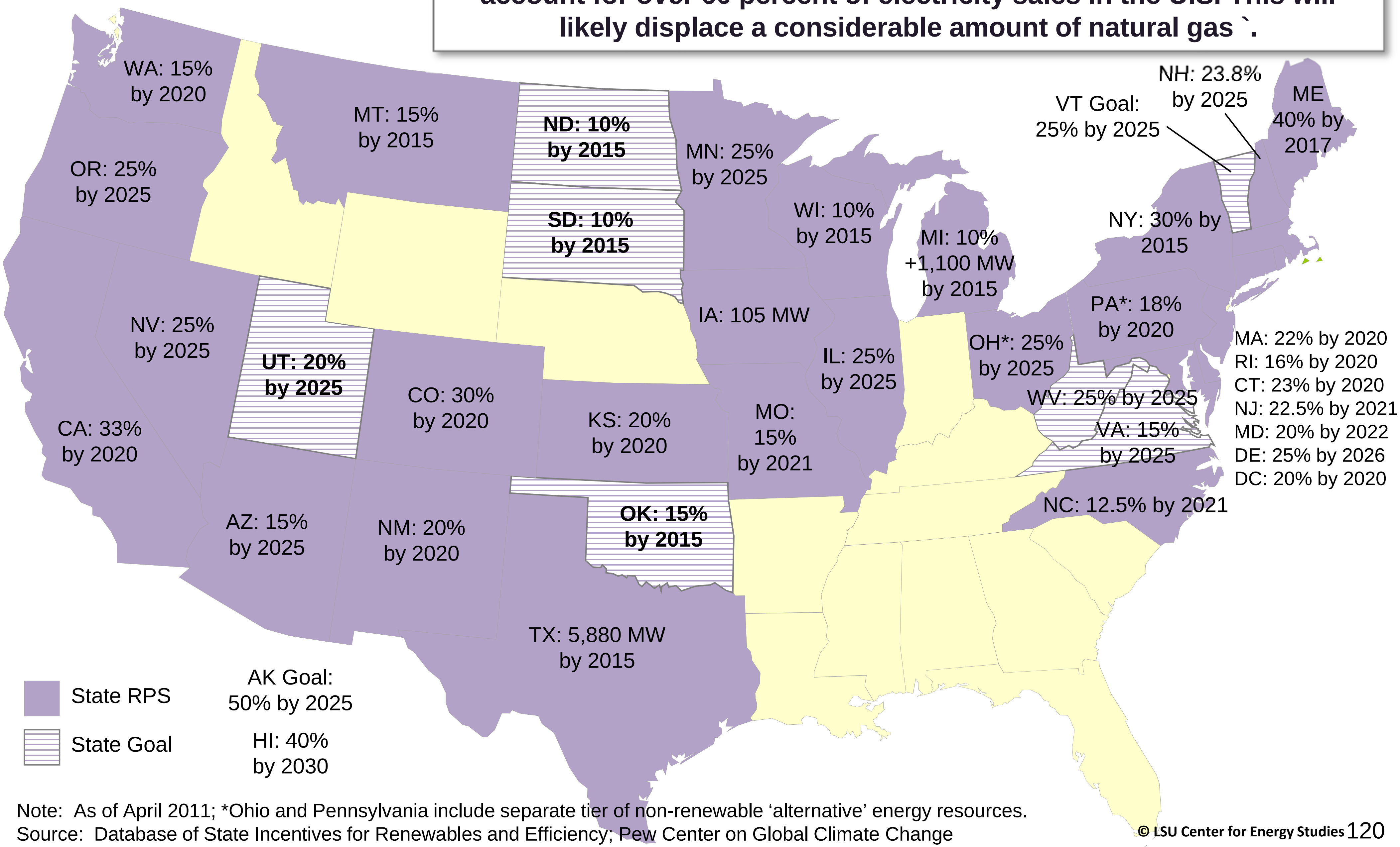
With market prices of around $62 per MWh, renewables have a considerable margin that will need to be recovered through an alternative financial support mechanism.



Source: Calculations based on assumptions published by the Energy Information Administration, U.S. Department of Energy.

RPS States (April 2011)

Currently 37 states have RPS policies in place. Together these states account for over 60 percent of electricity sales in the U.S. This will likely displace a considerable amount of natural gas `.



Note: As of April 2011; *Ohio and Pennsylvania include separate tier of non-renewable 'alternative' energy resources.
Source: Database of State Incentives for Renewables and Efficiency; Pew Center on Global Climate Change

Existing Louisiana Renewable Developments

Louisiana Renewable Energy Pilot Program:

- Louisiana Public Service Commission (LPSC) adopted pilot program plan November 2010.
- Two major components: the Research and the Request for Proposal (RFP).
- Each investor-owned utility is required to develop a minimum of three projects building new renewable energy facilities or purchasing new renewable energy resources by the end of 2013.
- The RFP Component applies both to investor-owned utilities and cooperative utilities.
- Utilities must issue RFPs for new, long-term renewable resources that will come online between 2011 and 2014.
- Regarding renewable-energy credits (RECs), the PSC will review the feasibility of a REC-trading program as part of the commission's ongoing renewable portfolio standard (RPS) rulemaking process.

Energy Efficiency Policies

Like renewables, the promotion of a greater degree of energy efficiency across all types of energy end-uses is commonly cited as a means of reducing overall carbon-related air emissions.

Some states have set aggressive numeric goals and mandates for reducing energy use over the next decade, with some states setting targets as large as 20 percent by 2020.

While Louisiana has not set specific numeric goals for reducing energy use, the state has a number of energy efficiency programs that help homeowners reduce their energy consumption.

Energy Efficiency Mandates

WA: pursue all cost effective conservation: ~10% by 2025

OR: 1% annual savings by 2013

CA: save 1,500 MW, 7,000 GWh; reduce peak 1,537 MW: 2010-12

NV: 0.6% annual savings (~5%) to 2015; EE to 25% of RPS

UT: PUC examining 1% annual

CO: 11.5% energy savings by 2020

AZ: at least 22% cumulative savings by 2020; peak credits

NM: 10% retail electric sales savings by 2020 .

OK: EE up to 25% of renewable goal

TX: 25% annual savings in 2012; 30% in 2013 and beyond

HI: 30% electricity reduction by 2030

MN: 1.5% annual savings to 2015

IA: 1.5% annual; 5.4% cumulative savings by 2020

WI: 1.5% electric savings by 2014; 15% peak reductions

MI: 1% annual energy savings

IL: 2% energy reduction, 0.1% peak by 2015

IN: 2% energy savings by 2019

OH: 22% energy savings by 2025 ; 8% peak by 2018

ME: 1.4% annual energy savings by 2013

VT: 2% annual; 11% cumulative energy reductions by 2011

MA: 2.4% annual electricity savings by 2012

NY: reduce electric use 15% by 2015

CT: 1.5% annual utility savings, 10% peak

RI: reduce consumption 10% by 2022

NJ: BPU proceeding to reduce consumption, peak

DE: reduce consumption 15%; peak 10% by 2015

PA: reduce consumption 3%; peak 4.5% by 2013

MD: reduce electricity use and peak 15% by 2015

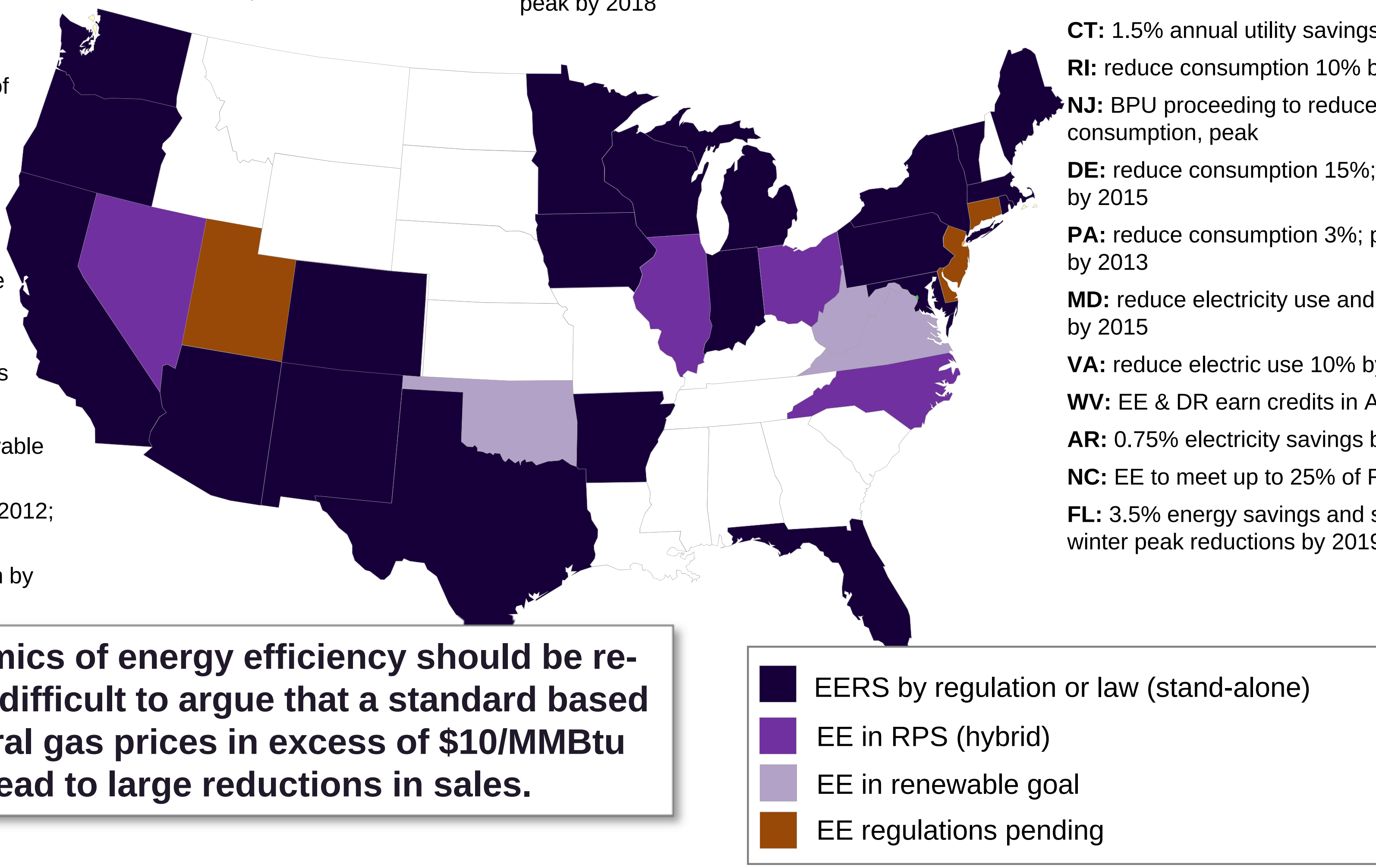
VA: reduce electric use 10% by 2022

WV: EE & DR earn credits in A&RES

AR: 0.75% electricity savings by 2013

NC: EE to meet up to 25% of RPS by 2011

FL: 3.5% energy savings and summer and winter peak reductions by 2019



The economics of energy efficiency should be re-evaluated – difficult to argue that a standard based upon natural gas prices in excess of $10/MMBtu can lead to large reductions in sales.

Note: As of April 15, 2011.
Source: Federal Energy Regulatory Commission.

Existing Louisiana Existing Energy Efficiency Programs

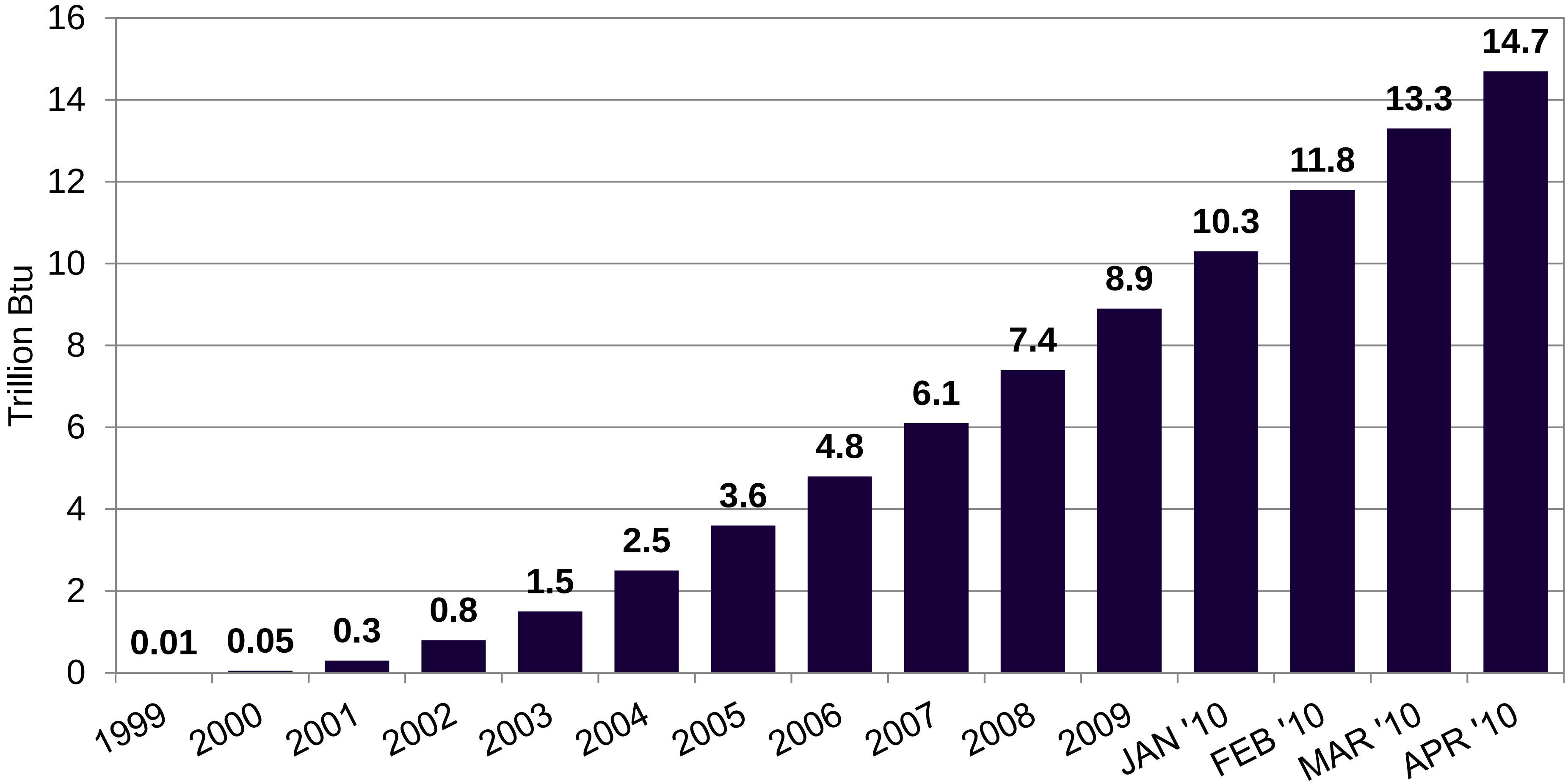
Louisiana Department of Natural Resources: Home Energy Rebate Option (HERO)

HERO has been active since 1999. DNR's original HERO Program provides a cash rebate of up to $2,000 to homeowners for increasing the energy efficiency of their existing home by a minimum of 30%. Through Stimulus Funding under the American Recovery and Reinvestment Act of 2009 (ARRA) the Louisiana Department of Natural Resources received additional funding to expand the HERO Program. Through this funding the HERO Program has widened its scope increasing the amount of the rebate for existing homes to $3,000, re-introduced new homes into the program and added an additional existing commercial building component all under the ARRA funded Empower Louisiana HERO Program.

Louisiana Department of Natural Resources: Home Energy Loan Program (HELP)

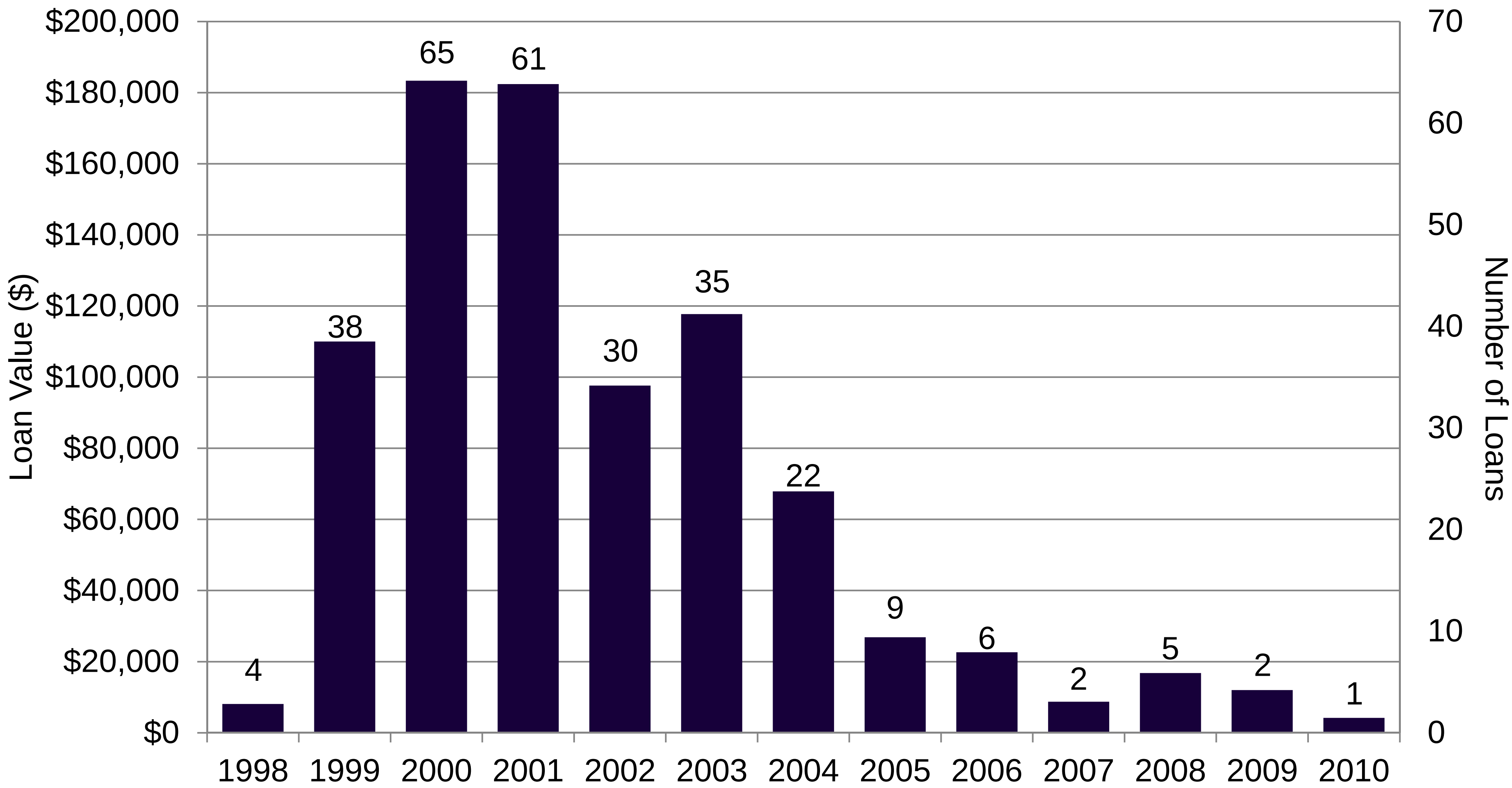
Through the HELP program, a homeowner can obtain a five year loan to improve the energy efficiency of their existing home. This is accomplished by DNR subsidizing one half of the financing for the energy efficient improvements at a low interest rate to participating lenders. The maximum DNR's participation for half of the loan amount is $6,000. Each participating lender sets its own maximum loan amount, along with the interest rate that is charged to the homeowner. Each participating lender also services the loan for DNR. To participate in the HELP program, homeowners must utilize a lending institution participating in the program.

Trillion Btu Cumulative Savings Attributed to HERO



Source: LDNR, Technology Assessment Division, 2011

HELP Loans and Value of Loans



Source: LDNR, Technology Assessment Division, 2011

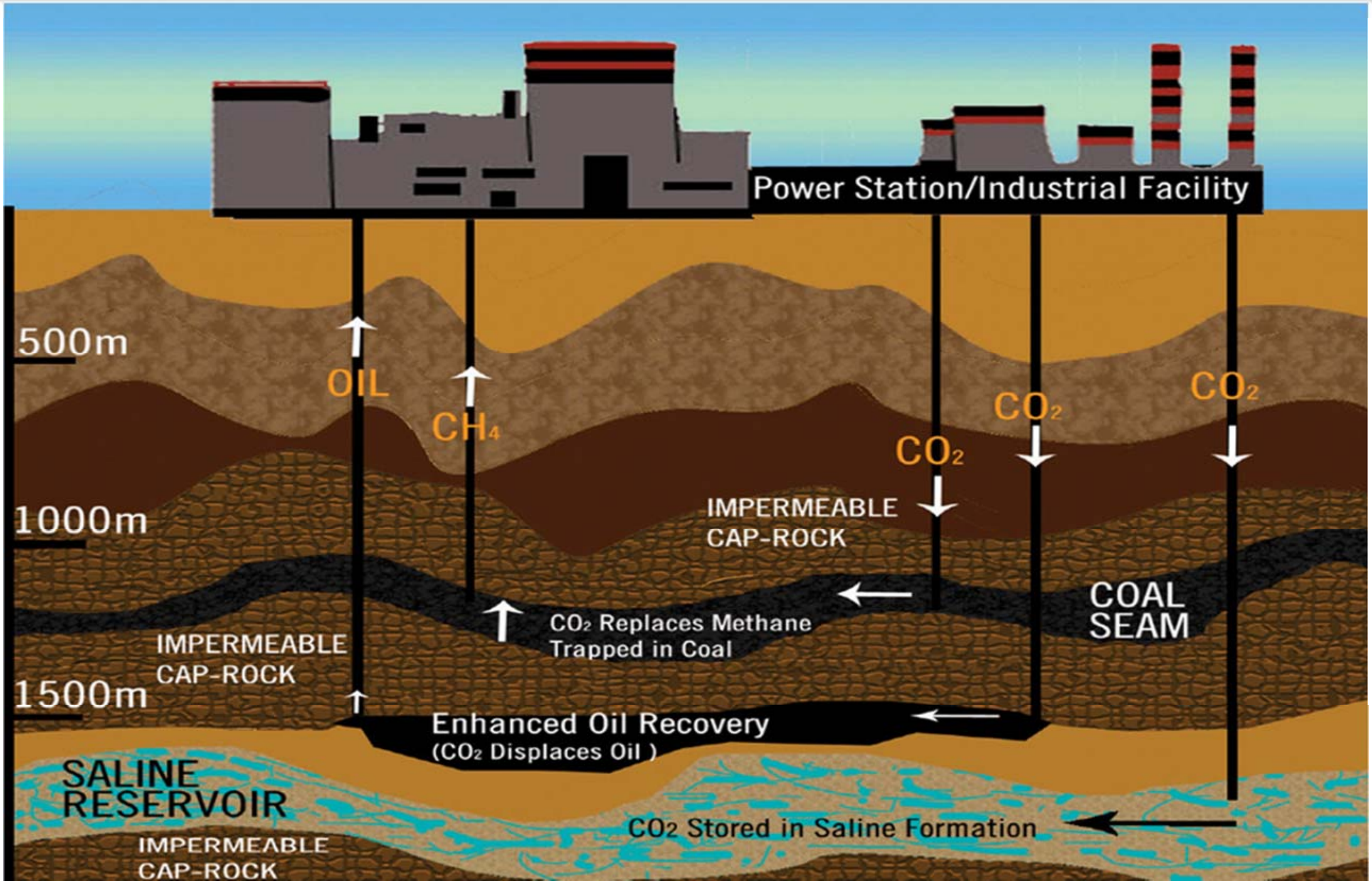
What is Carbon Capture and Storage?

- **Carbon Capture and Storage (“CCS”) is a method of managing and reducing CO_2 in the atmosphere**
- **Carbon dioxide is captured from a power plant or other industrial source, compressed and put in a pipeline where it travels to a nearby oil or gas field or “sequestration site”.**
- **CO_2 can be safely sequestered (or stored) in depleted oil or natural gas fields for an indefinite period of time.**
- **CO_2 can be held underground by the same solid rock layers that have held the trapped oil and gas for millions of years.**

Source: Energy Information Administration, U.S. Department of Energy

Carbon Capture and Sequestration

Carbon capture and sequestration (“CCS”) involves the capture of CO_2 from power plants and other large industrial sources, its transportation to suitable locations, and injection into deep underground geological formations for long-term sequestration.



Big Picture Cost Estimates

Process	Cost range per metric ton of CO_2 captured	Comments
Capture from power plant	$15.00 - $75.00	Net cost
Transportation	$1.00 - $8.00	Per ~155 miles via pipeline
Geological storage	$0.50 - $8.00	Not including EOR revenue
Monitoring of storage	$0.10 - $0.30	Depending upon regulation
Total estimated costs	$16.60 - $ 91.30	

Source: Intergovernmental Panel on Climate Change, JPMorgan Chase.

Louisiana CCS Policies

In 2009, Louisiana passed legislation (Act 517) governing the geologic storage and withdrawal of carbon dioxide. Act 517 authorizes the Commissioner of Conservation to broadly regulate carbon storage and withdrawal. The legislation clearly defines property rights and liabilities for carbon storage and withdrawal.

Act 517 also assesses a fee on carbon storage paid into the "Carbon Dioxide Geologic Storage Trust Fund." This trust fund can be used for the regulation and administration of carbon storage and withdrawal in additional all inspection, testing and monitoring required by the Commissioner of Conservation. The fund can also be used for research and development purposes to examine and test advanced storage and withdrawal technologies and processes.

References

References

Bohi, Douglas R., "Analyzing Demand Behavior," Baltimore: Johns Hopkins University Press (for RFF). 1981.

Bohi, Douglas R. and Zimmerman, Mary, "An Update of Econometric Studies of Energy Demand," *Annual Review of Energy*, 1984 (9) pp. 105-154.

Bernstein, M.A and J. Griffin. "Regional Differences in the Price-Elasticities of Demand for Energy," *National Renewable Energy Laboratory.* February 2006. NREL/SR-620-39512

Chicago Climate Exchange. "Historical Prices". Accessed February 8, 2011. Website: www.theice.com/publicdocs/ccx/CCX_Historical_Price_and_Volume.xls

Dahl, Carol A. "A survey of energy demand elasticities in support of the development of the NEMS," *Munich Personal RePEc Archive. Colorado School of Mines.* October 1993.

Dismukes, David E. "Energy Market Changes and Policy Challenges." September 2, 2011. Southeast Manpower Tripartitie Alliance (SEMTA) Summer Conference. Center for Energy Studies, Louisiana State University.

Dismukes, David E. "Learning Together: Building Utility and Clean Energy Industry Partnerships in the Southeast." May 20, 2011. American Solar Energy Society, National Solar Conference. Center for Energy Studies, Louisiana State University.

Dismukes, David E. "Energy Market Trends and Policies: Implications for Louisiana" June 20, 2011. Executive Briefing, Lakeshore Lion's Club Monthly Meeting. Center for Energy Studies, Louisiana State University.

Dismukes, David E. "Carbon Regulation: Policies, Trends & Impacts." February 24, 2011. LPSC ARRA Seminar on Clean Air Markets. Center for Energy Studies, Louisiana State University.

Dismukes, David E. "How Current and Proposed Energy Policy Impacts Consumers and Ratepayers." November 15, 2010. 122nd NARUC Annual Meeting. Center for Energy Studies, Louisiana State University.

Federal Energy Regulatory Commission. *Renewable Power & Energy Efficiency: Energy Efficiency Resource Standards and Goals*. 2010.

JPMorgan Chase. *Carbon Capture and Sequestration: A report for the London Accord*. 2007

International Energy Agency, "Iron and Steel," Energy Technology System Analysis Program. November 2009.

References

Intergovernmental Panel on Climate Change. *Carbon Dioxide Capture and Storage: Summary for Policy Makers*. September 2005.

Kreutzer, David W. Karen A. Campbell, William W. Beach, Ben Lieberman, and Nicholas D. Loris. "Impact of the Waxman-Market Climate Change Legislation on Louisiana," *The Heritage Foundation*. August 2009.

Li, Hongyi and G.S. Maddala. "Bootstrap Variance Estimation of Nonlinear Functions of Parameters: An Application to Long-Run Elasticities of Energy Demand." *The Review of Economics and Statistics.* Vol. 81, No. 4. November 1999. pp. 728-733.

Louisiana State Census Data Center, *Census 2010 Total Population by Race and Ethnicity by Parish*.

Louisiana Department of Natural Resources. *Historic Well Production by County.* SONRIS.

Louisiana Department of Natural Resource. *Home Energy Rebate Option.* Technology Assessment Division.

Louisiana Department of Natural Resource. *Home Energy Loan Program.* Technology Assessment Division.

McDaniel, Mike D. "Overview of Climate Change Science and Policies." February 24, 2011. Louisiana Public Service Commission. Center for Energy Studies, Louisiana State University.

McDaniel, Mike D., and David E. Dismukes, Lauren L. Stuart, Kathy R. Perry. *Louisiana Greenhouse Gas Inventory*. February 2010. Center for Energy Studies, Louisiana State University.

McDaniel, Mike D., and David E. Dismukes, Lauren L. Stuart, Jordan L. Gilmore. *Louisiana Greenhouse Gas Inventory Project: Task 2 Report: Overview of States' Climate Action and/or Alternative Energy Policy Measures*. February 2010. Center for Energy Studies, Louisiana State University.

Oak Ridge National Laboratory. Accessed June 3rd, 2011. Website: www.cdiac.ornl.gov/ftp/ndp030/CSV-FILES/

Pew Center on Global Climate Change. *States with Renewable Portfolio Standards*. 2010.

Taylor, Lester D. "The Demand for Electricity: A Survey." *The Bell Journal of Economics*. Vol. 6, No. 1. Spring 1975. pp. 74-110.

U.S. Department of Commerce, Bureau of Economic Analysis, "BEA National Economic Accounts."

References

U.S. Department of Energy, *Database of State Incentives for Renewable & Efficiency*. 2011

U.S. Department of Energy, Energy Information Administration, AEO 2009 & 2010.

U.S. Department of Energy, Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2008*

U.S. Environmental Protection Agency; and U.S. Department of Energy, Energy Information Administration. "Emissions of Greenhouse Gases in the United States 2008." December 3, 2009. Report #: DOE/EIA-0573(2008).

U.S. Environmental Protection Agency, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2009." April 2011.

U.S. Environmental Protection Agency, "Global Warming and Climate Change". Accessed June 5, 2011. Website: www.epa.gov/airtrends/aqtrnd95/globwarm.html

U.S. Environmental Protection Agency, *State Inventory and projection Tool*, 2007.

U.S. Environmental Protection Agency, "Technical Support Document for the Iron and Steel Sector: Proposed Rule for Mandatory Reporting of Greenhouse Gases," Office of Air and Radiation. August

Wennberg, Jeffery., "State and Regional Climate Initiatives: Lessons for Federal Action," *American Bar Association: Section of Environment, Energy and Resources*. 18th Section Fall Meeting. September 29 – October 2, 2010.

Woods & Poole Economics. *County Projections to 2040*. 2010.