IMPROVING ENERGY EFFICIENCY IN THE US:

A State Level Analysis

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Submitted to

Central European University

Department of Public Policy

In partial fulfillment of the requirements for the degree of Master of Arts in Public Policy

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Budapest, Hungary 2011

ABSTRACT

Despite its technological advancement, wealth, and sound constitutional ethic, the United States is one of the most energy inefficient countries in the world. Major efforts have been made to increase energy efficiency in the United States. However, public policy has been missing the target. Why is that? What is the role of the policy maker in shaping economic regulations in the context of energy efficiency? Are the constraints on efficiency a result of consumer interests or producer interests?

Past studies have focused on energy conservation as well as utility and transportation regulations on the US national level. However, this study investigates the cases of Texas and California, which have shown remarkable similarities in their state characteristics, and lead to a strong conclusion explaining the large gap in the states' energy efficiency scores. This invites further questions about why exactly energy inefficiencies are not being tackled on the state level.

The research executed in this study confirmed the hypothesis according to Interest Group and Economic Regulation Theory. Finding that the main constraints affecting energy efficiency in the United States today are due to the weighted influence that large energy producing and associated firms have on state policy makers and their constituencies. Therefore policy makers have detoured from the best path of near-term energy efficiency policy solutions in exchange for endorsement and financial donation of producer interest groups.

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ACYRONYMS & ABBREVIATIONS

ACEEE - American Council for Energy Efficient Economy

BEA - United States Bureau for Economic Analysis

BLS - United States Bureau of Labor Statistics

CAFE - Corporate Average Fuel Economy

CCS - Carbon Capture and Sequestration

CHP - Combined Heating and Power generation

CPUC - California Public Utilities Commission

CRP - Center for Responsive Politics

EIA - United States Energy Information Administration

EPA - United States Environmental Protection Agency

GDP - Gross Domestic Product

GSP - Gross State Product

GWh - Gig watt per hour

IEA - International Energy Agency

MWh - Meg watt per hour

NREL - National Renewable Energy Laboratory

R&D - Research and Development

PUCT - Public Utilities Commission Texas

US - United States

WTI - West Texas Intermediate crude oil

GLOSSARY

Decoupling – "disassociation of utility profits from sales volume" (Cochran, Doris, & Vorum 2009).

Democratic Party – political party representing liberal values and preferences, in the two-party, pure presidential system in the United States.

Efficiency Demand – achieving maximum productivity with minimum wasted effort or expense as a function of the desire of purchasers, consumers, clients, employers, etc., for a particular commodity, service, or other item.

Energy Efficiency – obtaining identical services or output with less energy input.

Energy Intensity – "physical energy units per unit of value added (tons of oil-equivalent per dollar) measured at the sectoral level, identifies the effect of environmental as well as energy policy" (Fredriksson & Vollebergh 2009, 218). The energy intensity of an economy is a measure of how much energy is required to produce each unit of national revenue (IEA 2009).

Fuel Economy–"the number of miles traveled by a given vehicle on a gallon of fuel" (ACEEE 2011).

Interest Group and Economic Regulation Theory – A combination of **Economic Regulation**

Theory and **Interest Group Theory of Government,** which claims that specialized interest groups, such as lobbies, have strong interests that lie in the possible gains from regulation or lack thereof, especially when designed on their behalf (Razzolini & Shughart 2001). **Economic Regulation Theory**, as outlined by Stigler, a government decision maker faces special interest pressure from producers and electoral pressure from consumers (1971). Because the influence of the producers is always stronger than the consumers, Stigler claims that policy makers only work for the benefit of producers, rather than the benefit or protection of consumers or the market (1971).

Lobbying – "is the act of attempting to influence decisions by individuals, legislators or government actors, constituencies, and advocacy groups on behalf of a special interests " (CRP 2011).

Public Choice Theory – The application of economic theories and methodology to the study of politics (Drazen 2000).

Republican Party – this is the political party representing conservative values and preferences, in the two-party, pure presidential system in the United States.

1. INTRODUCTION

The United States is one of the most inefficient users of energy in the world. For each dollar of economic product, the United States consumes the most energy per passenger mile (EIA 2009; IEA 2010). American drivers, households and businesses use more energy than those in most other developed countries. However, despite wealth, technological development, and successful regional markets, efficiency demand is not being met.

It is beyond the scope of this thesis to compare practices on the US national level to other nations, which are more energy efficient. For example, the mere size of the US compared to Germany or Japan will leave any conclusions easily debated. While others have compared best practices in energy efficiency with the policy movements on the national level to other countries, the US is a unique case. There is currently no national comprehensive policy strategy for energy efficiency in the United States (Cochran, Doris & Vorum 2009).

Energy efficiency throughout the twentieth century has improved, and these improvements were mostly organized on the state level. Though, there has been little extensive comparative research done concentrating on energy efficiency at the state level. The strengths of state-level regulation are, as defined by National Renewable Energy Laboratory (NREL)(Cochran, Doris &

Vorum 2009), tailoring policy to specific state needs, having primary control and closeness with in-state utility regulation. It is limited by its geographical characteristics, and funding (2009).

Therefore, in order to best explore the question, this study compares two cases within the US, California and Texas, and the relationship between state level economic drivers and energy efficiency policy. This study evaluates the structure, functioning, and regulation of US energy policy through the interest group and economic regulation models found in the Public Choice literature. The cases of California and Texas are used because of their similarities in size, population, per capita gross state product (GSP), geography, energy mix as well as net consumption and production.

The expected outcome of this paper is that energy inefficiencies at the state level are largely due to interest group pressure and influence on policy agenda setting. This pressure and influence has been reinforced by the legacies of state-level institutional structures avoiding the most urgent problems instead of acting to resolve them.

For instance, policy makers have dodged urgent issues such as vehicle efficiency policies, which can be easily made more efficient through regulation. They instead are ignoring near-term solutions and investing more in biomass fuel production, and research and development (R&D) of lithium and battery packages for electric cars. However, biomass is a complementary rather than substitute commodity for oil-based gasoline and does not necessarily make efficiency gains.

There is progress in R&D with lithium technologies, which are being used to tackle coal-fire carbon storage with, retrofit carbon capture-storage (CCS) packages, but is still far from discovering an affordable electric battery package for vehicles. Thus, efficiency is being improved in some ways. However, it is evident that current methods merely mask the core constraints on energy efficiency, and have thus far not been dealt with to the extent or scale that is required.

Several studies examine the context of state-level adoption of energy conservation and environmental policies (e.g., Rossi 2009; Cook 2010; Delmas, Montes-Sancho, & Russo 2007; Kwoka, Ozturk, & Pollitts 2008; Yandel 1999; Menz & Vachon 2006; Dixon, et al. 2010). Former research covers all of the states to find trends and generalizations, but there have been few studies addressing the constraints on energy efficiency from a state-level using a two-state sample.

This study seeks to further pinpoint the causes of state-level efficiency constraints, and thus has chosen two states that are remarkably similar but with a wide gap in energy efficiency levels. The demographic data and energy statistics used correspond to the most recent data available from the US Energy Information Administration, US Bureau of Labor Statistics, and the American Council for Energy-Efficient Economy.

The existence of a potential improvement in energy efficiency without extra costs or "energy efficiency gap" has not thus far been empirically explored but has been attributed to market conditions and behavior of economic drivers (Afonso, Silvo, & Soares 2010, 6). This study therefore, exposes the behavior of economic drivers, such as voters and energy interest groups' interaction with policy makers. It draws out the policy constraints of energy efficiency present in the US energy sector using the framework of Interest Group and Economic Regulation Theory. Interest Group and Economic Regulation Theory have proved their explanatory power in a remarkably wide range of contexts of governmental activity (Ekelund and Tollison in Razzolini & Shughart 2001).

This study analyzes and evaluates the reasons behind the existing economic constraints, which are keeping the US from reaching its energy efficiency potential. In addition, this paper puts forth recommendations addressing the constraints of efficiency through more adequate policy options, which fill these energy efficiency gaps. This research contributes to the debate regarding energy policy in the context of energy efficiency across the nation and proposes recommendations for changes, which can in turn, be implemented in other states as well.

Why does the US energy sector remain inefficient? To answer the main question, this study proposes that inefficiencies are caused by economic drivers, in the form of consumer votes and producer influence in policy making. What role does the interaction between interest groups and the state institutions have in shaping and regulatory policies? To what extent do consumers impact energy efficiency policies?

This study determines certain constraints on energy efficiency in the US, through revealing why some states are more aggressive in promoting energy efficiency policies than others. Important drivers such as consumer and producer interests, founded in Public Choice Theory, influence the adoption of energy efficiency policies in the states of Texas and California are discussed in chapter two. The underlying theoretical literature provides relevant context to substantiate the analysis. The third and fourth chapters link adoption of energy efficiency measures to California and Texas as well as provide insight into the methodology and analytical framework employed. The empirical findings are presented in the fifth chapter followed by policy implications and conclusions in the sixth chapter.

2. LITERATURE REVIEW

"A good cause seldom triumphs unless someone's interest is bound up in it." – John Stuart Mill

Public Choice Theory is the application of economic theories and methodology to the study of politics (Drazen 2000). It derives a positive analysis of self-interested agents, such as policy makers and their interactions with producers and consumers in the market economy (2000). When used for normative analysis it measures the effects of different policy choice mechanisms on economic outcomes rather than the mechanisms themselves (2000). However to begin the methodological approach a basic overview of the different decision-making mechanisms in place should be overviewed to better understand the effect they have on the current political economy in the United States concerning energy efficiency governance.

The decision-making mechanisms discussed in this study analyze energy efficiency policy in the US via the branch of Public Choice Theory, which explains the interplay of policy makers with interest groups, representing producers, and voters, representing consumers. These mechanisms are tested using Interest Group, and Economic Regulation Theory, which state that interest groups and voters determine which policies and regulations are endorsed and implemented by policy makers. This theory is derived from Olson's logic of cost-benefit strategies and behavior of institutions that is observed when maneuvering collective action problems (Drazen 2000).

Many authors contributed afterwards to this theory, including Stigler, Peltzman, Becker, and Tullock, in pursuit of linking economic interests to public policy, (Mueller 1997, Razzolini & Shughart 2001). The theory goes on to explain that the nature of political competition lies in markets where regulations are being devised and implemented. Responding systematically and balancing all meaningful pressures imposed on them, the policy makers design rules that compromise efficiency in some way but in some sense, are still considered efficient when all political costs are considered.

Efforts to promote energy efficiency could be explained by many factors, including different levels of voter interest in energy efficiency measures, strategic behavior among states competing for private investments, differences in economic and political interests, and influence of interest groups. The three main stakeholders are the public, the policy maker and the firm. Because state consumer and producer compositions and interactions are different, these independent variables can explain differences in observed state-level energy efficiency policies.

Interest Group Theory claims that specialized interest groups, such as lobbies, have strong interests, which lie in the possible gains from regulation or lack thereof, especially when designed on their behalf (Razzolini & Shughart 2001). Economic Regulation Theory explains "the effects of regulation upon the allocation of resources" (Stigler 1971, 3). It also entails who bears the burden and benefits of regulations.

Interest Group and Economic Regulation Theory together, establish that all stakeholders, both producers and consumers are in pursuit of self-interests, and therefore have an affect on policy making (Razzolini & Shughart 2001). All these factors need to be integrated in a coherent and inclusive model in order to be relevant in explaining state-level energy efficiency policy adoption (Menz & Vachon 2006). Consumer or social interests lie in protecting their incomes and livelihoods. Producer or economic interests lie in protecting their investments and being able to meet demand.

Interest groups have cause then, to ensure these gains through political control. Group power is unbalanced as they are able to concentrate benefits to themselves while spreading the costs over the greater population. In a political system where votes determine outcomes and policy makers are seeking elections or re-election, special interest groups have operational incentives to seek favors or rents. Competition ensues, and efficiency loses out to restrictions that assist or protect successful interest groups.

In the case of energy efficiency however, there are many variables including behavioral and technical changes that increase the complexity of the puzzle of how to improve it. Current research must fill in the gaps of uncertainty by considering the ways that the continuous advancements in energy technologies will affect future costs and forecast long term preferences of both supply and demand side of the market in order to minimize welfare losses (Jaccard & Rivers in Afonso, Silvo, &

Soares 2010). The Interest Group and Economic Regulation Theory propose that powerful industry groups can influence the outcome of a policy to their advantage (Stigler 1971). These theories, as in many social sciences, still remain largely inconclusive concerning energy efficiency (Cochran, Doris & Vorum 2009).

> *Measuring policy impact is critical for evaluating the effectiveness of policies at all levels of government. But such measurement is difficult due to the overlapping nature of policy implementation, the lack of coordination of intended impacts, and the challenge of calculating and attributing whether actual energy savings result from a particular policy* (Cochran, Doris & Vorum 2009).

This study draws on Yandel's (1999), Menz & Vachon's (2006), and Dilorenzo's (1988), empirical studies on regulatory control and provides strong support of Interests Group and Economic Regulation Theory, as used to explain lobbies' as well as consumers' interests. They find that perception is key for policy adoption.

If a voter perceives a policy to be to their benefit, they will join the camp of the policy maker in support of that legislation. Therefore the role of an elected official or policy maker, who wants votes and endorsements, is to deliver the demands of both consumers and producers. For example, if the lobby group endorses a policy maker, they must also persuade voters to join the camp in support of the policy, which the policy maker supports, and therefore win votes for the candidate that has high probability of getting the policy passed. Lobbies do this through funding political campaigns and financing their candidate's publicity. Thus, the policy makers' decisions are actually the decision of the most influential interest group.

Therefore, the actions of the policy makers are not in the interest of efficiency for the sake of efficiency, especially when efficiency-bound policies, are characterized by long-term investment and gains. Yet, the policy maker's role is also to react and change or create change in the market for the sake of efficiency. Efficiency is traded away partly for interest group benefits and neither the demand for efficiency or interest groups ever completely dominate the decision (Yandel 1999). Policy makers receive a higher payoff from promoting their constituencies' interests than from taking unclear and risky policy positions on behalf of economic efficiency or the national interest (1999). For example, a representative works hard to obtain sources of federal funding to their states and strongly oppose those policies threatening it, not for the sake or welfare of society, but because they directly benefit their constituencies, while the cost is spread amongst taxpayers outside of their constituency (1999).

In DiLorenzo's analysis he compares government movements to those of a market (1988). Policy makers respond to the wishes of interest groups and voters, just as a perfectly competitive market would respond to consumer demand (1988). Yet, he states that this analogy is missing the element of uncertainty, which also has a strong influence on producers. This uncertainty is never ending and always provoking producers to create "profitable opportunities to stimulate demand for goods or services" (DiLorenzo 1988, 59-71).

After a policy has been implemented, the expectations from policy makers can affect the behavior of energy firms. For example, if a firm expects favorable treatment in the regulation, this in turn will dictate the firm's investment decisions. If the firm is uncertain of the outcome, the firm's interest groups are much less likely to participate aggressively in influencing the regulation's adoption (1988). To put it simply, firms will invest less in the final decision of the policy maker, when the expected gains or losses are uncertain.

If an industry is producing less than the competitive level, a common policy prescription to promote efficiency is to increase that firm's production, as through divestiture. This may harm the producers since it requires them to do something they did not voluntarily choose to do, but it is efficient because the gain to consumers outweighs the loss to the producers.

This is debated in Kwoka, Ozturk, and Pollitts' (2008) study on US electric power distribution from 1994-2003. State enforced divestitures imposed on utility companies had adverse affects on efficiency (2008). Yet, utilities that undertook divestitures voluntarily did not experience any adverse effects on efficiency (2008).

Rossi (2009) points to the fact that despite various regulations and deregulations the "duty to serve" prevails in energy production and distribution (2009, 9). Though, the interaction between interest groups, consumers, and policy makers in the energy industry indeed reflect self-interest, this duty to serve concept, through regulatory framework, can present benefits to both consumer and producer sides of the energy market (2009).

3. STATE PROFILES & POLICIES

California is one of the top producers of crude oil in the nation (EIA 2009). It contains 17 of the top producing US oil fields (2009). California's largest refineries are capable of processing a wide variety of crude oil types and ranks third in the nation in petroleum refining capacity (2009). California is the most populous state in the nation and its total energy demand is second only to Texas. Although California is a leader in "energy-intensive chemical, forest products, glass, and petroleum industries, the state has one of the lowest per capita energy consumption rates in the country" (2009). The state's energy-efficiency programs are responsible for their strides in reducing energy consumption.

Texas contains more than 20 of the top US oil fields (EIA 2009). Texas is number one in the US in both crude oil production and refining capacity (2009). These refineries have high capacity for refining local production, as well as foreign imports (2009). Texas has the largest oil and natural gas reserves (2009). Natural gas storage capacity in Texas is also one of the highest in the nation (2009). These facilities allow storage when national demand is low and usage when demand is high to meet heating and cooling needs throughout the US via their extensive pipeline infrastructure (2009).

Due to its large population and an energy-intensive economy, Texas leads the nation in energy consumption (2009). Texas natural gas demand is dominated by the industrial and electric power sectors (2009). Texas leads the country in consumption of asphalt, road and aviation gasoline, distillate fuels, lubricants, and liquefied petroleum gases (LPG) (2009). Texas LPG use is greater than the LPG consumption of all other states combined, due primarily to the state's large active petrochemical industry (2009). Texas is made up mainly of "energy-intensive industries that include aluminum, chemicals, forest products, glass, and petroleum refining" (2009).

Natural gas-fired power plants typically account for about one-half of the electricity produced both in California and Texas (EIA 2009). In Texas, coal-fired plants account for much of the remaining generation (2009). Due to high electricity demand, California imports more electricity than any other state (2009). Strict emission laws, restricting the coal-fired generation within the state, allow only a few small coal-fired power plants to operate in California (2009). However, Los Angeles operates a coal-fired power plant in Utah, and almost all of its output is used for the cities utilities (2009). California's import mix consists of hydroelectric and coal-fired sources from its neighbors (2009). Texas, though it produces and consumes a substantial amount of coal from local mines, still relies on imports of higher-hydrocarbon producing coal from other states to meet demand (2009).

Texas and California both lead the nation in wind-powered generation (EIA 2009). California uses the most electricity generation from non-hydroelectric renewable energy sources than any other state, where as Texas has the most non-hydroelectric renewable energy potential (2009). Although renewable energy sources contribute minimally to the Texas power grid, Texas leads the nation in wind-powered generation capacity (2009).

Texas produces and consumes more electricity than any other state (EIA 2009). Its residential use of electricity is significantly higher than the national average, due to high demand for Combined Heating Power (CHP) (2009). Despite large net interstate electricity imports in some areas, the Texas Interconnect power grid is largely isolated from the integrated power systems serving the rest of the US, and therefore has limited ability to export or import electricity to and from other states (2009).

3.1 State-level Decoupling Policies

US utility companies' gains depend on the amount of energy they produce and deliver to consumers. Utility companies are therefore unlikely to invest in energy efficiency programs because of the reduction in gains (ACEEE 2011; Pew 2011). Implementation of efficiency policies cuts into profits by decreasing sales and company gains.

Decoupling can be used in both electricity and natural gas markets to ensure companies receive fair compensation regardless of fluctuations in sales (2011). The state mitigates, correcting the difference between a utility companies' yearly sales and sales projections. Decoupling policies remove the pressures placed on utilities to sell as much energy as possible by eliminating the relationship between gains and sales capacity (2011). Decoupling policies are designed to reduce the amount of electricity and gas that customers use, which impacts company gains and therefore remains one of the most debated areas of policy targeting utilities (ACEEE 2011; Pew 2011).

California implemented decoupling policy in the late 1970's but later suspended it due to restructuring of the electricity sector (Pew 2011). However, in 2000 and 2001, California suffered an energy crisis characterized by electricity price instability and four major blackouts caused by a supply and demand imbalance (EIA 2009).

Following the energy crisis, the state created their Energy Action Plan, designed to decrease the state's vulnerabilities. To achieve these goals, California resumed decoupling policy implementation (ACEEE 2011). California's Energy Action Plan includes incentives for optimizing energy conservation, building sufficient new generation facilities, upgrading as well as expanding the electricity transmission and distribution infrastructure (EIA 2009). Both electric and gas utilities in California have decoupling. Policy programs like this have a significant impact on per capita electricity use and led California to be the most efficient state in the US (ACEEE 2011; EIA 2009).

Energy efficiency programs administered to utility companies are overseen by the California Public Utilities Commission (CPUC), which establish policies and guidelines, set program goals, and approve spending (ACEEE 2011). Utility companies saved a little over three million meg watts per hour (MWh) in 2008, based on ACEEE calculations (2011).

However, Texas does not decouple utility companies' profits from their sales. In 2009, the state considered a bill, proposing decoupling policies (U.S. Senate 1972). However, this was not passed into legislation. Though the bill did not pass, Texas law has had utility efficiency policies in place since 1999 (ACEEE 2011). These require utility companies to submit future plans and report on their capacity and annual savings to the Public Utilities Commission of Texas (PUCT) (2011). The PUCT must approve the plans and utilities can receive performance bonuses based on their annual energy savings (2011). In 2008, Texas electric utility companies reported saving around 700 gig watts per hour (GWh)(ACEEE 2011; EIA 2009).

3.2 State-level Vehicle Policies

Transportation efficiency focuses on efficiency through improving miles per passenger, or traveling more miles on each unit of fuel consumed. The **fuel economy** is defined as "the number of miles traveled by a given vehicle on a gallon of fuel" (ACEEE 2011). This concept was introduced by the Environmental Protection Agency (EPA) after the 1970's oil crisis under the federal Corporate Average Fuel Economy (CAFE) model, and basically consists of vehicle and consumption regulation (Combs 2008). The transportation sector consumes a quarter of all end-use energy in the US (ACEEE 2011). Road vehicles use about three-quarters of "transportation-related energy", with more than half used by cars and light trucks (Combs 2008). This translates to enormous expenditures for fuel as well as vehicle maintenance and roadway construction.

Increased efficiency through the use of improved vehicle technology is expected to be the primary method for obtaining these reductions (2008; ACEEE 2011). Though California has the highest rate of consumption in transportation in the US, it still leads the way in efficiency measures. "Technical improvements in vehicles and reasonable government policies that encourage vehicle efficiency could substantially reduce energy consumption in the transportation sector" (ACEEE 2011).

> *To facilitate compliance with the higher standards, recent fuel economy legislation should be complemented by a combination of policies, including: incentives for the purchase of highly- efficient vehicles; consumer education efforts; and continuing R&D on fuel-efficient, low-emissions vehicle* (ACEEE 2011).

California established state-level manufacturer standards to meet even higher fuel efficiency requirements than originally proposed by the EPA (2009). This policy has been effective on a state level in California, despite solely federal control over manufacturer standards in the pas, which requires vehicles sold in California to be no or low emission vehicles (Cochran, Doris, & Vorum 2009).

Emissions policies, therefore, also directly affects fuel efficiency by encouraging sales of alternative fuel vehicles (2009). Energy efficiency policies in this sector therefore focus on developing and deploying new technologies that increase fuel efficiency as well as create incentives. As mentioned before, incentives can be offered at the state level to push the use of fuel-efficient technologies, though Texas is not among them (Cochran, Doris, & Vorum 2009).

More motor vehicles are registered in California than any other state, and worker commute times are among the longest in the country (EIA 2009). Most drivers are required to use a special ethanol mix of gasoline most of which is imported (2009). To meet strict environmental regulations, California refineries have the capability to produce ethanol blends of gasoline bio-diesel (2009).

The transportation sector consumes the most energy in order to support the demands of the huge volume of drivers in the state, its many airports, and military bases (2009). However, California is not connected via pipelines to any other major US refining centers, and California refineries often operate at near maximum capacity due to high demand for petroleum products (2009).

Texas also uses four separate ethanol gasoline blends to meet its diverse air quality needs requirements in metropolitan areas (2009). This is one of the only vehicle policies in place in the state. However, unlike California, Texas is rich in agriculture and has several bio-ethanol plants and has no need to import from other states to meet their bio-gas needs. Refineries in Texas use advanced refining processes beyond simple distillation to yield high-value products, usually made from West Texas Intermediate (WTI) crude oil (2009).

This sums up an interesting puzzle. California is a front-runner in energy efficiency in the US. It has the longest history of energy distribution and consumption policy and regulation as well as being a top producing state. Like California, Texas is a top producing state but lagging behind in efficiency. California has the largest population and the second highest GSP. Texas is the top energy producer and consumer and has the second largest population as well as the highest GSP of all the states (EIA 2009). Both of these states primarily run on natural gas for electric power and CHP. However, Texas, according to the ACEEE and EIA has spends more per unit energy consumed than California and therefore much less energy efficient (2011; 2009). The fact that these states have an impressive set of infrastructural accomplishments suggests that something rather unusual is going on here.

Energy efficiency is measured by a unit energy consumed, per each real dollar GDP spent (Cochran, Doris, & Vorum 2009; EIA 2009). In this method, lower energy intensity is equated to improved energy efficiency, and does not attempt to measure policy impacts, but instead reflects changes in energy use relative to changes in the economy.

However, according to Bernstein, Lempert, Loughran & Ortiz (2000) other factors affect energy intensity levels of a state, such as "age of the capital stock, climate, and energy policy" and provide that energy intensity is a "noisy indicator" of for measuring changes in production methods as seen in industrial efficiency measures and the introduction of more energy efficient technologies, as in the transportation sector (2000, 51). The strength of energy intensity data, accounts for both economic development and energy reductions. Because the purpose of this study is to analyze regulatory policy impact, a policy analysis framework is used.

4. METHODOLOGY & ANALYTICAL FRAMEWORK

This study follows an empirical research design using the case study method, i.e. within-case design with spatial variation, which is intended to be an acute study within a case in order to understand a larger class of similar units, or the population (Gerring 2007). In this case the population is the United States. Case studies provide for more depth in the study, case comparability and an insight into causal mechanisms. The value of within-case analysis allows for a tight focus and in-depth analysis of a given sample of the population, by explaining the specific features of a given event beyond the simple occurrence of events, which can be explained through case studies (Gerring 2007).

A critique of the with-in case study is that boundedness is weak, and forgoes generality, though it makes up for this weakness in terms of depth of understanding about a limited area as opposed to the cross-case studies whose design tests inferences explicitly. Generalizations, which cannot be based on a within-case investigation, are not a threat to the analysis since the objective of this study is to explore in depth the various reasons behind US energy inefficiencies. Descriptive insights can be drawn as opposed to providing just a broader and more representative and comparable overview, which falls short in specificity and depth.

Data for the research was collected from secondary sources. Research was conducted through the review of relevant literature on energy efficiency, governmental and industry reports, legal documents as well as state and national level statistical data on energy indicators. The focus of this study is on the US energy sector and its inefficiencies. Individual states in the US share numerous commonalities with the other states in terms of structural legacies in the energy sector such as state-owned monopolies, high import dependence, high-energy intensity, governance problems, and others.

The findings of this within-case study will elucidate essential factors that should be addressed concerning state-level energy policy in order to enhance energy efficiency. These implications can further be relevant to other states beyond the cases selected, which face similar problems, and lead to possible solutions to promote a national over-haul of energy infrastructure and governance in the US. The study could have important implications both for state and national level policy makers as it aims to expose the reasons behind failures in US energy policy. The sample cases explored in this study can be an example and further used as a comparison to other states' cases of energy efficiency policy options that draw inference and further insights as to why the process of creating a more efficient America has been progressing so slowly and ineffectively at the national level.

This comparison employs two in-depth case studies of states chosen on the basis of similarities relative to the Interest Group and Economic Regulation Theory. For the case comparison of Texas and California, the study will focus on the composition of the labor force in each state. This structure will indicate the capital markets with in each state, which contribute to the strength of interests groups in each state's energy sector. Thus evaluate and measure the decision-making mechanisms determining energy efficiency at the state level in the US.

The conclusions about the role of interest groups are difficult to gainsay with out controlling for a number of other physical and situational variables such as climate, energy intensity of state industries, and energy source location. For example, the states' climate is constant and geographic locations are immovable and therefore policy will have little impact on inefficiencies from small differences in the states' climates. In addition, the demand for energy is constant. The fact that California must import electricity from its neighbors to the east is not remedied via policy.

Therefore, the efficiency gained from importing industry is not addressed in this study, despite having a possible secondary effect on structure of the political environment of the state. Energy intensity will be looked at later on in the analysis to better control for its impact on efficiency. The purpose at hand is concerning policy-making and therefore, Interest Group and Economic Regulation Theory have most relevance. It adds strength of this case in, where all other plausible explanations for an outcome are disparate.

4.1 The Logic of the Model

According to the Cochran, Doris, & Vorum study the fundamental theme of energy efficiency policies is that of "market transformation, defined as permanent success of energy efficiency technologies in the marketplace" (2009, 5). Strategies to achieve this have two primary categories that contribute to opening, and expanding markets for energy efficiency; 'barrier reduction', which is the focus of this study, and 'technological accessibility' (Brown & Busche, Geller & Nadel in Cochran, Doris, & Vorum 2009, 5). To control for technological advancement and accessibility, this study assumes that both Texas and California have perfect accessibility at equally advanced levels. Barrier reduction policies remove barriers or constraints from energy efficiency (2009). They include performance standards policies and create clear criteria, which help streamline regulatory approval for adoption (2009).

This study uses an empirical model that employs state characteristics as indicators of its likelihood to adopt energy efficiency policies. This takes the states of California and Texas, and looks at two popular energy efficiency policy measures outlined by the EIA (2009) and ACEEE (2011): decoupling regulations targeting natural gas and utility efficiency, and vehicle policies targeting efficiency in the US fuel economy.

The cases of Texas and California will use these indicators to rank the state as having high propensity or low propensity to adopt energy efficiency policies, such as decoupling regulations and vehicle fuel regulatory policies, and address some of the most prominent possible constraints to better substantiate the conclusion and prescribe policy solutions.

The main question of this study asks if consumer and producer interests are the cause of constraints on efficiency levels. In addition, the causal relationship implies that the power of interest groups and consumers to influence policy agendas, provision of public goods, and regulations of industrial sectors, makes a substantial impact on state energy efficiency. The empirical model will measure consumer impact, indicated by voting preferences, with the indicator of labor force composition of the state. This indicator assumes that the labor force represents consumers' income and thus consumers do not support that policies and regulation that adversely affect their incomes.

On the producing side, the empirical model will measure associated firms' interest group participation with industrial composition. It assumes that if a majority of a states industrial sector is made up of energy or associated firm's, then the state's energy sector is less likely to support any policy or regulation that would adversely effect gains.

This study addresses policy adoption, and therefore operationalizes energy efficiency by policy adoption or non-adoption of energy efficiency policies. Specifically, decoupling regulation for utilities, and vehicle policies in the US fuel economy are analyzed in the framework set forth by the Interest Group and Economic Regulation Theory.

According the theoretical framework, voters, policy makers, and interest groups all are in constant pursuit of there own interests. Therefore, if consumers make up the labor force, and a large majority of the labor force in a state is receiving its income from associated firms, such as energy dependent, energy intense, energy resource producing, or energy resource distributing. The state will be less likely to adopt an associated energy efficiency policy (vehicle fuel regulatory policy or decoupling regulation), than a state where the labor force majority is receiving a most of their income from others sectors.

If a majority of state's industrial sector is made up of energy associated industries, that state is less likely to adopt energy efficiency policies that would adversely affect those industries, and more likely to adopt an efficiency policies that are in their favor.

A state's energy firms have energy interest groups to protect their interests, as is customary in the US. Firms' interest groups or lobbies are more likely to be active in lobbying when their interests have high stakes in gains. A state that has a large energy industry and energy interest groups are more likely to protect those interests are more likely to be active in lobbying for their interests. Thus, states with a large presence of industries that can be adversely affected by regulatory policies are less likely to adopt efficiency policy.

In order to test the hypotheses proposed, an empirical analysis relates the adoption of a state's efficiency policies to selected state characteristics, resource endowment, and industrial structure variables for Texas and California. This model safely assumes, because of the historical patterns and records of energy interest group participation that states with a large energy sector also have large energy interest groups in place to protect their interests (CRP 2011).

Since natural gas-fired power accounts for half of all the electricity generated in both Texas and California, it is indicative of the industrial interest group that would lobby against the promotion of decoupling regulations. It reflects the adverse effects that utility companies can undergo via decoupling policies. Thus, states with a large presence of industries that can be adversely affected by more stringent energy conservation policies are less likely to adopt measures promoting energy efficiency. After deregulations were enacted in many states, contributions to candidates and parties opposing deregulation more than doubled (CRP 2011).

In recent developments, many large energy firms began investing in more than one energy resource such as renewable resources for both the vehicle fuel economy and power generation. This supports the claim that firms with a larger mix of resource endowments are more likely to adopt regulatory policies promoting energy efficiency (Menz & Vachon 2006). Therefore, if a state, again, is producing most of it GSP from a single energy resource, rather than having investments in more than one energy resource, that firm is less likely to adopt efficiency policies that will adversely affect production consumption or distribution of that resource.

For example the proportion of electricity generated from fossil fuels was positively associated with the adoption of renewable portfolio standards in the study of Menz & Vachon (2006). Thus, if economies of scale can be achieved for alternative resources, as demand incurs or policy prods, big energy firms, investing mainly in oil, would see the potential in endowment into alternative resource production. In fact, this is happening with wind energy in both Texas and California (EIA 2009; Menz &Vachon 2006).

Under past utility structures, regulatory commissions were expected to articulate the desires and protect the interests of the populace, in pursuit of creating efficient outcomes (Pew 2011). However, instead of being "dominated by the companies they regulated", attention was refocused on consumer interest targeting fuel and construction costs (Delmas, Montes-Sancho, & Russo 2007, 204).

To the extent that a firm is more efficient, "generating resources that are well matched to the current conditions should be the less likely to initiate or capitalize on new initiatives that require changes to those resources" (Delmas, Montes-Sancho, & Russo 2007, 195). There is economic demand for energy efficiency, and therefore, power interest groups are responding via multiple endowments. It is not that there aren't possibilities for efficient firms. "Rather, as with utilities heavily invested in coal- fired plants, launching initiatives in alternative power can divert efficient utilities from their strategic intent and compromise the clarity of their strategy" (Delmas, Montes-Sancho, & Russo 2007, 195).

Delmas, Montes-Sancho, & Russo (2007) conclude that a firm can make the strategic shifts necessary to meet both their interests and efficiency demand by mixing its investments. Therefore, reflecting a new strategic imperative for gains. If a firm follows this agenda, it will need to create or invest in those resources in order to respond to the consumer demand. Only by strategically altering its generation mix, will it be able to create value by successfully differentiating.

T. Boone Pickens's recent capital management strategy has exemplified this in their recent investment activity. This strategy entails, investing in renewable powered generation, as well as maintaining capital stocks well grounded in oil and gas (Barber 2009). This strengthens the likelihood of efficiency policies being implemented when endowments in multiple resources are greater.

5. FINDINGS & ANALYSIS

Social interests or the interests of consumers, is primarily to protect their incomes. If a large part of the voting labor force is employed in the energy sector of a state, then a state is less likely to pass an efficiency policy that would adversely affect the livelihoods and incomes of the majority of consumers in that state. However, indicators show that both in California and Texas, the majority of the state labor force is employed in the trade, transportation and utilities industry. Therefore, these states' consumer interests have equal propensities to adopt or not adopt an efficiency policy depending on the expected effect of the policy on their income. This equality suggests that this is not a strong economic driver for enforcing efficiency policies at the state level. While the quantitative analysis testing 48 of the 50 United States, by Menz & Vachon (2006), found that social interests in efficiency policy making was stronger than the impact of producer interest groups. This study is able to control for social interests through using the cases of only two states, which are remarkably similar in their characteristics.

Even so, the example of California's proposition 10 in 2008, which pushed natural gas for vehicle use, received nearly nineteen million dollars in lobbies' donations to support the measure (Barber 2009). Chesapeake Energy gave three million dollars and Westport Fuel Systems, a Long Beach company that makes natural gas engines for heavy-duty trucks, gave a quarter million as proponent of the proposition (2009). The outcome of Proposition 10 indicates that despite the millions of dollars donated in proponing those policy measures; it took only five labor unions with mere pocket change in comparison to kill the policy proposition (2009).

Energy intensity has been the most accepted reason for Texas' low score in energy efficiency despite the similar producing and consuming status of the states. The figure below shows that energy intensity in Texas is appreciably higher than that of other states (Bernstein, Lempert, Loughran, & Ortiz 2000). There are certain industrial activities that require a significantly greater input of energy per dollar of output than others such as mining operations, metal, paper and chemical manufacturing, and petroleum refining. Petroleum and chemical products require significantly more energy to produce one unit than most other industries. The difference is due to the mixture of industries that comprise the industrial sector in Texas as opposed to those in California. This is a plot of the fraction of the gross industrial product due to "energy intensive industry" from 1977 to 1995 (2000, 5). Texas does indeed have a larger share of its industrial product from energy intensive industry.

Accounting for about one-third of all end-use energy in the United States, the industrial sector consumes more energy than any other sector followed by the transportation sector. There are still tremendous opportunities for energy savings, as well as the potential to instill the tenets of energy efficiency in a sector that impacts, employs and influences millions of people.

The industrial sector, working constantly to increase shareholder value and reduce expenses, has found energy efficiency investments to be an attractive avenue to achieve those ends.

Industrial energy efficiency programs have been successful in achieving savings in the industrial sector. The transportation sector is constantly working to decrease fuel used to drive each mile. Though the industrial and transportation sectors are difficult to impact, these sectors provide significant returns on program investments. The policies that underpin these programs include utility regulation and legislation that guides state efforts to advance energy efficiency. Regulations can provide utility incentives to pursue energy efficiency and compensate a utility's lost revenue from energy efficiency measures in a process through decoupling policy. Efficiency programs in the transportation sector include alternative modes of transportation, alternative fuel mixes, and vehicle standards.

According to the Bureau of Labor Statistics both in California and Texas the majority of their labor forces, have the highest concentrations of employment in the Transportation, Trade and Utilities sector (BLS 2011). Non-farming labor force compositions in California and Texas both have highest percentages of their labor forces employed in Trade, Transport, and Utilities industry. Therefore, both in Texas and California an efficiency policy is less likely to pass based on the model used to measure consumer interests. Policy makers are not only influenced by consumer interests, but also environmental justice political contributions and pressure from interest groups, party ideology, and government capacity to endorse and implement policies and endure the transaction costs that accompany them (Cook 2002).

The assumption is that politicians will favor a certain policy if it is supported by a majority of voters. Voting patterns reflect the pressures that politicians receive over time from their respective constituencies. These pressures are a function of consumer demands. A voting history in support of more efficiency policies is associated with a higher likelihood of adoption of such measures (Menz & Vachon 2006).

According to EIA statistics for 2008, end-use-by-sector measurements show that consumption in both Texas and California is nearly equal in commercial and residential use. However, in transportation end-use consumption is much higher in California than in Texas (EIA 2008). In addition, the industrial sector in Texas has much larger end-use consumption than in California (EIA 2008). Therefore under the measurement of the model, these two states are less likely to pass an efficiency policy that would drive costs up in the transportation sector in California and in the industrial sector in Texas.

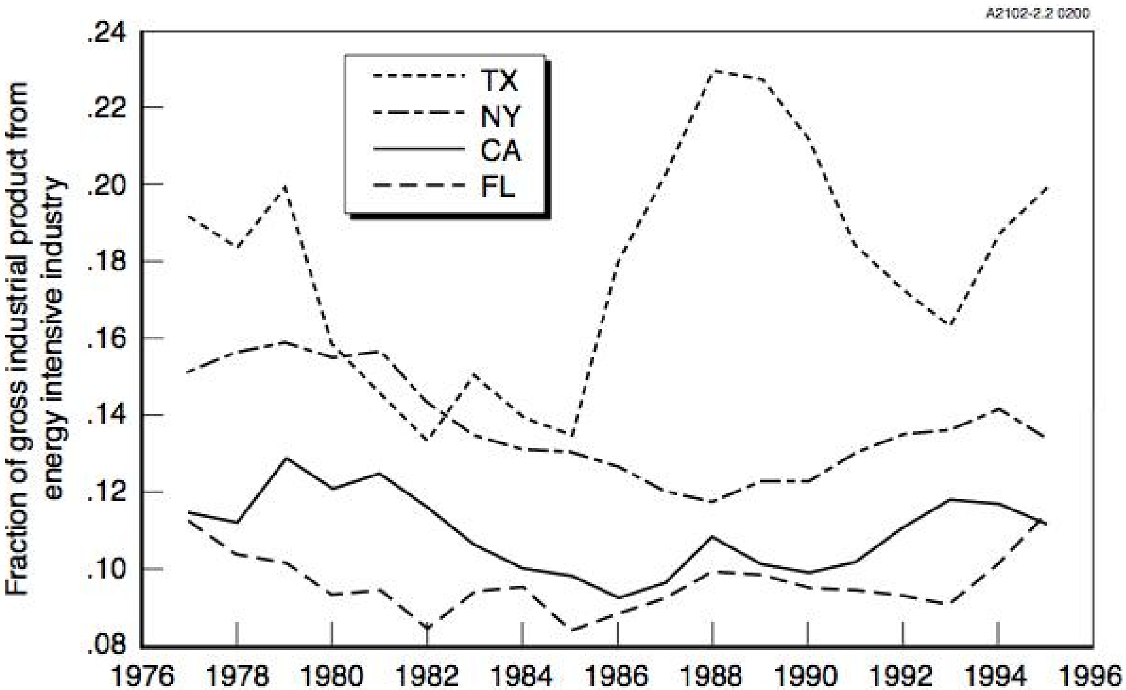

Figure taken from Bernstein, Lempert, Loughran & Ortiz 2000

The scoring methods used in this study show that energy intensity, defined as "aggregated physical energy units per unit of value added (tons of oil-equivalent per dollar), measured at the sectoral level" (Fredriksson & Vollebergh 2009, 218), equates California and Texas again, though in different sectors. California has the most energy intense transportation sector in the nation, and Texas has the most energy intense industrial sector in the nation (EIA 2009; ACEEE 2011).

The indicator, according to the model, puts both states again on an equal playing field and again strengthens the research goals of this study to better target and focus in on the most prominent constraint afflicting energy efficiency in the US today. To bring the last two variable indicators together, Dijkgraaf, Fredriksson, & Vollebergh (2004) found that stakes are greater insofar as, regulation being adverse to income, in energy policy outcomes in energy intensive sectors, given the larger amount of energy per unit of output used in these sectors.

Energy producers' interest and associated firms in the energy sector have big interest groups to protect their interests. Lobbies for Exxon Mobil, one of the largest energy producers in the US, were the fourth largest contributor to political campaigns in the 2009-2010 period (CRP 2011). Chief Oil and Gas was fifth largest (2011). These producers are both Texas based firms.

From the total of lobby donations recorded in 2010, seventy-five percent (75%) went to the Republican political party (CRP 2011). This suggest that in a state where the political party preference is Republican, interest groups have more impact and influence upon policy making. In turn, this would impact the ability of Texas, a Republican state, to implement an efficiency policy, assuming that it would adversely affect energy producers and associated industries interest, because their lobbies have more influence on policy makers via large donations.

Where as in California, a Democratic state, has fewer donations and energy producer interest groups have less impact and influence on policy making. This can also explain why California has made major strides at executing energy efficiency policies in it most inefficient sector. In Texas however, efficiency policies do not penetrate the industrial sector, the stats most inefficient sector.

Texas and California are home to some of the largest energy firms in the world, such as Chevron Corporation, Edison Electric Institute, ConocoPhillips and ExxonMobil. Therefore, they are home to some of the most powerful lobby groups. These companies have an established legacy in government and policy making. This is shown through donations in past energy efficiency bills (CRP 2011). They have donated millions of dollars to the opposition or proposition of efficiency bills according to gains or losses expected from their enactment. Electric utilities contribute the most to campaigns according to the Center for Responsive Politics (2011).

In the most recent elections, oil and gas companies have donated millions to political campaigns. Lobbies therefore, have always been blamed for diluting policy moves in favor of efficiency and conservation in the US.

Greater contributions from lobbies according to Fredriksson & Vollebergh (2009) reduce the adversity of an energy policy, by shifting a policy maker's focus from welfare to potential gains. In this way, the producers' donation is facilitating influence on the policy maker's decision, consistent with the Interest Group and Economic Regulation Theory. This suggests that lobby participation is a strong indicator of a state's propensity to adopt or not adopt a policy.

Fredriksson Dijkgraff, & Vollebergh's study found that interests group donations strongly correlate with the energy intensity of production (2004). This suggests that the strongest and most influential interest groups are those of the energy intense sectors. In California, the transportation is the state's most energy intense sector. In Texas, industrial production and manufacturing is the state's most energy intense sector. This figure shows the top contributing lobbies in 2010 by sector in both utilities and transportation (CRP 2011).

Table 1. Top Contributing Lobby Industries in Energy and Natural Resources Sector 2010

Industry	Total
Electric Utilities	$191,344,085
Oil & Gas	$145,892,043
Misc Energy	$65,883,444
Mining	$29,324,919
Environmental Services/Equipment	$8,057,356

Tables provided by the Center for Responsive Politics (CRP) 2011:
http://www.opensecrets.org/industries/indus.php?ind=E&goButt2.x=7&goButt2.y=6&goButt2=Submit

Table 2. Top Contributing Lobby Industries in Transportation Sector 2010

Industry	Total
Air Transport	$88,216,610
Automotive	$59,123,319
Railroads	$44,113,612
Sea Transport	$25,370,078
Misc Transport	$16,096,482

6. IMPLICATIONS & CONCLUSIONS

This study and its findings have important implications both for state and national level policy makers. The study exposes the constraints on efficiency policies at the state level as significantly attributed to interest group activities. For example, reducing donations by limiting the amount interest groups are allowed to contribute, which includes addressing the numerous wording loopholes in qualifying interests groups' donations, would have the indirect benefit of improving energy efficiency in energy intense sectors.

Another implication is for states to encourage multiple resource endowments. If a large firm is putting heavy constraints via lobbing on efficiency policies, then a state might execute a program to incentivize multiple resource endowment, which in turn would make potential losses to producers and associated firms much less of a threat to their businesses. It becomes less of a risk if firms allow efficiency measure to be implemented, possibly adversely affecting their gains in one resource if they are also well invested into other resource revenues as well. Then a state can successfully implement efficiency policies with less threat of losing major firms' endorsements.

In conclusion, this study has contributed to the academic and policy debate over the cause of inefficiencies that plague the US, despite its wealth and technological advancements. The dynamic of the within case study proved a strong method of focus because the sample units, California and

Texas resemble one another in so many ways. The usual suspects, social interests, and energy intensity, were eliminated as the main cause for constraint, and variables beyond the capabilities of policy to solve, location and climate, are controlled for. Thus, in comparing only two cases, the true culprit attributing to major state level sectoral constraints of energy efficiency are shown to be the influence and power of energy producer and associated firms' interest groups.

The findings coincide with the Interest Group and Economic Regulation Theory, which fundamentally pins down the rationale that all major stakeholders, firms, consumers, and policy makers, are in constant pursuit of self-interests. This theory goes on to explain the causal mechanism, the interest group's influence in the form of donations, on the policy maker's and therefore the state constituency's propensity to adopt an energy efficiency policy. In addition, it can explain the effects of regulations on the allocation of resources. When the costs of a more efficient use of a resource threatens potential gains to firms, lobbies up the ante, seen in the historical trends of increased donations to political campaigns, which coincide with the growth in efficiency demand in the energy sector.

The study shows Texas as having less propensity to adopt an energy efficiency policies. This is not due to consumer interests, protecting their pocket books. Nor is it because of the energy intensity of top GSP providing sectors. As the theory shows it is certainly not for energy efficiencies sake. The main cause of Texas' failure to adopt energy efficiency policies, such as utility decoupling or transportation policies in their state, is that it is not in policy makers' best interest to adopt a policy that would directly affect endorsement a financial donation potential to be gained when supported by major sectoral firms, in the pursuit of getting elected or re-elected.

Now that interest group's are clearly established as major constraints to energy efficiency on the state level, further policy analysis can spearhead the development of constitutional means to strategically maneuver and displace the influence of interest groups from the policy making process and therefore lead the US into a more energy efficient era.

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APPENDIX

Data provided by the American Council for Energy- Efficient Economy (ACEEE) 2011 http://www.aceee.org/sector/state-policy

Policy	CA	TX
Utility Policies		
Customer Energy Efficiency Programs	☐	☐
Energy Efficiency Program Funding	☐	☐
Energy Efficiency Resource Standards	☐	☐
Alternative Business Models	☐	-
Reward Structures for Successful Energy Efficiency Programs	☐	☐
Energy Efficiency as a Resource	☐	☐
Appliance Standards	☐	-
Building Codes	☐	☐
Clean Distributed Generation		
Interconnection Standards	☐	☐
Financial Incentives for CHP	☐	-
Standby Rates	☐	☐
Output-Based Emissions Regulations	☐	☐
CHP in Renewable Portfolio/Energy Efficiency Standards	-	☐
Net Metering	-	-
Vehicle Policies		
Tailpipe Emissions Standards	☐	-
Financial Incentives for Efficient Vehicles	☐	-
Transport System Efficiency	☐	-
Lead by Example Initiatives		
Building Requirements	☐	☐
Product procurement	☐	☐
Fleets	☐	-
Energy Savings Performance Contracting: Enabling Legislation	☐	☐
Financial Incentives	☐	☐
Climate Change Policies	☐	-

Consumption, Price, and Expenditure Estimates	State Energy Data System (SEDS)

State Energy Data System 2008
Released: June 30, 2010
Complete 2009 Data Release: Last Week of June 2011

Table R3. Total Energy Consumption, Gross Domestic Product (GDP), Energy Consumption per Real Dollar of GDP, Ranked by State, 2008

Rank	Total Energy Consumption		Gross Domestic Product (GDP)		Energy Consumption per Real Dollar of GDP	
	State	Trillion Btu	State	Billion Chained (2000) Dollars	State	Thousand Btu per Chained (2000) Dollar
1	Texas	11,552.2	California	1,546.1	Wyoming	24.9
2	California	8,381.5	New York	964.8	Louisiana	24.1
3	Florida	4,447.4	Texas	925.5	Alaska	21.7
4	Illinois	4,088.7	Florida	603.5	North Dakota	18.2
5	New York	3,988.1	Illinois	516.1	West Virginia	17.9
6	Ohio	3,987.0	Pennsylvania	443.7	Mississippi	16.5
7	Pennsylvania	3,899.7	New Jersey	390.4	Montana	15.9
8	Louisiana	3,487.5	Ohio	385.6	Kentucky	15.6

9	Georgia	3,015.4	Georgia	329.5	Alabama	15.1
10	Michigan	2,918.3	North Carolina	329.4	Oklahoma	15.0
11	Indiana	2,857.4	Michigan	326.1	Arkansas	14.2
12	North Carolina	2,702.2	Virginia	324.5	Indiana	13.6
13	New Jersey	2,637.1	Massachusetts	312.5	South Carolina	13.1
14	Virginia	2,513.7	Washington	264.6	Iowa	12.8
15	Tennessee	2,261.1	Maryland	220.9	Texas	12.5
16	Alabama	2,065.0	Minnesota	217.0	Nebraska	11.7
17	Washington	2,050.2	Arizona	210.2	Maine	11.6
18	Kentucky	1,982.8	Tennessee	210.2	Idaho	11.6
19	Minnesota	1,979.1	Indiana	209.9	Kansas	11.6
20	Missouri	1,937.0	Colorado	203.0	South Dakota	11.6
21	Wisconsin	1,862.4	Wisconsin	198.3	New Mexico	11.3
22	South Carolina	1,659.5	Missouri	193.8	Tennessee	10.8
23	Oklahoma	1,603.4	Connecticut	177.7	Ohio	10.3
24	Arizona	1,552.8	Oregon	147.1	Missouri	10.0
25	Colorado	1,498.1	Louisiana	144.9	Wisconsin	9.4

26	Massachusetts	1,475.0	Alabama	137.1	Georgia	9.2
27	Maryland	1,446.9	South Carolina	127.1	Minnesota	9.1
28	Iowa	1,414.4	Kentucky	127.0	Utah	9.1
29	Mississippi	1,185.6	Iowa	110.4	Michigan	8.9
30	Kansas	1,135.6	Oklahoma	106.9	Pennsylvania	8.8
31	Arkansas	1,124.7	Nevada	103.2	North Carolina	8.2
32	Oregon	1,104.7	Kansas	98.1	Illinois	7.9
33	West Virginia	830.8	Utah	87.7	Washington	7.7
34	Connecticut	809.9	Arkansas	79.2	Virginia	7.7
35	Utah	799.4	District of Columbia	74.8	Oregon	7.5
36	Nebraska	781.9	Mississippi	71.7	Arizona	7.4
37	Nevada	750.1	Nebraska	66.6	Colorado	7.4
38	New Mexico	693.3	New Mexico	61.4	Florida	7.4
39	Alaska	650.8	New Hampshire	50.6	Nevada	7.3
40	Wyoming	541.6	Hawaii	49.8	Vermont	7.1
41	Idaho	529.3	Delaware	49.2	New Jersey	6.8
42	Maine	469.3	West Virginia	46.3	Maryland	6.6
43	North Dakota	440.9	Idaho	45.5	New Hampshire	6.2
44	Montana	434.3	Maine	40.3	Delaware	6.0
45	South Dakota	350.2	Rhode Island	38.1	Rhode Island	5.8
46	New Hampshire	311.3	South Dakota	30.3	Hawaii	5.7
47	Delaware	295.3	Alaska	30.0	California	5.4

48	Hawaii	283.8	Montana	27.3	Massachus etts	4.7
49	Rhode Island	220.1	North Dakota	24.3	Connecticut	4.6
50	District of Col umbia	180.4	Wyoming	21.8	New York	4.1
51	Vermont	154.4	Vermont	21.7	District of C olumbia	2.4
	United States	99,382.1	United States	11,523.6	United Stat es	8.6

Web Page: All data available at http://www.eia.gov/emeu/states/_seds.html under "Complete Data Files."

Sources: Data sources, estimation procedures, and assumptions are described in the Technical Notes.

Data based on 2008 statistics provide by the Energy Information Administration and the US Department of Energy 2010.

http://www.eia.gov/emeu/states/hf.jsp?incfile=sep_sum/plain_html/rank_use_gdp.html