The 50 State Index of ENERGY REGULATION

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Executive Summary

Energy is an essential part of our daily lives. Whether making the morning coffee, traveling to work, using computers, manufacturing goods, cooking dinner, or watching TV before bed, energy touches nearly every aspect of our lives.

The energy that we consume is primarily generated from oil, natural gas, and coal. But, it also includes nuclear power, hydroelectric dams, wind farms, and solar energy. All of these energy sources are subject to regulations, both federal and state.

Federal regulations on energy are expanding. For instance, the Environmental Protection Agency (EPA) has proposed regulations in June 2014 that, if implemented, would require a 30 percent reduction in carbon dioxide emissions relative to 2005 by 2030. This proposal exemplifies the expanding reach of federal regulations as well as the timeliness and importance of evaluating energy regulations at both the federal and state levels.

The *50 State Index of Energy Regulations* does not incorporate federal regulations because all states must comply with these regulations. It is important to note that equal compliance does not imply equal impact. For instance, the EPA's proposed carbon dioxide regulations will impact states with relatively more coal-fired power plants more than states with relatively fewer coal-fired power plants. Additionally, expanding federal regulations reduces the variation in energy regulations across the states, thereby impacting states differently as well.

Historically, state energy regulations have focused on utilities, gas stations, motor vehicle fuels, and the level of energy consumption. However, the energy market continues to evolve in remarkable ways, and regulations are changing in response. State regulations now also focus on how electricity can be generated and the types of energy products consumers can use. Even the regulation of utilities has changed. Your local utility likely is no longer "your father's" utility. Seventeen states now separate electricity generation and transmission in order to give residents and industries a choice from whom to purchase power. As a result, regulations increasingly affect independent electricity generators as well.

There are also monumental changes to the regulation of technologies used to produce energy, especially in the area of drilling technologies. Thanks to the hydraulic fracturing (fracking) revolution (the process of injecting pressurized fluids into wells in order to fracture the rocks and extract more oil and natural gas from each well), the price of natural gas has plummeted and the United States, once obsessed with its dependence on the Middle East for energy, is now projected to become the world's top producer of oil by 2015. With that growth, however, this process has come under increased public scrutiny.

Amidst all this change, state regulations are altering the evolutionary path of the energy industry. To evaluate regulation's impact requires a consistent framework that can distinguish between public policy with a positive effect and policy with a negative one. Any such framework has a specific perspective, and whether the effect is positive or negative will be sensitive to the perspective chosen.

The *50 State Index of Energy Regulation* is not a political perspective. It is not trying to prove whether left wing or right wing arguments are correct. It is indifferent to whether red states or blue states rank higher. Nor does the *Index* adopt the perspective of those who are concerned or not concerned with climate change. As economists, we have adopted a basic economic perspective, economic efficiency, defined as allocating resources to their most productive uses. The effects of policies are evaluated, as objectively as possible, solely from that perspective. Policies that promote economic efficiency receive higher scores, those that reduce economic efficiency receive lower scores. Given the regulatory variation across states, a picture emerges of where in the country the regulatory environment for energy consumption, production, and distribution is relatively more economically efficient.

This economic efficiency approach does not deny that there are other concerns such as pollution or implications for geopolitical strategy and security. Instead, the economic efficiency approach supplies a useful perspective on state energy regulations. It also provides an important contribution to uncovering what data exist for defining and measuring the relative regulatory implications across the states. We welcome efforts to extend the economic efficiency perspective to include other concerns.

The economic efficiency perspective is also indifferent to the source of data. Whether the data come from the U.S. Department of Energy, conservation groups. or energy industry organizations is not the defining factor. Data from all three are used in this study. The primary concern is that the data are consistent and reliable across all the states.

Care must be used in interpreting the final rankings. *The 50 State Index of Energy Regulation* is ordinal, meaning only the ranking order has information. The distance between absolute scores does not provide useful interpretation. The use of ordinal measures follows the tradition of many other well-known indices such as the World Bank's *Doing Business*, Transparency International's *Transparency Index*, and the *Wall Street Journal*/Heritage Foundation's *Index of Economic Freedom*.

Evaluating the regulatory environment from an economic efficiency perspective requires asking the right questions. The questions must capture for each state how regulations affect all energy industries and their consumption, production, and distribution decisions. In the end we condense a state's energy industry into seven component indices or sets of questions that form the core of the *Index* scoring and rankings. These core issues are:

1. What are the degrees of retail choice among energy suppliers for consumer, industrial, and commercial customers?

2. How stringent are restrictions on electricity production?

3. Are there restrictions on the transportation and transmission of energy?

4. What green technology subsidies does the state provide and how do these affect economic efficiency?

5. What are the regulations designed to reduce energy consumption including appliance and building code standards, and does the resulting drop in energy use trigger de-coupling or lost revenue recovery?

6. Do producers have flexibility to allow utility prices to fluctuate with market conditions? Can utilities easily adjust prices to reflect the costs of new plants and the rise in wholesale prices? What is the ease of constructing new utility plants?

7. How do regulations affect motor vehicles? How much of the gas price is state taxes? Can station owners offer self-serve pumps? Must refiners include renewable fuels in every gallon of gasoline? Are there idling or emissions standards that must be met? Are the fuel economy standards in a state higher than federal standards?

The answers to the questions come from data. The data in turn create a 10-point scale for each of the seven component indices. A score of 1 means a state's energy regulatory environment is relatively economically efficient (easy to allocate resources to where they are most productive), and 10 means a relatively inefficient economic environment (very difficult to efficiently allocate resources).

A state's overall ***50 State Index*** score is the simple average of the seven component indices for that state. Comparing the scores for the 50 states generates the ordinal rank. The results from the *Index* are summarized in Table ES-1.

Several patterns emerge from the overall *Index*. First, there is little relationship between whether a state has substantial energy resources like oil, gas, and coal, and whether its regulations are economically efficient. Some big producing states like Texas and Alaska are ranked at the very top, yet California, another major energy producing state, is at the very bottom.

There is, however, a geographical pattern. States on the West Coast, in the Northeast, and in the upper Midwest have the most economically inefficient energy regulations. In contrast, states in the South and the heart of the country have regulatory environments more conducive to efficient allocation in production and consumption of energy.

The most interesting relationship is between a state's ranking and its economic growth rate. High ranked states on average grow faster than those ranked low. Moreover, the higher rate of economic growth is associated with faster employment growth. Energy regulation can, therefore, be an important factor in determining the eventual prosperity of a state.

This relationship makes sense. Energy is one of the essential ingredients that drives economic growth in a modern economy. Consequently, states that encourage the efficient production and consumption of energy should be expected to experience faster economic growth than those states that discourage economic efficiency in the energy marketplace. The *50 State Index of Energy Regulation* supports that conclusion.

The Relative Economic Efficiency of State Energy Regulations

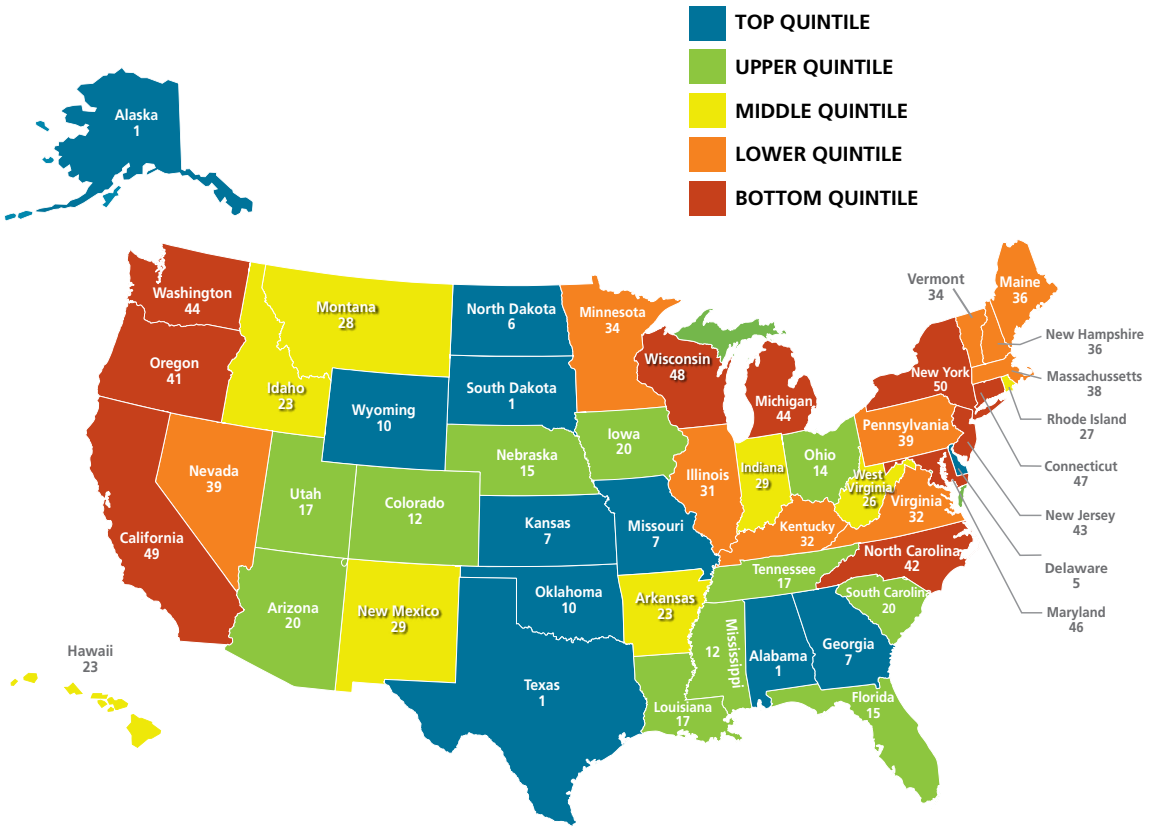


Table ES-1: The 50 State Index of Energy Regulation

	Rank	Average Score	Regulations Affecting Retail Choice for Electricity	Regulations Affecting Production of Electricity	Regulations Affecting Transmission of Energy	Regulations: Subsidies & Net Metering	Regulations Affecting Consumption of Energy from Utilities	Regulations Affecting Producer Flexibility	Regulations Affecting Motor Vehicles
Alabama	1	4.29	10.0	1.0	2.0	2.0	5.0	8.0	2.0
Alaska	1	4.29	10.0	1.0	5.0	7.0	1.0	5.0	1.0
South Dakota	1	4.29	10.0	3.0	3.0	2.0	1.0	7.0	4.0
Texas	1	4.29	2.0	2.0	8.0	4.0	5.0	7.0	2.0
Delaware	5	4.48	6.3	4.0	2.0	4.0	5.0	6.0	4.0
North Dakota	6	4.57	10.0	3.0	3.0	3.0	2.0	8.0	3.0
Georgia	7	4.86	10.0	1.0	3.0	5.0	7.0	5.0	3.0
Kansas	7	4.86	10.0	5.0	6.0	3.0	2.0	5.0	3.0
Missouri	7	4.86	10.0	2.0	5.0	6.0	1.0	8.0	2.0
Oklahoma	10	5.00	10.0	4.0	3.0	6.0	4.0	5.0	3.0
Wyoming	10	5.00	10.0	2.0	5.0	5.0	3.0	8.0	2.0
Colorado	12	5.14	10.0	5.0	7.0	5.0	1.0	5.0	3.0
Mississippi	12	5.14	10.0	1.0	6.0	2.0	4.0	8.0	5.0
Ohio	14	5.24	7.7	3.0	6.0	5.0	6.0	6.0	3.0
Florida	15	5.29	10.0	2.0	6.0	4.0	5.0	5.0	5.0
Nebraska	15	5.29	10.0	1.0	2.0	4.0	5.0	10.0	5.0
Louisiana	17	5.43	10.0	2.0	5.0	5.0	5.0	7.0	4.0
Tennessee	17	5.43	10.0	1.0	7.0	4.0	4.0	10.0	2.0
Utah	17	5.43	10.0	4.0	5.0	6.0	5.0	5.0	3.0
Arizona	20	5.57	10.0	3.0	7.0	5.0	4.0	5.0	5.0
Iowa	20	5.57	10.0	2.0	5.0	6.0	5.0	7.0	4.0
South Carolina	20	5.57	10.0	1.0	6.0	5.0	6.0	7.0	4.0
Arkansas	23	5.71	10.0	1.0	10.0	5.0	5.0	7.0	2.0
Hawaii	23	5.71	10.0	3.0	4.0	7.0	4.0	7.0	5.0
Idaho	23	5.71	10.0	1.0	6.0	4.0	6.0	9.0	4.0
West Virginia	26	5.86	10.0	3.0	4.0	3.0	5.0	8.0	8.0
Rhode Island	27	6.00	4.0	4.0	5.0	5.0	10.0	8.0	6.0
Montana	28	6.05	7.3	5.0	3.0	8.0	7.0	8.0	4.0
Indiana	29	6.14	10.0	3.0	4.0	4.0	7.0	8.0	7.0
New Mexico	29	6.14	10.0	5.0	4.0	7.0	5.0	8.0	4.0
Illinois	31	6.19	5.3	6.0	5.0	9.0	8.0	6.0	4.0
Kentucky	32	6.29	10.0	2.0	6.0	8.0	7.0	7.0	4.0
Virginia	32	6.29	10.0	3.0	8.0	7.0	6.0	6.0	4.0
Minnesota	34	6.43	10.0	7.0	7.0	8.0	4.0	6.0	3.0
Vermont	34	6.43	10.0	3.0	6.0	8.0	5.0	7.0	6.0
Maine	36	6.48	6.3	9.0	8.0	6.0	1.0	8.0	7.0
New Hampshire	36	6.48	6.3	5.0	10.0	8.0	7.0	6.0	3.0
Massachusetts	38	6.52	7.7	5.0	7.0	9.0	7.0	6.0	4.0
Nevada	39	6.57	10.0	5.0	4.0	7.0	7.0	9.0	4.0
Pennsylvania	39	6.57	8.0	5.0	6.0	10.0	5.0	5.0	7.0
Oregon	41	6.62	9.3	3.0	4.0	10.0	8.0	7.0	5.0
North Carolina	42	6.71	10.0	2.0	6.0	7.0	7.0	9.0	6.0
New Jersey	43	6.81	5.7	5.0	9.0	10.0	6.0	8.0	4.0
Michigan	44	6.86	9.0	4.0	7.0	7.0	6.0	8.0	7.0
Washington	44	6.86	10.0	4.0	8.0	4.0	9.0	8.0	5.0
Maryland	46	7.10	4.7	5.0	5.0	10.0	9.0	9.0	7.0
Connecticut	47	7.14	6.0	6.0	7.0	8.0	8.0	9.0	6.0
Wisconsin	48	7.29	10.0	5.0	8.0	9.0	6.0	7.0	6.0
California	49	7.71	9.0	7.0	7.0	9.0	8.0	5.0	9.0
New York	50	7.86	8.0	9.0	8.0	10.0	7.0	6.0	7.0

THE 50 STATE INDEX OF ENERGY REGULATION

Energy is an important part of our daily lives from making our morning coffee, to traveling to work by car or mass transit, to using our computers, and to cooking dinner and relaxing in front of the TV before bed. Imagine a world without these everyday conveniences. Clearly our lives would resemble more those of our forefathers of the 17th and 18th centuries than what we have come to expect. In a word energy is *essential* to our current way of life and standard of living.

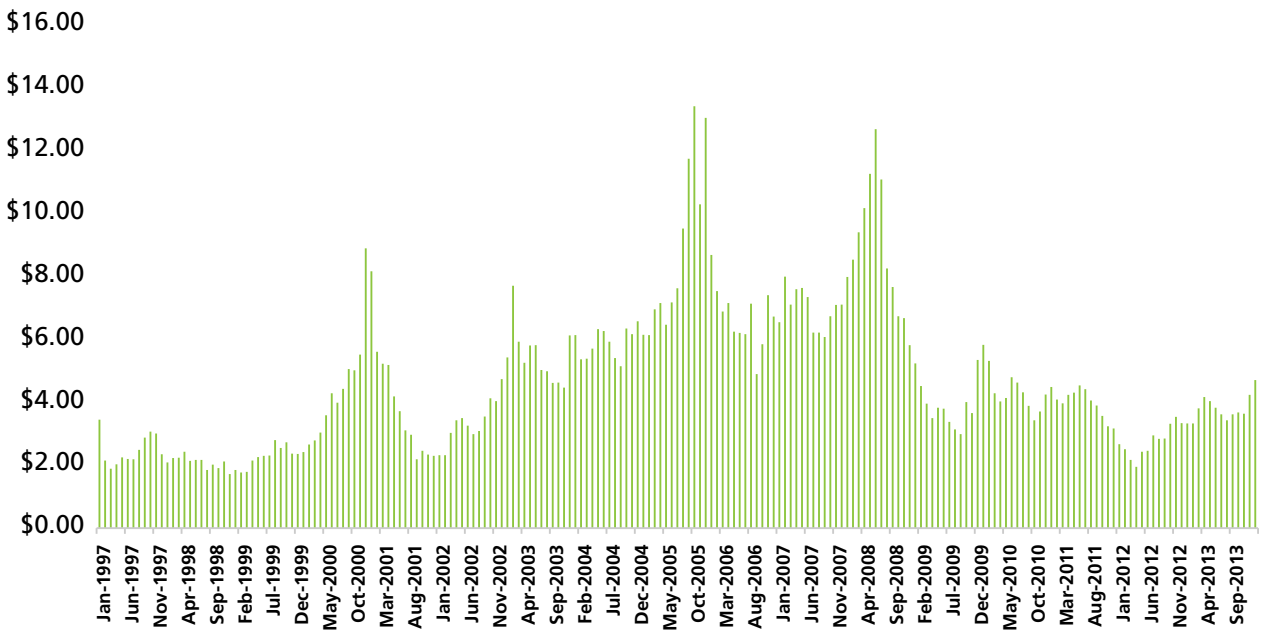
Moreover, energy is becoming even more essential. Total energy expenditures comprise 8.3 percent of our economy.[1] And, thanks to hydraulic fracturing (also referred to as fracking, or the process of injecting pressurized fluids into wells in order to fracture the rocks and extract more oil and natural gas from each well) and other technological advances, the energy industry has been experiencing an economic resurgence. A 2012 Merrill Lynch research note estimates that the new energy extraction technologies, and the resulting increase in energy supplies, contributed 2.2 percentage points of growth to U.S. GDP between January 2010 and the end of 2011.[2]

In tandem with the accelerated growth, the composition of the energy market continues to evolve. The change is nothing short of remarkable. For example, residential electricity customers can now produce their own solar powered energy and possibly sell the excess back to the utility.[3] Moreover, the use of wind power is growing. In January 2014 wind accounted for almost five percent of the U.S. electricity.[4] Ironically, some of the places getting the most electricity from wind are such gas rich states as Texas, Oklahoma, and Colorado.[5] Some attribute this growth to the tax credit subsidy for wind generation that expired at the end of 2013.[6]

With the increase in supply through fracking, domestic natural gas prices have tumbled (Figure 1).[7] In 2013 natural gas prices were about half what they had been in 2007.[8] One side effect of this fall in natural gas prices is the impact on the competition between coal and natural gas generated electricity. The drop in natural gas prices in the U.S. has made coal much less competitive. One implication is a reduction in carbon emissions from electricity generation.[9]

Another implication of the explosive growth of both traditional and renewable energy is that our position in world energy markets is changing drastically. Since at least the 1970s, politicians and pundits have bemoaned the fact that so much of our energy is imported from places like Venezuela and the Middle East.[10] However, in November 2013 the International Energy Agency announced that by 2015 the United States would become the world's top oil producer, bigger than either Russia or Saudi Arabia.[11] The Energy Information Administration now estimates that "The net import share of total U.S. energy consumption [will be] 4 percent in 2040, compared with 16 percent in 2012 and about 30 percent in 2005."[12]

Figure 1
Henry Hub Natural Gas Spot Price (Dollars per Million Btu)[13]



Regulations affect the evolutionary path of the energy industry, both federal and state. At the federal level, energy regulations are expanding as exemplified by the EPA's proposed regulations in June 2014 that, if implemented, would require a 30 percent reduction in carbon dioxide emissions relative to 2005 by 2030. The *Index* does not incorporate federal regulations, however, because all states must equally comply with the federal regulations.

It is important to note that equal compliance does not imply equal impact. For instance, the EPA's proposed carbon dioxide regulations will impact states with relatively more coal-fired power plants more than states with relatively fewer coal-fired power plants. Additionally, expanding federal regulations reduce the variation in energy regulations across the states.

In addition to the federal government's expanding labyrinth of energy regulations, the energy industry must comply with the rules and restrictions implemented by all 50 states. State regulations significantly affect choices in the energy market, since they apply to all aspects of the energy industry from drillers and miners to the final sale of energy to the consumer.

From an economic efficiency perspective, meaning that resources are allocated to where they are most productive, some state regulations distort decisions by directly raising costs. Other regulations reduce the ability of producers to respond efficiently to changing market conditions or changing technological availability. Still other regulations *improve* economic efficiency. For example, seventeen states have deregulated at least some energy purchased through the local utility, so that residential, commercial, and industrial customers can choose their provider of electricity or natural gas, even possibly negotiating a price. On the other hand, sometimes regulations change consumers' ability to obtain preferred energy products.

For many regulations, states can choose from a wide spectrum of possible regulatory approaches. The broad range of regulatory options means that the cost of producing energy and the ease of consuming energy

can vary significantly across the states. As the vector of regulations varies from state to state, the economic efficiency of the energy sector varies as well.

The *50 State Index of Energy Regulation* captures the variation in the regulatory environment for energy consumption, production, and distribution across states. The goal is to indicate the relative degree of difficulty for consuming energy and operating energy-related businesses in one state compared with another.

The *50 State Index of Energy Regulation* focuses on the degree of regulation in a state and how it affects the economic efficiency of the energy sector's evolution—only that. Other targets await the efforts of others. We hope that the work that we have done in creating a framework and identifying and collecting relevant data and information will provide a springboard for future research into this dynamic economic market.

How the Regulatory Environment Is Measured

The *50 State Index of Energy Regulation* captures how the regulatory environment for energy consumption, production, and distribution varies across states. The goal is to indicate the relative degree of difficulty for consuming energy and operating energy-related businesses in one state compared to another. Any such framework has a specific perspective, and whether the effect from a regulation is positive or negative will be sensitive to the perspective chosen.

The *50 State Index of Energy Regulation* in undertaken from an economic perspective. It is not a political perspective. It is not trying to prove whether left wing or right wing arguments are correct. It is indifferent to whether red states or blue states rank higher. Nor does the *Index* adopt the perspective of those who are concerned or not concerned with climate change. As economists, we have adopted a basic economic perspective, *economic efficiency*, defined as allocating resources to their most productive uses.[14] The effects of policies are evaluated as objectively as possible, *solely* from that perspective. Policies that promote economic efficiency receive better scores, those that reduce economic efficiency receive worse scores. Given the regulatory variation across states, the *Index* rankings provide a picture of where in the country the regulatory environment for energy consumption, production, and distribution is relatively more economically efficient.

This economic efficiency approach does not deny that others have concerns such as pollution or implications for geopolitical strategy and security. Instead, it supplies an important framework from which to evaluate the alternative approaches to state energy regulations. The *Index* also identifies the important first step of uncovering what data exist and using that data to define and measure the relative regulatory implications across the states. We welcome efforts to extend the economic efficiency perspective to include other concerns.

The economic efficiency perspective is also indifferent to the source of data. Whether the data come from the U.S. Department of Energy, conservation groups, or energy industry organizations is not the defining factor. Data from all three are used in this study. The primary concern is that the data are consistent and reliable across all the states.

Care must be used in interpreting the final rankings. The *50 State Index of Energy Regulation* is ordinal, meaning only the ranking order has information. The distance between absolute scores does not provide useful interpretation. The use of ordinal measures follows the tradition of many other well-known indices such as the World Bank's *Doing Business*, Transparency International's *Corruption Perceptions Index*, and the *Wall Street Journal*/Heritage Foundation's *Index of Economic Freedom.*[15]

Given the economic efficiency perspective, moving from the conceptual framework to a concrete index involves four steps.

1. Identify all the potential types of energy activities that occur in one or more states.
2. Identify as many possible ways that regulations can affect the economic efficiency of the energy industry. That process involves:
    - First, creating larger economic categories capturing dimensions of market economic efficiency that regulations can impact.
    - Second, breaking those large categories into smaller issues or basic components to form the seven sub-index backbone of the *50 State Index of Energy Regulation.*
    - Finally, further dissecting these basic components into relevant, measurable factors that quantify the positive or negative effects of specific regulations.
3. Determine how to score data for each of these factors and how to combine the numbers into a meaningful 10-point scale for the relevant sub-index.
4. Average the 10-point scales of the individual sub-indices to create the overall *50 State Index of Energy Regulation* for the state.

It is important to once again emphasize that energy consumption, production, and distribution are also subject to federal regulations. However, these federal regulations, while potentially affecting states differently, usually apply equally to all states. Due to the equal application of the federal regulations across all 50 states, generally they are not relevant to this *Index.* Additionally, local regulations exist in many areas, producing differences *within* the state. Such intra-state differences are also beyond the scope of this report. Only the *differences across* states are measured in the *50 State Index of Energy Regulation.* These differences are the source of the comparative scores.

What is today's energy business?

The energy business is evolving. For example, green technologies have become more prevalent over the last few years.[16] There are increasing numbers of businesses and private homes that get electricity from solar panels.[17] Wind farms have popped up from Nantucket Sound in New England to the desert of Southern California.[18] Innovations in hydropower are enabling electricity generation without constructing dams.[19]

As these energy sources have grown, new issues and policies have developed. For instance, states may encourage or underwrite the growth of green technology through mandates to public utilities or outright subsidies. Or, as businesses and homes generate more of their own power, what happens in a state when they create surplus power? Can they sell that power to the local utility grid, or does it just go to waste? What price should the utility pay for this surplus power? Should the utility be required to purchase this surplus power?

Similarly, energy efficiency is viewed by many as having a positive effect. Indeed, improved technology does allow more performance from less power, but usually at a higher cost for the appliance. Is energy efficiency a net positive force to the economy if it and the higher cost are not a matter of choice, but mandated? Does eliminating access to less efficient but far cheaper appliances make people better off? Maybe the cost savings from running the more energy efficient appliance do not justify the added upfront cost. Also, many

states have a policy known as "decoupling". This regulation raises the regulated cost of energy precisely because the public is using less. So not only must consumers pay more for the newer appliance, but the resulting higher cost of each unit of energy cuts into the promised energy savings.

The bottom line is that the energy industry is becoming increasingly complex, magnifying the number of aspects that must be considered. We have done our best to include as much of the industry as possible, but as always the effort is limited by available data.[20]

Some of the basic energy industries regulated by state agencies are:

- **Utilities:** The most visible energy businesses to the average citizen are the utilities that deliver electricity or natural gas directly to the home. Typically these companies are regulated by the state public utilities commission. Regulated utilities also have a designated geographical market and have historically been the only source of these important types of consumer and industrial energy. Utility companies take many forms, from a local distributor owned by the municipality to a large generating and transmission company that is part of a multi-state energy conglomerate. Each of these entities is subject to state regulations, but due to differences in their size and structure, they are often regulated to differing degrees.

  However, the utility business is changing. Today there are increasingly two separate functions of a utility, originating or generating the energy and transmitting it to the consumers. The distinction between generation and transmission is becoming more common and important.

  Currently 17 states permit customers to purchase their electricity or natural gas from multiple potential suppliers.[21] [22] [23] [24] In these cases the local utility is responsible primarily for transmission, which remains a monopoly.

  With the advent of solar and wind generators, electrical utilities are undergoing additional changes. Many states require utilities to generate a certain percentage of power from these renewable sources, and many states are implementing regulations that discriminate against coal or other carbon-based energy. In some states, regulations require a utility company to purchase excess energy generated from homes or businesses that employ one or more of these new technologies. With each step in the evolution, new state regulations appear.

- **Oil, Refining, and Gasoline Stations:** Every time a consumer fills up the family car, he is engaging with another very visible part of the energy industry—oil. The gasoline station, however, is only one end point in the whole oil business production chain. At the other end of the chain, some states have oil reserves, whether from underground wells, oil shale, or oil sands. Industries in these states are part of the oil extraction segment of the business. In between, the oil must be sent to refineries, perhaps then to more local storage tanks, and finally to the local gas station. Refineries, transportation of the unrefined oil, transportation of the refined gasoline, storage, and final distribution are all subject to state regulation. Of course, the federal government regulates interstate transmission through the Federal Energy Regulation Commission or FERC, but the pipelines are in many instances subject to state laws.

- **Natural Gas:** Like oil, natural gas has many different levels of business. Extraction occurs in only some states. Some states' natural gas is extracted through conventional techniques; others employ "fracking" techniques (i.e. hydraulic fracturing techniques that inject fluids into the cracks of rock formations allowing more oil and gas to be extracted). Both are state regulated. Some natural gas is transported through pipes regulated at both the federal and state level. Again, federal regulations do not usually create differing economic efficiencies among states. It is the (differences in) state

regulations that provide information and are captured in the *50 State Index*. Typically the natural gas is distributed through a utility, and as indicated above, that separate business is highly regulated at the state level.

Formulating the Important Issues

Given the diverse businesses involved in the field of energy, how can one separate the basic issues that are common and different to each? Our methodology is to start with the five major ways (categories) regulation can affect the economic efficiency of the energy industries. These are:

- **Regulations Affecting Market Competition:** Some states' regulations encourage market competition and others restrict it. A good example is in the utility industry. Regulations can permit customers to purchase energy at market cost from a variety of suppliers, some suppliers even in other states. These regulations encourage market competition and more efficient use of consumers' incomes (resources). In contrast, where utilities are given the exclusive right to generate, distribute, and sell energy in an area at a regulated price, competition and efficient allocation are stifled.

- **Regulations Affecting Energy Production and Distribution:** Energy producers face many potential regulations that alter production and distribution decisions. Requiring that a certain percentage of power be generated by more expensive solar or wind methods directly raises a utility's costs above those available from alternative sources. So the cost of production is higher than necessary, causing it to exceed the value of the resulting energy. In other words resources are not allocated most efficiently. Also, consumers find their energy bills rising and can be expected to reduce how much they buy. Less energy is consumed than could be if resource allocation were more efficient. Subsidizing green technologies has a similar efficiency distortion. So do restrictions on refining energy resources or regulations imposing caps on carbon or other greenhouse gas emissions.[25] There can also be specific regulations or taxes on transportation, generation, or sale.

- **Regulations Affecting Utility Consumption:** There are also regulations that initially affect the consumer. Appliance efficiency standards can reduce choice and raise the price of all models, perhaps increasing the combined purchase and energy cost above alternatives. Once again, economic efficiency declines. Building codes can have a similar impact.

- While energy efficiency programs reduce energy consumption and, therefore, reduce the load on local utilities, they also reduce the utility's revenue because of smaller purchases of the utility's product. Often the state regulatory agency simultaneously guarantees the total revenue or rate of return to the utility. To compensate for the quantity of energy sales "lost" to energy efficiency, the state triggers mechanisms that increase utility revenues. These programs are known as "decoupling" or "lost revenue recovery" (or both) and allow the utility to raise the cost of its product delivered to the customer. Decoupling and lost revenue policies raise energy prices to the very consumers who are conserving on the use of energy. Hence, consumers are essentially punished for taking steps to curb the use of energy and fuels, and economic efficiency is further reduced.

- **Regulations Affecting Producer Flexibility:** These restrictions may limit methods of energy generation, say by greatly restricting the use of coal. They could also limit the choices of corporate form, prohibiting specific options along the continuum between municipal ownership and private multi-state vertically-integrated conglomerates. Sometimes the regulations limit the price at which a utility can purchase energy from another supplier or the price at which it can sell to the customer. Consumers in California can remember the fiasco that ensued in 2000 and 2001 when the state

restricted the price at which electric utilities could sell their product at a time the wholesale price to the utility was soaring. Electric utilities were unable to adjust to changing conditions, and in the process at least one California utility (PG&E) filed for bankruptcy.[26] Clearly, the asymmetry with which the utility companies could respond to wholesale versus retail markets caused a misallocation of resource, reducing economic efficiency.

- **Regulations Affecting Motor Vehicles:** A state may have fuel economy standards for automobiles that exceed the national laws, or even requirements that the composition of fuel pumped into cars differ from the federal law. Or a state may have a regulation denying a service station owner the choice of selling gasoline at full-serve or self-serve pumps (Oregon is an example), thus reducing competition. Vehicles may be limited in where and how long they can idle. And of course let's not forget the gasoline excise taxes that vary considerably from state to state. In addition, service station storage tanks are often the focus of very rigid regulations concerning ground water contamination or other concerns.[27] The regulations and taxes affect the cost or value of resources, causing non-efficient allocation choices.

Ranking the States

The issues raised by these five major ways (categories) regulations can affect the energy industry in turn lead to seven component indices or questions that are the core of the *Index* scoring and rankings. These state components indices are:

1. What are the degrees of retail energy supplier choice for consumer, industrial, and commercial customers?

2. How extensive are the restrictions on electricity production?

3. Are there additional state regulations on the transportation and transmission of energy?

4. What green technology subsidies do the state provide, and how do these affect economic efficiency?

5. How extensive are regulations designed to reduce energy consumption including appliance and building code standards, and does the resulting drop in energy use trigger de-coupling or lost revenue recovery?

6. Are producers allowed to let utility prices fluctuate freely with market conditions, or are the prices decreed by the regulators? Can utilities easily adjust prices to reflect the costs of new plants and the rise in wholesale prices? What are the restrictions on construction of new utility plants?

7. How do regulations affect motor vehicles? How high are state gasoline taxes relative to other states? Can station owners offer self-serve pumps? Must refiners include renewable fuels in every gallon of gasoline? Are there idling or emissions standards that must be met? Are the fuel economy standards in a state higher than federal standards?

The seven components are summarized in Table 1 below:

Table 1
Index Construction Summary: The Components

	COMPONENT INDEX
1	Do state regulations allow retail choice when purchasing energy?
2	Do state regulations reduce economic efficiency by limiting how electricity can be produced?
3	Do state regulations place extensive restrictions on how energy is transmitted/transported?
4	Do state green technology mandates or subsidies distort efficient resource allocation in the energy market?
5	To what extent do state regulations distort energy consumption decisions?
6	To what extent do state regulations hinder producers' flexibility to set prices and build new generation facilities?
7	In what way and how stringently do state regulations affect operating a motor vehicle?

The goal is to measure each of the seven component indices for each state on a 10-point scale, where a score of one means an energy regulatory environment that highly encourages economic efficiency (low restrictions or maximum choice) and 10 means an energy regulatory environment that results in a low level of economically efficient choices (high restrictions and little if any choice). These 10-point scales are computed using the relevant, consistent, available data that address directly or as a proxy the seven questions.

Since the component scores are on a scale of 1 to 10, the resulting average score used to determine the *50 State Index of Energy Regulation* will also be on a 1 to 10 scale. The result is that, by design, the final index equally weights each one of the seven components.

The Subcomponents or Factors: Details of How the Energy Index is Created

As just described, the index for each component is computed from available data of directly relevant factors and sub-components or their proxies.

In order to create a 10-point scale for each component, consistent data on the issues for all 50 states must be found from reputable sources and transformed into the *Index*. Limitations on data that satisfy these criteria limit the scope of questions actually answered and the precision of their measurements.

Details of the construction of the 10-point indices for each of the seven components, as well as the 50 state rankings for each of the seven components, is described in the following sections:

1. Factors Affecting Market Competition

As described above, regulations that encourage market competition enhance economic efficiency. The degree of market competition is measured by whether a state permits consumers choice from whom they purchase energy. There are three types of consumers: industrial, commercial, and residential. A state might permit choice to one type of consumer and not to another, to none, or to all. Moreover, the degree of choice might differ among the three. A major task is to find available data that provide insights into this issue.

Data exist about simply which states do and do not permit choice for each of these groups. However, it is preferable to have some indication about the degree of choice. For example, if choice is permitted, how hard is it to actually find an alternative energy provider and have that energy delivered to one's residence?

Finding data that measure precisely this type of question is usually impossible, as it was in this case. Instead, we resort to a "proxy" or closely related estimate that can be used in its place.[28]

The proxy is constructed from official US government energy statistics published by the Energy Information Agency (EIA). Specifically, the EIA reports the percentage of industrial, commercial, and residential customers in the state who choose an alternative retail energy supplier to the local utility.[29] The percentages tell us nothing regarding the number of competitors that have entered the market—it could be very few, or it could be many. The percentages illustrate the number of customers who now purchase their energy from a generator that is considered to be a "competitor supplier" by the EIA.

While this statistic is not precisely the one desired, there should be a useful positive correlation. We assume that the easier it is for a customer to successfully choose a competitor supplier, the higher will be the percentage of customers who choose to do so. Our assumptions are consistent with statements from the U.S. Energy Information Administration about retail choice, "Seventeen states and the District of Columbia have adopted electric retail choice programs that allow end-use customers to buy electricity from competitive retail suppliers. While residential customer participation rates are low in almost all of these states, a majority of commercial customers have signed up with competitive suppliers in nine states and a majority of industrial customers have signed up in 12 states. *The highest participation rates are found in the Northeast, Mid-Atlantic states, and Texas where electricity is supplied through Regional Transmission Organizations (RTOs) and states have unbundled generation from retail delivery and sales*[emphasis added]."[30] [31]

The criteria for assigning the 10-point scale for each of the three classes of customers appears in Table 2. In order to receive a very good score of 1, between 91 and 100 percent of energy customers are choosing an alternative supplier to the utility. Clearly, if that many customers choose an alternative supplier, the market must be very competitive. At the other extreme, if no customers are using an alternative there must be large obstacles to doing so. The obstacles could be state regulations that do not permit choice, or it could be that regulations make finding and choosing an alternative very difficult. In between these extremes the greater the percentage of customers that use an alternative supplier, the easier it is to find and choose one, and the more competition there is and the better the score (lower number).

Table 2
Scaling the Degree of Market Competition in Energy Providers

SCORE	PERCENTAGE OF CUSTOMERS CHOOSING AN ALTERNATIVE SUPPLIER
1	91 TO 100% of the customers
2	81 TO 90% of the customers
3	71 TO 80% of the customers
4	61 TO 70% of the customers
5	51 TO 60% of the customers
6	41 TO 50% of the customers
7	31 TO 40% of the customers
8	21 TO 30% of the customers
9	0.1 TO 20% of the customers
10	0% of the customers

The same 10-point scale criteria are used for each of the three customer groups. The average of these three scores in any one state is the overall state score. For example, in Illinois the percentage of residential customers using alternative energy is less than one percent. According to Table 2, Illinois, therefore, receives a score of 9. But 85 percent of industrial customers and 56 percent of commercial customers use an alternative, resulting in scores of 2 and 5 for those categories. The overall score for Illinois (5.3) is the average of 9, 2, and 5.

Calculating the overall scores for all 50 states, the states are ranked from best (lowest score) to worst (highest score) as shown in Table 3.

Table 3
The 50 State Ranking for Degree of Market Competition

STATE	RANK	MARKET COMPETITION SCORE
Texas	1	2.0
Rhode Island	2	4.0
Maryland	3	4.7
Illinois	4	5.3
New Jersey	5	5.7
Connecticut	6	6.0
Delaware	7	6.3
Maine	7	6.3
New Hampshire	7	6.3
Montana	10	7.3
Massachusetts	11	7.7
Ohio	11	7.7
New York	13	8.0
Pennsylvania	13	8.0
California	15	9.0
Michigan	15	9.0
Oregon	17	9.3
Alabama	18	10.0
Alaska	18	10.0
Arizona	18	10.0
Arkansas	18	10.0
Colorado	18	10.0
Florida	18	10.0
Georgia	18	10.0
Hawaii	18	10.0
Idaho	18	10.0
Indiana	18	10.0
Iowa	18	10.0
Kansas	18	10.0
Kentucky	18	10.0
Louisiana	18	10.0
Minnesota	18	10.0
Mississippi	18	10.0
Missouri	18	10.0
Nebraska	18	10.0
Nevada	18	10.0
New Mexico	18	10.0
North Carolina	18	10.0
North Dakota	18	10.0
Oklahoma	18	10.0
South Carolina	18	10.0
South Dakota	18	10.0
Tennessee	18	10.0
Utah	18	10.0
Vermont	18	10.0
Virginia	18	10.0
Washington	18	10.0
West Virginia	18	10.0
Wisconsin	18	10.0
Wyoming	18	10.0

As expected, states in the northeast plus Texas have the highest rankings (lowest scores). These are the states where utilities were deregulated first. The ranking numbers 1 through 17 are the states that currently provide at least some customers choice of energy provider from whom to purchase. In contrast, the remaining 33 states have yet to deregulate any utility sector. Combined with the fact that the median score is 10, there is much room for states to encourage economic efficiency by implementing retail choice-type regulations.

2. Regulations on the Production of Energy:

There are four subcomponents with consistent, available data that comprise the Regulations on the Production of Energy index component. The four subcomponents are designed to measure how current state regulations are affecting a utility's ability to generate electricity.

First, some states establish explicit targets on the type of alternative energy generation utilities must use to generate electricity, formally known as renewable portfolio standards (RPS). Next, some states have implemented legislation requiring the RPS to rise in the future. Third, some states participate in a regional pact that requires capping greenhouse gas emissions (cap and trade). And, fourth, some states require that carbon emissions are captured (a carbon capture mandate).

Implementing these regulations forces the utility to use more expensive resources to produce the same power and hence reduces a state's economic efficiency—the higher the additional cost, the greater the economic inefficiency.

Comparing state regulations on energy production is slightly more involved because there are four subcomponents to this index. The last three subcomponents (a legislated rise in the RPS, participation in a cap & trade compact, and a carbon capture mandate) can only be measured based on whether these programs exist in a state or not.[32] The RPS can be measured more precisely, however.

A RPS mandates a specified percentage of utility energy generation that must come from renewable energy sources such as wind or solar in order to encourage development of these renewable (or "green" technologies) alternatives to the traditional coal, gas, or nuclear powered generation.

In 2013, the percentage individual states required varied from zero percent to 36 percent.[33] Similar to the retail choice data, regulations creating a renewable portfolio mandate are easily compared based on the specified percentage. That mandated percentage in turn is used to allot scores for states according to the severity of the requirement. Each state is given a score between 1 and 7 as shown in Table 4 below:

Table 4
Scaling a State's Current Renewable Portfolio Mandate

SCORE	PERCENTAGE OF ELECTRICITY THAT MUST BE GENERATED FROM RENEWABLES
1	Less than 5%
2	5.01% to 10%
3	10.01% to 15%
4	15.01% to 20%
5	20.01% to 25%
6	25.01% to 30%
7	Over 30%

To account for the three other subcomponents (that cannot be measured beyond noting whether the program exists or not), single additional points are added. For instance, as noted above, the same data sources indicate that in many states the current mandate is legislated to rise over time. For example, in 2013, Oregon's mandate was only 5 percent, but according to existing legislation[34] it will rise to 25 percent in 2025. The fact that the future mandates will be higher has a negative impact on the energy regulatory environment and choices in the state today. A utility knows that capital investments will be required in the coming years to meet those future standards. Those extra investment costs raise the cost of generation above alternative methods, negatively affecting the allocation of resources and economic efficiency. For that reason, where the legislated future standard exceeds the standard in the current year, one point is added to the state's restrictions on the production of the energy index score.

Another point is added for those states that participate in a regional pact that requires capping emissions, (cap and trade).[35] Cap and trade regulations are "quantity constraints" in economics. The "cap" portion of cap and trade regulations establishes (or constrains) the aggregate amount of greenhouse gas emissions that can be produced in the state, region, or country where cap and trade is adopted. These aggregate constraints are divided and either sold to or given away to current emitters of greenhouse gasses. Each company's greenhouse gas emissions are then constrained by the specific emissions caps they own. Companies that wish to emit greenhouse gasses in excess of their individual emissions cap must purchase these rights from a company whose emissions are below the emitting rights that company owns—the trade part of cap and trade. By definition, quantity constraints create greater price volatility, reduce economic efficiency, and reduce economic growth. The Federal Energy Information Administration (EIA) analyzed the impact on economic growth from implementing a cap and trade policy at the national level finding that growth would be reduced by 1.9 percent to 4.2 percent, depending on the assumptions.[36]

The program could be state specific, or the state may participate in one of the three regional cap and trade programs, the Greenhouse Gas Initiative (primarily in the northeastern U.S.), CA AB 32 (California's cap and trade program), or the Western Climate Initiative. Data showing which states participate in such a program come from the Environmental Protection Agency (EPA).[37]

A third potential point is given to any state that has a carbon capture and storage mandate. Under this program companies are required to remove a certain amount of greenhouse gas emissions and store them. For reasons similar to the cap & trade issue, carbon capture and storage mandates increase the costs of production and prohibit the most efficient use of resources to generate electricity. These regulations, consequently, decrease the economic efficiency of electricity generation as well. Data for the existence of a mandate are provided by the National Conference of State Legislators (NCSL).[38]

Combining the up to 7 scale points for renewable fuel mandates and the three other potential points, the sub index for limitations and mandates on the production of energy is again measured on a combined 10 point scale. The resulting production rankings and scores for all 50 states appear in Table 5.

Table 5
The 50 State Rankings for Production Regulations and Restrictions

STATE	RANK	PRODUCTION RESTRICTIONS SCORE
Alabama	1	1
Alaska	1	1
Arkansas	1	1
Georgia	1	1
Idaho	1	1
Mississippi	1	1
Nebraska	1	1
South Carolina	1	1
Tennessee	1	1
Florida	10	2
Iowa	10	2
Kentucky	10	2
Louisiana	10	2
Missouri	10	2
North Carolina	10	2
Texas	10	2
Wyoming	10	2
Arizona	18	3
Hawaii	18	3
Indiana	18	3
North Dakota	18	3
Ohio	18	3
Oregon	18	3
South Dakota	18	3
Vermont	18	3
Virginia	18	3
West Virginia	18	3
Delaware	28	4
Michigan	28	4
Oklahoma	28	4
Rhode Island	28	4
Utah	28	4
Washington	28	4
Colorado	34	5
Kansas	34	5
Maryland	34	5
Massachusetts	34	5
Montana	34	5
Nevada	34	5
New Hampshire	34	5
New Jersey	34	5
New Mexico	34	5
Pennsylvania	34	5
Wisconsin	34	5
Connecticut	45	6
Illinois	45	6
California	47	7
Minnesota	47	7
Maine	49	9
New York	49	9

The median score for this component is only 3. Hence, most states have economic efficient policies with respect to regulations on energy production.

3. Restrictions on Transport of Energy:

This component measures the economic efficiency of getting energy resources to market. In the case of energy forms such as coal, the goal is to find how difficult states make it to transport the item by rail or truck.

Coal and the rail industry are closely linked. In 2012, coal accounted for 41.0 percent of rail tonnage and 21.6 percent of the gross revenues of railroads.[39] More than 70 percent of coal tonnage delivered to coal-fired power plants is delivered by rail.[40] In 2012, 92.6 percent of coal consumption in the United States was for electricity generation.[41]

Natural gas is primarily delivered to the user through pipelines, but it, too, can be distributed by rail or truck.[42] By contrast, electricity comes to our homes through the long distance, high voltage, high capacity wire grid, the lower voltage sub-transmission system, and the still lower voltage system of local wires.[43]

The 50 State Index of Energy Regulation measures only the part that states play in regulating these activities. That fact has important implications for some of the aspects mentioned above. Trains and trucks are regulated almost exclusively at the federal level, so restrictions on those two modes of transportation do not appear in the *Index*. The primary reason for that federal focus is Article I, Section 8, clause 3 of the U.S. Constitution that states that the U.S. Congress has the authority to "regulate commerce between the several states." This short phrase is the familiar Commerce Clause. In fact the first independent regulatory agency that Congress ever created was the Interstate Commerce Commission (ICC), which was established in 1887 to regulate railroads and eventually came to regulate the trucking industry as well.[44] These two industries were deregulated in the late 1970s, and the ICC was terminated in 1996. The functions of the ICC were turned over to the Department of Transportation and a new regulatory body, the Surface Transportation Board (STB). Today the federal STB is the primary regulatory body for rail and truck transportation.[45]

With the trucking and railroad transportation controlled exclusively at the federal level, only electricity transmission and pipeline transmission restrictions remain a part of the state transport of energy component.

Electricity transmission regulation within a state involves mostly permission of where to site the transmission lines. Each state has a regulatory body such as the public utilities commission or the public service commission that oversees these projects—additionally, other agencies such as environmental and local authorities may also require permission. Not every state, however, has the same siting requirements. There may be different regulations for high voltage transmission versus the lower voltage sub-transmission or the familiar still lower voltage lines that come to homes and businesses.

Within the component index, the economic efficiency of siting transmission lines is measured by the number of voltage transmission level hurdles that a local company must overcome—the larger the number of hurdles, the higher the costs for performing the same task, and therefore the greater the amount of economic inefficiency.

The data are provided by the Edison Electric Institute's State Generation and Transmission Siting Directory,[46] which summarizes each state's policies for erecting these lines. Each state is assigned a score of 1-5 based on the stringency of siting regulations. The stringency reflects which type of line structure as outlined by OSHA (i.e. transmission, sub-transmission, and distribution) is affected.[47] OSHA defines "transmission" (long lines) as between 230-500 kilovolts (kv). Sub-transmission is 69-138 kv and distribution (local lines) as between 7-13 kv. The scores reflect how many of these categories require permission from the state Public Utility Commission (PUC) for siting.[48] The scoring ranges from 1 for states with no PUC requirements to 5 for states that require PUC permission for all types of lines.[49] The underlining assumption in the scoring is that the more types of lines that require approval, the greater the cost of gaining approval, and the more economic efficient choices are affected. The scoring table is:

Table 6
How State Electric Transmission Siting Requirements Translate into Index Scores

SCORE	DEFINITION
1	No permits required[50]
2	Permits required only for transmission lines of 230-500 kv
3	Permits also required for sub-transmission lines of 69-138 kv
4	Permits also required for distribution lines 7-13 kv
5	Permits required for all types of lines including less than 7kv

If the state voltage permit requirements differ from the OSHA definition, the lower OSHA number in a category was assumed to be the minimum voltage. For example, if the state requires all lines of less than 170 kv receive permits, that size line was assumed to be a sub-transmission line because it is less than 230 kv of a long-line.[51]

Pipelines are subject to federal regulations. However, most states have regulations that exceed the federal ones. The scoring for pipelines is the number of these regulations within a state that exceed the federal laws, as reported by the National Association of Pipeline Safety Representatives.[52] The scoring ranges from 0-5 according to:

Table 7
Scoring Scale for Pipeline Transmission Regulations

SCORE	NUMBER OF STATE PIPELINE SAFETY INITIATIVES THAT EXCEED FEDERAL CODE
0	None of the initiatives exceeds federal code
1	1-7 initiatives exceed federal
2	8-14 exceed federal code
3	15-28 exceed federal code
4	29-56 exceed federal code
5	More than 56 exceed federal code

This scoring system is based on the fact that the median number of state initiatives that exceed federal is 14, and that the first few initiatives are more costly in terms of economic efficiency than when many additional initiatives already exist.

Combining the transmission line siting requirements (scored 1 to 5) and the pipeline transmission regulations (scored 0 to 5), the transportation component index is scored on a 1 to 10 scale. The resulting transportation restriction rankings and scores for all 50 states appear in Table 8.

Table 8
The 50 State Rankings for Transport Regulations and Restrictions

STATE	RANK	TRANSPORT RESTRICTIONS SCORE
Alabama	1	2
Delaware	1	2
Nebraska	1	2
Georgia	4	3
Montana	4	3
North Dakota	4	3
Oklahoma	4	3
South Dakota	4	3
Hawaii	9	4
Indiana	9	4
Nevada	9	4
New Mexico	9	4
Oregon	9	4
West Virginia	9	4
Alaska	15	5
Illinois	15	5
Iowa	15	5
Louisiana	15	5
Maryland	15	5
Missouri	15	5
Rhode Island	15	5
Utah	15	5
Wyoming	15	5
Florida	24	6
Idaho	24	6
Kansas	24	6
Kentucky	24	6
Mississippi	24	6
North Carolina	24	6
Ohio	24	6
Pennsylvania	24	6
South Carolina	24	6
Vermont	24	6
Arizona	34	7
California	34	7
Colorado	34	7
Connecticut	34	7
Massachusetts	34	7
Michigan	34	7
Minnesota	34	7
Tennessee	34	7
Maine	42	8
New York	42	8
Texas	42	8
Virginia	42	8
Washington	42	8
Wisconsin	42	8
New Jersey	48	9
Arkansas	49	10
New Hampshire	49	10

The scores are clustered in the middle of the scale, indicating that most states have a mixed record of achieving economic efficiency in energy transportation regulations.

4. Green Technology Subsidies:

There are three sub-components to the index of green technology subsidies—tax breaks and subsidies encouraging energy efficiency, tax breaks and subsidies encouraging the use of renewable sources of energy, and net metering policies.

States offer a variety of programs to encourage the purchase of energy efficient appliances, machines, windows, lighting, insulation, etc. These programs include sales tax exemptions, personal and/or corporate tax credits, tax rebates, rebates and long-term loans at low interest rates. Not every state offers the same programs or the same types of incentives.

Renewable energy incentives at the state level include those listed above for energy efficiency plus property tax exemptions, outright grants, low interest bonds for financing, and performance based incentives determined by how many megawatt hours of electricity the solar power produces.

Incentives for either energy efficiency or use of green technology reduce economic efficiency. There is a saying in economics that the more an activity is subsidized, the more that activity occurs. Presumably if the subsidies were high enough, only green technology would be employed. Some may find that appealing, but to an economist it is not the best solution. The reason is that subsidies misallocate resources.

To understand, think of why the energy efficiency or green technology was not adopted before the subsidies. The simple answer is that the expenditure did not make sense to the consumer or producer. From the consumer's perspective, ideally resources (insulation, new windows, etc.) should be used until the additional benefit (think value of the additional energy saved) just equals the value or cost of the man-hours and materials that are required to make the material and install it (what the consumer pays the contractor). If the state provides a subsidy to make these savings larger, it encourages people to spend more on man-hours and materials producing renewable energy or saving energy. They hire the contractor for a bigger project. But from the economy's perspective, the economic value of the last bit of additional energy saved will not be great enough to cover the value of the contractor's man-hours and material used to achieve those savings. Hence, the extra man-hours and/or material used in the project could have yielded more elsewhere for the economy. The value of the economy's total production shrinks. Something of value to the economy has been lost or wasted.

Similarly, subsidies to encourage use of green technologies entice energy producers to use more resources for energy generation than the value of the additional energy would justify. Again, the value of the economy's total production is lessened, because something of value has been lost or wasted.

Net metering refers to whether homes or businesses that produce their own electricity through green technology can sell their excess power to the utility grid and on what terms.

Net metering is becoming an increasingly important issue as homes and businesses install solar or other forms of renewable electricity generation. A characteristic of these sources of electricity is that sometimes they produce more energy than the building needs (think a solar powered building mid-afternoon on a sunny day) and sometimes they do not produce any energy (such as a solar powered building at night). Other times the supply is somewhere in between. That means the building must rely on the local utility and its grid for power when the building's demand exceeds its genera-

tion, and the building has power to sell back to the grid when more than enough power is generated. With net metering, the home or business would only pay for the "net" (amount taken from grid minus amount sold to grid) electricity used.[53]

Currently 44 states and the District of Columbia have adopted net metering policies. There are six states that have either no policy or a voluntary policy. The federal Energy Policy Act of 2005 requires that all utilities must provide net metering options when requested by buildings owners.

There are two big issues in the discussion of net metering, what price should the utility pay for excess electricity put on its grid, and what does a utility do when it already has enough electricity to fill its grid to maximum capacity?

Most states with regulations require that the utility reimburse energy-generating customers the same full price that it charges when selling the power. However, there is a problem with this rule. Those readers living in states with deregulated electricity will notice that the utility bill has two components—the charge for electricity generation and the charge for transmission of the electricity. The generation charge is the price the utility, or some alternative source that has an agreement with the customer, sells just the energy. The transmission charge is the cost of getting the power from the source through the utility's grid to one's home.

For that reason it is economically inefficient to require the utility to pay the combined generation and transmission charge to a home that sells its excess electricity back to the grid. Think of it this way. That home selling electricity is really no different from any other large or small generator selling power to the grid. The reimbursement the home should receive is only the price that other electricity suppliers receive, the generation charge. The home is not providing any transmission services, so it should not be reimbursed for something it does not provide.

In other words the home needs the utility's grid to get the net energy it needs. It, therefore, pays both a transmission and generation charge. It also needs the grid to sell electricity, or that power would go nowhere. So it is appropriate (economically efficient) for the utility to bill for a transmission charge when the home buys electricity, but it is not appropriate for the utility to reimburse the transmission charge when electricity is sold back onto the grid.

Economic efficiency, therefore, has an answer to the question of what price the utility should pay homeowners for excess electricity. It should only pay the same price it pays other generators, the wholesale generation charge. For that reason, states that allow utilities to pay the wholesale price are more efficient than those who require the full price (generation plus transmission) be paid.

However, there is another problem/issue. What happens when the utility grid reaches capacity? Does the utility still have to buy electricity from the homeowner? Where would the utility store it? This problem has already surfaced in states with lots of sunshine like Hawaii and Arizona.[54] Clearly, in these cases the utility must have flexibility of choice concerning whether or not to buy the power. It should have the right to refuse excess electricity as the grid approaches capacity. In other words a program where the buyback option is voluntary is preferable to one where the utility must buy all the excess electricity, whether at wholesale or retail price.[55]

Based on these possible outcomes, the states' net metering policies are graded on a three-point scale (0-2). Those with the most economically efficient policies (voluntary purchase of electricity at wholesale price) receive a score of 0. Allowing voluntary exchange between a utility and customers generating electricity via solar technology is the most economically efficient policy. If a state must buy *all* electricity at the wholesale price, its score is 1—while the most economically efficient criteria (voluntary exchange) is lost, being required to purchase solar powered energy at the wholesale price is more economically efficient than being required to purchase solar powered energy at the retail price. If the state is both required to purchase all excess energy and at the retail price (including transmission cost), it has the least efficient policy and receives a score of 2.

Information about all the state programs promoting energy efficiency and renewable energy are provided by the Database of State Incentives for Renewables and Efficiency (DSIRE), a joint project of the US Department of Energy and the North Carolina Solar Center.[56] Ideally both the energy efficiency and renewable energy subcomponents would employ the average size of the subsidy to show the degree of economic inefficiency created. Unfortunately, these data are not readily available. An alternative proxy measure is available from the DSIRE database. It is the summary table for either set of incentive programs showing by state the number of programs available under different categories. These incentive categories are separated into those provided by the federal government, state government, local government, utility or a non-profit. Our component index focuses only on the state programs.

Specifically, the scoring system adds up within each state the total number of state energy efficiency subsidy programs and renewable energy subsidy programs under each of the categories. For example, there are nine different categories of energy efficiency programs offered by states. These categories are personal tax, corporate tax, sales tax, property tax, rebates, grants, loans, bonds, and "green building". Not every state has every kind of program. However, states often have multiple programs in one of the categories. Since each such subsidy program is a market distortion reducing economic efficiency, the number of programs a state offers is the proxy for the level of inefficiency.[57] The greater the number of total programs, the more inefficient (less efficient) the state, and a higher index number is given.

The number of state subsidy programs for energy efficiency and use of renewable energy are graded using the same scale. Either type of subsidy starts with the *average* number of that type of program across all 50 states. Index points are then allocated on a 0-4 scale as follows:

Table 9
How Index Points Are Assigned for Total Subsidy Programs Encouraging Both Efficient Energy and Renewable Energy

SCORE	NUMBER OF SUBSIDY PROGRAMS IN STATE
0	The state has no such subsidy programs
1	Half of the 50 state average number of programs or less
2	More than half the average number of programs up to the average
3	More than the average number of programs up to 50 percent more
4	More than 50 percent above the average number

Adding together for each state the scoring system in Table 9 for the two types of subsidies, plus the scale for net metering, yields a state green technology subsidies component index with up to 10 points. The actual state rankings and scores are:

Table 10
The 50 State Rankings for Green Technology Subsidies

STATE	RANK	GREEN TECHNOLOGY SCORE
Alabama	1	2
Mississippi	1	2
South Dakota	1	2
Kansas	4	3
North Dakota	4	3
West Virginia	4	3
Delaware	7	4
Florida	7	4
Idaho	7	4
Indiana	7	4
Nebraska	7	4
Tennessee	7	4
Texas	7	4
Washington	7	4
Arizona	15	5
Arkansas	15	5
Colorado	15	5
Georgia	15	5
Louisiana	15	5
Ohio	15	5
Rhode Island	15	5
South Carolina	15	5
Wyoming	15	5
Iowa	24	6
Maine	24	6
Missouri	24	6
Oklahoma	24	6
Utah	24	6
Alaska	29	7
Hawaii	29	7
Michigan	29	7
Nevada	29	7
New Mexico	29	7
North Carolina	29	7
Virginia	29	7
Connecticut	36	8
Kentucky	36	8
Minnesota	36	8
Montana	36	8
New Hampshire	36	8
Vermont	36	8
California	42	9
Illinois	42	9
Massachusetts	42	9
Wisconsin	42	9
Maryland	46	10
New Jersey	46	10
New York	46	10
Oregon	46	10
Pennsylvania	46	10

The green technology scores are widely dispersed, indicating widely different policies and degrees of economic efficiency among the states.

5. Regulations that Affect the Consumption of Energy:

Several state regulations are designed with the intention of prohibiting certain consumption choices. For instance, the purpose of appliance efficiency standards is to keep appliances "—whose competitive sticker prices conceal high operating costs—out of the marketplace…"[58] Explicit in such regulations is the need to reduce consumer choices—more precisely, products that often have lower purchase costs but higher energy costs.

States implement regulations that limit choices both on the types of appliances people can purchase and on the energy efficiency of buildings. By definition, if such regulations are necessary, it must be the case that some consumers prefer appliances (or buildings) that are cheaper to purchase, but require higher energy costs to operate. Consequently the regulations limit the preferred consumption opportunities of some consumers and, therefore, reduce overall economic efficiency.

Simultaneously states also allow utilities (to varying degrees) to raise prices in response to reduced energy demand caused by energy efficiency programs. These programs, generally known as decoupling or lost revenue recovery policies, distort energy prices and diminish the incentive for consumers to conserve energy since their energy bills remain roughly the same regardless of their actions.

Together these policies create four sub-components or factors that generate the 10-point scale measuring how state regulations affect economic efficiency choices about the consumption of energy. The four are:

- Appliance efficiency standards
- Building codes for commercial buildings
- Building codes for residential buildings
- The presence of a state decoupling or lost revenue recovery policy

Appliance efficiency standards can add one point, assigned only if the state's appliance standards exceed the federal standards or are applied to products not covered by the federal standards.[59] No state has standards below the federal standards, as the federal law serves as a floor.[60] A state with tougher standards requires the purchase of appliances that are costlier and eliminate perhaps more economically efficient options than are permitted in other states. Hence, the state with more stringent standards reduces the attainable economic efficiency and, like other regulations that are measured based on whether they exist or not, receives a point.

Statewide energy building codes first appeared in California in 1978.[61] Today, uniform energy building codes are established by the American Society of Heating Air Conditioning Engineers (ASHRAE), and the International Energy Conservation Code (IECC). Information about energy building codes for both commercial and residential structures are provided by the ACEEE (American Council for an Energy-Efficient Economy) State Energy Efficiency Report Card.[62] In both commercial and residential cases there are progressively more extensive codes that have been established over approximately the last 10 years.

Our commercial building code rating system for states uses the ASHRAE Standard 90.1-2004 as a starting point for commercial energy codes. This code was revised and expanded in 2007 and again in 2010. Similarly, the starting point for state residential building energy codes is the 2006 IECC, which was subse-

quently revised with increased regulations in 2009 and 2012. Scores for both the commercial and residential building codes in each state come from which version of the codes the state enforces. Each state starts with one point that reflects the initial code adopted by ASHRAE or IECC. Then the more extensive the codes (the later the version of the code adopted), the more points are added to the initial score. The points are assigned for a state according to:

> **1 point:** The minimum score for a state is one point, applied only if a state's commercial and residential energy standards precede the uniform codes, or any commercial standard does not exceed the initial ASHRAE 2004 and any residential standard does not exceed the initial 2006 IECC.
>
> **1 additional point:** One point is added if the commercial standard is above ASHRAE 2004, but the same or less than ASHRAE 2007. Similarly, an additional point is added if the residential energy code is above 2006 IECC, but equal or less than 2009 IECC.
>
> **2 additional points:** If the commercial energy code is above ASHRAE 2007 but does not exceed ASHRAE 2010, two points are added. Two points are also added if the residential code exceeds 2009 IECC, but not 2012 IECC.
>
> **3 additional points:** Three points are added if the commercial code exceeds ASHRAE 2010. An additional three points are also given if the residential code exceeds the 2012 IECC.

Hence, the range of the potential combined commercial and residential energy building codes score is between 1 and 7 points.

Increasing energy efficiency, of course, reduces the amount of energy sold. If the price of energy stayed the same, while the consumer would find lower energy bills, the utility would find its revenue declining. Many states have adopted decoupling or lost revenue recovery to protect the utility from this fate.[63] In the simplest case say the Public Utility Commission (PUC) divides the utility's revenue that would have been received if energy efficient steps had not been taken by the actual amount of energy sold. This percentage ratio is the amount by which utility prices must be raised. The result is a new, higher price of energy that the consumer must pay. So in the end the utility revenue is protected from declines in energy use, but the consumer is penalized for investing in energy efficient appliances, insulation, windows, etc. The decline in consumer energy usage is offset by rising energy prices keeping their utility bills high. Clearly, this state intervention distorts the consumer's incentive to conserve energy and insulates the utility from change. In short, it reduces economic efficiency.[64]

Decoupling (or a similar policy known as Lost Revenue Recovery) can add up to two additional points to a state's score. A point is added if either decoupling or lost revenue recovery exists in the state electricity industry regulations, and another point is added if either exists in the natural gas utility regulations. If it is not part of regulations for either utility, then no points are added.

Reviewing, there are up to 7 points in the scaling of commercial and residential energy building codes, and up to one point from appliance standards plus up to two points depending on whether decoupling or lost revenue recovery exist for electricity and natural gas utilities. The potential maximum score is again 10. Assessing the data for all 50 states, the rankings and scores are shown in Table 11.

Table 11
Rankings and Scores by State for Energy Consumption Regulations

	RANK	CONSUMPTION INDEX SCORE
Alaska	1	1
Colorado	1	1
Maine	1	1
Missouri	1	1
South Dakota	1	1
Kansas	6	2
North Dakota	6	2
Wyoming	8	3
Arizona	9	4
Hawaii	9	4
Minnesota	9	4
Mississippi	9	4
Oklahoma	9	4
Tennessee	9	4
Alabama	15	5
Arkansas	15	5
Delaware	15	5
Florida	15	5
Iowa	15	5
Louisiana	15	5
Nebraska	15	5
New Mexico	15	5
Pennsylvania	15	5
Texas	15	5
Utah	15	5
Vermont	15	5
West Virginia	15	5
Idaho	28	6
Michigan	28	6
New Jersey	28	6
Ohio	28	6
South Carolina	28	6
Virginia	28	6
Wisconsin	28	6
Georgia	35	7
Indiana	35	7
Kentucky	35	7
Massachusetts	35	7
Montana	35	7
Nevada	35	7
New Hampshire	35	7
New York	35	7
North Carolina	35	7
California	44	8
Connecticut	44	8
Illinois	44	8
Oregon	44	8
Maryland	48	9
Washington	48	9
Rhode Island	50	10

Energy consumption scores run the full gambit from 1-10, indicating that the policies differ considerably among states. This observation is reinforced by the fact that the median score is 5, halfway down the scale.

6. Regulations that Hinder Producer Flexibility:

There are three ways that state regulations can affect producer flexibility to adjust to change. First, there can be restrictions on the price that utilities charge their customers. If the utility has added investment costs of a new power plant or transmission pipes, the state regulatory agency may not permit the company to include some or all of these in the cost basis for determining the retail price that customers pay. That investment can be substantial, and if the basis for the retail price does not include enough of those expenditures, the utility cannot get a sufficient return on the investment. Utilities, just like people, do not like to do something for nothing. Even with rising demand for energy, if the ability to recoup the costs of the plant is inadequate, the plant will not be built. Clearly, resources will not be allocated efficiently.

A related restriction, though generally not important today, is a freeze on the price that consumers can be charged. Like any price control, retail price freezes can produce extremely undesirable side effects. Suppose, for example, that the retail price of electricity is frozen, but the wholesale energy price increases. Immediately the utility finds that its profit margin is squeezed. Each unit of power is less profitable. As a result, the utility will want to supply less energy, producing an energy shortage or worse.

This scenario of wholesale price increases with fixed retail costs is what happened to California electric companies in 2000-2001. The resulting energy predicament is often blamed on the Enron speculation in the energy market. While Enron had some culpability, the underlying problem was asymmetry between wholesale and retail price increases. The Federal Energy Regulation Commission (FERC) had allowed wholesale energy prices to fluctuate in an open market beginning in 1996. On the other hand, the California Public Utilities Commission (CPUC) had frozen the retail price of electricity.

As the price of electricity rose on the spot and futures (wholesale) energy markets (this is where Enron had its impact), the cost that California utilities had to bear in order to reduce their own energy generation shortfall rose. Between April 2000 and December 2000 the wholesale cost of energy rose about 800 percent. As the wholesale price went up, the amount of energy the utilities purchased on the wholesale market failed to keep pace with demand, resulting in persistent shortfalls and rolling blackouts throughout the state. In fact, eventually the price exceeded the retail charge to customers, and money was lost on each kWh the utilities sold. Not surprisingly, one California utility (Pacific Gas and Electric) was pushed into bankruptcy, and another (Southern California Edison) came very close. This retail price fixing is an example of how attempts to control price can trigger a shortage, and how apparent gains to customers can be a serious loss to the supplier they depend on.[65]

While such price freezes have clearly been important in the recent past, such rigid policies are not used today. There may be temporary rate freezes as *a quid pro quo* for some other concession, but little else.[66] Perhaps states have learned a lesson from California. But will they remember it in the future?

A second way that regulations can restrict a utility's ability to adjust to market changes is to make it very difficult to build new power plants. Demand for electricity may be rising and the construction of a plant may be profitable. Still the utility may find it very difficult and burdensome to receive a permit to proceed. The likely outcome in this scenario is a shortage of power, because without the additional generation capabilities, at some point the utility will be unable to match the ever increasing demand. Burdensome restrictions on the building of new power plants effectively prevent resources from being allocated to where they are most valuable.

The restrictions on building new generation plants were another aspect of the California electricity crisis. The state had dragged its feet on approving new electricity plants. So as demand kept increasing, the gap between what electricity consumers wanted and what the utility could supply widened. Normally such a shortfall would be offset by purchases of electricity on the open market. But, as already pointed out, wholesale prices there were rising dramatically, and utilities eventually lost profit with each kWh they purchased. So the state's failure to approve new generation plants contributed to the resulting rolling blackouts.[67]

A third way regulations can restrict adjustment to change is by limiting the corporate form of energy companies. Suppose that two state utilities find that combined they could reduce costs and supply energy at a lower price. Yet if their merger is not permitted, these cost savings and price reductions cannot be realized. The benefits from reallocating resources cannot be realized. Economic efficiency is reduced.

However, the decision of state regulators whether or not to permit such a combination is often not a simple yes or no. Usually there are criteria that must be met before approval is given. In the past a standard measure for permitting a merger was whether it would produce "no harm" to the consumer. Many states are now adopting the more stringent criterion of whether the merger creates a "net benefit" for consumers.[68] Unfortunately, because no consistent measure across the states of these restrictions on corporate form could be found, this barrier to economic efficiency is not included in the current index.

The 10-point Index of Regulations that Hinder Producer Flexibility, therefore, incorporates only the first two factors. The index is constructed using 5 points associated with a lack of cost-price flexibility, plus a 1-5 scale for the restrictions on the construction of new power plants factor.

The 5 potential price points indicate whether the state implements regulations that: permit a utility to include the costs of capital construction in deciding rates for either electric or gas utilities; whether the costs of ongoing (but uncompleted) construction are also included; and, whether the state has a multi-year rate plan for either electricity or gas utilities.[69]

The measure of inclusion of capital costs in the rate base is called the Capex Cost Tracker. This "tracker" typically captures accumulating depreciation, the return on asset value, and any taxes that the capital expenditure creates. Such a tracker is important to both the electric utilities and the gas utilities.[70] So for each state, two points are at stake, one for each industry (electricity and natural gas). A point is added if there is no tracker to add the capital costs to the rate base for an industry, no points added if the regulations permit the inclusion of capital cost trackers.

Construction of utility plants does not occur overnight. It often takes years. In the interim the utility is expending large construction costs. If the company has to wait until the plant is finished to include the costs in the rate base, the utility's cash flow is often strained and the consumer experiences "sticker shock" when the rate base suddenly jumps. Utility commissions often avoid these problems by keeping an ongoing account of "construction work in progress" (CWIP) and allowing an immediate recovery of these costs through the rate base.[71] Those states that have a CWIP do not receive a point, but those without one do.

Multiyear rate plans allow a utility to avoid making constant trips back to the utility commission in order to be compensated for changing business conditions. Typically these plans are designed for a period of one to three years. Often any rate escalation is based on an automatic attrition relief mechanism (ARM) that provides the utility with an allowance for growing costs. The ARM provides the utility with an incentive for better performance while simultaneously reducing regulatory costs.[72] While there is often a cap on how much rates can rise, clearly this provision will cause a more efficient allocation of resources (for both

customers and the utility) than if it did not exist. States are, therefore, given a point if they fail to have multi-year rate plans. Again, two points are possible, one for electricity and one for the gas utility.

Restrictions on the construction of new utility plants are also measured on a 5 point scale. These restrictions vary widely by states. At one extreme are states that do not require additional PUC review of construction plans no matter how large the proposed project. Since these states create lower regulatory compliance costs, and allow resources to migrate freely to where they are most efficient, these states receive the best score of 1. At the other extreme, there are states that require all plant proposals, regardless of how small the project may be, to be reviewed by the state commission. These states create the biggest barriers to efficient allocation of resources, so they receive the worst score of 5. In between are states that require reviews of only some plants, and they receive scores of 2-4. The threshold for review is the proposed megawatt output of the plants. The larger the power threshold that triggers a review (the fewer plants that require review), the better the score.

The 10-point scale for regulations hindering producer flexibility is summarized in Table 12:

Table 12
How Points Are Allocated in the Index of Regulations Hindering Producer Flexibility

SCORE	HINDRANCES TO PRODUCER FLEXIBILITY	
1	No Review Necessary	
2	Required Review on Plants Over 500 MW	
3	Required Review on Plants Over 100 MW	
4	Required Review on Plants Over 20 MW	
5	Construction of Plants of All Sizes Must Be Reviewed	
Points	Existence of Capex Tracker	
	• Electric Utilities	Yes = 0, No=1
	• Gas Utilities	Yes = 0, No=1
	Existence of Construction Work in Progress (CWIP)	Yes = 0, No=1
	Existence of Multiyear Rate Plans	
	• Electric Utilities	Yes = 0, No=1
	• Gas Utilities	Yes = 0, No=1

Applying this scoring system to the 50 states produces the following rankings:

Table 13
The 50 State Rankings of Regulations Hindering Producer Flexibility

STATE	RANK	PRODUCER FLEXIBILITY INDEX
Alaska	1	5
Arizona	1	5
California	1	5
Colorado	1	5
Florida	1	5
Georgia	1	5
Kansas	1	5
Oklahoma	1	5
Pennsylvania	1	5
Utah	1	5
Delaware	11	6
Illinois	11	6
Massachusetts	11	6
Minnesota	11	6
New Hampshire	11	6
New York	11	6
Ohio	11	6
Virginia	11	6
Arkansas	19	7
Hawaii	19	7
Iowa	19	7
Kentucky	19	7
Louisiana	19	7
Oregon	19	7
South Carolina	19	7
South Dakota	19	7
Texas	19	7
Vermont	19	7
Wisconsin	19	7
Alabama	30	8
Indiana	30	8
Maine	30	8
Michigan	30	8
Mississippi	30	8
Missouri	30	8
Montana	30	8
New Jersey	30	8
New Mexico	30	8
North Dakota	30	8
Rhode Island	30	8
Washington	30	8
West Virginia	30	8
Wyoming	30	8
Connecticut	44	9
Idaho	44	9
Maryland	44	9
Nevada	44	9
North Carolina	44	9
Nebraska	49	10
Tennessee	49	10

Because the lowest score among the states is 5, clearly no state has a highly economic efficient regulatory policy for producer flexibility. In fact, since almost half the states have scores between 8 and 10, there is considerable room for states to improve their policies.

7. Regulations that Affect Motor Vehicles

Ask the average person to name a state's biggest impact on everyday car driving and chances are he will mention the state's gasoline tax. However, that tax is only one way state regulations reduce the economic efficiency of driving an automobile. Many states increase requirements for renewable fuel, emission reductions, and mileage standards beyond even the federal mandates. Two states even restrict whether the driver can pump his own gasoline.

The component index for the impact of motor vehicle regulations captures into a 10-point scale each of these ways that states affect the cost and ease of driving. First, states receive between 1 and 5 points based on the magnitude of the gasoline tax:

Table 14
The Higher a State's Gasoline Tax, The Worse Its Score[73]

SCORE	HOW POINTS ARE ALLOCATED FOR STATE GASOLINE TAXES
1	At least 5 cents and not more than 15 cents
2	More than 15 cents, up to 25 cents
3	More than 25 cents, up to 30 cents.[74]
4	More than 30 cents, up to 40 cents
5	More than 40 cents

Second, the remaining five subcomponents of this index are based on whether the state implements the policy (which adds an additional point) or not (no additional point added).[75] These five subcomponents are:

- Prohibition of self-service gasoline stations
- Additional renewable fuel standards
- Idling regulations
- Emission and air quality standards, and
- Acquisition or fuel use standards

Each one of these five subcomponents reduce economic efficiency because they reduce consumer choice (prohibition on self-service gasoline stations) or impose additional costs on motor vehicle operators (additional renewable fuel standards, idling regulations, emission and air quality standards, and acquisition or fuel use standards), raising the costs of operating a motor vehicle. Hence, these five subcomponents reduce overall economic efficiency by erecting barriers that prevent otherwise efficient outcomes from emerging.

For example, New Jersey and Oregon prohibit the sale of gasoline at self-service stations. That prohibition eliminates the consumer's choice of whether to save say 4 cents per gallon by spending the time and effort to pump their own gasoline, or to pay the premium to have someone else do it for them. Not everyone

objects to full-service gasoline stations, but given the fact that self-service stations are the predominant method of delivering gasoline from the pump in most states, clearly there are a lot of people who do not feel the extra service is worth the extra premium. To them the additional 4 cents a gallon could be better spent (more valuable) elsewhere. Their counterparts in New Jersey and Oregon are forced to pay that extra price on gasoline whether they want to or not. Clearly economic efficiency is reduced as time and money are allocated to where they are less valuable. For that reason each of these two states receives a point for prohibiting the choice of how to pump gas.

The additional renewable fuel standards refer to whether the state mandates that mixture requirements on private sector fuel exceed those already imposed by the federal government. These standards could involve the quantity of renewable fuel (such as ethanol) used in the total amount of gasoline sold in the state, or that each gallon contain a prescribed percentage of the renewable fuel. Without this elevated regulation, consumers could choose gasoline containing less renewable fuel. Forcing the expanded use of the alternative ingredient, therefore, gives consumers no alternative other than to buy a blend they might prefer not to use. Economic efficiency is reduced, and the state receives a point.

The federal government allows states to impose regulations limiting the idling of primarily trucks and buses. A state with such rules receives a point.

There is more than one type of regulation aimed at decreasing vehicle emissions and increasing air quality standards. For example, a state may require that a minimum percentage of the state government car fleet be electric or alternative fuel vehicles. Or trucks and trailers in the state may be required to use fuel efficient tires and other devices that improve the gas mileage of the vehicle. Alternatively, private cars in the state may have similar types of requirements. While the goal of increasing air quality is noble, from an economic efficiency perspective resources have been diverted from where they are more productive. So, if the vehicles are subject to such laws, the state receives a point.

Finally, the acquisition and fuel use standards set targets (usually) for what the state government can buy for its fleet. As the state purchases vehicles now and in the future, the cars and trucks are required to have legislated standards for both fuel economy and emissions. Diverting purchases to vehicles meeting these standards means that other, cheaper cars and trucks that could provide the same services are avoided. More resources are diverted to the legislated fleet than otherwise. The state receives a point.

The ranking and scores for each state from the combination of up to 5 points for the gasoline tax plus the 5 other potential points is provided in Table 15 on the next page.

Table 15
State Rankings for Motor Vehicle Regulations

STATE	RANK	MOTOR VEHICLE REGULATIONS INDEX
Alaska	1	1
Alabama	2	2
Arkansas	2	2
Missouri	2	2
Tennessee	2	2
Texas	2	2
Wyoming	2	2
Colorado	8	3
Georgia	8	3
Kansas	8	3
Minnesota	8	3
New Hampshire	8	3
North Dakota	8	3
Ohio	8	3
Oklahoma	8	3
Utah	8	3
Delaware	17	4
Idaho	17	4
Illinois	17	4
Iowa	17	4
Kentucky	17	4
Louisiana	17	4
Massachusetts	17	4
Montana	17	4
Nevada	17	4
New Jersey	17	4
New Mexico	17	4
South Carolina	17	4
South Dakota	17	4
Virginia	17	4
Arizona	31	5
Florida	31	5
Hawaii	31	5
Mississippi	31	5
Nebraska	31	5
Oregon	31	5
Washington	31	5
Connecticut	38	6
North Carolina	38	6
Rhode Island	38	6
Vermont	38	6
Wisconsin	38	6
Indiana	43	7
Maine	43	7
Maryland	43	7
Michigan	43	7
New York	43	7
Pennsylvania	43	7
West Virginia	49	8
California	50	9

This is another component where the state scores vary widely. However, since the median score is only 4, in general states have economically efficient regulations for motor vehicle regulations.

The 50 State Index

The seven component indices just reviewed in detail comprise the overall *50 State Index*. The construction of the overall index is straightforward—simply average the scores of the seven components of any given state. Comparisons of state rankings, overall average scores, as well as the individual state component scores are provided in Table 16.

The table is divided into quintiles (5 shaded parts) for easier comparison.[76] Those at the top of the list (top quintile) are states with the best economic efficiency environments for energy consumption and production. Those at the bottom (5th quintile) are states that have the most or largest barriers to economically efficient use of energy resources.

Table 16 THE 50 STATE INDEX OF ENERGY REGULATION

	Rank	Average Score	Regulations Affecting Retail Choice for Electricity	Regulations Affecting Production of Electricity	Regulations Affecting Transmission of Energy	Regulations: Subsidies & Net Metering	Regulations Affecting Consumption of Energy from Utilities	Regulations Affecting Producer Flexibility	Regulations Affecting Motor Vehicles
Alabama	1	4.29	10.0	1.0	2.0	2.0	5.0	8.0	2.0
Alaska	1	4.29	10.0	1.0	5.0	7.0	1.0	5.0	1.0
South Dakota	1	4.29	10.0	3.0	3.0	2.0	1.0	7.0	4.0
Texas	1	4.29	2.0	2.0	8.0	4.0	5.0	7.0	2.0
Delaware	5	4.48	6.3	4.0	2.0	4.0	5.0	6.0	4.0
North Dakota	6	4.57	10.0	3.0	3.0	3.0	2.0	8.0	3.0
Georgia	7	4.86	10.0	1.0	3.0	5.0	7.0	5.0	3.0
Kansas	7	4.86	10.0	5.0	6.0	3.0	2.0	5.0	3.0
Missouri	7	4.86	10.0	2.0	5.0	6.0	1.0	8.0	2.0
Oklahoma	10	5.00	10.0	4.0	3.0	6.0	4.0	5.0	3.0
Wyoming	10	5.00	10.0	2.0	5.0	5.0	3.0	8.0	2.0
Colorado	12	5.14	10.0	5.0	7.0	5.0	1.0	5.0	3.0
Mississippi	12	5.14	10.0	1.0	6.0	2.0	4.0	8.0	5.0
Ohio	14	5.24	7.7	3.0	6.0	5.0	6.0	6.0	3.0
Florida	15	5.29	10.0	2.0	6.0	4.0	5.0	5.0	5.0
Nebraska	15	5.29	10.0	1.0	2.0	4.0	5.0	10.0	5.0
Louisiana	17	5.43	10.0	2.0	5.0	5.0	5.0	7.0	4.0
Tennessee	17	5.43	10.0	1.0	7.0	4.0	4.0	10.0	2.0
Utah	17	5.43	10.0	4.0	5.0	6.0	5.0	5.0	3.0
Arizona	20	5.57	10.0	3.0	7.0	5.0	4.0	5.0	5.0
Iowa	20	5.57	10.0	2.0	5.0	6.0	5.0	7.0	4.0
South Carolina	20	5.57	10.0	1.0	6.0	5.0	6.0	7.0	4.0
Arkansas	23	5.71	10.0	1.0	10.0	5.0	5.0	7.0	2.0
Hawaii	23	5.71	10.0	3.0	4.0	7.0	4.0	7.0	5.0
Idaho	23	5.71	10.0	1.0	6.0	4.0	6.0	9.0	4.0
West Virginia	26	5.86	10.0	3.0	4.0	3.0	5.0	8.0	8.0
Rhode Island	27	6.00	4.0	4.0	5.0	5.0	10.0	8.0	6.0
Montana	28	6.05	7.3	5.0	3.0	8.0	7.0	8.0	4.0
Indiana	29	6.14	10.0	3.0	4.0	4.0	7.0	8.0	7.0
New Mexico	29	6.14	10.0	5.0	4.0	7.0	5.0	8.0	4.0
Illinois	31	6.19	5.3	6.0	5.0	9.0	8.0	6.0	4.0
Kentucky	32	6.29	10.0	2.0	6.0	8.0	7.0	7.0	4.0
Virginia	32	6.29	10.0	3.0	8.0	7.0	6.0	6.0	4.0
Minnesota	34	6.43	10.0	7.0	7.0	8.0	4.0	6.0	3.0
Vermont	34	6.43	10.0	3.0	6.0	8.0	5.0	7.0	6.0
Maine	36	6.48	6.3	9.0	8.0	6.0	1.0	8.0	7.0
New Hampshire	36	6.48	6.3	5.0	10.0	8.0	7.0	6.0	3.0
Massachusetts	38	6.52	7.7	5.0	7.0	9.0	7.0	6.0	4.0
Nevada	39	6.57	10.0	5.0	4.0	7.0	7.0	9.0	4.0
Pennsylvania	39	6.57	8.0	5.0	6.0	10.0	5.0	5.0	7.0
Oregon	41	6.62	9.3	3.0	4.0	10.0	8.0	7.0	5.0
North Carolina	42	6.71	10.0	2.0	6.0	7.0	7.0	9.0	6.0
New Jersey	43	6.81	5.7	5.0	9.0	10.0	6.0	8.0	4.0
Michigan	44	6.86	9.0	4.0	7.0	7.0	6.0	8.0	7.0
Washington	44	6.86	10.0	4.0	8.0	4.0	9.0	8.0	5.0
Maryland	46	7.10	4.7	5.0	5.0	10.0	9.0	9.0	7.0
Connecticut	47	7.14	6.0	6.0	7.0	8.0	8.0	9.0	6.0
Wisconsin	48	7.29	10.0	5.0	8.0	9.0	6.0	7.0	6.0
California	49	7.71	9.0	7.0	7.0	9.0	8.0	5.0	9.0
New York	50	7.86	8.0	9.0	8.0	10.0	7.0	6.0	7.0

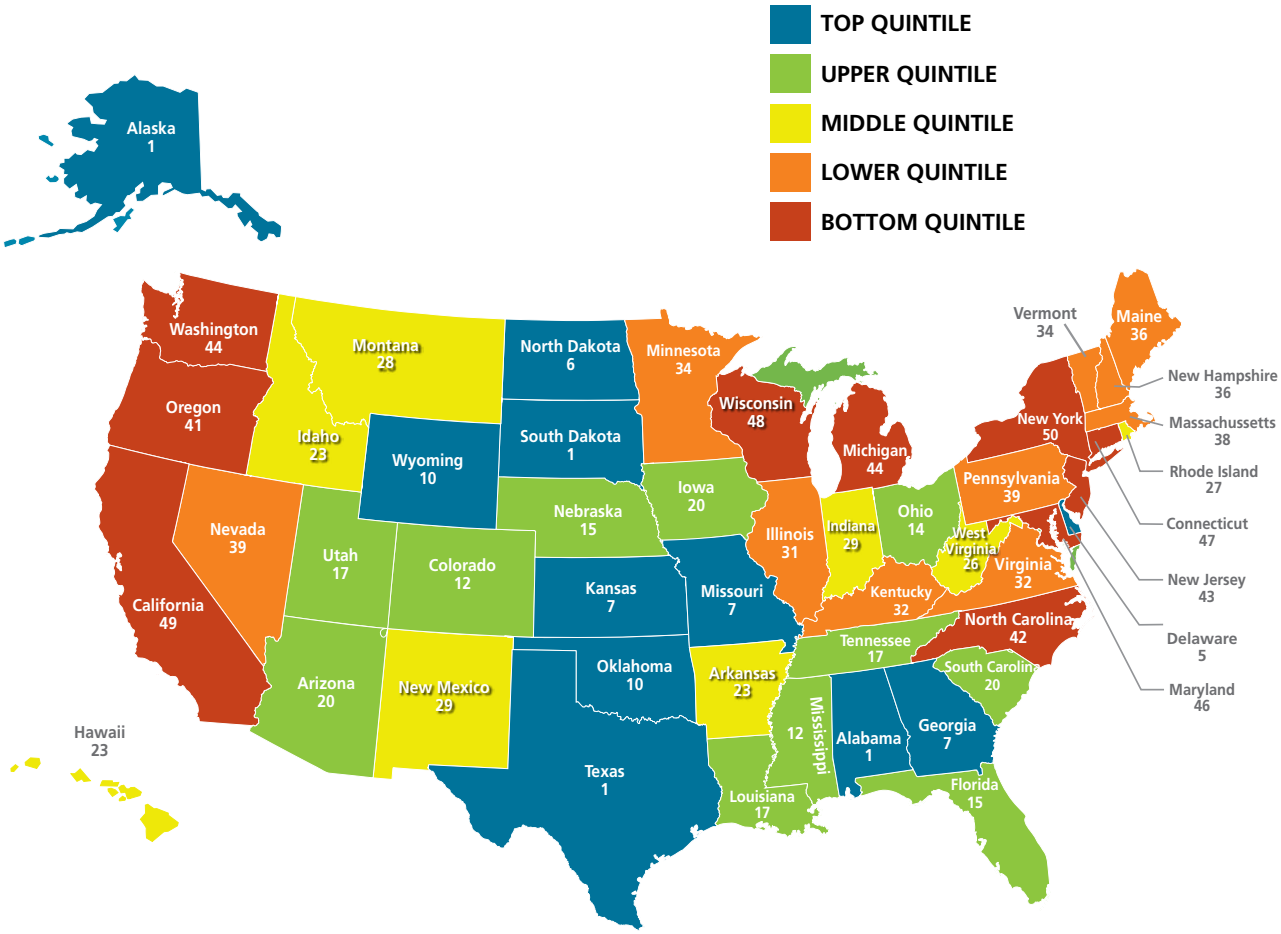
Several patterns emerge. First, there appears to be little relationship between whether a state is a source of energy resources oil, gas, or coal, and whether it is an economically efficient state for consumption or operating energy-related businesses. Table 17 below shows the 15 states that account for 95 percent of oil and natural gas reserves in the continental United States.[77] The table lists separately the percentage of oil reserves, gas reserves, as well as the overall ranking in the *50 State Index*. While the two states with the largest reserves (Texas and Alaska) are ranked at the very top of the *Index*, the state with the third largest reserves (California) is ranked at the very bottom. Several of the states are ranked near the middle. Coal reserves are not shown, but major coal producers[78] West Virginia and Kentucky are ranked 26th and 32nd, which puts them in the third and fourth quintiles.

Table 17
RANKING OF TOP RESERVE STATES

STATES COMPRISING 95% OF OIL AND NATURAL GAS RESERVES			
	% of Reserves		Rank
	Oil	Natural Gas	
Texas	34.2%	30.9%	1
Alaska	16.2%	2.8%	1
North Dakota	11.2%	0.8%	6
Kansas	1.5%	1.1%	7
Oklahoma	4.8%	8.9%	10
Wyoming	3.9%	10.9%	10
Colorado	2.3%	7.7%	12
Louisiana	2.2%	9.0%	17
Utah	2.5%	2.4%	17
Arkansas	0.2%	4.9%	23
West Virginia	0.2%	3.1%	26
Montana	1.6%	0.2%	28
New Mexico	4.0%	4.8%	29
Pennsylvania	0.2%	7.9%	39
California	12.7%	0.9%	49

There is, however, a geographical pattern. The map of the United States in Figure 2 below is a color coded picture of state rankings (the actual ranking number is also included for each state). The red and orange states are those in the bottom two quartiles, the states with the biggest barriers to economic efficiency. In contrast the green and blue states are those with environments most amenable to consuming energy economically efficiently.

Figure 2
A Map of the 50 State Index of Energy Regulations[79]



States in the South and the Plains tend to have better energy regulation policies; while the Pacific states and New England tend to promulgate regulations that create relatively more obstacles to the efficient consumption, production, and use of energy. Additionally, the states that scored well, while imposing a few efficiency reducing policies, tend to score well across all categories. Those states that scored poorly, on the other hand, tend to score poorly across all categories. Consequently, both the top scoring states and the bottom scoring states were not driven by any single category, but were the result of consistently good regulatory policies in the case of the top states and consistently bad regulatory policies in the case of the bottom states.

Interestingly, the strongest relationship to ranking is a state's growth rate.[80] High ranked states have faster growth rates than those ranked low. Table 18 below provides 5-year and 10-year growth rates by quintiles. The average growth rates for states within the quintiles follow a consistent trend. Over the 10-year period 2002-2012, states in the top quintile had on average cumulative growth rates that were more than 20 percentage points higher than those in the bottom quintile. The top quintile also had growth rates that exceeded those of middle three quintiles. The bottom quintile's cumulative growth was lower than most of these other three.[81]

Ten-year growth rates better smooth out the effects of a particularly good or bad year and provide better contrasting totals. However, the results for 5-year total growth have precisely the same pattern. Hence, the results do not seem sensitive to the length of time period chosen.

Table 18
Comparison of Average 5-Year and 10-Year Growth Income Rates to Rank

	AVERAGE GDP GROWTH 2007-12	AVERAGE GDP GROWTH 2002-12
Top Quintile	18.7%	65.6%
Upper Quintile	12.4%	51.7%
Middle Quintile	12.5%	52.1%
Lower Quintile	12.0%	43.7%
Bottom Quintile	11.1%	44.2%

A similar pattern holds for employment growth.[82] Not only do the top-ranked states generate more economic activity, more jobs are created in these states as well. Table 19 below provides the 10-year growth rates, over the period 2002-2012, by quintiles. The average employment growth rates for states in the quintiles follow the same consistent trend. States in the top quintile had, on average, cumulative job growth rates that were more than 8 percentage points higher than those in the bottom quintile. The top quintile also had growth rates that exceeded those of the middle three quintiles. The bottom quintile's cumulative growth was lower than these middle three. The numbers for 5-year cumulative growth have a similar pattern.

Table 19
Comparison of Average 5-Year and 10-Year Nonfarm Employment Growth Rates to Rank

	AVERAGE EMPLOYMENT GROWTH 2007-12	AVERAGE EMPLOYMENT GROWTH 2002-12
Top Quintile	2.6%	9.8%
Upper Quintile	-1.7%	5.0%
Middle Quintile	-1.9%	6.1%
Lower Quintile	-2.1%	2.8%
Bottom Quintile	-2.2%	1.7%

Conclusion

Using publicly available data for states, we construct a *50 State Index* of the energy regulatory environment by state. The goal of the economic framework is to objectively capture the relative economic efficiency of energy consumption and use across the country. The results are summarized in an overall *Index,* an average of seven component indices measuring important aspects of the economic efficiency of regulations among the states.

The rankings indicate that the states with the economic environments most conducive to efficient production and consumption of energy are primarily in the South and the Plains. Those states on the West Coast, Northeast, and upper Midwest are just the opposite. Another major conclusion from this study is a close correlation between a state's energy regulation ranking and its growth rate. Those states ranked highest tend to have faster growth than those at the bottom of the rankings. Efficient energy use is one of the essential ingredients that drive economic growth in a modern economy.

The aim of this study is not only to create a useful index, but also to gather conveniently in one place links to all the relevant data available for such an analysis. As stated at several points in this study, data relevant to capturing some important aspects of state regulation cannot be found. Therefore, some aspects of regulation that might add insight cannot currently be measured. One would hope that over time more and more of the desired data will appear, and that future editions of this *Index* will be able to provide an even more complete picture of state energy regulation.

Endnotes

1 "Annual Energy Review" *U.S. Energy Information Administration*; http://www.eia.gov/totalenergy/data/annual/#summary

2 Blanch, Francisco, Bank of America Merrill Lynch, "Energy Carrying America," July 2012. Available at: http://wealthmanagement.ml.com/Publish/Content/application/pdf/GWMOL/Energy-carrying-America.pdf.

3 http://energy.gov/energysaver/articles/small-solar-electric-systems.

4 These numbers and a discussion of the issues surrounding wind power generation can be found in two articles on *Bloomberg.com,* Tom Randall, "U.S. Wind Power Blows New Records. Again. And Again.," April 7, 2014, and Christopher Martin, "Shale Gas Boom Leaves Wind Companies Seeking More Subsidy," April 6, 2014.

5 http://www.awea.org/Resources/Content.aspx?ItemNumber=5059.

6 http://www.ucsusa.org/clean_energy/smart-energy-solutions/increase-renewables/production-tax-credit-for.html.

7 Clayton, Mark (2013) "Natural gas 'fracking' has flipped US energy map, study says" *Christian Science Monitor*, October 9; http://www.csmonitor.com/Environment/2013/1009/Natural-gas-fracking-has-flipped-US-energy-map-study-says.

8 "Henry Hub Natural Gas Spot Prices"; http://www.eia.gov/dnav/ng/hist/rngwhhdm.htm.

9 According to the EIA: "The largest drop in emissions in 2012 came from coal, which is used almost exclusively for electricity generation. During 2012, particularly in the spring and early summer, low natural gas prices led to competition between natural gas- and coal-fired electric power generators. Lower natural gas prices resulted in reduced levels of coal generation, and increased natural gas generation—a less carbon-intensive fuel for power generation, which shifted power generation from the most carbon-intensive fossil fuel (coal) to the least carbon-intensive fossil fuel (natural gas)." http://www.eia.gov/todayinenergy/detail.cfm?id=10691.

10 As an example, the American Security Project released a joint report with the Sierra Club that argues that "America's addiction to oil threatens our national security, our economy and our environment."; http://www.americansecurityproject.org/report-asp-and-sierra-club-release-joint-report-outlining-dangers-of-our-reliance-on-foreign-oil-and-the-need-for-a-new-transportation-infrastructure/.

11 *Bloomberg.com,* "U.S. to Be Top Oil Producer by 2015 on Shale, IEA Says," November 12, 2013. http://www.bloomberg.com/news/2013-11-12/u-s-nears-energy-independence-by-2035-on-shale-boom-iea-says.html

12 AEO2014 Early Release Overview, Energy Information Administration, December 16, 2013; http://www.eia.gov/forecasts/aeo/er/early_production.cfm.

13 "Henry Hub Natural Gas Spot Prices"; http://www.eia.gov/dnav/ng/hist/rngwhhdm.htm.

14 *The Concise Encyclopedia of Economics* (http://www.americansecurityproject.org/report-asp-and-sier-

ra-club-release-joint-report-outlining-dangers-of-our-reliance-on-foreign-oil-and-the-need-for-a-new-transportation-infrastructure/) provides a more detailed definition of economic efficiency as used by economists: "To economists, efficiency is a relationship between ends and means. When we call a situation inefficient, we are claiming that we could achieve the desired ends with less means, or that the means employed could produce more of the ends desired. "Less" and "more" in this context necessarily refer to less and more value. Thus, economic efficiency is measured not by the relationship between the physical quantities of ends and means, but by the relationship between the value of the ends and the value of the means…." "The inescapably evaluative nature of the concept raises a fundamental question for every attempt to talk about the efficiency of any process or institution: Whose valuations do we use, and how shall they be weighted? Economic efficiency makes use of monetary evaluations. It refers to the relationship between the monetary value of ends and the monetary value of means. The valuations that count are, consequently, the valuations of those who are willing and able to support their preferences by offering money." http://www.econlib.org/library/Enc/Efficiency.html. As applied to the *Index*, regulations that lead to lower costs or increase the available number of options for energy production, consumption, and distribution are defined as promoting economic efficiency; whereas, regulations that lead to higher costs or reduce the number of options for energy production, consumption, and distribution are defined as reducing economic efficiency.

15 See (2013) "Doing Business 2014: Understanding Regulations for Small and Medium-Size Entrepreneurs" The World Bank and IFC, 11th edition; http://www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB14-Full-Report.pdf, Miller, Terry, Kim, Anthony B., and Holmes, Kim R., (2014) "2014 Index of Economic Freedom" Heritage Foundation*/Wall Street Journal*; http://www.heritage.org/index/pdf/2014/book/index_2014.pdf, and Transparency International, "2013 Corruption Perceptions Index"; http://cpi.transparency.org/cpi2013/.

16 A large share of the new U.S. power capacity is coming from alternative energy sources. For a breakdown of the top sources of new U.S. power capacity see: http://cleantechnica.com/2014/01/28/solar-surpasses-natural-gas-part-us-energy-infrastructure/.

17 According to the Solar Energy Industries Association, "2013 was another record year for the U.S. solar industry. There were 4,751 MW of new photovoltaic (PV) capacity installed in 2013, representing a 41 percent increase in deployment over installation levels in 2012."http://www.seia.org/research-resources/solar-industry-data.

18 According to the American Wind Energy Association, "At the end of 2013 there were more U.S. wind power megawatts (MW) under construction than ever in history: Over 12,000 MW of new generating capacity was under construction, with a record-breaking 10,900 MW starting construction activity during the fourth quarter." http://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=6044.

19 For instance, see the Wave Energy Conversion Programs; http://www1.eere.energy.gov/water/pdfs/wp_accomplishments_brochure.pdf.

20 Due to data limitations drilling and mining regulations (extraction regulations), for instance, are not covered in the *Index*. With respect to regulations on mining and oil and natural gas drilling, there are no consistent and comprehensive state regulatory comparisons as far as we were able to confirm. With respect to mining regulations (due to the Surface Mining Control and Reclamation Act of

1977), states must receive federal approval and, therefore, there is a great deal of similarity across the states. Additionally, extraction regulations are not applicable in all states—only in those states that have extraction activity. For these reasons, we did not include extraction regulations in the *Index*. Despite their exclusion, state regulations on extraction activities are obviously meaningful. For instance, while some states (such as New York and now possibly California) are considering banning fracking, other states (such as North Dakota) are embracing this technology improvement. Such regulatory uncertainty in New York leads to economic inefficiencies and lost potential economic growth; while, the regulatory certainty in North Dakota is fostering greater economic efficiencies that are paying large economic growth dividends.

21 Deregulated utilities originated in Britain. As the U.S. Energy Information Agency wrote in 2010, "Beginning in about 1990, Britain and Wales began restructuring their utilities to allow *direct access* by letting customers choose a power supplier competitively and pay the utility only for distribution service. Under restructuring, utilities may provide combined billing for both the distribution service (which they provide) and for the power (which is supplied by others). (The term *retail electricity service* is widely used overseas to mean the business that actually interacts with the consumer, issuing bills and collecting revenues. In the U.S., distribution utilities perform these functions almost exclusively.) After 1994 the British experiment was followed by some U.S. states…. In most cases, investor-owned utilities in these states had previously owned power plants, but sold them to unaffiliated entities, or transferred them to non-regulated subsidiaries of the same parent corporation. These states made provisions for a *default supply* — also referred to as *basic service* — for those consumers that do not choose a competitive supplier, or whom the competitive market simply does not serve." *Source:* U.S Energy Information Administration, States With Restructuring Activity As of 2010; www.eia.doe.gov/cneaf/electricity/page/restructuring/restructure_elect.html

22 The push for deregulation of natural gas and electric happened when the Federal Energy Regulation Commission (FERC) decided it should limit its authority to wholesale transactions. This move cleared the way for individual states to determine if and how they should allow retail price competition. Allied Power Services, "Deregulated States," http://www.alliedpowerservices.com/deregulated-states.shtml

23 Deregulated states are California, Connecticut, the District of Columbia, Delaware, Illinois, Massachusetts, Maryland, Maine, Michigan, Montana, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, and Rhode Island. Source: American Public Power Association, "Retail Electric Rates in Deregulated and Regulated States: 2012 Update", April 2013, P.1. http://www.publicpower.org/files/PDFs/RKW_Final_-_2012_update.pdf (Data originally from U.S. Energy Information Administration)

24 "In most deregulated states, IOUs [Independently Owned Utilities] sold off their electric generating facilities as part of the implementation of the retail choice regime. Over the past few years, the percentage of customers purchasing from an alternative supplier has increased and currently ranges from about 15 to 45 percent in most retail choice states…. With the exception of part of Montana, all of these states are located in regions where wholesale electricity prices are set through centralized wholesale markets run by regional transmission organizations (RTOs) and Independent System Operators (ISOs)". Source: American Public Power Association, "Retail Electric Rates…." P.1

25 As pointed out previously, to some restricting the types of power generation or power usage can be viewed as a positive, reducing externalities. However, as also pointed out, our approach only evaluates from an economic efficiency perspective.

26 Joskow, Paul L. "California's Electricity Crisis" *Oxford Review of Economic Policy* Vol. 17, No. 3.

27 It should be noted that some of the issues, such as choice of corporate form and storage tanks, are not actually included in the *50 State Index*. These are two more examples of how data availability limited what aspects could actually be measured.

28 Other Index studies, such as the World Bank's *Doing Business* use a proxy for variables due to the unavailability of the precise measure for the activity in question.

29 http://www.eia.gov/todayinenergy/detail.cfm?id=6250.

30 Source: http://www.eia.gov/todayinenergy/detail.cfm?id=6250. The EIA does not provide specific data for Texas, the Texas data are from the "Public Utility Commission of Texas, Report Cards on Retail Competition and Summary of Market Share Data"; http://www.puc.texas.gov/industry/electric/reports/RptCard/Default.aspx. The data is based on Total Market Share as of September 2013, MWh sold.

31 "America's experience with retail competition in supplying electricity has revealed that the costs of acquiring and administering the accounts of low-volume users generally exceed the profit margins that sales of the power as a commodity, separate from distribution, allow." www.eia.doe.gov/cneaf/electricity/page/restructuring/restructure_elect.html

32 This data limitation arises again with other index subcomponents. The general methodology to address this limitation depends upon the impact that the regulation has on economic efficiency. The category score for those states that implement regulations that diminish economic efficiency (increase economic inefficiency) increases by 1, a higher score indicating the state's regulations are more economically inefficient. The reverse methodology is used for those regulations that enhance economic efficiency (decrease economic inefficiency).

33 The data on each state's current renewable portfolio mandate are from: http://www.eia.gov/forecasts/aeo/table_3.cfm (EIA Annual Energy Outlook) and http://www.dsireusa.org/.

34 Future mandates are considered to be higher *only* if they actually exist in current law. The mere proposal of future higher mandates does not affect the score.

35 California participates in the Western Climate Initiative and has passed AB 32 imposing a state-based cap & trade targets. California is assigned one point similar to the other participants in other regional climate initiatives.

36 (1998) "Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity", Energy Information Administration, October (SR/OIAF/98-03).

37 http://www.epa.gov/captrade/programs.html

38 http://www.ncsl.org/research/energy/carbon-capture-and-storage-in-the-states.aspx

39 Source: Association of American Railroads, "Railroads and Coal," August 2013, https://www.aar.org/keyissues/Documents/Background-Papers/Railroads-and-Coal.pdf

40 Source: Association of American Railroads, "Railroads and Coal," August 2013, https://www.aar.org/keyissues/Documents/Background-Papers/Railroads-and-Coal.pdf

41 Source: Association of American Railroads, "Railroads and Coal," August 2013, https://www.aar.org/keyissues/Documents/Background-Papers/Railroads-and-Coal.pdf

42 http://www.aga.org/KC/ABOUTNATURALGAS/CONSUMERINFO/Pages/NGDeliverySystem.aspx.

43 https://www.osha.gov/SLTC/etools/electric_power/illustrated_glossary/transmission_lines.html.

44 See the Center for Effective Government, http://www.foreffectivegov.org/node/3461.

45 For a more complete explanation of the history of the Commerce Clause, the ICC and the STB, see Kara Slaughter, "Runaway Train? Federal Preemption of State and Local Laws Regulating Railroads," A report prepared for the Shoreham Area Advisory Committee, February 14, 2005, http://www.cura.umn.edu/sites/cura.advantagelabs.com/files/publications/NPCR-1208.pdf

46 Edison Electric Institute, State Generation and Transmission Siting Directory, November 15, 2013, http://www.eei.org/issuesandpolicy/transmission/Documents/State_Generation_Transmission_Siting_Directory.pdf

47 https://www.osha.gov/SLTC/etools/electric_power/illustrated_glossary/transmission_lines.html

48 Other regulatory requirements from local governments or environmental agencies, for example, are not examined.

49 Louisiana was an exception. The state has two options for an electric utility, seek no approval (a score of 1) but not include the cost in the rate base, or seek approval for any lines to be included in the rate base (a score of 5). Given only this bifurcated choice, Louisiana was given the middle score of 3.

50 If a utility does not need a permit within its service area, the score is a 1 regardless of whether the utility needed to obtain permission outside of its service area. The justification is that most investments will likely be within the service area.

51 Even using this approach, not every state falls neatly into these categories. For example, in Delaware the commission requires certificates if the new transmission lines extend beyond the predefined service territory of that utility. Missouri is also unclear for the same reason. Each case required a judgment call on our part. We tried to be consistent and to follow the categories as closely as possible.

52 National Association of Pipeline Safety Representatives and National Association of Regulatory Utility Commissioners, Compendium of State Pipeline Safety Requirements and Initiatives Providing Increased Public Safety Levels Compared to Code of Federal Regulations, 2nd Edition, September 9, 2013, http://www.naruc.org/Publications/Compendium%20FINAL%20NAPSR%20Oct%2028%202011%20First%20EditionR%20.pdf

53 For a discussion of net metering and its issues, see the Institute for Energy Research (IER), "Net Metering 101," http://www.instituteforenergyresearch.org/2014/01/14/net-metering-101/

54 Mulkern, Anne C. (2013) "Hawaii solar boom so successful, it's been halted" *ClimateWire,* December 20; http://www.eenews.net/stories/1059992167.

55 There are at least two ways that a utility can deal with excess electricity: refuse to buy electricity from the consumer, or refuse to buy it from a larger generation source. The utility might choose not to buy the consumer's power if, say, there exist contracts specifying a minimum amount of energy it must purchase from larger sources. If the utility refuses to buy the consumer's excess solar panel power, that electricity will go to waste. However, since the consumer's marginal cost of generating power (given the solar panels) is zero, the economy's marginal cost equals the marginal benefit, i.e. both are zero. Alternatively, if the larger generation plant is operating in a range where it might easily adjust output up or down, it makes sense for the utility to tell that power supplier to simply curtail some of the output. The economy would benefit, for that electricity output has a positive marginal cost (think oil, gas or coal used for generation) and is replaced by the zero marginal cost electricity from the consumer. However, neither the regulator nor the utility knows well in advance which of these two alternatives will be the right one. The utility will be better informed at the time the decision has to be made. Hence, the preferable regulation is to give the utility flexibility to make that call, not mandating a particular outcome before the relevant facts are available.

56 For the link to the tables showing by state which programs are offered for both energy efficiency and renewable energy, see *Database of State Incentives for Renewables and Efficiency* (DSIRE) "Summary Tables," http://www.dsireusa.org/summarytables/index.cfm?ee=0&RE=0

57 Alternatively we could have used the total number of programs plus the number of categories for each state. We compared this alternative to the method we used and found the correlation coefficient is 0.95.

58 http://www.ase.org/resources/appliance-and-equipment-standards-fact-sheet.

59 Source: *The 2013 State Energy Efficiency Scorecard*, ACEEE. http://aceee.org/research-report/e13k

60 "The history of federal-state regulation of buildings and appliances, however, differs significantly from the regulation of traditional pollutants from power plants, automobiles, and other industrial sources under the Clean Air Act ("CAA"). Specifically, for stationary sources, the CAA framework creates a federal "floor," setting national minimum air quality standards; states are able to set more restrictive standards if they choose." Klass, Alexandra (2010) *Harvard Environmental Law Review* Vol. 34; http://www.law.harvard.edu/students/orgs/elr/vol34_2/335-368.pdf.

61 According to the EPA, "In 1978, California became the first state to include energy requirements in its code." http://epa.gov/statelocalclimate/documents/pdf/guide_action_chap4_s3.pdf. See also, http://www.bsc.ca.gov/abt_bsc/history.aspx.

62 http://energycodesocean.org/code-status-commercial

63 According to the EPA, "traditional regulation may lead to unintended disincentives for the utility promotion of end-use efficiency because revenues are directly tied to the throughput of electricity and gas sold. To counter this "throughput disincentive," a number of States are considering alternative approaches intended to align their utilities' financial interests with the delivery of cost-effective energy efficiency programs. "Decoupling" is a term more are hearing as a mechanism that may remove throughput disincentives for utilities to promote energy efficiency without adversely affecting their revenues." (2007) "Decoupling for Electric & Gas Utilities: Frequently Asked Questions" *The National Association of Regulatory Utility Commissioners*, September; http://epa.gov/statelocalclimate/documents/pdf/supp_mat_decoupling_elec_gas_utilities.pdf.

64 Obviously in states where energy prices are deregulated, the PUC cannot simply mandate a higher price for a kilowatt hour of electricity or a cubic foot of natural gas. Those prices are determined by the competition. Instead, the PUC allows the price increase in the one aspect in which the utility still has a monopoly, the transmission charge for use of the grid or pipelines.

65 The Congressional Budget Office (CBO (2001) "Causes and Lessons of the California Electricity Crisis" A CBO Paper, September, http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/30xx/doc3062/californiaenergy.pdf) similarly attributes the California electricity crisis to inflexible retail prices:

"Neither the state legislature and Public Utility Commission (PUC), which framed the plan, nor the Federal Energy Regulatory Commission, which approved it, envisioned the immediate or full deregulation of the electricity market covered by the plan. Instead, retail prices were to be frozen during an interim period. After that, the PUC would continue to oversee how much the utilities could charge their retail customers for generating or distributing electricity…."

"Even without restructuring, California's electric utilities would have faced a difficult challenge in meeting the demand for power and holding down prices in 2000. But at several key points during the unfolding crisis, features of the restructuring plan limited the responsiveness of the supply and demand sides of the electricity market. Consequently, wholesale electricity prices were higher than they probably would have been in either a traditionally regulated market or a more fully deregulated market."

"On the supply side, the plan's freeze on retail prices left the three big utilities in a financial shambles when wholesale prices in the spot market—where those utilities were acquiring nearly half of their power—rose above the freeze level."

66 Edison Electric Institute, "Alternative Regulation for Evolving Utility Challenges: An Updated Survey," January 2013, P. 5, http://www.eei.org/Pages/default.aspx. An example of the types of rate freezes today is a case in Wisconsin. On May 3, 2012, Alliant Energy filed a proposal with the Public Service Commission of Wisconsin (PSCW) to freeze retail electric base rates for 2013 and 2014, plus reduce gas base rates for 2013 by 7 percent, and then freeze them for 2014. On June 15, 2012, the PSCW approved the proposal, effective during the 2013 and 2014 calendar years. Under PSCW rules, Alliant Energy is still required to file annual electric fuel cost plans for calendar years 2013 and 2014, so increases or decreases in electric fuel costs could impact customer electric rates during that time. While gas prices have been near historic lows, gas prices change regularly and the cost remains a monthly pass-through to customers and will continue to affect customer bills.

67 See the previously cited CBO study: (2001) "Causes and Lessons of the California Electricity Crisis" *A CBO Paper*, September; http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/30xx/doc3062/californiaenergy.pdf.

68 For an example of the "net benefit" criteria in use rather than the "no harm" see: Ailworth, Erin (2011) "NStar merger must benefit environment" *The Boston Globe*, March 11; http://www.boston.com/news/local/massachusetts/articles/2011/03/11/nstar_merger_must_benefit_environmnent/.

69 These data all are found in Edison Electric Institute, "Alternative Regulation for Evolving Utility Challenges: An Updated Survey," January 2013, Table 1, "Innovations to Reduce Regulatory Lag:

An Overview of Current Precedents" pp. 3-4, http://www.eei.org/Pages/default.aspx.

70 Cost trackers also serve another purpose – allowing utilities to raise their retail prices to compensate for rising energy and other costs. To quote the Edison Electric Institute's study, "Trackers are used in various situations where they are a more practical means of adjusting rates for particular business conditions. Utilities usually recover fuel and purchased power costs via trackers because the volatility and substantial size of these costs would otherwise lead to frequent general rate cases and high risk. Other volatile expenses that are sometimes addressed using trackers include those for pension contributions and uncollectible bills." http://www.eei.org/Pages/default.aspx.

71 These data all are found in Edison Electric Institute, "Alternative Regulation for Evolving Utility Challenges: An Updated Survey," January 2013, Table 1, "Innovations to Reduce Regulatory Lag: An Overview of Current Precedents" pp. 3-4, http://www.eei.org/Pages/default.aspx.

72 These data all are found in Edison Electric Institute, "Alternative Regulation for Evolving Utility Challenges: An Updated Survey," January 2013, Table 1, "Innovations to Reduce Regulatory Lag: An Overview of Current Precedents" pp. 3-4, http://www.eei.org/Pages/default.aspx.

73 Sources: American Petroleum Institute and the Tax Foundation.

74 Almost 40 percent of the states' gasoline taxes fall between 20 and 30 cents per gallon. Because of that clustering, a five cent interval is used in the middle category.

75 The source of data for these five points is the U.S. Department of Energy, Alternative Fuels Data Center, "All Laws and Incentives Sorted by Type – Regulations tab," http://www.afdc.energy.gov/laws/matrix/reg

76 Due to ties in rankings, there are not precisely 10 states in each quintile.

77 Source: Energy Information Administration www.eia.gov.

78 Coal production by state as of December 2013 can be found here: http://www.nma.org/pdf/c_production_state_rank.pdf. West Virginia and Kentucky are the number 2 and 3 top coal producers behind Wyoming.

79 Author calculations.

80 Each state's growth rate is computed from state GDP data provided by the government's Bureau of Economic Analysis, http://bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=1#reqid=70&step=1&isuri=1 The numbers for each quintile are simple averages of the growth of states in that ranking category.

81 One would in general expect the two extreme quintiles to contain the best information for comparison. Differences in the intervening quintiles would be much fuzzier, so it is not unusual for one of these quintiles to have slower growth than the bottom one. The basic pattern holds.

82 Each state's nonfarm employment growth rate is computed from state nonfarm employment data provided by the U.S. Bureau of Labor Statistics, http://www.bls.gov/sae/. The numbers for each quintile are simple averages of the growth of states in that ranking category.

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