Backing into State-led Energy Performance Focus

EPMI has previously recommended that federal or supra-national policies on climate initiatives should keep a strong focus on *easily measured goals*, and not on *modeled or obscure goals* or on required methods or practices to meet those goals. (See *Shaping Residential Sector Energy Performance*, available at: http://epminst.us/states/ shapingres.htm) EPMI maintains that a 2ºC goal is doubly obscure. Climate improvement goals will continue to suffer from "blurred vision" if separate, measureable energy performance goals are not also promulgated and tracked.

Obscure goals are typically subject to manipulation. Obscure goals can be used, as long as easily measured goals that underlie the obscure goals are established in tandem and tracked simultaneously.

Methods and practices for meeting the goals will be much more successful if established and monitored at more local geographic domains. In Europe currently, extensive attention is focused on recognizing that effective implementation of energy efficiency initiatives requires methods and practices that work on a local level, and mandates from the EU can never be detailed enough to address local energy program implementation needs and methods.

In the United States, the dictatorial "clean power plan" mandated at the federal level attempted to achieve climate improvements through requirements for cutting carbon "pollution" (by the states). The "clean power plan" was the subject of intense debate about whether the planned regulations would be good or bad. Extensive controversy existed over whether the proposed efforts would actually do much. Implementation would have been drawn out over many years yet, and extensive litigation may have stopped all efforts at some point. As of 2017, the controversy continues on a different path as the new administration has ordered a thorough review of the clean power plan mandates and at the same time has withdrawn from the 2015 Paris climate agreement, in order to satisfy campaign promises (and maybe try to make more sense of what really needs to be accomplished).

For climate improvement hawks, EPMI continues to recommend that separate energy performance goals that underlie typical climate goals must also be established. As long as climate goals and performance are hidden behind suspect computer models, as long as hoary scientific societies are being called on the carpet for not being able to conduct even a high-level carbon balance that makes sense, and as long as climate zealots continue to unethically manipulate data, measurement of climate improvements will be subject to many uncertainties. On the other hand, measurement and estimation of total energy use is fairly advanced, is cross-checked by many parties internationally, and is far less prone to unethical manipulation. Establishing energy performance goals for states or countries, and measuring progress toward goals with real data that are not too arcane, can be an important resource for understanding whether climate improvement goals are being furthered or not by energy efficiency and energy technology improvements. (And also support tracking progress of more obscure climate goals.)

States to the Rescue

As of June 2017, individual states, cities, and companies in the United States have organized to submit a plan to the United Nations aimed at meeting US greenhouse gas emissions targets under the Paris climate accord, despite the federal decision to withdraw from the agreement. Some states have either indicated or

mandated they will move forward with state-specific efforts to reduce emissions, regardless of federal actions. Exactly what all this means is uncertain at this time.

Having the states take primary responsibility for meeting US goals is directly in line with previous EPMI recommendations that states should be the primary implementers of such activities. In a peculiar political twist, some states will now be the "Phase 1 Initiators," by taking direct responsibility for meeting performance goals, which is also intrinsic to the US federal system established at the country's founding. (The current administration might be smart to offer encouragement to the states.)

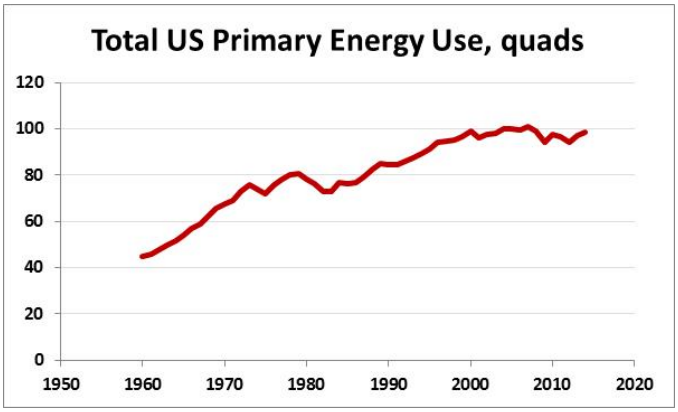
Measuring Energy Reductions from 2005

One reason EPMI has recommended that states be the primary implementers of climate and energy performance goals is that state-level data are available on energy use and can be used to track energy use over time. Cities can do a lot of hand-waving, but basically the methods for measuring energy use at the city level are still in development, and cities often track different sets of energy end users when trying to measure energy use of the city. The existing US state-level energy data are available back to 1960, and methods for estimating and reporting of these data by the Energy Information Administration have been fairly well developed over several decades.

This short paper will examine total energy use data for states from a few different perspectives to offer a potential baseline for tracking energy use changes of the states from a 2005 baseline, as well as provide some discussion about differences and some factors affecting energy use.

Total US Primary Energy Use, 1960–2014

Total primary energy use is the most direct energy link to air emissions, so a brief consideration of where things stand as of 2014 is presented. Even with deindustrialization occurring steadily from the mid-1980's through the early 21st century, total primary energy use was still increasing until about the year 2000. From 2000 until 2014, total primary energy use remained approximately constant, due primarily to varying forms of economic upset that still may not be finished playing with the world and US economies.

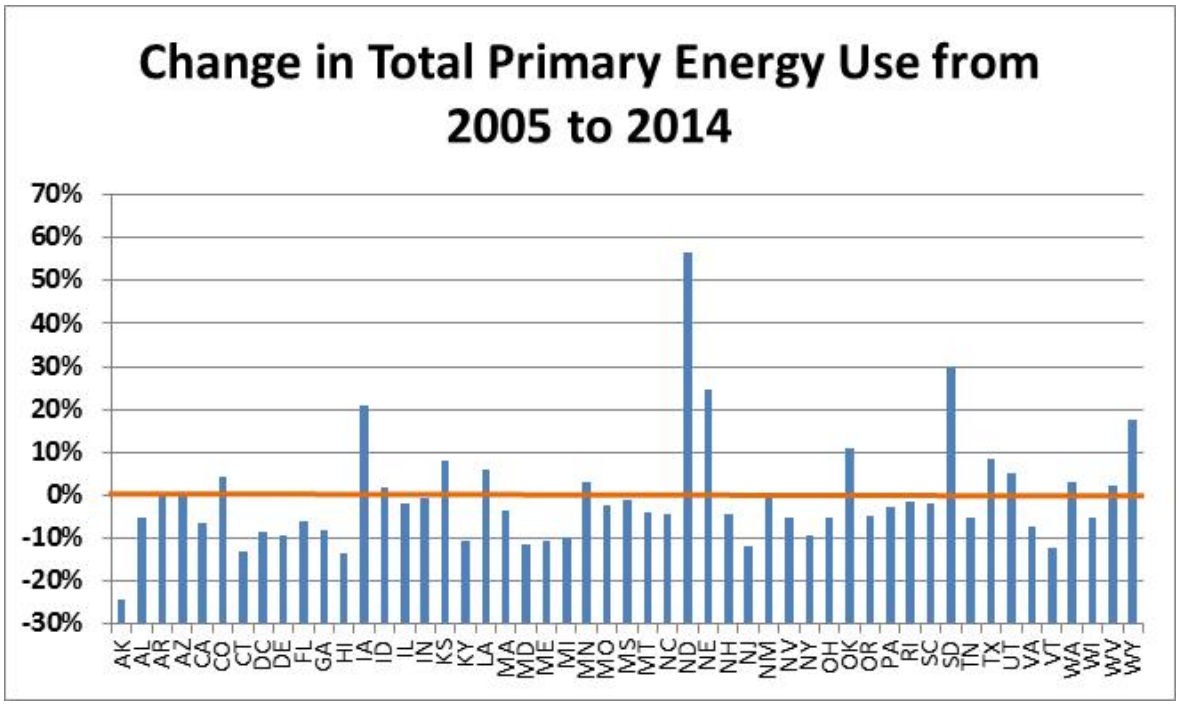


If a 2005 baseline is used, total US primary energy use in the year 2014 is 1.8% less than in 2005.

While US industrial activity for the country has stayed approximately level from 2005 through 2014, there are some signs in the energy use data that some reindustrialization is occurring, seemingly related primarily to oil and gas production.

State-Level Changes, 2005–2014

First the basic situation for all 50 states and the District of Columbia will be presented. Some states have achieved noticeable reductions in total primary energy use, while others have increased from 2005 to 2014. The figure below shows the change in total primary energy use for each in 2014 relative to 2005, as a percentage change.

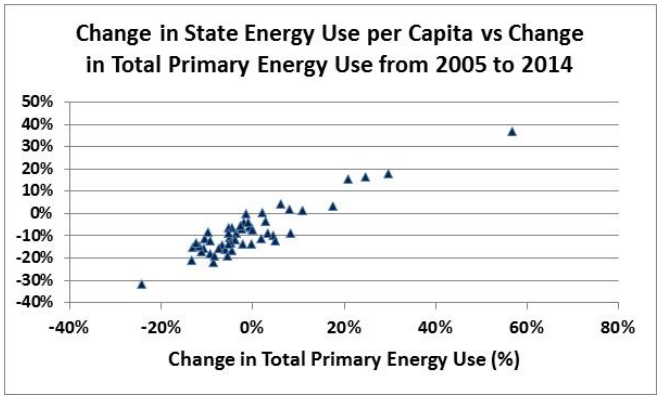


Important energy-producing states like Oklahoma, Texas, North Dakota, and Wyoming, have seen primary energy use increases. Some states have had population shifts, possibly aiding with increases or decreases (in the absolute world of required reductions, changes in population are not factored in typically). Industrial mix and extent also have some impacts. South Dakota had the largest absolute increase in industrial energy use fraction from 2005 to 2014. (See table at end.)

Alaska has had the largest decrease, –24%. North Dakota had the largest increase, 57%. California had a decrease of –7%, Colorado had an increase of 4%, Illinois had a decrease of –1.9%, Massachusetts had a decrease of –3.6%, New York had a decrease of –9.4%, and Washington had an increase of 3% (the governor of Washington may be in for a surprise, given rhetoric about reducing).

Per-Capita Changes

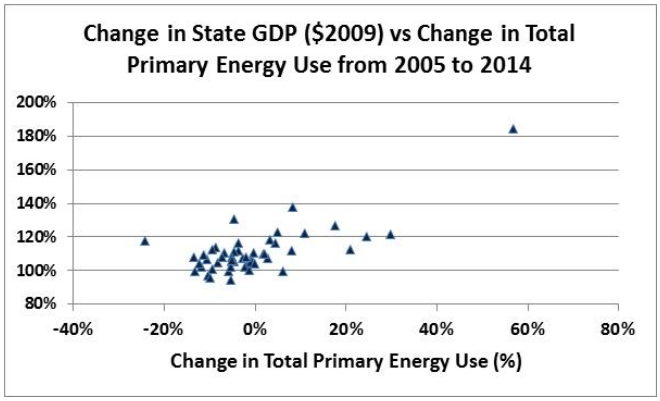
Decreases in per-capita energy use correlate strongly with changes in total energy use, as shown in the figure here. Most states (41 out of 51, when DC included) achieved reductions in per-capita energy use, but some of these still had total energy use increases, due to population increases and other factors. Similarly, population decreases helped some states (MI and RI) decrease total energy use.



So times can be tough when trying to reduce total energy use while population is increasing. Total energy use is strongly related to population. (World population is expected to increase by 30% from 2010 to 2040.) Population seems to be mostly ignored when politicians proclaim environmental goals, but at least they are not publicly discussing any "Rainbow Six (novel)"-type of population control solutions (yet).

GDP Changes

Changes in gross domestic product (GDP) give some indication of changes in industrial activity in a state, as well as other business activity levels. The figure here shows percentage change in state GDP from 2005 to 2014 (in chained $2009) vs change in total energy use. The GDP for North Dakota almost doubled, and energy use increased almost 60%. The central locus appears to be a 3.6% energy use reduction while also increasing GDP by 8%.



Tracking Energy Performance

The available data allow changes in total primary energy use to be tracked over time, and the initial results here show the change from 2005 to 2014. If energy performance is defined simply as reduction in total primary energy use relative to 2005, then the results here provide the energy performance of each state through the year 2014. A 100% reduction (–100%) means zero-energy has been achieved.

If climate protection requires that total energy use be reduced, and if total primary energy use is the best indicator of energy use impacts on climate concerns, then the method of tracking energy performance presented here should be both a support to understanding how measured energy use is changing over time and whether changes in that energy use appear related to observed changes in climate.

EPMI will plan to update these data intermittently, possibly depending on the nature of current events. The genesis of this report was the statement by states, cities, and others that they would pursue climate goals independently of the federal government. EPMI is independently presenting energy performance data for the states to help in understanding what states may or may not have accomplished.

Data Table

Several percentage quantities for 50 states plus the District of Columbia for the year 2014 relative to the year 2005 are presented in the following table.

Energy performance is as described above. Change in per-capita energy use is the percentage change from 2005 to 2014. Change in GDP is the ratio of 2014 GDP to 2005 GDP, measured in chained $2009. Change in population is the ratio of 2014 population to 2005 population.

The absolute change in industrial energy is the change in percentage points of the ratio of total primary industrial energy use to the sum of total primary energy use for all sectors. This ratio of industrial to all sectors is also displayed for the year 2014. As an example, Iowa in 2014 is shown to have 49.7% of total primary energy in the industrial sector. The "absolute" change for Iowa from 2005 to 2014, is 6.44%. This means the 49.7% ratio in 2014 is 6.44 percentage points larger than in 2005. The ratio in 2005 could be determined, if needed, by calculating: 49.7 – 6.44 = 43.3. Thus, the ratio of primary industrial energy to energy use for all sectors in 2005 was 43.3% for Iowa.

All data presented were derived from EIA's SEDS data, 2014 final.

EPMI
Energy Performance Measurement Institute

State Energy Performance and Factors

	2014 vs 2005					2014
State	Energy Performance	Absolute change in industrial energy fraction	Change in per-capita energy use	Change in GDP	Change in population	Industrial energy use fraction
AK	-24.4%	2.14%	-31.6%	117.5%	110.5%	54.6%
AL	-5.2%	-1.75%	-10.6%	105.5%	106.1%	43.3%
AR	-0.4%	-2.21%	-6.5%	110.6%	106.5%	36.5%
AZ	-0.3%	1.25%	-13.5%	105.1%	115.3%	16.5%
CA	-6.7%	0.60%	-14.0%	110.6%	108.5%	24.4%
CO	4.3%	2.01%	-9.8%	116.3%	115.7%	29.1%
CT	-13.2%	-2.44%	-15.0%	99.8%	102.1%	11.1%
DC	-8.7%	2.06%	-21.7%	113.8%	116.5%	4.1%
DE	-9.4%	-0.78%	-18.2%	100.6%	110.7%	31.8%
FL	-6.0%	-0.78%	-15.9%	99.5%	111.7%	11.4%
GA	-8.3%	-1.51%	-19.0%	104.9%	113.2%	27.0%
HI	-13.5%	0.62%	-21.1%	107.9%	109.7%	22.9%
IA	20.9%	6.44%	15.3%	112.4%	104.8%	49.7%
ID	1.8%	-2.64%	-11.2%	110.0%	114.6%	34.2%
IL	-1.9%	0.35%	-4.0%	103.2%	102.2%	30.3%
IN	-0.8%	-0.98%	-5.7%	106.4%	105.2%	45.3%
KS	7.9%	-0.56%	2.1%	111.8%	105.7%	33.4%
KY	-10.7%	-5.99%	-15.4%	106.7%	105.5%	37.5%
LA	6.1%	4.61%	4.5%	99.5%	101.5%	70.7%
MA	-3.6%	-1.32%	-8.6%	111.7%	105.4%	11.3%
MD	-11.3%	-15.99%	-17.0%	109.5%	106.9%	8.2%
ME	-10.5%	-2.20%	-11.2%	97.1%	100.8%	30.9%
MI	-9.8%	-1.19%	-8.5%	95.6%	98.5%	25.9%
MN	2.8%	3.62%	-3.6%	107.7%	106.7%	34.7%
MO	-2.4%	-2.74%	-6.8%	102.4%	104.8%	19.1%
MS	-1.1%	-1.50%	-4.0%	104.9%	103.0%	34.5%
MT	-3.8%	-4.79%	-11.7%	116.4%	108.8%	31.1%
NC	-4.6%	-3.21%	-16.6%	111.3%	114.3%	21.2%
ND	56.8%	4.32%	36.9%	184.5%	114.5%	52.2%
NE	24.6%	7.22%	16.5%	120.2%	106.9%	41.4%
NH	-4.6%	-2.29%	-6.4%	105.6%	101.9%	13.6%
NJ	-11.8%	-4.18%	-14.7%	102.4%	103.4%	10.5%
NM	-0.2%	0.99%	-7.4%	104.2%	107.8%	33.7%
NV	-5.5%	0.48%	-18.8%	94.5%	116.4%	27.2%
NY	-9.4%	-1.56%	-12.0%	112.4%	103.1%	10.4%
OH	-5.4%	-0.48%	-6.3%	102.0%	100.9%	32.2%
OK	10.7%	-0.62%	1.4%	122.2%	109.2%	36.1%
OR	-4.8%	-1.24%	-13.2%	130.5%	109.8%	25.0%
PA	-2.8%	3.60%	-5.3%	107.6%	102.6%	35.2%
RI	-1.4%	0.76%	0.0%	100.0%	98.6%	12.3%
SC	-2.2%	-4.42%	-13.6%	107.7%	113.2%	33.3%
SD	29.7%	9.77%	17.7%	121.7%	110.2%	40.0%
TN	-5.2%	-5.33%	-13.4%	108.0%	109.5%	26.9%
TX	8.3%	-3.11%	-8.6%	137.8%	118.5%	48.8%
UT	5.0%	-0.33%	-12.3%	123.0%	119.7%	29.5%
VA	-7.4%	-3.16%	-15.6%	107.8%	109.8%	18.6%
VT	-12.4%	-2.71%	-13.2%	104.4%	101.0%	14.7%
WA	3.2%	1.83%	-8.7%	118.7%	113.0%	28.2%
WI	-5.3%	-2.65%	-9.0%	105.8%	104.1%	31.7%
WV	2.1%	0.11%	0.5%	110.0%	101.6%	38.9%
WY	17.4%	4.83%	3.4%	126.6%	113.6%	57.3%
US	-1.8%	-0.26%	-8.8%	112.1%	107.7%	32.2%