Public Comment on EPA proposed rule for existing carbon-burning power plants
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Introduction

In the following comments I will address only two foundational issues regarding the intended issuance of regulations to limit CO2 emissions from existing power plants.

1. The fundamental physical basis that motivates the EPA’s intent to regulate CO2 emissions has not been scientifically demonstrated to be true.

2. Even if (1) were true at any level, the impact on global temperatures of the regulation will be undetectable and thus unattributable as accomplishing the intent of the regulation.

Despite the maneuver that allowed the slimmest majority on the U.S. Supreme Court to defer to the EPA for scientific assertions, a true cross-examination of the scientific basis for the ruling (which concluded that EPA may regulate CO2 as a pollutant), was not performed. As shown below, the evidence utilized by the EPA would not pass the Daubert Standard for admissible evidence or even be viewed as evidence with sufficient weight to support the proposed rule. For the sake of basic scientific principles and for the sake of the American system of open democracy, this cross-examination must be performed. Such a task if thoroughly done would cover so many issues, such as the Social Cost of Carbon, as to make a comment such as this too voluminous for a single person to submit. I shall focus on only the two issues noted above that lie squarely in areas of my acknowledged expertise.
The fundamental physical basis that motivates the EPA’s intent to regulate CO2 emissions has not been scientifically demonstrated to be true.

The EPA has concluded that increasing amounts of CO2 in the atmosphere constitute a danger to public health and thus these emissions should be regulated for the public good. This danger is not due to any toxic aspect of the gas because humans regularly live and work in concentrations many times what the current outdoor value is (~400 ppm.) The alleged danger to health is based on the claimed negative impact on the global climate system of increasing CO2 concentrations. It is this claim that has not, in fact, been scientifically established.

The basic question that must be addressed before attempting to establish climate regulations is, “Why does the climate change?” This has been, unfortunately, confused with the separate question, “What is the climate doing?”

The latter question is, for the most part, knowable through the observations we have been creating using instruments (e.g. weather stations, satellites, proxy data, etc.) over the past several decades and centuries. All of these observations indicate the climate is the kind of system that changes on all time scales and which has seen fluctuations in the past centuries similar to and even greater than what has occurred in the past 50 years. These previous fluctuations occurred as the system responded to natural variations in the forces, both external and internal, that cause such responses. In other words, we have a fairly good idea of “What” the climate has been doing by measuring the response of the system (e.g. temperature) to whatever forces are acting upon it.

Now, the issue boils down to this; we indeed have instruments that measure “what is happening” to climate, however, we do not have instruments that tell us “why” the climate does “what” it does. This is the crux of the problem in EPA’s claim - the agency asserts that it knows “why” climate varies. However, such a claim incontrovertibly implies (as is foundational in the scientific method) that the EPA can then replicate “what” the climate has done and predict “what” it will do. Here the EPA and the sources of climate-claims it relies upon (e.g. IPCC), fail. Thus one cannot conclude the EPA knows “why” the climate varies and thus cannot assume to control “what” it does through regulation. The following demonstrates this.

Because there are no instruments that tell us “why” the climate varies, scientists employ models which are intended to mimic the real world in all of its detail. In many aspects of science (and other disciplines) models are valuable tools because they replicate the systems they describe to high precision, such as the load-stress on an aircraft wing or the crop-yield on a farm if accurate inputs are known. In a typical set of climate experiments, the forces (e.g. volcanic aerosols, greenhouse gases), for the historical past, are applied to a model that then generates responses in the output, temperature being the most common. We then check those outputs against the real observations for the same period.

In numerous experimental runs involving an international set of climate models with historical greenhouse gas concentrations, one “global warming” response is highly
consistent and significant. This response is the relatively rapid heating of the bulk tropical atmosphere below about 15 km and is so large, it should be clearly evident by now. Too, this response is not in an insignificant part of the climate system, but represents a massive volume of the atmosphere that incorporates our understanding of critical heat and moisture processes. It is a clear signal that can be tested. In other words, this model response is “what” the climate system should show due to the “why” of extra greenhouse gases.

In Figs. 1a and 1b below, I have plotted the results of all 102 rcp4.5 IPCC AR5 climate model runs available as of Aug 2014 for the layer of the tropical atmosphere which has this unambiguous response in the models. All time series, both models and observations, have their linear trends for 1979-2014 (observations through Oct 2014) anchored to the year 1979, so that this is a true “apples-to-apples” comparison of the models and observations. In Fig. 1b, the 102 runs have been grouped according to model type and averaged by type.

Climate models, accepted by EPA as evidence for the public endangerment finding through the IPCC, embody the level of understanding of the “why” as well as the “what” of climate variations. The results below demonstrate that the models do not yet have the ability to discern “why” a climate variation may have occurred simply because they cannot even reproduce “what” has occurred. Therefore, to say, as EPA does, that CO2 is causing and will cause dangerous climate change presupposes the models entrusted by EPA are able to discern the cause of current changes. The charts show they cannot. This is legally important regarding admissible evidence since, according to the Daubert Standard, models should be validated by successfully reproducing past examples of the issue being litigated.

![Figure 1a. Linear temperature trends from 102 IPCC AR5 (CMIP-5) rcp4.5 climate model runs for the tropical mid-tropospheric temperature (lines) for 1979-2014. Linear trend of balloon observations (green circles) and satellite observations (blue squares) are also shown. CMIP-5 output from KNMI Climate Explorer. Balloon data from RICHv1.5, RAOBCOREv1.5, HadAT2 and RATPAC. Satellite data from UAHv5.6 and RSSv3.3. Balloon and satellite data are independent.](image-url)
Figure 1b. As above but showing the 5-year running averages and again with all time series trends anchored to a common point, 1979. The 102 runs have been combined into the 32 model types. The average of the U.S. model runs is shown in the thicker dashed line. Error bars for estimating the accuracy of the observations have been included, and in all cases there is considerable overlap of the two independent types of measurements (balloons and satellites.)

The discrepancy in Figs. 1a and 1b between models and observations is such an obvious and clear result (all 102 model runs overcook the atmosphere), one wonders why it was not highlighted in the IPCC AR5 as a fundamental weakness and failure of the climate modeling industry. Careful examination of the IPCC text shows the evidence is there, though buried in the Supplementary Material (and buried without comment.)

Figure 2 below is taken directly from the IPCC AR5 Supplementary Material for chapter 10 of Working Group I. Though expanded in the vertical scale and colored in a way that obscures the issue at hand, the key portion is delineated by the red frame. What is difficult to see are the black lines and the gray observations-envelop that are completely disjoint from the red band of model projections for the same time period. Note that this chart covers the period 1979-2011, but the results are essentially the same as I have provided in Figs. 1a,b which run through 2014.
Figure 2. Figure 10.SM.1 from the IPCC AR5 Supplementary Material. Temperature trends of the atmosphere at various altitudes. The model results (blue – without extra greenhouse gas forcing, red – with observed greenhouse gas forcing and other known forcings such a volcanic aerosols.)

In Fig. 3 below I have magnified and annotated the key portion of the figure that represents the evidence of Fig. 1 above. The two key variables to compare are the red envelop (model projections) and the white-bordered envelop (range of observations.) What is again clearly evident is that the models with realistic greenhouse gas increases are completely separate from the observations, meaning they are warming the planet significantly more than is observed. As a scientific test we are able to conclude with very high confidence that the models fail the test of reproducing the climate of the last 33 (36) years. Thus, the models are not suitable for future projections because they are unable to reproduce the past, in essence failing the Daubert Standard as admissible evidence.

A further conclusion is also evident in Fig. 3. This IPCC figure shows that the white-bordered observational envelope lies completely within the blue envelop of models which have no extra greenhouse gas forcing. Thus, the proper scientific conclusion here is that the models demonstrate that CO2 has had no discernable impact in the atmospheric region where models assert greenhouse gas impacts should be largest.

Attempts to explain parts of this discrepancy have been published. In one, it is claimed that “up to 15 percent” of the small trend since 1998 may be due to small volcanoes that escaped detection (Santer et al. 2014). However, this is insignificant as the impacts were estimated at only 2 to 15 percent of the model trends for only the latter 16 years – essentially within the noise of the monitoring system and certainly well below the large difference between models and observations which differed by an average of over 300 percent. This indicates model error is surely the most likely source of the discrepancy.
Figure 3. From Fig. 10.SM.1 (tropics) of the IPCC AR5 Supplementary Material, magnified and annotated from Fig. 2 above. The envelop of white-bordered observations falls within the blue envelop of no anthropogenic greenhouse gas increases and completely disjoint from the model runs with anthropogenic greenhouse gases.

A simple way to summarize the comments above in the framework of the scientific method is to say that when we understand a system we then can reproduce its past behavior and predict the future (though the former does not necessarily imply the latter). The evidence above demonstrates that the present level of modeler’s (i.e. EPA’s) understanding the climate is so poor we are unable even to reproduce “what” has happened in the past. Thus we should have little confidence that the future will play out as the models suggest. The EPA should not have relied on these model simulations as accepted outcomes to be mitigated by regulations. The EPA cannot conclude it knows “why” the climate system changes and thus cannot assert it will control “what” the climate will do (see also Swanson 2013).

That the climate is changing, or more specifically that it has warmed over the last few decades, is not a very controversial issue, though virtually no warming has occurred in the most recent 17 years. There has been modest warming since 1950. But, as demonstrated
above, the current ability to explain “why” the warming occurred, modest as it is, is beyond our capability at the present time. It is also clear that models are oversensitive to CO2 as demonstrated above, so controlling CO2 will not provide the climate benefits EPA claims.

Further, the modest warming rate and drought/flooding events of the last 60 years are comparable to and even less severe than many such events in recent history – events that could only have been caused by nature (e.g. Muhs 1985, Lindstrom 1990, Esper et al. 2012, Lu et al. 2012, Thomas et al. 2013, Rosenthal et al. 2013, Rinne et al. 2014, Boll et al. 2014.) As a result, one cannot “convict” higher CO2 concentrations of committing “crimes” of climate warming/disruption when the same (and worse) “crimes” have occurred numerous times in the past before the defendant existed. Thus we have no confidence that incarcerating CO2 (i.e. through regulations) will prevent or mitigate any particular climate “crime” in the future.

[Note: Not considered in this Comment are the direct, measureable, positive consequences that relate to increases in CO2 concentrations including, higher food yields, invigorated biosphere, energy production that has (a) more than doubled human life spans, (b) made possible every medical advance in the past 100 years, (c) enabled technological advances on every front, (d) enhanced security from innate threats to human life, etc. No one could imagine these direct consequences being viewed as “crimes.” In other words, we don’t burn carbon because we are bad people, we burn carbon because we are good people, i.e. we consider human life worth enhancing in every way.]

The legal standard for admitting scientific evidence is the Daubert Standard (Harlow and Spencer, 2011). One tenant of this standard as it applies to model output is that model simulations should pass tests in which they reproduce previous examples of the system they intend to depict with minimal and calculable error rates. As demonstrated above, using the example of 1979-2014 temperature trends, the models fail this test of replicating the dominant greenhouse response (on average model trends are 300 percent higher than the real world). There are other aspects of the Daubert Standard (validated techniques, known error rates for prediction tests, etc.) but the comparison with past examples is the starting point. That the EPA would rely on model results that do not pass the legal test of the Daubert Standard as the basis for creating binding regulations that have considerable and detrimental economic impacts is being ethically, legally, and scientifically bankrupt.

Given the simple analysis above, the conclusion one must rationally reach is that the “why” of climate changes has not been established by the EPA. That the EPA can then assume that extra greenhouse gases cause certain responses in the climate system (and that they are allegedly harmful) is an unfounded leap of faith because the models on which the EPA relied for the climate response have failed the simplest of tests. Therefore, since the proposed EPA rule has no firm standing that can be based on openly cross-examined (admissible) evidence (i.e. Daubert Standard) it should be withdrawn.
Even if (1) were true at any level, the impact on global temperatures of the regulations will be undetectable and thus unattributable in accomplishing the intent of the regulations

The goal of a regulation is to affect a result that is discernable and measureable in order to reduce the alleged harm that would have occurred in the absence of the regulation. The truth is the proposed rule for existing power plants to reduce emissions by 30 percent will have no discernable impact on the climate system as demonstrated below.

Figure 4 quantifies the U.S. emissions versus those of only China and India combined, indicating that the hoped-for 750 million metric ton U.S. reduction as a result of the rule is a small fraction (1/7) of total U.S. emissions (green line) and is minuscule compared to global emissions. As such, climate impacts of these reductions will also be minuscule and thus undetectable and unattributable.

![Figure 4](http://www.eia.gov/fof/seo/tablebrowser/#release=E2013&subject=0&E2013&table=10-E2013&region=0-0&cases=Reference-041117)

Figure 4. Estimate of total CO2 emissions from China and India combined vs. the U.S. The proposed rule addresses only emissions from existing power plants, hoping to cut 750 MM tons of CO2 of the current 5,500 MM tons by 2030, or only about 15% of overall U.S. emissions. (From EIA 2013).

To calculate the impact of the proposed rule on global surface temperature one must determine the magnitude of the climate sensitivity, i.e. how sensitive is the temperature to an increase in CO2. Many up-to-date empirical estimates of the climate sensitivity are
much below those calculated from climate model projections, in an analogous result described in the first part of this Comment where model temperatures soared well above actual temperatures.

To demonstrate the minuscule impact of this rule on the global temperature we first assume that the climate models, with their theoretical transient sensitivity (1.8 °C at doubling, IPCC AR5), are correct. We take the case that the U.S. halts ALL emissions as of today, in other words, we assume the U.S. ceases to exist in any form – no factories, no power plants, no vehicles, no people. Using this ridiculous scenario with the typical climate model sensitivity, the result would be a potential reduction in global temperature of about 0.20 °C by 2100. This calculation simply indicates how small the CO2 influence of the U.S. really is because the developing world has embarked on a humane path to eliminate energy poverty in a way they can afford by burning carbon – just as the U.S. did.

To be realistic though, we now use an empirically-based value of climate sensitivity (around 1.3 °C at doubling) and the reduction of only 15% of the U.S. CO2 emissions as indicated by the proposed rule. In this realistic case, the impact is 0.02 °C at 2100, an amount too small to measure even with our calibrated satellite sensors. [All results based on the IPCC-sanctioned MAGICC response model and mid-range IPCC-based scenarios of greenhouse gas increases used by the author as admissible evidence in U.S. Federal Court proceedings – Case Nos. 2:05-cv-302 and 2:05-cv-304, District of Vermont.]

The result here is straightforward – the proposed rule will have no discernable or attributable impact on the climate system. Thus the rule will fail at mitigating the allegedly harmful effects on public health due to the emissions of CO2 it was designed to provide. The rule will also fail because it will not be possible to attribute any climate change to the rule itself. However, there will be certain negative economic impacts, but I leave these for other commenters. (I might add that is also disingenuous of EPA to calculate a public health benefit based on reducing emissions of non-CO2 pollutants as these are regulated elsewhere and should be addressed on their own.)

The direct, measurable impact of CO2 emission reductions on public health due to climate change mitigation will be zero. Because the rule has no discernible efficacy regarding the impact of CO2 on climate, there is no rational basis to insist it be adopted.

Postscript: An opportunity to help America and preserve the scientific method

The EPA has an opportunity for, and an obligation to the American people here. Based on the clear evidence above, the EPA should step back and re-examine the fundamental basis for the onerous regulations now being proposed. The EPA should constitute a “Red Team” of analysts, independent from the climate modeling industry, to judge the current state of knowledge, i.e. the current state of how much we know about the “why” of climate variations. Such an examination would provide transparency to the process and give confidence to the public that the agency values open examination of its methodology.
References


