April 12, 2013

The Honorable Kevin Brady and Mike Thompson
United States House of Representatives
Committee on Ways and Means
Energy Tax Reform Working Group
1102 Longworth House Office Building
Washington D.C. 20515

Re: Determination on extension of the wind energy Production Tax Credit

Dear Congressmen Brady and Thompson,

I am writing in regard to the extension of the Production Tax Credit (PTC) for wind power development under consideration by your committee per your request for comments. I am a visiting scholar at the University of California – Berkeley and serve as an academic reviewer for the Intergovernmental Panel on Climate Change (IPCC). I neither represent nor am I funded by any parties affected by the PTC. This letter introduces a summary of my academic research and includes relevant citations and articles.

A tax credit may be defensible if it demonstrates a benefit or reasonble potential benefit for society. Wind power proponents centrally point to the ability of wind turbines to offset fossil fuel use and therefore also mitigate greenhouse gas emissions. In fact, numerous assessments of wind power implicitly assume that new wind power production will offset fossil fuel use. However, this is an assumption, not a demonstrated reality. There is also no *a priori* basis to assume that wind turbine projects mitigate greenhouse gasses or offset fossil fuel use in practice.

In short, my research indicates that assumptions of wind energy offset and mitigation potential are neither supported by historical data nor demonstrated in the field (Zehner, 2012a; Zehner, 2012b). A recent empirical analysis published in *Nature Climate Change* suggests that modern wind power systems have not offset fossil fuel use in practice (York, 2012). Analysis of historical and behavioral characteristics of energy use suggest that wind energy deployment may have greatly limited ability to offset fossil fuel use, or may even accelerate fossil fuel use, if deployed within a context of growing economies and populations (Zehner, 2012a). These findings bring into question the central presumed benefit of wind energy production and therefore the appropriateness of a tax credit to expand such production.

All energy production techniques, whether labeled renewable or not, instigate a wide variety of detrimental effects that extend well beyond concerns of resource scarcity and greenhouse gas production (Zehner, 2011). Subsidies to any type of energy production

can artificially lower retail energy prices and spur overall energy demand in a *boomerang effect* (Zehner, 2012a). Demonstrated alternative means to reduce fossil fuel use and greenhouse gases do exist – energy tax shifts and utility decoupling among them. These methods are demonstrated by field data and have a long history of support within the general scientific community including researchers at the Department of Energy, National Academies of Science, and the IPCC.

I have included my recent article published in *The Hill*, which surveys these points in more detail. I also attached an academic reference to frame the broader unintended consequences of energy production. I remain available to discuss this letter and related research with your committee as you work toward a decision.

Sincerely,

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Relevant Citations:

York, R. (2012). Do Alternative Energy Sources Displace Fossil Fuels? *Nature Climate Change* **2**, 441–443.

Zehner, O. (2012a). *Green Illusions*. University of Nebraska Press, Lincoln and London. (available by request)

Attachments:

Zehner, O. (2012b). "Windy Assumptions." *The Hill*, December 12.
Abstract: Like the 28 governors and numerous environmental groups currently scrambling to extend wind power subsidies, I long assumed that wind turbines and solar cells offset fossil fuel use. They probably don't.

Zehner, Ozzie. (2011). "Unintended Consequences of Green Technologies." In Green Technology, edited by Paul Robbins, et al, 427-32. London: Sage.
Abstract: Green technologies (e.g. wind turbines, solar cells, and biofuels) and initiatives (e.g. efficiency, recycling, and organics) yield distinct unanticipated consequences that can partially or fully offset intended environmental benefits.

Windy assumptions
By Ozzie Zehner, author, "Green Illusions" - 12/12/12 01:00 PM ET

Like the 28 governors and numerous environmental groups currently scrambling to extend wind power subsidies, I long assumed that wind turbines and solar cells offset fossil fuel use. They probably don't.

Solar and wind power advocates are fighting to renew clean energy subsidies, which expires at year's end. They argue that these technologies are worth the investment because they offset fossil fuel dependence and carbon emissions. Indeed, that's the conventional assumption of most energy researchers, government labs, and think tanks. However, there is an emerging problem with that assumption – there's no evidence to back it up.

In fact, experience and field data point to the opposite: wind turbines and solar cells might not offset fossil fuel use in the United States at all.

The effervescence of renewable energy starts to go flat when human behavior and basic economics come into the picture. Consider hydropower. As recently as 1950, dams quenched roughly a third of U.S. electrical demand. Subsidized hydropower helped keep electricity costs low and demand subsequently increased across the board. Utilities filled that demand by building more fossil fuel power plants, not fewer. Dams have multiplied since 1950 but hydropower now fills just seven percent of the nation's electricity grid.

It's a boomerang effect. Subsidized energy induces a downward pressure on energy costs. Demand subsequently expands, bringing us right back to where we started with high demand and so-called insufficient supply. The harder we throw energy into the grid, the harder demand comes back to hit us on the head. Larger solar arrays and taller wind turbines are just ways of throwing harder.

A new paper by Dr. Richard York published in Nature Climate Change draws upon 50 years of energy data to reveal that solar and wind power have not offset a single fossil fuel plant. "The common assumption that the expansion of production of alternative energy will suppress fossil-fuel energy production in equal proportion is clearly wrong," he concludes.

It doesn't have to be this way.

Renewable technologies would likely hold greater offset potential in an alternate context. However, building more of them today may be doing more harm than good.

First, clean energy isn't so clean. Alternative energy simply breeds alternative side effects. Solar cells contain heavy metals. Photovoltaic manufacturing releases greenhouse gases such as sulfur hexafluoride, with a global warming potential over twenty-three thousand times higher than CO2, according to the Intergovernmental Panel on Climate Change. Wind turbines require a dual system – one set of turbines for when the wind is blowing and a backup system to cover still periods – an incredibly expensive luxury. And, alternative energy technologies still rely on fossil fuels. Sunlight and wind are renewable. Solar cells and wind turbines are not.

Second, the glare from alternative energy technologies blinds us to the real goal: reducing fossil fuel use. In the United States, with an expanding population of heavy consumers, alternative energy technologies pose the greatest risk. They supply profligate waste while conjuring an illusion of responsibility.

Finally, directing funds and political attention toward energy production leaves less for research and development into wiser energy strategies. There's only so much room on the stage.

Should we expect alternative energy technologies to solve problems that are social, political, and economic in nature? We generally associate more energy with greater prosperity. This rubric holds in poor regions. But among industrialized nations, the correlation is roughly flipped. High energy consumption instigates a host of negative side effects and liabilities. As the challenges to wrestle energy from the earth intensify, so will the burdens.

The big renewable energy players, including BP, GE, and JP Morgan, argue that they need subsidies to advance cleaner technologies. But it's the context, not the technologies, which require attention.

Improving energy contexts will be more enjoyable and less expensive than we might think. Successful regions have shifted from income taxes to consumption and energy taxes. They value architectural techniques that make buildings more efficient and comfortable. They prioritize walking, bicycling, and transit infrastructure. And, they embrace seemingly unrelated initiatives that greatly improve energy security in practice: universal healthcare, streamlined military spending, durable monetary policies, and campaign finance restrictions.

Ultimately, it's not a question of whether we hold the technological prowess to create a renewable energy society. The real question is the reverse. Do we have a society capable of being powered by renewable energy? The answer today is clearly no. But we can change that.

Zehner is a visiting scholar at UC Berkeley and the author of ***"Green Illusions"****.*

Unintended Consequences of Green Technologies

Ozzie Zehner
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This summary is based on research from *Green Illusions: The Dirty Secrets of Clean Energy and the Future of Environmentalism* by Ozzie Zehner and published by University of Nebraska Press, Lincoln and London, 2012. | GreenIllusions.org

Abstract: Green technologies (e.g. wind turbines, solar cells, and biofuels) and initiatives (e.g. efficiency, recycling, and organics) yield distinct unanticipated consequences that can partially or fully offset intended environmental benefits.

Excerpt: Fossil fuel energy yields many benefits but the associated extraction operations, distribution networks, and combustion practices yield a host of negative unintended consequences. Environmental groups, politicians, and businesses frame green energy technologies as clean alternatives to fossil fuels. Through, green energy alternatives generate unanticipated consequences of their own.

As with traditional energy production, the unanticipated consequences arising from green technologies can generate political tensions. Once a government or organization backs a certain green technology, it risks loosing credibility if detrimental consequences are exposed. For instance, in 2008 riots broke out around the world in response to rising corn prices. Some blamed the increase on weather conditions, others claimed that demand from India and China was to blame. The World Bank studied the price jump but kept its findings secret, presumably because they might have upset the bank's major donor, the United States. However, *The Guardian* obtained a leaked copy of the report and published its findings. The World Bank study group had determined that the rise in corn prices was an unintended consequence of biofuel production. The report concluded that biofuel producers' demand for corn pushed prices higher for everyone, including those who needed corn for food.

Economists and ecologists have identified numerous other unanticipated consequences of biofuel production. Biofuel proponents maintain that their fuel cycles net no additional CO_2. In theory, biofuel feedstock plants absorb and offset combustion-related CO_2 emissions. However, when Indonesian swamps were drained in order to grow palm oil crops, soil decomposition accelerated, unexpectedly releasing large quantities of greenhouse gasses into the atmosphere. France, Germany, and other European nations withdrew support for palm oil when they discovered that these rogue emissions were more than ten times greater than the potential savings afforded by converting from petroleum to palm-based biofuels.

Biofuel producers can refine fuel from sugarcane but critics maintain that sugarcane cropping practices endanger rainforests and biodiversity. Authors of an article published in the journal *Science* argue that the benefits of producing biofuels

from sugarcane are greatly diminished if the unanticipated consequences of sugarcane production are taken into account. They argue that carbon rich rainforests are frequently leveled to make room for sugarcane plantations. This not only interrupts the carbon cycle but also endangers local biodiversity, hydrological functioning, and soil stability. Ideally, farmers would plant biofuel crops exclusively on abandoned farmland but such land is relatively rare and usually less fertile. Even on suitable sites, crop residues left behind from farming activities release methane, a greenhouse gas with 23 times the warming potential of CO_2. Furthermore, fertilizing fields of sugar, corn, rapeseed, and other biofuel feedstocks with nitrogen rich fertilizers yields nitrous oxide. Nitrous oxide has a global warming potential 296 times greater than CO_2 and additionally damages stratospheric ozone.

Many people admire solar photovoltaic cells for silently extracting clean energy from the sun's rays but the panels contain heavy metals that can leach into groundwater when disposed at the end of their lifecycle, according to the Silicon Valley Toxics Coalition. Photovoltaic manufacturers employ toxic and explosive compounds that can lead to unintended health risks for workers and local residents. While solar cells do not produce CO_2, the photovoltaic manufacturing industry is one of the leading emitters of hexafluroethane (C_2F_6), nitrogen trifluoride (NF_3), and sulfur hexafluoride (SF_6), greenhouse gasses that are 10,000 to 25,000 time more harmful than CO_2 according to the Intergovernmental Panel on Climate Change. The unintended consequences of photovoltaic production offset at least part of the carbon and environmental benefits of solar cells.

Wind turbines generate energy from a freely available and renewable resource. Though, large turbines can disturb residents and therefore regularly generate NIMBY (Not In My Back Yard) resistance when sited near residential communities. If sited in remote regions, associated maintenance roads can inadvertently afford poachers and loggers access to ecologically sensitive areas.

Alternative energy generation may also instigate unintended macroeconomic consequences. Alternative energy promoters aim to reduce dirty fossil fuel use by expanding clean energy production. However, increasing any form of energy supply can exert downward pressure on energy prices, thereby stimulating overall demand for energy services. Economists warn that without appropriate countermeasures, any increase in energy production, alternative or conventional, may unintentionally perpetuate energy intensive modes of living. Also, when energy consumers believe their energy is derived from clean sources, they may be less concerned about conserving it.

Unintended Consequences of Energy Efficiency

Instituting energy efficiency measures can lead to both beneficial and detrimental unintended effects. According to behavioral psychologists, when energy users employ more efficient energy technologies they may in turn increase their frequency of use. In one study, participants that purchased energy efficient washing machines subsequently started doing more loads of laundry. When individual or organizational energy consumers institute energy efficiency measures, such as using more efficient light bulbs or machinery, they also save money on energy. However, consumers may choose to spend these savings on other products or endeavors that still lead to energy consumption. In this case, money-saving energy efficiency measures can

unintentionally stimulate other forms of consumption, leaving overall energy footprints unchanged. Energy efficiency measures can spur similar unintended effects on a macroeconomic scale. Efficiency measures frequently lead to larger profits, which can spur more growth and higher energy consumption overall. This unintended consequence of energy efficiency is termed the Jevons paradox. It is named after William Stanley Jevons who in 1865 explained how James Watt's introduction of the steam engine greatly improved efficiency, which in turn made steam engines more popular and subsequently drove the use of coal ever higher.

Energy efficiency advocates argue that instituting energy taxes or other incentives designed to thwart energy demand can block some of these unintended consequences. They point to California, which instituted a system called decoupling three decades ago. Decoupling is a financial arrangement that rewards energy companies for selling less of their energy services rather than more. Since its introduction, decoupling has stabilized per capita electricity consumption in California even though national per capita electricity consumption surged fifty percent higher over the same period.

Energy reduction endeavors can clearly spur positive unintended consequences as well. For instance, when cities started to shift to energy efficient LED municipal lighting they also realized maintenance savings and traffic safety improvements since the new bulbs failed less frequently than the bulbs they replaced. In older cities, builders often constructed dwellings shoulder-to-shoulder in order to efficiently utilize urban space and save energy (heat transfers from one flat are absorbed by others, reducing everyone's energy bills). Physical proximity brought people closer together in novel ways, allowing for the efficient walkable neighborhoods and cosmopolitan exuberance now taken for granted in cities such as Paris, Tokyo, New York, and London. Downshifters – people who choose to greatly reduce their material consumption – often unexpectedly discover new interests and report higher satisfaction with their low consumption lifestyles.

Critiques of Unintended Consequences

Critics of the concept of unintended consequences point out that the concept can obscure deeper structural problems that should be addressed. For instance, journalists, corporations, and politicians frequently frame oil spills as accidents, or unintended consequences of resource extraction. However, they could alternately frame spills as the inevitable and expected outcome of an undertaking with extreme environmental risks.

Some political and economic theorists stress the many negative unintended consequences of government spending and regulation in order to argue for limiting the government's reach. Others claim that this use of the concept of unintended consequences is politically motivated and suspect. Presumably if legislators suspend an activity in order to eliminate its unintended consequences, the intended benefits of the activity will also be lost. These theorists maintain that all human actions yield unanticipated consequences and strong governance, even if imperfect, is required to prevent even greater injustices from harming people and their ecosystems.

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Bibliography

Bastiat, Frédéric. “What is Seen and What is Not Seen.” *Ideas on Liberty* (v.51:2001).

Beck, Ulrich. *Risk Society: Towards a New Modernity*. Newbury Park, CA: Sage, 1992.

Chakrabortty, Aditya. “Secret Report: Biofuel Caused Food Crisis.” *The Guardian* (July 3, 2008).

Herring, Horace and Steve Sorrell, eds. *Energy Efficiency and Sustainable Consumption: The Rebound Effect*. New York: Palgrave Macmillan, 2009

Merton, Robert K. “The Unintended Consequences of Purposive Action.” American Sociological Review (v.1/6, 1936).

Scharlemann, Jörn P. W. and William F. Laurance. “How Green Are Biofuels?” *Science* (v.319, 2008).

Zehner, Ozzie. *Green Illusions: The Dirty Secrets of Clean Energy and the Future of Environmentalism*. Lincoln, NE and London: University of Nebraska Press, 2012.

Zehner, Ozzie. "Light-Emitting Diodes." In *Green Technology*, edited by Paul Robbins, Dustin Mulvaney and J. Geoffrey Golson, 288-91. London: Sage, 2011.

Zehner, Ozzie. "Population/Overpopulation." In *Green Culture*, edited by Paul Robbins, Kevin Wehr and J. Geoffrey Golson, 366-69. London: Sage, 2011.

Zehner, Ozzie. *Producing Power: The Semiotization of Alternative Energy in Media and Politics*, Department of Science and Technology Studies Amsterdam: University of Amsterdam, 2007.