

December 13, 2012

To:

**Mr. Daniel Esty
Commissioner,
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-512710**

Copy to:

**The Honorable Dannel P. Malloy
Governor, State of Connecticut
State Capitol
210 Capitol Avenue
Hartford, CT 06106**

**Mr. George Jepsen, Esq.
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From:

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RE: Public Comments on the Draft Comprehensive Energy Strategy

Dear Commissioner Esty:

The Berkshire-Litchfield Environmental Council (BLEC) respectfully submits the comments below regarding the new Draft Comprehensive Energy Strategy currently under consideration. We have grave concerns regarding the direction that the Department of Energy and Environmental Protection (DEEP) is proposing for key aspects of state energy policy. Of particular concern are smart grid technologies and industrial-scale wind generation for which we are uniquely qualified to comment.

BLEC Background:

The Berkshire-Litchfield Environmental Council is a 501 (3)(c) non-profit organization that focuses on environmental issues affecting the Northwest Corner of Connecticut and the Berkshires region of Massachusetts. Founded in 1970, we have a membership of 560 and have addressed our efforts to diverse subjects, including a proposed/failed hydroelectric pumped storage power plant, water and air contamination, land preservation, zoning controls, vernal pools protection, the environmental effects of radio frequency radiation associated with the siting of telecommunications infrastructure, and industrial-scale wind turbines.

Since its founding, BLEC has focused on how infrastructure impacts the environment. BLEC was among the first environmental organizations to advocate for renewable energy sources, having published a book on the subject in the early 1980's. Wind was a part of the mix although no one at that time could have envisioned the industrial-scale wind farms of today or the massive technological overhaul of the nation's power utility grid via smart technology.

BLEC President, Starling W. Childs, a lecturer at the Yale School of Forestry and President of EECOS Inc. Environmental Consultants -- a land-use planning/scientific assessment group specializing in innovative farm and forest management and creative development designs - has been a consultant to wind projects throughout the east coast. He has also been a longstanding proponent of responsible, clean wood biomass energy generation.

BLEC Communications Director, B. Blake Levitt is a decades-long member of the science press, former *New York Times* contributor, and award winning author of two books on the health and environmental effects of nonionizing radiation, which includes the radiofrequencies of the electromagnetic spectrum used in smart grid/metering as the systems are currently designed. She has written on the smart grid for Energy Bulletin in 2011.¹

BLEC is therefore uniquely qualified to address this commission on these subjects.

BLEC has sponsored educational forums -- all well attended -- on responsible cell tower siting in 1996 (Falls Village) and 2000 (Litchfield). BLEC co-sponsored cell towers forums in

¹ *The Problems with Smart Grids*, B. Blake Levitt and Chellis Glendinning, Energy Bulletin, 2011. <http://www.energybulletin.net/stories/2011-03-23/problems-smart-grids>

2007 (Sheffield, MA.) and 2008 (Cornwall). In April of 2011, we sponsored a forum on industrial-scale wind turbines (Falls Village) that was co-sponsored by the Housatonic Valley Association, Cornwall Bridge, CT; Sharon Audubon, Sharon, CT; the Housatonic Environmental Action League, Inc. Cornwall Bridge, CT; the Housatonic Riverkeepers, MA/CT, Lee, MA; the Housatonic River Initiative, Lenoxdale, MA; the Northwest Conservation District, Torrington, CT; and Green Berkshires, Great Barrington, MA. Environmental protection in all of its subtle variations is of critical concern in this part of Connecticut and tri-state region.

BLEC forums bring in top research scientists, federal regulators, policy makers, and legislators, typically with expertise that is unavailable at the local level and not easily accessible at the state level. Our forums on cell towers have included: Carl Blackman, Ph.D., U.S. Environmental Protection Agency; Robert Cleveland, Ph.D., Federal Communications Commission; Albert Manville II, Ph.D., U.S. Fish & Wildlife Service; Henry Lai, Ph.D., Director, Department of Bioengineering, University of Washington, Seattle; Andrew Marino, Ph.D., professor, Department of Orthopaedic surgery, Louisiana State University Medical Center; James Hobson, J.D., a telecommunications attorney in Washington, D.C. and former counsel at the FCC; Edward Barron, J.D., chief counsel to US Senator Patrick Leahy, among others.

BLEC's forum on wind generation included: Keynote Albert M. Manville II, Ph.D. Senior Wildlife Biologist, Division of Migratory Bird Management, U.S. Fish and Wildlife Service; Dave McGlinchey, J.D., Senior Program Leader for Energy and Environment at the Manomet Center for Conservation Sciences in Plymouth, MA; Madga Havas, Ph.D., Professor of Biology, University of Trent, Canada; and psychologist Helen Parker, Ph.D., who discussed Wind Turbine Syndrome caused by environmental infrasound.

Before BLEC makes recommendations to the many communities, legislative offices and other environmental organizations that rely on us for infrastructure policy advice, we do considerable homework regarding all aspects of an issue.

DEEP's Connecticut Draft Comprehensive Energy Strategy: General Impressions

There are many laudatory goals and sweeping approaches in the proposed Comprehensive Energy Strategy, called the 'Draft Strategy,' that could help Connecticut achieve an 80% greenhouse emissions reduction by 2050 as stipulated by the state's Global Warming Solutions Act in 2008. Some beneficial things include the expanded commitment to reaching all social sectors and buildings such as small businesses and the low-income community to help increase cost-effective energy efficiency. Also laudatory is the intent to go beyond the traditional focus on lighting and weather stripping to seek deeper efficiency in others areas; establishing building efficiency standards for both new construction and retrofits; establishing and disclosing efficiency standards at the time of sale or rental; and the reinvigorating/broadening of the state's Home Improvement Solutions program.

But there are serious problems with the Draft as written in that it misses the mark regarding the most current analysis of the effectiveness – indeed intelligence – of the 'smart'

grid. The Draft also misses the mark on solutions in other key aspects, too, such as ‘Green Bank’ financing.

The ‘Green Bank’ -- Public v. Private Funding

Reliance on the leveraging of private capital through ‘innovative’ financing via Connecticut’s “first-in the-nation Green Bank” is not without risks. This public/private financial “partnering” is vague and has no well-established ethical parameters between corporate interests v. environmental protection/integrity. The entire concept is fraught with potential conflicts when business interests are so closely co-mingled with matching taxpayer funding. Of special concern is the protection of state assets held in public trust such as our cherished state forests, water and other natural resources. In the name of “green energy,” neither public assets nor environmental protection should be bargaining chips to garner industry funding at potential public expense, especially at the behest of a newly “partnering” DEEP. Indeed under DEEP’s consolidated umbrella now are the departments of Energy, Environmental Protection, Public Utility Control and the Siting Council – all with a regulatory stake in these proposals. There is much room for cooptation and conflict in both fact and in psychological principle when regulatory agencies are too close – indeed ‘captured’ – by the industries they are supposed to regulate.

The consolidation of so many agencies under DEEP’s aegis is a formula for just this kind of capture but the Draft takes this one step further with the Green Bank concept. Commissioner Esty is one of the nation’s intellectual framers of the Green Bank idea, along with Reed Hundt, former Chairman of the Federal Communications Commission and now in private practice as a consultant to the telecom and other industry sectors, many of which have a stake in smart grid technologies. Under Chairman Esty and a consolidated DEEP, Connecticut has become the trial state for what is largely an untested, potentially corrupting economic theory. It is largely a financial experiment espoused and created by a handful of former federal government employees who transitioned into the private sector, now in league with the industries they once regulated.

Reed Hundt, a longtime friend of Chairman Esty’s, heads a lobbying group called the Coalition for the Green Bank. There is strong representation in the coalition by private equity financiers like Equilibrium Capital Group, KRP Energy Advisors and many others. This is an area of finance with little transparency. Critics, such as the Union of Concerned Scientists, have noted there is not enough congressional oversight and that there is disproportionate favoritism for capital intensive non-renewable energy technologies at the expense of less costly, cleaner technologies. One main problem, they say, is that loan decisions have been removed from congressional oversight and there is inadequate calculation on the risk of default and potential taxpayer bailout. There is also concern that taxpayer guaranteed loans will be moved into secondary markets, creating “...poorly vetted energy investments backed by taxpayers.”² These are the same mistakes as the housing bubble, securitized mortgages and credit default swaps that wrecked the global economy.

² *Green bank proposals probe the hostile frontier of politics and finance*, Peter Behr, ClimateWire, Friday, October 2, 2009.

BLEC does not recommend moving forward with any substantial public works programs or large overhauls of state infrastructure without much closer scrutiny regarding how precisely this will work and to whose advantage. Industries of all stripes have always had a vested profit motive in gaining access to public assets and natural resources. The Draft would actually codify their entry by right as state policy, unlike any other state. Just in principle, this cannot be in the best interests of Connecticut citizens or the environment so many have devoted their lives to protecting. Some environmental organizations, such as the Environmental Defense Fund and The Natural Resources Defense Council, have wandered into “partnering” with various industries but it has cost them members. Connecticut should not presume that because this sounds like a new progressive idea, that it has been vetted by either the financial sector, is well-controlled at the federal level, or is acceptable to other broad-based environmental groups.

While there is a place for private/public partnering in large-scale public works projects, the issue of regulatory capture is a serious one, especially given the *Citizens United* ruling at the US Supreme Court after which industry “citizenship” gained solid footing in competing with live citizens. Connecticut’s “Green Bank” is a new wrinkle in blurring the line between public and private interests. The Draft would solidify this method of financing into state environmental practice. That’s the real ‘first’ here.

Unfortunately, many of the proposals in the Draft rely on this funding possibility to get off the ground, without which they would be inconceivable at this time. That should tell us something.

Natural Gas Over-Emphasized

Another general problem with the Draft concerns the emphasis on natural gas. Increasing the availability of natural gas in our energy mix is something that should have been done long ago. Many would like to take advantage of the lower current costs, especially for home/business heating. The absence of gas infrastructure throughout the entire Northeast corridor has been problematic for some time and puts us at a competitive disadvantage on many levels, including reducing CO2 emissions. But increasing natural gas in our energy mix is at best a temporary solution -- the Draft rightly calls it a “bridge” – given that it relies on increased fracking (with all of the accompanying environmental problems) and the fact that gas is traded as a commodity where prices, until recently, have not been competitive with oil.

Relevant points are:

- Given severe fiscal constraints into the foreseeable future, and the untested/ inherently conflicted Green Bank concept, should we invest in huge new infrastructure for such an uncertain, theoretical return? And this at a time when our true aim is to transition to renewable energy sources? It may simply be too late for natural gas to gain a significant foothold now. The tradeoffs are steep: environmental disruption in laying that much pipeline, and the increased state regulatory oversight required afterward. These factors are not sufficiently addressed in the Draft.

- The home heating oil business and its thousands of employees will be adversely impacted by the preferential treatment and introduction of a new energy sector. For the money that taxpayers spend on the frontside and what ratepayers may pay on the backside, those same dollars might be better spent on simply upgrading everyone's furnaces to more energy efficient models.

Far less sweeping approaches might well hit the mark more effectively for a lot less money and a lot less societal/environmental disruption than what's contained in the above areas of the Draft.

The 'Smart' Grid Is Not Smart :

The Draft places adoption of the 'smart' grid, advanced 'smart' metering, and time-of-use pricing as a cornerstone in the Electricity Sector. This is bewildering given the overwhelming resistance in at least 18 states regarding smart metering, as well as a reexamination of the intelligence of the entire smart grid concept by think-tanks and key agencies at the federal level. Connecticut has an important opportunity to learn from this. Yet the Draft takes us in the opposite direction, endorsing smart grid/metering that has problems so systemic that they may not be fixable, according to the US Government Accountability Office.³

The smart grid was initially funded at \$3.4 billion taxpayer dollars through the American Recovery and Reinvestment Act of 2009 with loans guaranteed through the Department of Energy. Additional funds totally as much as \$11 billion were allocated through other agencies through 2011. But the smart grid is increasingly understood as an over-engineered, ill-advised, financial boondoggle at taxpayer expense, capable of endangering the security of the entire national grid, violating constitutional privacy protections and endangering public health. In addition, the smart grid/metering has not been found to save energy when all the new variables in the system are factored in. Plus, time-of-use pricing is largely punitive to those who can least afford it. Time-of use-pricing is fundamentally a Wall Street model designed to maintain shareholder profits as we transition to more energy efficient models that will reduce demand. DEEP appears not to understand that the smart grid takes us in the direction of more centralized utilities when a big thrust in environmental circles is toward less centralized facilities as the best way to address utilizing local renewable energy sources and faster response times when the power goes out.

A new report called "*Getting Smarter About the Smart Grid*"⁴ was recently published by the National Institute for Science, Law and Public Policy in Washington, D.C. Written by smart grid technology expert, Timothy Schoechle, PhD, the report says billions of taxpayer dollars have been misspent by the federal government in subsidizing new smart meters. The

³ *Cybersecurity – Challenges in Securing the Modernized Electricity Grid*, Testimony Before the Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, Statement of Gregory C. Wilshusen, Director Information Security Issues and David C. Trimble, Director Natural Resources and Environment, February 28, 2012.

⁴ *Getting Smarter About the Smart Grid*, by Timothy Schoechle, PhD., National Institute for Science, Law and Public Policy, Washington, D.C., 2012.

http://www.gettingsmarteraboutthesmartgrid.org/pdf/SmartGrid_Report_PDF-2012-11-26-Final.pdf

report further notes that investment in technologies that would facilitate integration of renewable energy technologies, distributed (or local) power generation, and offer real-time in-home energy management capability, have languished, while subsidies for smart meters, that do not contribute to energy management efficiency or sustainability, have wasted enormous sums with taxpayer dollars. The report also notes that smart meters do not take us forward toward sustainability and that the only parties who benefit from the new meters are the utilities and meter companies, which include GE, Itron, Elster, Landis+Gry, Oncor and others. Most meters are made in China and do not increase manufacturing jobs in the US.

Some quotes from the report:

“The meters also do not stimulate the economy, but do cut jobs. Their large-scale rapid deployment, benefiting utility and meter company stocks, conceals the reality that today’s utility business model is broken, being propped up by these market distortions, and may require a government bailout to truly embrace renewable energies in America.”

"In reality, these meters and their dedicated networks are primarily for the benefit of utilities, reducing their operating costs and increasing profits by firing meter readers--ironically with federal stimulus funds--while doing essentially nothing to advance what should be the real goal of the smart grid: balancing supply and demand and integrating more renewable sources. Instead, the meter networks squander vast sums of money, create enormous risks to privacy and security, introduce known and still unknown possible risks to public health, and sour the public on the true promise of the smart grid.

"The present policy approach to electricity infrastructure in the United States depicted in the report, *Policy Framework for the 21st Century: Enabling Our Secure Energy Future*, issued by the National Science and Technology Council (NSTC) of the Executive Office of the President, evidences a fundamental lack of understanding of the problems associated with the future of electricity and energy.

"There are inherent conflicts in the monopoly utility business model preventing the nation from moving to a renewable energy economy, and utilities may eventually require a government bailout.

"Because Investor-Owned Utilities (IOUs) are paid on a per-kilowatt-of-energy-sold basis, and also receive a guaranteed ROR on assets, they do not have a financial incentive to encourage less energy usage, or to invest in technologies that would help citizens reduce energy consumption.

"Investors in utilities gain from the smart meter deployment, as they would from any other capital expenditure, while there is no clear gain and significant new risks (financial, privacy, security, health and safety, and cost) for the ratepayer and consumer.

"We must stop subsidizing a centralized, wasteful infrastructure approach that will not lead to sustainability and that puts the nation at long-term global economic disadvantage."

DEEP's Draft takes us in the exact wrong direction.

How the Smart Grid Works:

A glaring hole in the Draft is that it does not go into detail about how the smart grid actually functions, the health concerns associated with it, how easy it is to hack, how unreliable wireless systems inherently are, or include current information now established in many other states with more experience in smart metering.

The smart grid is a 2-way communications system that will eventually turn all of our appliances into radiofrequency radiation (RF) transceivers just like cell phones, capable of being controlled remotely by us and the utility companies. That's every washer, dryer, refrigerator, freezer, computer, printer, fax, coffee maker, stove, oven, furnace, air conditioner, and on and on—all turned into constantly RF-emitting cell-phone like devices, transmitting RF in the 900 MHz – 3 GHz range of the electromagnetic spectrum, 24/7. The average home has at least 15 appliances. This is an involuntary ambient exposure that does not now exist and no government regulatory agency regulates for cumulative background exposures such as this. It is a large-scale system being forced on citizens at a time when the International Agency for Research on Cancer (IARC), which is part of the World Health Organization, has classified RF in these frequencies as a 2B (possible) carcinogen⁵ along with formaldehyde, lead, DDT and exhaust fumes.

New appliances are already being equipped with internal antennas that cannot be deactivated without voiding warranties, even when people do not want such exposures. All of these indoor transmitters communicate with smart meters attached to the outside of homes and businesses, which will, in turn, transmit utility usage information several times a day, and sometimes several times a minute, to a new centralized hub like a cell tower or newly installed equipment on distribution poles throughout neighborhoods. Peak power bursts of RF when a device first transmits have been measured in excess of federal guidelines. These are unsafe, involuntary exposures, especially to the elderly, the infirm, pregnant women and children.

The below illustration is taken from a report by Richard A. Tell for Hydro One in Canada. It shows how the wireless smart grid works, creating and bouncing radiofrequency signals from appliances to meters to houses to hubs in a “mesh” network.⁶ As should be obvious, it is a far more complex system than what currently exists.

⁵ http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf

⁶ An Analysis of Radiofrequency Fields Associated with Operation of the Hydro One Smart Meter System, October 28, 2008, prepared for Hydro One Networks Inc., Toronto, Ontario M5G 2P5, by Richard A. Tell, Richard Tell Associates, Inc., Colville, WA 99114-9352

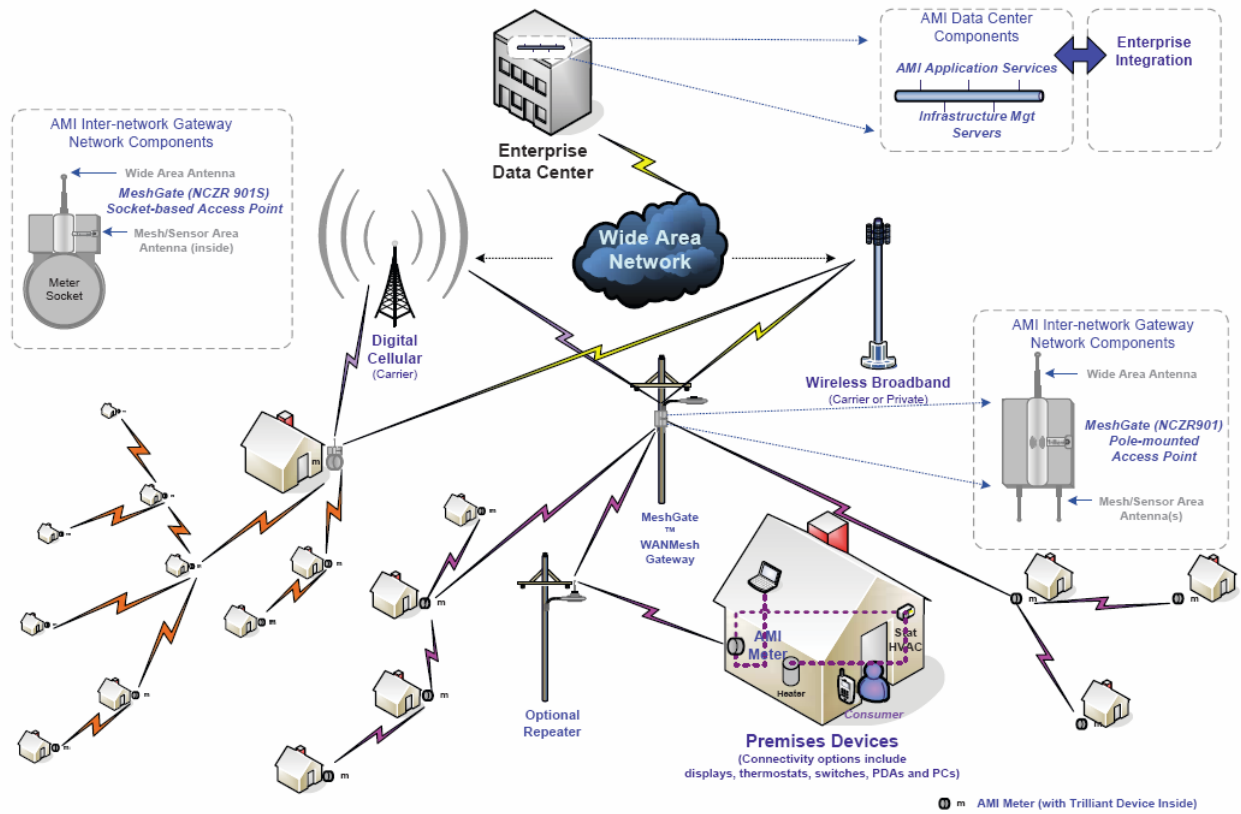


Figure 1. Illustration of components of the Hydro One Smart Meter system showing the use of radiofrequency (RF) signals for communications among electric power meters, relays, access points and, ultimately, Hydro One’s enterprise management systems. (From Trilliant Networks’ sales literature).

Connecticut’s utility companies replaced the old mechanical analog meters with a first generation advanced metering model (AMR) that has an RF component. The first generation meters, which most of the state’s users have, store usage data until it is called for by a van that passes through a neighborhood. As such, it only transmits once a month. Some first generation AMR meter models used in other states like New York, transmit signals constantly but a van is still required to collect the data. Those are more dangerous models from a health standpoint. In some locations with already high ambient RF backgrounds, metering is done via landline phone networks with a modulated signal placed on the phone line typically once a day.

The second generation of advanced metering infrastructure, called AMI, is the smart meter system. It transmits signals at a minimum of several times a day and at a maximum several times a minute. Signals in the mesh network are designed to bounce from house to house. The final collector meter on the last house on the network fires constantly and can transmit usage data for between 500 and 5,000 houses, creating strong RF exposures that may exceed FCC guidelines. Apartments and office buildings where multiple meters are congregated together have significant exposures. No van or meter reader is required. It is a completely wireless network.

Health Concerns are Real: Problems at the FCC

That there are potential adverse health and environmental effects from nonionizing radiation has been known since the advent of radar used in WW2 aboard US ships when cataracts, numerous cancers and infertility were observed in US Navy midshipmen and radar technicians. Since that time, and especially within the last 15 years, the use of wireless technologies has exploded – all without a clear understanding of the biological implications and without adequate regulatory controls. Ambient nonionizing radiation exposures are the fastest growing environmental exposures today. In fact, it has become a hidden variable in all research.

The Federal Communications Commission (FCC) has standards in place but they only regulate for acute, short term, high-intensity exposures capable of heating tissue the way a microwave oven cooks food. Although a safety margin is built into the standards, any effects below that thermal threshold are simply unregulated. In addition, the FCC categorically excludes from review any device or application that falls below a certain power density which most wireless products, including smart meters, do. That means that there is no true regulatory oversight of just about all of the wireless products in use today with the exception of cell phones which have to meet a threshold for a specific absorption rate of energy deposited in tissue. The FCC is currently reviewing the adequacy of the cell phone exposure limit.

One primary criticism of how the FCC functions is that they time-average exposures rather than regulate for peak exposures, which is the most important biological metric. Smart meters, for instance, during the duty cycle, put out a peak burst of RF that has been found to exceed FCC limits by orders of magnitude. Yet that peak is averaged away into the duty cycle's lower exposures and essentially disappears into what is considered "safe." That is like saying that a bullet passing through flesh is "safe" because it comes out the other side and moves more slowly by the time it passes through bone, blood and tissue. The FCC standards are based on a dose-metry model of how to make communications systems work with the least amount of transmitted power necessary, not on true biological models regarding the consequences to living systems in the path of technology.

In addition, the FCC standards – indeed no state or federal regulatory entity – regulates for cumulative exposures from myriad sources all functioning together. RF power density and categorical exclusion are considered one product at a time. The smart grid/metering will add a whole new layer of ambient RF exposure that does not now exist.

It is the unregulated, long-term, low-level, chronic exposures that are increasing exponentially today from all manner of wireless devices, such as cell phones, wifi, cordless domestic phones, myriad screen 'apps,' wireless security systems, baby monitors, and now smart grid/meters. Add to this ambient exposures from all of the infrastructure, such as cell towers and myriad antenna arrays to support 1G, 2G, 3G and now the 4G network creating ubiquitous internet connectivity and it is easy to understand why many governments and health agencies are calling for a precautionary approach before further buildout.

What's more, man-made radiation creates very different kinds of exposures -- with unusual signaling characteristics like digital pulsing, phased array and saw-tooth waveforms, and at much higher power intensities than anything found in nature. RF is actually a form of energetic air pollution. Myriad species are known to be fantastically sensitive to low-level

energy⁷ and may be affected by these increasing background levels. No federal or state agency has standards to protect wildlife from RF.

What the Studies Show:

Below is a chart compiled by Levitt and Lai⁸ of biological effects at extremely low intensities comparable to smart grid/metering. These exposures cannot be considered biologically inactive. Scores of studies have found otherwise, despite industry assurances.

Table I. A list of studies reporting biological effects at low intensities of RFR. These papers gave either SAR (W/kg) or power density ($\mu\text{W}/\text{cm}^2$) of exposure.

		SAR (W/kg)	Power density ($\mu\text{W}/\text{cm}^2$)	Effects reported
Belyaev et al. (2005) (in vitro)	915 MHz, GSM 24 & 48 hr	0.037		Genetic changes in human white blood cells
Belyaev et al. (2009) (in vitro)	915 MHz, 1947 MHz GSM, UMTS 24 & 72 hr	0.037		DNA repair mechanism in human white blood cells
Blackman et al. (1980) (in vitro)	50 MHz, AM at 16 Hz	0.0014		Calcium in forebrain of chickens
Boscol et al. (2001) (in vivo) (human whole body)	500 KHz-3 GHz, TV broadcast		0.5	Immunological system in women
Campisi et al. (2010) (in vitro)	900 MHz, CW or 50-Hz AM, 14 days, 5, 10, 20 min per day, CW- no effect		26	DNA damage in human glial cells
Capri et al. (2004) (in vitro)	900 MHz, GSM 1 hr/day, 3 days	0.07		A slight decrease in cell proliferation when human immune cells were stimulated with mitogen and a slight increase in the number of cells with altered distribution of phosphatidylserine across the membrane.
Chiang et al. (1989) (in vivo) (human whole body)	People lived close to AM radio and radar installations for more than one year		10	People lived and worked near AM radio antennae and radar installations showed deficits in psychological and short-term memory tests.
De Pomerai et al. (2003) (in vitro)	1 GHz 24 & 48 hr	0.015		Protein damages
D'Inzeo et al. (1988) (in vitro)	10.75 GHz CW 30-120 sec	0.008		Operation of acetylcholine-related ion-channels in cells. These channels play important roles in physiological and behavioral functions.
Dutta et al. (1984)	915 MHz, sinusoidal	0.05		Increase in calcium efflux in brain cancer cells.

⁷ For a list of studies on wildlife and RF, see <http://www.livingplanet.be/emranimals.htm>

⁸ *Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays*, B. Blake Levitt and Henry Lai, *Environ. Rev.* **18**: 369–395 (2010) doi:10.1139/A10-018 Published by NRC Research Press. <http://electromagnetichealth.org/electromagnetic-health-blog/levitt-lai/>

(in vitro)	AM at 16 Hz			
Dutta et al. (1989) (in vitro)	147 MHz, sinusoidal AM at 16 Hz 30 min	0.005		Increase in calcium efflux in brain cancer cells.
Fesenko et al. (1999) (in vivo) (mouse- wavelength in mm range)	From 8.15 - 18 GHz 5 hr to 7 days direction of response depended on exposure duration		1	Change in immunological functions.
Forgacs et al. (2006) (in vivo) (mouse whole body)	1800 MHz, GSM- 217 Hz pulses, 576 µs pulse width; 2hr/day, 10 days	0.018		Increase in serum testosterone.
Guler et al. (2010) (In vivo) (rabbit whole body)	1800 MHz AM at 217 Hz, 15 min/day, 7 days		52	Oxidative lipid and DNA damages in the brain of pregnant rabbits
Hjollund et al. (1997) (in vivo) (human partial or whole body)	Military radars		10	Sperm counts of Danish military personnel, who operated mobile ground-to-air missile units that use several RFR emitting radar systems, were significantly lower compared to references.
Ivaschuk et al. (1999) (in vitro)	836.55 MHz, TDMA 20 min	0.026		A gene related to cancer.
Jech et al. (2001) (in vivo) (human partial body exposure- not included)	900 MHz, GSM- 217 Hz pulses, 577 µs pulse width; 45 min; narcoleptic patients	0.06		Improved cognitive functions.
Kesari and Behari (2009a) (in vivo) (rat whole body)	50 GHz; 2hr/day, 45 days	0.0008		Double strand DNA breaks observed in brain cells
Kesari and Behari (2009b) (in vivo) (rat whole body)	50 GHz; 2hr/day, 45 days	0.0008		Reproductive system of male rats
Kesari et al. (2010) (in vivo) (rat whole body)	2450 MHz, 50-Hz modulation, 2 h/day, 35 days	0.11		DNA double strand breaks in brain cells.
Kwee et al. (2001) (in vitro)	960 MHz, GSM 20 min	0.0021		Increased stress protein in human epithelial amnion cells.
Lebedeva et al. (2000) (in vivo) (human partial body)	902.4 MHz, GSM 20 min		60	Brain wave activation.
Lerchl et al. (2008) (in vivo) (hamster whole body)	383 MHz (TETRA), 900 and 1800 MHz (GSM) 24 hr/day, 60 days	0.08		Metabolic changes.
Magras and Xenos (1999) (in vivo) (mouse whole body)	'Antenna park'-TV and FM-radio, Exposure over several generations		0.168	Decrease in reproductive function.
Makova et al. (2005) (in vitro)	915 and 905 MHz, GSM 1 hr	0.037		Chromatin conformation in human white blood cells.
Mann et al. (1998)	900 MHz GSM		20	A transient increase in blood cortisol.

(in vivo) (human whole body)	pulse-modulated at 217 Hz, 577 μ s width, 8 hr			
Marinelli et al. (2004) (in vitro)	900 MHz CW 2 - 48 hr	0.0035		Cell's self-defense responses triggered by DNA damage.
Navakatikian and Tomashevskaya (1994) (in vivo) (rat whole body)	2450 MHz CW and 3000 MHz pulse-modulated 2 μ s pulses at 400 Hz Single (0.5-12hr) or repeated (15-60 days, 7-12 hr/day) exposure, CW-no effect	0.0027		Behavioral and endocrine changes, and decreases in blood concentrations of testosterone and insulin.
Nittby et al. (2007) (in vivo) (rat whole body)	900 MHz GSM 2hr/wk, 55wk	0.0006		Reduced memory functions.
Novoselova et al. (1999) (in vivo) (mouse whole body-wavelength in mm range)	From 8.15 -18 GHz, 1 sec sweep time-16 ms reverse, 5 hr		1	Functions of the immune system.
Novoselova et al. (2004) (in vivo) (mouse whole body-wavelength in mm range)	From 8.15 -18 GHz, 1 sec sweep time-16 ms reverse, 1.5 hr/day, 30 days		1	Decreased tumor growth rate and enhanced survival.
Pavicic et al. (2008) (in vitro)	864 and 935 MHz, CW, 1-3 hrs	0.08		Growth affected in Chinese hamster V79 cells.
Panagopoulos et al. (2010) (in vivo) (fly whole body)	GSM 900 and 1800 6 min/day, 5 days		1 - 10	Reproductive capacity and induced cell death.
Panagopoulos and Margaritis (2010a) (in vivo) (fly whole body)	GSM 900 and 1800 6 min/day, 5 days		10	'Window' effect of GSM radiation on reproductive capacity and cell death.
Panagopoulos and Margaritis (2010b) (in vivo) (fly whole body)	GSM 900 and 1800 1- 21 min/day, 5 days		10	Reproductive capacity of the fly decreased linearly with increased duration of exposure.
Pérez-Castejón et al. (2009) (in vitro)	9.6 GHz , 90% AM, 24 hrs	0.0004		Increased proliferation rate in human astrocytoma cancer cells.
Persson et al. (1997) (in vivo) (mouse whole body)	915 MHz-CW and pulse-modulated (217-Hz, 0.57 ms; 50-Hz, 6.6 ms) 2-960 min; CW more potent	0.0004		Increase in permeability of the blood-brain barrier.
Phillips et al. (1998) (in vitro)	813.5625 MHz (iDEN); 836.55 MHz (TDMA) 2 hr and 21 hr	0.0024		DNA damage in human leukemia cells.
Polonga-Moraru et al. (2002) (in vitro)	2.45 GHz 1hr		15	Change in membrane of cells in the retina.
Pyrpasopoulou et al.	9.4 GHz GSM	0.0005		Exposure during early gestation affected kidney

(2004) (in vivo) (rat whole body)	(50 Hz pulses, 20 μ s pulse length) 1-7 days postcoitum			development.
Roux et al. (2008a) (in vivo) (tomato whole body)	900 MHz		7	Gene expression and energy metabolism.
Roux et al. (2008b) (in vivo) (plant whole body)	900 MHz		7	Energy metabolism.
Salford et al. (2003) (in vivo) (rat whole body)	915 MHz GSM 2 hr	0.02		Nerve cell damage in brain.
Sarimov et al. (2004) (in vitro)	895-915 MHz GSM 30 min	0.0054		Human lymphocyte chromatin affected similar to stress response.
Schwartz et al. (1990) (in vitro)	240 MHz-CW and sinusoidal modulation at 0.5 and 16 Hz, 30 min, effect only observed at 16-Hz modulation	0.00015		Calcium movement in the heart.
Schwarz et al. (2008) (in vitro)	1950 MHz UMTS 24 hr	0.05		Genes in human fibroblasts.
Somosy et al. (1991) (in vitro)	2.45 GHz, CW and 16 Hz square-modulation, modulated field more potent than CW	0.024		Molecular and structural changes in cells of mouse embryos.
Stagg et al. (1997) (in vitro)	836.55 MHz TDMA duty cycle 33% 24 hr	0.0059		Glioma cells showed significant increases in thymidine incorporation, which may be an indication of an increase in cell division.
Stankiewicz et al. (2006) (in vitro)	900 MHz GSM 217 Hz pulses-.577 ms width 15 min	0.024		Immune activities of human white blood cells.
Tattersall et al. (2001) (in vitro)	700 MHz CW, 5-15 min	0.0016		Function of the hippocampus.
Velizarov et al. (1999) (in vitro)	960 MHz GSM 217 Hz square-pulse, duty cycle 12% 30 min	0.000021		Decrease in proliferation of human epithelial amnion cells.
Veyret et al. (1991) (in vivo) (mouse whole body)	9.4 GHz 1 μ s pulses at 1000 pps, also with or without sinusoidal AM between 14 and 41 MHz, response only with AM modulation, direction of response depended on AM frequency	0.015		Functions of the immune system.
Vian et al. (2006) (in vivo) plant	900 MHz		7	Stress gene expression.

Wolke et al. (1996) (in vitro)	900, 1300, 1800 MHz, square-wave modulated at 217 Hz; Also 900 MHz with CW, 16 Hz, 50 Hz and 30 KHz modulations	0.001		Calcium concentration in heart muscle cells of guinea pig.
Yurekli et al. (2006) (in vivo) (rat whole body)	945 MHz GSM, 217 Hz pulse-modulation 7 hr/day, 8 days	0.0113		Free radical chemistry.

Such studies demonstrate that low-level RF affects every aspect of biological function. This is a body of work that we ignore at our own peril, especially with the deployment of smart/grid/metering into every home and business.

Many are sounding alarms. David O. Carpenter, MD, MPH, founder of the University of Albany (NY) School of Public Health and director of the Institute for Health and the Environment at the State University of New York at Albany, School of Public Health, drafted an open letter signed by more than 54 scientists and medical professionals called “Smart Meters: Correcting the Gross Misinformation.”⁹ The letter was recently updated and signed by many additional scientists and medical professionals from five continents. In the U.S., co-signers include researchers at Columbia University, Michigan State University, the University of California at Berkeley, the University of Colorado, the University of Pittsburgh, and the University of Washington.

Joel M. Moskowitz, Ph.D., Director, Center for Family and Community Health, School of Public Health, University of California, Berkeley, noted that “...Fifty-four experts on the health effects of electromagnetic fields (EMFs) have called for use of common sense and the development and implementation of best practices in using these technologies in order to reduce exposure and risk of health hazards. These scientists and medical professionals who come from twenty countries have published hundreds of peer-reviewed studies on the health effects of EMFs.”

Points from Dr. Carpenter’s letter include:

- “The mass deployment of smart grids could expose large chunks of the general population to alarming risk scenarios without their consent.”
- “Many scientists and medical experts urgently recommend that measures following the Precautionary Principle be applied immediately — such as using wired meters — to reduce biologically inappropriate microwave exposure. We are not advocating the abolishment of RF technologies, only the use of common sense and the development and implementation of best

⁹ [Smart Meters: Correcting the Gross Misinformation](http://maisonsaine.ca/smart-meters-correcting-the-gross-m...) The open letter, a list of the 54 experts who signed it and their affiliations, and links to supplementary resources are available at: <http://maisonsaine.ca/smart-meters-correcting-the-gross-m...>
Source: Joel M. Moskowitz, Ph.D., Director, Center for Family and Community Health, School of Public Health, University of California, Berkeley.

practices in using these technologies in order to reduce exposure and risk of health hazards.”

- “The International Agency for Research on Cancer (IARC) classified radiofrequency radiation as a 2B, possible human carcinogen.”
- “Children are especially at risk.”
- “While the specific pathways to cancer are not fully understood, it is scientifically unacceptable to deny the weight of the evidence regarding the increase in cancer cases in humans that are exposed to high levels of RF/microwave radiation”
- “More than 1,000 studies done on low intensity, high frequency, non-ionizing radiation, going back at least fifty years, show that some biological mechanisms of effect do not involve heat. This radiation sends signals to living tissue that stimulate biochemical changes, which can generate various symptoms and may lead to diseases such as cancer.”
- “This energy can cause DNA damage indirectly leading to cancer by a combination of biological effects. Recent publications have documented the generation of free radicals, increased permeability of the blood brain barrier allowing potentially toxic chemicals to enter the brain, induction of genes, as well as altered electrical and metabolic activity in human brains upon application of cell phone RF/microwaves similar to those produced by smart meters.”
- "High frequency EMFs such as the microwaves used in cell phones, smart meters, Wi-Fi and cordless "DECT" phones, appear to be the most damaging when used commonly."
- “Authorities are worried about the growing number of citizens who say they have developed electrohypersensitivity (EHS), especially since for many of them, the symptoms developed after the installation of such meters."
- “Adverse neurological effects have been reported in people who sustain close proximity to wireless meters, especially under 10 feet.”
- “Wireless smart meters typically produce atypical, relatively potent and very short pulsed RF/microwaves whose biological effects have never been fully tested. They emit these millisecond-long RF bursts on average 9,600 times a day with a maximum of 190,000 daily transmissions and a peak level emission two and a half times higher than the stated safety signal.”
- “People in proximity to a smart meter are at risk of significantly greater aggregate of RF/microwave exposure than with a cell phone, not to mention the cumulative exposure received by people living near multiple meters mounted together, pole-mounted routers or utility collector meters using a third antenna to relay RF signals from 500 to 5,000 homes.”
- “RF levels from various scenarios depicting normal smart meter installation and operation may violate even the out-of-date US public safety standards which only consider acute thermal effects."

- “Caution is warranted because the growing variety of RF/microwave emissions produced by many wireless devices such as smart meters have never been tested for their potential biological effects.”

In addition to Dr. Carpenter’s open letter, the American Academy of Environmental Medicine recently issued a report entitled “Electromagnetic and Radiofrequency Fields Effect on Human Health”¹⁰ which calls for, among other things:

- An immediate caution on Smart Meter installation due to potentially harmful RF exposure.
- Accommodation for health considerations regarding EMF and RF exposure, including exposure to wireless Smart Meter technology.
- Independent studies to further understand the health effects from EMF and RF exposure.
- Recognition that electromagnetic hypersensitivity is a growing problem worldwide.
- Understanding and control of this electrical environmental bombardment for the protection of society.
- Consideration and independent research regarding the quantum effects of EMF and RF on human health.
- Use of safer technology, including for Smart Meters, such as hard-wiring, fiber optics or other non-harmful methods of data transmission.

Symptoms increasingly reported in the population, sometimes with sudden onset after smart meters have been installed include: heart arrhythmias, headaches, sleeplessness, dizziness, concentration problems (‘brain fog’), memory loss, skin rashes, lowered libido, fatigue, malaise, miscarriages, immune system effects with more frequent colds/flu and fertility problems.¹¹

This is just a fraction of what is currently available regarding concerns in professional circles and calls for reform and caution. The European Union’s Environment Committee has called for caution, as has the European Parliament.¹² Germany, France, Italy, Switzerland, Sweden, Austria, the UK, Spain, Israel, India, Japan, Australia, New Zealand, and other countries have in varying degrees also called for precaution when it comes to RF exposures. Many professional groups throughout Europe have called for more stringent controls.¹³ The US lags far behind in research, regulatory update, and recommendations to protect the public. Industry is given way too much benefit of the doubt at the expense of public health.

Of special concern are people with implanted medical devices like deep-brain stimulators for Parkinson’s, pain pumps, ventilators, some pacemakers, insulin pumps, and in-home hospital equipment. The radiofrequency interference (RFI) inherent to smart grid/metering can cause such

¹⁰ “Electromagnetic and Radiofrequency Fields Effect on Human Health,” American Academy of Environmental Medicine, submitted by Amy L. Dean, DO, William J. Rea, MD, Cyril W. Smith, PhD, Alvis L. Barrier, MD

¹¹ Ibid.

¹² EUROPEAN PARLIAMENT EMF RESOLUTION, APRIL 2, 2009

<http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2009-0216+0+DOC+XML+V0//EN>

¹³ There are many resolutions and reports issued by professional organizations throughout Europe. One example is The Frieberger Appeal, 10/9/2002 [Interdisciplinary Association for Environmental Medicine](http://www.frieger.de) Tel. 07761 913490, FAX 913491, e-mail: igumed@gmx.de

equipment to go haywire, or even stop altogether. RFI from ambient exposures has caused wheelchairs to behave erratically and surgical beds have jump.

What's clear from the above information is that there is legitimate reason for concern from renowned researchers and organizations from all over the world. The DEEP Draft mentions none of this. Connecticut should not commence in the direction of smart grid/metering in light of this. To do so not only endangers the public health, it also puts the state in line for litigation. Vermont has ordered its Department of Health to review the science literature before smart meters can be installed and the Superior Court in Maine has ruled that the public utilities there must investigate health issues before their buildout can continue.

European Systems: Powerline Carrier Technology (PLC), 'Dirty Electricity,'

Of interest is the fact that most of the 'smart' systems throughout Europe are built on Powerline Carrier Technology (PLC) which does not have the same wireless component that US and Canadian systems have.¹⁴ PLC modulates a signal on existing powerlines to record energy use. Some systems are 2-way not unlike broadband-over-powerline systems (BPL) in the US which puts significant RF on powerlines used for internet communications. Unfortunately BPL is also an unsafe system, with people measuring RF coming right through their light and electrical sockets. While there are simple PLC systems that are not 2-way – a few such systems exist in rural Vermont – anything that modulates in a 2-way capacity puts significant harmonics on the lines that can affect people badly and are not recommended as a substitute for smart grid/metering as currently designed. The safest systems are fiberoptic.¹⁵

¹⁴ Many smart meter networks in Europe are based on PLC. There is a white paper on this technology by one of the leading smart meter companies (Landis+Gyr): http://www.landisgyr.eu/files/pdf1/LG_White_Paper_PLC.pdf

¹⁵ Katarina Gustavs www.buildingbiology.ca wrote in an email: "These PLC systems are certainly two-way and have all the monitoring and executing capabilities as an RF mesh network. In the US, Boulder, Colorado, (4.5 and 21 MHz http://www.bouldercolorado.gov/files/City%20Council/Study%20Sessions/2008/10-28-08/xcel-6-health-safety_of_bpl.pdf) runs such a system. In Canada, Fortis Alberta started with PLC (900-108 Hz <https://camrosecounty.civicweb.net/Documents/DocumentDisplay.aspx?ID=1338>) and now adds an RF mesh network. In Europe, these systems gather data by the second. Though PLC does not emit microwave radiation, it does emit electromagnetic fields in the frequency range a given PLC network is operating at, anywhere from a few hundred hertz to a few ten megahertz. This radiation is emitted from ALL wiring in the house, not just the electric meter. At the EI Wellspring Web site provided by Libby Kelly www.eiwellspring.org: http://www.eiwellspring.org/plc/PLC_antenna_effect.htm., one can find lots of information on the emission and interference issues associated with PLC or BPL. A report from Sweden <http://www.eiwellspring.org/tech/FilteringNewSmartMeters.pdf> explains the challenges when someone tries to filter out the respective frequencies. In some locations in Germany, you can simply call your utility provider and ask for a filter to be put in at the meter... [This should be standard procedure.] Fiber-optic networks have the least amount of emissions. However, the "last mile" of such systems (the last connection to the consumer) is often wireless like in Chattanooga <https://www.epb.net/power/home/products/smart-meters>. Be aware that these low MHz signals (1-30 MHz) are not only used by utility providers but also by some phone and Internet provider companies. In British Columbia, for example, the traditional phone company Telus, which owns the copper wiring, offers high-speed Internet in the MHz range across its phone wiring. The traditional cable TV company Shaw, which owns the coaxial cable, offers digital phone in the MHz range also across the phone wiring in a house. These services are best avoided if the wiring is not all shielded."

High frequency harmonics on powerlines is colloquially called ‘dirty electricity’ by the industry. Research by Magda Havas, Ph.D.,¹⁶ of Trent University in Canada, and U.S. epidemiologist Samuel Milham, M.D.,¹⁷ former director of the Department of Health, Washington, links dirty electricity with diabetes, malignant melanoma, and cancers of the breast, thyroid, uterus and lung. BPL is 100% dirty electricity – that’s how it functions. And PLC has the same ambient exposure potential.

Privacy and Liability: Smart Meters as Surveillance Systems

Privacy is of enormous concern with smart grid/metering and constitutional issues are on the table. This alone is reason to halt the deployment until such time as questions are settled. Smart grid/metering provides for the first time near-real-time energy use, including specific information on when people are home, how many people live in a home, what appliances one owns, how appliances are used, whether one owns a security system or high-end consumer products like plasma TVs and whether they use certain types of medical equipment, for instance. Critics say there is far too much “granularity” in smart metering that opens us up to everything from insurance companies changing personal homeowner’s and medical policies, unconstitutional police searches and seizures, and home invasions/burglaries.

The simple truth is that a lot can be known about a person through their energy consumption habits. Smart meters offer significantly more detailed information about an individual’s energy usage than analog or first generation AMR meters. In addition, there are no controls in place to guarantee what a utility does with such personal information regarding sale to third parties seeking, for instance, to sell you new appliances; police seeking information; or the government tracking of individuals. The legal ramifications are legion.

Smart meters are fundamentally surveillance systems. Even former CIA Director David Petraus, in an article in Wired magazine¹⁸ entitled *CIA Chief: We’ll Spy on You Through Your Dishwasher*, mused about the emergence of an “Internet of Things” saying “Transformational’ is an overused word, but I do believe it properly applies to these technologies... particularly to their effect on clandestine tradecraft.”

According to a 2012 Congressional Research Service report,¹⁹ there are potential violations of the Fourth Amendment as well as violations of several federal statutes including: The Electronic Communications Privacy Act (ECPA), The Stored Communications Act (SCA), The Computer Fraud and Abuse Act (CFAA), the Federal Trade Commission Act (FTC Act), and the Federal Privacy Act of 1974 (FPA) among other problems.

¹⁶ *Electromagnetic Hypersensitivity: Biological Effects of Dirty Electricity with Emphasis on Diabetes and Multiple Sclerosis*, Magda Havas, *Electromagnetic Biology and Medicine*, 25: 259–268, 2006

¹⁷ *Dirty Electricity, Electrification and the Diseases of Civilization*, Sam Milham, MD, MPH, iUniverse, 2010

¹⁸ *CIA Chief: We’ll Spy on You Through Your Dishwasher*, Spencer Ackerman, WIRED, Danger Room, What’s Next in National Security, March 15, 2012.

¹⁹ *Smart Meter Data: Privacy and Cybersecurity*, Brandon J. Murrill, Edward C. Liu, and Richard M. Thompson II, Congressional Research Service, 7-5700, www.crs.gov R422338.

The authors say:

“Installation of smart meters and communications technologies that accompany them may have unforeseen legal consequences for those who generate, seek, or use the data recorded by the meters. These consequences may arise under existing federal laws or constitutional provisions governing privacy of electronic communications, data retention, computer misuse, foreign surveillance and consumer protection.”

They add that consumer data moving through a smart grid is stored in many locations both within the grid and in the physical world. “Thus, because it is widely dispersed, it becomes more vulnerable to interception by unauthorized parties and to accidental breach,” they note.

With smart meters, police will have access to data that might be used to track residents’ daily lives and routines while in their homes, including their eating, sleeping, and showering habits, what appliances they use and when, and whether they prefer the television to the treadmill, among a host of other details.²⁰ Insurance companies will be able to tell the couch potatoes from more active customers or if someone regularly comes home after the bars close.

This is all in violation of the Fourth Amendment in the US Constitution for a reasonable expectation of privacy. Smart metering is rife for legal challenge. Indeed suits are already in the courts.²¹

Then there is the issue of whether we actually want utilities controlling how and when our appliances work. Wireless technology is notoriously “buggy.” The possibility of errant RF signals from other sources turning off a furnace in the dead of winter when no one is home, or turning on an oven, or blasting an air conditioner with an infirm person at home incapable of turning it off are not out of the realm of possibilities. The issue of liability looms over who would be responsible if someone’s house burns down or when pipes freeze. Suits are in the courts for those issues, too.

CyberSecurity:

The smart grid/metering creates security vulnerabilities that never existed with the old hardened utility grid in large part due to new IT connectivity. The problems are inherent to its very wireless design in a way that better encryption alone cannot fix. The smart grid as currently designed cannot be made safe from cyberattack, according to many experts, and it is more vulnerable to solar storms than the older utility grid. We are, in fact, making the national utility grid less stable in going ‘smart’ due to multiple factors.

²⁰ Jack I. Lerner and Deirdre K. Mulligan, *Taking the “Long View” on the Fourth Amendment: Stored Records and the Sanctity of the Home*, 2008 Stan. L Rev. 3, (2008).

²¹ For a list of current smart grid/metering lawsuits with links to court documents, see the EMF Safety Network website at <http://www.smartmeterlawsuits.blogspot.com/>

According to a 2012 US Government Accountability Office report,²² the GAO found the smart grid's reliance on IT systems and networks exposes the electric grid to potential and known cybersecurity vulnerabilities, which could be exploited by attackers. Among other things, they found:

- A lack of coordinated approach to monitor industry compliance with voluntary standards. The Federal Energy Regulatory Commission (FERC) has not coordinated with utilities to determine if the voluntary approach is even effective.
- There is a lack of security features built into smart grid devices. A panel of experts convened by the GAO found that smart meters had not been designed with a strong security architecture and lacked important security features. Without securely designed systems, utilities are at risk for attacks occurring undetected.
- There is a lack of effective information-sharing within the electric utility industry without which utilities cannot protect their infrastructure assets from attack.
- There is a lack of metrics for even evaluating cybersecurity within the industry. Until such metrics are developed, utilities may not invest in security in a cost-effective manner or make informed decisions about cybersecurity investments.

The report notes that the smart grid is vulnerable to a variety of attacks. They say:

“Threats to systems supporting critical infrastructure—which includes the electricity industry and its transmission and distribution systems—are evolving and growing. In February 2011, the Director of National Intelligence testified that, in the past year, there had been a dramatic increase in malicious cyber activity targeting U.S. computers and networks, including a more than tripling of the volume of malicious software since 2009. Different types of cyber threats from numerous sources may adversely affect computers, software, networks, organizations, entire industries, or the Internet. Cyber threats can be unintentional or intentional. Unintentional threats can be caused by software upgrades or maintenance procedures that inadvertently disrupt systems. Intentional threats include both targeted and untargeted attacks from a variety of sources, including criminal groups, hackers, disgruntled employees, foreign nations engaged in espionage and information warfare, and terrorists. Moreover, these groups have a wide array of cyber exploits at their disposal. Table 1 provides descriptions of common types of cyber exploits.”²³

Any and all of the below can adversely affect the smart grid, and can be introduced through a single smart meter.

²² *Cybersecurity – Challenges in Securing the Modernized Electricity Grid*, Testimony before the Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives, Statement by Gregory C. Wilshusen, Director, Information Security Issues, and David C. Trimble, Director, Natural Resources and Environment, GAO-12-507T, February 28, 2012.

²³ *Ibid*, p.8-9.

Table 1: Common Cyber Exploits Type of exploit

	Description
Cross-site scripting	An attack that uses third-party web resources to run script within the victim's web browser or scriptable application. This occurs when a browser visits a malicious website or clicks a malicious link. The most dangerous consequences occur when this method is used to exploit additional vulnerabilities that may permit an attacker to steal cookies (data exchanged between a web server and a browser), log key strokes, capture screen shots, discover and collect network information, and remotely access and control the victim's machine.
Denial-of-service	An attack that prevents or impairs the authorized use of networks, systems, or applications by exhausting resources.
Distributed denial-of-service	A variant of the denial-of-service attack that uses numerous hosts to perform the attack.
Logic bomb	A piece of programming code intentionally inserted into a software system that will cause a malicious function to occur when one or more specified conditions are met.
Phishing	A digital form of social engineering that uses authentic-looking, but fake, e-mails to request information from users to direct them to a fake website that requests information.
Passive wiretapping	The monitoring or recording of data, such as passwords transmitted in clear text, while they are being transmitted over a communications link. This is done without altering or affecting the data.
SQL injection	An attack that involves the alteration of a database search in a web-based application, which can be used to obtain unauthorized access to sensitive information in a database.
Trojan horse	A computer program that appears to have a useful function but also has a hidden and potentially malicious function that evades security mechanisms by, for example, masquerading as a useful program that a user would likely execute.
Virus	A computer program that can copy itself and infect a computer without the permission or knowledge of the user. A virus might corrupt or delete data on a computer, use e-mail programs to spread itself to other computers, or even erase everything on a hard disk. Unlike a computer worm, a virus requires human involvement (usually unwitting) to propagate.
War driving	The method of driving through cities and neighborhoods with a wireless-equipped computer—sometimes with a powerful antenna—searching for unsecured wireless networks.
Worm	A self-replicating, self-propagating, self-contained program that uses network mechanisms to spread itself. Unlike computer viruses, worms do not require human

Zero-day exploit

involvement to propagate.

An exploit that takes advantage of a security vulnerability previously unknown to the general public. In many cases, the exploit code is written by the same person who discovered the vulnerability. By writing an exploit for the previously unknown vulnerability, the attacker creates a potent threat since the compressed time frame between public discoveries of both makes it difficult to defend against.

The report adds : “While presenting significant potential benefits, the smart grid vision and its increased reliance on IT systems and networks also expose the electric grid to potential and known cybersecurity vulnerabilities, which could be exploited by a wide array of cyber threats. This creates an increased risk to the smooth and reliable operation of the grid. As we and others have reported these vulnerabilities include:

- an increased number of entry points and paths that can be exploited by potential adversaries and other unauthorized users;
- the introduction of new, unknown vulnerabilities due to an increased use of new system and network technologies;
- wider access to systems and networks due to increased connectivity; and
- an increased amount of customer information being collected and transmitted, providing incentives for adversaries to attack these systems and potentially putting private information at risk of unauthorized disclosure and use.

The report continues: “We and others have also reported that smart grid and related systems have known cyber vulnerabilities. For example, cybersecurity experts have demonstrated that certain smart meters can be successfully attacked, possibly resulting in disruption to the electricity grid. In addition, we have reported that control systems used in industrial settings such as electricity generation have vulnerabilities that could result in serious damages and disruption if exploited. Further, in 2009, the Department of Homeland Security, in cooperation with DOE, ran a test that demonstrated that a vulnerability commonly referred to as “Aurora” had the potential to allow unauthorized users to remotely control, misuse, and cause damage to a small commercial electric generator. Moreover, in 2008, the Central Intelligence Agency reported that malicious activities against IT systems and networks have caused disruption of electric power capabilities in multiple regions overseas, including a case that resulted in a multicity power outage.”²⁴

²⁴ For the full report and references to sources cited within, go to <http://www.gao.gov/> *Cybersecurity – Challenges in Securing the Modernized Electricity Grid*, Testimony before the Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives, Statement by Gregory C. Wilshusen, Director, Information Security Issues, and David C. Trimble, Director, Natural Resources and Environment, GAO-12-507T, February 28, 2012.

The GAO, CIA and other government entities aren't the only ones worried. There have been cyber attacks close to home. It has been demonstrated that the smart grid can be penetrated by both wired and wireless networks. In August of 2009, hackers robbed 179,000 Toronto Hydro customers' names, addresses, and billing information from their e-billing accounts. Security consultant Mike Davis of IOActive, Inc.²⁵ in Seattle has shown how easy it is to install computer worms that can take over whole regions of the grid. Such worms can be programmed to alter billing information, gather information on electricity use for sale to third parties, or shut down hundreds of thousands of households.

Ross Anderson and Shailendra Fuloria²⁶ at Cambridge University's Computer Laboratory note that hostile government agencies or terrorist organizations could bring whole countries to their knees by interrupting electrical generation. More so than traditional grids, they stress that smart grids create a new strategic vulnerability as the cyber equivalent of a nuclear attack.

Smart Grids are also easy to sabotage with simple jamming devices, mounted on cars, traveling through neighborhoods.

Is this the direction that DEEP really wants to take the state of Connecticut?

Safety: Fires, Appliances Acting Erratically, No UL Listing, Billing Errors

Smart meters have started thousands of fires due, in part, to poor training of temporary installers, but also to defective meter manufacture. In 2011, California's PG&E said that as many as 23,000 meters could be defective but claimed that had nothing to do with increases in billing. There are also problems in the inherent engineering/safety issues when the differing voltages between the extremely low frequency 60 Hz powerline system marries to the ultra high frequency RF used in smart metering.

There are reports of appliances acting erratically after smart meters are installed. Ceiling fans with remote controls have started spontaneously at all hours of day and night with fan paddles running backwards, changing speeds. Circuit boards in computers and appliances have burned out. Garage doors with remote control devices have spontaneously opened, among many other things. This indicates broad RFI from smart metering with other systems.

In addition, smart meters are not UL listed for safety. There are now hundreds of reports in several countries of smart meters exploding or catching on fire. In New Zealand, firefighters reported 422 fires in 2010 involved with smart meters. There are numerous reports of fires in

²⁵ [ioactive's mike davis to unveil smart grid research at black hat usa](http://www.ioactive.com/news-events/DavisSmartGridBlackHatPR.html) , Jul 28, 2009
<http://www.ioactive.com/news-events/DavisSmartGridBlackHatPR.html>

²⁶ *Who controls the off switch?* Ross Anderson and Shailendra Fuloria, 2011.

California, Florida, Pennsylvania, Illinois, and across Canada.²⁷ One California suit has been filed for wrongful death due to a smart meter fire.²⁸

There are billing errors galore after smart meters have been installed and a class action suit in California because of rampant problems there. People have seen bills go from \$200 to \$600 in one billing cycle with no increased energy use on their part. Complaints of the same are rampant across Canada, too, in some cases with bills jumping above \$800.00 for no apparent reason.

The Smart Grid Does Not Save Energy: ‘Vampire’ Loss, Meter Disposal Fees, Data Storage, and Tiered Pricing

Despite the promise of the smart grid saving energy via consumer choice and the ability to ration individual energy use to less costly times of day, there is no evidence that this promise has delivered anything substantial toward saving energy.

Connecticut is one of the few states to try a pilot program to see if smart metering works before a full buildout was commenced. In 2011, the State’s Attorney General George Jepsen said in a press release²⁹ that a pilot program of 10,000 such meters found no energy savings in 2009, but would cost ratepayers \$500 million. He said that Connecticut Light & Power Company’s plan to replace existing electric meters with advanced technology would be very expensive and would not save enough electricity for its 1.2 million customers to justify the expense. At the time, CL&P was also asking regulators to guarantee that the company would be allowed to recover its full cost of installation before the department actually evaluated what the costs were or if they were reasonable.

To evaluate the technical capabilities and reliability of the advanced metering system, state regulators previously approved a limited study of 10,000 meters. Between June 1 and Aug. 31, 2009, CL&P tested the meters on 1,251 residential and 1,186 small commercial and industrial customers, who volunteered and were paid for their participation in the study. The company reported its results to the DPUC on Feb. 25, 2010. But according to Jepsen, “The pilot results showed no beneficial impact on total energy usage.... And the savings that were seen in the pilot were limited to certain types of customers and would be far outweighed by the cost of installing the new meter systems.” He noted that CL&P’s proposal would force the company’s ratepayers to spend at least \$500 million on new meters that are likely to provide few benefits in return, and urged regulators to continue to evaluate emerging meter system technologies as well as other conservation programs and only approve installation of the advanced meters when they

²⁷ *Smart Meter Causes Dumb Fire*, Kim Zetter, Wired, 09.12.12

²⁸ See <http://www.smartmeterlawsuits.blogspot.com/> for details.

²⁹ Press Release: *Jepsen Urges State Regulators to Reject CL&P’s Plan to Replace Electric Meters*, Tuesday, February 8, 2011

are cost effective. Nothing has changed in that assessment, despite DEEP's DRAFT embrace of smart metering and tiered pricing.

Connecticut installed the first generation AMR meters between 1994 and 2005 which have a useful life of 20 years. Jepsen unfortunately did not come out fully against smart meters but rather implied that they should only be used as the AMR meters become obsolete.

No one has shown significant energy savings with either near-real-time energy use knowledge on the part of consumers or tiered pricing. Many people and businesses simply cannot change when or how they use energy. Tiered pricing automatically penalizes the elderly, the self-employed, the infirm, the unemployed, stay-at-home parents with young children and anyone else who functions on a normal daylight schedule. People can choose to do their laundry later at night but meals and bathing carry fewer options.

A simple educational insert in utility bills explaining the problem of peak demand as well as showing which appliances typically use more energy and asking for voluntary help might have better results than the utility company controlling our appliances remotely. There was skepticism 30 years ago about whether people would voluntarily recycle plastics, metal and glass. Today towns are proud of their voluntary recycling numbers and reduced wastestream .

Nowhere in the makeover of the world's utility grids have key increases in energy consumption that are inherent to smart technology been discussed. Environmentalists in particular have embraced smart technology without enough scrutiny. The actuaries do not factor in vampire energy use, for instance, when all of our appliances and meters are equipped with embedded transmitters using higher frequencies that require more energy. Plus such appliances are always in "on" mode even when not in use, or they wouldn't be able to receive a remote signal to turn fully on or off. For years, environmentalists have advised anyone with an appliance that has a remote control capability such as a TV, to unplug the device completely because they are never completely off. It's called "vampire" energy and the smart grid proposes to increase that invisible energy consumption by orders of magnitude with trillions of new appliances and meters.

Nor has anyone factored in the extra energy required in the constant stepping up and down of voltage between the higher frequency RF components and the lower frequency utility lines – a process that uses far more energy than just leaving the old systems alone.

Also not factored into the larger picture is the energy required to store such vast amounts of data. New data storage facilities are among the biggest energy users today. The smart grid will greatly increase that need. Nor has the energy required to manufacture millions of new meters, power the vans to replace the old ones, and dispose of the old meters been factored in.

The smart grid is neither a short nor a long-term energy-saver when all aspects are considered, and it is far from an energy-saving panacea despite people's best intentions and environmental aspirations. The smart grid originated in the largest corporations in the world – IBM, GE, Siemens, and others. It is fundamentally a Wall Street model meant to shore up investor profits, especially as we transition to renewable sources when energy generation and

consumption are expected to decrease for various reasons. One great irony in the green scenario is that some smart meters as currently designed do not run backward thereby disallowing people with home solar panels or small wind turbines to sell electricity back to the grid. The smart grid takes us in the exact opposite direction of distributed sources collecting energy from myriad points.

There is another dark horse regarding smart metering. The main purpose of a system that allows a utility to remotely turn electricity on and off is to shift customers not only to tiered pricing but also to prepaid plans. Anderson and Fuloria³⁰ have written that the main purpose of smart metering is to ensure that customers who default on their payments can be switched remotely to a prepay tariff system where they purchase a card for so many hours of electricity in advance. Such a system has been in operation in South Africa for several years. Such a system increases shareholders' bottom line because there are virtually no unpaid bills or wait times before turning people's power off. But there are also no safeguards in place to protect people from mistaken shutoffs or recourse during winter months.

National and International Backlash:

There is enormous backlash – and successful lawsuits -- against smart grid/metering at all levels and for very good reasons.³¹ Connecticut has not yet seen this backlash because there has been no large-scale smart meter buildout. But considerable resistance is likely if DEEP's Draft recommendations come to fruition. There are already a handful of residents in Litchfield County with signs posted on their meters saying not to replace their AMR meters with AMI smart meters.

At the EMF Safety Network in California, a state where smart meters were first installed, they list opposition websites and law suites at: http://emfsafetynetwork.org/?page_id=6914 Many of the websites are quite sophisticated in their understanding of complex science and electrical engineering They include:

United States:

Arizona:

[Ban Smart Meters Arizona.com](http://BanSmartMetersArizona.com)

[Electromagnetic Safety Alliance](http://ElectromagneticSafetyAlliance.org)

California:

[Burbank Action](http://BurbankAction.org)

[Center for Electrosmog Prevention \(CEP\)](http://CenterforElectrosmogPrevention.org)

[Eon3 EMF Blog](http://Eon3EMFBlog.com)

[EMF Analysis SF](http://EMFAnalysisSF.org)

³⁰ *Who controls the off switch?* Ross Anderson and Shailendra Fuloria, Computer Laboratory, Cambridge University, England, (Ross.Anderson@cl.cam.ac.uk) and (Shailendra.Fuloria@cl.cam.ac.uk).

³¹ For a list of US websites regarding local opposition to smart grid/meters and other information, see http://emfsafetynetwork.org/?page_id=6914

[EMF Safety Network](#)
[No Smart Meters SF](#)
[OJAI Smart Meter Opt-Out](#)
[Refuse Smart Meter](#)
[Refuse Smart Meters Mendocino](#)
[Smart Meter Action Group](#)
[Smart Meter Dangers San Diego](#)
[Smart Meter Health Alert](#)
[Southern Californians Against Smart Meters \(SCASM\)](#)
[Stop OC Smart Meters \(Orange County\)](#)
[Stop Smart Meters](#)
[Stop Smart Meters Irvine](#)
[TURN Smart Meters N. CA](#)
[UCAN Smart Meters S. CA](#)
[WirelessMess.org](#)

Colorado:

[Colorado Citizens Smart Meter Awareness \(CCSMA\)](#)

Florida:

[Coalition for Health Against Smart Meters](#)

[Smart Meter Matrix](#)

[Florida Against Smart Meters](#)

Georgia:

[StopsmartmetersGeorgia](#)

Hawaii:

<http://www.kauaitruth.com>

[Stop Smart Meters Hawaii](#)

Illinois:

[Naperville Smart Meter Awareness](#)

Iowa:

[Fairfield Safe Meters](#)

Maine:

[Smart Meter Safety](#)

Maryland:

[Maryland Smart Meter Awareness](#)

Massachusetts:

[Halt MA Smart Meters](#)

[Stop Smart Meters Massachusetts](#)

Michigan:

[Smart Meters- Stop the Invasion!](#)

[Michigan Stop Smart Meters](#)

[Stop Smart Meters in Grand Rapids](#)

Nevada:

[NVE Stop Smart Meters](#)

[True EMF Solutions](#)

New Mexico:

[Why Fry? Smart Meters](#)

Tennessee:

[Stop Smart Meters Now.com](#)

Texas:

[Ban Texas Smart Meters](#)

[Texans United Against Smart Meters](#)

Vermont:

[Smart Meters Blogspot](#)

[Stop Smeters](#)

[Wake up Opt-Out!](#)

Virginia:

[Center for Safer Wireless](#)

Wisconsin:

[Electrical Pollution Solutions](#)

[First Do No Harm](#)

[Stop Smart Meters Wisconsin](#)

US:

[American Coalition Against Smart Meters](#)

International:

Australia:

[Stop Smart Meters Australia](#)

[Stop Smart Meters NOW](#)

CANADA

[Citizens for Safe Technology](#)

[Coalition québécoise de lutte contre la pollution électromagnétique \(Quebec\)](#)

[Coalition to Stop Smart Meters \(British Columbia\)](#)

[EMR Health Alliance of BC](#)

[Gulf Islanders for Safe Technology](#)

EUROPE:

[Europeans on Smart meters](#)

[Stop Smart Meters UK](#)

Japan:

[VOC-EMF Measures Research Association](#)

En Espanol

<http://www.concienciaradio.com/nosmartmeters/> Spanish site (under construction)

Law Suits:

A list of law suits with links to the court filings/decisions can also be found at the EMF Safety Network website at <http://www.smartmeterlawsuits.blogspot.com/> that includes cases in:

- California: California Edison ordered to pay for health damages or remove smart meters. There is a class action suit regarding misrepresentation of radiation levels from smart meters, and for violations of the Americans with Disabilities Act. There are cases for wrongful deaths when fires resulted from improperly installed smart meters, and several cases for overcharging.
- Maine: The Superior Court ruled that utilities did not adequately address health and safety issues and must do so before the smart meter buildout continues. A court in Portland also ruled that the utilities did not address safety, constitutional privacy, or health issues and must do so.
- Kauai, Hawaii: On privacy, constitutional violations, and security risks, utilities settled and agreed not to install smart meters on a plaintiff's house. In a separate suit involving discrimination in Kauai, Hawaii, a plaintiff successfully sued, saying he should not have to pay opt-out fees in refusing a smart meter.
- Napperville, Illinois: filed for injunction on several grounds in federal court to stop smart meter buildout.
- There are several other suits in courts in Canada, throughout Europe, and Australia.

Conclusion on Smart Grid/Metering:

No sane person could argue that our aging utility infrastructure does not need upgrading, or that government has no role to play, but smart grid/metering as currently designed isn't the way. On close examination, the smart grid is not smart, not safe, and not green.

The problems with smart grid/metering are so legion and potentially catastrophic that it boggles the mind that DEEP would be pushing this as a centerpiece in their Electricity Sector.

Either Deep in writing the Draft has fallen for the early superficial hype surrounding smart grid/metering and is unaware of the enormous body of work that has resulted since its early inception, not to mention the informed national customer backlash, or DEEP is simply waiving these significant issues aside in pursuit of a pre-determined ideology.

Simple compromises such as opt-out agreements, with or without extra fees to customers, or, as in the case of Connecticut with its current opt-in agreement, does not address the broader issues of privacy, security, and health. In a mesh network, one is exposed not only to one's own smart meter, but also to those of one's neighbors. An individual can opt-out but that only marginally alters that person's RF exposure. High frequency harmonics are traveling on the lines into that home, and neighboring meters' RF is creating an ambient environmental exposure.

As a country, we have walked blindly into this without understanding the full ramifications of how the smart grid functions. And we have done this with no real general informed consent. The simple fact is that smart grid technology is vastly more complex than our ability to ever fully control it.

BLEC hopes that DEEP abandons its blithe recommendation that Connecticut go "smart." And we encourage Governor Malloy to appoint an independent panel separate from DEEP and at arms-lengths from it, to look at all of the problems associated with smart grid/metering. We also hope that Attorney General George Jepsen continues to have a clear eye on all aspects of this issue, which is one that affects every citizen right where we live – in our homes.

BLEC Comments on the Draft's Wind Generation:

BLEC held the state's first large forum on industrial scale wind generation in 2012. We brought in experts from several government agencies and a research scientist from Canada. Some critical questions addressed at the forum included:

- What is the real risk/benefit ratio of wind turbines? Does that ratio change from region to region? What determines those variables?
- Are there potential, permanent adverse effects to other species such as birds and bats that are being ignored?
- Are there adverse effects from low frequency sound, vibration, and light flicker to humans and other species, especially in wetland habitats? What about increased ground current effects near turbines to reptiles and amphibians? Are sensitive habitats such as vernal pools especially vulnerable?
- Are environmental concerns primarily one of scale? And are there some windmill designs that are better than others?
- Are there inherent environmental problems when converting a direct current resource such as wind to an alternating current infrastructure? Are there ways avoid the phenomenon called "dirty electricity," which creates high frequency

harmonics on common utility lines and is considered a new metric for adverse health effects in humans?

- What are reasonable ways to mitigate, legislate, and anticipate such problems before damage is done?
- What is happening at the federal, state, and local levels?

BLEC's Position:

Industrial wind turbines are more complex than anyone imagines at first glance. This is an issue suddenly facing many communities as wind companies seek to place facilities on pristine ridgelines and in wide valley corridors, ignoring the fact that sometimes our windy areas are also our most cherished.

Everyone is for renewable energy sources such as wind, solar, geothermal, and tidal resources. In fact, people have embraced small and medium-scale applications with an admirable fervor. Many applaud the federal government for stepping up with stimulus dollars, as well as state governments with tax breaks, to help get promising approaches to clean energy off the ground. DEEP's Draft follows in that line.

But in our enthusiasm for 'green' technologies, have we neglected potential downsides with industrial-scale facilities, especially when proposed for residential neighborhoods, sensitive environmental areas or scenic ridgelines? Have we factored that many interior regions of New England may not lend themselves to anything other than small-scale approaches due to weather, topography, and population density? Or that the financial payback for large-scale facilities may never be justified in some areas in either the short or the long term? Or the fact that this nascent field is attracting speculators with no intention or ability to build such large systems but are rather developing sites to flip for profit after approvals are garnered? Is our automatic goodwill toward renewables being taken advantage of and how much caution should we bring to the table without being blindly obstructionist?

While BLEC lauds the Draft's green intentions, some suggestions should not be adopted as proposed without changes. Below are suggestions:

General Impression: The overall intent of the Draft seems to be to facilitate the wind industry with nothing too onerous and with maximum siting discretion having been recently awarded to the Connecticut Siting Council (CSC). Unfortunately, this approach may well prove extremely onerous to wildlife and host municipalities, especially residential/scenic areas where 500+ foot turbines are wholly inappropriate, as is the case in tiny Colebrook where six turbines have been approved. Connecticut has a unique opportunity to set the bar higher and better; to actually create a best-practices environmental wind model for the rest of the country. BLEC encourages the DEEP to think more outside-the-box. Toward that end, please consider:

- **Incorporating Specific References to US Fish & Wildlife Wind Guidelines and Conservation Documents** by specifically referencing and requiring that the USFWS recommendations for wind energy development through the Service's "2012 Wind Energy

Guidelines” be strictly followed.³² USFWS strongly recommends that states follow the “Eagle Conservation Plan Guidance (ECPG), Version 1, Wind Module,” also available on the USFWS’s website. This ECPG guidance provides details of how to assess site development risk to Bald Eagles and Golden Eagles in Connecticut and elsewhere, and to avoid “take resulting in disturbance” and “take resulting in mortality” to both species. The ECPG, Version 1, provides details of how to acquire an individual “take” permit for Bald Eagles (50 CFR 22.26) as well as programmatic “take” for this species, provided the breeding population is stable or increasing. USFWS will not be issuing any permits for “take” of Golden Eagles -- either “disturbance” or “take resulting in mortality”-- individually or programmatically for this species in Connecticut, or anywhere east of Minnesota. While those two documents are voluntary, and the ECPG will provide a protocol for permitting “take” of Bald Eagles in Connecticut through 50 CFR 22.26 and 22.27 (nest take), other established statutes prevail. The “disturbance,” killing, and injuring of bald and golden eagles, and the injuring or killing of any of the other 1,007 species of protected migratory birds, are each criminally culpable and each potentially criminal violations of The Bald and Golden Eagle Protection Act, as well as The Migratory Bird Treaty Act. Both are strict liability laws. Without specifying this in the DEEP Draft, the wind developer, their consultants, and the state could be in violation of federal laws protecting the environment. Litchfield County is documented home to many of the species on the federal list, including both species of eagles.

- **Request New Wind Facility Designs:** BLEC requests that the DEEP require safer, lower turbine designs such as vertical-axis wind turbines (VAWT’s)³³ – especially for interior land sites. (Quinnipiac University has several on campus.) Such designs can be positioned much closer together than bladed models; can be far shorter; can better capture wind in narrow valleys and thereby spare scenic ridgelines; can completely protect wildlife unlike large-scale bladed facilities; create no infrasound, ice/blade throw or flicker. In addition, VAWT’s do not create “barotraumas” to myriad species, especially bats. Barotraumas are the result of blade wake, turbulence and pressure gradients that can force birds and bats into the blades, sometimes from a great distance away from the facility. In fact, VAWT’s bypass most of the problems that the CSC is trying to regulate. Requiring such designs and outlawing the bladed models could apply to both the customer-side distributed resources, as well as the grid-side distributed resources. They have even been shown to capture more wind nearer the ground than taller turbines at significantly higher altitudes. In the least, the DEEP could specify that interior hilly areas such as Litchfield County can only site VAWT’s. But even off-shore areas along the coast may lend themselves better to VAWT’s than bladed models as those are primary seasonal migratory flyways too. Industrial-scale bladed models may eventually be found appropriate only in wide-open windy areas such as the Great Plains. Connecticut has an opportunity to truly go “green” by mandating critical design distinctions. VAWT’s also reduce community opposition.

³² These are posted at www.fws.gov/windenergy/

³³ For a feature and photos of VAWT’s, see

http://www.scienceagogo.com/news/20110613232554data_trunc_sys.shtml

- **The Draft should require industrial, bladed turbine setbacks of at least 1.24 miles.** The setback at the CSC is 1.1 times the height of the wind turbine is nowhere near enough. DEEP should override them. At this small distance, with the wind turbines approved for instance in Colebrook at 492 feet with a blade sweep of close to 2-acres, that would permit a facility to be placed at a mere 500 feet from a property line. Ice throw alone will be greater than that and a serious liability. There are numerous reports of people being made ill from such installations at less than 1.24 miles away and more in hilly/mountainous regions. Areas with far more experience than Connecticut are all moving toward much larger setbacks, especially in Europe. The Cape Cod Planning Commission recommends 3000 feet; a lawsuit in Maine was settled when residents living within 3,500 feet of a wind farm were made ill. Falmouth, MA now requires a wind turbine there to be turned off at night because people at 1,320 feet away were being made ill. Please increase this setback to at least 1.24 miles away from property lines, not dwellings.
- **The Draft should include provisions to reduce shadow flicker, ice throw, infrasound, dirty electricity (technology exists to filter and stop this), and to require additional/better environmental review near protected lands.** There are waivers granted in the CSC review over all key aspects of wind facility siting that are too broad and essentially allow industrial spot zones to be created at will throughout the state. DEEP should override these waivers on a case-by-case basis. Such waivers are contrary to state and local plans of conservation and development. The language of these waivers would allow the CSC to site mammoth wind installations close to lands held by private land trusts, near private recreational areas such as ski resorts, and near state-owned forests and preserves where wildlife abounds. Contained in these waivers is no mention that the CSC should then engage in a more robust environmental analysis near such protected properties. DEEP should conduct wildlife inventory and environmental reviews near such sites.
- **BLEC requests that the DEEP consider placing a time limit on when wind facilities must be built after site approval, after which the approval is automatically rescinded.** This will hopefully discourage speculators from taking financial advantage of upfront federal/state stimulus money, then flipping approved sites for profit without facilities ever being built.

Wood-burning Energy Generation/BioMass:

It is disappointing not to see mention of the potential for wood as a clean fuel for energy generation. The technology has come a long way toward the incorporation of small-scale facilities that run so clean no one knows they are present. The Hotchkiss School in Lakeville, CT had a new wood-burning generator go online in 2012 with much success. All Connecticut towns and arborists have wood waste from tree trimming and stump removal. Wood-burning generators are significantly different from other burn facilities and should not be confused with waste recycling of other materials or the small, polluting domestic outdoor wood ‘furnaces’ that towns have increasingly outlawed for pollution reasons. Properly built facilities like the one at Hotchkiss are in a league of their own. Wood is a mostly free -- and wasted -- source of energy that should be part of our energy mix.

Conclusion on Wind:

Wind is a clear part of renewable energy but siting such facilities must be done with great care. Connecticut has the opportunity to learn from the mistakes of other states. Unlike passive solar collection or tidal energy capture, wind facilities carry significant environmental risks – many of which simply cannot be mitigated in sensitive environments. Wind energy is not a one-size-fits-all. Siting guidelines should be very region-specific and include considerations that go way beyond available wind modeling. While the Draft is a good start, more can be done to reduce the downside of wind facilities while augmenting the upside. The public confidence would be better served by clearer, more stringent siting guidelines, based on the best/highest environmental principles.

Thank you for the opportunity to address the DEEP on behalf of The Berkshire-Litchfield Environmental Council.

Respectfully Submitted,

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