Mr. Electricity

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March 5, 2013

Connecticut Energy & Technology Committee

Subject: Public Hearing 03/05/13

Reference: S.B.948 An Act Concerning Development of Energy Related Technologies.

Comments by: Lee A. Hebert Mr.Electricity Energy Storage Systems L.L.C.

Dear Energy & Technology Committee Members,

I agree with the intentions of S.B. 948 for Connecticut, however I feel you need to recognize where CT continues to be missing the low hanging fruit on Energy Efficiency, that is Energy Storage.

I have included a number of reference links they are summarized as follows.

1) Climate Change Business Journal: The U.S. Energy Storage Market is forecast to exceed $5 Billion.

2) Why do we need Energy Storage? Shown is Energy waste on a typical U.S. power grid. The graph is Northern CA. New England is about the same, Texas and the PJM Interconnect are typically 5 times more.

3) Department of Energy, Sandia National Laboratories. Energy Storage for the Electricity Grid: Benefits and market Potential Assessment Guide.

4) Department of Energy: Energy Storage of low cost surplus off peak energy for use during the peak can reduce the cost of Energy, and increase the reliability of the grid without additional infrastructure, and greatly increase the effectiveness of other sources of renewable energy.

5) The Energy Efficiency and Conservation Block Grant (EECBG) Program, funded for the first time by the American Recovery and Reinvestment Act (Recovery Act) of 2009, represents a Presidential priority to deploy the cheapest, cleanest, and most reliable energy technologies we have. Energy Efficiency and Conservation which can be deployed immediately. The grants also empower local communities to make strategic investments to meet the nation's long-term clean energy and climate goals."

6) U.S. Department of Energy Sandia Labs.
Solar Energy Grid Integration Systems–Energy Storage (SEGIS-ES)

This paper describes the concept for augmenting the SEGIS Program with energy storage (SEGIS-ES) in residential and small commercial applications. Integrating storage Providing increased value to both customers and utilities. The systems can reduce customer utility bills, and provide power outage protection.

7) American Council for an Energy Efficient Economy (ACEEE) 2012 Report. I don't know how CT was deserving of being ranked number 6 without Energy Storage.

From Maryland number 9 on the ACEEE list: "Excess energy is produced during periods of low demand, but it is lost if it can't be stored for use **during** peak demand.

From Hawaii number 18 on the ACEEE list: Renewable ambitions make storage imperative in Hawaii. Energy storage is becoming required to manage growing wind and solar additions in Hawaii.

Battery technology is emerging as the leading option for managing intermittency issues.

8) Germany & Japan: Germany Gets Serious on Energy Storage

On May 1, 2013 access to one of Germany's investment incentive programs will be granted, but only to the bright spark who is able to solve the problem of storage capacity.

9) Japan 7 Germany: Panasonic pointed at Germany as the main market for its energy storage solutions designed for European homes.
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10) Connecticut Department of Energy & Environmental protection (DEEP).

Quoting DEEP Commissioner Esty: "For every dollar spent on Energy Efficiency Connecticut receives back Electric, Gas, Fuel-Oil, and Propane system benefits of $2.40.

"They reduce customer costs, generate jobs, and make the State's businesses more competitive."

11) From Congresswoman Elizabeth Esty Campaign Website:

For the past several years, I have promoted the development of green energy industries in Connecticut. By investing in the clean energy sector we can create good jobs here, in everything from technology to manufacturing to construction, while reducing our dependence on foreign oil.

Closing: Public Act 11-80 mandates the Utilities as a condition of their license's to offer time of use rates.

We do not need a "SMART GRID and SMART METERS to do this.

We only need an attractive rate split and to replace the meters we now have with old fashioned dual clock meters now in storage.

With Energy Storage the Comprehensive Energy Plan will have identified and will meet the true goals of Public Act 11-80 through all available and cost-effective efficiency and demand reduction measures.

Thank You for your Time

Sincerely,

Lee A. Hebert

Mr.Electricity Energy Storage Systems, L.L.C.

A Connecticut Energy Storage Manufacturing Company to reduce the cost of Energy for CT ratepayers and create jobs in our State.

References and Links:

1) Climate Change Business Journal

U.S. Energy Storage Market Forecast to Exceed $5 Billion in 2014

http://www.climatechangebusiness.com/U.S._Energy_Storage_Market_Forecast_to_Exceed

2) Why do we need Energy Storage? The following graph is from the power grid for Northern California 03/04/13, not including the huge loads of Sacramento and a few regional grids.

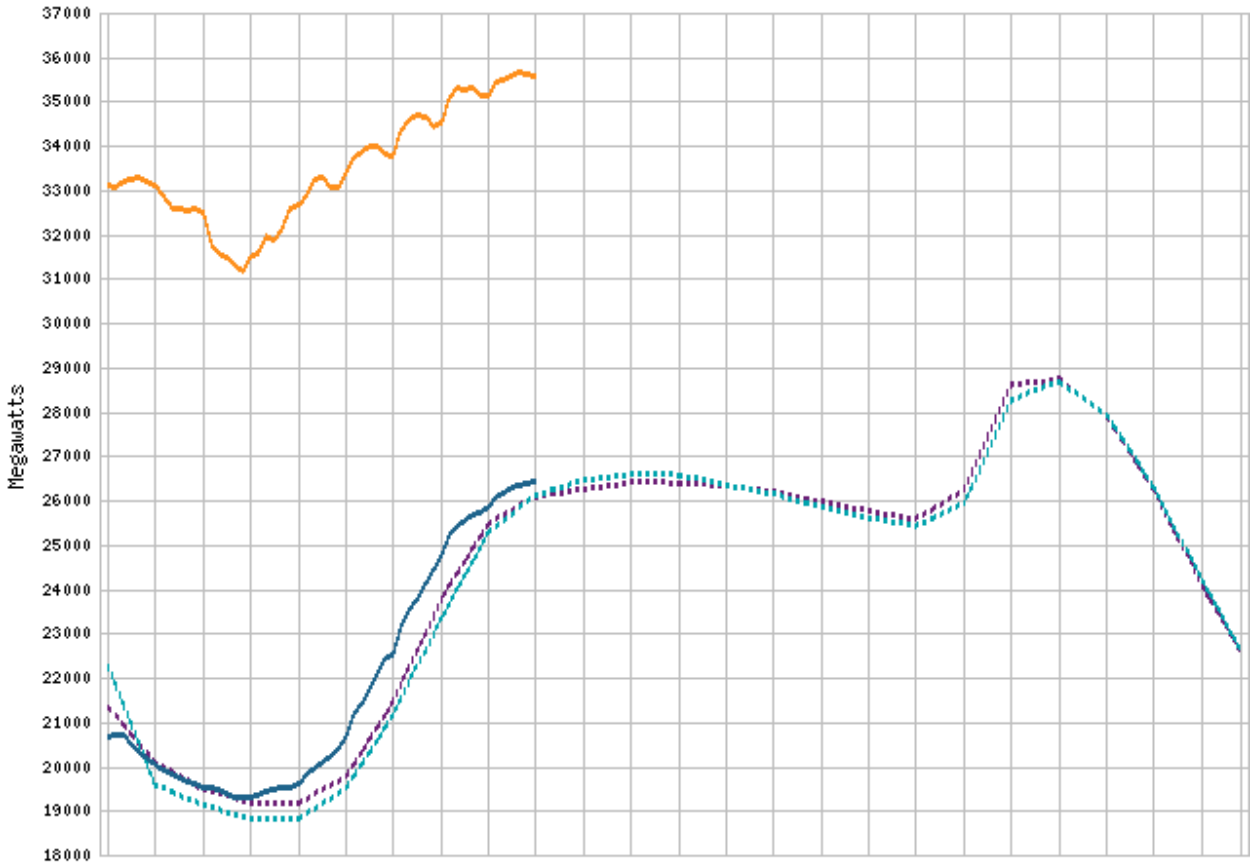
http://www.caiso.com/outlook/SystemStatus.html

This is a 24 hour graph from midnight to midnight. Each square is 1,000 MWh of available "Capacity". This is the equivalent Energy produced from a large Nuclear Reactor such as Millstone or 2 large Fossil Fuel Power Plants such as the Notorious New England Dirty Six.

All of produced and available "Capacity" between the top curve and the lower solid (actual load) is "SURPLUS" Capacity being generated and just going to waste.

The downward slope in the load forecast is from Solar however you will find by revisiting this site yourself from time to time they do not turn down the generators.

The net effect from Solar is it is only increasing the amount of Energy Capacity going to waste. If it was stored along with surplus lower cost off peak energy and known to be a constant Energy source, CA would not need as much traditional generation Capacity.



3) Department of Energy, Sandia National Laboratories. Energy Storage for the Electricity Grid: Benefits and market Potential Assessment Guide. February 2010. SAND2010-0815

http://www.sandia.gov/ess/publications/SAND2012-9422.pdf

Application 1 — Electric Energy Time-shift

Electric energy time-shift means that storage can take advantage of the electricity price difference between on-peak and off-peak hour by purchasing and store energy at times when electricity price is low and selling it back to the grid when the price is higher.

Application 2 — Electric Supply Capacity

Energy storage could be used to defer the cost of installation of new power plant or to “rent” generation capacity in the wholesale electricity marketplace.

Application 3 — Load Following

Energy storage could serve as load following capacity that adjusts its output to balance the generation and the load within a specific region or area.

Following are brief descriptions of the 17 applications listed in the Sandia Report:

Application 4 — Area Regulation

Area regulation is the use of on-line generation or storage which can change output quickly (MW/min) to track minute-to-minute fluctuations in loads and to correct for the unintended fluctuations in generation. It helps to maintain the grid frequency and to comply with Control

Application 5 — Electric Supply Reserve Capacity

Reserve capacity is the generation capacity that can be called upon in the event of a contingency such as the sudden, unexpected loss of a generator. Three types of reserve capacities are: spinning reserve, supplemental reserve, and backup supply.

Application 6 — Voltage Support

The purpose of voltage support is to maintain the grid voltage. Common method is to use resources like energy storage to inject or absorb reactive power (VAR) that offsets reactance in the grid.

Application 7 — Transmission Support

Energy storage could be used to enhance the T&D system performance by providing support during the event of electrical anomalies and disturbances such as voltage sag, unstable voltage, and sub-synchronous resonance.

Application 8 — Transmission Congestion Relief

Transmission congestion happens when shortage of transmission capacity to transmit power

during periods of peak demand. When the transmission systems are becoming congested, congestion charges are usually applied and increased. Energy storage system would be installed to avoid the congestion related charges and cost. Energy could be stored during the off-peak hours, and be released during on-peak hours, when the transmission systems are congested.

Application 9 — Transmission and Distribution Upgrade Deferral

Energy storage could be installed to defer the installation/upgrade of transmission lines and substations. The market is believed to be necessary due to the difficulty in siting transmission lines/substation, and then once sited, the cost of building the transmission lines/substation. Storage can be utilized to defer the need for the additional lines/substation.

Application 10 — Substation On-site Power

Energy storage system could be used as back-up power at utility substation to provide power to switches and substation communication and control equipment when the grid is not energized.

Application 11 — Time-of-use Energy Cost Management

Energy storage could be used by end users (utility customers) to shift or reduce energy consumption at peak hours to reduce their overall cost for electricity. Energy is purchased at off-peak hours when electricity price is low, and then released at the on-peak hours when electricity price is high.

Application 12 — Demand Charge Management

Energy storage could be used by end users (utility customers) to reduce power consumption when demand charge is high to reduce their overall cost for electricity. Energy is purchased when demand charge do not apply or low, and then discharged when the demand charge do apply or high.

Application 13 — Electric Service Reliability

The electric service reliability application focuses on the need for back-up power systems at commercial and industrial facilities. Usually, the facilities use a combination of batteries for ride through of momentary outages and then have a diesel generator for longer duration outages.

Application 14 — Electric Service Power Quality

Power quality problem may cause a mis-operation or failure of sensitive industrial equipment and critical commercial operations. Energy storage could be used to improve power quality at end user side against short-duration events such as harmonics, variation in voltage magnitude and frequency and interruptions in service et.al.

Application 15 — Renewables Energy Time-shift

Renewable resources are unpredictable and don't align with typical peak load patterns. For example, wind production tends to peak during the evening and morning hours when load is at a low and ebbs during daytime hours when load is at a maximum. Having a storage device with durations of four to six hours can provide a tremendous advantage to renewable efficiencies, easing of grid impacts, and renewable production. The device will be able to (a) store and discharge renewable generation from low cost periods to high cost periods, (b) provide transmission relief for wind farms – wind farms infrastructure is typically not sized to maximum output of the farm, storage can capture energy that would be typically dumped in these cases and increase wind farm capacity factor.

Application 16 — Renewables Capacity Firming

The objective of renewable capacity firming is to make the generation output somewhat constant. Storage could be used to store wind and solar power during hours of peak production regardless of demand, and discharge to supplement traditional generation when renewable output reduces during expected generation time.

Application 17 — Wind Generation Grid Integration

As wind generation penetration increases, the electricity grid effects that are unique to wind generation will also increase. Storage could be used to manage or mitigate the less desirable effects from high wind generation penetration. For example, wind farms are beginning to be Faced with specific requirements in order to interconnect their devices to the grid. This

requirement comes from utility interconnections and well as the power purchase requirements,

which can apply penalties to the developers if certain ramping (2%) requirements are not met.

Storage can be applied to smooth wind output and off-set these requirements. American Electric Power. Functional Specification for Community Energy Storage (CES) Unit,

4) U.S. Department of Energy, Energy Storage would be a major breakthrough and reduce the need for more infrastructure.

http://energy.gov/oe/technology-development/energy-storage

One of the distinctive characteristics of the electric power sector is that the amount of electricity that can be generated is relatively fixed over short periods of time, although demand for electricity fluctuates throughout the day. Developing technology to store electrical energy so it can be available to meet demand whenever needed would represent a major breakthrough in electricity distribution. Helping to try and meet this goal, electricity storage devices can manage the amount of power required to supply customers at times when need is greatest, which is during peak load. These devices can also help make renewable energy, whose power output cannot be controlled by grid operators, smooth and dispatchable.

They can also balance microgrids to achieve a good match between generation and load. Storage devices can provide frequency regulation to maintain the balance between the network's load and power generated, and they can achieve a more reliable power supply for high tech industrial facilities. Thus, energy storage and power electronics hold substantial promise for transforming the electric power industry.

5) Energy Efficiency and Conservation Block Grant Program

http://www1.eere.energy.gov/wip/eecbg.html

The Energy Efficiency and Conservation Block Grant (EECBG) Program, funded for the first time by the American Recovery and Reinvestment Act (Recovery Act) of 2009, represents a Presidential priority to deploy the cheapest, cleanest, and most reliable energy technologies we have—energy efficiency and

conservation—across the country. The Program, authorized in Title V, Subtitle E of the Energy Independence and Security Act (EISA) and signed into law on December 19, 2007, is modeled after the Community Development Block Grant program administered by the Department of Housing and Urban Development (HUD). It is intended to assist U.S. cities, counties, states, territories, and Indian tribes to develop, promote, implement, and manage energy efficiency and conservation projects and programs designed to:

- Reduce fossil fuel emissions;
- Reduce the total energy use of the eligible entities;
- Improve energy efficiency in the transportation, building, and other appropriate sectors; and
- Create and retain jobs.

Through formula and competitive grants, the Program empowers local communities to make strategic investments to meet the nation's long-term goals for energy independence and leadership on climate change.

"The Block Grants are a major investment in energy solutions that will strengthen America's economy and create jobs at the local level," said Secretary of Energy Steven Chu. "The funding will be used for the cheapest, cleanest, and most reliable energy technologies we have—energy efficiency and conservation—which can be deployed immediately. The grants also empower local communities to make strategic investments to meet the nation's long-term clean energy and climate goals."

6) U.S. Department of Energy Sandia Labs.

Solar Energy Grid Integration Systems–Energy Storage (SEGIS-ES)

http://prod.sandia.gov/techlib/access-control.cgi/2008/084247.pdf

This paper describes the concept for augmenting the SEGIS Program (an industry-led effort to greatly enhance the utility of distributed PV systems) with energy storage in residential and small commercial applications (SEGIS-ES).

This paper describes the concept for augmenting the SEGIS Program with energy storage (SEGIS-ES) in residential and small commercial (≤100 kW) applications. Integrating storage with SEGIS in these applications can facilitate increased penetration of distributed PV

systems by providing increased value to both customers and utilities. Depending on the application, the systems can reduce customer utility bills, provide outage protection, and protect equipment on the load side from the negative effects of voltage fluctuations within the grid. With sufficient penetration, PV-Storage systems are expected to reduce emissions related to generation and will be critical to maintaining overall power quality and grid reliability as grid-tied distributed PV generation becomes more common.

7) American Council for an Energy Efficient Economy (ACEEE) 2012 Report

http://aceee.org/energy-efficiency-sector/state-policy/aceee-state-scorecard-ranking

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#1 **Massachusetts**	#18 **Hawaii**	#33 **Texas**
#2 **California**	#18 **New Hampshire**	#36 **Kentucky**
#3 **New York**	#20 **Pennsylvania**	#37 **Arkansas**
#4 **Oregon**	#21 **Utah**	#37 **Virginia**
#5 **Vermont**	#22 **Idaho**	#39 **Oklahoma**
#6 **Connecticut**	#22 **North Carolina**	#40 **Alabama**
#7 **Rhode Island**	#22 **Ohio**	#40 **South Carolina**
#8 **Washington**	#25 **Maine**	#42 **Nebraska**
#9 **Maryland**	#25 **Montana**	#43 **Louisiana**

I don't know how CT was elevated to #6 without identifying Energy Storage. At a whim I goggled Maryland #9, then Hawaii #18, and then I went to Germany, and Japan. Everyone is ahead of CT.

Maryland:

http://mdcleanenergy.org/clean_technologies/energy_efficiency

The buzz about hydrogen fuel cells and "smart grid" technologies has been growing louder. But what does it mean, and how is it connected to clean energy?

First, clean technologies and renewable power are only part of solving the energy puzzle we face. In order to make these technologies more viable, we need to reduce our demand through energy efficient practices that enable us to use any power we generate more wisely.

But we also need to find ways of storing and distributing that power as effectively as possible. That's because energy demand and energy generation are never constant and do not always coincide. Excess energy is produced during periods of low demand, but it is lost if it can't be stored for use during peak demand. Similarly, energy produced in one location might go unused while another location is straining to meet demand with too little energy produced. Renewables won't fix this problem at all.

Getting serious about clean energy also means getting serious about energy efficiency.

- Reduce peak demand strains for power generation
- Provide greater flexibility in utilizing all power sources (including renewables) when and where they are needed or appropriate
- Improve cost-effectiveness, reliability, power quality and efficiency
- Reduce the environmental impact of electricity generation, transmission, and distribution.

With ENERGY STORAGE TECHNOLOGIES

Hawaii

http://www.hawaiicleanenergyinitiative.org/storage/media/5_Hawaii%20Packs%20Punch%20with%20Battery%20Storage.pdf

Renewable ambitions make storage imperative in Hawaii. Energy storage is becoming required to manage growing wind and solar additions in Hawaii, as power prices around US$0.28/kWh drives utilities to meet aggressive renewables targets. A lack of interconnection between Hawaiian islands means any imbalance between customer demand and generation can result in system instability. Battery technology is emerging as the leading option for managing

intermittency issues as compressed air energy storage and pumped-hydro are limited by land costs and siting issues. Four battery projects equivalent to 17.6 MW are currently operating, with 10 additional projects equivalent to at least 24.6 MW slated to be online by 2013. customer demand and generation can result in system instability. Battery technology is emerging as the leading option for managing intermittency issues as compressed air energy storage and pumped-hydro are limited by land costs and siting issues.

8) GERMANY & JAPAN:

http://www.wcax.com/story/21306541/germany-gets-serious-on-energy-storage

Germany Gets Serious on Energy Storage

SOURCE Germany Trade and Invest

BERLIN and TOKYO, February 22, 2013 /PRNewswire/ --

On May 1, 2013 access to one of Germany's investment incentive programs will be granted, but only to the bright spark who is able to solve the problem of storage capacity and the balancing of decentralized power generation.

That problem will feature high on the agenda at the Batteries Japan 2013 convention as well as the Fuel Cell Expo, both happening in Tokyo from Tuesday February 27 and where *Germany Trade and Invest* will be explaining why the country's Ministry of Environment so urgently requires further progress in this area of research.

9) JAPAN & GERMANY:

Panasonic Mass Production of Energy Storage Solutions for the European Market

http://cleantechnica.com/2012/06/06/energy-storage-for-homes-panasonic-europ/#ExB40Gs8wKbuxuyf.99

In the press release, Panasonic pointed at Germany as the main market for its energy storage solutions designed for European homes. Germany is “of course” the world’s largest market for photovoltaic power generation and has reached consumer price parity and even grid parity in some cases this year.
In accordance with this development, the country’s groundbreaking Fit for solar energy will soon be lowered below electricity prices, a change that puts the struggling solar industry in a difficult situation at the moment as small investors question the profitability of going solar.

But this change also creates huge new opportunities for storage solutions, as solar power becomes a cost saver the more people can use their own power throughout the year. It seems Panasonic has anticipated this development.

The entire system consists of a management unit that includes controls that manage energy flows and an inverter that converts direct current (DC) from solar or battery into the AC we all love for powering our gadgets at home. A battery of various sizes is then hooked into the management system to make it work. The size of the battery depends on the number of 1.35-kWh modules, but it's mainly promoted with a 5.4 kWh capacity (4 x 1.35-kWh modules)

DEEP:

From the CT Energy Efficiency Board 2012 Annual legislative Report:

https://www.box.com/s/qlol6k6gmuqr94p8mafx/1/703548365/6602408685/1

Quoting DEEP Commissioner Esty: "For every dollar spent on Energy Efficiency Connecticut receives back Electric, Gas, Fuel-Oil, and Propane system benefits of $2.40.

"They reduce customer costs, generate jobs, and make the State's businesses more competitive."

Note: A return of $2.40 for every $1.00 spent sounds great and perhaps more real from the DPUC statements a few years ago of a $4.00 return on every $1.00 spent on reducing the "peak" load.

Regardless of the actual number this is what an Mr.Electricity Energy Storage Systems does. It Stores "SURPLUS" lower cost off peak Energy for use during the next peak, or anytime as a source of automatic, silent, fuel-less backup power to reduce the peak load on the power grid, reduce the cost of Energy on a time of use rate for ratepayers, reduce Global Warming emissions and provide emergency backup power during power outages such as Hurricanes Irene & Sandi, or Winter Storm Nemo.

From Congresswoman Elizabeth Esty Campaign Website:

http://www.elizabethesty.com/issues/job-creation-and-economic-growth

Creating new jobs and promoting innovation

Connecticut has a history as a leader in innovation. We must ensure that our tax laws and regulations reward innovation and promote job creation – so that our children don't have to leave the state to get good jobs.

Promote clean energy industry. For the past several years, I have promoted the development of green energy industries in Connecticut. By investing in R&D in the clean energy sector we can create good jobs here, in everything from technology to manufacturing to construction, while reducing our dependence on foreign oil. The payoff is greater security for our country, as well as the economic benefit of developing processes and products that we can license and sell to the world.

Closing:

Public Act 11-80 mandates the Utilities as a condition of their license's to offer time of use rates.

We do not need a "SMART GRID and SMART METERS to do this.

We only need an attractive rate split and to replace the meters we now have with old fashioned dual clock meters now in storage.

With Energy Storage the Comprehensive Energy Plan will have identified and will meet the true goals of Public Act 11-80 through all available and cost-effective efficiency and demand reduction measures.

By Law the DEEP must determine how efficiency and related measures can cost-effectively meet consumer needs. This is Off Peak Energy Storage of surplus capacity already paid for in the overall rate structure and just going to waste

Thank You for your Time

Sincerely,

Lee A. Hebert

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A Connecticut Energy Storage Manufacturing Company to reduce the cost of Energy for CT ratepayers and create jobs in our State.