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Energy Efficiency Fact Sheet

U.S. Energy Independence means we will not need to endanger the health of our people or our climate in order to generate electricity, and we will not need to negotiate with other countries for resources in order to power our own country. The most rapid and cost-effective means of achieving this goal is through energy efficiency programs,[1] which improve the lives of rate-payers by lowering the power-generated toxins in the air they breathe and the water they drink, by lowering their home and business monthly electric bills, and by improving the comfort and value of their homes and commercial buildings. Clean energy and efficiency programs are proven to generate a significant increase in jobs, and lower electric bills attract new industry to the area. Tennessee Valley Authority (TVA), the largest public utility in the United States, can lead the nation in our transition away from the dirty power sources of coal and nuclear, toward true energy independence.

Because TVA is a non-profit government corporation, we suggest a few ways to help clarify and accomplish this goal of energy independence and the mission of TVA. First, we think the top-heavy corporate structure needs to be examined, in light of TVA's rising debt, and probably downsized to reflect the goals of a not-for-profit corporation. Second, we suggest the executive bonus business-model be adjusted to provide major incentives for saving money and energy, and to encourage discovering safety issues rather than rewarding NOT finding issues (so the Browns Ferry 'red finding' and Widows Creek and Kingston-like accidents might be avoided). Third, we suggest that the buy-back scheme of selling off TVA assets, then leasing them back, be halted. Not only does this reduce resources for future generations, it also increases the cost of generating electricity in the long run. This is short-term thinking that squanders TVA resources in order to make the budget look more balanced, at the expense of TVA's capital assets. Now is the time for a change in TVA employee incentives away from rewarding expensive coal and nuclear contracts, that will incur heavy clean-up debts, to instead providing strong incentives for modern energy efficiency and sustainable programs, thereby reducing TVA's financial and environmental debts to the future.

We recommend the TVA Integrated Resource Plan (IRP) Committee read the pertinent articles referred to in this paper (presented to the IRP on March 26, 2014) and also make use of the energy efficiency expertise of TVA Board Member Marilyn Brown, whose 2009 study, "A Source of Energy Hiding in Plain Sight," found that the electric utility industry alone can "reduce U.S. consumption by an astounding 30% to 75%" using "cost-effective energy efficiency measures".[2] A year later, Dr. Brown led a Georgia Tech team in a joint study with Duke University focusing on our area, and published the study,

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[1] Maggie Molina, "The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs," ACEEE, March 25, 2014. http://aceee.org/research-report/u1402

[2] Marilyn A. Brown and Benjamin K. Sovacool, "A Source of Energy Hiding in Plain Sight," Yale Global Online, February 19, 2009. http://yaleglobal.yale.edu/content/source-energy-hiding-plain-sight

Energy Efficiency in the South, which found that aggressive energy efficiency measures in the south would "lower utility bills by $41 billion, create 380,000 new jobs, reduce the need for new power plants, and save 8.6 billion gallons of freshwater by 2020." [3]

After the national study showing utility companies can both save money and reduce U.S. consumption by 30% to 75%, TVA's 2011 IRP rather embarrassingly suggested only 10% to 14% long-term energy reduction. We certainly hope this new IRP has greater vision and creates a grander plan. Given TVA's 2014 stated "Dependable net summer capacity" of approximately 36,580 Megawatts (MW), the 2011 IRP offered a paltry 3,600 to 5,100 MW – rather than the achievable 30% to 75% or 10,974 MW to 27,435 MW reduction in energy consumption. We question why TVA aims low, when its mission is high – to lead the nation in energy innovation?

Given the achievable reduction of 30% to 75%, if TVA only achieved a 40% reduction, it would be possible to shut down half of its coal plants and the dangerous Browns Ferry Mark-I Nuclear Plant as well. If TVA pursued national leadership with a 70% reduction, it could close down three-quarters of its coal plants and all of its costly nuclear plants. As efficiency expert Benjamin Sovacool and other international scientists have stated, every dollar invested in energy efficiency displaces nearly 7 times as much carbon dioxide as a dollar invested in nuclear.[4] Seven to one carbon reduction with efficiency.

"TVA Coal in Crisis: Using Energy Efficiency to Replace TVA's Highly Non-Economic Coal Units," a 2012 Cambridge study demonstrates, "a substantial fraction of TVA"s coal capacity – about 64% – are more expensive to retrofit and operate than simply buying power off the market. Rather than passing on billions in expenses to ratepayers to keep these plants online, TVA should be exploring ways to retire these non-economic plants as quickly as possible."[5]

The study goes on to say, "TVA's own efficiency study – which was not available when TVA conducted its most recent integrated resource planning (IRP) process – demonstrates that there is a better way. Energy efficiency can rapidly produce hundreds or thousands of megawatts in savings, savings which are sufficient to replace capacity requirements now met by many of TVA's coal units in time to meet public health deadlines. Specifically, if TVA simply committed to the 1.2% annual savings rate which its study identifies as achievable, it could save 1,590 MW of capacity by 2015, which is more than

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[3] Marilyn A Brown, Etan Gumerman, Xiaojing Sun, Youngsun Baek, Joy Wang, Rodrigo Cortes, and Diran Soumonni, *Energy Efficiency in the South*, April 2010. http://nicholasinstitute.duke.edu/climate/seclimate/energy-efficiency-in-the-south#.UmcV3BZs020

[4] Benjamin A. Sovacool, et al. "Comment on 'Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power'," American Chemical Society, May 22, 2013. http://pubs.acs.org/doi/abs/10.1021/es401667h | Environ. Sci. Technol. 2013, 47, 6715−6717

[5] Jeremy Fisher and Kenji Takahashi, "TVA Coal in Crisis: Using Energy Efficiency to Replace TVA's Highly Non-Economic Coal Units," Synapse Energy Economics, Inc., August 14, 2012, pg. 3. http://www.synapse-energy.com/Downloads/SynapseReport.2012-08.SC.TVA-Coal-in-Crisis.12-041.pdf

sufficient to replace the capacity of either its Gallatin, Allen, or Colbert plants, or the units now being considered for retrofits at its Shawnee and John Sevier plants. Taking that course and retiring any of those plants rather than retrofitting them would produce major savings. Replacing Gallatin, for instance, could save at least $2.7 billion by 2032, based on TVA's own conservative assumptions about the cost of energy efficiency, and cut residential ratepayer bills by at least $2.00 per month for several decades."[6]

And, "If TVA were to match leading national utilities and move to incremental efficiency savings to 2% per year it could do even better. TVA could replace two non-economic plants, saving between $7.3 to $10.6 billion between 2012 and 2032, and cutting the cost of supplying equivalent capacity and energy by half or more.[7] Instead of residential bills rising by 4.5% (about $8 per month in 2016) just to retrofit and maintain these units, we would expect residential bills hold steady or fall, even while TVA meets all applicable environmental compliance obligations."[8] As the study points out, these savings are based on conservative TVA assessments, and we not only think TVA can find a better way, we think it is financially and environmentally imperative that it move more aggressively to implement more sweeping energy efficiency programs for the financial survival of TVA and its rate-payers.

It is recognized that reducing utility bills is a practical goal for the utility IRP as a whole rather than just lowering electric rates, as stated in "Best Practices in Electric Utility Integrated Resource Planning," published last year, "In general, IRP focuses on minimizing customers' bills rather than on rates—but an overall reduction in total resource cost achieved through the efficient use of energy will lower average energy bills. As a result, all customers benefit from the lower system costs that IRP achieves."[9]

A presentation by Tim Woolf at the American Council for Energy Efficient Economy (ACEEE) 2013 Energy Efficiency as a Resource Conference, "Energy Efficiency: Rate, Bill and Participation Impacts,"[10] contained excellent graphs to illustrate the impact of energy efficiency for the utility companies and for consumers. Below, Slide 7 shows the forecast for rate changes without efficiency.

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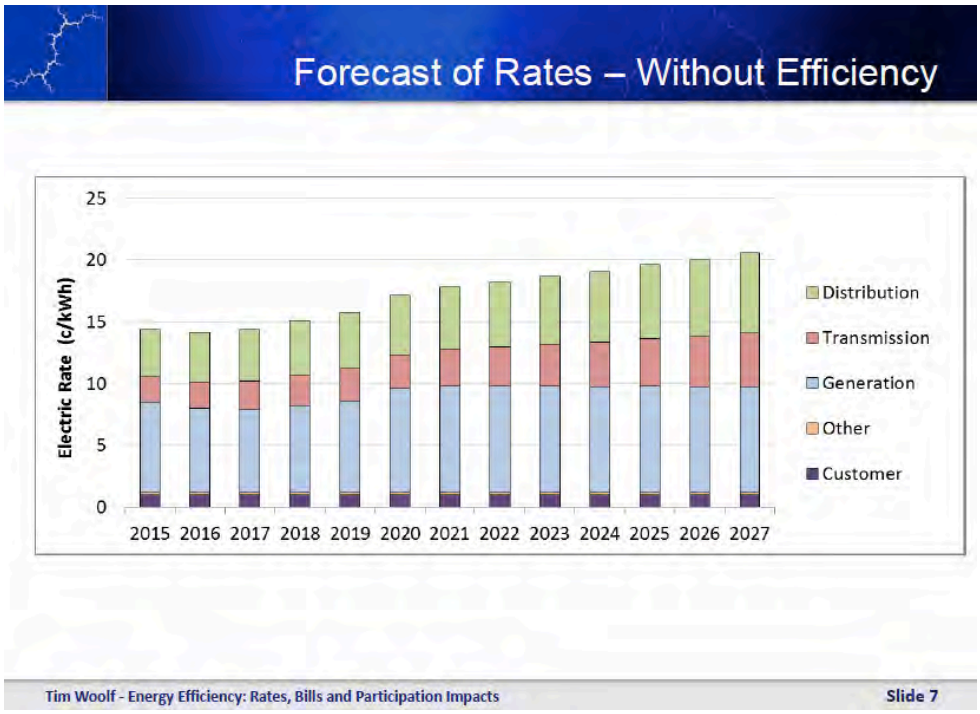
[6] Ibid, 2012, pg 3.

[7] Present value. Difference between coal retrofit scenario for Gallatin, Colbert, and John Sevier 3 ($12.6 w/o CO2 price and $15.9 billion with $21/tCO2 levelized CO2 price) and "Synapse Aggressive" efficiency scenario of 2% incremental EE per year ($5.3 billion). This valuation assumes that energy efficiency is employed only to replace non-economic coal units, and is not extended beyond 2016, even if highly cost-effective to do so. (Ibid,2012, footnote, pg.3)

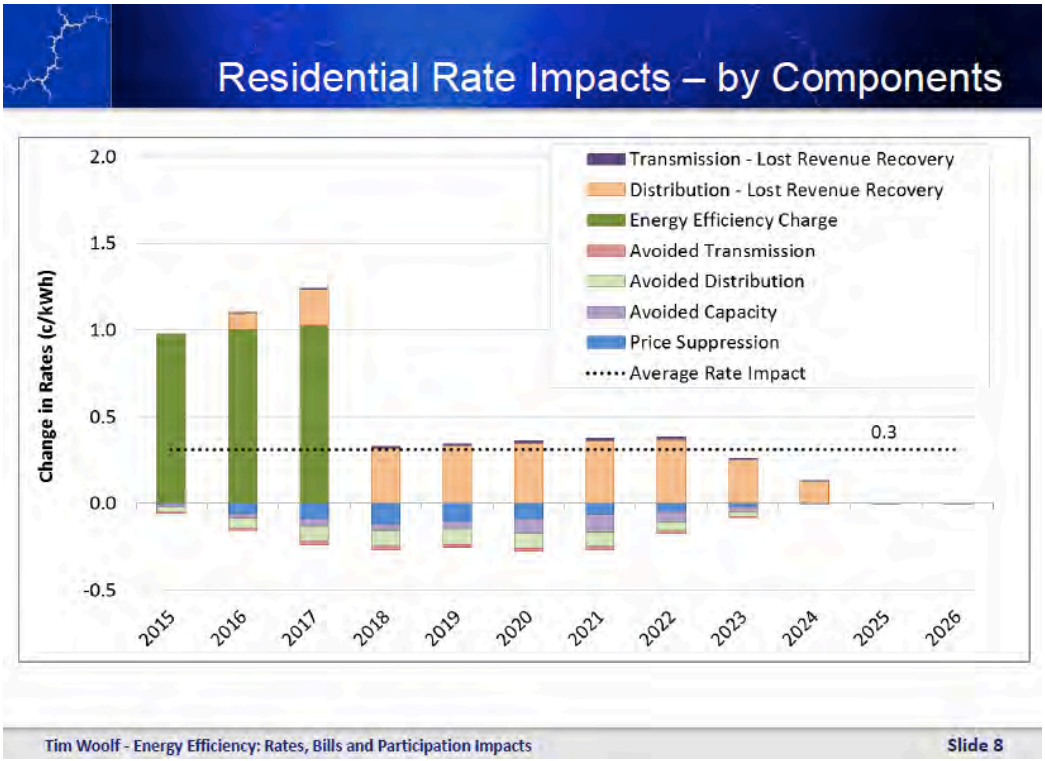
[8] Ibid, 2012, pg 3.

[9] Rachel Wilson and Bruce Biewald, "Best Practices in Electric Utility Integrated Resource Planning," Synapse Energy Economics, Inc., Cambridge, June 2013, pg. 5. http://www.synapse-energy.com/Downloads/SynapseReport.2013-06.RAP.Best-Practices-in-IRP.13-038.pdf

[10] Tim Woolf, "Energy Efficiency: Rate, Bill and Participation Impacts" presentation at the ACEEE Energy Efficiency as a Resource Conference, Sept 24, 2013, Slides 7-9. http://www.synapse-energy.com/Downloads/SynapsePresentation.2013-09.0.ACEEE-Conference-Impacts.S0074.pdf



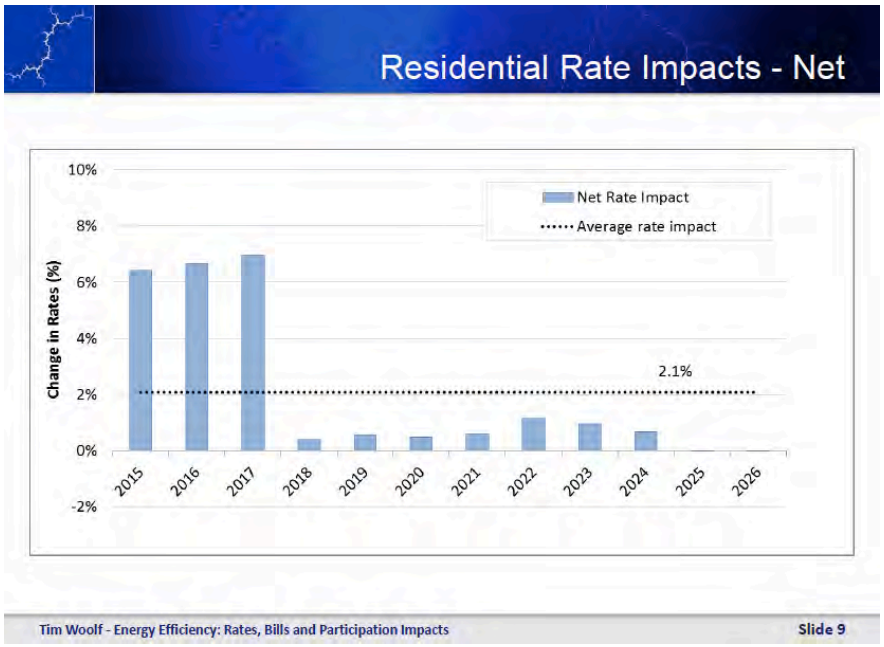
As you can see from the Residential Rate Impacts by Components graph (Slide 8) below, the investments in energy efficiency at only 2.4% annual savings projected for 2015-2017 would entail costs for 3 years, then show precipitous drops in rates into the future.



We suggest that TVA initiate a program similar to one discussed in previous comments, the highly successful TVA Energy Conservation Program initiated in 1977 when David S. Freeman was Chairman of the TVA Board. The program, which we will discuss further near the end, improved the lives and homes of over half a million customers by TVA investing in its customers and loaning them the costs of efficiency improvements, by achieving agreements with all TVA electric distributors whereby the loans were managed by deducting the savings in the customers bills until the loans were paid in full, at which time, the distributor was released from managing the loan payments and the customer's electric bill rates drop precipitously, making a lot of people happy and improving the valley's overall economy.

ACEEE Annual Energy Efficiency Scorecard ranks Tennessee 31st of 51,[11] with its score reaching only 13.5 of 50 possible points. The worst of the Tennessee scores aims responsibility directly at TVA, with only 2 points of a possible 20 for Utility Public Benefits Programs & Policies. This is shameful for a public utility that aspires to lead the nation in affordable energy innovation.

To invest further in nuclear power is also unjustifiable and irresponsible, given the financial and the health and environmental risks to our valley. As one of the most highly respected CEO's in the world, Jeffery Immelt of General Electric, has stated repeatedly (despite the fact that his company is the largest supplier of nuclear power components), "If you were a utility CEO, ... You would never do nuclear. The economics are overwhelming."[12] If you need further economic advice on this, we suggest you read the 2013 Forbes Magazine article, "New Centralized Nuclear Plants: Still an Investment



[11] American Council for an Energy-Efficient Economy, from "Table ES-1. Summary of States' Total Scores" in "Executive Summary of the 2013 State Energy Efficiency Scorecard, November 2013, pg. v. http://www.aceee.org/files/pdf/summary/e13k-summary.pdf

[12] Jeffery Immelt, CEO of General Electric, London Financial Times, November 18, 2007.

Worth Making?"[13] which summarizes that even without Fukushima, 'the verdict is in' on large centralized U.S. nukes for the following reasons:

"1) They take too long: In the ten years it can take to build a nuclear plant, the world can change considerably (look at what has happened with natural gas prices and the costs of solar since some of these investments were first proposed). The energy world is changing very quickly, which poses a significant risk for thirty to forty year investments.

"2) They are among the most expensive and capital-intensive investments in the world; they cost many billions of dollars, and they are too frequently prone to crippling multi-billion dollar cost overruns and delays. In May 2008, the US Congressional Budget Office found that the actual cost of building 75 of America's earlier nuclear plants involved an average 207% overrun, soaring from $938 to $2,959 per kilowatt.

"3) And once the investments commence, they are all-or-nothing. You can't pull out without losing your entire investment. For those with longer memories, WPPS and Shoreham represent $2.25 bn (1983) and $6 bn (1989) wasted investments in which nothing was gained and ratepayers and bondholders lost a good deal."

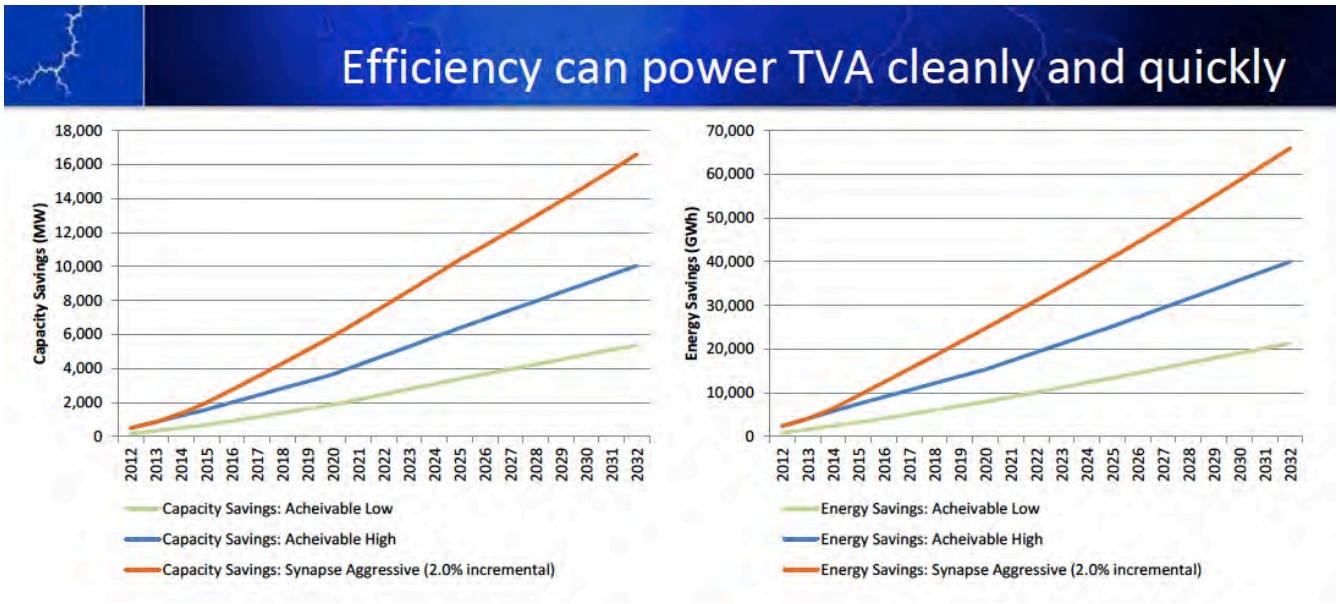
The Forbes article goes on to say, "So it appears that the nuclear renaissance may be largely over before it started. And yet, many projects have not yet been canceled, with utilities and ratepayers accepting ever more risk in order to rescue sunk costs. In many cases, these costs have soared or will soar into the billions. As risk management expert Russell Walker of the Kellogg School of Management is quoted as saying in the Tampa Bay Times **"**When the stakes get higher, it gets harder for organizations to walk away…this happens a lot. It's the same problem a gambler has: If I play a little longer, it'll come around." TVA has a seriously underfunded decommissioning fund for its existing nuclear plants; gambling further will not help TVA's financial debt crisis or the people of the Tennessee Valley.

So, it falls to this IRP to provide TVA with viable alternatives to the high risk courses it has been following with its coal and nuclear plants. TVA's own study of efficiency saving is a start, but it also aims low, far below the leading utilities' national average.

The Synapse "Greening TVA" presentation at ACEEE's 2013 National Conference illustrates TVA's low bar compared to the 2% annual average efficiency paths of other major U.S. utilities. TVA's own efficiency study shows the savings (in blue) at 1.2% annual "Achievable High" rate. Rising to the challenge of the average major utility 2% rate of annual energy efficiency savings is shown (in red) as

[13] Peter Kelly-Detwiller, "New Centralized Nuclear Plants: Still an Investment Worth Making?", Forbes Magazine, January 15, 2013. http://www.forbes.com/sites/peterdetwiler/2013/01/15/new-centralized-nuclear-plants-still-an-investment-worth-making

"Synapse Aggressive" rate.[14] Again we ask, why does TVA aim low for energy efficiency and the subsequent financial savings?



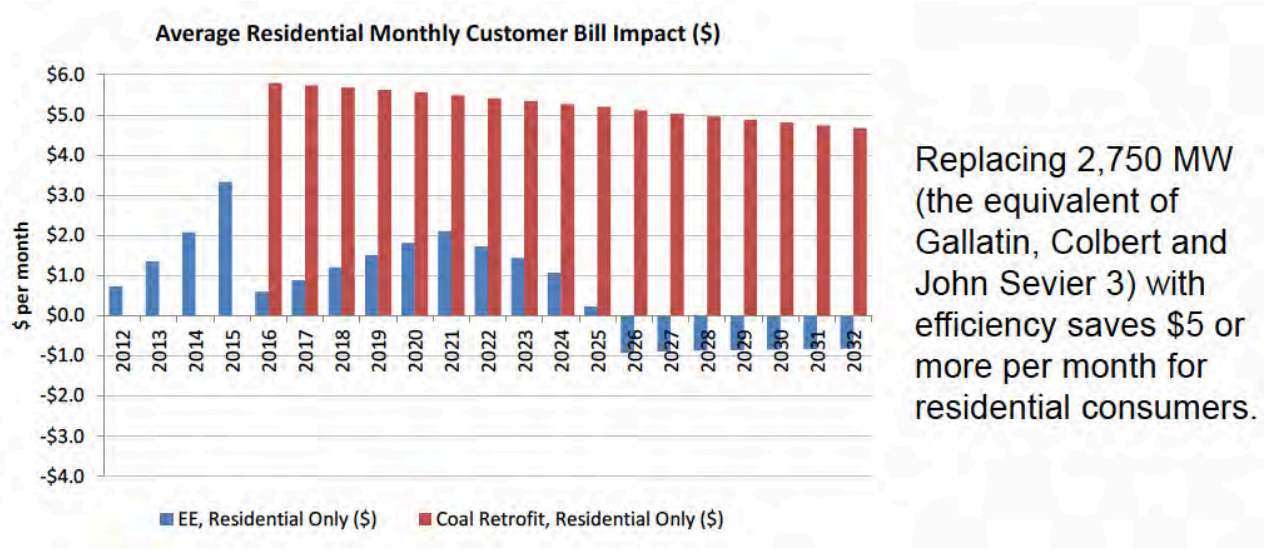
Looking at the customer savings, if the goal is to serve the people of the Tennessee Valley, we can see immediate and long term savings in electric bills. This represents money in the pockets of valley families, money that moves into our local economy, money that eases the stress of our difficult recessive economy. It represents an adherence to the TVA mission on multiple levels.

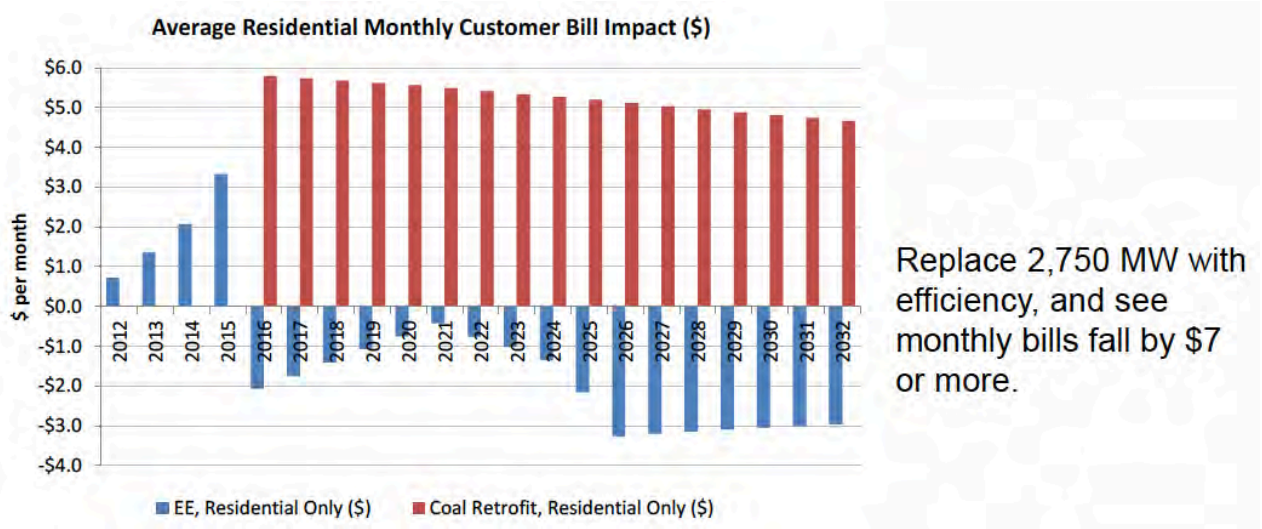
When factoring in carbon costs, the "Greening TVA" study found the savings are even greater:

Again, we come back to the question: Why does TVA aim low for energy efficiency goals and cost savings? An answer requires some acknowledgement that TVA has been running itself like a poorly managed for-profit corporation, that is top-heavy with management and loaded with debt. When management announced a $2 Billion cost overrun at Watts Bar II last year, the board's lack of reaction or acknowledgement of the gravity of the error was disturbing. Probably any company on the planet that announces a $2 Billion project cost overrun would have also announced the firing of those responsible. The TVA Board of Directors acted as if it were a minor accounting error, rather than searching out the cause and effect and ensuring there would be no repeat of the problems that allowed such a gigantic cost overrun. TVA needs to commit itself, from the boardroom down, to being a not-for-profit government

[14] Kenji Takahashi and Jeremy Fisher, Ph.D.,"Greening TVA: Leveraging energy Efficiency to Replace TVA's Highly Uneconomic Coal Units," Synapse presentation at the 2013 ACEEE National Conference of Energy Efficiency as a Resource, Nashville, TN, September 23, 2013. http://www.synapse-energy.com/Downloads/SynapsePresentation.2013-09.0.ACEEE-Conference-Greening-TVA.S0074.pdf

corporation, mandated to provide electricity at the lowest achievable rates (which should be quite low without profits), but with the goal to improve the lives and health of Tennessee Valley residents.





Multiple studies and the latest ACEEE report findings clarify that the best value for utility investment dollars is found in energy efficiency programs. The new ACEEE report demonstrates, "As shown in figure S2 [below], electricity efficiency programs, at a range of about 2 to 5 cents per kWh and an average of 2.8 cents per kWh, are about one half to one third the levelized cost of alternative new electricity resource options."[15]

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[15] Maggie Molina, "The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs," ACEEE, March 25, 2014, pgs. v-vi. http://aceee.org/research-report/u1402

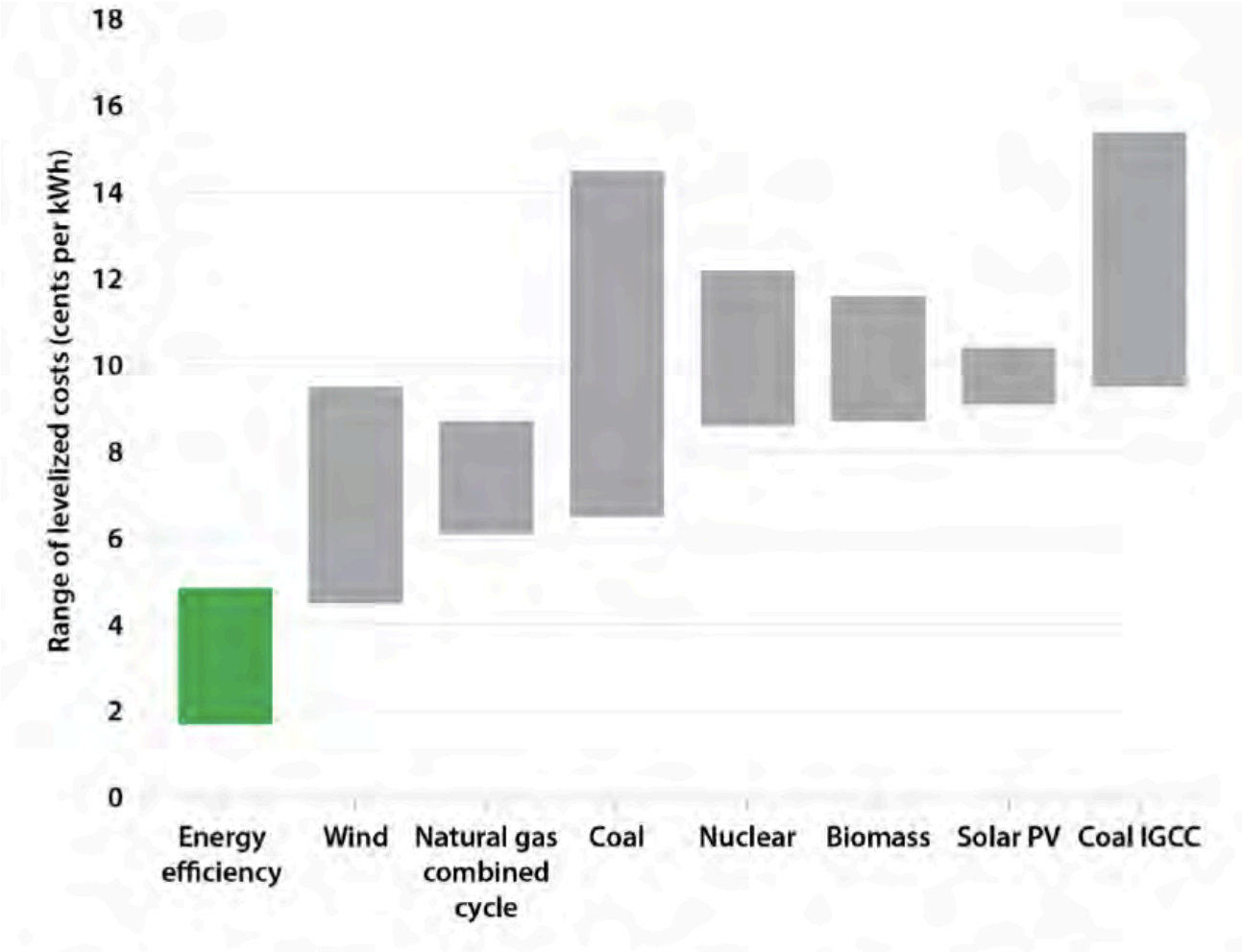

Figure S2. Levelized costs of electricity resource options. ***Source:*** **Energy efficiency data represent the results of this analysis for utility program costs (range of four-year averages for 2009-2012); supply costs are from Lazard 2013.**

Energy Efficiency is not only cost effective, it provides long-term 24/7 power with no fuel costs or toxic waste cleanup costs to burden TVA, the people of the valley, or costs to the environment. As we enter an age of significant and possibly catastrophic climate change, may we remember that, "There is no doubt that energy efficiency should play a significant role, even the primary role, in meeting climate change requirements."[16]

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[16] Tim Woolf, William Steinhurst, erin Malone, Kenji Takahashi, "Energy Efficiency Cost-Effectiveness Screening," Synapse Energy Economics, Inc., Cambridge, November 2012, pg. 7. http://www.synapse-energy.com/Downloads/SynapseReport.2012-11.RAP.EE-Cost-Effectiveness-Screening.12-014.pdf

In short, energy efficiency programs are a win-win for TVA because they:

1. Save TVA money by eliminating the need to retrofit expensive coal plants or to retrofit or build more expensive and high-risk nuclear power generating facilities.
2. Improve the lives of TVA customers and the viability of the Tennessee River ecosystem by significantly reducing the power plant pollutants piling up in our valley.
3. Improve the lives of TVA customers by providing home energy improvements resulting in more comfortable homes with improved resale values.
4. Save customers money by reducing their electric bills, without changing their energy usage habits, so they have more money to spend on fueling our local economy.
5. Create local green jobs, with no need for nuclear security clearances or for hazardous materials training and protections. It is estimated that energy efficiency creates 90 times more jobs than nuclear while fulfilling the same power need. [17]
6. Save our precious freshwater and stop building more nuclear reactors which generate more highly-toxic radioactive waste with no safe long-term storage solutions for future generations. EE creates a legacy of hope rather than a legacy of radioactive waste.
7. Open the possibility of new Valley industries, fulfilling the reduced base-load need with Wind and Solar Power, using Hydro Power and Energy Storage facilities for backup power, and generating new Smart Grid industries for our creative engineers.

TVA was ahead of its time and led the way toward this modern view of energy generation from 1977 to 1988, when then Chairman David S. Freeman helped pull TVA back from the brink of bankruptcy by stopping the construction of eight extremely expensive nuclear power plants and instead implementing a highly successful Energy Efficiency Program that improved the lives and finances of over 630,000 TVA customers.

The TVA Energy Conservation Program began in 1977 with the cooperation of all 160 distributors of TVA power, and was wide-reaching and immensely successful. The beauty of the plan was in its simplicity for the customers – the plan only required one signature from the customer and TVA energy advisors and the distributors worked with the customers to help the process run smoothly. Here is how it worked:

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[17] EnergySavvy, "A Ticking Atomic Clock: Nuclear Power vs. Efficient Homes," July 2013. http://www.energysavvy.com/blog/2011/07/13/ticking-atomic-clock-nuclear-power-vs-efficient-homes/

TVA/David Freeman Energy Conservation Program

1. 'Energy Doctors' made 'House Calls' to determine what could be done for your home to reduce your energy consumption – through wall and attic insulation, double-paned windows, and/or more modern energy-efficient appliances, such as heat pumps and solar water heaters, etc.
2. Once the potential improvements were determined, TVA asked customers to sign a loan agreement to pay for the improvements to your home by deducting **the savings** from your future electric bills, until the improvements were paid for in full.
3. TVA provided a list of construction contractors who agreed to meet their standards, thereby spurring local construction, support services, and material purchases, which created more jobs and increased the local economy immediately. TVA advisors and the local distributors worked to help customers through the construction and installation processes.
4. The cost of the home improvements were paid for in monthly installments taken from the savings in the customer's energy bills. This meant that the customer's bill remained the same as before, until the cost of the improvements were paid. After the improvements were paid in full, the electricity bills would take a sharp dive, and the customers were left with increased comfort and value of their home, and with lower electricity bills – providing cash-in-hand to help spur the local economy even further.

Needless to say, this was a huge success in terms of TVA's image in the valley – great for TVA customers and for TVA itself. Not only did customers enjoy a friendly, personal relationship with the corporation, the corporation benefited immensely from the cost savings in displaced 'energy generation'; that is, the Energy Conservation Program was able to replace the need for the fuel, security, generating equipment, facilities, distribution infrastructure, waste containment, decommissioning and other financial and environmental debts created by coal and nuclear power plants.

Between the years 1977 to 1988, "before national legislation was developed," TVA led the nation in energy conservation by designing programs "to meet the needs of its customers and the power system." Here is a brief list of TVA's Residential Conservation Accomplishments quoted from the same source:[18]

- Over one million homes received free on-site energy surveys, with more than 630,000 homes being weatherized which included more than 140,000 low-income homes being weatherized.
- More than 64,000 heat pumps were installed to replace electric resistance heat.
- Approximately 27,000 energy saver homes were built.
- More than 54,000 air conditioner and 57,000 water heater cycling devices were installed.
- Over $626 million was loaned to residential customers for energy improvements.
- Winter peak reduction totaled 1,215 megawatts and customers saved over $117 million annually.

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[18] "Accomplishments of TVA's Conservation Programs: 1977-1988," 0900H, TVA Library Archives.

Just through TVA's Residential Program alone, in eleven years, TVA facilitated: weatherizing 630,000 homes through its Home Insulation Programs; installation of 127,000 Heat Pumps, 100,000 Direct Load Controls for load management, 35,000 new Super Saver Home Construction projects, 7,000 Solar Water Heaters, 2,000 Heat Pump Water Heaters, 5,000 Sun Screens, and 35 Solar Homes for the Valley. Folks, this was a quarter century ago. Just think of the innovations in efficiency and renewables since then. We once were leaders, and can be again.

We now have the proven technologies to save TVA and its customers considerable money; to significantly reduce our contribution to climate change and our environmental debt by shutting down TVA's coal and nuclear facilities; to improve existing generating facilities and incentivize industries to save money and energy by co-generating electricity using Combined Heat to Power (CHP) units to recycle wasted heat energy; to encourage a modern 21st century perspective of improving our lives, our homes, and our industries through smart, cost-effective and energy-wise efficiency programs; and, to encourage and benefit from the rapidly flourishing renewable energy technologies in solar and wind power generation and in smart grid development. Our valley is uniquely qualified to prosper during this energy transition due to our extraordinary engineering resources, our abundant solar insolation resources, our hydro energy storage potential, and our gift of the non-profit TVA – created to lead the nation in energy innovation, as well as to improve the lives of the people of the Tennessee Valley.

Energy Efficiency is not only cost effective, it provides long-term 24/7 power with no fuel costs or toxic waste cleanup costs to burden TVA, the people of the valley, or costs to the environment. The toxic wastes being generated by coal and nuclear right now are creating a financial and environmental debt to the future for countless generations to come.

With resolve and vision, TVA can guide the nation by showing how to improve our environment and generate truthfully clean, affordable, self-sustaining electricity to achieve complete energy independence for our nation.

Gretel Johnston 3/24/14 revised 6/29/14