Protecting Kentuckians' Economic Well-Being In the Face of Energy Cost Increases

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Acknowledgements

This study has its genesis in a request from the Cumberland Chapter of The Sierra Club that we outline a possible project to look at what state policies would best serve the economic interests of the average Kentuckian in the emerging era of high energy costs and constraints on carbon emissions. That request was made months before the 2008 session of the General Assembly, and the proposed work plan looked mainly at HB 1 and the plans to subsidize goal liquefaction.

As that session progressed and HB 2 took shape and garnered political support, the original work plan had to be completely scrapped. Instead of looking at alternatives to subsidizing one coal liquefaction plant, we needed to turn to the progress in addressing both energy conservation and renewable energy that the Commonwealth has already made in passing HB 2 and the examination of PSC policies mandated by HB 1 and address what steps logically followed on the path that Kentucky has decided to follow.

A less flexible sponsor than the Cumberland Chapter and the Sierra Club Foundation might have had difficulty in adapting a contract to a changing political environment – or might have decided not to pursue the study after all. Thus we owe a debt of gratitude to the Cumberland Chapter, and especially Wallace McMullen, the Chapter Energy Chair and Rick Clewett, Co-Chair of the Chapter Political Committee and member of Chapter Energy Committee, both of whom have actively participated in launching and later reshaping the focus of this study.

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Executive Summary

Kentucky's energy assets – ample coal, low-cost electricity from coal and employment in companies taking advantage of low cost electricity – may become liabilities as the United States and the world addresses the problems of climate change. The Commonwealth urgently needs to undertake major short term efforts to adapt to a changing energy environment and to launch longer term efforts to strengthen its economy and respond to new opportunities that are opening up in this transition period.

This study reviews the threats Kentucky faces, the steps already taken to respond, and new moves the Commonwealth might undertake to further enhance the capacity of Kentuckians to respond to – and take advantage of – the changing energy priorities and policies of the United States and countries and companies across the globe. The threats are real, but the prospects for Kentuckians can be very bright despite the problems.

The Threats

The threats are obvious:

- Energy costs are rising – and coal costs per ton are rising more rapidly than the costs of a barrel of oil, so electricity costs alone will soon explode for Kentucky citizens and businesses. These long term patterns will not be affected much by the current economic downturn (and, as of early October, the cost of coal continued to rise as oil prices fell).
- Carbon emissions controls and/or taxes are coming, whether due to US on international action, and will further drive up the cost of coal-fired electricity for Kentuckians and their employers, potentially threatening the basis of the state's industrial economy.
- Kentucky household budgets – and family wellbeing – are exceptionally vulnerable to these cost trends since residential electricity usage in the Commonwealth is 24% higher than the national average.
- Firms using traditional coal-fired electricity may face negative publicity, if not actual economic disadvantages such as new tariffs, in a world that penalizes carbon emissions and values cleaner energy, so attracting new employers could become more difficult for Kentucky, whatever the costs of its electricity.

These threats pose major problems for a Kentucky economy that saw limited growth even before the economic downturn and credit crunch, evidenced by employment in building construction, which barely grew over the 2002-2008 period. When there is little new business development or population immigration, construction slows, so this pattern is a good measure of statewide economic stagnation.

Initial Opportunities and Responses

But opportunities for rapid responses also abound – and the Commonwealth is already taking some action:

- Energy efficiency investments will produce higher cost savings and greater usage reductions in Kentucky than elsewhere: consumption has been so high in the past that just cutting back to national average will generate significant benefits for households, governments, schools, and businesses.
- Led by the Kentucky Department of Education's Facilities Management Division, schools in the Commonwealth are leading in the nation in pursuing school building energy efficiencies.

- Energy saving performance contracting by state agencies and universities is saving millions annually in utility costs, even at current power costs, and the payoffs will grow over time.
- House Bill (HB) 1 launched a re-examination of the role played by the Public Service Commission (PSC) and initiated examination of demand-side management, alternative energy portfolios, full-cost accounting and modified rate structures as energy and emissions management approaches, so Kentucky already has data on options that make it easier to take rapid action.
- HB 2, passed in the last legislative session, has already declared "it to be the public policy of the Commonwealth to maximize the use of energy efficiency measures in the construction, renovation, and maintenance of buildings owned or leased by the Commonwealth."
- In pursuit of that policy and in that law, Kentucky has:
  - Mandated state-level pursuit of further energy efficiencies in government operations;
  - Offered tax incentives to induce new private investments in energy efficiencies;
  - Facilitated small-scale private generation of alternative, renewable energy; and,
  - Authorized up to $80 million in state bonds to help finance energy efficiency investments.

Overall, the Commonwealth appears to have done more than many other states, and energy clearly has become a major part of the state-level policy agenda.

Limited Efforts to Date

While initial steps have been taken, Kentucky has a long way to go to seriously address the threats it faces:

- The PSC report issued under the HB 1 requirement ignores the risks inherent in doing nothing and continuing the Commonwealth's 94% dependence on coal for electricity, despite the fact that it is obvious that plant operating procedures and costs can be massively affected by the actions of regulatory bodies over which the Commonwealth, the PSC, and the generators have no power. As a result, the apparent costs of innovation are exaggerated relative to the (overlooked) costs of the *status quo*.
- Little in-state regulatory action has been proposed or seriously examined, despite decades-long experience with demand-side management and energy efficiency promotion efforts in other US states that could be examined and adapted to local conditions. The PSC regulatory powers remain extremely limited relative to those in other states.
- Short-term internal rate of return calculations are mandated to govern energy and environmental policy decision-making under both HB 1 and HB 2. Calculations tend to ignore the long-term trend lines in costs and thus undervalue major restructuring that will pay off over time. The approach undermines efforts to take longer term looks at where the Commonwealth wants to be in a decade or more, and to undertake major efforts to assist its citizens and businesses to compete in the global economy.
- The $80 million in bonding for energy efficiency under HB 2 is merely symbolic and woefully inadequate in light of obvious needs – Kentucky schools spend over *ten times that annually* on new and renovated buildings.
- The needs of all the businesses and households in the Commonwealth that do not have – and cannot borrow – the money needed to make energy efficiency investments that are known to pay off have been totally ignored to date. This omission is made more serious by the current economic contraction and liquidity crisis facing the world economy.
- Tax credits only work for those who can afford the investments or can borrow to make the investments that will be rewarded with the tax relief. Thus the lower income families and the

smaller and more marginal businesses that can least afford the budget-breaking energy costs increases they face have not been helped by any of the measures taken to date by the Commonwealth.

Kentucky has acknowledged problems with regard to energy, and has taken some tentative steps, but much more needs to be done.

Possible Next Steps and The Payoffs

There are myriad opportunities to put more Kentuckians to work and to limit the negative effects of rising energy costs and constraints on domestic reliance on coal-fired electricity:

- ✓ Just improving average home energy efficiency could save the average household $150 a year *at current energy costs* and would be a gift that kept on giving over time.
- ✓ The payback period for replacing an incandescent with a compact fluorescent light bulb, for example, is about a year at mid-2008 residential electricity costs – a 100% rate of return!
- ✓ Heating and cooling costs are a big part of building energy efficiency and special needs exist for many of the 150,000 manufactured homes in the Commonwealth, who residents are among those least likely to have the funds to invest in their homes and need help.
- ✓ Those energy savings, applied to state and local government buildings and schools, can save operating costs and hold back tax increases and/or improve the efficiency of government services to all the taxpayers in Kentucky.
- ✓ Data from the state's public school systems show savings of over 45% in energy costs for schools upgraded to ENERGY STAR standards – and similar results are possible for state and university premises, with energy performance contracting firms bidding for the right to do the improvements, with costs paid for by energy savings.
- ✓ Similar results should be possible for commercial enterprises and office buildings, with the savings contributing to increased profits for owners and/or lower costs for the consumers to whom they sell.
- ✓ Alternative energy generation in Kentucky is possible, but the Commonwealth does not have the obvious high impact opportunities available in deserts for solar power and major open spaces or bodies of water for windpower, so immediate impacts from these arenas will be limited.
- ✓ All the immediate prospects for helping Kentuckians address their future of higher cost energy will produce jobs in the building trades – thousands of jobs at above average salaries.
- ✓ Tax savings from energy efficiencies overall in the Commonwealth, including state and local governments, will start at 0.5% and keep growing as the cost of power rises.

Overall, an energy efficiency program that served just 10% of the total households in Kentucky (165,577) and saved an average of 10% on their annual bill through education and efficiency investments (a very low number to expect, given available data) *could save householders $16,557,700 in the first year, and keep rising from there.* Such an investment program would cost around $130,000,000, would generate some $100,000,000 in new building construction spending, adding a bare minimum of 1,830 new jobs, and $33,215,308 just in new construction job wages and salaries, not including construction firm profits and the sales, profits, and payrolls of the firms supplying materials and equipment to the construction industry.

Such a program could easily be financed by state bonds, with the debt service from the very first year financed 100% from the savings in energy costs. The faster the energy costs rose, the greater the payoff to Kentuckians as homeowners and taxpayers would become over time.

Moving Forward

While there are real problems in the financial markets at present, Kentucky has an excellent credit rating, and energy savings produce effectively guaranteed cash for servicing debt. This means that the Commonwealth has the capacity to commit hundreds of millions of dollars to energy efficiency investments. The General Assembly has already committed close to $400 million for energy projects and those funds could be reallocated in order to:

- Reduce taxes on all Kentuckians, now and in the future;
- Reduce monthly energy bills for hundreds of thousands of households, saving them more money as time goes by;
- Provide new jobs for thousands of workers at a time when the sector in which they work is depressed;
- Reduce economic risks in the future by diversifying the economy and stimulating new activities and training for works; and,
- Bring the Commonwealth to prominence in a global economy striving to reduce the carbon intensity of human activity.

Over the longer term, these are returns that any government would be pleased to provide to its taxpayers and citizens.

One big fear about any innovation is always the cost in the immediate period. But the data exhibited here show that the steps to get there do not need to cost the Commonwealth *anything* in the current period:

- Performance contracting and lease-buyback arrangements can finance all the public sector energy efficiency investments needed. The investments pay for themselves at first, and earn additional savings with the passage of time.
- Removing the unlegislated 12-year payback requirement for energy efficiency building improvements with longer lifetimes can expand the current performance contracting markets and promote more efficiency over the long term.
- The $30 million in bond financing already committed to energy efficiency in the public sector program of the Bluegrass Turns Green initiative can be diverted from unnecessary grants to use as loan guarantees and finance $300 million in household or business energy efficiency investments for which the short term self-financing systems do not work.
- The $300 million in bond financing that the Commonwealth committed to the Peabody coal liquefaction plant under HB 1 is not likely to become a factor for over a decade, with the US Department of Energy expected delays in carbon capture and sequestration technology development. Borrowing capacity currently committed to economic development can be shifted to promote energy efficiency investments and the job and income potentials (plus user cost savings) they promise. This shift and the economic diversity and positive image it could generate may contribute more to long term economic prosperity for Kentucky than the traditional uses of these resources.

- The 150,000 occupants of manufactured and mobile homes, some of whom are among the lower income households in the Commonwealth, as well as others living in poor quality housing may have to face a less severe “heat or eat” choice in the coming winters and as a result are likely to place fewer demands on health care and other support services that have to be paid for in the end by other Kentuckians, so both groups are better off.

A $1 billion initiative with debt financed through savings on energy costs should not be difficult to finance once the current debt markets are stabilized. Lowered interest rates provide additional opportunities for cost savings. While private borrowers are being shunned right now, public debt is being purchased. The economic risks and threats posed by global warming translate into grounds for expectations of the capacity to service debt out of costs avoided, so financing should become available.

The time for Kentucky to act is now. Two years from now, the nation may have taken a stand on carbon emissions and the Commonwealth, doing nothing different than what is proposed here, but then doing it because it had to, would be seen as a follower, not a leader. The economic development potential of taking the initiative will have been lost. The economic return to the program suggested here thus is far greater if it is implemented early in 2009 than in any later session of the General Assembly.

Introduction

Kentucky has long enjoyed some of the lowest cost electrical power in the United States. The low cost has led to a level of electricity consumption that may now become an economic burden to the citizens of the Commonwealth due to rapidly rising prices for coal and the prospect of limits or taxes on carbon emissions, both of which will drive up costs since 94% of the state's electricity is coal-generated.

The problem of exceptional exposure to rising electricity costs is not getting better, but worse: Residential electricity usage, which is above the national average in any case and long has been, climbed 4.9% between March 2007 and March 2008 while that of the US residential sector as a whole rose only 1.7% according to the US Energy Information Agency.[1] Household energy efficiency thus is dropping relative to that of the nation as a whole, making Kentuckians more vulnerable to fuel cost price increases than other Americans.

But *total* electricity usage in the state across all sectors over the same 12 months rose 7.5% while US consumption rose only 1.5%, led by an over 10% increase in industrial electrical usage in the past year. That rise in industrial use would be a good sign for Kentuckians if it reflected additional job creating economic activity. Unfortunately, while that industrial usage rose so rapidly, the state's unemployment rate rose from 5.6% to 5.7% and total employment in the Commonwealth actually fell by almost 5,500.[2] So, although it is true that industry in Kentucky is more energy intensive than elsewhere due to historically low electricity costs, this recent pattern is a remarkable increase in energy intensity, which is not promising for the global competitiveness of the Commonwealth's largest private sector employers, nor for the jobs, payrolls and taxes they contribute to the state's economy.

Both these patterns reveal the opportunity to greatly increase the energy efficiency of homes and businesses in Kentucky without undermining quality of life or really cutting back on what have come to be considered necessities to the modern American lifestyle. Reducing energy consumption not only protects against the rising cost of power, but it also may protect – and the transition process will definitely generate – jobs, wages, profits and potential taxes paid to state and local governments and school districts across the Commonwealth.

This report is focused on Energy Efficiency (EE) while acknowledging that there are options for Renewable Energy (RE) generation, simply because the major low-lying fruit and massive returns on investment are in EE, not RE, in Kentucky, given local weather, winds, and geothermal conditions. House Bill (HB) 2 has already provided some support for small scale RE, but the major economic returns in the current period are from actions taken to promote EE.

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1 U.S. Energy Information Agency. 2008. Energy Consumption Table. Data downloaded July, 2008, from <http://www.eia.doe.gov/cneaf/electricity/epm/table5_4_a.html>.

2 Kentucky Labor Cabinet. 2008. Kentucky Labor Force Statistics. Data downloaded July, 2008 from <http://www.workforcekentucky.ky.gov/cgi/dataanalysis/labForceReport.asp?menuchoice=LABFORCE >.

I. The Problem Kentucky Faces

Kentucky's problem with rising energy prices is different from that of many other states for a wide variety of reasons. Therefore, the Commonwealth's response needs to be tailored to the specific needs and vulnerabilities.

Energy Price Trends and Forecasts

Energy supplies and rising costs are all over the news. The nation's focus has been on the uncontrolled and apparently uncontrollable rise in the cost of crude oil – and thus on diesel fuel and gasoline. While oil prices go up and down and retreated from their highs in early August 2008, they are not the only measure of a threat from energy costs.

Kentucky faces a somewhat different problem with energy that may make the citizens of the Commonwealth more vulnerable than most Americans. Kentucky depends, more than almost all the rest of the nation, on coal for electricity – and, to some degree, for heating homes. And the price of coal has gone up ***faster*** than that of oil, natural gas, diesel or gasoline.

The evidence is stark. Table 1 shows the current product and futures prices of energy in the mid-summer editions of the *Kentucky Energy Report* in 2006 and 2008.[3] The Table shows that:

- ✓ If oil futures had gone up as much as coal futures have since Summer 2006, it would cost over $164 a barrel, and at prices that has not yet been reached.
- ✓ If the current price of a gallon of gas had gone up as much as coal futures, it would cost $6.42 a gallon!

Table 1 – Recent Energy Price Trends in Kentucky

***Kentucky Energy Report* of …**	**08/01/08**	**08/02/06**	**Two-Year Change**	
			$$s	**%**
Product				
Gasoline (State avg. pump cost)	$ 3.778	$ 2.908	$ 0.870	29.92
Diesel (State avg. pump cost)	4.559	2.916	1.643	56.34
Crude Oil ($$s per barrel)	$ 124.08	$ 75.82	48.26	63.65
Natural Gas ($$s per MMBtu)	9.230	8.670	0.560	6.46
Futures				
Crude Oil ($$s per barrel next mo)	$ 124.95	$ 74.77	$ 50.18	67.11
Coal ($$s per ton next month)	107.00	48.50	58.50	120.62

* Data from *Kentucky Energy Report,* Vol. 7, No. 31 (August 3, 2006) and Vol. 9, No. 31 (August 1, 2008)

Obviously, there are forces at work that are driving up the price of coal – and thus the price of electricity in Kentucky – that are not being discussed in the current major focus on oil price

[3] The "Product" price quotes are for what the item is selling that week. The "Futures" quotes are for delivery of the product in the next month; in this case, since the data are from August 3, the quotes are for September delivery. It must also be noted that the coal price is for mined coal, not the coal delivered to utilities. The latter is under long term contracts, so the full impact of the rising coal prices has yet to be felt, although KY residential rates rose 5.5% between March, 2007 and March, 2008, while national rates rose 3.0%. (US Energy Information Agency data from <http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_a.html>.)

changes. The trend, however, is not just a matter of the past couple of years, but dates back at least to 2000 in terms of its impacts on Kentuckians:

> "The average price of electricity for all sectors in Kentucky has risen each year since 2000. Between 2000 and 2006, the average price of Kentucky's electricity has increased nearly 30%. The year-to-year price increase in 2005 and 2006 was over 8 percent." (*Kentucky Energy Watch,* January 8, 2008, p. 3)

The future picture is murky and uncertain, but what is clear is that prices will be rising in the near future as demand for alternatives to oil continues to grow, including demand for US coal. A case can be made that investing in new coal-fired generating capacity is a very risky proposition, given regulatory and other issues.[4] If such investments lag, then the demand for coal for new electrical generating capacity may weaken.

But the other side of the coin is that the real quantity of available coal is limited. One international review of coal, citing data from the US Energy Information Agency (EIA), argues that the peak production of Appalachian and Illinois basin bituminous coal has already passed, and that the current levels of coal energy generation in the US cannot be sustained past 2025.[5] The US itself is relying more and more on sub-bituminous, mostly Western, coal, which generates less energy per ton burned than bituminous. This shift reflects export demands since the Eastern bituminous coal offers more energy value and thus is preferred by importers who have to transport it across oceans. Thus, even if no more coal fired plants are built, the shrinking supply of bituminous coal (and current export demands) will tend to push the prices of the coal that Kentucky relies on for its electricity, ever higher – and at accelerating rates.

The Commonwealth's prior electricity cost advantage over other states is shrinking right now. Earlier in the century, Kentucky had the cheapest electricity in the country. The EIA found it had the fourth cheapest electrical power in its 2006 Annual Energy Review; the 2007 edition ranks it seventh cheapest. So prices for Kentuckians – and for their employers – are rising.

Not all of the rising costs are due to the price of coal. Coming price pressures include regulatory changes with respect to carbon emissions – whether a carbon tax or a "cap-and-trade" system, which would be market-based or a more rigid set of absolute limits on emissions – that will raise costs for electrical generating stations using fossil fuels.[6] Another factor in the short term is exploding demand for coal and increased US exports.[7] Thus, in the next few years, the cost of electricity in Kentucky can thus be expected to rise *faster* than the cost of other forms of energy.

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4 See, for example: Synapse Energy Economics, Inc. 2008. *Don't Get Burned! The Risks of Investing In New Coal-Fired Generating Facilities*. Cambridge, MA: Authors.

5 Energy Working Group. 2007. *Coal: Resources And Future Production*. EWG-Paper No. 1/07. P. 6. Downloaded from: <http://www.energywatchgroup.org/fileadmin/global/pdf/EWG_Report_Coal_10-07-2007ms.pdf>

6 The inevitability of some restrictions – and their relative efficiency in macroeconomic terms – is attested to by many sources. C.f.: Creyts, J., A. Derkach, S. Nyquist, K. Ostrowski and J. Stephenson. 2007. *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?* U.S. Greenhouse Gas Abatement Mapping Initiative. Washington, DC: McKinsey & Company and The Conference Board**.** Downloaded from <http://www.mckinsey.com/clientservice/ccsi/pdf/US_ghg_final_report.pdf>. Also Ball, J. 2008. Wall Street Shows Skepticism Over Coal. *Wall street Journal*, February 2. Downloaded from <http://online.wsj.com/article_print/SB120209079624339759.html>.

7 Mufson, S., and B. Harden. 2008. Coal Can't Fill World's Burning Appetite: With Supplies Short, Price Rise Surpasses Oil and U.S. Exporters Profit. *The Washington Post.* March 20, p. A01. Downloaded from <http://www.washingtonpost.com/wp-dyn/content/article/2008/03/19/AR2008031903859.html?hpid=topnews>.

When it comes to household energy use, electricity costs, however, are not all the cost risks that Kentuckians face. Table 1 shows that natural gas, which 44% percent of households used for heating as of the 2000 Census, has not risen that much in the last two years when compared to oil and coal, so it does not appear to be an immediate problem. But between 2000 and 2004, the cost of 1,000 cubic feet of gas to households rose from $7.41 to $10.97, a 48% increase in four years during a period of low inflation below 3% a year. And the Commonwealth's gas supply comes primarily through pipelines from the gulf coast, so prices really spiked after Hurricane Katrina, hitting an average of $13.09 after the storm hit late in 2005 and climbing even further to $14.14 across 2006 before dropping back to "only" $11.85 in 2007.[8]

Without arguing whether steadily rising prices or extremely volatile ones pose the greatest problem, it is clear that Kentucky households face economic stresses generated by the costs of the energy they consume. Price stresses create greater budget problems when they are larger proportions of household budgets. The Commonwealth ranked 47th among the states in per capita income in 2007, which means that fuel and power costs caused more problems for Kentuckians' budgets than they did elsewhere – and this problem was made far worse by the state's pattern of above-average consumption of power.

Kentucky's Energy Usage

Low cost generally is associated with higher levels of consumption in most markets. The historically low cost of electricity in Kentucky has led to less concern over energy saving, and thus a higher level of energy intensity (power used to accomplish common tasks) than the national average.

> "Nationally, Kentucky is ranked third in energy intensity (kilowatt hour [kWh] per customer), about 55 percent higher than the national average … Our residential sector energy intensity is 24 percent higher than the national average ..." (*Kentucky Energy Watch,* January 8, 2008, p. 3)

The rising cost of coal and electricity thus add an exceptional financial burden to the budgets of households across the Commonwealth, one that is greater than that experienced by most American families simply because Kentuckians consume more power.

Moving beyond household consumption and energy budgets, the higher energy intensity in the Commonwealth both raises costs and provides employment for Kentuckians. To the extent that public buildings and other facilities and services supported by tax dollars are less energy efficient than they could be (as measured against what other states are doing), taxes are higher to pay for those expenses. But that low-cost electrical power has also attracted industry, providing jobs and raising payrolls and household incomes to pay those taxes.

Historically, Kentucky households have most likely benefited from its low-cost electricity, especially to the extent that the demand for coal was met by Kentucky mines and miners. But

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8 US Energy Information Administration. *Kentucky Natural Gas Residential Price (Dollars per Thousand Cubic Feet)*. <http://tonto.eia.doe.gov/dnav/ng/hist/n3010ky3A.htm>. Downloaded August, 2008. Price volatility in the energy sector is extreme, however, and statistically reliable detailed trends are very difficult to extract. The wholesale price for natural gas, for example, fell $1.03 or 12.5% a the last week in August, 2008, according to the 9/3/08 *Kentucky Energy Watch*. (Downloaded 9/5/08 from: <http://www.energy.ky.gov/NR/rdonlyres/827D57EC-8DF9-4C2D-A261-08911C5F5603/0/KentuckyEnergy>. Over the preceding year, it had risen some 25%, but that was less than the 44% increase in oil (after the latter's decline form the summer peaks). Retail prices, moreover, reflect cycles in specific utilities' long term purchase contracts, and are thus even more volatile and inconsistent across a region than are the whole numbers.

the balance may be changing, especially if fuel prices continue to rise faster than other costs. Because of the higher costs of distributing power to many small consumers rather than a small number of large ones, household electrical rates have been above those for factories and other major facilities, and that pattern will continue into the future. But that leaves households likely to see their home energy prices climbing rapidly in the coming years. At the same time, those costs will be climbing for the businesses that employ them and need to hold down expenses to compete in global markets, for the businesses from which they buy the goods and services they consume, and for the government facilities and schools that have to tax them to pay their rising bills.

There is only one short-term response possible to those rising costs, given the technologies currently available: Tapping the underutilized energy efficiency gains that could be attained. Looking at 2006 patterns, the Governor's Energy Office concluded that,

> "Kentucky's average residential electric price is 33% less than the national average but the average residential bill is only 16% below the national average."
> – *Kentucky Energy Watch*, January 8, 2008, p. 4.

Kentucky should be able to reduce its energy intensity substantially without changing lifestyles or reducing quality of life. The residential electrical intensity (electricity usage per customer) in the Commonwealth was 24% above the national average in 2006.[9] That means that, if Kentucky could, as a matter of public policy, assist households to achieve the national average consumption level it could save the average household over 20% on its electrical bill. If state and local governments and schools are equally inefficient on average, then generating improved efficiencies there could save tax dollars. That may not lower taxes, but it at least might keep them from going up with higher electrical rates.

The electrical intensity of manufacturing in the Commonwealth in 2006 was more than *five times* the national average.[10] That reflects the fact that manufacturers that value low-cost electrical power opened facilities in Kentucky specifically in order to take advantage of the lower cost electricity available for their energy-intensive operations. In fact, the prices paid per kWh of electricity by industrial users in Kentucky was less than two-thirds the price paid on average elsewhere in the country. But industrial rates per kWh are growing faster than any other rates – mainly because the cost of generating the power is a higher proportion of the cost of delivery to large bulk users and thus they are more affected by the rising cost of coal. Kentucky's manufacturing plants don't just compete with those located elsewhere in the US, they compete globally. Therefore the rising cost of power locally means the advantages of being in the state are disappearing. That could cost Kentuckians jobs – and the payroll and taxes paid by those plants.

Kentucky's electricity use patterns, shaped by historically low prices, make it exceptionally sensitive to rising costs for its generating fuel. And coal costs are only one of the factors that could drive up the costs of electricity in the state. The other is any restriction on carbon emissions or taxation of those emissions (whether a carbon tax or a "cap-and-trade" market-based regulatory system). The biggest current threat to Kentucky lifestyles thus could come from what has been a lifeline for the Commonwealth – its close connection to coal.

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9 *Kentucky Energy Watch*, January 8, 2008, p. 3.

10 *Idem.*

Coal and Economic Development

Coal mining jobs themselves are not under threat. That, at least, is not a problem facing the Commonwealth. Coalminers' jobs seem secure due to the fact that the global demand for coal is exploding. As one newspaper article earlier this year noted,

> "The value of coal exports, which account for 2.5 percent of all U.S. exports, grew by 19 percent last year, to $4.1 billion, the National Mining Association said. An even bigger increase is expected this year." – Mufson, S., and B. Harden, "Coal Can't Fill World's Burning Appetite -- With Supplies Short, Price Rise Surpasses Oil and U.S. Exporters Profit." *Washington Post,* March 20, 2008, p. A01

Promoting energy efficiency is not going to threaten coal mining jobs, especially since Kentucky can offer bituminous coal to the market, which is preferred to the sub-bituminous coal available from the Western US.[11]

Overall Kentucky job growth has not been strong, and any weakening in manufacturing employment could pose a major problem. Over the 10-year period from May 1998 to May 2008, total nonfarm employment in the state grew only 7.62% while the growth in national nonfarm employment was 9.61%.[12] The employment growth in the Commonwealth was below the population growth over roughly the same period, 8.47%.[13] So job growth has been, at best, stagnant, since these data do not address the growth of part-time jobs as a proportion of all employment over the period.

If the Kentucky economy cannot generate jobs as fast as the nation as a whole during a decade in which it was often the state with the lowest cost of electricity, then its citizens face dire problems if its attractiveness to large plants that are heavy power users declines relative to other areas as the relative cost of coal-fired electrical power rises.[14] Addressing the vulnerabilities associated with the state's coal dependence is thus a serious economic development, not just environmental, issue.

The looming problems are substantial and they require an equally strong state government response to protect the economic well being of Kentuckians. The latest report on energy issues facing the Commonwealth, issued earlier this summer by the Public Service Commission (PSC) and discussed in greater detail below, never confronts the question of whether relying on coal-fired electricity to provide low-cost power to employers attracted to the Commonwealth remains a strong basis for pursuing future economic development.[15]

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[11] The preference for bituminous coal is exceptionally strong in export markets, since it produces more energy per ton, and shipping cost per ton is m ore important for more distant – overseas – markets. So the same surging third world economies in China and India that may be hurting Kentuckians by petroleum demands that drive up oil prices or by manufacturing goods with very low-cost labor may be stabilizing or even expanding coal mining activity in the state. A nice discussion is in Mufson, S., and B. Harden. 2008. Coal Can't Fill World's Burning Appetite: With Supplies Short, Price Rise Surpasses Oil and U.S. Exporters Profit. *Washington Post*. March 20. p. A01.

[12] May, 2008 was the most recent seasonally adjusted employment data available. Data downloaded from the US Bureau of Labor Statistics at <http://www.bls.gov/data/#employment>.

[13] Population figures are for calendar 1997 and 2007, downloaded from < http://www.workforcekentucky.ky.gov>.

[14] Admittedly, the BLS data already cited show that Kentucky lost about 18% of its manufacturing jobs in the past decade while employment in the sector across the whole US declined over 22%. But this relative advantage may be due to energy cost. The loss as a whole suggests that the Commonwealth needs to generate new good-paying jobs for workers who do not go to college if it is to protect the economic well-being and quality of life of its residents.

[15] Kentucky Public Service Commission. 2008. *Electric Utility Regulation and Energy Policy in Kentucky.* Frankfort, KY: Authors. See especially pp. 10-16, on the policy and economic context assumed as the basis for the discussion in the report.

This omission is unfortunate since even a casual read of US and international events and US presidential politics demonstrates the magnitude of the risks to this strategy:

- In April 2007, the Supreme Court ruled that CO_2 is subject to regulatory control under the Clean Air Act; the EPA under the new president will establish standards for emissions which have not previously existed, so the ruling has added uncertainty to energy planning efforts.[16]
- Late in 2007, the US agreed to emissions reductions at the Bali meeting on climate change; though timing, standards, and implementation mechanisms remain to be determined; both presidential candidates' platforms call for efforts to limit CO_2 emissions, but what they will propose, and what Congress will adopt, remains to be seen.[17]
- A 2008 federal review of expert opinions on climate change response options found that, "All of the economists on the panel agreed that the Congress should consider establishing a price on greenhouse gas emissions using a market-based mechanism but expressed differing views on the type of mechanism and its stringency."[18]
- The vast majority of all new pilot projects for carbon sequestration or capture that were in planning stages earlier this year have been suspected or cancelled; "clean coal" technologies needed to reduce plant emissions remain prohibitively expensive and the rate at which they may become available – and cost-effective – remains a major question.[19]
- The European Union is considering tariffs on imported goods (and, to the extent possible, even services) based on their carbon content; to avoid such tariffs, exporters will want to produce in places in the US where their energy is less carbon-intensive than Kentucky.[20]

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16 Supreme Court of the United States.2007. *Massachusetts, et al., Petitioners v. Environmental Protection Agency, et al.* 549 U. S. The 5:4 decision, issued April 4, 2007, was written by Justice Stevens and clearly lays the .legal foundation for national Greenhouse gas emission control in the United States by ruling that the emissions are covered under the Clean Air Act.

17 John McCain's position includes mandatory emissions limits implemented through a cap and trade system and declining steadily over time; see <http://www.johnmccain.com/Informing/Issues/da151a1c-733a-4dc1-9cd3-f9ca5caba1de.htm>. Barack Obama's position leads with a massive investment in innovation and new jobs, and includes a cap and trade program to limit emissions; see <http://my.barackobama.com/page/content/newenergy>.

18 U.S. Government Accountability Office. 2008. CLIMATE CHANGE: Expert Opinion on the Economics of Policy Options to Address Climate Change. Washington, DC: Authors. p. .7. Downloaded from <http://www.gao.gov/new.items/d08605.pdf>.

19 Wald, M.L. 2008. Mounting Costs Slow the Push for Clean Coal. *The New York Times*, May 30. <http://www.nytimes.com/2008/05/30/business/30coal.html?pagewanted=2&_r=1&hp>. Ironically, the Supreme Court ruling in Mass v. EPA that CO_2 is a pollutant under the Clean Air Act means that any underground sequestration of the gas, which was what most of the cancelled projects were intended to do, now falls under the regulatory purview of the Clean Water Act in the event that the contaminant, CO_2, comes into contact with water that should be clean of any contamination.

20 EU Ponders Carbon Tariff on Imports. 2008. *Business Week.* January 8. <http://www.businessweek.com/globalbiz/content/jan2008/gb2008018_121679.htm?chan=globalbiz_europe+index+page_top+stories>.The issue is not the effect of international agreements, but the much easier to implement decisions of large US trading partners, domestic policy shifts over which the US has no real power. The US chemical industry has already experienced impacts on its domestic operations as the result of EU policy concerns about chemicals and cancer risks. C.f. Layton, L. 2008. Chemical Law Has Global Impact: E.U.'s New Rules Forcing Changes By U.S. Firms. *Washington Post.* June 12, p. A01. <http://www.washingtonpost.com/wp-dyn/content/article/2008/06/11/AR2008061103569_pf.html>

II. Responses to Date

Energy policy is not new on the state policy agenda. So it is appropriate to review what has been accomplished in the Commonwealth in recent years and what has been adopted in new legislation in recent sessions. A logic for responding to both economic development and environmental issues has been worked out, and any new programs should build on the past experience and decisions made.

HB 1 and the PSC's Section 50 Report

In the summer of 2007, Kentucky took a major step toward adapting to the emerging pressures in energy markets with the passage of HB 1. The 2007 Energy Act authorized subsidies for various kinds of "alternative energies," with the largest amount being dedicated to a major subsidy for a coal liquefaction plant if one were to be built in the Commonwealth (assuming, implicitly, that technology would be available for carbon sequestration that could make the facility both economically viable and environmentally acceptable). The bill also directed the state PSC to address four issues associated with improving the efficiency of energy generation, consumption, and pricing policy and practices in the Commonwealth.

Some assumptions inherent in the calculations about the costs and benefits associated with the liquifaction plant subsidy authorized may no longer be appropriate, most notably the presumption that the plant would produce 460 new coal mining jobs when the industry now has massive export demand and does not need to generate new uses for coal. That factor, however, combined with the termination of virtually all US field pilot projects in carbon sequestration and the pledges of both of the current US presidential candidates to take steps to incentivize carbon emission reductions, reduces the likelihood that the plant will be built in the near future.[21] Thus the expenditure of the $300 million authorized in subsidies is not a serious issue in the short term, certainly not in the next biennium.

On the other hand, progress has been made in considering some other issues the Act was intended to address, with the PSC issuing *Electric Utility Regulation and Energy Policy in Kentucky* in early July of this year. The report addresses the four issues the PSC was directed to examine in Section 50 of the 2007 Energy Act:

- Eliminating impediments to consideration of cost-effective demand-side management (DSM);
- Encouraging diversification of generating power from coal through promotion of renewables and distributed generation;
- Incorporating full-cost accounting by utilities and the PSC; and

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[21] Most of the field pilots planned before 2008, such as FutureGen, which was heavily supported by the federal government are on life support at best, with one surviving project, supported by Duke Energy reported to be still in the pipeline as of May, 2008. (Wald, M.L. 2008. Mounting Costs Slow the Push for Clean Coal. *The New York Times*. May Downloaded 6/1/08 from <http://www.nytimes.com/2008/05/30/business/30coal.html>.The Department of Energy (DOE)' program plan as of 2007 did not anticipate field testing of selected technologies to begin until 2012, so there is no expectation that any technology will be demonstrably economically viable and attract private investment for installation until tests are completed at the end of that decade. (U.S. DOE. Office of Fossil Energy National Energy Technology Laboratory. 2007. *Carbon Sequestration Technology Roadmap and Program Plan.* Washington, DC: Authors. Figure 5, p. 11. Downloaded 8/3/08 from: <http://www.netl.doe.gov/technologies/carbon_seq/refshelf/project%20portfolio/2007/2007Roadmap.pdf>.

- Modifying rate structures and cost recovery to align financial interests of the different parties involved.[22]

Unfortunately, the report and the process by which the data for it were collected and analyses conducted by the PSC left much to be desired. The consultants took an extremely traditional and conservative approach.

The consultants, and thus the PSC, never acknowledged, let alone incorporated, the changing realities in energy markets and the approaches to reducing power demands and associated environmental impacts that are increasingly being implemented in other US states with which Kentucky competes for business, for jobs, and for residents. Thus, the PSC declared its objective as being to identify,

> "… certain recommendations … which it deems to be most important to promoting energy efficiency while preserving Kentucky's historically low energy costs." – Kentucky Public Service Commission. 2008. *Electric Utility Regulation and Energy Policy in Kentucky*., p. 17,

Given the domestic and international pressures to reduce carbon emissions, the initiatives already under way in other states, the higher emissions generated by coal as compared to even other fossil fuels, and the surging demand for coal as an interim fix for exploding power demands in growing low-income countries, it is time to confront the fact that the preservation of low energy costs is not possible.

The PSC consultants, Overland Consulting of Overland Park, Kansas, and their subcontractors, also narrowed the scope of their investigation unnecessarily, and arguably inappropriately, in the parties that they invited to participate in their deliberations. From the PSC report description of their study process and comments from participants it appears that no information was obtained from organizations in Kentucky that systematically engage in some of the more significant current DSM efforts: those groups that specialize in weatherization and other energy efficiency assistance to low-income households and those firms engaged in green building practices for both new construction and retrofits, and the many school systems in the Commonwealth that have made substantial investments in, and are achieving significant cost savings through energy savings and alternative energy projects.[23] They similarly failed to consult those engaged in heat and power cogeneration, those developing hydropower, or otherwise actively engaged in or attempting to develop distributed generation capacity in Kentucky.

This omission from the data collection effort represents a significant failure to attempt to establish the actual and reasonably anticipated returns to investment in energy use reductions in specific contexts within the Commonwealth. Absent such information, recommendations for specific actions are more difficult to craft and the dollars and cents rationale for action is not as clear as it could be. The cost of currently available power is one factor in private ratepayer investment of money and time in demand management efforts, but so are attitudes and understandings, not to mention expected future costs. Those costs are minimally addressed and the forecasts of probable returns to different actions seem to ignore the history to date of rising coal prices, the inevitability of some costs being imposed on processes (such as those in coal-

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22 Kentucky Public Service Commission. 2008. *Op. cit*., p. 9.

23 Admittedly, Community Action Kentucky, an alliance of 23 Community Action Agencies in the Commonwealth, was a participant. While CAK members did weatherize 2,255 homes statewide in 2006-2007, they do not represent the technical expertise in architecture and engineering that could have contributed to a more thorough analysis of DSM through building design and retrofitting.

fired power plants) that release carbon emissions, and other impending threats to the economic viability of the Kentucky *status quo*.

The consultants' – and thus the PSC's – stress on the inevitability of any price increases having major negative impacts on lower income households reflects this narrow data collection process.[24] Their failure to consult the energy efficiency practitioners who could have provided insights into programs to protect the poor from the potentially devastating impacts of rapidly rising energy costs. This oversight is not just a matter of letting everyone into the consultation. The concern about imposing new costs on the poor shapes some of the PSC recommendations – as it should. But one result of ignoring ways of mitigating those cost burdens through state investments in energy efficiency measures that have both macroeconomic and environmental benefits may be rejected due to what appear to be inevitable negative economic justice impacts.

Finally, the discussion of risk in the report returns repeatedly to the uncertainties associated with different recommendations for action. The risks inherent in doing nothing and continuing with the current overwhelming dependence on a single generating source, coal, are ignored in comparison. While the fuel itself is abundant in Kentucky, global market conditions can alter its price, as is already evident. The risks inherent in the fact that plant operating procedures and costs can be massively affected by the actions of regulatory bodies over which the Commonwealth, the PSC, and the generators have no power are never compared with the risks associated with alternatives. As a result, the apparent costs of innovation are exaggerated relative to the (overlooked) costs of the *status quo*.[25]

These procedural and methodological flaws ended up shaping the PSC's findings and reducing the value of the report and its relevance to the changing policy environment now facing the Commonwealth. The problem is evident in the discussion of each of the individual issues the Commission addressed in response to the Section 50 mandate. Without addressing each of the individual action recommendations, the general discussions of the four issues illustrate how these limitations weakened an otherwise excellent PSC report.

1. *Eliminating impediments to consideration of cost-effective DSM* – The potential for encouraging cogeneration at industrial installations using high volumes of electrical power is never considered in the discussion of industrial opt-outs from the DSM programs, however they may be shaped and monitored by the PSC. Where the power usage involves processes

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[24] It also may explain the assumption about its ability to hold down price increases, while ignores political realities. No state legislature would let people freeze, or sit in the dark, as a matter of state policy by its inaction in the face of the major increase in the cost of coal-fired electricity that may be arriving. There are also grounds for suspecting that some action may be ordered by the courts in the absence of new legislation. In any case, shot-term *ad hoc* interventions and financial assistance (such as low-income energy assistance year after year) will cost non-poor Kentuckians more in tax dollars – and/or higher utility bills – if nothing is done. So it would become rational to see if a one-time investment with some future maintenance might not save the non-poor taxpayers and ratepayers money over time.

[25] The different scenarios and outcomes cited in the conclusions of a recent study on the global coal market serve to highlight the extent of uncertainty the reliance on coal-fired electricity faces in the coming decades and the extent to which decision-making that understates the risks of business as usual fails to map the realities that good public policy must address:

> "Analysis of coal consumption under alternative assumptions about price penalties on CO2 emissions shows that, even under greenhouse gas controls, the coal industry will likely be larger in 2050 than today if nuclear growth is restrained and natural gas prices follow the projection of our economic model. *Provided*, that is that CO2 capture and storage (CCS) is available. If CCS development is for some reason restrained then projected 2050 coal use is substantially reduced. Growth in nuclear power also reduces coal use in the period to 2050, though not necessarily below levels of today if CCS is applied." – J.R. McFarland, S. Paltsev and H. D. Jacoby. 2008. *Analysis of the Coal Sector under Carbon Constraints.* Report No. 158. Cambridge, MA: MIT Joint Program on the Science and Policy of Global Change, p. 20.

generating heat above some level, the industrial user (and utility) should demonstrate the lack of any cost-effective distributed co-generating capacity before any opt-outs are permitted, since cogeneration may have a greater effect on overall usage than industrial users' energy conservation efforts alone.[26]

The major gap in the recommendations offered for DSM lies in its effective omission of a large subset of ratepayers with massive investment in buildings that could be encouraged to do more to reduce demands through actions that the PSC could encourage: school systems, local and state government-owned buildings, large rental housing facility operators and commercial building owners. Schools and rental housing complexes, in particular, have land under lawns, playgrounds and ball fields amenable to installation of geothermal systems that can drastically cut needs for electrical and gas service for heating, ventilating, and air conditioning (HVAC) purposes.[27]

A further myopia is evident in discussion of Recommendation 7 for educating ratepayers about the potential DSM and cost saving returns to small behavioral changes: under consideration of the legal standing of such efforts, the report notes that it "… [r]equires utility action."[28] Requirements for such action could be included in the minimum specifications set for any DSM program, a power the PSC already has – and the standard could be implemented through billing inserts each month not just recommending easy behavioral and low-cost energy saving actions, but also explaining why such actions also have long-term benefits for customers.

2. *Power diversification through promotion of renewables and distributed generation* – The failure to address the inadequacy of Senate Bill (SB) 83's 30 kW limit for net metering installation on buildings is directly attributable to the omission of public sector and commercial ratepayers from the groups invited to participate in discussions with the consultants. Large public sector and commercial users and garden apartment complex operators might have large expanses of perfectly aligned rooftops for solar or high ground location amenable to wind power, etc. Yet these potentials for distributed generation are never explored.

The only high priority recommendation regarding this issue in the PSC report is for developing common standards for net metering and interconnection. No attention is given to the cost savings that might be realized by promoting a smaller number of large installations (exceeding the 30 kW standard) for which only one special interconnection would be needed, as

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[26] Financing for the cogeneration facility could also be facilitated by the PSC, since in cases in which growing power demand suggests a need for new generating capacity, or if the industrial user and utility agree: the cogeneration unit that produces the electricity could be owned by the utility and its cost added to the capital accounted for in the rate base while the utility pays rent to the industrial user for permitting the unit on site. (This issue, however, might come up in consideration of Recommendation 32, for reconsideration of the regulation of industrial DSM practices and opt-out provisions, an approach the PSC approves [p. 58].)

[27] Schools, for example, can install geothermal heat exchangers for HVAC on their grounds for about $4 per square foot of interior space to be served. At current power costs, those systems can pay for themselves in seven to 10 years. In fact, Kentucky has one of the highest ratios of schools on geothermal systems of any state in the nation, with 255 out of 1,200 school buildings using geothermal HVAC. It appears that, on average, those schools save 20% on their annual utility bills -- but some of that return is due to different HVAC management practices." (Phone Interview, August 13, 2008, with Mark Ryles, Director of the Division of Facilities Management, Kentucky Department of Education) With gas and coal, thus electricity, prices rising as they have been the past two years, the overall payback period may well drop well below five years by the time new projects just being planned today get installed.

[28] Kentucky Public Service Commission. 2008. *Op. cit*. Table 2, p. 18.

distinct from the many such hookups required for equivalent distributed generating capacity installations meeting the low legislated standard.[29]

The issue of a Renewable Portfolio Standard (RPS), requiring some minimum commitment of effort to include renewables in the energy sources used by each utility to deliver electricity attracted extensive discussion and a great diversity of opinion across stakeholders. The discussion, unfortunately, is couched in terms of the mere *possibility* of rising costs for coal-fired generation, which is a *de facto* denial of the evidence of an effective *inevitability* of such costs.[30] Thus the rationales for the recommendations are based on very short-term analyses.

Given the limited scope of the PSC's legislative mandate, it is understandable, perhaps, that the economic development consequences of not taking action to promote renewables use in the Commonwealth are not addressed in the report.[31] But, in rejecting RPS mandates and/or subsidies and incentives, the PSC report refers repeatedly to waiting for the new technologies to develop and prove their cost effectiveness. If those technologies are developed elsewhere and by companies outside Kentucky, then the jobs that they make available are not likely to be open to the Commonwealth's labor force. If the economic development and possible job creation effects of a RPS stimulating innovation in the state were combined with the expected lifetime benefits to ratepayers of more rapid diversification away from ever more expensive coal-fired generation, then it is possible that a state mandate or strong incentives might make economic sense. Unfortunately, the consultants, and thus the report, failed to consider these possibilities.

3. *Incorporating full-cost accounting by utilities and the PSC* – In effect, the PSC Report rejects Full Cost Accounting (FCA) as an *energy policy planning tool* by focusing exclusively on its failings as a *basis for rate-making*. FCA can be described as an effort to include all the costs and benefits of all the alternative actions for which one wants to account. In the public sector decision-making realm, which is the arena for energy policy planning, FCA would attempt to assess the economic, social and environmental impacts of alternative policies and actions.

The PSC is completely correct to reject the tool as a basis for rate-making. Such an approach would not only have the effect of driving up utility rates but also would impose the additional burden on the utilities – or the PSC – of disbursing the additional funds collected to those parties suffering any economic, environmental and/or social losses attributable to the state's energy policies. Paying off in this manner those who, in economists' terms, suffer the negative externalities is clearly a policy absurdity. Kentucky should not want to do this.

But the very absurdity of this idea should have alerted Overland and the Commission itself that the legislative intent in ordering an examination of FCA as a tool for decision-making by the PSC and the utilities was not the idea of applying the logic to rate-making. The PSC logic in identifying Recommendation 15, "Implement Statewide Planning" as a recommended but low

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[29] The lower level of attention given this issue in the PSC report may be understandable, given that it was initiated prior to the passage of HB2 in the 2008 regular session of the legislature that extended the net metering coverage to include power sources other than photovoltaics. Still, the report was completed after the legislature extended the same net metering hookup requirements for those generating electricity with wind and water power.

[30] E.g.: "According to Overland, the costs of conventional generation have the potential to increase in the future …" (p. 33), and the comment that the Generating Utilities "… indicated that [alternative energy capacity] should only be considered to the extent that it represents the least cost resource." (p. 34). Obviously, what constitutes a "least cost resource" depends on fuel cost projections – and whether costing is done as of the current instant or over the lifetime of the installation.

[31] On the other hand, the economic development consequences of electrical power *rates* have long been considered a key element in utility regulation in Kentucky. C.f. Kentucky Public Utility Commission. 2005. *Kentucky's Electric Infrastructure: Present and Future. An Assessment Conducted Pursuant to Executive Order 2005-121.* Frankfort, KY: Authors.

priority for action, while assigning high priority to rejecting Recommendation 19 for the use of FCA in the Integrated Resource Plan (IRP) and Certificate of Public Convenience and Necessity (CPCN) decision making (which is not rate setting) is not at all clear.[32] After all, the FCA process would provide more data for state-wide planning if it were integrated into regulatory processes that are ongoing at the PSC. Moreover, requiring the utilities to collect social, economic and environmental impact data would reduce the public sector costs associated with statewide planning – and might even induce some behavior change by utilities if they discover that an equally profitable alternative has fewer adverse effects off the company balance sheet.

FCA could be used effectively to assess alternative power regulation policies and practices that the PSC might contemplate, and certainly could provide data and grounds for arguing in favor of actions the Commission might want to recommend to the legislature. (One example is the legislated 30 kW limit on net metering generation, which does not appear to serve a clear logical function.) The tool also could be used for reviewing utility proposals for investments in new generating capacity if there are known untapped potentials present in energy efficiency and cogeneration investments. That use, however, requires data inputs, which argues in favor of a high priority on *rejecting* Recommendation 19.

The real value of FCA lies in its value in providing data for well-informed decisions on utility regulation that includes public, not just private, costs and benefits. Moreover, some elements of full cost accounting, in its broadest sense, include risk factors that companies do not include in their internal private accounts, but that should be included. These risks are ***not*** logically external to the company accounts: corporate accounting systems frequently fail to actually include all prospective costs when their cost and revenue projections do not consider the effects of regulatory and market conditions that the firm simply hopes will not occur – or that the company has not previously had to consider.

One example of the tendency to overlook possible risks that should be incorporated into company accounts is the issue of the possible impact of acute climate changes on the ability of companies to continue to do what they have done. Even assuming the availability of a reliable and cost-effective carbon sequestration system which does not yet exist, and even assuming that the regulation of emissions and/or costs of carbon capture are minimal, there are reasons to be concerned about Kentucky's reliance on coal-generated electricity. Among them is the fact that coal power plants require cooling after steam is generated to drive turbines and produce electricity. There is thus a need for a constant supply of relatively cool water, unless more of the electricity generated is to be diverted to on-site cooling. Both significant temperature changes and weather shifts, including possible irregular but severe droughts are predicted, but uncertain and unpleasantly problematic, consequence of the build-up of greenhouse gasses in the atmosphere.[33]

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[32] Kentucky Public Service Commission. 2008. *Op. cit*. Table 4, p. 20

[33] Whether or not more droughts will hit Kentucky is not the issue, the problem is that such possibilities are rarely incorporated into company forecasts that get used in internal planning and decision-making. FCP, under PSC supervision, could reduce the likelihood of such errors. Public involvement in improving such decisions is appropriate to assure that regulated entities serve the "Public Convenience and Necessity" at the least possible cost and lowest risk of failure. The National Aeronautics and Space Administration predicts that summer temperatures in the Southeastern US will rise 10 degrees by 2080, raising the prospect of increased surface water evaporation – and massive increases in demand for cooling capacity. (National Air and Space Administration. 2007. "Study Suggests Extreme Summer Warming in the Future." (May 9, 2007). Downloaded from <www.nasa.gov/centers/goddard/news/topstory/2007/extreme_summer.html>. The major risk of major long term droughts in the US is described by the Intergovernmental Panel on Climate Change as arising not in this part of the country, but in the Colorado River and Columbia River basins. (Bates, B., Z.W. Kundzewic., S/ Wu and J. Palutikof (Eds.). 2008. *Climate Change and Water*. Technical Paper of the Intergovernmental Panel on Climate Change, Geneva, SW: IPCC Secretariat.)

When there is a sufficiently high risk of not enough running water to cool power plants, electric utilities may need to build or retrofit cooling towers to reduce water used or otherwise use fans and/or refrigerants to cool (both expensive propositions that would result in higher electricity costs). In acute cases, and in the event of severe drought, however, plant operators also may also be forced to reduced power generation, resulting not only in power shortages and possible brown- or blackouts, but in a situation in which a given sunk investment by a utility might generate fewer kWhs per year, so the unit cost of power would have to rise further in order to meet targeted levels of return on investment on the rate base. FCP would at least alert the PSC as the state's regulatory body that it may want to assure a mix of power sources to minimize the displacements and economic costs of such occurrences, even if their probability is relatively low.

4. *Modifying rate structures and cost recovery to align financial interests* – Aligning utilities' financial interests with conservation and distributed generation may involve modified rate structures, as the PSC report suggests. However, the discussion, consistent with the narrow language in Section 50 of HB 1, fails to consider regulatory options other than pricing that could support such an alignment of public and private interests. This is unfortunate, since non-pricing regulatory actions may be more cost-effective than monetary tools alone in attaining an alignment of economic interests.

DSM itself provides an excellent example of the issue. The public's interest in limiting demand is not merely a matter of lower bills through consumption. Bills also are held down by delaying or avoiding new plant construction since the average cost of power from new generators is generally higher than that for older plants: construction cost and depreciation charges may raise costs more than the greater efficiency of the facilities serves to lower them. Generating companies' returns are determined in part by their rate bases, which would grow with new plant construction, so they appear to conflict with consumers' interests. However, they need PSC permission to build new generating capacity or change the rates they charge, so it is in their financial interest to meet – or even exceed – regulatory requirements in order to attract even marginally faster PSC assessment of their requests for rate increases and approvals for other actions. Might not regulatory requirements, not cost-reimbursements, generate the needed DSM?

Obviously, the PSC-cited funding and personnel authorization issues (with respect to Recommendation 25) may compromise the work of the Commission on many levels. If the commission is to function, it needs the resources to do its work and it should be provided with the needed funds, salaries and staffing. But that increased/enhanced organizational capacity should also enable the PSC to move beyond the traditionally narrow rate and facility authorizing roles it has played in the past and which are not adequate to address the public policy choices with respect to energy that now face the Commonwealth.

The Commission's request for the power to offer financial incentives for DSM measures (Recommendation 26) reflects its HB 1 mandate. Other states have long required DSM actions as conditions for consideration of rate increase and new generating facility requests. It might better serve the energy and economic development interests of the citizens of Kentucky to emulate those other state procedures. Some of them avoid lowest common denominator standards but tailor requirements to utility service area characteristics and needs for demand management efforts. A new mandate to the Commission for examination of these so-far

overlooked opportunities to use behavioral standards as a means of expanding utility involvement in DSM remains in order, notwithstanding the provisions of Section 19 of HB 2.[34]

Similarly, rate caps are not the central issue in controlling costs. Investor rates of return are never guaranteed in the marketplace – and may not be possible to assure under regulation. For example, as already noted, the failure to address the potential long-term impacts on economic development efforts and manufacturing payrolls of the Commonwealth's reliance on coal-fired electricity could result in loss of industrial and commercial ratepayers if carbon emissions were to be regulated. In such a case, power sales would be lower than utilities expected. Would the PSC raise rates to residential ratepayers to assure the expected investment returns to the utilities? Are they constitutionally required to do so?

Energy efficiency and DSM measures do not pose the future economic problem of assuring some return to invested capital that requires a rate increase if major power users reduce their operations in the Commonwealth. They – and distributed generation using renewable energy sources – thus are preferable, on risk management terms, to authorizing new centralized generating capacity.

Treating these tools more as economic development risk avoidance measures than exclusively as energy policy options would give them the higher standing they deserve in state policy-making than they were given in HB 1. HB 2 raised their profile, but still more may need to be done to protect Kentuckians from the economic ravages of rapidly rising energy costs.

HB 2 and Investments in Energy Efficiency and Renewables

The passage of HB 2 in the 2008 session of the Kentucky legislature represents major progress in addressing some of the economic issues raised by rising fuel costs and the threat of new costs or limits placed on carbon emissions. Section 2 declares a specific intent with respect to energy consumption:

> "The General Assembly finds and declares it to be the public policy of the Commonwealth to maximize the use of energy efficiency measures in the construction, renovation, and maintenance of buildings owned or leased by the Commonwealth."

This statement of principle and legislative intent is a major step forward, given past consumption patterns. The "High-Performance Buildings Advisory Committee" ("the Committee") created under Section 5 is specifically given a mandate that extends far beyond a concern for buildings owned or leased by the Commonwealth. In principle, given its mandate, the Committee could greatly influence and promote other energy efficiency efforts, even excluding provisions to promote them in later sections of HB 2.

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[34] That section of HB 2 does mandate additional PSC examination of DSM opportunities, but it remains focused on financial incentives and cost recovery as means of assuring regulated entity involvement in the activities. Whether or not permitted under current Kentucky law, mandating DSM efforts as conditions for standing to submit rate change requests and other petitions for approval by the PSC could be more effective incentives, especially if the standards for effort are tailored to the markets served by the regulated companies. (That is, for example, the higher the proportion of lower income ratepayers living in mobile homes in a utility's service area, the more its DSM efforts should be committed to providing capital and construction capacity to those ratepayers. One approach to financing might have the PSC facilitate more rapid utility rate change requests to allow cost recovery through billing. Alternatively, the capital cost of the "weatherization" efforts might be borne by the state, with the PSC using its regulatory powers alone to assure certain efforts by the utility to assure that the needed local effort was committed.)

On the other hand, HB 2 is a limited first step, as can be seen from examination of some sections implementing the declared public policy:

- Section 8 specifies detailed monitoring and reporting on state government energy efficiency efforts, which appears to reflect the General Assembly's concern for maximizing returns on energy efficiency investments. However, there is no provision for using the state's experience to encourage similar efforts by other large property owners in the Commonwealth, which could be accomplished simply by requiring broader dissemination of the legislatively required reports. They can be examined with an eye to how they can be strengthened in order to more thoroughly protecting Kentuckians' economic well-being in the face of energy cost increases.
- Section 9 mandates a state revolving fund for the needed energy efficiency expenditures, but it does not recommend or appropriate a specific level of funding. The section could have established a principle for accumulating funds for energy efficiency investments across the Commonwealth by including provisions for sharing some proportion of the realized energy savings with the fund, not just for the principal borrowed.[35]
- Section 10, promoting the use of energy savings performance contracts, appears to reflect an effort to minimize the public investment required to pursue the primary objective of HB 2. The problem with this strategy is that a major portion, if not all, of the cost savings resulting from energy saving investments made by the firms with which the Commonwealth would contract for such work, would go to the contractors. By contrast, if the state floated bonds for the work and then contracted for the required retrofits, new construction, etc., the General Fund – or the special energy saving revolving fund created under Section 9 – could earn those returns. Kentucky already has the expertise to manage its own energy savings efforts, as demonstrated by the successes of the Division of Facilities Management, of the Department of Education.[36] Thus, in relying on private contractors for energy saving investments – many of them likely to be out-of-state firms given the Commonwealth's limited past interest in such efforts – the General Assembly has failed to maximize the possible tax savings and employment benefits from such public investments for Kentuckians.

So, HB 2 is a first step. Examining the Sections intended to stimulate energy savings efforts in Kentucky beyond those of state government can help illuminate the path to next steps.

Section 11 provides badly needed definitions and standards required to give focus and meaning to efforts to increase buildings' energy efficiency and facilitate renewable energy investments across the Commonwealth. Unfortunately, the definitions legislated to identify the investments eligible for tax state credits place Kentucky in the positioning of certifying particular existing technologies during a period of accelerating technological change on both the energy efficiency and distributed generation fronts. Moreover, in some instances, the definitions, intended to assure some level of efficiency gain per dollar of state subsidy to energy efficiency investments, may impose performance standards that are cost-ineffective and become a barrier.

- Subsections 6, 7, and 12 lock the Commonwealth into the Federal definitions existing at the end of 2007, when those definitions, and their appropriateness, may change over time.

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[35] Costs avoided through reduced energy use could be determined by comparisons to some prior years' moving average of total power consumption, adjusted for current year heating and cooling degree-days, with that proportional savings applied to current utility unit costs for power. The High-Performance Buildings Advisory Committee is mandated to guide such calculations (and which would be required in any case to complete the reports required under Section 8).

[36] Mark Ryles. 2008. *Phone Interview* August 13. Mr. Ryles, Director of the Division of Facilities Management, Kentucky Department of Education, described massive energy savings already achieved in schools across the Commonwealth, with plans and construction reviewed and approved by his office.

- Subsection 14 locks in a particular set of technologies for solar water heating when other cost-effective systems already exist, and delegates to a potentially biased body the power to certify the eligibility of particular technologies when the Committee created under HB 2 to deal with energy efficiency would have the knowledge needed to certify technologies for Kentucky.[37]
- The R-value standards for "Upgraded insulation" in Subsection 15 may be unattainable and/or prohibitively expensive to install for manufactured homes, especially for those built prior to the imposition of federal minimum standards in 1976.[38] Manufactured homes comprised roughly 25% of all homes in the Commonwealth as of 2007. Those older mobile homes, over 15% of manufactured housing in the state, or at least 35,000 homes, are reported to consume up to *two times* the energy of site-built homes. They are in desperate need of assistance in managing current and future energy costs, yet it may be cost-ineffective or even impossible to reach the legislated performance standards for those residential units.[39]
- Subsection 16 relies on certifications as does Subsection 14, but these involve a public body, the US Department of Energy. The requirement that wind power installations comply with local zoning and land use requirements appears to appropriately defer to local controls, but leaves open the possibility that parochial local interests could deter the Commonwealth from taking advantage of its best opportunities to utilize this renewable resource.

The General Assembly took major steps towards extending promotion of energy efficiency and use of renewable resources beyond its initial focus on state buildings in Sections 12–28 of HB 2. Tax credits and actual bond-financed loans and grants, in addition to state-supported information and guidance, have been made available to stimulate local government, school district and a variety of private sector efforts. Much remains to be done, however, to assure that the investments that HB 2 attempts to stimulate actually take place.

Energy Efficiency Tax Credits for buildings are offered in Sections 12 and 13, clearly intended to stimulate investment in retrofitting and building residential and commercial buildings that are more energy efficient than is the norm at present in the Commonwealth. That intent may be served to only a limited extent by the provisions of HB 2 for a number of reasons.

- The dollar value of the credits is extremely limited, so its real incentive value is questionable. While HB 2 promulgates a “30% tax credit,” the real costs of the requisite investments are such that the limit on total subsidy permitted any one taxpayer means the effective percentage tax credit is lower. The $100 credit limit for insulation, for example, means that the credit is 30% of the investment up to an expenditure of $333, after which it is zero. Relatively few buildings with inadequate insulation, other than those with very limited attic or

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[37] HB 2 relies exclusively on the Solar Rating and Certification Corporation as the certifier of eligible technologies. Given the interests of its members (and funders), that body might substantially delay certifying as acceptable a new proprietary technology that rendered obsolete many of the products offered by its over 60 participating companies. The Kentucky High-Performance Buildings Advisory Committee also should be given the power to certify such technologies as eligible for tax credits.

[38] The U.S. Department of Housing and Urban Development (HUD) enacted thermal standards in 1976. (Judkoff, K.D., C.E Hancock, E. Franconi. 1990. *Testing the effectiveness of mobile home weatherization measures in a controlled environment: The SERI CMFERT Project* (SERI/TP-254-3629). Golden Colorado: Solar Energy Research Institute. Downloaded from <http://www.nrel.gov/docs/legosti/old/3629.pdf >.

[39] Blown-in insulation works well for roofs and floors, but narrow walls may not reach HB2’s R-13 standard. Manufactured homes as proportion of all homes taken from Kentucky Manufactured Housing Institute. 2007. *Serving Kentucky Facts*. Retrieved from <http://www.kmhi.org/facts.htm>. Energy efficiency comparison from Judkoff, K.D., *et al.*1990. *Op. cit.* Estimate of proportion and number of mobile homes built pre-1976 derived from the U.S. Census Bureau’s 2006 American Community Survey for Kentucky; raw PUMS data downloaded from <http://factfinder.census.gov/home/en/acs_pums_2006.html>.

roof insulations, could enjoy an effective energy use reduction for that level of expenditure on installed insulation.[40]

- The total tax credit dollar limits in Section 12 are not per residential unit or even per building, they are per taxpayer. With a maximum tax credit for HVAC-related investments of $1,000 a year, and an equally small amount for investment in lighting efficiency, large rental premises operators, whose commitment to increasing energy efficiency might affect hundreds of dwelling units, may find no incentive for action in HB 2. The same problem arises for commercial building operators that may control thousands of square feet of premises.
- A tax credit, by its nature, presumes that the recipient has access to the capital needed to make the qualifying investments. Any household that cannot self-finance or borrow funds for the energy efficiency investments will not be able to get the credits. There is generally a correlation between household income and the quality of the housing stock it occupies, so the greatest need for energy saving investments is likely to be in those homes that are least likely to take advantage of the credit since the owners cannot obtain the funds for the needed improvements. The potential energy savings could easily generate the funds to underwrite loans for better insulation and heating plant improvements in older homes, many of which remain completely uninsulated.[41]
- The same problem arises for the commercial building operators, with those leasing out the oldest and worst maintained buildings being the ones whose tenants consume the most power, but who may not have access to the capital for upgrading the quality of their building stocks.
- A further problem for many commercial properties is the prevalence of "triple net" leases, under which the finishing – including lighting and HVAC in most instances – on retail and office premises is the responsibility of the tenants, not the owners. Section 12(3) provides a tax credit for a property that is "owned and used by the taxpayer as commercial property," excluding from tax credit eligibility the lessees who may own and operate the lighting, heating and cooling in spaces they occupy under long term leases.

Section 13 focuses on new residential construction, offering limited tax incentives for construction of ENERGY STAR Qualified homes and manufactured homes. This provision responds to a known need to promote more efficient construction since, as the Kentucky Roofing Contractors Association recently reminded its members that only 6% of new homes in the Commonwealth in 2007 qualified as ENERGY STAR while nationwide the figure was 11%.[42] Given that an average of $390-a-year reduction in heating and cooling costs can be realized on

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[40] The HB-2 limits on possible tax credits contrast with those in other states that range up from multiple thousands for homes to millions for some commercial structures, according to DSIRE, the Database on State Incentives for Renewables and Efficiency. While other states may have lower percentages of tax credits (or full sales tax exemptions) that appear to offer less that the Commonwealth's 30%, the low level of the maximum subsidy means that other states, among them Montana and Oklahoma, not just the traditionally liberal states, are providing much stronger tax incentives. See and click on the entries of the comparison table at <http://www.dsireusa.org/summarytables/FinEE.cfm?&CurrentPageID=7&EE=1&RE=1>.

[41] One flyer promoting construction of ENERGY STAR in Kentucky, using dated power and building cost information, estimated the *annual savings* associated with upgrading from a new home meeting current state standards to an ENERGY STAR qualified home to be $390 a year. (Kentucky Office of Energy Policy. ND. *ENERGY STAR Homes.* Frankfort, KY: Author. Available from 800-282-0868.

That savings would be greater today, given power cost increases, and would grow in the future. And those are the savings for a *brand new site built* home. The savings are far greater for older manufactured homes built to lower insulation standards, but the owners and occupants of such homes do not have access to private capital for the energy-saving investments.

[42] Kentucky Roofing Contractors Association. 2008. *Kentucky effort promotes energy-efficient building.* Posted May 9. Downloaded from <http://www.krca.org/news/details.aspx?id=10>.

a 2,000 square foot site-built home, it is not clear that the new $800 tax credit for homes and $400 for manufactured homes can make a real difference. The return on investment in the additional cost for meeting ENERGY STAR standards (if it actually costs more) is so high that not having a subsidy does not seem to be the barrier to building to a higher energy efficiency standard. Any review of HB 2 should consider whether a different state investment comparable to the tax losses associated with Section 13 could result in a more cost-effective stimulus to increased new home energy efficiency.[43]

Funding is an issue for implementation of many of the initiatives in HB 2. The mandate to facilitate hydroelectric power on Kentucky River dams in Section 15 does not impose serious additional work on the Kentucky River Authority. The same cannot be said for the requirement in Section 16 that all 174 school systems enroll in the "Kentucky Energy Efficiency Program that is offered by the Kentucky Pollution Prevention Center (KPPC) at the University of Louisville …" The KPPC simply does not have the staff and field operations to fully support the program for all the school systems in the Commonwealth; the absence of funding for technical assistance and encouragement means that the school systems will get some workshop training on what is possible, but little no-cost support in initiating programs to increase efficiency.[44]

The energy efficiency career track promoted in Section 17 recognizes key emerging job opportunities. Not just the energy efficiency and renewable energy sectors but the traditional power utilities are all reporting job shortages.[45] Student interest in, and the economic benefits of, such new training programs is likely to be somewhat related to the availability of jobs in the Commonwealth. State investments that promote new energy investments and businesses in Kentucky will be complemented by this career training, increasing the benefits from both lines of effort.

The major funded program under HB 2 is the "Bluegrass Turns Green" initiative, comprising both a Public Sector Grant Program (funded with $50 million in authorized bond proceeds) and a Private Sector Loan Program (funded with $30 million). This initiative is explicitly intended to promote energy efficiency across the Kentucky economy through demand management, to save taxpayer dollars, contribute to economic development, preserve natural resources (presumably coal assets), and even to position "the Commonwealth as a benchmark state for demand-side management efforts." This last objective complements the longer term objectives of career training of Section 17, while the other objectives comprise responses to the current energy cost pressures on Kentuckians and Kentucky businesses.

While this initiative expresses an admirable intent and has the potential to contribute significantly to improved economic prospects and quality of life for Kentuckians, in its current form it is not likely to have a significant impact even if all the authorized bonds are floated.

- First and foremost, the bond funding authorized is not close to adequate for serving the needs of the Commonwealth. The $80 million in combined authorization for all private and public initiatives can be compared to the annual actual expenditure on new construction and

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43 *Energy Star Homes. Op. cit.*

44 10-20% improvements in school building energy efficiency can be attained through altered school building management practices with little or no capital investment (Mark Ryles, 2008 Interview. *Op. cit.*). Fuller funding of the KEEP-Schools effort by the KPPC that enabled it to provide more encouragement and guidance could be a very cost-effective state investment.

45 United States Senate, Committee on Energy and Natural Resources. 2007. *Domestic Energy Industry*. Hearings to receive testimony on whether domestic energy industry will have the workforce—crafts and professional. 11/06/07. Washington, DC: US GPO. Downloaded from <http://frwebgate.access.gpo.gov/cgi-in/getdoc.cgi?dbname=110_senate_hearings&docid=f:40735.pdf>.

rehabilitation of Kentucky's K-12 school buildings alone, some $600 million.[46] With all the public and business buildings, not the mention homes that could realize cost savings through energy efficiency investments, the funds made available are inadequate.

- Nationally, 2004 investment in energy efficiency technologies in the US was estimated to be roughly $43 billion and that expenditure was expected to yield at least $77.4 billion in energy savings by the end of this year.[47] This means the expected payoff to the investments over a mere 4-year period was at least $1.80 for every $1.00 invested. That is far better than the maximum permitted payback period in HB 2, five years. (The Internal Rate of Return (IRR), a measure used to see if a possibly risky investment is worth undertaking, turns out to be 80% even if there were no savings from the 2004 investment until 2008.) The payoffs to investing in energy efficiency of processes and buildings will continue over time beyond that 4-year period, and their value in constant dollars would rise if energy costs went up faster than overall inflation – which they appear to be doing at an accelerating rate.
- The payoffs are obvious, even for something a simple as energy efficient lighting that may require not structural work or construction. The University of Louisville's Center for Environmental Policy and Management found that just converting state-owned buildings to more efficient lighting systems, replacing incandescent with compact fluorescent (CFL) bulbs, would save $356,710 a year at an absolute minimum, using energy costs as of 2007, with an IRR in excess of 150%.[48] That is just lighting, not heating and cooling, and the estimate includes the difference in the cost of the bulbs, but does not include the labor cost savings of not having to replace bulbs as often, so the savings would actually be even greater.
- Given these massive returns on investments in energy efficiency, there is no need for the Commonwealth to provide *grants* to public sector bodies, as provided for in Section 23 of HB 2. The funds could be made available as loans, with reasonable certainty that the borrowers could pay the debt service costs back to the General Fund out of their realized energy savings, that is, with no budget costs to local governments or school districts.[49] Obviously, having the public component of the Bluegrass Turns Green initiative be based on loans would make the bond funds raised serve more energy efficiency investments.[50]
- The logic for issuing state debt for public sector and business investments in energy efficiency applies equally well for comparable investments in residential premises. Section 24, the private component of the initiative, appears to exclude rental housing, but there is no logical reason for those business buildings to be left out, since energy efficiency would either

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46 Mark Ryles. 2008. *Phone Interview. Op. cit.*

47 Ehrhardt-Martinez, K., and J.A. Laitner. 2008. *The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture.* Report Number E083. Washington, DC: American Council for an Energy-Efficient Economy. P. iv.

48 Opp, S., *et. al.* 2008. *Energy Efficiency as a Public Priority.* Practice Guide #20. Louisville: Center for Environmental Policy and Management, U. of Louisville. Table 7. p. 7. The actual per-bulb calculation (Table 6, p. 7) yields an IRR of 162%, assuming no energy savings in the first year after the bulb switch and a constant price of electrical power!

49 For building rehabilitation and energy system improvements, the returns might not be available until after all construction was completed. But this, in itself does not warrant a grant: a cushion for first-year debt service could be added to each loan, above and beyond the funds needed for the energy efficiency construction.

50 Given the IRRs of the investments in energy efficiency, local government should be able to demonstrate to potential lenders that they would be capable to service the costs of borrowing for such expenditures. Thus the only real rationale for centralizing the borrowing at the level of the Commonwealth of Kentucky is that some state body could review the construction plans for cost-efficiency (as is done now for school district construction plans by the DOE's Division of Facilities Management), and so that borrowing costs and effort may be minimized by floating a larger bond issue to cover many different projects, some of which may be too small to attract debt capital on their own. (The other possibility is to replicate or extend the existing efforts of the Finance Cabinet's Division of Facility Efficiency that manages relations with energy service companies for energy performance contracts to improve state-owned building efficiencies.)

increase landlords' profits or save tenants utility costs, a net gain to the Commonwealth if the rental properties are owned by Kentuckians.[51]

- There is no provision for loans to the owner-occupants of single family homes or larger buildings in which they occupy one unit while renting others. The majority of these homeowners are not capable of borrowing further, and those households are the economic actors in Kentucky who are in greatest need of some external financial support in increasing their energy efficiency.

If it makes sense to float bonds to support the energy efficiency investments promoted under the Bluegrass Turns Green initiative, then analysis needs to be conducted to determine how much really should be raised and how the proposals to use the funds should be prioritized in order to maximize Kentucky's ability to successfully and cost-effectively pursue the objective of HB 2.

The criteria used for energy efficiency cost-effectiveness in HB 2 may have the unintended effect of undermining the legislation's potential. The objective of treating each prospective energy efficiency effort as an investment and determining its economic return is admirable; the problem lies in its implementation. The process involves three distinct questions:

(1) What measure of return on investment is to be used?

(2) How are future benefits from energy savings to be valued?

(3) What minimum standard for investment returns is the cutoff for considering a project?

The measured cost-effectiveness of different investments will depend on the answers to these questions. Those efficiency measures are then likely to be used to prioritize efforts and investments, and thus affect Kentucky's overall success in reducing energy and other utility services consumption.

- Continued reliance on the almost decade-old process of relying on energy performance contracts to underwrite improving operations of the Commonwealth's physical plant (as is, in effect, recommended in Section 24, subsection 3) avoids committing bonding capacity or taxes to energy efficiency. The danger is that the energy efficiency investments undertaken will tend to be those that promise the greatest certainty to the contractors (who accept the debt service risk if the energy savings are not realized) given current utility service prices. In a period of apparently rapidly rising energy costs, however, they may not be the investments in physical plant that offer the greatest energy savings for the public in Kentucky over the long run.
- Section 24, subsection 4, addressing the use of the bond funds for the Bluegrass Turns Green initiatives specifies an initial maximum investment payback period of five years, and later permits a 12-year payback period. The logic appears to be that "low-hanging fruit" – the easy cost savings – should be undertaken first, then more complex and costly measures later. The problem is that minor or partial fixes today may lower the returns to major efficiency investments later, and that the combination may not be cost effective. Moreover, this provision demands a more rapid payback period in the near term, while the technology is not yet fully developed and energy costs are lower than they are likely to become, but allows for a longer payback period for future energy efficiency investments, after the technology will have had years to get more efficient and energy costs more. The higher the threatened energy cost increases, the more current investments in projects with substantially longer payback time horizons may be warranted. This is especially true with respect to housing energy

[51] Subsection (2) specifically references only loans to "any private retail, commercial, or industrial business."

consumption projects that may have to be debt financed, in particular for those low-income households facing massive power cost increases and living in very energy inefficient premises.

- No language is provided in HB 2 nor in other cited legislation to guide the critical issue of the unit energy cost projections (cost per kWh of electricity or 100 cubic feet [Ccf] of gas, etc.) to be used in the payback period projections, nor provisions for explanation of the cost forecasts employed in project appraisal. This leaves the estimation subject to political pressures and distortions when there are conflicts over particular projects.
- Reliance on a simple payback period measure of minimum efficiency means that the speed with which a return on investment becomes available during that time period is irrelevant. That is, so long as the investment cost results in total savings over, say five years, it meets the minimum, even if there are no savings at all until the fifth year. If the investment were to be financed with a loan (as in the private side of the Bluegrass Turns Green initiative), the absence of any energy savings for four years would mean operating costs would go up, with full utility bill payments AND debt service payments due. This may not be economically acceptable, and the risk that this could happen might deter potential investments under the initiative.
- An alternative tool for measuring investment returns is the IRR which is sensitive to the dates at which energy savings are experienced, as illustrated in Table 2. The three projects in this table all meet 110% of the maximum 5-year payback period criterion, but the payoffs occur at different points in time – and all show IRRs that well exceed current returns on secured investments. The timing of the savings affects the IRR, and thus permits prioritizing across projects exceeding the base criterion. (Prioritizing is likely to be essential to project selection with the limited bond support included in HB 2's Bluegrass Turns Green initiative.)
- The IRR tool, like a payback period measure, remains sensitive to the effects of different assumptions about the rate of increase in energy costs, as is evident across the three panels in the table. Not having accurate data on future costs for power makes any planning difficult. Recent evidence suggests that costs in Kentucky are likely to be rising far more rapidly than planners and policy analysts have expected.[52]

[52] The electricity rates paid by Kentuckians can be tracked, but the PSC provides for fuel adjustments monthly, so the roughly 10% state average increase is less visible than if there were a one-time adjustment. The latter just occurred for the Tennessee Valley Authority (TVA). On August 20, 2008, the TVA announced 20% increases in its electricity costs. TVA's customers, 226,000 households and close to 51,000 industrial and commercial ratepayers in Western and South Central Kentucky, face a $12-$15 increase per 1,000 kWh of electricity consumed. Their average household consumer will thus spend between $175 and $219 more on electricity each year as a result. Just getting typical Kentucky household consumption down to the not very energy efficient national average could effectively counteract the impact of this increase. Tennessee Valley Authority. 2008. TVA Board Approves 2009 Budget, Rate Adjustment. Press Release, Aug. 20. Knoxville, TN: TVA News Bureau. Downloaded 8/20/08 from <http://www.tva.gov/news/releases/julysep08/budget09.htm>; Tennessee Valley Authority. ND. *TVA in Kentucky.* Downloaded 8/21/08 from <http://www.tva.com/abouttva/pdf/kentucky.pdf>.

Table 2 -- Comparing IRR for Projects Meeting 110% of the 5-Year Payback Standard

YEAR	Cash Flow in Year	Project A	Project B	Project C
	(Assuming Energy Costs Rising 5%/year)			
0	Initial Investment	-$100	-$100	-$100
1	Energy Cost Savings	$110	$22.00	$0
2	Energy Cost Savings	$0	$23.10	$0
3	Energy Cost Savings	$0	$24.26	$0
4	Energy Cost Savings	$0	$25.47	$0
5	Energy Cost Savings	$0	$26.74	$133.71
	Internal Rate of Return	10.00%	6.65%	5.98%

Source: Authors' calculations.

III. Moving Forward on Energy Efficiency and Generation

Kentucky planning for energy and economic development in 2008 needs to take into consideration the reality that higher costs for emitting carbon – and thus for reliance on the electricity generated by the existing coal-fired power plants in the Commonwealth – will be a permanent part of its environment. Those costs will raise electrical rates for Kentuckians. Electricity rates will rise in the near future anyway due to the increased price of coal itself, which has become more expensive as all fossil fuel prices have climbed following the run-up in the cost of a barrel of oil.

The risk of a power cost shock that was raised as a concern shaping the policy recommendations in the 2008 PSC Report is already a reality, not an avoidable danger.[53] That concern, expressed by the then Governor's Office of Energy Policy, related to adding the costs of a RPS to the cost increases already expected from national policy to limit carbon emissions. Given the current economic reality of rapidly climbing coal prices and the advances in renewable energy technology lowering the costs of these alternatives, state implementation of an RPS is arguably a cost-saving measure over time.

In the near term, however, the damage of rising electricity and other power costs to the budgets and well-being of Kentuckians can be reduced through only one means: energy conservation. The technology and accepted standards for new construction and retrofitting exist, and the Commonwealth already has programs in place to increase the efficiency of many public buildings. Now is a good time to pursue energy efficiency since the effort requires new building construction spending and the sector has extensive slack capacity, as Table 3 illustrates.

Table 3 – Employment in Kentucky's Building Construction Sector

Year	Mo	Industry	Number Employed	% Change '02 to '08	% Change '07 to '08
2008	Apr	**Total Private Sector**	1,546,500	5.33%	0.48%
2007	Apr		1,539,100		
2002	Apr		1,468,200		
2008	Apr	**Specialty Trade Contractors**	53,400	4.50%	4.30%
2007	Apr		51,200		
2002	Apr		51,100		
2008	Apr	**Construction of Buildings**	17,600	1.73%	-9.28%
2007	Apr		19,400		
2002	Apr		17,300		

Source: Data selected from: <http://www.workforcekentucky.ky.gov/cgi/dataanalysis/AreaSelection.asp?tableName=Ces>

As the table shows, neither of the two key elements of the building construction sector in the Commonwealth has kept up with the employment growth in the private sector as a whole since 2002. Employment in the specialty trade contractors, which include plumbers, electricians, HVAC firms, and the like, has not seen the collapse shown by the building construction firms, and has actually grown in the past year while overall Kentucky employment has stagnated. This pattern reflects the strength of the remodeling sector when new home construction and buying declines. Its recent expansion, after stagnating employment from 2002 to 2006, may reflect new public sector and business investments in energy efficiency retrofits in the face of growing

53 PSC. 2008. *Electric Utility Regulation …* p. 13.

energy costs. That pattern suggests ample opportunity for public policy to encourage additional private sector investment in buildings to increase their energy efficiency.

The evidence is clear that energy efficiency improvements are the "low hanging fruit" that can be readily pursued and provide investment grade financial returns today while fuel technologies are still improving rapidly and standards for their implementation have not been derived.[54] Moreover, in terms of state actions, studies from across the US show that state investments can help to reduce electricity use – and can generate jobs in the process.[55]

The job and business creation potential of these investments is all the more important in Kentucky since rising electricity costs for firms attracted to what were once the lowest kWh prices in the nation could contribute to slower than anticipated economic growth, and thus job losses. The cost advantage of using coal rather than oil or natural gas to generate electricity will be eliminated further by implementation of any national policy to reduce carbon emissions. In the short term, loss of that cost advantage could mean lower sales and payrolls for firms in the Commonwealth – and thus lost tax revenues from them and their employees. Over the longer term, the state would have to develop new ways of attracting new employers for the Kentucky workforce if the lower cost of power could no longer be used as a recruitment tool. (If, as many forecasts suggest, the cost of carbon would have to be raised over time to meet national emissions targets, then reliance on coal would become a *relative cost disadvantage* that economic development efforts would have to overcome.)

These are real risks to firms, but much greater risks to the Commonwealth and the citizens of Kentucky. The Full Cost Accounting rejected in the PSC 2008 report could help assess those risks. FCA would assign a greater than 0% probability to this event and allow the PSC and the legislature to consider the loss potential associated with investing in a new coal generating plant as an offset to the demonstrably-higher current cost of investing in renewable power sources such as solar installations on the rooftops of major industrial, commercial and residential multi-family buildings.

So there is a need for action, opportunities for economically efficient investments exist, and HB 2 has laid the logical and legislative foundation for further efforts. Some actions may be initiated by the PSC and some will require legislative action, but there is a wide range of options available and those possible paths need to be prioritized. The options available and their payoffs are driven by available and still-developing technologies, by a region's geological and topographic characteristics that affect access to renewable energy, and of the local built environment, from factories to single-family homes. The national picture surveyed in a 2007 McKinsey consulting report shows a far greater payoff to efficiency investments than those in co-generation or combined heat and power plants, but their assessments relate to the nation as

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54 Creyts, *et al.* 2007. *Reducing U.S. Greenhouse Gas Emissions …* [supra Note. 6]. C.f.: Rufo, M., and F. Coito. 2002. *California's Secret Energy Surplus: The Potential for Energy Efficiency.* Final Report, XENERGY Inc. San Francisco, CA: The Hewlett Foundation and The Energy Foundation. Downloaded 6/16/08 from <http://www.ef.org/documents/Secret_Surplus.pdf>.

55 C.f.: Bezdek, R. 2007. Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century. Boulder, CO: American Solar Energy Society. Downloaded 6/15/08 from: <http://www.ases.org/images/stories/ASES-JobsReport-Final.pdf>; Geller, H., J. DeCicco and J.A. Laitner. 1992. *Energy Efficiency and Job Creation*. Report ED922. Washington, DC: American Council for an Energy-Efficient Economy (ACEEE). Downloaded from <http://www.aceee.org/pubs/ed922.htm>; Laitner, J.A., and M. Kushler. 2007. *The Economic Benefits of an Efficiency-Led Clean Energy Strategy to Meet Growing Electricity Needs in Michigan. R*eport E07X.Washington, DC: ACEEE Downloaded from: <http://www.aceee.org/pubs/e07x.htm>; Laitner, J.A., R. Elliott, R. Neal, and M. Eldridge. 2007. *The Economic Benefits of an Energy Efficiency and Onsite Renewable Energy Strategy to Meet Growing Electricity Needs in Texas*, Report E076. Downloaded from: <http://www.aceee.org/pubs/e076.htm>.

a whole and individual opportunities may exist on which state and local governments can build.[56] There is no known path for Kentucky to follow to assure itself the most cost-effective and least difficult transition from the highest dependence on the highest carbon emitting fuel in all of the 50 states to a more sustainable – and more externally marketable – power economy. But there are a range of needs and opportunities that can be assessed to guide efforts.

Starting with what has already been identified as the short-term priority – energy efficiency – a number of factors suggest that the highest returns to improving buildings may be getting overlooked despite substantial investment in the Commonwealth. But energy efficiency itself involves more than just buildings, so other issues should also be considered, most significantly transportation costs. Then there are the questions of the economic returns to alternative or renewable energy investments and the options in that regard in Kentucky, looking from wind to water to solar and geothermal sources.

Improving Building Energy Efficiency

Rising costs for power have hit the budgets of every household in Kentucky. An initial focus on residential energy efficiency makes sense when the cost of electricity has risen at least 10% in the past year for virtually all Kentuckians and there is every reason to expect costs to rise further – and faster – in the future.

Looking at average residential electricity usage, which includes appliances as well as costs associated with heating, cooling and lighting, *Kentucky Energy Watch* earlier this year reported that the typical Kentucky household used 13,659 kWh of power in 2006, while the average US household used 11,035 kWh. The average household electricity bill in Kentucky in 2006 was less than that of the average US household, simply because of lower cost power, only $959, compared to a national $1,148.[57] But those numbers mean that, had Kentucky home energy intensity in 2006 been at the national average, the average home's annual bill for electricity would have been under $775. More efficient buildings and appliances, therefore, could have saved an average of over 19 percent – over $150 per home per year – at 2006 prices for energy.

But electricity costs are headed up and the costs for energy efficiency improvements are not rising like that of power, so that $150 figure should be considered to be a lower bound on possible annual savings, not an average predicted return. Three distinct sources of power consumption are present in all homes: lighting, appliances, and HVAC. All have seen technological changes that greatly reduce the power needed for the same quality of service and convenience, but some involve much more upfront costs than others.

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[56] Creyts, *et al.* 2007. *Reducing U.S. Greenhouse Gas …* p. 20.

[57] Kentucky Governor's Office of Energy Policy. 2008. *Kentucky Energy Watch. Special Edition: Electricity in Kentucky.* Issued January 8. P. 4. Downloaded 6/20/08 from < http://www.energy.ky.gov/NR/rdonlyres/6BD66312-4950-4312-AAF7-263E70A58A4A/0/SpecialEditionElectric12008.pdf>.

Lighting

Compact fluorescent (CFL) bulbs can provide massive savings in energy use very quickly and their higher upfront cost can pay off in less than two years, depending on usage. Table 4 illustrates the potential savings if a 60-watt incandescent bulb is replaced with an equivalent CFL bulb. If the light were on for an average of 8 hours a day, the lifetime of the CFL bulb, 10,000 hours, would be reached in less than three and a half years. So, using 2005 prices, it shows that spending $3.10 more in 2005 (the cost of the CFL minus that of the incandescent bulb) would quickly result in savings of over $25.50.

Table 4 – Comparing CFL and Incandescent Costs for Lighting

	CFL	Incandescent
Energy Output (watts)	13	60
Light Output (lumens)	810	830
Useful Life (hours)	10,000	1,500
# of Bulbs for 10,000 hours	1	6.7
Bulb Cost for 10,000 hours of use *	$3.50	6.7@$.40 = $2.68
Electricity Used (kWh)	130	600
Electricity Costs @ $0.0565 / kWh	$7.35	$33.90
TOTAL COST for 10,000 hours' use	**$10.85**	**$36.58**

Source: Opp, S., L. Heberle, E. Chavez-Graciano, and P. B. Meyer. 2007. *Energy Efficiency as a Public Priority*. Practice Guide #20. Louisville, KY: Center for Environmental Policy and Management, Univ. of Louisville, Table 6, p. 7. Downloaded 6/20/08, from: <http://cepm.louisville.edu/Pubs_WPapers/practiceguides/PG20.pdf>.

Updating Table 4 for 2008 prices, the $0.0565 cost per kWh would be changed to around $0.0723.[58] That is an increase of about 28% in two years, far more than the inflation rate – and the cost savings at that rate (ignoring the likelihood of additional cost increases, and also ignoring the time and effort needed to replace the incandescent light bulbs that burned out) would rise to almost $33. Taking the very conservative assumption that lighting in the average home would have the equivalent of only eight (8) 60-watt bulbs turned on for an average of eight hours a day, then the average Kentucky household could save over $260 in less than 3.5 years for an extra up-front investment of about $20 per bulb, even assuming that the CFLs have become more expensive relative to the incandescents. *That is equivalent to earning over $65 extra in tax-free income a year.*

Appliances

Appliances also use a lot of electricity, starting with refrigerators, which almost everyone has. While the newer appliances don't look as different from the old ones as a CFL does from a conventional incandescent bulb, they have become significantly more energy efficient. The national ENERGY STAR program was launched in 1992 to increase US energy efficiency. Its ratings for appliance energy efficiency were developed specifically to encourage buyers to pay attention to operating costs – and to get appliance manufacturers to increase their energy efficiency as a tool to boost sales. The program worked, with product availability and sales growing steadily over time. But Kentuckians' adoptions lag those of the nation as a whole, with

[58] Price of Electricity - Residential as of the August 21, 2008 update to the *Kentucky State Energy Profile* of the US Energy Information Agency, downloaded Aug 23, 2008 from <http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=KY>.

the proportion of new appliances bought that meet ENERGY STAR standards below the national average for all appliances except air conditioners.[59]

If every household in Kentucky had ENERGY STAR appliances, electricity and gas bills would go down – as would water consumption with more efficient washing machines and dishwashers. The savings any one household would gain would depend on which appliances they owned. Appliance ownership, obviously, varies with income, but there are data from the 2000 Census on ownership of refrigerators, dishwashers and washing machines that can help identify benefits by income of a program to replace inefficient appliances. Table 5 provides some insights. Even the lowest income group, those least likely to have a dishwasher or washing machine, could benefit just from having a more efficient refrigerator, and those annual savings would grow over time from the 2006 data used in the table, as the appliances would be used over a number of years. That could more than cover any additional costs associated with higher purchase prices for the ENERGY STAR units. Again, these dollar figures are the equivalent of additional tax-free income.

Table 5 – Annual Savings by Kentucky Income Group from Using ENERGYSTAR Appliances (2006 Energy Prices)

Income Group	Savings
Under $15,000	$24.61
$15,000 - $29,999	$27.15
$30,000 - $49,999	$28.85
$50,000 - $74,999	$30.77
Over $75,000	$32.91

Source: Derived from Opp, S., *et al.* 2007. *Energy Efficiency …* Tables 22, 25, pp. 22, 26

Obviously, it would not be cost-effective for all households to go out and buy new appliances when their existing household equipment works. These numbers are indicative of the minimum savings that could be garnered annually if new appliances, when bought, were always ENERGY STAR.[60] The total savings would depend on the working life of the appliances, which were reported to range from 10 years for dishwashers to 13 for refrigerators (based on national data on installed units and annual sales).[61] Those households that could not afford the higher cost of the ENERGY STAR units, however, might require help to pay the cost difference if widespread adoption were to become a state policy priority. An efficient system for providing the needed financing support and collecting repayment from the realized energy cost savings, such as one integrating the program into the utilities' billing systems, could promote greater equity, reduce energy consumption, and do so at zero net cost to the taxpayers in the Commonwealth.

Manufactured Homes – A Special Need

According to the Kentucky Manufactured Housing Institute, there were approximately 240,000 manufactured and mobile homes in Kentucky in 2007, housing an estimated 560,000

[59] Opp, S., L. Heberle, E. Chavez-Graciano, and PB. Meyer. 2007. *Energy Efficiency as a Public Priority*. Practice Guide #20. Louisville, KY: Center for Environmental Policy and Management, Univ. of Louisville, Table19, p. 20. Downloaded 6/20/08, from: <http://cepm.louisville.edu/Pubs_WPapers/practiceguides/PG20.pdf>.

[60] The dollar savings must be considered to be gross underestimates on two grounds: (1) energy costs will go up, so the returns on saving power will rise, and (2) the energy efficiency standards the ENERGY STAR appliances meet will continue to climb, further cutting energy consumption and compounding the annual savings realized.

[61] Opp, S., *et al.* 2007. *Energy Efficiency …* Table 23, p. 23.

Kentuckians. Such homes comprise almost 25% of all the existing homes in the state and 31% of the total number of residential building permits issued for new homes in the Commonwealth.[62] While manufactured housing tends to be smaller both in the lots they occupy and in the living space they provide, The Residential Energy Conservation Survey found that, on average, mobile homes use substantially more energy per square foot of living space than single-family detached houses.[63] They also involve different problems and opportunities for energy efficiency retrofits and repairs.

The expansion in the proportion of new housing in Kentucky that is manufactured rather than site-built is not a new phenomenon. The trend was noted in the 1990s.[64] The major energy efficiency problem lies in the older mobile homes built before the US Department of Housing and Urban Development (HUD) enacted thermal standards in 1976, since they consume from 1.25 to 2 times the energy per square foot of comparable conventional single-family detached houses.[65] According to the 2006 American Community Survey (ACS), over 17% of the 2,088 "mobile homes" surveyed were built in that period, and thus would be expected to be exceptionally energy inefficient.[66]

But even more recently-built manufactured homes suffer from lower levels of insulation than is typical for site-built units. A field validation study of the Department of Energy's Weatherization Assistance Program's Manufactured Home Energy Audit found that,

> "On average, the mobile homes had 4.2 in. of insulation in the ceiling, 2.0 in. in the floor, and 2.8 in. in the walls. However, many of the mobile homes had 1 in. or less of insulation in the ceiling, floor, or walls. This was especially true for floors, where 44% of the homes had 1 in. or less of insulation in the wing or belly areas of the floor. Ceilings had 1 in. or less of insulation in 15% of the homes, and walls had 1 in. or less of insulation in just 5% of the homes. The windows in 36% of the mobile homes were predominantly single-pane without storm windows." – Ternes, M.P. 2007. *Validation of the Manufactured Home Energy Audit (MHEA)* (ORNL/CON-501).Oak Ridge, TN: Oak Ridge National Laboratory. P. xiii. Downloaded from <http://weatherization.ornl.gov/pdf/CON%20501.pdf>.

Of particular interest in terms of the attainable energy efficiency of manufactured homes was the finding (p. 11) that "the average wall insulation thickness of 2.8 in. indicated that most wall

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62 Kentucky Manufactured Housing Institute. (2007). *Serving Kentucky: Facts*. Downloaded 8/ 14/08 from <http://www.kmhi.org/facts.htm>.

63 Cited by McCold, L., R. Goeltz, M. Ternes, Mark, and L. Berry. 2008. *Texas Field Experiment: Performance of the Weatherization Assistance Program in Hot-Climate, Low-Income Homes* (ORNL/CON-499). Oak Ridge, TN: Oak Ridge National Laboratory. Downloaded from <http://www.eia.doe.gov/emeu/recs/>.

64 Between 1991 and 1996, the number of manufactured homes in Kentucky grew by 59.6%. Appalachia—Science in the Public Interest. 1999. *Mobile and Manufactured Homes in Kentucky* (A-SPI Technical Series TP – 45). Mt. Vernon, KY: Author. Downloaded 8/13/08 from <http://www.a-spi.org/tp/tp45.htm>.

65 Judkoff, K.D., C.E. Hancock, and E. Franconi. 1990. *Testing the effectiveness of mobile home weatherization measures in a controlled environment: The SERI CMFERT (Collaborative Manufactured Buildings Facility for Energy Research and Training) Project.* SERI/TP-254-3629. Golden, CO: Solar Energy Research Institute. Available for download from: <http://www.osti.gov/energycitations/product.biblio.jsp?osti_id=6979563>.

66 US Bureau of the Census. 2008. *2006 American Community Survey.* Kentucky Public Use Microsample (PUMS) data available for download from <http://factfinder.census.gov/home/en/acs_pums_2006.html>. It must be noted that the PUMS data recorded only 2,088 or 10.42% of the total Kentucky housing units surveyed were 'mobile homes," which means that type of housing was under-sampled in the survey, relative to the proportion reported by the KY Manufactured Housing Institute. There is no clear bias associated with the under-sampling, but the findings from it may be slightly less reliable than from the 100% sample on which the decennial census data are based.

cavities were already fully insulated." This means that higher wall energy efficiency is simply not attainable for these structures without adding an additional skin – more wall thickness – even to recently built homes.

Manufactured homes as a group pose a confusing problem for efforts to reduce energy consumption because of the lower incomes of their occupants, compared to the population as a whole. Table 6 illustrates the combined problems facing policy decision-makers. Energy costs, both in absolute terms, and as a percentage of household incomes, rose faster for all Kentuckians (including the manufactured home residents) than they did for just the manufactured home occupants. Despite the energy inefficiency of mobile homes, moreover, total heating costs rose more for all households, including both manufactured and site-built units, due presumably to the larger size of the latter.[67]

Table 6 – Rising Energy Costs for Occupants of Different Home Types (*)

	Manufactured Housing Occupants	**Percent Change '00–'06**	**Average of <u>all</u> Housing Occupants**	**Percent Change '00–'06**
2000 Mean Household Income	$27,184	**18.32%**	$43,816	**22.51%**
2006 Mean Household Income	$32,163		$53,678	
2000 Mean Home Heating Cost	$356.25	**55.02%**	$461.76	**59.99%**
2006 Mean Home Heating Cost	$552.26		$738.79	
Change in % of Income used to Heat Homes		**30.96%**		**35.90%**

<u>Source</u>: US Bureau of the Census. 2008. *2000 and 2006 American Community Surveys.* KY Public Use Microsample data download from <http://factfinder.census.gov/home/en/acs_pums_2006.html>. Data not adjusted for inflation since the same adjustment would apply to all table elements, thus not changing the relationships discussed.

While the population as a whole saw almost a 36% increase in the percentage of its actual current income needed to heat homes, manufactured home occupants experienced only a 31% increase. But the latter, with lower incomes, are less capable of absorbing rising energy costs without sacrificing other necessities. Moreover, the incomes of manufactured home residents did not grow as fast as those of the population as a whole, reflecting a worsening relative income status and a decreasing capacity to compete for the goods and services needed for weatherization investments.

Rising energy costs for really-low-income households, including those on public assistance and those receiving other forms of public support – many of whom would likely be occupants of older mobile homes in the Commonwealth – end up as rising costs for all Kentuckians as needs are met with public funds. If energy costs pinch budgets and people skimp on medications and

[67] Note that the ACS data reference "heating costs," not total fuel costs, so the air conditioning impacts are omitted. With the site-built homes more likely to have air conditioning, Table 6 understates the energy cost increases that hit residents of those structures relative to those in manufactured housing, and thus understates the savings possible in improving even site-built home energy efficiency.

food, they are more likely to get seriously ill, raising Medicaid costs, or they may miss work due to illness, causing income losses and inefficiencies for Kentucky businesses.

A state energy policy that aims to be cost effective needs to consider how funds get allocated to minimize ongoing costs through strategic one-time investments. To the extent that rising energy costs for the poor create costs beyond simply those associated with their energy consumption, investments to minimize cost increases for that population will save the average Kentuckian more than expenditures lowering energy costs for those that can more readily absorb higher annual energy bills. A special program to upgrade energy efficiency in older and smaller manufactured homes is likely to prove exceptionally cost-effective.

Building Standards for New Construction

As already noted in discussion of HB 2, home energy efficiency has big payoffs, according to analyses done at the University of Kentucky and summarized by the Kentucky Office of Energy Policy. The difference in the heating and cooling cost for a typical $150,000 newly-built 2,000 square foot home between just meeting today's Kentucky state energy code and going to the ENERGY STAR efficiency level was $390 a year and that annual savings could be attained with only an additional $1,763 in construction costs, or under 1.2% more.[68]

Taking the entire additional construction cost and adding it to the mortgage, that is, financing it over time, the authors claim that the energy costs avoided would result in the new homebuyer saving $20 per month in combined utility and mortgage costs despite a higher mortgage.[69] That calculation, however, severely understates the returns to increased efficiency since the energy costs may be expected to rise over time. Taking the recent 8% annual electricity rate increases as a norm for a 30-year mortgage, the $20 a month in savings today would rise to a monthly $27 in five years, $40 in 10, $86 after 20 and hit $186 a month by the last year of the mortgage.

Admittedly, Kentucky and national energy policy intends to limit that electricity cost increase and bring if back down to well under 8%. Even if those efforts succeed, however, the returns on upgrading to ENERGY STAR construction standards suggest that, under any energy policy, there will be a positive return to site-built homebuyers, *without any tax credits to the builder*.

This finding suggests that the HB 2 Section 13 $800 subsidy for site-built homes is not needed, since a more stringent state construction code for new homes could save homebuyers money and may actually make their homes more affordable. The application of a more stringent code to *manufactured homes*, however, may have a greater cost impact since size and weight limitations and efforts to maximize interior space may make wider walls (for more insulation) and double-pane windows difficult and very costly. Given the cost/benefit differentials, the HB 2 provision that manufactured home sellers are entitled to only $400, just half the tax credit that is provided to the builders of site-built ENERGY STAR homes, appears inappropriate. Whatever subsidy is provided for new homes under Section 13, therefore, may be more productively targeted to the manufactured home sector. The level of subsidy needed, however, should be more closely examined, following the lines of analysis conducted for site-built homes.

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68 Kentucky Office of Energy Policy. ND. *ENERGY STAR Homes. Op. cit.*

69 *Idem.*

Non-Residential Building Efficiency Improvements

Retrofit and renovation construction for utility cost reduction and efficiency in existing buildings in Kentucky has arguably been led by the public sector. The state itself, as already noted, has been issuing Requests for Proposals (RFPs) and energy saving performance contracts out of the Division of Facility Efficiency in the Finance and Administration Cabinet's Department for Facilities and Support Services. Some Kentucky universities are doing performance contracting on their own, although not through the Division of Facility Efficiency but operating in a very similar fashion. Finally, all the building construction by the 174 different school systems in the Commonwealth pass through an oversight and approval process in the Education Cabinet that is also encouraging energy efficiency and demonstrating its payoffs to schools.

All this activity is clearly recognized in HB 2, which attempts to build upon it. Arguably, therefore, moving forward in terms of these public efforts involves doing more of the same and making modifications of programs and policies where they may prove most cost-effective. But all the programs have lessons for local and county governments and for private sector commercial and non-profit properties and these should be promoted. The lessons from each of the three strands of effort can be examined separately in order to derive policy recommendations:

State Energy Savings Performance Contracting (ESPC)

The Commonwealth's Energy Efficiency in Government Buildings Program utilizes publicly assured tax exempt financing through lease-purchase agreements to finance efficiency rehabilitation of publicly-owned buildings. The performance contract need not be limited to energy use, and can include water and other utility services, but the bulk of the cost savings are likely to come from reduced energy consumption. Contractors bid on rehabilitation jobs and provide assurances of minimum savings in the future over a baseline utility service consumption level, assuming no increased utility cost in the future. They also solicit financing on behalf of the Commonwealth for a lease-purchase agreement for a specified period (typically 6-12 years), except for infrastructure projects, which can run to 18 years and the payments under which must come from the cost savings. Those savings on reduced usage that exceed the amount needed under the lease-purchase agreement accrue to the agency whose premises are being retrofitted, so the more that energy costs rise the more savings the operating agency gets for doing nothing more than inviting the Division of Facility Efficiency to issue an RFP on their behalf.

These contracts certainly do contribute to increased energy efficiency in state-owned buildings, but accomplish far less than they might due to the way in which they are negotiated and structured.

- The 12-year term limit policy on the lease purchase contracts effectively eliminates many energy efficiency investments that do make economic sense given current energy costs and available technologies. Among the improvements that cannot be undertaken because they cannot pay back in that time period are new energy efficient windows, new roofs, extensive HVAC improvements, and many deferred maintenance projects. Given that new windows, roofs, and HVAC systems generally have life expectancies of 20 years or longer, a policy that limited contracts to not longer than (or, to be conservative, one or two years less than) the

expected service life of the improvements would be more appropriate than the arbitrary 12-year limit.[70]

- The reliance on a constant historic price record as the baseline against which cost savings are to be measured poses a higher hurdle on energy efficiency investments than is realistic. In a period in which rising final user energy costs have become the norm and are expected to be so in the future, decision-making as if future costs will not be higher is not going to produce optimal results and may cause serious inefficiencies. By assuming a low future cost for energy, the process understates possible future payoffs to efficiency investments, raising the bar for all possible investments, especially those with any possible delays in returns due to construction complexities and unanticipated problems. Some mechanism for including price forecasts into the contracting process is needed for more efficient decisions.
- Partial measures, supplemented by further partial measures at a later date, may be far less efficient than a more complete response to a problem from the outset. By limiting projects to those with 12-year payoffs and not incorporating any allowances for cost increases the process assures that partial measures are the norm. This is analogous to building a two-lane bridge while traffic projection suggest that four lanes will be needed within 15 years, and while knowing that two two-lane bridges, or adding on to an existing two-lane bridge, will be far more expensive than just building a four-lane bridge.

ESPC in Kentucky clearly improves short term energy efficiencies, but it almost certainly is doing so at the expense of longer-term efficiency – and the long-term is much longer than the short-term.

The fundamental problem is one of extreme risk aversion. The Commonwealth is not prepared to take on *any* risk that an energy forecast may be wrong, or that a window may break or a tornado rip off a roof, limiting the working lives of those longer-lasting energy efficiency investments. The damage risks to long-term installations can be addressed through insurance, but the energy cost risk might remain a problem. Given that no incentive is offered to the contractors, who do not share in the gains if the energy savings far exceed what was projected, they cannot be expected to take on the energy forecast error risk. Kentucky cannot predict if any contractors would bid using energy forecast models for a share of excess savings if realized. So a more cost-effective and efficient energy cost performance contracting system will probably have to rely on the Commonwealth itself taking on the energy price risk.[71]

HB 2 committed the state to $30 million in grants to local governments for energy efficiency investments in their buildings. Those funds, handed out as grants, will constitute a complete 100% loss of that money as a source of fiscal capacity to repay the bond debt. General revenues will be needed. By contrast, Kentucky as a whole could get a far higher return on that $30 million if it used it as a guarantee pool for energy cost performance contracts that included a mandatory energy cost forecast element and committed those funds to assuring that lease payments would be made if the forecasted costs did not rise as fast as expected. The bond debt might then generate far more than just its face value in energy efficiency investments.

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[70] In fact, the 12-year term limitation would appear to be in violation of the intent of the authorizing statute for the program. KRS 56.770.5 clearly states that, "The term of a guaranteed energy savings performance contract shall not exceed the life of the energy savings generated from the implementation of the energy efficiency measures financed by the contract." There is no provision for arbitrarily shortening the term.

[71] The risks and rewards may be shared with contractors in other states and under other arrangements, and the different possible implementations of a revised ESPC need to be examined.

Depending on the quality of past energy forecasts and the predictive capacity of the models used, it is possible that the $30 million could cover as much as $300 million in energy price risks.[72] That price risk, in turn, is not for the entire energy-saving project, since many energy saving investments could be covered under the assumption of constant prices, just as they are now, and even more investments would be possible at constant price forecasts if the contract horizon was permitted to extend beyond five years, so additional hundreds of millions in energy retrofits could be financed through such a scheme, possibly providing a state service to all county and city governments that could help them pursue greater energy efficiency.[73]

University Energy Savings Performance Contracting

Many of the universities in the Commonwealth are undertaking their own ESPCs, using their own borrowing capacity and avoiding the need to pursue capital appropriations or formal bond authorizations from Frankfort. Among the institutions actively engaged in the process are Eastern Kentucky University that just signed a contract for services and the University of Louisville which has partial results from an on-going audit that demonstrates some of the returns on such energy saving investments. Both institutions have large contracts covering entire campuses, not individual buildings. Table 7 displays some of the relevant data.

The possible project scale is the maximum that the projected cost savings can finance, given that the energy cost savings have to cover not merely paying back the investment principal, but also the interest paid, just like on a mortgage. The relationship between savings and project scale, and thus the anticipated savings to be realized after the 12-year performance contract is over and the lease is paid off with the university owning the improvements, depends on the interest rate at which the university can finance the lease purchase. Past borrowing and current credit rating will matter, but so will the reputation of the contractor, since that firm is responsible for assuring that the energy savings are realized so that the funds for the payments are available – and is the guarantor of the cost savings which provide the funds needed for the lease payments.

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[72] A 10/1 ratio of risk taken to guarantee funds is common for economic development loan guarantee programs, where the longevity and success of the company borrowing funds in never assured and comparable risk would appear to be present for energy price increase forecasts.

[73] The possible expansion of the program may be limited by other factors, however. An expanded program would also affect the Commonwealth's borrowing capacity, since the lease service agreements are logically indistinguishable from bonds as long term obligations, albeit they generally command a higher interest rate. As the Finance Cabinet's Policy Manual describes the situation,

> "An item of future concern is the amount of money authorized for these projects and the potential for significantly more of these projects, which are being financed as lease purchase obligations, which carry higher interest rates than state appropriate supported debt. While the state does not count these obligations as debt or in the debt capacity model, it has become clear in discussions with the rating agencies that these types of obligations do constitute debt and are being considered in the overall credit analysis of the Commonwealth." – Commonwealth of Kentucky, Finance and Administration Cabinet. 2005. *ESPC Energy Saving Policy Manual Section 1.* p. 3. Downloaded 8/13/08 from: <http://finance.ky.gov/NR/rdonlyres/C49516D6-5ECE-4513-B740-B9E2D85BD074/0/firstsectionpolicymanual.pdf>.

Table 7 – Two Examples of Large Scale Energy Savings Performance Contracts

University	Eastern Kentucky Univ. (1)	Univ. of Louisville (2)
Overall Project Scale	$22 million	$33 million
Funding Guaranteed through	energy savings over a 12-year term	energy savings over a 12-year term
Annual Utility Bill (baseline)	$5.8 million	$13.8 million
Projected Savings (%)	39.66 %	30.43 %
Expected Annual Savings	$2.3 million	$4.2 million
Expected Daily Savings	$6,200	$11,400

(1) Preliminary data as presented at Eastern Kentucky University press conference of 3/4/08.

(2) Preliminary data as presented at the University of Louisville press conference of 7/17/08. Energy Audits still under way and cost figures will reflect capital market conditions, energy prices, and interest rates when project is launched in 2009.

Source: Derived from Siemens Building Technologies, Inc. 2008. *Project Press Conference Powerpoints.* Provided to authors by Michael Azzara, Business Development Manager

Small projects will not attract major energy or environmental engineering firms, the so-called Energy Services Companies or ESCos. Thus this approach to improving energy efficiency may not be pursuable by smaller cities and counties in Kentucky. But the approach is applicable to many other owners and operators of buildings in the Commonwealth, including:

- ✓ Hospitals & Healthcare Facilities
- ✓ Larger City or County Governments
- ✓ Multifamily Rental Premises and Condominium Complexes
- ✓ Office Buildings
- ✓ Industrial Facilities
- ✓ Other Large Commercial Facilities [74]

The problem with using performance contracting with these entities is that they may not be capable of providing the tax-exempt financing that facilitates the projects run by the Commonwealth. On the other hand, some of the limitations under which the Kentucky program operates, most notably the 12-year project term limit and the complete risk aversion, may not apply. It might be appropriate for the Commonwealth to advertise its use of the tool and the returns that it is realizing as a way to encourage others to do the same where appropriate. In those instances in which the state provides funds that support construction and/or operations costs, from subsidies to new economic development investments through reimbursements to in-state service providers to Kentuckians, it may even be appropriate to mandate that those doing business with the Commonwealth at least contract for energy audits to determine the feasibility of energy savings performance contracts.

Public School Building Energy Efficiency Efforts

The Division of Facilities Management of the Kentucky Department of Education is the state-level body charged with overseeing the quality of the schools and grounds of all the schools in the Commonwealth's 174 school districts. Its powers with respect to promoting energy efficiency come from its responsibility:

[74] List adapted from that on the homepage of the industry association, the Energy Services Coalition, at <http://www.energyservicescoalition.org/index.html>.

> "The division provides assistance to school districts by reviewing and approving all sites, new buildings, additions, alterations of existing buildings, energy savings projects, and hazardous material abatement from initial construction project application through final completion." – Kentucky Department of Education, Division of Facilities Management. 8/12/08. *Home Page.* <http://www.kde.state.ky.us/KDE/Administrative+Resources/Facilities/>.

The review and approval process provides all school districts with a common standard for construction contracts and plans. Bond ratings are the same for all school districts due to the state intercept provision and state oversight of all bond issues. All projects get routed through the Division, and the fully costed-out detailed construction plans must be in place before borrowing is authorized. The oversight thus assures districts of a common bond rating and fiscal agent fees, derived from the overall state-wide performance of school construction bonds and aggregation of the market, a major benefit to the smaller districts that might otherwise have to pay far higher interest rates on their borrowing and a higher fiscal agent fee percentage on their smaller bonds.

The process also provides the opportunity for the Division to promote energy efficiency in school construction and rehabilitation projects. As a result of the centralized oversight and encouragement, and using bond issues for capital improvements, school districts have pursued large-scale interventions and retrofits in rehabilitations well beyond those undertaken under the Kentucky state-wide and individual university ESPCs.

The accomplishments to date are very encouraging and appear to offer examples of what can be done by other comparable installations:

- Schools have learned that they can install geothermal heat exchangers for HVAC on their grounds for about $4 per square foot of interior space to be served. At current power costs, those systems can pay for themselves in 7 to 10 years, with average annual savings of about 20%. In fact, Kentucky has one of the highest ratios of schools on geothermal systems of any state in the nation, with 255 out of 1,200 school buildings using geothermal HVAC.
- Substantial additional savings on HVAC may come from different HVAC management practices. Kenton and Warren County School Districts that have been most active in pursuing energy efficiency, report that they can save at least 10% per month simply through improved behavioral and building maintenance practices (temperature settings at different times, door and window usage and the like).
- School energy efficiency is measured in kBtu/SqFt/Year, a standard measure.[75] The national average score for school buildings is 73; Kentucky schools average 76, typical of the above national average power usage in the Commonwealth.
- Thirteen schools in the Commonwealth have been certified as ENERGY STAR buildings, with average savings of 45% over the energy costs for other schools (including in that average of other schools over 200 using geothermal HVAC), with kBtu/SqFt/Year consumption of 41.5.
- Two of those ENERGY STAR schools are retrofits, demonstrating that this high performance is cost-effectively attainable even for older buildings.

[75] kBtu is 1,000 British Thermal Units and all forms of energy can be converted into this heat measure. kBtu/SqFt/Year provides a standardized basis for building Energy Use Intensity that automatically adjusts for size of building and for the different power sources used for HVAC, hot water heating, etc.

- The ENERGY STAR standard, in fact, can be seen as a floor on the attainable efficiency. One school in Kenton County is only using 36 kBtu/SqFt/Year while another in the Warren County School District is even more efficient at 28 kBtu/SqFt/Year.

The potential energy savings in schools are such that the Division of Facilities Management, working with several school districts around the Commonwealth, is actively pursuing even great efficiency, lowering usage to 20 kBtu/SqFt/Year. At that level, it is likely that the addition of solar photovoltaics could permit schools to operate at net zero energy consumption.[76]

The experiences of those school districts that have pursued energy conservation efforts appear not to have been lessons learned by many other school districts in the Commonwealth. HB 2 appropriately requires that all districts go through training in energy efficiency in the Kentucky Energy Efficiency Program for Schools (KEEPS). But, especially for smaller districts, basic training in the logic and the attainable efficiencies may not result in any action without ongoing technical assistance to facilities and staffs that have not thought in terms of energy conservation in the past. The University of Louisville's Kentucky Pollution Prevention Center (KPPC) that operates KEEPS simply does not have the staff capacity to serve 174 school districts. Given that simple behavioral and management practices changes can generate more than 10% energy cost savings, the returns to Kentucky school district taxpayers from additional KPPC staffing to provide more KEEPS support should far exceed the cost in needed state funds to expand the KEEPS capacity to provide on-going hands-on technical support.

But the lessons from the schools' experiences also need to be communicated more effectively to other property owners and operators. The experience with geothermal retrofits for HVAC cost savings is relevant to the many building operators that have campuses or land that is not occupied by buildings, including those located in office and industrial parks, and those in garden apartment or low-rise condominium complexes. Even shopping centers may be able to do retrofits under their parking lots, since those lots are rarely full except during the peak shopping season, and the excavations and installations could be scheduled around those dates.

Other Energy Efficiency Measures

Buildings are not the only consumers of energy, as anyone who drives a vehicle can attest. So the pursuit of energy efficiency can also benefit from investments in transportation. Moreover, the location of buildings and their relationship to each other can affect community-wide energy efficiency and the potential for using renewable energy sources that will become relatively more cost effective with time. Options to increase energy efficiency potential in both arenas need to be addressed.

Transportation Investments

Kentucky remains well served by freight rail lines, the demand for which may be driven in part by the heavy industry attracted to the state by low energy costs. Air travel is minimally relevant internal to the state. Bus service exists in the major urban centers around Louisville, Lexington, and in Northern Kentucky. But cars and trucks are overwhelmingly the main mode of in-state transportation for Kentuckians. There are no alternatives in most areas for intercity

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[76] Data on school performance and potential combined from two sources: Ryles, Mark. 8/13/08 *Phone Interview.* Conducted by Peter B. Meyer [Mr. Ryles is Director, Division of Facilities Management, KY Dept of Education; [KY] Governor's Office of Energy Policy. 2008. *Kentucky Energy Watch: Special Edition – K-12 Schools Energy Bills.* March 3. Downloadable at: <http://www.energy.ky.gov/NR/rdonlyres/5F989787-AD59-438B-8BB9-F0CA5DD68C7E/0/KEWSEK12EnergyFINAL332008.pdf>

travel – Greyhound Bus Lines has stops in only 9 communities and not all stops are open seven days a week.

In the short-term, these conditions will not change significantly. The options to be considered thus involve adapting and improving existing systems without creating a barrier to more effective future innovations. The recent run-up in gasoline prices has led to such large shifts from cars to mass transit in many American communities that the public systems were overwhelmed with passengers. Reduced car usage, however, lowers the tax revenues used to subsidize mass transit, so the systems have trouble expanding to meet demand. State efforts to support such flexible adjustments as more frequent service on high demand routes and line extensions to high employment or residential density locations outside city boundaries might produce improvements. One finding of major relevance to the Commonwealth's transportation planning efforts is the finding from a 2007 national survey that respondents preferred investments in mass transit and improving existing road infrastructure over construction of new roads.[77]

Over the longer term, the potential for using freight rail corridors for intercity, and some intra-metropolitan, transportation services should be examined since the capital costs of the rail rights-of-way and lines could be avoided and the service thus provided on a relatively cost-effective basis. A further consideration is the use of the existing rights-of-way of state parkways for rail or high-speed bus service in the more distant future. The demand is not present now, but any highway expansion projects should take into consideration the effects of new car lanes on the land available for complementary mass transit on the same corridors.

Land Use and Development Patterns

The expansion of urbanized areas in the nation as a whole has long been recognized to be a major contributor to energy inefficiency in day-to-day travel.[78] A similar pattern has emerged in parts of the Commonwealth, with counties near urban centers promoting and sometimes actively encouraging farmland subdivision to promote development. The motivation in most instances is the need for new tax revenues given demands on local governments to provide services that are growing more rapidly than tax receipts and capacity. These patterns reflect individual preferences and decisions about the use of private land – but they produce higher energy consumption levels and costs for all citizens and for the public sector as well, which can result in higher taxes.

Some new regulation of, and permitting for, land uses will be required for most of the alternative and renewable energy innovations that have been proposed. Adding a solar installation to a building makes little sense without some assurance that a building next door will not shade the solar array from the sun. No investor will build a wind farm without some assurance that the initial investment will not be protected from a regulatory intervention after the first turbine is built and begins operation.

New forms of controls over land and land uses can be expected to develop as the price of fossil fuel energy rises and the benefits to alternatives offer new profit opportunities. The Commonwealth would be well served by an effort to examine experiences elsewhere and to

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[77] National Association of Realtors and Smart Growth America. 2007. *2007 Growth and Transportation Survey.* Washington, DC: Authors. Results downloaded from <http://www.smartgrowthamerica.org/narsgareport2007/narsga2007fullpoll.pdf >.

[78] Ewing, R., K. Bartholomew, S.Winkelman, J. Walters, and D. Chen. 2008. *Growing Cooler: The Evidence on Urban Development and Climate Change.* Washington, DC: Urban Land Institute.

develop guidelines for protecting individual freedoms while providing the opportunities for new profitable energy investments.

While such control experiences are being considered, more detailed examination of voluntary revenue-sharing agreements would also be worthwhile. Rural counties at the edge of urban centers are now experiencing the sacrifice of farms to tract development, a process driven by economic necessity. At the same time, large tracts of land within urban centers, already well-served with roads and utilities, are underutilized for an array of reasons, including the availability of that cheaper rural land.

Revenue sharing and cooperative planning within Area Development Districts (ADDs) and other economic areas that might voluntarily band together to promote more centralized development might generated benefits from rural and farm preservation to urban regeneration and make some limited public transportation available to lower income workers through the greater density that could result. Revenues shared by urbanized areas that would get more redevelopment if the rural areas restrained farmland conversions could pay for improved public services and schools in the rural counties while preserving their rural character, something that the large lot zoning they now adopt will not do.[79]

Policy and legislative changes to reverse current implicit and explicit subsidies in the Commonwealth that reduce the costs of development outside of previously developed areas and promote the spread of settlements to rural areas would also be needed. In most cases these steps would NOT involve new expenditures, but reduction or reallocation of existing spending patterns.[80] The most obvious prospect here is for reallocation of Department of Transportation spending. New roads and road width expansions facilitate rural land conversions to more urban uses; a shift in emphasis to improved maintenance for existing roads could slow that process without changing total budgets and might actually serve more of the drivers in the Commonwealth in the process.

Regulatory actions matter and policies could be changed. PSC regulations do not now demand full cost hookup payments by developers asking to be connected to sewer and water lines, so their existing ratepayers subsidize new developments that sometimes involve very expensive line extensions and new pumping facilities. If the developers had to pay full costs, they would try to pass those costs on to new home buyers on lands beyond existing public service lines, so the price of new homes in outlying suburbs would rise relative to comparable homes in existing urban areas.[81]

Another prospect exists in the many state services offered to sub-state governmental units. For example, Kentucky helps school districts with their building operations and construction planning, and could prioritize resources to support retrofits and modernization of existing buildings and site rather than construction of new schools in newly developed suburban areas.

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79 There is precedent for such efforts in tax sharing arrangements in Kentucky's metropolitan counties prior to merger. Other states have facilitated the process: Environmental Law Institute. 2008. *Improving Economic Health and Competitiveness Through Tax Sharing.* An Environmental Law Institute Issue Paper. Washington, DC: Authors.

80 Examination of unintended subsidies and measures to rebalance the development playing field has become widespread across the country. Much of the research and experience is being documented by the Brooking Institution's Metropolitan Studies Program (<http://www.brookings.edu/metro.aspx>) that actually looks beyond what the Census Bureau calls metropolitan areas to spatial development patterns and issues in less dense areas.

81 A more draconian alternative is simply to not permit certain urban services to be provided beyond an agreed upon boundary. That practice can be voluntary by a utility or more formally mandated, as in the case of Lexington's longstanding Urban Service Boundary.

This reallocation of commitments would make even more sense if the PSC requirements were imposed simultaneously so that school age populations would remain closer to older schools.

Savings to Kentuckians would come in the form of shorter travel-to-work distances, less spent in gas and less time spent on the road. These benefits would be shared by all, but will provide the greatest benefit to lower-income workers and their households, since they are the ones traveling the greatest distances to find good paying jobs while they live in areas where costs of living are low enough for them to afford. This approach does not control land use choices in any way, but merely affects development costs and thus the relative competitiveness of land in locations with urban infrastructures and services when compared to rural land.

Alternative and Renewable Energy Generation

Kentucky has limited renewable energy capacity if compared to the potential of exceptionally windy or sunny areas to generate power for transmission to the electricity to replace the coal-fired electricity now produced in the Commonwealth.[82] That limitation, however, does not mean that there are not opportunities for businesses and homeowners to make investments that reduce their need to pay for electricity and other fuels.

At its most fundamental level, diversifying energy sources to reduce the proportional reliance on coal serves an economic development objective: it improves the image of Kentucky as a progressive place in which to live and do business. The more the Commonwealth appears to be resting on its laurels as a low-cost coal-fired electricity providing state, the less likely it will be to be able to attract the emerging industries of the 21st Century.

Energy policy at the state level needs to recognize that the economic returns in the form of lower power bills for ratepayers and new construction jobs and incomes for workers and businesses that result from energy conservation and alternative energy generation efforts are only part of the total payoff to such efforts. Some initiatives may not, in and of themselves, pay off in terms of current project cash flow – power from a photovoltaic (PV) or wind installation may cost more than power from a coal-fired plant, at least for the next few years – but the projects may be worth undertaking in order to attract businesses to the Commonwealth. Economic development efforts routinely spend funds, whether in advertising the good business climate in the state or in subsidies to incoming businesses that are intended to generate and attract new businesses and jobs. Some energy policy initiatives may have such positive publicity value that their costs should be subsidized in order to enable Kentucky to attain the economic development objective of showing itself a leader in innovative and technologically-advanced manufacturing, distribution and service provision.

Electrical power losses in long distance transmission lines will become a more significant economic issue as the cost per unit of power generated rises due to rising fuel costs or regulatory requirement such as carbon capture. Those losses in Kentucky on average comprise at least 6% of the power generated at centralized coal-fired plants.[83] Distributed generation for

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82 US Department of Energy – EERE State Partnerships and Activities. 2008. *Alternative Energy Resources in Kentucky.* Last update 2/28/08. Downloaded 6/23/08 from: <http://www.eere.energy.gov/states/alternatives/resources_ky.cfm?print>.

83 The six percent figure was cited by numerous PSC and other commentators in Kentucky. Nationally, the figure is estimated by the Department of Energy at about 9%. (US Department of Energy, Energy Information Administration. 2008. *Annual Energy Review 2007. W*ashington, DC: Author. p. 62). An analysis of Southern energy strategies uses the same figure. C.f.; Beck, F., D. Kostiuk, T. Woolf and V. Singh. 2001. *Powering the South: A Clean & Affordable Energy Plan for the Southern United States.*

on-site uses can avoid this power loss, and small localized systems could be as much as 6% less efficient using today's technologies but still be cost-competitive in delivering power. As coal prices rise, or fees and requirements for carbon emissions come on-line as national public policy, the dollar value of this margin will grow, which means that the economic efficiency hurdles that decentralized generation would need to pass will be falling with time.

While the average line loss for electricity distribution from centralized plants averages 6%, those losses – and the costs of maintaining the distribution grid – are likely to be far greater for isolated small cities and rural areas. In those places, investments in decentralized generation may be significantly more likely to prove cost effective, especially in those instances in which a number of different renewable power sources could be combined.[84]

Decentralized power potentials come in four general forms: (1) land-based, including solar, wind and geothermal, (2) water-based, hydroelectric power from dam-based generators, (3) co-generation of heat and power at facilities that use large amounts of heat in their production processes, and (4) methane capture from landfills and other idiosyncratic potentials. The first provides many opportunities for state intervention. The second is already in play and is further enhanced by existing provisions of HB 2, as has been noted, and will not be addressed here. The third and fourth both warrant some comment on untapped potentials.

Solar, Wind and On-Site Geothermal

Decentralized generation for on-site consumption has a very specific potential payoff if it can contribute to reducing the need to subsidize power consumption by poor households living in very energy-inefficient housing. The Low Income Home Energy Assistance Program (LIHEAP) cannot keep up with demands for assistance today, and those demands are growing every year. Equipping households occupying homes that cannot be cost-effectively weatherized with distributed power generating capacity might, for those units heating in large part using electricity, actually reduce their annual need for LIHEAP funds. The financial payoff to the capital investment, therefore, may be the annual stream of energy bills – and LIHEAP support – avoided.[85]

Homeowners and other business property owners that do not need assistance with energy bills still may be incapable or unwilling to divert capital or borrow to install PV or wind generating capacity, but might want to make the investment. In such instances, loans could be made to provide the needed funds, with paybacks to be taken from the utility charges avoided. In the case of large commercial and residential premises, the greater efficiency made possible by the larger installation and level of usage could mean that systems that are not competitive with coal-fired electricity today, if operated at the residential level, might already satisfy cost break-even

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Washington, Dc: Renewable Energy Policy Project. Endnote 49, p. 67. Downloaded 7/17/08 from <http://www.repp.org/articles/static/1/binaries/pts_repp_book.pdf>.

[84] The major payoff would occur if a diverse mix of renewable sources in a local area could be combined with reliable power storage capacity and the isolated community would no longer have to be connected to a distribution grid altogether. The technology for that prospect is not available today – but there are massive investments pursuing the battery of power storage media that could enable the possibility in the future.

[85] There are, of course, serious and complex issues to be addressed in financing such investments, but they have been addressed and overcome in many other jurisdictions. Those experiences can inform Kentucky choices. The administrative value of a cost-avoidance investment is that the investment return does not require any collection effort. All that needs to be done is to declare certain premises and occupants ineligible for further LIHEAP or other funding – the process is controlled by the agency administering the program, requiring no cooperation from the beneficiaries.

requirements.[86] Again, there is a relatively simply process available for collecting the funds for debt service if the projects are funded with a state bond float: a special tax assessment against the property being improved, to be paid back over a specified time period.[87]

Some homeowners might contemplate building new homes with geothermal heat, but retrofits for single units are most likely to be too expensive, especially for houses on relatively small or difficult to excavate lots. On-site geothermal heat exchangers that save energy by using the relatively constant 55 degree below ground temperatures to preheat for winter heating and cool in the summer have significant potential in the Commonwealth.[88] The potentially post cost-effective application of this technology involves projects serving multiple households. Apartment and garden condominium complexes may have the grounds and land area to dig and retrofit piping to utilize geothermal for residents. The fixed costs of equipment, vertical connectors to underground piping and above-ground installations make systems that serve many households more efficient than those for single family homes.[89]

In fact, at current pricing, single-site geothermal is cost-effective for 2,000 square foot and larger new homes today. But the major payoff may be to developers of new housing tracts that can run continuous trenches along roads as they are built and pre-install separate piping systems for each lot. The construction costs would be far lower than for individual sites, and the lower utility cost expectations could enable a developer to sell the lots with the pre-installed systems for a price that would generate a profit above the higher cost of the site preparation.[90]

Cogeneration and Landfill Methane Capture

Among the major power consuming companies in Kentucky, there are a number that use power to generate significant amounts of heat for production processes. (A cement kiln, for example, operates at temperatures well above 1,000 degrees Fahrenheit, some five times the temperature needed to make the steam coal-fired power plants use to drive electricity turbines.) The Commonwealth could show itself to be a major innovator if it launched a program and promulgated utility regulations to encourage cooperation between the firms operating such plants and electric utilities in installing turbines that could be driven by the waste heat from such operations.

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86 In many instances, the building owners are already coming to realize the economic returns to generating some of their own power. C.f.: Rosenbloom, S. 2008. Giant Retailers Look to Sun for Energy Savings. *The New York Times.* Aug 11, p. A13. Downloaded from <http://www.nytimes.com/2008/08/11/business/11solar.html?_r=1&sq=big%20box&st=cse& oref=slogin &scp=7&pagewanted=print>.

87 If this funding logic looks familiar, it is. This is merely an adaptation of the Energy Savings Performance Contract logic, with the Commonwealth or some instrumentality of it acting as the funder and the property owner committing to a long-term lease-purchase agreement for the energy facility. This scheme simply taxes advantage of the fact that all property is recorded with particular tax obligations, including waivers for non-profit owners.

88 The US Department of Energy notes that, "Kentucky has vast low-temperature resources suitable for geothermal heat pumps." (Energy Efficiency and Renewable Energy unit assessment of *Alternative Energy Resources in Kentucky*, downloaded from < http://apps1.eere.energy.gov/states/alternatives/resources_ky.cfm>.

89 Installation during site development can take advantage of excavation for land contouring, drainage, roads and underground utility installation to lay horizontal loops for heat exchanging five feet or more underground across the expanses that are intended as lawns. Similarly, lawns and recreational spaces between structures in garden apartment complexes can house horizontal or vertical loops for geothermal exchange units.

90 This claim takes into consideration the need to replace traditional furnace elements more frequently than the components of a geothermal system, lower fuel consumption levels and the very high efficiency gains made possible by reducing the electricity demands for air conditioning in the Kentucky climate.

The engineering issues will vary from plant to plant, depending on levels of heat-generated/heat-dissipation practices, if any, and plant layout which might determine the costs to install generating capacity. The common issue for all potential cogeneration facilities that feed power back to the grid will be the financing and ownership of the generators. In some instances the businesses may want to own the generators and sell power to the utilities. In other settings, especially for firms operating with limited capital or under severe debt burdens, the only way cogeneration could proceed would be for the utilities to finance the generators and add that capacity to their rate base. Regulatory action by the PSC – and possibly legislative action to permit such interventions – might be required to promote the energy efficiency associated with cogeneration under those conditions.

Landfill methane is another potential source of power, already tapped in many instances in the US. The problems of financing and ownership of the facility tapping the methane are not straightforward since the title to – and legal responsibility for the safe maintenance of – closed landfills is a complex matter. Again, however, Kentucky has the potential to use a resource at its disposal (hundreds of closed landfills, some of which may be dangerously accumulating explosive gasses) to diversify and distribute its power generation and demonstrate its innovative commitment to reducing its carbon footprint over time.

IV. The Economic Returns – Improving Well-Being for Kentuckians

The manner in which Kentucky confronts the threats of rising energy costs and regulation of coal emissions will affect the impact of the adjustment on the economic livelihood and well-being of its citizens. It is possible to not merely *protect* economic capacity and quality of life, but to enhance it – to actually *improve* well being.

This is not a numbers game. The issue is not merely improving non-monetary quality of life. The actual discretionary dollar incomes of Kentuckians – the amounts of money people have after paying for absolute necessities to maintain lifestyles – can actually go up. But it will take a lot of common effort, some new and innovative roles for governments and power companies to play, and, above all, a willingness to look beyond the short term. Opportunities exist, but choices need to be made and efforts must be prioritized. Above all, it will take a willingness to change and to do things differently from the ways they have been done in the past.

Delaying the issue of how to organize the financing of these changes for the next section of this report, the costs and benefits of the steps already recommended are presented here. The starting point is to understand the uncertainties and risks confronting any decision-making, and the extent to which they are well understood. This is necessary since it sets the foundation for all that is to follow. The first step after that is prioritizing across some broad options. The second step is deriving the dollar value to households and families of taking the different options at or near the top of the priority list. That second step involves several elements, combining as it does both money saving measures and job creation processes. Finally, there is the third step of pursuing the opportunities created by taking the right path at the second stage.

Energy Futures – Risks and Uncertainties

In late 2007, virtually no one forecast $140 per gallon oil for July 2008. In June 2008, virtually no one expected the price of oil to fall to under $100 per gallon by October. The uncertainty about prices is part of the reality of any energy policy planning efforts. But that is not the only aspect of the risk that prices will burden energy users.

There is another major source of uncertainty: the likelihood of any concerted national action to address the massive US oil dependency and how much political will there is behind pursuit of real energy independence. The national political will, in turn, is not fully determined domestically. Whether it is the threat of renewed embargoes or massive price hikes by oil-rich countries, the possibility of tariffs imposed by some of the US trading partners on the carbon content of the goods they import, or changing whether conditions threatening the major oil and gas infrastructures of the US in the Gulf Coast regions, external events can shape domestic willingness to act – and the directions those actions are likely to take.

A third obvious uncertainty lies in the fact that, even if there was a 100% probability of some Federal action taken in response to global warming and its threats, the form of the response is not known. Even though both Senators Obama and McCain say they will act on the matter, and even though which of their approaches will be introduced by the new President will be known before the General Assembly meets in 2009, the bill that emerges from the US Congress after all compromises and negotiations are completed will contain details that cannot be determined in advance.

All this uncertainty adds up to a simple observation about the future: we cannot predict it without making massive assumptions about what will change from the past and we cannot tell what will change. That is not to say that the assumptions are bad or intentionally biased. The point is that all the modeling has to make some assumptions and the uncertainties make understanding the assumptions – and especially the extent to which the assumptions are forecasting a future that looks like the past when change is expected – is essential to working with any cost-benefit analyses. Moreover, uncertainties can compound one effect over another over time. Thus, the further into the future we try to look, the more our ability to adequately predict outcomes is diminished. This requires us to allow for the possibility of even greater errors (thus discounting the future) as one would normally do for expected returns on more predictable processes. This is not appropriate for forecasting in this policy arena. [91]

Having admitted the weakness of the entire planning process does not, however, relieve the analyst of the obligation to provide what guidance is possible. The uncertainty simply means that minor changes in returns cannot be considered to be worth much, since they could easily be wiped out, and that short term gains followed by longer term losses or simply uncertain payoffs in the more distant future cannot measure up.

Prioritizing Across Options

The options to be considered here are not "*where do we put wind turbines?*" or "*how should we manage coal mine restoration and coal gasification or liquefaction?*" or "*should we invest in insulating state building first or in promoting home insulations?*" Some of those questions may come up later. The issue here is deciding what broad approaches should be the top priorities – the details of implementation come later.

One recent effort at this form of analysis is the study cited above that examined the choices facing the US as a whole.[92] The focus in that analysis was the payoff in reduced greenhouse gas emissions. However, in the short run and in that report, those returns depended on increasing energy efficiency, alternatives to fossil fuels, and/or carbon capture for use of carbon emitting fuels. These are the major choice issues facing the Commonwealth. The national findings can be adapted to the Kentucky setting using knowledge of local economic and environmental conditions, but two observations from their Conclusions are worth citing as a context for deriving the economic benefits to Kentuckians:

> "In regions with high-carbon grids, energy efficiency improvements, typically through upgrades to building standards, HVAC equipment, and appliances, are likely to be the most cost effective and lowest-cost strategies…" (pp. 67-68) [and]
>
> "… every year we delay producing energy-efficient commercial buildings, houses, vehicles, electric motors, and the like, the more negative-cost options we lose. The cost of building energy efficiency into an asset when it is created is typically a fraction of the cost of retrofitting it later or retiring an asset before its useful life

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91 The problem has come to be known among economists as the problem of the "fat tail." This is a reference to the "normal distribution" of scores or occurrences, in which the likelihood that the extremes occur are expected to gradually decline towards zero, and the most likely outcomes are clustered around the middle. The extremely high uncertainty of both environmental and socio-political events are such that the "tails" of the distribution cannot be counted on to decline towards zero – they main remain fat. C.f.: Collier, C. 2008. *Discounting with fat-tailed economic growth*. Discussion Paper. Toulouse, FR: Toulouse School of Economics (LERNA and EIF). Also: Weitzman, M.L. 2008. On Modeling and Interpreting the Economics of Catastrophic Climate Change. Forthcoming, *Review of Economics and Statistics.*

92 Creyts,, *et al.* 2007. *Reducing U.S. Greenhouse Gas Emissions …* [at Note. 6]

is over. In addition, an aggressive energy efficiency program would reduce demand for fossil fuels and the need for new power plants." [p. 69] -- Creyts, J., A. Derkach, S. Nyquist, K. Ostrowski and J. Stephenson. 2007. *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?* U.S. Greenhouse Gas Abatement Mapping Initiative. Washington, DC: McKinsey & Company and The Conference Board.

A "negative-cost" option in this argument is one that costs less to implement than it saves.[93]

What, then, should the priorities be? The short-term answers are obvious and just need to be restated:

- Kentucky certainly has a "high-carbon grid" so the major immediate paybacks are in energy efficiency.
- Much of the Commonwealth's housing stock and other older buildings exhibit levels of energy inefficiency that creates serious danger of economic damage from rising energy costs.
- That high-carbon grid is associated with below-average costs to burn coal and that makes any of the alternative energy options more difficult to justify economically since they are more likely to cost more than existing power – not a "negative-cost" by any means.
- Relative to other parts of the country where sunlight and/or wind are more reliable and hot magma to generate steam is more readily available, Kentucky shows less short-term potential for economic returns to using those alternative fuels to feed the electricity grid.
- Large scale photovoltaic or other systems providing power for on-site use remain a real possibility for the Commonwealth with net metering for electricity generating equipment a useful adjunct in the event of excess supply at certain times of day.
- Cogeneration may have some potential, but site-specific conditions will determine economic viability and investment costs would be substantial, so the most logical role for the state would be to encourage private examination of the options.

Over the longer term, carbon sequestration technologies may contribute to higher utilization of coal within Kentucky, but that technology is not expected to prove economically viable until 2020.[94]

Measures of Expected Money Savings

One clear measure of expected money savings shows relatively little uncertainty: the returns to building energy efficiency, which are known to be positive and to grow as utility rates rise. This effect is observable across many different states and regions in the US.[95] Even in a low power cost state as Kentucky, the monthly savings for comprehensive retrofitting and related efficiency measures are generally expected to be in excess of 20% over current bills – and that is more than enough to cover the debt service on borrowing or lease payments to cover the

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93 Those kinds of projects are already recognized in Kentucky in the Commonwealth's ESPC program and the KEEPS-promoted efforts for school systems, with more to be implemented under HB 2.

94 U.S. DOE. Office of Fossil Energy National Energy Technology Laboratory. 2007. *Carbon Sequestration Technology Roadmap and Program Plan.* Washington, DC: Authors. *Op. cit., Supra 21.*

95 Laitner, J.A., and V. MicKinney. 2008. *Positive Returns: State Energy Efficiency Analyses Can Inform U.S. Energy Policy Assessments*. Washington, DC: ACEEE. p. iv. Downloaded 6/12/08 from < http://www.aceee.org/pubs/e084.htm >.

costs of the energy saving improvements.[96] As already noted above, the savings can be even greater than those for mobile homes and older site-built houses.

From the point of view of the average household or business in the Commonwealth, a state-level energy efficiency program to maximize the savings in public buildings and assist those that do not have the funds to become more efficient in their homes and premises provides actual dollar savings in several ways:

- All households and taxpayers will benefit from public sector cost savings from lower building operations costs at all levels of government through lower taxes required to cover utility bills. These benefits will vary with income levels and effective tax rates, but can be estimated at mean levels with some measure of how the benefits vary with income
- If the household or business receives help in improving its own energy efficiency, it will save money each month with a lower utility bill, even though in most cases it would be expected to repay the cost of the investments made to generate the savings. Some of those households may not have the funds to make desirable energy efficiency improvements while others may really be able to pay for them, but may have trouble borrowing the funds needed for the investments, especially in tight credit markets.
- Even if a ratepayer does not receive direct aid in pursuing energy efficiency, it will benefit marginally from the fact that lower income households might face lower energy bills, need less government aid in meeting those bills, and thus be less likely to default on payments to their utility providers. The lower need for government support would mean lower taxes and the lower probability of bill payment default would eventually translate into smaller future rate increases to cover losses. [97] If overall usage is held down, then the higher cost power associated with meeting peak loads would be less likely to come on line and the need for, and likelihood of, construction of new generating facilities, with their higher unit costs, would also decline.

These savings are largely a function of the proportion of the total operating cost of the government, household, or business that is currently devoted to energy utility services. Each can be examined for the benefits it provides.

Savings from Lowering the Costs of Government Operations

Public sector accounting systems for utilities bills are such that a general figure for the percent of a government's current account budget that goes for utility services is very difficult to derive. Estimates offered range from 2% to 3.5%, depending on the governmental unit and its functions – and not allowing for the many governments in the Commonwealth that are themselves utility services providers to their citizens, where the costs would be lower.[98]

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[96] As already indicated, the state itself and the universities within it, for their own operations and the KY Department of Education, for the 174 school districts in the Commonwealth, have found such savings to be readily attainable and worth pursuing to save costs even at the current price of electricity and other utilities. Savings estimates cited above.

[97] These savings are very difficult to determine and will depend on the proportion of homes and families needing assistance in the state – and in each individual utility's service area. Since the other potential cost savings are so much greater, we are not attempting to quantify these real, but small savings.

[98] This estimated range was derived by authors from Kentucky state officials' descriptions of the savings attainable through Energy Savings Performance Contracts and on public school building cost efficiencies.

The University ESPCs reported on in Table 7, however, provide an indirect means of estimating a total savings level, at least for the state itself, since the Commonwealth keeps records on the interior square feet of all state-owned buildings.[99] Table 8 shows the derivation.

Table 8 – Deriving Estimated First-Year Utility Savings from Energy Efficiency

Buildings Operated by	Interior Space in sq-ft	Annual Utility Bill (baseline)	Projected Savings (%)	Expected Annual Savings	Savings/ interior sq-ft
All State Gov't.	50,582,055				
All but Univs	19,423,051				
EKU	3,252,074	$5,800,000	39.66%	$2,300,000	**$0.71**
KY State	913,790				
KCTCS	3,445,109				
Morehead	1,957,361				
Murray	3,296,273				
NKU	1,275,927				
UK	9,961,932				
UofL	5,376,649	$13,800,000	30.43%	$4,200,000	**$0.78**
WKU	1,679,889				
EKU + UofL	**8,628,723**	**$19,600,000**	**33.16%**	**$6,500,000**	**$0.75**
Total State Savings		**$38,103,362**			
Tax Revs 08		**$9,787,410,584**			
Savings as % of State Taxes		**0.39%**			

Source: Wylie, Rhonda. 2008. *RE: State Buildings -- Interior Area Estimates*. E-mail in response to query from P.B. Meyer, dated 8/22/08 and Table 7, *supra*. Tax revenues for 2008 taken from the 2009-2010 Kentucky State Budget.

The percentage savings for EKU and UofL were averaged and an average savings per square foot of $0.80 derived. Then that savings was applied to the interior space of All State Buildings to arrive at the over $38 million in savings. That number, in turn, was divided by the FY 2008 tax revenues to get a percentage rate.

Given this estimate for energy costs, a major commitment to pursue all cost-effective energy conservation options available for state-owned buildings alone in the Commonwealth would reduce the operating cost for those structures by a minimum in the first year of over $38 million

[99] The actual estimate is somewhat over $83 million, but all numbers are rounded down to avoid overstating any findings.

annually. *Those savings are just for the first year. They would be expected to grow faster than inflation over time, as energy costs rise relative to other expense items.*

Those operating cost savings from energy efficiency are the equivalent of a reduction in the average tax rate paid by all Kentuckians to the Commonwealth of 0.39%. *That percentage also will rise over time.*

Those savings can be seen as permanent since they involve capital improvements that last over time. They can raise operating costs for maintenance in the future, but the dollar value of the energy savings to total operating cost will also rise with the price of energy. The faster the cost of power rises, the more energy efficiency investment will pay off and reduce need to raise public funds through taxation and fees.

The debt- or lease-energy efficiency investments, then, will constitute the equivalent of a tax cut growing over time. How much of a tax cut will depend on taxpayer income. A simple example might be for three different Kentucky households, looking just at individual income taxes paid.[100]

- A family with $25,000 in taxable income would save about $ 5.00 in the first year.
- A family with $50,000 in taxable income would save about $10.00 in the first year.
- A family with $125,000 in taxable income would save about $23.00 in the first year.

Those savings would grow year after year, financed by the lower utility bills paid on all the buildings owned by state government. Overall energy costs for "commercial" users, the user group most like government offices and facilities, rose close to 40% in Kentucky between 2000 and 2005.[101] Cost increases have actually accelerated since then, but taking 40% as a forecast for future energy hikes means those *annual tax savings will grow to $7, $14, and over $32 by 2013 – and just keep on growing*.

A full state program, targeting the energy inefficiency of all public buildings in the Commonwealth, would deliver far more than these returns in lower taxes between all the school districts and county and local governments across Kentucky. Those units of the public sector operate budgets totaling some 70% of the state government budget, but they operate fewer grant and assistance programs housed outside their own buildings. The pursuit of energy efficiency for the buildings they own should at a minimum *double the annual returns generated from the state-owned buildings.*

Savings with Utility Bills from Help with Household Energy Efficiency

Unless Kentuckians live in ENERGYSTAR or Leadership in Energy and Environmental Design (LEED) certified homes – and have acquired the knowledge about how to save energy usage without altering lifestyles – they can benefit from help with increasing their household

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100 Estimates are from the Kentucky Department of Revenue. 2008. *740/740-EZ - Instructions - Form 42A740-S11.* p. 8. Downloaded from <http://revenue.ky.gov/NR/rdonlyres/90295300-F236-470C-B516-06DE790EC7EA/0/42A740S11.pdf>.

101 US Energy Information Agency. 2008. *Commercial Sector Energy Price and Expenditure Estimates, 1970-2005, Kentucky.* At <http://www.eia.doe.gov/emeu/states/hf.jsp?incfile=sep_prices/com/pr_com_ky.html&mstate=KENTUCKY > on 7/17/08.

energy efficiency.[102] Every bit of the energy savings they realize can translate into dollars saved on energy bills.[103]

So why does Kentuckians' residential usage of electricity continue to be so much higher than the national average? There are many explanations, each possibly applicable to one or more households:

- Some households may have the funds to take action, but they fail to do so because they do not know how easily they could save a substantial portion of their electricity bill.
- Other households have the funds needed to make improvements and know they could save money doing so, but they lack the information to decide what to do efficiently to reduce their bills.
- Still others may be paying their bills, see them climb, and want to do something about them, but may not have the funds to make needed investments in efficiency and do not have the credit or visible discretionary incomes needed to borrow the funds to get the savings.
- Finally, there are some households that are having trouble paying their utility bills and have to turn to the government for assistance every year. Thus government itself can become more efficient if it can help reduce the need for assistance through energy saving investments.

An integrated program of assistance that combines education with a state-managed and mandated system to permit self-financing investments in improved efficiency can help all these different needs.

There are a number of different educational efforts already underway to promote energy efficiency in Kentucky. Some are mandated or required under HB 2, including efforts yet to be launched, and others, such as the transformation of the Governor's Office of Energy Policy into the Department for Energy Development and Independence, reflect a growing understanding of the importance of the issue in Frankfort. There is, however, no clear mandate for public education focused on homeowners and small businesspeople, and above all, limited funding for educational outreach. The funding issue is, of course a problem in a contracting economy, but there are other tools that have not been used.

Inserts in utility bills are commonplace, but this potential educational tool has not been used to the extent that it could be for energy efficiency education. Many of the materials about the economic returns to efficiency already developed by the Commonwealth (and cited in this report) could be reformatted for inclusion in utility distribution company monthly billings. Materials could even be tailored to the consumption patterns of the individual ratepayer to whom a bill is sent, in order to maximize perceived relevance and stimulate responses. If the PSC does not now have the power to require that such materials be disseminated, the General Assembly could give it that capacity. In this manner the information already gathered or research and experiments being done with public funds could more directly be disseminated to those who could save money if provided the needed information about actions they could take.

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[102] ENERGYSTAR is a federally directed and supported energy efficiency standard for buildings, appliances and equipment. LEED was developed by the U.S. Green Building Council as a series of efficiency performance standards for different types of buildings. Both are applicable to new buildings and to retrofits and renovations of existing structures.

[103] The same statement can be made about Kentucky businesses, whether manufacturers, service providers, engaged in sales, or transportation and warehousing. Given the diversity of their specialized needs – and the existence of the Kentucky Pollution Prevention Center at the University of Louisville that can advise on increasing energy efficiency – this report focuses on the problems facing households, and the benefits they can garner from reducing consumption. The financing alternatives discussed in the report can apply to businesses as well as households.

Providing information about *which* actions to take to save the most with whatever funds are available for energy efficiency improvements is more complicated. The efficiency gains from an insulating "jacket" on a hot water tank will depend on how old – and inefficient – the tank is. But that variation is minimal and the range can be destroyed. It is vastly more complicated for a whole building. The amount of insulation may not be know, the leakage around window frames can vary, and the siting and exposure of a building can make a huge difference, as can the heating system being used. It is literally possible that one building may need a furnace replacement while another, very similar in age and size, might need insulation and weatherization, not a new piece of equipment. A homeowner who wants to invest in energy efficiency may not know where to start – and may waste money by doing the wrong things.

The PSC could mandate that utilities make optional energy audits for a fee to be paid over a year's energy bills available upon request to all building owners in the Commonwealth. Many utilities already offer the service through periodic bill inserts, so this need not be a major change for many of them. The quality of the audits is the key issue in assuring that maximum savings are generated. Some licensure by the state might be required for energy auditors, which could put a potential burden on both businesses and state agencies. An alternative might be to require that utilities either maintain a cadre of their own staff or subcontracted specialists that can conduct energy audits within some specified time period after a request is made and that they certify the competence of the auditors (and, perhaps, even take financial responsibility for failures to meet expected energy savings).

Utilities might also be required to act as performance contractors more generally, which would be one way to provide financing for those building owners that wanted to make energy efficiency investments but could not borrow the funds needed. The utility could contract with the homeowner to arrange for the energy efficiency improving investments (whether appliances, heating plant, insulation or other system or structural improvements), collecting a fee for the service, comprising a de facto loan repayment and interest, out of the energy savings and reduction in monthly utility bill realized as the result of the investment. If the utilities did not want to take on such a role, other businesses might, but the utilities have the advantage – to the ratepayers, to the potential efficiency contractors, and to the Commonwealth as the overall monitor – of already having in place a regular monthly billing system tied to premises occupied by a ratepayer.

Such a system could serve both middle class and impoverished homeowners. It could even serve rental properties if there were an arrangement in place to collect repayment for the investment from the landlord in the event of tenant-ratepayer failure to pay. Utilities might be more willing to invest in creating such a service arm and developing the weatherization and energy efficiency capacities needed if the program could include business ratepayers as well. There is no reason why it could not do so. It even provides a new revenue stream for the utilities, replacing at least some of the revenues lost due to lower demands for power[104].

For decades, LIHEAP has had to turn away applicants for assistance with their utility bills due to insufficient public funds.[105] The program pays current bills and helps lower income

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[104] Some protection for the utilities in the event of nonpayment of utility bills would have to be built into the system, wither through a provision to permit the utilities to take out a lien on the improved property in the form of a lease-buyback contract or through some comparable mechanism.

[105] The inadequacy of LIHEAP assistance in light of ever growing demand is evidenced in the inserts from most utilities soliciting contributions from better off ratepayers for private assistance to the poor. The emergence over the past 30 years of

households (many not below the poverty line but overburdened with large winter heating bills) retain their electricity, gas, or other utility service. But payments have no long term effects on people's ability to pay and recipients return year after year for more help. LIHEAP is a helpful, but very inefficient, program.

Kentucky needs LIHEAP and cannot afford to weaken it as energy prices rise (which they are doing and will continue to do). However, the Commonwealth can make the program much more efficient by taking action to reduce needs for bill payment assistance in the future. That can be done through weatherization and other energy efficiency investments in the homes of the recipients.

According to the Kentucky Cabinet for Health and Family Services, "The Kentucky LIHEAP program helps approximately 150,000 Kentucky families pay their heating bills each winter."[106] This represents 150,000 cases of households, many of them homeowners, which could benefit from energy efficiency services – and could be in a position to repay the funds needed for the improvements out of the money they paid on their utility bills.

Whether or not the 150,000 exceptionally burdened ratepayers who had to turn to LIHEAP are included, there were a total of 1,655,767 households in the Commonwealth as of 2007.[107] As of 2006, they paid an average electricity bill of $959, a number that has certainly grown since that date. Assuming a $1,000 average annual electricity bill for Kentucky households, and an energy efficiency program that served just 10% of the total households (165,577) and saved an average of 10% on their annual bill through education and efficiency investments (a very low number to expect, given available data), *that program could save householders $16,557,700 in the first year, and keep rising from there.*

Of course, if the savings all came from investments made through some bonding or performance contracting system, then debt service would have to be considered as an offset. That is, the savings would have to be used to pay off the debt incurred to invest in the energy efficiencies. Those savings could cover the cost of $800 worth of energy improvements on average across all of the assumed 165,577 households assisted. That translates into being able to support total new investments in programmable thermostats, compact fluorescent light bulbs, insulation, duct system repairs, and even more energy efficient furnaces, hot water heaters and appliances of over $130,461,600.

Most of those investments, however, are likely to be in the buildings and their systems, not the appliances. This example, then, suggests that a state commitment to helping 10% of the households in the Commonwealth to lower their electricity bills could generate $100 million in new construction sector business. That's new business for a sector that really needs the work.

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utility- and community-funded and supporter assistance programs aimed at limiting the 'percentage of income" poorer households are expected to pay are responses to the growing price pressures on low or fixed income utility consumers. C.f.: Meyer, P.B., and B.S. Curry-White. 1994. *The Affordable Energy Corporation's All Season Assurance Plan.* Louisville, KY: The E.P. Systems Group, Inc.

106 Downloaded July 30, 2008 from <http://chfs.ky.gov/dcbs/dfs/LIHEAP.htm>.

107 U.S. Bureau of the Census. 2008. 2007 American Community Survey – 1-year Estimates. Downloaded 8/29/08 from <http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenuId=&_lang=en&_ts=>.

Financial Returns from Others' Reduced Energy Consumption

Even the households and business that have pursued energy efficiency themselves with no state guidance or support and with little or no financial assistance could benefit economically from a strong statewide effort to promote energy efficiency. These returns would not be limited to just lower utility bills, but could also take the form of new opportunities.

- Energy bills might decline, as noted above: peak loads would decline with overall usage and that could lower average bills throughout a billing cycle since the energy cost component of a bill is usually an average of the least and most expensive power used to provide power to ratepayers during in a cycle.
- Delays or cancellations of new investments in increased generating or power delivery capacity (or in new contracts for purchased power required to meet expected demands) may be made possible by lower aggregate demands. Since those new activities generally deliver power at higher unit costs than the existing arrangements, this, too, may lower energy bills.
- The need for new energy auditing capacities and for greater capacity and skill in conducting energy efficiency retrofits to existing buildings will expand business opportunities for entrepreneurs.
- The expanded local market for both auditing and retrofitting capacities will lower the barrier for Kentucky investors who might make progress on new tools and techniques for conducting these activities.
- To the extent that the Commonwealth takes the lead in such state-organized financing for energy efficiency (which it could if it moved quickly), then it might also attract out-of-state entrepreneurs and inventors, as well as branches of non-local business that produce goods and services to support energy efficiency activities, all of which would expand opportunities for Kentucky businesses and workers.
- Skilled personnel will be needed for the work promoted by these measures and may provide new job training opportunities for those not already pursuing some form of post-secondary education.
- The new investments will create jobs – and more sales of construction supplies, tools and equipment – contributing to expanded incomes for Kentuckians.[108]

Job and Income Creation Processes

The most immediate payoff to a major energy efficiency push for the average Kentuckian, outside of lower utility bills, is clearly in the realm of job opportunities. In the short term, before the new businesses and related opportunities just discussed emerge, and even if they never do, some major job and income impacts can be expected to emerge.

Using data from the 2002 Economic Census for Kentucky, Table 9 illustrates the job creation potential of different segments of the construction industry.[109] The first row across

[108] This last point assumes that the construction work is financed using funds that would not otherwise be spent in the Commonwealth. The assumption would be valid for most of the funds obtained through bond or lease-buyback arrangements under performance contracts, for the funds used for home improvement by those who might otherwise invest them through major money center financial institutions, and, to some degree, even for those funds diverted from the purchase of consumer or other end-user products produced out of state.

shows the entire construction industry in the Commonwealth including highway and other infrastructure construction. Each of the other rows looks at different subset of the industry in Kentucky. First, there are the residential builders, leaving out the developers who turn farmland and other non-urban property to urbanized land by installing infrastructure along with building structures. Then there are residential remodelers, very often small firms with part-time employees hired as jobs are contracted. After that, there are the specialty contractors: foundation, roofing, electrical, glazing and others – a group that includes plumbers and HVAC specialists. Then there is a row showing only the HVAC and related services specialists since they are the ones most likely to get the bulk of the work under the ESPC requirements for 12-year paybacks currently required. The bottom row shows the industry characteristics associated with industrial construction, such as might be associated with the building of a new power plant – or a coal liquefaction facility.

The columns characterize the individual segments of the construction sector and help to show what a $100 million investment in construction would generate in jobs and payrolls. Listed first is the total value of construction under contract, then the proportion of all the construction sector that each row represents, the number of establishments (payroll paying places), and number of employees in the industry and the segments. Next are the total payroll and then the average payroll per worker for the sector and the segments. The average payroll is the total payroll divided by number of workers, so the proportion of workers with full- or part-time work and wages cannot be determined. The calculations consider how many jobs and what total payroll would be generated by another $100 million in total contracted work for the sector or segment, and, just to put the payroll in perspective, the last column shows the proportion of the contracted work that would translate into payroll.

What stands out in this Table is that what $100 million in new construction would do for workers and payrolls in Kentucky would depend very much on what type of construction work would be done.

- Average earnings per worker are clearly higher for infrastructure construction than building work and for industrial building construction relative to residential work.
- The specialized building firms all pay workers more on average than do those working in new residential construction.
- The HVAC specialists make more per worker than do the other specialized building sector employees, at over $32,500 compared to over $29,500.
- Even the residential rehabilitation workers do better than those working on new home construction, at almost $23,000 compared to just over $22,500 per worker.
- Total Payroll as a percentage of all spending to execute a contracted job ranged from under 11% for residential construction to 30% or more for the specialized building contractors.
- Total payroll also was a smaller proportion of contracted work on new residential or industrial construction than it was for rehabilitation work

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[109] These data are from the Geographic Series of the quinquennial Census of Business on Construction. Average annual employment and payroll data were used; the numbers reflect a snapshot in a single year, do not incorporate the recent slowdown in new home construction and generally cannot be used for forecasting. They provide some evidence of patterns of employment and wage differences. Comparisons between different segments of the construction business in Kentucky below refer to the year 2002, so no adjustments for expected pay increases are included in the table.

Table 9 – The Construction Industry in Kentucky, 2002

INDUSTRY SEGMENT	Total Business Done ($1000s)	% of Sector	No. of Estabs	Total Workers	Payroll ($1000s)	Average Earnings	Payroll per $100 M	Jobs per $100M	Payroll as % of Business
All Construction	$12,644,444	100.00	8,814	83,946	$2,637,092	$31,414	$20,855,737	664	20.86%
Non-devel. residential Builders	$588,879	4.66	611	2,661	$59,945	$22,527	$10,179,511	452	10.18%
Residential remodelers	$402,512	3.18	906	3,181	$73,098	$22,980	$18,160,452	790	18.16%
Specialty trade contractors	$4,882,111	38.61	5,728	51,044	$1,513,501	$29,651	$31,000,954	1,046	31.00%
Plumbing, heating, and air-conditioning contractors	$1,363,485	10.78	1,219	12,557	$408,927	$32,566	$29,991,309	921	29.99%
Industrial building constructors	$268,120	2.12	34	1,278	$39,451	$30,869	$14,713,934	477	14.71%

Source: US Bureau of the Census. 2005. *2002 Economic Census – Construction - Geographic Area Series: Kentucky.* EC02-23A-KY. Released September. Washington, DC: Author. Downloaded from <http://www.census.gov/prod/ec02/ec0223aky.pdf >.

Under the current state policies controlling utility efficiency investment contracting under ESPCs, a new $100 million in funds available not only would do less good in terms of energy savings with the short-term horizon of the 12-year payback limit, but it would put a smaller proportion of the funds committed into the hands of workers – just under 30% for HVAC specialists – than would be the case if the projects could include roofing, foundation and glazing improvements, the broader set of specialized construction work, where a higher proportion of the funds spent would go to wages. The self-financing program for household energy efficiency improvements without the limitations placed on the ESPCs could generate the same $100 million in new construction work but more construction labor, virtually all of it hiring by the Specialty Trade Contractors (especially the HVAC specialists), with employees earning around $30,000 annually.

Another measure of possible impacts from $100 million in new construction activity can be garnered from an analysis of construction expenditures by Eastern Kentucky University by a distinguished Kentucky economist who arrived at job and income impact numbers far greater than those in Table 9:

> "… $10 million dollars of construction spending by EKU would generate 'downstream' spending of $12.8 million in Kentucky …Household incomes would be increased by $6.7 million …and [the spending] would add 219 jobs …" -- Haywood, C.F. 2006. *An Economic Impact Study of Eastern Kentucky University*. Richmond, KY: Eastern Kentucky University. P. 12. Downloaded 7/18/08 from: <http://www.president.eku.edu/economicimpact/eku_impact_report.pdf>.

Expanding the $10 million in this example suggests that $100 million in new construction work would result in 2,190 total jobs being generated and generate $67 million in new household incomes in Kentucky.

For the sake of conservatism, this analysis will derive measures of the *direct* employment and payroll numbers from Table 9, assuming all building energy efficiency improvement work is by Special Trade Contractors.[110] There are, however, other economic effects (Dr. Haywood's 'downstream' impacts).[111] Combining the real data on direct effects with a very conservative

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110 This assumption has strong empirical grounds in prior analyses of the national job generation potentials of energy efficiency efforts. C.f.: White, S., and J. Walsh. 2008. *Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy*. Madison, WI: Center on Wisconsin Strategy, U99

111 Much of the analysis of the economic implications of policy options for the Commonwealth is analyzed using the REMI econometric model. Both the Governor's Office and the Legislative Research Commission use the tool. A quick REMI run on the returns to the investment of a $100 Million more in new building efforts run at the request of one of the authors (Dr. Meyer) resulted in the finding of only 365 direct jobs and total income gains of $17.76 million. Both these numbers are well below the relationships evident in the 2002 Census numbers and Dean Haywood's estimates.

The Census results reflect actual numbers in 2002. The REMI econometric model is just that, a model of the Kentucky economy. It incorporates the best available data on economic activity and the relationships between different sectors. The key to the model is that it tracks the interactions between regions and between businesses that supply inputs to one another. Thus the model would adjust employment impacts for workers in Kentucky for the possibility that construction firms may have hired workers who live outside of the state, something the straightforward Census information would not have reported. Arguably, then, the REMI model is the more sophisticated tool for forecasting.

Even a very sophisticated model depends on the platform on which it is built. The 2008 REMI model for Kentucky uses an "input-output" table of how each sector in the US economy interacts with others that was calibrated in 1997. (REMI Econometric Models, Inc. 2007. *REMI Policy Insight 9.5: Data Sources and Estimation Procedures*. Cambridge, MA: Authors, p. 15. Downloaded 9/5/08 from <http://www.remi.com/uploads/File/Articles/Data_Sources_and_Estimation_Procedures.pdf >.) This dated basis means that the estimates do not incorporate all the technological changes of the past decade – and thus cannot adjust adequately for how the economy has adapted to such external factors as the high increase in the relative costs of power

1.75 multiplier for jobs, and one at 1.40 for incomes, we arrive at the expectation that each $100 million in new investment in improving building energy efficiency in Kentucky will generate a total of 1,830 new jobs and will add $33,215,308 in new *wages and salaries* (including many paying far less than the construction workers' industry mean of over $31,000). Thus low-income Kentuckians would benefit as well as those with more skills. Profits from business are not included in those numbers and will add even more to the total household income in the Commonwealth.[112]

The low-income multiplier above, just 1.11, reflects how little the Commonwealth actually produces for itself when it comes to construction: the vast majority of the spending for supplies and construction materials goes to buy inputs from out of state and does not add much to the incomes of Kentuckians. If Kentucky were to develop and produce better energy saving equipment and materials within the Commonwealth, as suggested above in discussion of the less direct economic benefits of stimulating investments in building energy efficiency, this number could change, the income multiplier could grow, and new sources of employment would arise at the same time.

That is why tackling the problem of energy cost increases can become easier if it is conducted in an integrated planned manner, not merely as a series of little adjustments to serve a particular immediate short term need or in response to a particular interest group's pressure for some sort of program. If an integrated approach were implemented, the findings above would *understate the potential benefits by ignoring the effects of possible investment in developing better technologies and better training workers in-state.*

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over the period. (Unfortunately, the national I-O tables only get updated every five years, and generally do not become available until five years after the business censes on which they are based.)

By examining interactions between construction activity and other economic sectors through the I-O construct, REMI also predicts the *indirect* effects of construction spending: the new jobs and income resulting from the spending by those getting paid as the result of the construction activity. The multiplier on direct jobs that REMI derived in the run conducted at our request was 1.46, meaning that 46 more jobs would be generated in non-construction businesses in Kentucky for every 100 construction jobs created. REMI also tracks the indirect income effects of the additional construction work, recording a $2 Million indirect income effect, for a total Kentucky income effect of $19.96, an income multiplier of only a bit over 1.11.

The logic on which the multiplier is based is the number of times any income earned circulates in an economy before it goes out for inputs or non-local labor. The larger the economy under consideration, therefore, the higher the multiplier would be expected to be. A state multiplier thus should be above one for a county or city. Yet the REMI projected 1.46 jobs multiplier for the whole state is well below the generally expected job multipliers around 2.0 for local economic development planning areas much smaller than the entire state of Kentucky. (Bartik, T. 1995. *Economic Development Strategies.* Upjohn Institute Staff Working Paper 95-33, p13. Downloaded 8/5/08 from: <http://www.upjohninst.org/publications/wp/95-33.pdf >.) A conservative assessment for Kentucky itself by an ex Budget Director claimed a multiplier of 2.0 in 2006. (Ramsey, J. 2006. *Address to the Kentucky Chamber Of Commerce Annual Meeting/Economic Summit.* July 26. Downloaded 8/5/08 from <https://louisville.edu/president/news/files/Ky%20COC%20Speech%20--%207-26-06.pdf>.)

The precise assumptions made in the REMI run conducted at our request – which was to simulate the effects of a $100 million infusion of new business into the construction sector in the Commonwealth – are not clear. The results of the run are not consistent with prior findings and other evidence. Thus, while we acknowledge those findings, we use them only as a warning to be very conservative in our projections of expected impacts.

[112] These figures further understate the job and incomes effects of an energy efficiency program by ignoring the positive effects of energy cost savings on the competitiveness of businesses in the Commonwealth and thus on employment in Kentucky. Failure to promote business energy efficiency, by contrast, can cost the state jobs. See, as an example of the potential of efficiency itself as a job generator, Environmental Law & Policy Center. 2002. *Job Jolt: The Economic Impacts of 'Repowering the Midwest: The Clean Energy Development Plan for the Heartland'*. Chicago: Author. Downloaded from: <http://www.repowermidwest.org/Job%20Jolt/JJfinal.pdf>.

Maximizing the Returns to Working Kentuckians

Kentucky is not at the forefront of the states promoting their own energy efficiency, regardless of what actions are taken on the national level to decrease US emissions. No one expects a state with one of the lowest electricity costs in the nation – and a fifth of its coal reserves – to pursue energy efficiency. But a major energy efficiency program and a highly visible state commitment to actions that would reduce emissions would generate headlines – and *could be a bonanza for other economic development initiatives.*

Globally, the renewable energy and energy efficiency sectors are among the fastest growing industries; they are growing more rapidly outside the US than within, driven by demand from their own internal policies. As one of the field studies noted,

> "… Renewable energy is more labor intensive than equal investments in traditional generation. Renewable energy is a young industry experiencing rapid growth, wind is the fastest growing energy source and the solar industry is growing above 25% annually….
>
> "… According to a study by the California Public Interest Research Group, Renewable Energy generates four times as many jobs per MW of installed capacity as natural gas, while the Renewable Energy Policy Project finds that renewables create 40% more jobs per dollar of investment when compared with coal fired plants." -- The Institute for America's Future and The Center on Wisconsin Strategy, with The Perryman Group. 2004. *New Energy for America -- The Apollo Jobs Report: For Good Jobs & Energy Independence*. San Francisco, CA: The Apollo Alliance. p. 33. Downloaded 6/23/08 from <http://www.apolloalliance.org/downloads/resources_ApolloReport_022404_122748.pdf>

If Kentucky took the lead in energy efficiency (it does not have the location to really lead in renewables-based electricity generation), it could jump ahead of many other states and attract those growing companies to the Commonwealth.[113]

Moving to more fully support EE and RE initiatives with state funds is likely to have far greater job income effects than might otherwise be expected, since the forecasts on the returns to new initiatives made by state government policy analysts use tools such as REMI. That model assumes that the "energy" sector in the future will look much like the sector has to date, but the whole reason for the investments is to change the sector. The relationship between capital investments and jobs is likely to change drastically if there is less reliance in the sector on large centralized power plants, so it is not surprising that one forecast found that efficiency-related investments generated an estimated 540 jobs per $100 million in sales while traditional energy supply generated only 190 jobs for the same sales volume when compared to roughly 1.9 jobs per million dollars of sales in the energy supply sector. That forecast also found roughly 700 new jobs per $100 million of sectoral output in residential and commercial building energy efficiency investments, numbers very much in line with Dean Haywood's estimates for EKU construction cited above.[114]

One approach to maximizing the benefits of the Kentucky energy policy for workers in the Commonwealth would be the creation of a Center for Innovative Energy Engineering and

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113 Additional evidence on these points is available from: Friendly, A., J. Makower, and R. Pernick. 2003. *Solar Opportunity Assessment Report*. Washington DC Solar Catalyst Group. Downloaded 6/23/08 from <http://www.solarcatalyst.com/soar.pdf>; Churchill, S., and B. Heavner. 2002. *Renewables Work*. CALPIRG Charitable Trust. Downloaded 6/23/08 from <http://www.environmentcalifornia.org/uploads/Gg/7m/Gg7mP2qpr4ZGj0deZnKIzQ/Renewables_Work.pdf>.

114 Ehrhardt-Martinez, K., and J.A. Laitner. 2008. *The Size of the U.S. … op. cit. Supra 45.* P. 24 and Table 8, p. 25.

Training to complement the institutional initiatives in HB 1 and HB 2 and the Kentucky Pollution Prevention Center. Whether located at one university or spread across several post-secondary education institutions, such a unit could have the potential to attract renewable energy research and development facilities as well as manufacturing plants in that sector, along with other environmentally-sensitive economic activity to Kentucky. To maximize its value, the center should be complemented with new associate degree programs and related vocational and technical training for those not pursuing four-year or advanced degrees. Attracting new manufacturing activity related to the EE and RE sectors also could provide new jobs for those who might lose jobs due to rising power costs and decreased competitive advantage for existing manufacturing plants.

And the job potentials are substantial, as Table 10 demonstrates. As of 2006, before a major push to increase energy efficiency, the industry generated almost 3.5 million direct jobs and 8 million total jobs and showed revenues over $900 billion. These numbers may be expected to at least double or triple in response to rising costs and new commitments to limit greenhouse gas emissions over time. The expansion in the sector and the jobs is taking place now, but Kentucky has not yet become a player. The Commonwealth cannot afford to wait.

But the new center should not be drawn too narrowly. Other skills associated with the existing energy industry are in short supply. There is a national shortage of electrical linemen, and other skills related to energy transmission and delivery. Training programs have not developed to replace the on-the-job training that apprentices in these fields once go, with only a scattered few community colleges and vo-techs offering programs. Kentucky could provide income opportunities for more of its residents simply by providing a center for recruiting and training for electrical linemen and related craftspeople.[115] Not only will Kentuckians find new work opportunities as linemen, but the center itself will attract attention and possibly open up other energy industry jobs.

Finally, and most importantly, job development in the renewable energy sector can even be targeted toward some of the most vulnerable working populations in the Commonwealth: the people of Eastern Kentucky. That region has the highest wind energy potential in the state, and the very process of mountaintop removal has expanded that potential and created more solar potential through removal of forests and opening of more exposed flat land. Whether or not that mining technique continues to be used, the lands already cleared could provide work in building and maintaining wind turbine installations on open spaces that may still not be appropriate for buildings and other more intense on-site uses.

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[115] Mcnabb , D.E., L. K. Gibson , and B.W. Finnie. 2006. The Case of The Vanishing Workforce. *Public Performance & Management Review.* XXIX(3): 358-368; Beach, J.F, and L.C. Dilts. 2007. *Electric Transmission & Distribution Infrastructure: Powerful Spending Trend Forecast to Extend Well Into the Next Decade.* Equity Research - Industry Analysis, Winter 2006/2007. Baltimore, MD: Stifel, Nicolaus & Company, Incorporated. P. 7. Downloaded 6/23/08 from <http://www.classicconnectors.com/downloads/Electric%20Transmission%20and%20Distribution%20Infrastructure%20Report%20-%20Stifel%20Nicolaus%20-%20Reduced.pdf >.

Table 10 – The Energy Efficiency Industry in the US, 2006

Industry Segment	Revenues or Budgets ($ billions)	Direct Jobs Created (thousands)	Direct Jobs per /$100 M	Total Jobs Created (*) (thousands)	Total Jobs per$100 M
Insulation	$5.0	26	520	60	1,200
ESCO	$3.0	19	633	44	1,467
Recycling	$275.0	1,310	476	3,013	1,096
Vehicle manufacturing	$73.0	165	226	380	521
Household appliances and lighting	$22.0	86	391	198	900
Windows and doors	$12.0	51	425	117	975
Computers, copiers & FAX mach.	$90.0	312	347	718	798
TV, video, and audio equipment	$45.0	183	407	421	936
HVAC systems	$12.0	45	375	104	867
Industrial and related machinery	$19.0	76	400	175	921
Misc. durable manufacturing	$105.0	389	370	894	851
Nondurable manufacturing	$220.0	528	240	1,214	552
Utilities	$2.0	14	700	32	1,600
Construction	$36.0	227	631	522	1,450
Total, Private Industry	$919.0	3,431	373	7,892	859
Federal government EE spending	$3.3	15	455	35	1,061
State government EE spending	$3.0	28	933	64	2,133
Local government EE spending	$2.3	21	913	48	2,087
Total Government	$8.6	64	744	147	1,709
EE trade and prof.assocs. & NGOs	$0.5	3	600	7	1,400
TOTAL, ALL SECTORS	$932.6	3,498	375	8,046	863

* Including both Direct Jobs in the sector named, and Indirect Jobs, generated by the new economic activity in the sector.

Source: Bezdek, R. 2007. Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century. Boulder, CO: American Solar Energy Society. Downloaded 6/15/08 from: <http://www.ases.org/images/stories/ASES-JobsReport-Final.pdf>Table 3, p.

V. Conclusions

In principle, as has been shown here, Kentucky has the capacity to commit hundreds of millions of dollars to energy efficiency investments in the Commonwealth that have the potential to:

- Reduce taxes on all Kentuckians, now and in the future;
- Reduce monthly energy bills for hundreds of thousands of households, saving them more money as time goes by;
- Provide new jobs for thousands of workers at a time when the sector in which they work is depressed;
- Reduce economic risks in the future by diversifying the economy and stimulating new activities and training for works; and,
- Bring the Commonwealth to prominence in a global economy striving to reduce the carbon intensity of human activity.

Over the longer term, these are returns that any government would be pleased to provide to its taxpayers and citizens.

One big fear about any innovation is always the cost in the immediate period. But the data exhibited here show that the steps to get there do not need to cost the Commonwealth *anything* in the current period:

- Performance contracting and lease-buyback arrangements can finance all the public sector energy efficiency investments needed. The investments pay for themselves at first, and earn additional savings with the passage of time.
- Removing the unlegislated 12-year payback requirement for energy efficiency building improvements with longer lifetimes can expand the current performance contracting markets and promote more efficiency over the long term.
- The $30 million in bond financing already committed to energy efficiency in the public sector program of the Bluegrass Turns Green initiative can be diverted from unnecessary grants to use as loan guarantees and finance $300 million in household or business energy efficiency investments for which the short term self-financing systems do not work.
- The $300 million in bond financing that the Commonwealth committed to the Peabody coal liquefaction plant under HB 1 is not likely to become a factor for over a decade, with the US Department of Energy expected delays in carbon capture and sequestration technology development. Borrowing capacity currently committed to economic development can be shifted to promote energy efficiency investments and the job and income potentials (plus user cost savings) they promise. This shift and the economic diversity and positive image it could generate may contribute more to long term economic prosperity for the Kentucky than the traditional uses of these resources.
- The 150,000 occupants of manufactured and mobile homes, some of whom are among the lower income households in the Commonwealth, as well as others living in poor quality housing may have to face a less severe “heat or eat” choice in the coming winters and as a result are likely to place fewer demands on health care and other

support services that have to be paid for in the end by other Kentuckians, so both groups are better off.

A $1 billion initiative with debt financed through savings on energy costs should not be difficult to finance once the current debt markets are stabilized. Lowered interest rates provide additional opportunities for cost savings. While private borrowers are being shunned right now, public debt is being purchased. The economic risks and threats posed by global warming translate into grounds for expectations of the capacity to service debt out of costs avoided, so financing should become available.

The time for Kentucky to act is now. Two years from now, the nation may have taken a stand on carbon emissions and the Commonwealth, doing nothing different than what is proposed here, but then doing it because it had to, would be seen as a follower, not a leader. The economic development potential of taking the initiative will have been lost. The economic return to the program suggested here thus is far greater if it is implemented early in 2009 than in any later session of the General Assembly.