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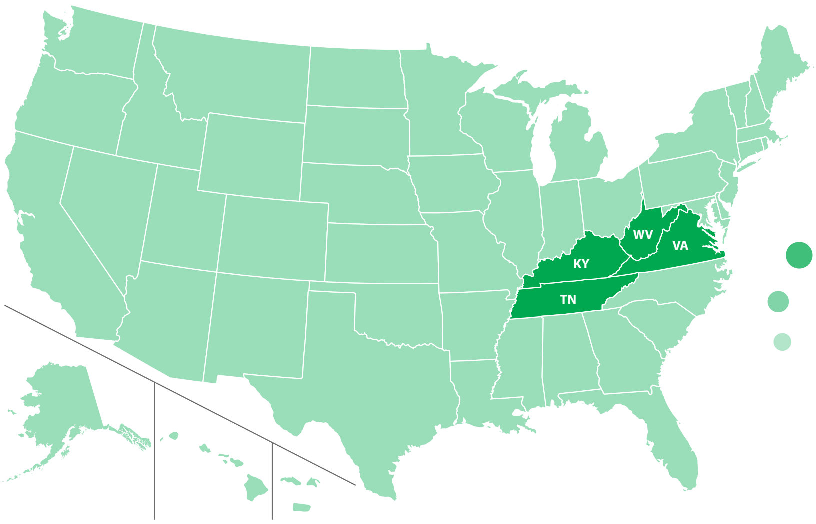

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Summary

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Changes in the cost of energy in one state's school districts

To support the work of Tennessee's Energy Efficient Schools Initiative (EESI) Council, this report describes data on energy expenditures in school districts for 2002/03–2007/08. Energy expenditures rose from about 2.6 percent to about 3.0 percent of total expenditures over the period, with some differences in the mix of energy types and expenditures per student by district characteristics. An index of fiscal stress can be used to establish priority districts for EESI Council funding. Simulation of the impact of future energy inflation by district characteristics finds that the variation within districts grouped by characteristics is just as large as that across district characteristics, suggesting that the EESI Council should investigate individual district circumstances in allocating state funds rather than create allocation rules based on district characteristics.

Energy prices have received considerable public attention in recent years, especially the run-up in crude oil prices to $140 a barrel in summer 2008. But the prices of other forms of energy, such as electricity and natural gas, have also risen dramatically. These price increases have affected energy expenditures by local education agencies. Facing unexpected increases in energy bills for which no budget allowance had been made, school districts have considered such drastic actions as reducing the school week to four days. Yet, despite the substantial public attention to the implications of rising energy prices for school districts, little research has examined the issue.

The Tennessee legislature addressed school district budget concerns through the statewide Energy Efficient Schools Initiative (EESI) of 2008, creating a 12-member EESI Council with a mandate to issue grants to school systems for capital outlays on energy-use projects. This report responds to a request to improve the council's understanding of energy use in Tennessee school districts by examining district energy expenditure data. The report addresses three main questions:

- What proportion of school district budgets was spent on energy, and how did this change over time?
- Did the increase in energy expenditure disproportionately affect districts with certain characteristics?
- What might happen to district energy costs if real energy prices continue to rise?

The study finds that in 2007/08, energy expenditures accounted for about 3 percent of

Tennessee school districts' total expenditures of $6,231 million. From 2002/03 to 2007/08 energy expenditures rose $82 million (from $164 million to $246 million), while total expenditures rose $2,050 million. However, the increase in aggregate energy expenditures likely reflected some changes in energy expenditures that were independent of changes in energy prices. For example, student population growth might have necessitated purchasing additional units of energy to run buildings. An alternative approach is to assume that energy is a fixed proportion of the budget. Using the difference between actual energy expenditure each year and a hypothetical level based on energy's 2.6 percent share of expenditures in 2002/03 yields an increase in energy's share of total expenditures of less than 0.4 percentage points, which could account for some $29 million of the overall increase in expenditures.

The mix of energy (electricity, natural gas, and oil-based products) and expenditures per student vary by district characteristics—region, size (number of students), and locale. By region, districts with the highest percentage of electricity use as a source of energy had the lowest cost per student. A similar pattern holds for district size: districts with larger student populations, which have the highest percentage of electricity use, also had a lower cost per student. But for locales, this pattern holds only for towns. City, suburban, and rural districts all had roughly the same percentage of electricity use, but the cost per student was 5 percent or more lower in suburban districts. Thus, factors other than energy prices seem to drive differences across locales. Without data on additional factors, such as the age of the buildings or the heating and air conditioning plants, it was not possible to identify the sources of these differences.

Not all districts had the same cost structure. Two measures of district spending on energy were used to investigate fiscal stress caused by the rise in energy costs. The ending rate, or operations and maintenance expenditures on energy per student in 2007/08, identifies districts that spent a relatively high proportion of their funds on energy for operations and maintenance. High energy expenditures could cause fiscal stress by crowding out other expenditures. The growth rate, or the rate of increase in energy expenditures on operations and maintenance over 2002/03–2007/08, identifies districts facing the largest change in circumstances over the past six years as a result of high energy price inflation. Districts with the highest growth rates have to make the greatest adjustments to higher energy costs.

Districts were ranked and grouped into quartiles on each of these measures. On average, the most energy-expenditure-efficient districts in 2007/08 spent $173 per student on energy, while the least energy-efficient-expenditure districts spent $295 per student. To support the EESI Council's decisions on funding requests, the study created an index of the fiscal stress resulting from the expenditure increases for each district. The distribution of stress scores, calculated by adding the quartile rankings for the two criteria, shows that more districts fall into the three middle scores than into the four extreme scores (see table). In other words, the stress scores identify a few districts under the most and least stress and then larger numbers in the middle. Use of this indicator could enable the EESI Council to

Distribution of Tennessee school districts by stress scores

Stress score[a]	Number of districts
2	8
3	19
4	30
5	30
6	19
7	17
8	13

a. Calculated by adding the quartile rankings for energy operations and maintenance (O&M) expenditures in 2007/08 and rate of increase in energy O&M expenditures for 2002/03–2007/08.

Source: Authors' calculations based on data from Tennessee Department of Education, *Annual Statistical Report*.

concentrate more support on a few districts and less on a larger number of districts.

These stress scores were used to examine whether district characteristics affect the increase in energy expenditures. The average stress scores follow a pattern similar to the expenditures per student calculations. Even though the stress metric includes the growth rate along with expenditures, the effect of the growth rate variable is too weak to change the underlying pattern in most cases. Thus, West Tennessee districts, districts with large student populations, and suburban districts are under less stress than are other districts. Population standard deviations of the stress scores were also calculated across all districts for each district characteristic. The standard deviations are uniformly larger than the differences in average stress scores, so the differences are not statistically significant. The magnitude and lack of statistical significance of these differences mean that district characteristics are not a reliable indicator of stress. Not all districts with the same characteristics have the same or even similar stress scores. As a result, the EESI Council might not want to use these district characteristics in establishing criteria for allocating state funds.

The final question asks whether certain types of districts face more difficult challenges than others if real energy prices continue to rise, given current expenditure patterns. For this analysis, a real increase in the price of energy means an increase relative to other prices (the overall inflation rate) or an increase in energy expenditures holding total expenditures constant. Actual increases in expenditures might be smaller than the simulated increases because if energy prices rise, districts would try to reduce energy consumption.

To simulate the impact of increased energy prices, the analysis was conducted backwards by first calculating the overall increase in energy prices that would raise the energy expenditure rate 0.43 percentage points—reflecting the largest increase in energy expenditures as a proportion of total expenditures (16 percent) over 2002/03–2007/08, from 2.62 percent to 3.05 percent. With 2007/08 as the base year, the effect of a 16 percent increase in expenditures for each district was simulated by increasing the price of all three types of energy separately and then together.

The simulated increases in the percentage of total expenditures devoted to energy show, for example, that if electricity prices rise 16 percent and other energy prices are stable, energy expenditures in East Tennessee districts would rise 0.36 percentage points, but if all energy prices rise 16 percent, energy expenditures would rise 0.44 percentage points. However, the differences in the averages for each characteristic and energy type are smaller than the

standard deviations, which means that they are not statistically significant. The variation by characteristics is not nearly as large as the variation across school districts.

Because the limited data available for this analysis precluded analysis of such important factors as the age of buildings or heating and air conditioning plants, the EESI Council will need to look at districts on a case by case basis when allocating resources, using the district stress scores for guidance, rather than predetermining allocations based on district characteristics.

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