

Understanding the Needs of Arkansas School Districts Relative to Building Use and Control, Utility Tracking, Personnel, and Facility Planning

Jay A. Keazer

Darin W. Nutter

Mechanical Engineering Department
University of Arkansas
Fayetteville, Arkansas

ABSTRACT

This paper documents the results and conclusions from a survey of Arkansas public school district superintendents as part of a project to analyze the energy performance and utility-related needs of Arkansas' K-12 school facilities. The survey was distributed to 252 school district superintendents in the state and contained 16 statements and one question related to the use and control of school buildings, attitudes towards tracking utilities and costs, the availability and effectiveness of personnel, and the influence of utility costs on facility planning. Over 30% of the surveys were completed and returned. The goal of the survey was to better understand the practices and concerns at the district level. A statistical analysis identified key differences in the responses of districts of different sizes. One of the major findings from the study is that the needs of small districts are significantly different than those of large districts.

INTRODUCTION

The cost of operating buildings has been increasing rapidly due primarily to rising costs of natural gas and heating fuel oil. Average consumer prices of natural gas were expected to be 23% higher nationwide and 26% higher in the southern part of the United States during the winter of 2005-2006 than the previous winter. In addition, prices are forecast to stay at these high levels (\$11.51 per thousand cubic feet) in 2006 and to increase again in 2007 for commercial buildings nationwide. Electricity prices are also predicted to continue to steadily rise over the next two years [1]. This means that operating budgets for school districts in Arkansas and across the U.S. will continue to be strained to pay for higher utility costs. Therefore, any effort to conserve utilities, by changing equipment or operational procedures, has the potential to significantly impact school districts' operating budgets. In addition to financial savings, energy saving retrofits can have further benefits such as improved occupant comfort and indoor air quality, better suitability for multiple building uses, increased ease of use and reduced maintenance, and reduced overall environmental impact.

In light of this situation, a study of the building performance and consumption of electricity, natural gas, and water in Arkansas school buildings has been undertaken, with the ultimate goal being a reduction in utility-related expenditures of the schools. The first steps in this study involved benchmarking the energy and water consumption of a number of school campuses in Arkansas [2], and distributing a survey to school district superintendents. District superintendents are normally in charge of all district operations, including buildings and maintenance. They have authority to make changes within their operating budgets. The purpose of the survey was to gain a better understanding of district needs relative to building performance, utility tracking, personnel, and financial decision making.

The Arkansas public school system contains 262 school districts, over 80 million square feet of buildings, and a total student enrollment of over 460,000 for the school year ending in 2006. For the purposes of this survey, districts with enrollments less than 2,000 were labeled as "small", and districts with enrollments of 2,000 or greater were labeled "large." Seventy-nine percent of Arkansas districts fall into the small district category, while only 21% percent are considered large districts. In addition,

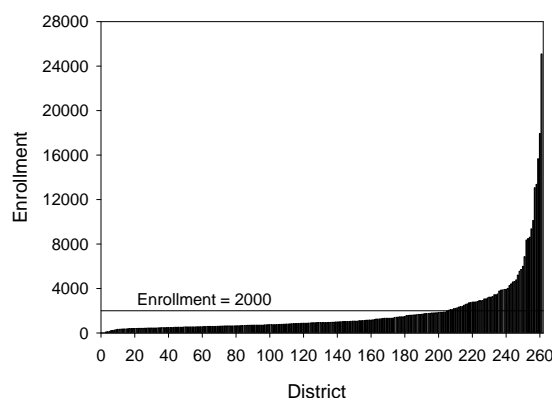


Figure 1. 2006 Enrollment for Arkansas school districts, sorted from lowest to highest. The division between small and large districts is noted.

small districts account for only 38% of state enrollment, but make up 45% of building square footage statewide [3]. It is clear from Figure 1 that there is a large disparity in the sizes of large and small districts, as the majority of small districts have less than 1,000 students enrolled, and several of the large districts have over 10,000.

METHODS

Surveys were e-mailed to 252 of the Arkansas school district superintendents with 77 (31%) responding by e-mail, fax, or mail. The survey contained 16 statements requiring a response on a Likert-type scale where the five possible responses were: strongly agree, agree, neutral, disagree, or strongly disagree. These statements were grouped in four general categories: building use and control, utility tracking, personnel, and decisions. In addition, respondents were asked to answer a short answer question requiring a written response. The survey statements and short answer question are shown in Figure 2.

Responses were coded from 1 to 5 indicating Strongly Agree to Strongly Disagree. When preparing the survey, it was originally hypothesized

that small districts would have different attitudes about these statements than large districts. To test the hypothesis that the responses of small and large districts were significantly different, a two-sided t-test was administered to the coded responses of the small and large districts for all 16 statements.

RESULTS AND DISCUSSION

The results of the survey were used to identify areas of greatest need and, to some extent, to gauge the relative interest of the districts in participating in any future utility analysis programs. Forty-eight (71%) of the respondents represented small districts and 20 (29%) represented large districts. The sizes of the remaining nine were not distinguishable, so their responses were only included in the overall results.

The difference in the mean responses of small districts versus those of large districts were found to be statistically significant ($P < 0.05$) for statements 2, 3, 4, 5, 8, 9, 10, 11, and 15. For the remaining statements (1, 6, 7, 12, 13, 14, and 16), there was not a significant difference in the response of large and small districts, but the results still provided useful insight into the opinions of school superintendents in general. For the following sections, “agree” indicates

<p>Building Use and Control</p> <ol style="list-style-type: none"> 1. Our school district buildings are used by the community for other than K-12 education. 2. Our school district utilizes automated building controls in most of our buildings. <p>Utility Tracking</p> <ol style="list-style-type: none"> 3. Our school district carefully tracks water, natural gas, and electricity usage in an effort to reduce operating costs. 4. As the superintendent, I receive useful reports that track the operating costs of each school. 5. Our school district would rank well in energy use per student as compared to other Arkansas school districts. 6. Our school district finds it difficult to track costs between academic and non-academic facilities. 7. Our school district has significant potential to reduce utility costs. <p>Personnel</p> <ol style="list-style-type: none"> 8. Our school district would benefit from tracking our utilities, but we do not have the necessary manpower to perform this potentially beneficial task. 9. Our school district could use assistance in tracking our utilities. 10. Our maintenance and facilities operation personnel could use more training related to optimal building operations. 11. Our school district could use additional or specialized evaluation assistance to help the district conserve water/energy and reduce operating costs. 12. Our local utility companies have helped our district conserve energy and reduce operating costs. 13. Reducing utility costs would free up monies very much needed for custodial, maintenance, and personnel services. <p>Decisions</p> <ol style="list-style-type: none"> 14. Tracking utilities (electricity, natural gas, and water) would benefit the district. 15. In planning for new buildings, minimizing capital costs weigh heavier upon decision making than minimizing future utility costs. 16. In planning for existing facility upgrades, minimizing capital costs weigh heavier upon decision making than minimizing future utility costs. <p>Short Answer</p> <ol style="list-style-type: none"> 17. What is your district’s primary concern related to utilities?
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Figure 2. Survey Statements and Short Answer Question

Table 1. Distribution of responses to each statement by district size.

District		Statement Number															
Size	Response	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Small	SA / A	83%	23%	63%	44%	40%	69%	50%	58%	73%	81%	77%	27%	94%	94%	56%	46%
	Neutral	2%	10%	23%	23%	50%	10%	33%	31%	19%	15%	19%	29%	6%	6%	17%	21%
	D / SD	15%	67%	15%	33%	10%	21%	17%	10%	8%	4%	4%	44%	0%	0%	27%	33%
Large	SA / A	95%	65%	90%	80%	70%	50%	40%	30%	20%	45%	40%	25%	90%	90%	30%	30%
	Neutral	0%	0%	10%	5%	20%	10%	5%	5%	10%	20%	25%	10%	10%	5%	10%	10%
	D / SD	5%	35%	0%	15%	10%	40%	55%	65%	70%	35%	35%	65%	0%	5%	60%	60%

Note: Strongly Agree and Agree responses have been combined (SA/A), as well as Disagree and Strongly (D/SD). Statement numbers in bold identify a significant difference in the responses of small and large districts.

a response of agree or strongly agree, and “disagree” indicates a response of disagree or strongly disagree. Numerical results are shown in Table 1.

Common Results for All Districts for Survey Statements 1, 6, 7, 12, 13, 14, and 16

Building Use and Control. Eighty-six percent of all superintendents surveyed agree that their district buildings are used by the community. This is significant because more use of the building translates into more consumption and cost, and indicates that some buildings may need additional controls installed in order to achieve efficient after-hours operation.

Utility Tracking. Sixty-two percent of superintendents agree that it is difficult to track costs between academic and non-academic facilities. Fifty-one percent of superintendents believe that their school district has significant potential to reduce utility costs, and 23% answered neutral. This finding suggests that there is room for improvement on utility usage within the school system, and that pursuing a consumption reduction program would be beneficial.

Personnel. Fifty-one percent of superintendents disagree with the statement that the local utilities have helped the district conserve energy and reduce operating costs. This indicates that most districts would welcome more help from their utilities in the area of conservation. Nearly all superintendents (92%) agreed that reducing utility costs would free up monies very much needed for custodial, maintenance, and personnel services. None of the superintendents surveyed disagree with this statement.

Decisions. Ninety-three percent of superintendents agree that tracking utility usage and expenditures would benefit the district. This indicates that most districts either are already

tracking utilities, or would welcome a utility tracking program. The response of superintendents regarding facility upgrade considerations was very nearly an even split with 41% agreeing, and 40% disagreeing with the statement that capital costs are more important than future costs when considering facility upgrades.

Results by District Size for Survey Statements 2, 3, 4, 5, 8, 9, 10, 11, and 15

Building Use and Control. Sixty-seven percent of small districts disagree, while 65% of large districts agree that the district utilizes automated building controls in most of its buildings. The distribution of responses is shown in Figure 3. This illustrates that a technology gap seems to exist between small and large districts, due to differences in available funding for renovations and equipment.

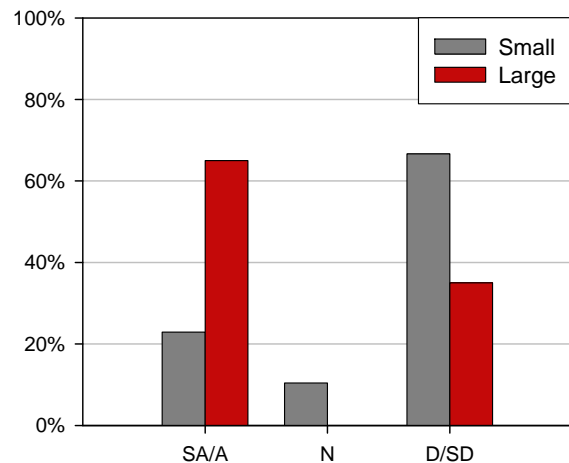


Figure 3. Response by district size to Statement 2: "Our school district utilizes automated building controls in most of our buildings."

Utility Tracking. Ninety percent of large district superintendents agree that the district carefully tracks

water, natural gas, and electricity usage, while only 63% of small districts agree to this statement. Eighty percent of large district superintendents agree that they receive useful reports tracking operating costs of each school, while only 44% of small district superintendents agree. Forty percent of small districts agree and 50% answered neutral to the statement, "Our school district would rank well in energy use per student as compared to other Arkansas school districts." Seventy percent of large districts agree with this statement. This indicates that large districts are more likely to feel they are doing a good job conserving utilities, while it appears that small districts are likely to feel that they would have an average rank, or possibly do not know where they would rank.

Personnel. Fifty-eight percent of small district superintendents agree that their district would benefit from tracking utilities, but they do not have the necessary personnel to do so. Most large districts (65%) disagree with this statement. Seventy-three percent of small districts agree that they could use assistance tracking their utilities, while 70% of large districts disagree. These results are shown in Figure 4. Eighty-one percent of small districts agree that their maintenance and facilities operation personnel could use more training related to optimal building operation. Only 45% of large districts agree with this statement. This is shown in Figure 5. Seventy-seven percent of small districts agree that the district could use additional or specialized evaluation assistance to help conserve water/energy and reduce operating costs. Only 40% of large districts agree. The wide variance in attitudes about personnel is a key finding as it identifies a specific need that most small districts

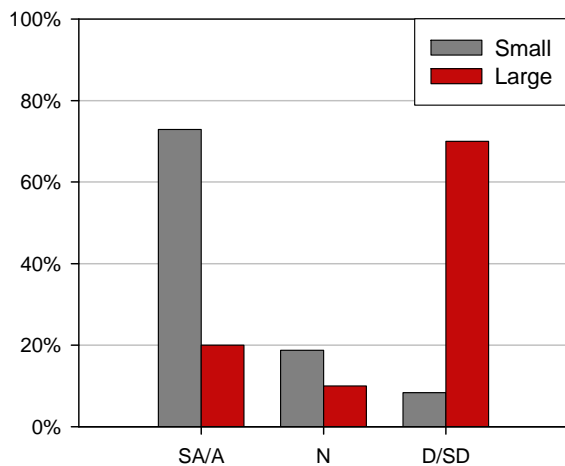


Figure 4. Response by district size to Statement 9: "Our school district could use assistance in tracking our utilities."

have and most large districts do not. If hiring more personnel is not feasible, training existing personnel may be a good option for small districts.

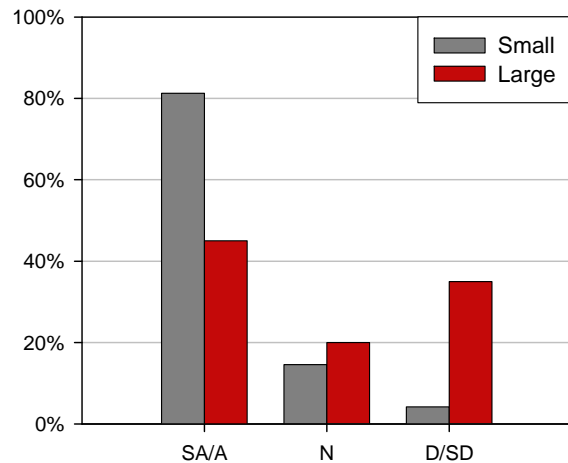


Figure 5. Response by district size to Statement 10: "Our maintenance and facilities operation personnel could use more training related to optimal building operations"

Decisions. Fifty-six percent of small districts agree that in planning for new buildings, capital costs are more important than future costs, while 60% of large districts disagree. This is shown in Figure 6.

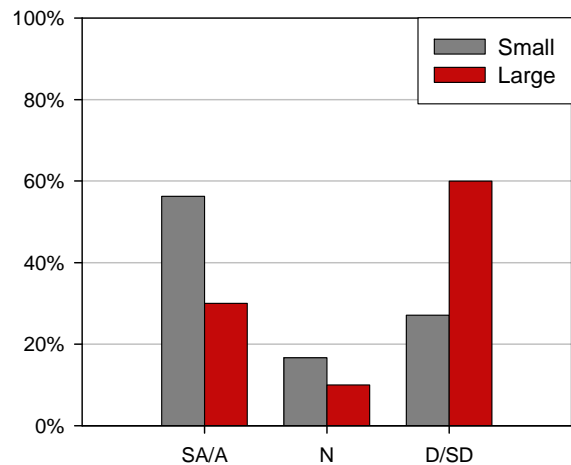


Figure 6. Response by district size to Statement 15: "In Planning for new buildings, minimizing capital costs weigh heavier on decision making than minimizing future utility costs."

Short Answer. Below is a brief summary of the most frequent responses to the question, "What is your district's primary concern related to utilities?" The most common concerns were related to rising utility costs. Many superintendents expressed great concern over the uncertainty of future utility costs and the continued increase in cost for electricity, natural gas, propane, and diesel. There were

numerous concerns related to paying for utility costs with relatively fixed budgets.

Other concerns pointed to specific needs that could be addressed in the future. There were concerns about the cost associated with complying with new indoor air quality standards. Many expressed concern over properly controlling buildings when not in use and related the lack of staff's attention to utility cost minimization. There was concern over the cost and difficulty of operating aging buildings and building systems. Many districts have small maintenance staffs that can only deal with keeping systems running, not necessarily optimized. Concerns were expressed about proper design of new buildings to incorporate energy savings alternatives and utilities impact statements. There were a few concerns regarding utility services, lack of rate increase notification, and natural gas rate structures.

SUMMARY AND CONCLUSIONS

Over 30% of the superintendents that were contacted responded to the e-mail survey. In general, all school districts: 1) use buildings for community activities, 2) find it difficult to track costs between academic and non-academic facilities, and 3) feel tracking utilities would be beneficial.

There appeared a significant difference in the responses of small versus large districts to some statements. In the typical large school district, the majority of buildings have automated controls. The superintendent receives regular operating cost reports, and the district is more likely to track utility usage than the typical small district. The superintendent generally feels that the district is doing a good job conserving utilities and would rank well in energy use per student statewide. The superintendent does not feel that the district needs outside assistance in tracking utility usage.

In contrast to the large districts, the typical small school district does not have automated controls in the majority of its buildings. The superintendent is less likely to receive operating cost reports than the typical large district, and utility usage is less likely to be tracked than in the typical large school district. The superintendent likely feels that the district could benefit from tracking utilities, but may lack the personnel to do so. He or she probably feels that outside assistance in utility tracking would be helpful. The superintendent very likely feels that the district's maintenance and facilities operation personnel could use more training related to optimal building operation, and that the district could use additional or specialized evaluation assistance to help conserve

water and energy and reduce operating costs. Finally, the typical small district is likely to place more importance on capital costs than future costs when planning for new buildings.

Most superintendents expressed concern over rising and unpredictable prices of natural gas, propane, and electricity and their impact on school budgets. Others expressed concern about operating older buildings, complying with new indoor air standards, small maintenance staffs, designing new buildings for energy efficiency, and issues with their utility companies.

In conclusion, responses to the survey indicate that many K-12 school districts could reduce their utility-related operating costs. In particular, districts that need help (most of which are small districts) are those that: a) do not have the personnel and/or expertise in utility cost reduction techniques and optimal building operation, b) do not have automated building controls, and c) struggle to minimize life-cycle costs.

Based on the results of this survey, it has been decided that the small school districts have a great need for assistance. Future work will include energy audits of several school buildings within small districts to better understand the previously mentioned difficulties as well as other challenges faced by these districts. The authors will seek energy and water conservation opportunities and recommend specific measures to reduce utility-related operating costs. The information and experiences obtained from these audits will then be disseminated to small districts throughout the state in an attempt to encourage cost-saving conservation projects that are achievable in small school districts.

ACKNOWLEDGEMENTS

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