Energy Management Program Review
October 25, 2016
9:30 - 10:30 a.m.

Committee Members:
Brian Fahrendholz, Director of Operations and Maintenance
Ralph Guenther, Environmental Systems Supervisor
Jeremy Taylor, Energy Specialist
Mimi Moore, Elementary Principal
Dr. Mike Rogers, Middle School Principal
BJ Koch, High School Principal

Review Question 1
Background: Energy rates have consistently increased over the past five years, and school districts have sought to reduce costs.
Q1: How do we quantifiably know that the Energy Management Program has saved dollars on what the District spends and toward what benefit has the reduction been?

Review Question 2
Background: An Energy Management Program should be able to show reduced usage and the corresponding environmental impact.
Q2: How do we know that there is a reduction of the total energy that we are using as a District that can truly be considered wasteful, and what difference does it make?

Review Question 3
Background: There is a cost to an Energy Management Program and Districts must evaluate the cost of programs in comparison to their benefit.
Q3: What has that cost been including the energy specialist position, and does the cost-benefit of the position with/without the contractual obligations of Cenergistic’s consultant services continue to make sense?

Review Question 4
Background: The Board set guidelines regarding space temperatures that are affected by the running of our HVAC systems. There has been a perception at times that energy may be saved at the degradation of comfort or safety.
Q4: What efforts have been made to ensure the fidelity of holding to a responsible learning environment that puts at the forefront the safety, comfort, and well-being of students and personnel?

Review Question 5
Background: The District needs to look at going forward post-contractual obligation with Cenergistic and would look for a recommendation from the committee.
Q5: What is the recommendation of the committee going forward for next steps, and what will the varying effects be of each course of action?
**Review Question 1**

Background: Energy rates have consistently increased over the past five years, and school districts have sought to reduce costs.

**Q1: How do we quantifiably know that the Energy Management Program has saved dollars on what the District spends and toward what benefit has it been?**

A1: The first way that we know that the Energy Management Program has saved dollars on what the District spends is from Energy CAP, which is the software that is used to quantify savings. This software takes our baseline (Sept 2011 – August 2012) and shows that when adjustments are made for weather, square footage changes, and commodity cost changes, we have an “Expected Energy Cost.” From the time the District signed the contract in September of 2012 until now (see the slide below), we would have spent $8,814,467. Instead, we actually wrote checks to the utility companies—Mid-American for electricity, Continuum for natural gas, and Sioux City for water/sewer/irrigation—for a total of $6,461,456. The difference in those two figures is savings or cost avoidance. Our cost avoidance number is $2,353,011, or 26.7%.

**$2.35 Million in Savings**

**26.7% Cost Avoidance**

![Cumulative Cost Savings Chart](image)
(See attached Excel sheet of Budget to Actuals and Per Unit Cost Increases)

The rates are found from left to right on the bottom in red.

### Average Unit Cost Increases

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<tr>
<th></th>
<th>FY 11</th>
<th>FY 12</th>
<th>FY 13</th>
<th>FY 14</th>
<th>FY 15</th>
<th>FY 16</th>
<th>Unit</th>
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<td>kcal</td>
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*Every commodity has been risen since program inception with the exception of natural gas which because of being based on supply/demand fluctuates with weather volatility. Water/Sewer (+28%), Irrigation (+21%), Electricity (+34%).*

Those rates are per commodity costs, and we’ll just take electricity. One can see that from FY 11 to FY 16, we’ve had a 34.25% increase in electricity costs, and water/sewer/irrigation costs increased between 21-28%. (Natural gas is up and down due to weather volatility). If the cost of what you are paying for is going up by 34%, you would anticipate spending 34% more than what you once had budgeted. But the case for so many school districts that have lamented enormous increases in their utilities budget has not been the case for the Sioux City Schools—in fact, it has been the opposite.

There is a spreadsheet on the next page that is important. The first part is the budget on every energy commodity for the District from FY 11 to FY 16 with the comparisons to what we actually spent. These are not savings because budgets are intended to be an estimate of what an entity anticipates spending, often with the goal of having nothing left over. This spreadsheet does however show what would be impossible without an Energy Management Program (below graphic representation included larger at end.)
From FY 13 to FY 14 and to FY 16 the total amount spent on energy consistently went down despite rising rates, adding fully air conditioned buildings (which we did every year), and weather that was often more extreme than in FY 12.

The first benefit to the District is that with spending authority and other challenges given finite available dollars, the District has not had to have “borrowed from” other areas in order to pay utilities, which are non-negotiable expenses. There are several years when Energy CAP calculates that we should have spent much more than we had in our energy budget. For example, FY 14’s “Expected Energy Cost” was $2,137,232 without an Energy Management Program. We only had $1,872,000 available to us in our energy budget. While that was a top 10 cold winter in Iowa’s history due to the polar vortex, we spent only $1,614,820.93.

The benefit has not only been what we have avoided (going into other areas, e.g. reserves, budgeted-for programs, etc.) but also one-time ending balances made up of dollars left over in our utility budget. We shared with the Board of Directors previously that the one-time budget ending balance of $257,179 in FY 14 went to reserves; in fact, the next year (FY 15) the District reduced its budget by $162,000 and by doing so was able to fund $100,000 in items needed for security, $11,000 for career academies (Harry Hopkins), and $41,000 for career academies (ESC). It is critical to remember that when the costs of commodities have risen, this $162,000 reduction is something that we have been able to enjoy every year even as we bring online fully air conditioned buildings. Indeed, from FY 16 to FY 17, we have reduced the budget by $58,300, meaning that we have reduced the total energy budget by $220,300 annually.

The important thing is that this budget reduction has stayed in place. While the District cannot expect to keep reducing its energy budget, the fact that they have been able to...
do so is also wonderful given that it would otherwise have gone into waste instead of to the core mission of student achievement.

**Review Question 2**

Background: An Energy Management Program should be able to show reduced usage and the corresponding environmental impact.

**Q2: How do we know that there is a reduction of the total energy that we are using as a District that can truly be considered wasteful, and what difference does it make?**

One can see from the graph that our 2011 and 2012 years prior to an energy management program had a very typical pattern of consumption until April of 2013 when the program was implemented with a full-time energy specialist. You will notice the separation has consistently been maintained so that in the summer time, in the July months of 2014-2016, we used about 50% of what was used in the July months of 2011 and 2012.
There is a benefit based on our most intensive commodity: electricity, which accounts for 2/3 of our total utility cost. This is not with weather normalization, but simply the addition of all our electrical bills calculated with a cumulative total. The year-end totals are at the end of each year below.

2012: 19.23 million kWh  
2013: 15.71 million kWh  
2014: 13.91 million kWh  
2015: 13.48 million kWh  
2016: 14.23 million kWh (suspension of dmhw pumps)  

(Average of 14.33 million from 2013-2016 which is 5 million kWh lower than 2012)  
It is important to remember that we have saved these costs while adding fully climatized, air conditioned elementary school buildings including Spalding Park, Loess Hills, Morningside, Perry Creek, and retrofit Clark Early Childhood Center. Whether it is in controlling time of day schedules for air handlers, better managing hundreds of exhaust fans, or matching exterior lighting to the needs of our building, our Energy Management Program has worked hand-in-hand with utilizing the best technologies, and using them responsibly.

Sustainable Environmental Impact

23 School Buildings  
Sioux City is #2 among all Cities by US EPA (pop. <100,000)  
Reduction of CO2  
20,293 metric tons!  
4,228 passenger cars taken off the road  
520,336 trees planted for ten years’ time
The environmental impact means that we have saved the environment +20,000 metric tons of CO2 which would otherwise be into the air. That is equivalent to 4,228 passenger cars taken off the road for an entire year, or planting over 520,000 trees for ten years’ time. This has resulted in recognition by the US EPA and Dept of Energy as Sioux City is now #2 nationally for Energy Star Certified Buildings in addition to Spalding Park Elementary being a case study for Trane on our geothermal system, which is one of only 5. The School District is the only contributor of Energy Star buildings in Sioux City and alone shares the accomplishment for putting Sioux City on the map nationwide.

The commitment to building sustainable buildings, which is included on Goal 4 of Focus 2022 Strategic Plan to Practice Effective Sustainable Business Practices is getting validation and reward.

Of all new buildings in the State of Iowa, the Association of Iowa Architects awarded Morningside Elementary #2 of the top 5 buildings architects identified for energy efficiency. The Morningside Eagles saved 61% of their expected energy use. These savings would not have happened without proper energy management complimenting the efficient design, and the administration and ALL staff and students deserve credit.

**Review Question 3**

Background: There is a cost to an Energy Management Program and Districts must evaluate the cost of programs in comparison to their benefit.

**Q3: What has that cost been including the energy specialist position, and does the cost-benefit of the position with/without the contractual obligations of Cenergistic’s consultant services?**

The District has paid Cenergistic $13,900 for 48 months, for a total of $667,000 as of March of 2017. Given that the District has already exceeded $2.3 million in savings as of September of 2016, the program has more than paid for itself even with the cost of the energy specialist position at $74,948 plus benefits. The Energy Specialist position has always been as a District employee, something that was a contractual obligation during that time. The total “cost” of the program is roughly $1.1 million, or just half of what has been saved. Having a program that will continue to save with a trained specialist in place and standardized procedures means that we have now paid for a program that can continue to experience savings as long as we continue to focus on progress.

How does we achieve these savings? The slide below documents how.
How Savings are Achieved

• Over 4,600 documented audits conducted to date varying from beginning of day, occupied, end of day transition, and late night audits (avg. 25/week)
• Matching HVAC systems (AHUs, chillers, boiler plants, etc.) and occupancy; all energy using commodities from irrigation to exterior/interior lighting; computer and other equipment on only when in use.
• Maximizing savings during shutdowns and physically walking 2.5 million square feet during each break.
• Educating further behavioral/cultural change in order to help show other ways to save energy.

Having fulfilled the contractual obligations of Cenergistic, we have in place a working relationship at Operations and Maintenance in which a fully training energy specialist provides the necessary oversight to ensure authorization for running HVAC/lighting/other energy using equipment is in accordance not only with energy responsibility but also with the safety, comfort, and security of our students and personnel. John Lampas, the Implementation Lead for our District from Cenergistic, reported that most districts remain in “good standing” with Cenergistic after their contract is paid. By doing so, they send their personnel to the annual training conference, maintain Energy CAP software to continue quantifying results with the nation’s leading energy software program, and maintain the confidential and propriety information used to increasingly guide systems as schools keep up with the latest technologies and best practices. For this, the relationship will continue to include consultant services, online remote guidance, Energy Star certifications (which must be done by a professional engineer) and the guarantee that the program will continue to more than pay for itself.
Review Question 4

Background: The Board set guidelines regarding space temperatures that are affected by the running of our HVAC systems. There has been a perception at times that energy may be saved at the degradation of comfort or safety.

Q4: What efforts have been made to ensure the fidelity of holding to a responsible learning environment that puts at the forefront the safety, comfort, and well-being of our personnel?

In some instances early on there were challenges both in matching HVAC occupancy and time of day schedules. Given wild swings in weather (2013 saw Sioux City with the nation’s high followed by the nation’s low within 3 weeks’ time) and our systems responding, we worked through those challenges. In doing so, we found that many of our systems had longstanding problems.

The District has rectified some longstanding HVAC issues to include increasing supply air temperatures during recovery our buildings, properly ventilating building (Leeds Elementary and North Middle Schools), and in some instances even increased entire building temperatures.

There are other times when gyms that are warm or humid that do not have the use of air conditioning can be rolled into the perception of saving at the hands of energy conservation. The reality is that we have not had air conditioning in our high school gyms since 1972 (ever) and our energy specialist has sought to see if we could perhaps retrofit those gyms with air conditioning. In lieu of the retrofit, our building engineers expend energy in the middle of the night when dew point (humidity) is lowest and air temperature is coolest to do the best with the means available.

We have also standardized the procedures for staff should there be any kind of complaint or concern so that the O&M department, building engineers, HVAC staff, and the energy specialist are best working with building personnel in order to quickly address problems as the learning environment is the priority.
This graph shows that we save 18-28% during the school year but because we are committed to saving the most amount of money during the unoccupied times, we can save 35-55% of our expected use during the summer time. Our goal is to save to the greatest degree during our unoccupied times.

Because of the Energy Management Program, we have changed the kind of thermostat sensor in entire buildings because the data showed one was more accurate. We also have increased energy costs in some instances because we are now properly ventilating, which goes to show that the safety and comfort of our occupants is paramount. Finally, the energy specialist has created through the SchoolDude Work Order system over 550 specific documented work orders, over 80% of which had to do with the identification of issues that could help to be at the lower end of guidelines during cooling (74 F setpoint, the lowest authorization allowed) and be at 70 F as a setpoint during heating. Standardizing our domestic hot water for food washing and tempering that back down and exempting domestic hot water pumps from our energy management system came as a result of some of data shared by our energy specialist.
Review Question 5

Background: The District needs to look at going forward post-contractual obligation with Cenergistic and would look for a recommendation from the committee.

Q5: What is the recommendation of the committee going forward for next steps, and what courses of action will have varying results?

The District can clearly see that while signing a contract with Cenergistic in September of 2012 that an “event” occurred in April of 2013. That was the beginning of full-time employment and oversight of an energy manager (see graph where electrical trend dramatically decreases). There are over 4,600 audits (over 1,200 annually) that have been conducted, each of which has been documented in over 200 typed up reports. These are given weekly to our Director of Operations and Maintenance and include physically walking our 2.5 million square feet of space during each “shutdown period,” in which the Energy Specialist verifies that staff is taking areas off line during breaks. The oversight necessary will only be maintained with an active energy specialist.

90% of programs continue an active Energy Management Program with the position and “sustainability” after ending the contractual obligations with Cenergistic. Sioux Falls is an example of where a full-time Energy Specialist has been maintained, and they have been out of contract for more than 3 years. They have successfully seen continued results, sent their Energy Specialist to the national conferences to maintain professional development, and they know what would happen if they let go of the position and program. In fact, John Berry, a professional engineer that Cenergistic just sent in to walk each one of our Energy-Star certifiable buildings, reported that they have had a few instances where Districts came back to Cenergistic after having not retained an energy specialist / program and saw such drastically increased energy consumption through a lack of oversight, auditing, and fidelity to standards. In that instance, they actually went back into a paid-for contract to re-institute all of the lessons learned, train a new energy specialist who at that time had moved on spending additional money to get energy consumption back in control.

Paul Hamman, our liaison from Cenergistic, reports that the best practices and habits that are currently instilled with the oversight of an active energy manager will mean that Cenergistic will continue to provide consultation guidance. They hope to continue working with the District in this partnership in the near future.
Going Forward

- Ensure administrative guidelines for energy conservation are adhered to while keeping the commitment to the best educational environment possible.

- Keep in good standing with Cenergistic (annual conference, Energy CAP maintained $2,593 fee, and energy specialist position), and they will consistently assist on consultant basis.

- Work to maintain and increase Energy Star Certifications and continually educate students and staff on responsible energy usage at PD, new teacher orientation, audits, etc.

- Continually show cost avoidance numbers and progress through weekly reports to O&M Director.

- Assist with identified rebate projects and new design.
Recommendation

## Sioux City Community School District

### Utilities Budgets & Cost Comparisons

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<th>Actual FY11</th>
<th>Budget FY12</th>
<th>Actual FY12</th>
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<th>Actual FY17</th>
<th>YTD 12-31-16</th>
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### Commodity Rates

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<tr>
<td>Electricity kWh</td>
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<td>Irrigation kgal</td>
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**District initial $162,000 budget reduction directly shown to fund $100,000 student security, $52,000 for student career academies, $10,000 Food Service (charged 80% elec, nat. gas)**

**District reduced budget from FY 14 to FY 15** ($162,000)

**District reduced budget $58,300 from FY 16 to FY 17** ($58,300)

**Annually Reduced Budget** ($220,300)