



# eGauge + ReNew our Schools

Colorado schools see energy conservation and cost savings using eGauge devices





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This eBook is based on the white paper written by Kathy Croasdale,  
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Brought to you by eGauge Systems LLC ○  
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All Current Transformers used with the eGauge units  
in the competition were provided by Magnelab

Photo Credit page 4/5: "Kids using the computers" by @San Jose Library

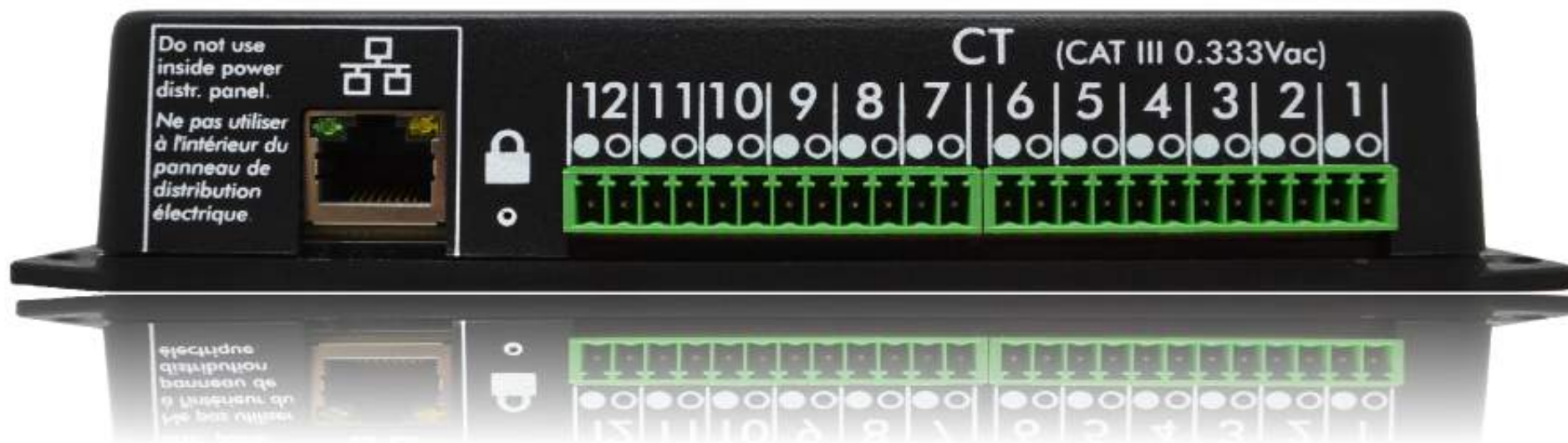






## About the eGauge Meter

In the Spring of 2013 the eGauge device was installed in 14 schools across Colorado in the St. Vrain Valley School District for an energy conservation competition called ReNew Our Schools, with the Center for ReSource Conservation in Boulder, Colorado.



The Revenue Grade eGauge series combines an energy meter, data logger, and web server into one. This advanced energy monitoring device has a robust multi-circuit architecture and power-line communication abilities while presenting the option to hard-wire a network connection.

**Big data**-Export data easily as an .XML or .CSV file. Thirty year solid state storage capacity. Record data as granular as second by second.

**Designed for convenience** - Fast installation with equipment that fits easily in the existing circuit panel, and does not require any new wires to transmit data.

**Cost Effective** - Ability to use multi-channel monitoring on 12 circuits to reduce monitoring price per circuit.

**Open data platform**-Ability to integrate seamlessly with third party sensors and graphic displays with the no cost API.





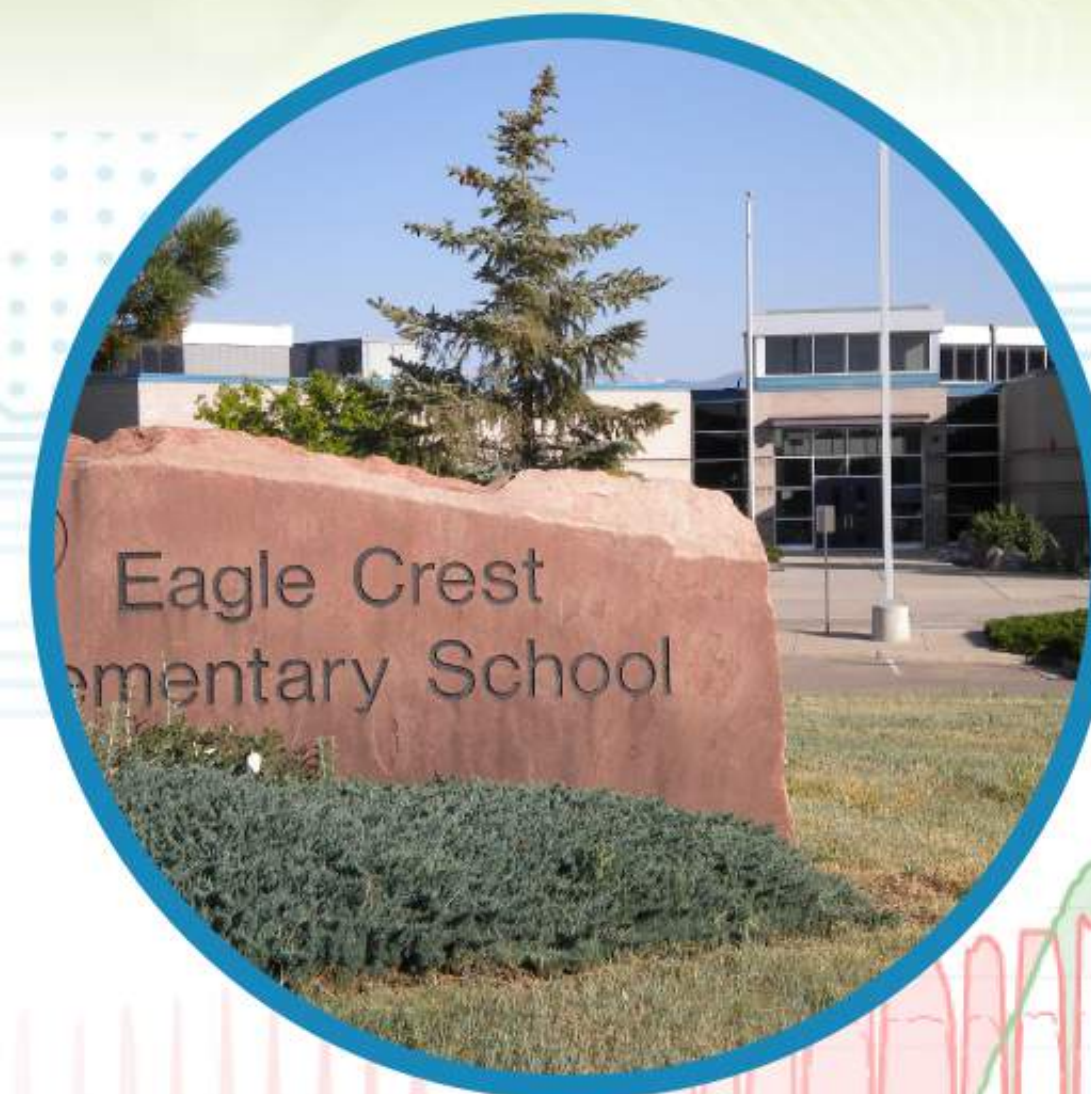
## Overview of ReNew our Schools



In the Spring of 2013 the **Center for ReSource Conservation** ran a highly successful ReNew Our Schools energy education and conservation competition at 14 Colorado elementary, middle and high schools. The competition sought to engage students, parents, teachers, administrators, and district energy maintenance specialists in finding new and innovative ways to reduce electricity consumption, increase energy literacy among all groups, and grow community awareness of their own energy footprint.

Three winning schools each received \$25,000 toward efficiency upgrades and/or renewable energy installations. All of the schools that participated in this competition received a **real-time energy** consumption tracking device from eGauge. The data provided by the eGauge devices along with the education of and by the student bodies during the competition inspired behavioral changes, and led to a collective reduction in electricity consumption of **4.9-7.8%** relative to baseline usage during the month of the competition.

This reduction saved the school district \$7,800 on their energy bills. In-home surveys reached 1,600 households that were able to stay engaged through online viewing of real-time energy consumption through eGauge data. Furthermore, the data from the eGauge devices was used by the school district energy staff to investigate no-cost operational changes that are projected to save the district **\$50,000-\$200,000 annually**.



*"The real-time data is helping us identify and understand our peak and base loads in these buildings."*  
- Dara Ward, Energy & Sustainability Manager for the district

In addition to immediate energy savings benefits, the competition also showed that real-time, **open access data** (such as the type provided by eGauge) can be a powerful tool to bring about energy savings, and that an investment in these tools can have a positive return in less than several months.



## RNOS Competition Stats

1 MONTH LONG



9,900 STUDENTS  
14 SCHOOLS  
1,600 FAMILIES

\$25,000 was awarded  
to top schools

All of the energy savings were measured in kilowatt hours and only the same school grade levels competed against each other.

\$7,800 in electricity savings during the month of the competition and ongoing energy management strategies used by the school district.

TOTAL INSTALLATION of  
14 permanent real-time  
monitors with a 3 month  
PAYBACK &  
\$200,000 in  
projected savings per year in the future



\$78,000 kWh saved at the schools in 1 month

TOP SCHOOLS  
17-18% ENERGY



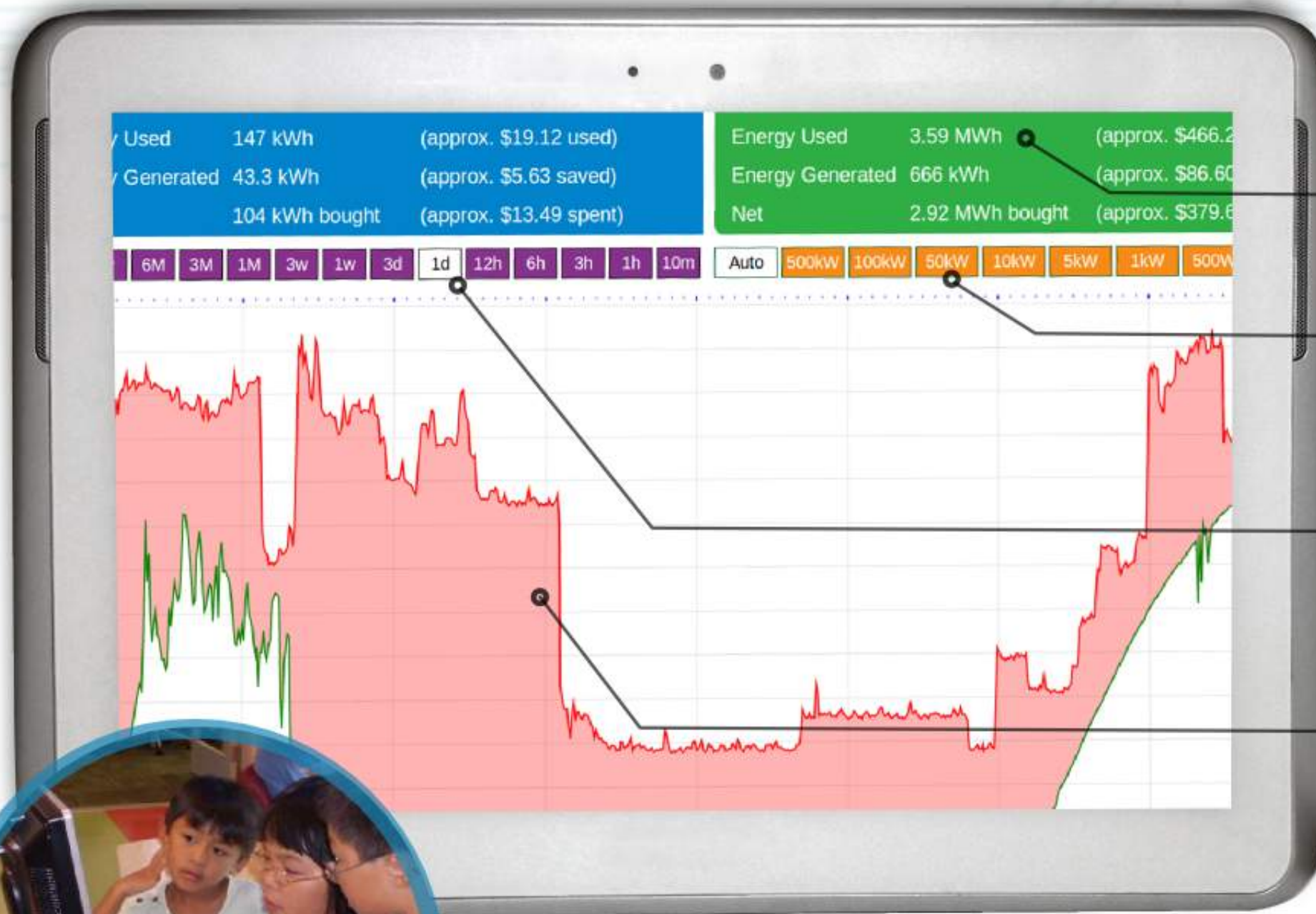
11-13%  
AVG. ENERGY  
REDUCTION

1,600,000 Sq. Ft. of  
Conditioned Space



# How eGauge was used in the Competition

School Principals directed parents to the **online interface**, where they could view the real-time data over an internet connection.

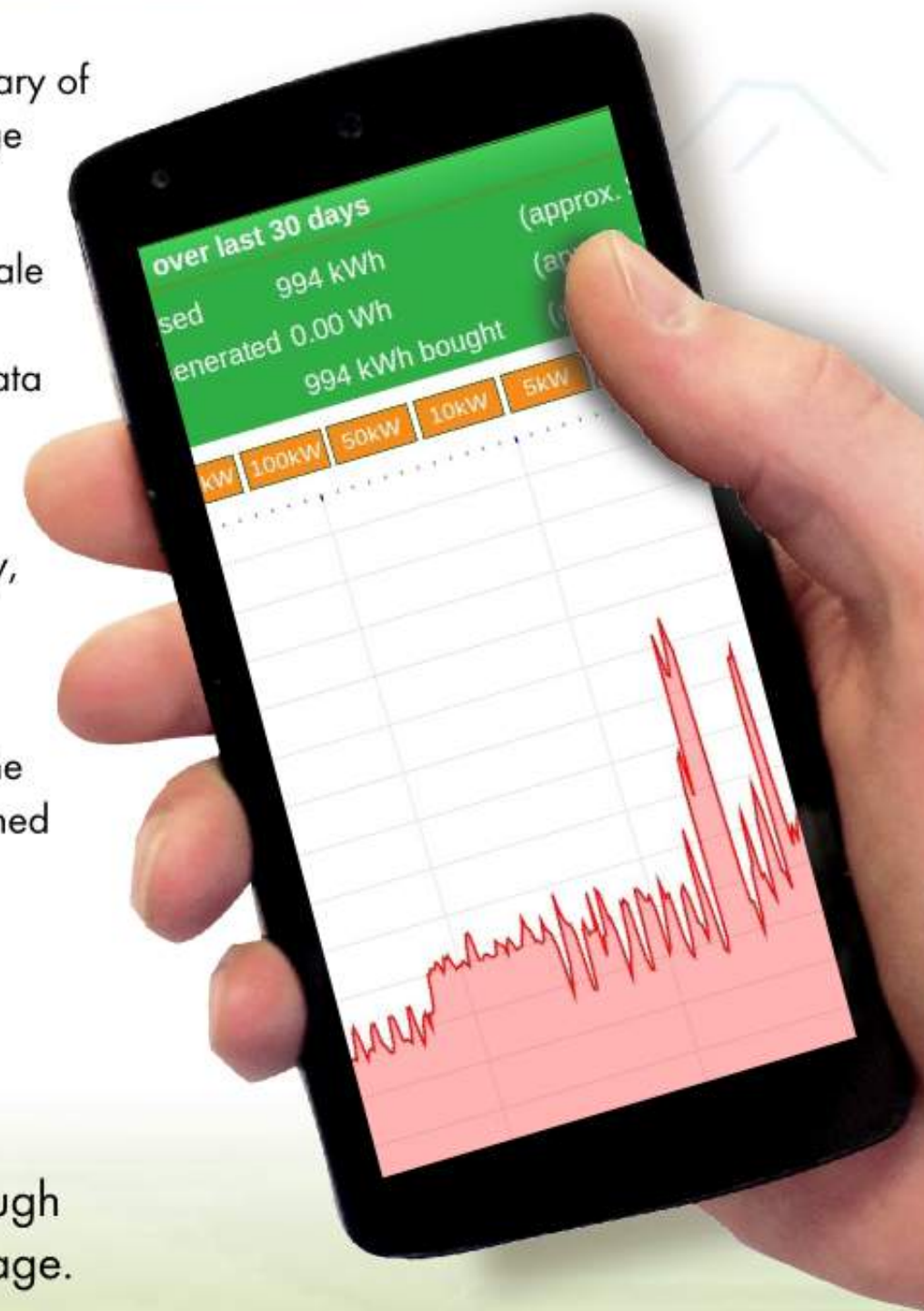


○ Easy to read summary of school energy usage

○ Able to change the scale in kWh at which the students viewed the data

○ Able to view data by the second, minute, hour, day, week, month or year.

○ Clear graphical display of the data showed energy consumed and produced



Students used the **real-time data** as they walked through the schools to help them see the effect that turning off the lights had on energy usage.





## The Results: Behavioral

### Behavioral Changes

The data provided by the eGauge devices was a motivating, educational, and impactful element of the RNOS program. Students, their professional energy mentors, and the school district energy staff were able to walk through the schools and determine what was effecting electricity consumption and how they could change behavior and infrastructure to reduce it. When students were able to view the data from the eGauge devices and see how actions such as turning off a light switch instantly changed the energy consumption in the building, they were noticeably impacted. This tangible appreciation for how electricity was being used (or wasted) was infectious. Classes collectively examined the eGauge data daily, teachers developed quantitative lesson plans around it, and principals were showing households in the community how to view the graphical interface from home.

### Short Term

Of the behavioral changes enacted, many will remain short term partially because of the cycling of school populations each year. As the competition continues each year a new group of young students will learn about energy conservation. As of now interest in the competition continues on primarily through school clubs and groups.

### Long Term

In the long term it would be beneficial to include the competition as part of the curriculum, such as the STEM requirement in schools today. Although the school population cycles, it is important to note that the greatest impact seen was in the middle school age where the students were old enough to see and understand quantitative data and take the new knowlege and understanding with them as they graduate and move on to High School and College.



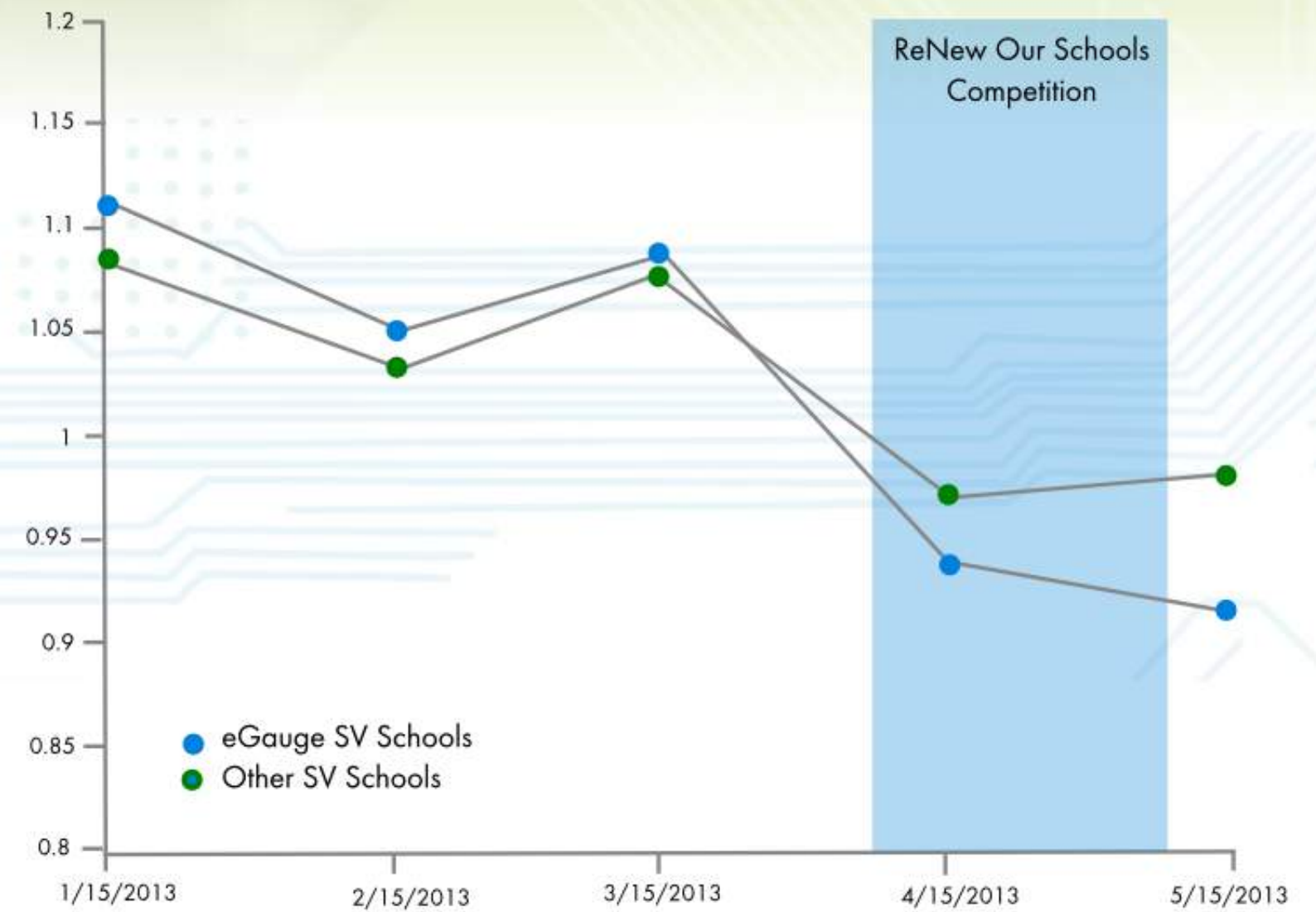
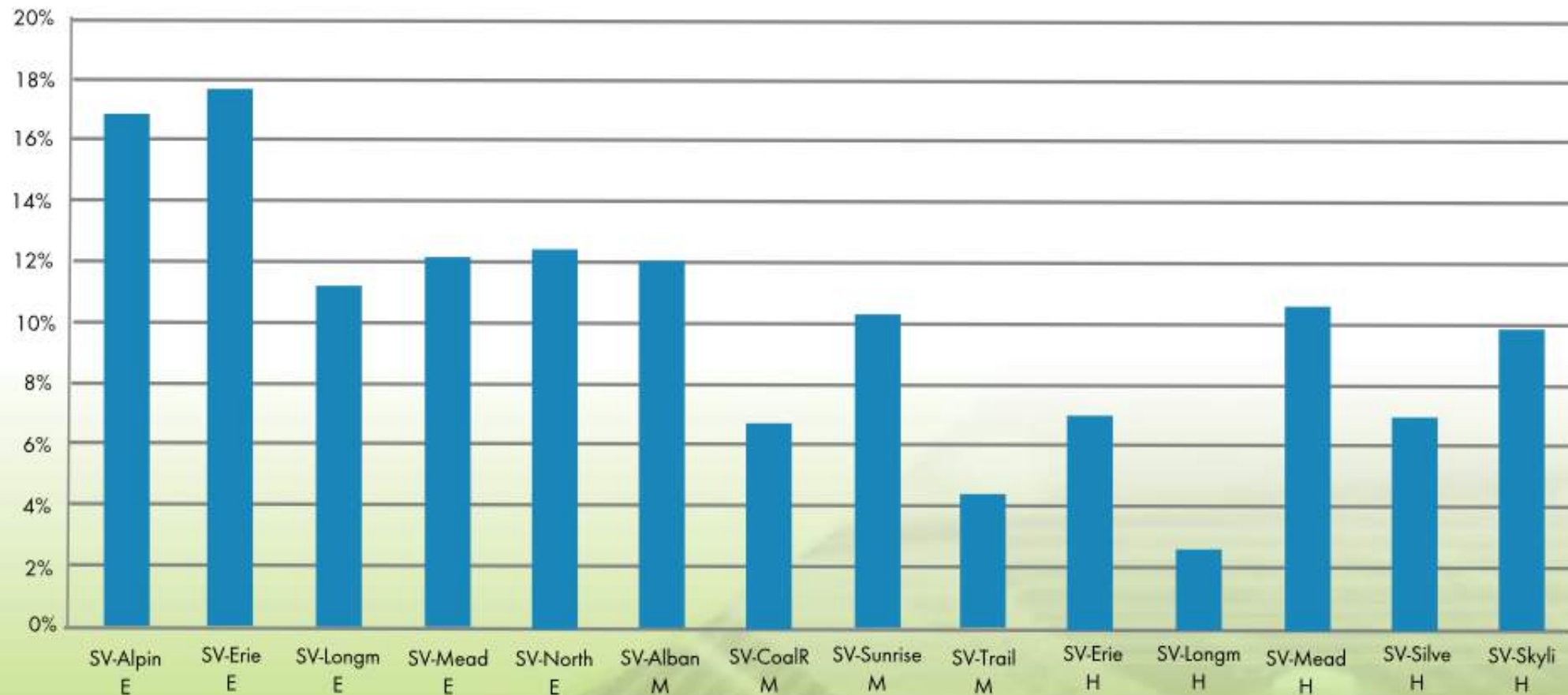


# The Results: Energy Reduction

## Energy Reduction in the Schools

The measured reductions in energy consumption confirmed the impact that the program had on the energy usage behavior in schools. The energy reductions made by the schools over the month long competition were impressive with the top performing schools having **17% and 18%** reductions in electricity use within the single month of the competition. Shown below are the energy conservation statistics for each of the 14 schools over the month long competition.

[Y-Axis] kWh Saved relative to baseline usage



[Y-Axis] Average Energy Use by St. Vrain (SV) Schools (normalized kWhs)

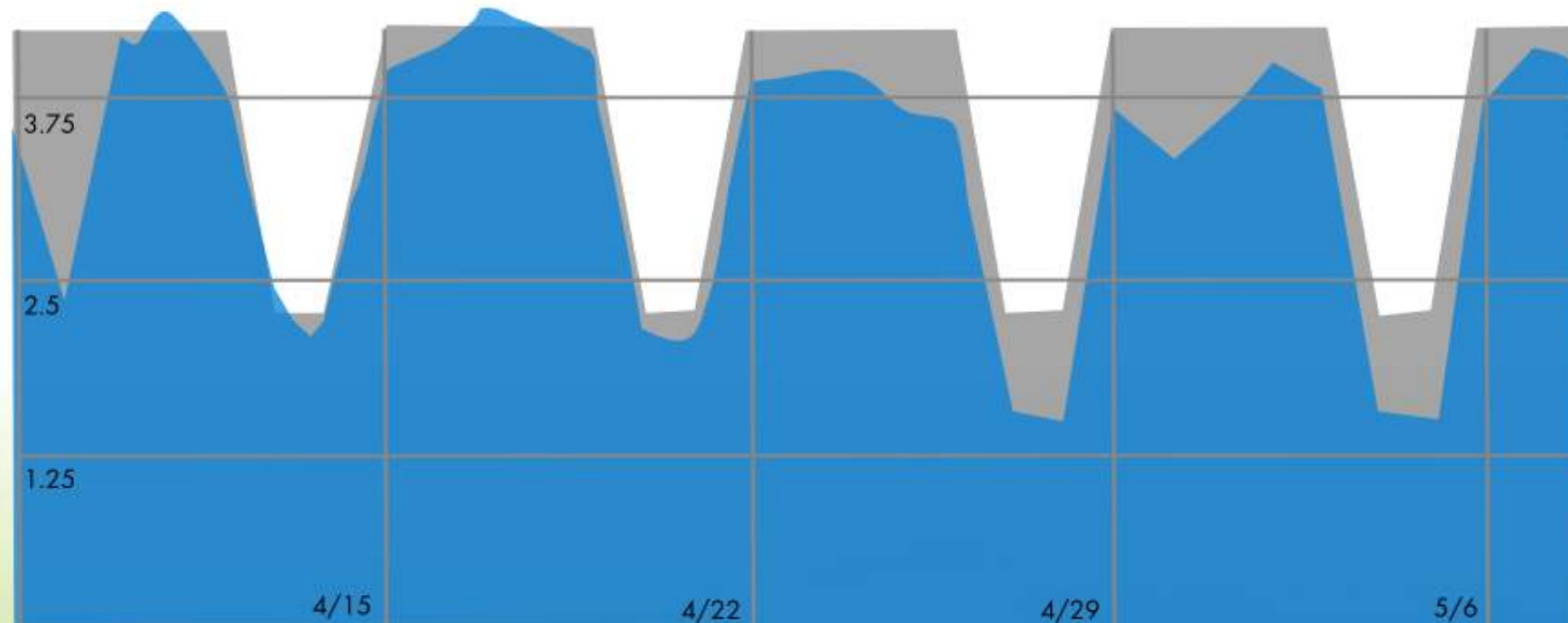
The graph above shows how relative to other schools in the district, the schools in the competition showed significant differences in energy consumption further verifying the effectiveness of the program. During April and May, the schools in the competition showed an average reduction in energy usage of 11.0% and 13.1% respectively, whereas other schools in the district had an average reduction of 6.6% and 5.2% in April and May. These reductions are normalized by average monthly electricity use at each school. Therefore, competition related conservation efforts through the use of the eGauge feedback were between 4.4-7.9%.



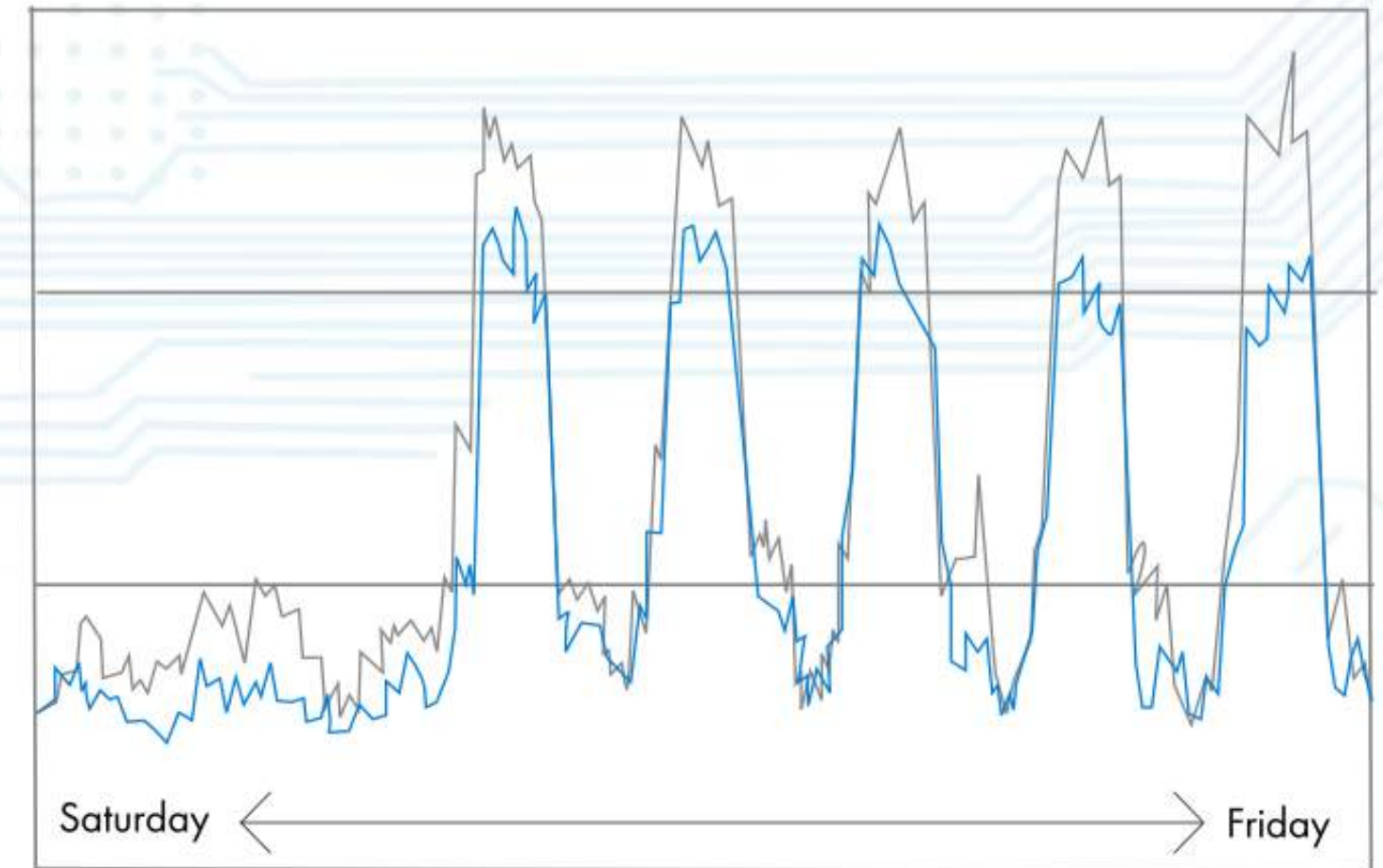
# The Results: Efficiency Improvements

## Consumption Comparison to Previous Years

The competition required that the schools come up with efficiency recommendations for school facilities, projects or programs. Students, the district energy management staff and school administrators all became engaged with this aspect of the competition. One example of the information made available by eGauge outputs is shown here. The gray areas show the baseline consumption data for each school, while the blue areas show the current consumption data. This shows how clear the savings were as well as the progressive improvement from week to week that was made by this school during the competition.



■ Competition Month  
■ Baseline



[Y-Axis] kW  
■ Last week of competition  
■ Week before competition

## Cost Savings

The cost savings from the single month of the competition for the school district was \$7,800. These savings were a direct result of the behavioral changes implemented in the schools, most often by the students themselves. While some of these behavioral changes may not continue in the future, longer term efficiencies in the schools are already being planned.



## Beyond the Competition: Efficiency

### Efficiency & Demand Management

The insight provided by eGauge data allowed the district's energy management staff to learn detailed information about the demand profiles of their buildings that they could not have seen without the high resolution of the eGauge devices. From this information the SVVSD energy management staff and district COO created a list of actionable operational changes that is predicted to result in savings of \$50,000 - \$100,000 over the next year including:

- Peak Limiting: limiting power during peak cooling events
- Peak shifting: precooling and more gradual ramping of cooling
- End-of-day chiller hold: not allowing a marginal temperature rise to include imperceptible cooling at the end of a school day
- Monitor optimization: levelizing power spikes in air handlers

Another change that the district identified as a second step toward increasing efficiency was to seasonally regulate chiller usage. Based on eGauge data from March 2013, temperatures induced cooling for only 15 minutes at the end of two school days in some monitored schools, and it was predicted that by avoiding cooling in spring and fall shoulder months that district could save at least \$200,000 per year in demand charges without substantial comfort effects. These valuable operational changes were only discovered after installation of the eGauge.

- Energy Management Tactics provided by Brad Queen



### Additional Cost Saving Tactics

- Optimizing operations schedules or minimize demand charges
- Enabling peak load SMS or email notifications available via eGauge
- Reducing school base loads
- Identifying high energy consumption systems
- Using real-time data for (continued) behavioral conservation
- Instituting failure prediction and preventative maintenance
- Identifying highest return on investment improvements with empirical data
- Making use of demand response algorithms and BACnet automation

*"I would never been able to tell what was going on in these building systems without this data... Seeing the loads real-time makes building diagnostics easy..."*

- Michael Monroe, HVAC Controls Specialist for SVVSD



## Benefits of using eGauge

- **Cost Savings** - The eGauge device is cost effective, with an incredible amount of features offered at an affordable price - and granular real-time data that will help you save money on your utility bills. As seen in the competition, from behavioral changes alone, the district was able to save \$7,800 in the first month of the competition. Viewing real-time data can have a substantial impact on usage.
- **Reduction of Energy Use** - The eGauge can help you identify how to most effectively reduce your energy usage. Access to real-time data from anywhere can show you the benefits of actions such as turning off lights. The ability to monitor up to 12 circuits can help you identify which loads are more or less demanding in overall usage. As was seen in the competition, energy reductions of up to 20% are possible with some planning and motivation.
- **Detailed understanding of Efficiency** - The short term energy reduction, and cost savings are shown in the month-long competitions, but the longer term implications of using the eGauge data are also clear. The School District is able to project approximately \$200,000 in yearly cost savings by using the eGauge data for efficiency and demand management. By shifting peak loads, and strategically reducing or eliminating other loads the schools can save on peak demand charges.



**Contact Us** - For more information on the eGauge, or for additional case studies and success stories.







<http://www.egauge.net>

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