



Solar Project Status Update



Kellond Elementary

Current Project Progress



- Phase I of project entails 43 total TEP metered sites, ~11 MW solar capacity
 - All Renewable Energy Credits ('RECs') associated with system kWh output are retained by the District
- Phase I organized and deployed via 6 grouping of sites (I-VI), expected Q1 2015 completion
- As of December 9th, 2014:
 - 23 sites complete (received TEP Permission to Operate, or 'PTO')
 - 20 sites currently in progress (various stages of the Design-Build process)

Group I	Group II	Group III	Group IV	Group V	Group VI
Site	Site	Site	Site	Site	Site
East Transit (63 kW)	Bonillas (302.4 kW)	Carrillo (180 kW)	Van Buskirk (270 kW)	Blenman (292.8 kW)	Collier (290.4 kW)
Erickson (216 kW)	Duffy (173.9 kW)	Cavett (189 kW)	Grijalva (378 kW)	Cragin (226.8 kW)	Fruchthendler (207 kW)
Gale (288 kW)	Howell (255.6 kW)	Drachman (173.9 kW)	Maldonado (315 kW)	Davidson (319.7 kW)	Pueblo Gardens (189 kW)
Henry (180 kW)	Kellond (279 kW)	LIRC (594 kW)	MB McCorkle (329.4 kW)	Manzo (252 kW)	Whitmore (137.3 kW)
Marshall (198 kW)	Lineweaver (264.6 kW)	Ochoa (183 kW)	Miller (378 kW)	Miles ELC (167 kW)	Wright (289.2 kW)
Secrist (419.4 kW)	Mary Meredith (226.8 kW)	Robison (256.2 kW)	Oyama (319.1 kW)	Robins (234 kW)	
Soleng Tom (253.8 kW)	Myers Ganoung (302.4 kW)		Warren (264.6 kW)	Tolson (226.8 kW)	
Wheeler (252 kW)	Sewell (210.5 kW)		White (343.8 kW)	Tully (288 kW)	
Status					
Complete					
In Progress					

Completion Status by School



Group I

Site
East Transit (63 kW)
Erickson (216 kW)
Gale (288 kW)
Henry (180 kW)
Marshall (198 kW)
Secrist (419.4 kW)
Soleng Tom (253.8 kW)
Wheeler (252 kW)

Group II

Site
Bonillas (302.4 kW)
Duffy (173.9 kW)
Howell (255.6 kW)
Kellond (279 kW)
Lineweaver (264.6 kW)
Mary Meredith (226.8 kW)
Myers Ganoung (302.4 kW)
Sewell (210.5 kW)

Group III

Site
Carrillo (180 kW)
Cavett (189 kW)
Drachman (173.9 kW)
LIRC (594 kW)
Ochoa (183 kW)
Robison (256.2 kW)

Group IV

Site
Van Buskirk (270 kW)
Grijalva (378 kW)
Maldonado (315 kW)
MB McCorkle (329.4 kW)
Miller (378 kW)
Oyama (319.1 kW)
Warren (264.6 kW)
White (343.8 kW)

Group V

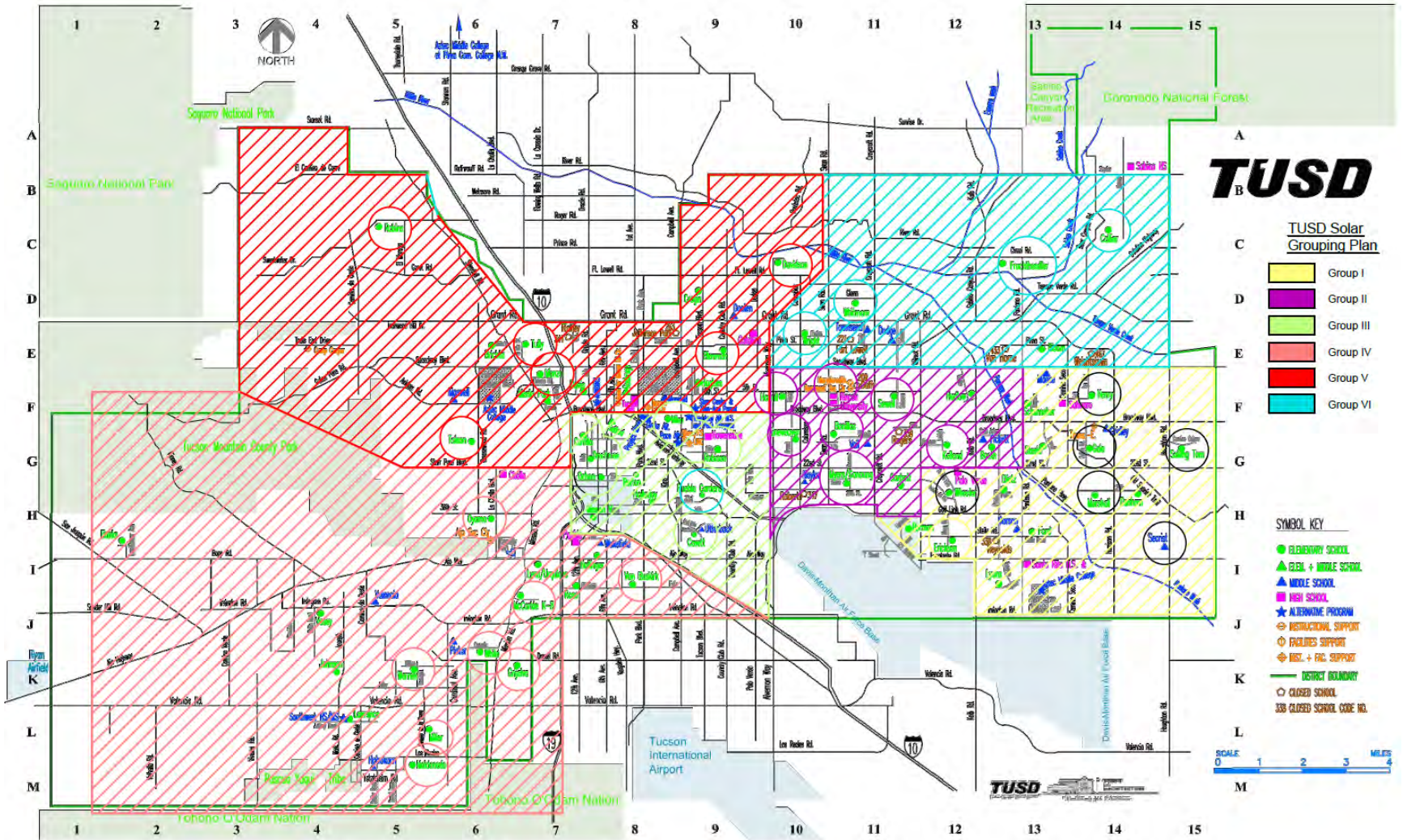
Site
Blenman (292.8 kW)
Cragin (226.8 kW)
Davidson (319.7 kW)
Manzo (252 kW)
Miles ELC (167 kW)
Robins (234 kW)
Tolson (226.8 kW)
Tully (288 kW)

Group VI

Site
Collier (290.4 kW)
Fruchthendler (207 kW)
Pueblo Gardens (189 kW)
Whitmore (137.3 kW)
Wright (289.2 kW)

Complete
In Progress

Project Phasing Plan





Henry Elementary

Community Outreach



- To support the phased rollout, 5 large Community Presentations/Q&A sessions have been conducted.
- Individual Principal meetings were conducted for each school for final sign-off.
- Additional meetings have been held for certain individual schools for project stakeholders, neighbor properties and community members.
- Where requested, layout proposals were subjected to school site council approval (e.g. Soleng Tom)
- Outreach was conducted with the Cities of Tucson and South Tucson, City Wards and Pima County.
- After soliciting District, principal and community feedback on the system designs, multiple iterations of system layouts per site have been generated with innumerable design accommodations (on average 5-10 design iterations per site from original proposals)
- Community feedback regarding system placement has been incorporated wherever possible, subject to technical design constraints such as:
 - Distance to site electrical gear
 - Solar panel orientation
 - Shading impediments
 - Easements and IGA's
 - Preserving recreation areas
 - Neighboring properties
 - Preserving trees and landscaping

- The feedback-iteration process has been extensive and has been employed across 43 sites and 175 distinct structures, with outreach increasing over time.



¡Ya viene el SOL a nuestras escuelas!

Carrillo K-5 Magnet School • Cavett Elementary School • Drachman K-6 Montessori Magnet School
Hollinger K-8 School • Lee Instructional Resource Center • Miles Exploratory Learning Center School
Ochoa Community Magnet School • Robison Magnet Elementary School • Van Buskirk Elementary School



Ahorro de energía para el beneficio de los Estudiante, Maestros y para la Comunidad

La Mesa Directiva del Distrito Escolar Unificado de Tucson ha autorizado la construcción de sistemas eléctricos solares en más de 40 escuelas e instalaciones del Distrito. Los sistemas serán proporcionados sin costo alguno al Distrito. Los paneles solares serán integrados a las estructuras de sombra y se ubicarán en lugares funcionales y económicos, principalmente áreas de juegos y estacionamientos.

Para más información sobre las estructuras de sombras solares que serán instaladas en su escuela, asista a la presentación a la comunidad el:

Miércoles, 26 de Marzo
Escuela Drachman K-6 Montessori Magnet School
Salón de Usos Múltiples "Multi-Purpose Room"
1085 S. 10th Avenue, Tucson, AZ 85701
La presentación comienza a las 6:00 pm



Wheeler Elementary

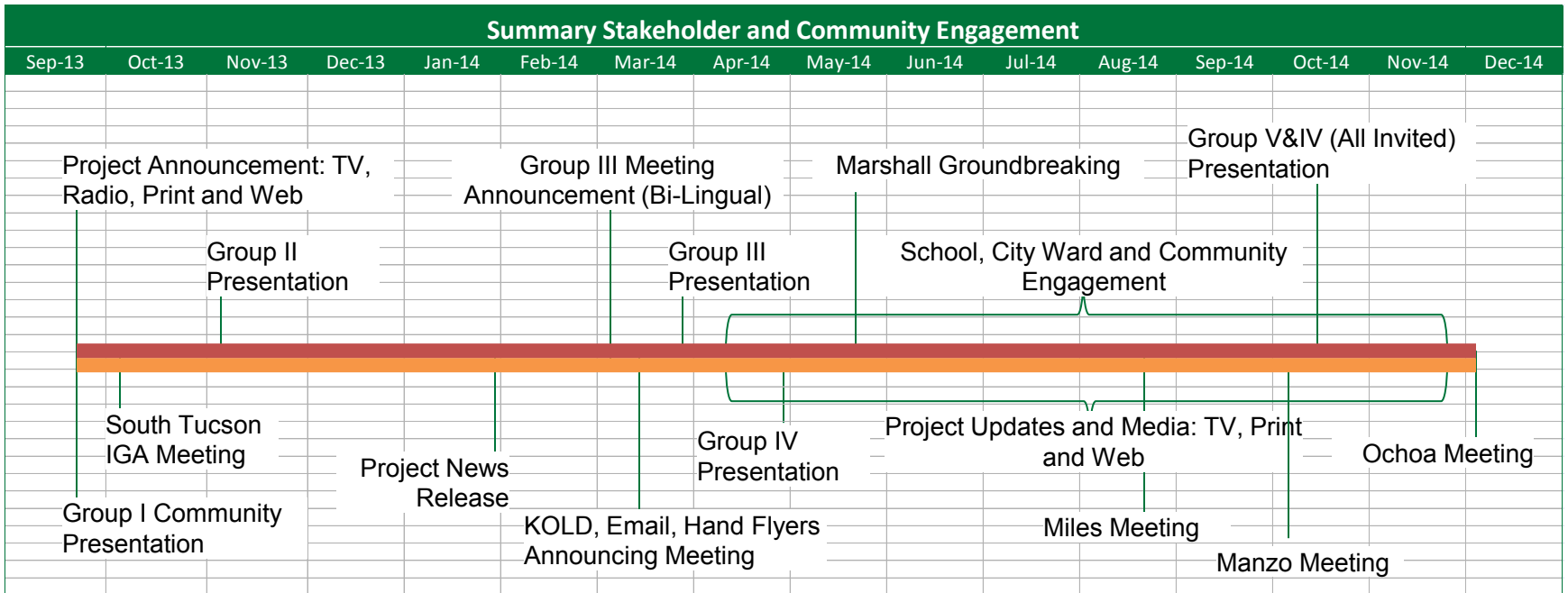
Summary Community Outreach Process



Promotion for attending the large group Presentation/Q&A sessions has been carried out via flyers distributed by the schools as well hand delivered to neighboring properties, website announcements, emails and for certain sessions - television and radio advertising.

When particular community groups and schools have desired their own meetings and Q&A sessions, the project team has accommodated, mostly recently at Ochoa Community Magnet School on 12/2/2014.

Local media, such as KOLD, Tucson.com and the Arizona Daily Star have followed the project closely and reported on its progress.



TUSD starting project to install solar power at 43 campuses

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November 06, 2013 12:00 am • By Alexis Huicochea



The Tucson Unified School District is bringing solar energy to 43 campuses, with a goal of reducing its carbon footprint while potentially saving more than \$11 million over the next 20 years.

The solar panels will generate about 80 percent of the electricity required at each site.

TUSD will not be responsible for the operation, maintenance or monitoring costs of the system at each school. They will be owned Constellation, a nationwide solar energy company. TUSD will pay only for the energy produced by the systems.

The deal will save the district money because the Constellation rate is less than what the district now pays Tucson Electric Power. TEP will continue to supply the school's electricity when the solar panels are not producing enough.

If you go

TUSD is holding an informational meeting about the solar project Wednesday at 6 p.m. at Bonillas Basic Curriculum Magnet School, 4757 E. Wnsett Boulevard.

Did you know?

More than 19,000 tons of carbon dioxide emissions will be averted from local power plants in the project's first full year of operation, along with 23.5 tons of nitrous oxides.

TOP NEWS STORIES

AZ Week: TUSD Solar Panels Expected to Save Money

Story by Maria Inés Taracena
APRIL 18, 2014

Tucson Unified School District is working on reducing its carbon footprint by installing solar panels in more than 40 of its schools.

The project, anticipated to wrap up construction in about 18 months, could be the largest of its kind in the country, said Cara Rene, director of communications at TUSD.

"Soleng Tom Elementary School (is) the second one of our elementary schools to have the solar structures built ... It is the start of a really extensive solar project for TUSD," Rene said for Friday's broadcast of *Arizona Week*. "We are able to be a leader in the nation for school districts in putting this many solar panels on our schools."

The district anticipates saving \$11 million in 20 years, with approximately \$17,000 the first year, she explained. But most important, she said, it will create carbon footprint reduction. TUSD estimates that the solar energy will keep 19,000 tons of carbon dioxide emission and 23.5 tons of nitrous oxide out of the atmosphere in the first year.

Another positive is that no money is coming from the district's pocket for the structures' construction and maintenance, Rene said.

"It is a win-win for the district because the district did not have to put any money up front," she said. "Basically (the Constellation Co.) ... is installing them. We are buying the energy from natural power and energy, so we are

TUSD school solar panels, could save district millions

Posted: May 13, 2014 9:29 AM CDT
Updated: May 27, 2014 9:29 AM CDT

By Maria Hechanova **CONNECT**

TUCSON, AZ (Tucson News Now) - This morning the Tucson Unified School District will be hosting a ribbon cutting for its newest solar energy project.

These solar panels are expected to save the district millions over the next few years.

Marshall Elementary School is the sight of this ribbon cutting, on 29th Street, just west of Harrison at 9 a.m. this morning.

Even though the ribbon cutting is happening at Marshall Elementary, this is not the only TUSD school that will be getting solar panels installed.

According to TUSD there are 42 schools that will be getting solar panels; these new panels will potentially save the district \$170,000 in energy costs in the first year, and \$20 million over the next two decades.

Each site is expected to produce about 80 percent of electricity on the systems.

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Ribbon cutting for solar panels at Marshall Elementary School. (Source: Maria Hechanova)

Solar structures to provide shade and energy for Marshall Elementary School (Source: Maria Hechanova)

Tucson's largest school district taps into southern Arizona's biggest energy source

Posted: Sep 26, 2013 12:52 AM CDT
Updated: Sep 26, 2013 12:52 AM CDT

By JD Wallace **CONNECT**

TUCSON, AZ (TNN) – More southern Arizona schools are using one of our most abundant resources to help one of our most precious ones.

Marana completed a solar project this summer to put panels on eight schools with no cost to the district. They pay the panels' owner for the electricity. Now, Tucson Unified School District is pursuing a similar avenue.

TUSD will start with seven schools, which are Frickson, Gale, Henry, Marshall, Soleng Tom, and Wheeler.

LOCAL



Oct 13, 2014 2:04 PM by Faye DeHoff

Public invited to learn about next phase of TUSD's solar project

TUCSON - Families, neighbors and residents are invited to attend a public meeting to learn more about the next phase of Tucson Unified School District's solar project.

The meeting will be at the Lee Instruction Resource Center (LIRC), 2025 E. Winsett Street on Oct. 15th at 6 p.m. Project leaders will provide an overview of the project, explain its benefits, show design plans for each school and answer questions.

The next set of schools scheduled for panels includes Blenman, Cragin, Collier, Davidson, Fruchthendler, Tolson, Tully, Whitmore and Manzo elementary schools, Miles Exploratory Learning Center PK-8, Pueblo Gardens K-8 School and Robins K-8 School.

In all, Tucson Unified School District's Governing Board authorized

Community Meetings Held:

- ☀ **Group I:** 9/25/2013 (@ Marshall)
- ☀ **Group II:** 11/6/2013 (@ Bonillas)
- ☀ **Group III:** 3/26/2014 (@ Drachman)
- ☀ **Group IV:** 4/30/2014 (@ M.McCorkle)
- ☀ **Group V&VI** 10/15/2014 (@ L.I.R.C)

TUSD hosts solar project information session

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March 23, 2014 3:00 pm • By Alexis Huicochea

The public is invited to learn more about the Tucson Unified School District's solar project Wednesday.

The meeting will be held at 6 p.m. in the multipurpose room at Drachman K-6 Montessori Magnet School, 1085 S. 10th Ave.

Representatives from TUSD will give an overview of the project, explain its benefits, share design plans and answer questions.

Drachman is one of 40 schools that will receive solar panels. Ground was broken in February at Marshall Elementary School for the first round of installations.

Two other solar meetings have been held, focusing on the installations at the first and second rounds of schools. The Wednesday meeting will focus on the third phase of the project, which will impact Drachman, Carillo K-5 Magnet, Cavett Elementary, Hollinger K-8, Lee Instructional Resource Center, Miles Exploratory Learning Center, Ochoa Community Magnet, Robison Magnet Elementary and Van Buskirk Elementary.

The 18-month project is expected to save TUSD approximately \$170,000 in the first year and more than \$11 million in energy costs over 20 years. The majority of the 38,000 solar panels will be placed over playgrounds to provide shading.

For more information about the district's solar project, go to www.tusd1.org/solar

TUSD to host 3rd public meeting for solar project

Posted: Mar 25, 2014 12:50 PM CDT
Updated: Apr 08, 2014 12:50 PM CDT

By Elizabeth Walton [CONNECT](#)

TUCSON, AZ (Tucson News Now) - Tucson Unified School District is holding a public meeting on March 26 to discuss the next phase of its solar project.

Representatives from TUSD will be on hand tomorrow to give an overview of the project, explain the benefits from the project and share design plans, as well as to answer questions.

There are nine schools and early learning centers that are in phase three of the project. They are: Drachman K-6 Montessori Magnet School, Carillo K-5 Magnet, Cavett Elementary, Hollinger K-8, Lee Instructional Resource Center, Mile Exploratory Learning Center, Ochoa Community Magnet, Robison Magnet Elementary and Van Buskirk Elementary.

Ground was recently broken at Marshall Elementary, according to a TUSD release. Once the project is complete 40 TUSD schools will be 'solarized'. This new program will help keep more than 19,000 tons of carbon dioxide emissions from the local power plant, along with 23.5 tons of nitrous oxides in the first year, according to a release from TUSD.

The 18 month project will also save TUSD \$170,000 in the first year and more than \$11 million in energy costs over the next 20 years. TUSD officials are saying the best part about the solar panels, aside from the savings and the environment, is that most of the panels will be placed over playgrounds to help provide much needed shade.

The meeting will be March 26 at 6 p.m. in the multipurpose room at Drachman K-6 Montessori Magnet School, 1085 S. 10th Ave.

For more information about the district's solar project, please go to www.tusd1.org/solar.

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Solar panels will provide shade for the playgrounds (Source: Tucson Unified School District)

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MOST READ

Police identify alleged French Quarter 'poker'

CAUGHT ON CAMERA: Woman on sidewalk randomly stabs pedestrians

[VIDEO INCLUDED](#)

More than 100





Henry Elementary

An Award Winning and Much Admired Project!



2014
GOVERNOR'S AWARD FOR ENERGY & TECHNOLOGY INNOVATION
SOUTHERN ARIZONA

CRESCORDIA



TUCSON UNIFIED SCHOOL DISTRICT
PIONEERING 11 MW SOLAR PROJECT

Submitted By: Natural Power and Energy



Since introducing the Environmental Excellence Awards program in 1980, the coveted Crescordia – a Greek term meaning “growing in harmony” – has been given as the highest honor in each category.



EPA's
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An Environmental Choice for Your Organization

We greatly look forward to welcoming TUSD into the Partnership and recognizing its support for renewable energy...

Steven Griffith
ERG, contractor to EPA Green Power Partnership

Organizations that become Green Power Partners can benefit from earned media recognition, EPA communications support, and resources such as the Green Power Equivalency Calculator and Green Power Partner mark.



Secrist Elementary

Addressing General Concerns



All applicable laws, rules, ordinances and standards have been followed throughout the project, with permit approvals secured from the City of Tucson/Pima County and the State Fire Marshal for each school. Educating stakeholders about the project and technology being installed has elicited questions, comments and concerns from the community. Examples include:

- ***Are the areas under the solar structures off limits to children playing underneath?***

The areas under the structures are completely accessible to the students.

- ***Do these structures really provide a shade benefit to our children?***

Yes! Based on the TUSD systems installed to date, we have observed that the children play extensively in the shade provided by the structures and in fact they seek it out.

- ***Do these systems have to be fenced off?***

No. Solar shade structures have been deployed all over Arizona and the US and are not required to be fenced off by permitting authorities. These systems are specifically designed to provide shade for children to play under.

- ***Are any of the TUSD systems subject to historic neighborhood supervisory board approval?***

No. We have verified with permitting authorities that no historic neighborhood approvals are required for the District's solar projects.

- ***Is the required equipment for physical education being retained (i.e. backstops)?***

As a rule, structures have been located 250' from existing backstops already being used for baseball/softball (based on principal feedback) to avoid potential damage to the panels. At some sites, backstops have been relocated, but in all cases school sites with systems being installed will remain in compliance with the Arizona School Facilities Board rules *R7-6-249.A. and R7-6-250.*

Addressing General Concerns (continued)

- ***Will the shade kill the grass under the structures?***

No. The shade cast by the structures moves throughout the day as the sun travels across the sky. In fact, we have observed that the grass actually grows better under the structures where it is not exposed to the constant strength of the Arizona sun.



*Erickson Elementary
(just 3 weeks
after installation)*

- ***Shouldn't the columns of the solar shade structures be padded?***

The solar shade structure columns, like any other shade structure column or basketball pole in the District, are not padded. Children have been playing under multiple TUSD solar shade structures for several months (since May 2014) without incident. Constellation owns solar systems at 10 other school districts (since 2012) and has received no reports of injuries.

- ***Is there a risk of electric shock or electrocution from the solar shade structures?***

No. It is not possible to be electrocuted simply by touching a solar panel. The risk of electric shock and electrocution from the systems is prevented by multiple safeguards. Design and installation is of course carried out in accordance with the National Electrical Code. All equipment is properly sized and fused to prevent over-current conditions. Equipment is specifically UL listed and utilized in accordance with these listings. Any equipment or installation accessible to the public is specifically designed to be located in these areas such that no live energized buses or conductors can be accessed by non-qualified personnel.

- ***Do these systems pose an electromagnetic radiation risk to the children?***

No. The strength of power frequency magnetic fields resulting from the systems designed and constructed for TUSD (verified by field observations) do not come close to the threshold for acute exposure for the general public established by the ICNIRP (<1% of these levels at 1 ft distance). To put it in context, being 1 ft away from an inverter yields less electromagnetic radiation exposure than the midpoint of the typical range for televisions (also at 1 ft distance), according to the California Department of Health Services, and less than the entire range given for a vacuum cleaner.

Addressing Safety Concerns (continued)

- ***Will children burn themselves if they somehow manage to touch a solar panel?***

The solar panels deployed in the TUSD solar project are inaccessible to people and are sloped with the lowest side being 9.5 ft above the ground (highest side over 17 ft). Regardless, if a solar panel is touched it will not burn, and would be approx. 10-15°F cooler than a car body sitting in the sun.

- ***Can the solar panel glass shatter if struck, endangering children with glass fragments?***

No. PV panels are made of strong tempered glass. They pass hail tests, and are regularly installed in Arctic and Antarctic conditions. They are not expected to be broken by impacts from footballs, kick balls or soccer balls. A direct hit from a projectile (very unlikely due to the height and slope of the panels) may break the glass but the glass would remain inside the frame.

- ***Can children injure themselves by climbing the conduit coming out of the inverters?***

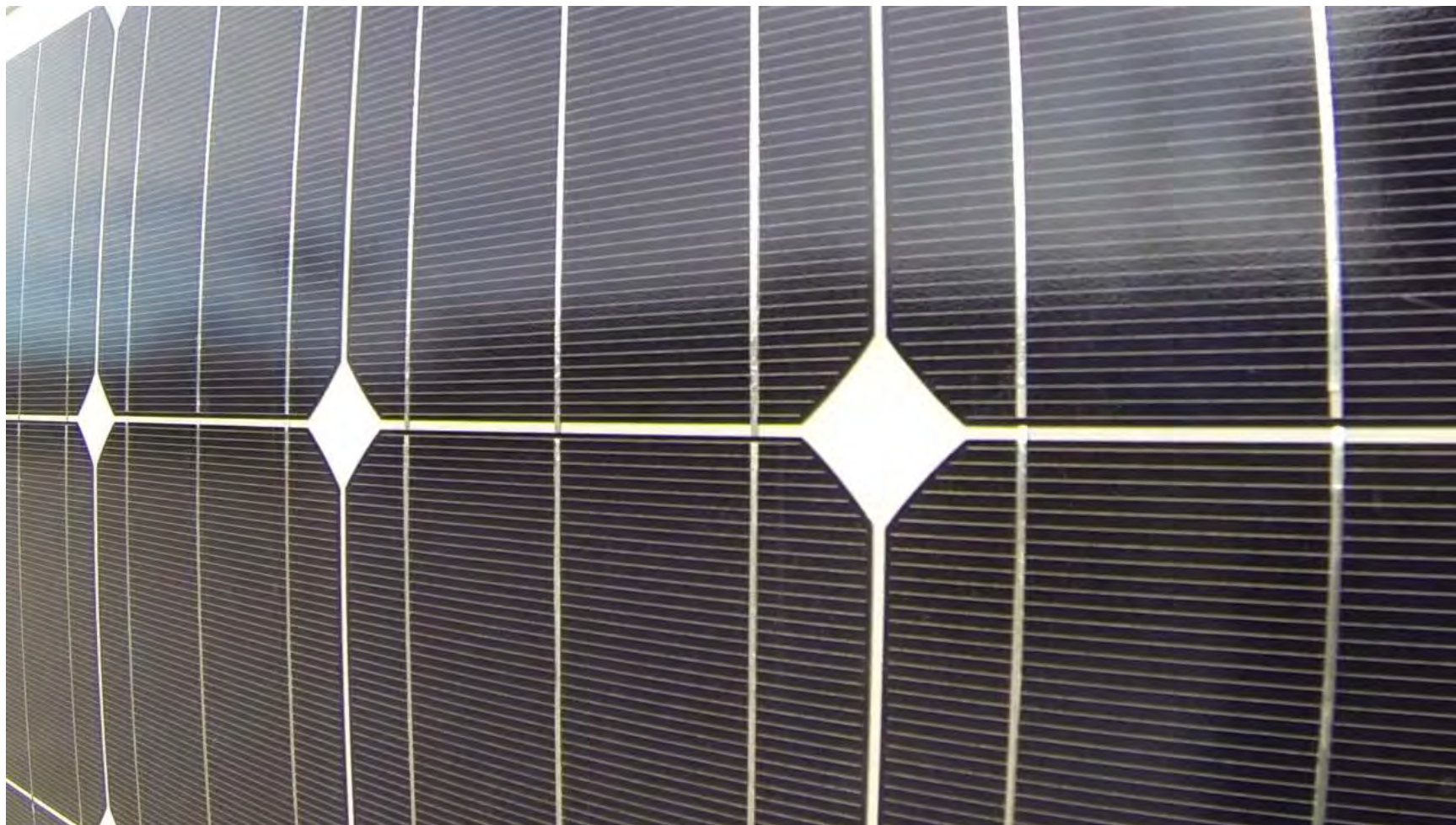
The conduit is highly durable and is designed to be out of the reach of children. It has been protected per the National Electric Code.



Addressing Safety Concerns (continued)



Solar Panel vs. Sports Balls - Test



Addressing Safety Concerns (continued)

Solar Panel vs. Projectile - Test



Addressing Safety Concerns (continued)

Solar Panel Glass Shatters on Impact, but Stays in the Frame



- ***What health risks do chemicals used in solar panels and other devices used in solar PV arrays pose if they are released into the environment, for example in a fire?***

Virtually none. All solar panel materials, including chemicals in the solar cells, are contained in a solid matrix, insoluble and non-volatile at ambient conditions, and enclosed. Researchers conclude that the potential for emissions derived from PV components during typical fires is limited given the relatively short-duration of most fires and the high melting point of PV materials (>1000 degrees Celsius). In the rare instance where a solar panel might be subject to higher temperatures, the silicon and other chemicals that comprise the solar panel would likely bind to the glass that covers the PV cells and be retained there.

- ***Are firefighters really afraid of tending to fires around PV panels?***

Of course not. Each of the TUSD systems have been permitted by the State Fire Marshal and Firefighters are properly trained to deal with fires around solar panels.

I understand that there was some concern from local residents about fire fighters being “terrified” when it comes to solar generated electricity, in particular the TUSD solar panels. Let me assure you that that is not the case. 50 firefighters have all had classes on how to fight a solar fire and are quite adept with the fire suppression aspect. If it turns out to be an electrical issue on solar arrays such as those at TUSD, then we would let TEP come in there and handle that aspect of it. We respect the power in these systems, just like the electrical systems these are, just like those in any regular building from a coal fire plant. We find there is very low life safety in your structure and therefore is not a whole lot to do. If they ever do short-circuit, there is not a lot for us to do.

So, if you have any further questions, I can assure you we are not terrified of these systems and we have the training and are very comfortable dealing with those life safety issues should they come about.

08-Dec-2014 Phone message from Phil Morgan, Captain in charge of Team 1, Tucson Fire Dept.



Kellond Elementary

Phase I Project Benefits



- Savings estimates increased vs. original estimates presented to Board due to a TEP surcharge implemented after the initial savings calculations were made

	Original Estimates	Revised Estimates
Expected Savings - Year One	~\$170,000	~\$300,000
Expected 20-year savings - 1.5% Annual TEP Rate Escalation	~\$11,000,000	~\$14,000,000
Expected 20-year savings - 3.0% Annual TEP Rate Escalation	~\$20,000,000	~\$24,000,000

- Price Certainty: The District’s solar energy cost is locked for 20 years.
- Environmental Impact: District-exclusive reduction in CO2 footprint of approximately 19,400 tons/year
- An average of 80% TEP energy offset, per site
- We have observed that where systems are installed, electricity usage drops by approx. 10%, as schools become more energy conscious, saving TUSD even more. We plan to monitor this closely as time passes.
- Shade provided for children to play under – especially valuable in summer!
- Solar Science, Technology, Engineering and Math (STEM) curriculum integration

Environmental Benefits

- ~19,400 tons of CO2 expected to be saved each year
 - Equivalent to the emissions of 4,042 passenger vehicles annually
 - Equivalent to the carbon sequestered by:
 - 337,958 tree seedlings grown for 10 years
 - 10,804 acres of U.S. forests in one year
 - 102 acres of U.S. forests preserved from conversion to cropland in one year

Source: EPA Greenhouse Gas Equivalencies Calculator



LATEST NEWS

September 24, 2014

Mayor to plant 10,000th tree this Friday at local elementary school

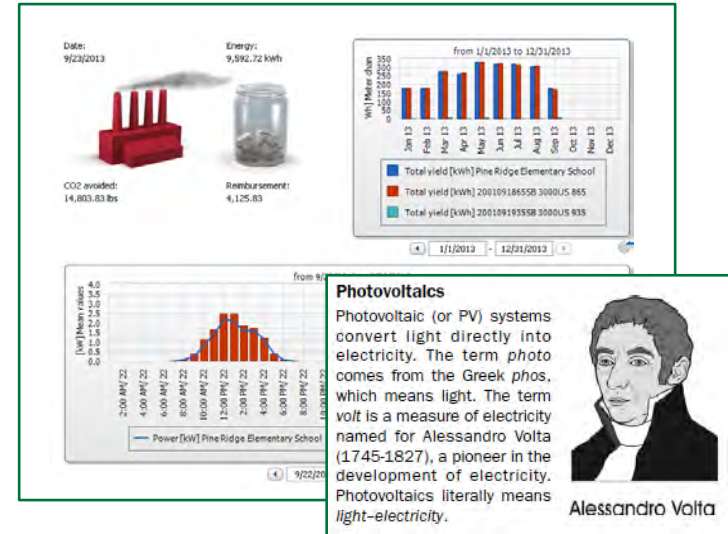


Solar Data Translated Into Student Curriculum



In addition to providing shaded play areas for students, all installed solar systems will feature **online data monitoring** accessible from any internet enabled device.

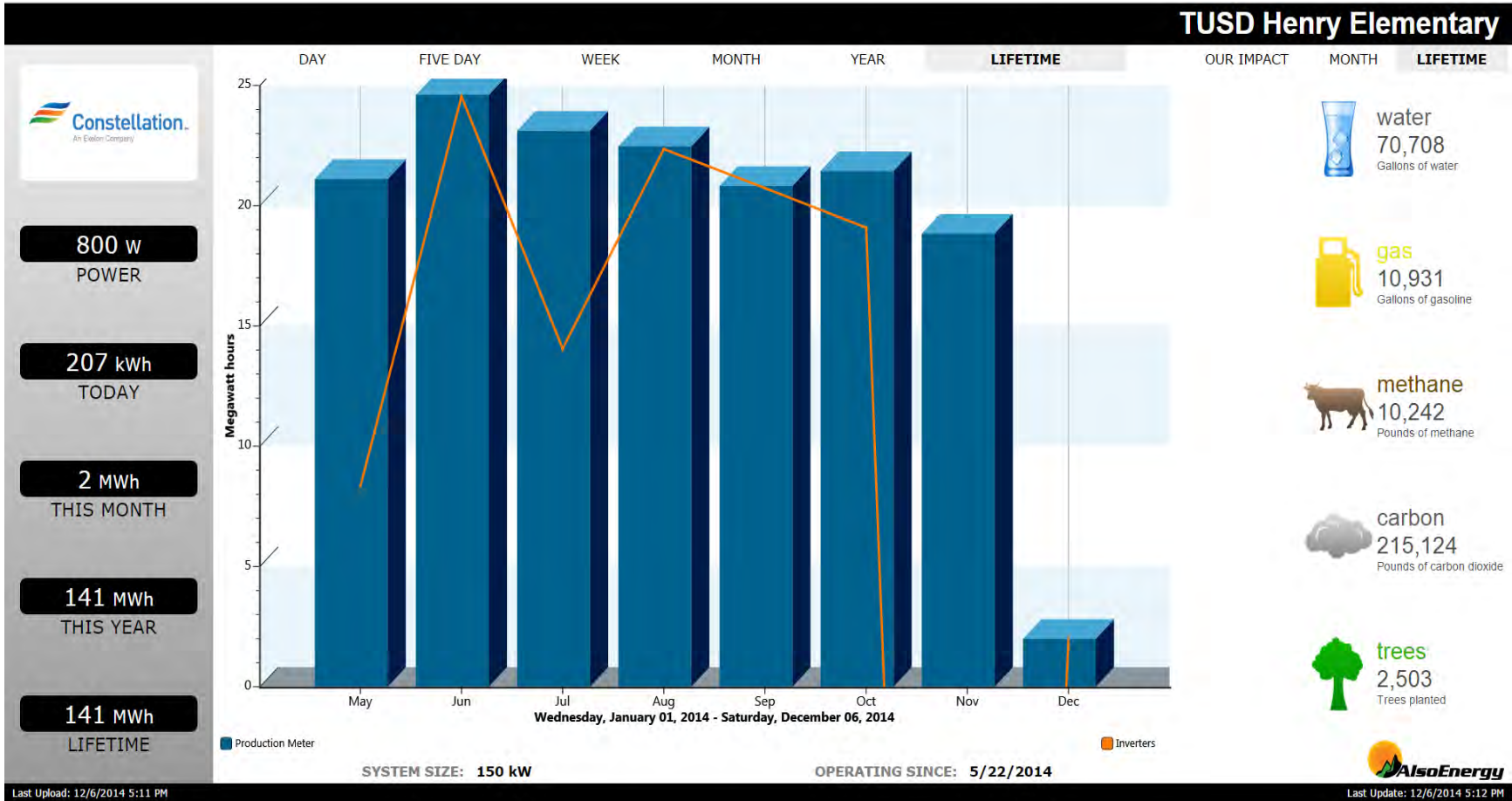
This data monitoring will allow students and teachers to **view the performance of the systems** instantly as well as scrutinize it for more detailed analysis.



The information supplied by the systems will also be **integrated into the school curriculum** to help students learn about how solar electricity works and the benefits of renewable energy.

Subject areas such as science, social studies, math, language arts and technology can all benefit from the **knowledge solar can provide**.

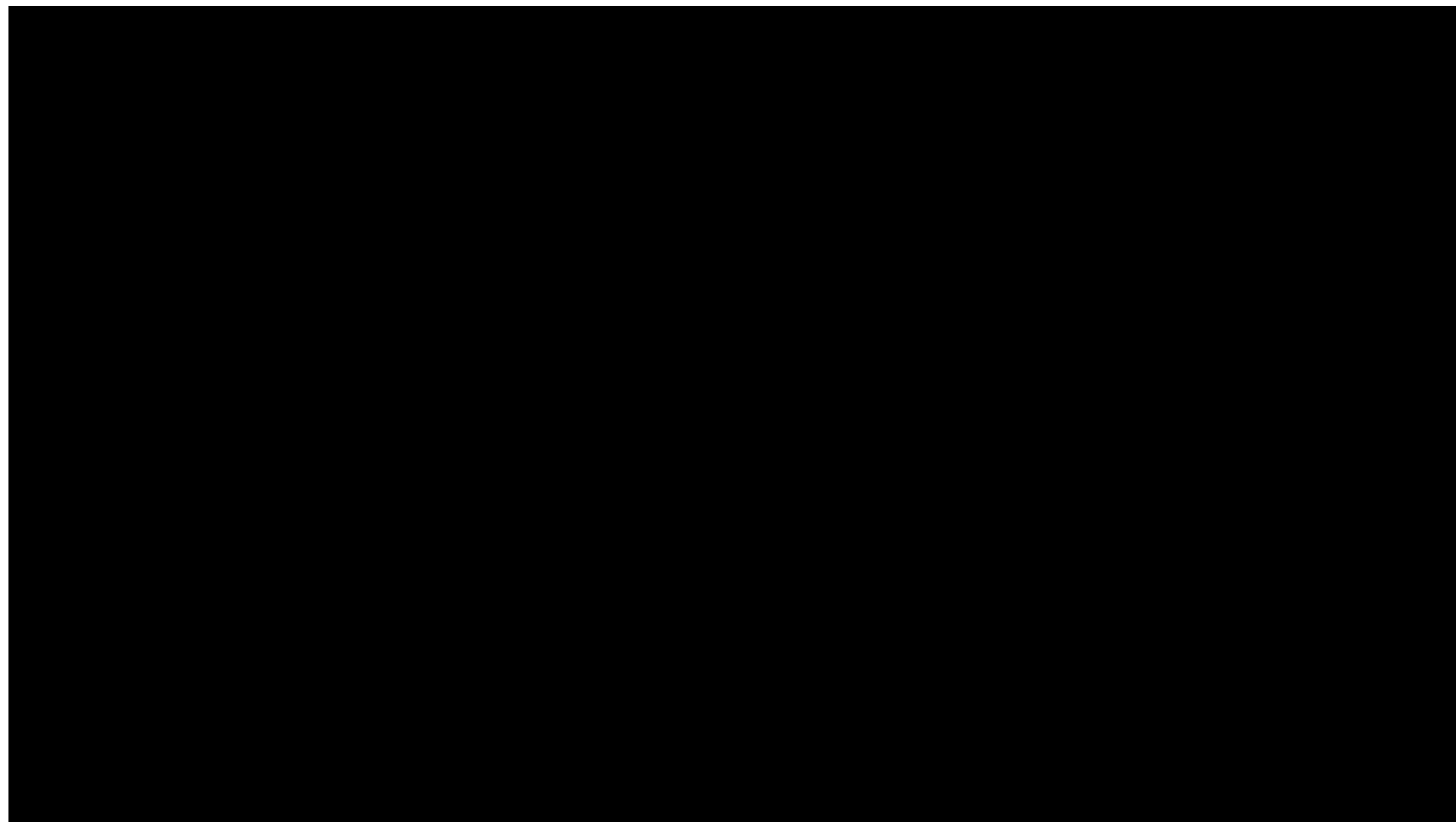
Real-Time Data Monitoring System



Lee Instructional Resource Center



Principal Feedback



Christopher Loya, Principal, Marshall Elementary



Questions and Answers

Q



&



A

