EEVC NEWSLETTER

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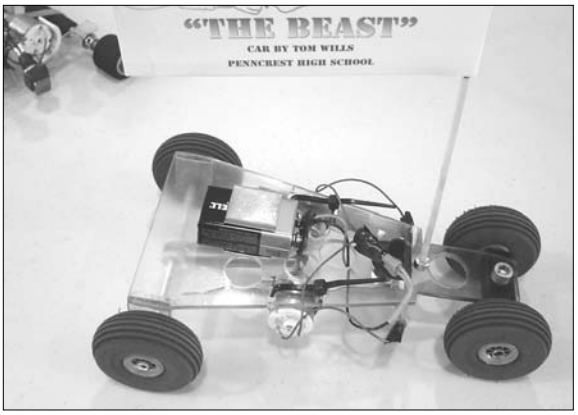
PHYSICS OLYMPICS
Oliver Perry

Tom Wills from Penncrest High School Wins the EEVC "Overall Best Electric Car" Award

Penncrest senior Tom Wills, winner of the EEVC Overall Best Electric Car Award with teacher: Mr. Robert Malkovsky.

Background
The Southeastern Pennsylvania, or more currently known as The Delaware Valley Physics Olympic League, holds three Saturday morning competitive meets per year. Approximately ten high schools in the Philadelphia region participate annually. The final meet of the year traditionally is hosted by Penncrest High School in Media, PA. Each year students are asked to compete for Olympic team points and individual medals in an electric car event. Rules, regulations, and standards for student-built working electric models are posted several months prior to the meet. The Physics Olympic League allows the Eastern Electric Vehicle Club to also present a special award to the student / student teams who design and construct what the EEVC picks for the overall best vehicle. Our choice is based upon creative engineering, how well the car is designed to win the event, actual performance, and craftsmanship. Unique and special features are also considered. In cases where cars are close in terms of judging, the use of the EEVC logo somewhere on the vehicle is a deciding factor.



The EEVC Overall Best Electric Car designed and constructed by Tom Wills.

Tom Wills with two special guests who came hoping to see him win: sister-in-law Kate Rapoport , class of 99 (middle) and sister Emily Regan Wills, class of 2000 (right).

2008 Objectives

This year the objectives were to design a dragster that would race 15 meters down a track that was 2 meters wide. The car was allowed to have one or two small specified electric DC motors designed for hobbyists. The motors were rated for approximately 3 volts and about 6000 rpm. However, experience has shown that these motors can be overloaded for greater performance. We allowed students to apply up to 9 volts per motor. Each car was limited to one pulley or gear reduction per motor via the use of two gears or pulleys. The maximum length of the car was 12 inches. Each car was required to carry an index card flag which would make and break the laser beam timing circuit, and was required to have a switch soldered into its circuit by which to turn the car on and off.

Tom Wills receiving the EEVC Overall Best Car Award from Oliver H Perry

Results

Although the specific objective of the car was to travel 15 meters in the shortest amount of time it turned out that the real challenge was to keep the car traveling in a straight line. Two-thirds of all runs in the event went out of bounds before reaching the finish line.

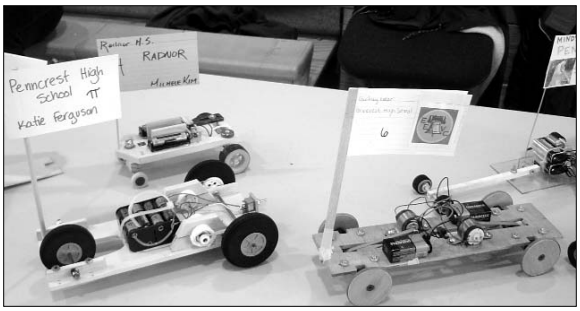
There was no question as to which team arrived to the starting line with the best cars. Individuals from Penncrest High School placed first, second and third, with times of 3.4, .3.9, and 4.6 seconds respectively. Penncrest also placed 4th and 5th in individual runs. Radnor as a school placed second with a 5.7 second time and Phoenixville was third with a time of 10.9 seconds.

Picking from the best

The 2008 entries presented a challenge for judging. We have never had so many well designed and well constructed cars to choose from. Usually the cars are not so elegantly designed as this year's top cars. From the cars that crossed the finish line we selected the car with the second best time as the overall best vehicle. That car belonged to Penncrest senior Tom Wills, one of the four Penncrest electric car event leaders. Tom spent three weeks designing, building, and testing until he finalized his car. Then he took two more weeks racing, wrecking, and refining his car after school.

Tom Wills getting the Silver Olympic medal

Tom told me that the Penncrest electric car team spent a lot



Some of the better cars constructed, from which we chose the EEVC Overall Best Electric Car.

of time in the beginning stages figuring out a winning design. In fact Tom e-mailed me a question at that time relating to the legality of placing two motors on a common axle. Tom gives credit for this winning idea to a brainstorming session with his teacher's father, Mr. Malkovsky (senior), his older brother, a former Olympian, and teammate, Junior Mindy Coleman, who eventually placed first in the competition. Mindy beat Tom's time by a slim 5 tenths of a second. During the

Mindy Coleman, a Penncrest High School Junior, had the fastest car and won the Olympic Gold Medal.

the Radnor team representative who won the Banner for winning the meet. The banner will be held by Radnor till the next meet next year.

practice trials Tom told me that Mindy's car ripped down the track with a record 3.1 seconds before smashing into the finish line laser stand, shattering her car's entire front end. Her official winning time two weeks later at our meet was 3.4 seconds. Tom's best time previous to the meet was 3.7 seconds. In actual competition he was second with a 3.9 second run.

Honorable Mention should also be given to Penncrest senior Tony Battaglia and Penncrest juniors Cortney Keeler and Katie Ferguson for their outstanding cars.

What makes Tom's car design-wise, the overall best?

Both Mindy and Tom, working together, came up with basically a similar drive train design which placed them in a "top car" category. Each connected their allowed two motors to opposite ends of a common output shaft. Since motor direction is controlled by polarity, electrically speaking, placing motors on opposite ends of a shaft was not a problem. One motor ran clockwise, the other counter clockwise. A pulley was placed in the center of the common motor shaft. The two rear drive wheels were also connected with a common axle with a pulley. A rubber band served as a drive belt connecting the motor shaft to the drive wheel shaft. Since the car was designed to go straight no differential was required.

The above concept proved to be unbeatable in our competition.

Other students chose to use gears to transmit the motor power to the drive wheels and some placed the drive wheels right on the electric motor output shafts. Others used a motor

connected to the outside of the drive wheel by a pressure contact friction drive setup.

Tom felt that gears posed a problem. Gears tend to bind up unless the right pressure is applied to them and they often go out of alignment. His belt drive, made from a model airplane rubber band which he stretched a few times to wear it to the right tension, worked amazingly well.

Several top cars and Tom's were tough to choose among for the overall best car award. But one difference, which favored Tom, was the number of 9 volt batteries he used. In theory a lighter vehicle is better. Tom chose to use one 9 volt battery (and parallel wire it to the two motors) rather than to use two separate batteries. Two batteries would have added significant weight to his car. Since this event was not a range event and fresh batteries could be swapped in at any point, cutting the battery weight in half but keeping the voltage the same, with only perhaps a slight loss in current, made engineering sense. (There was a lot of discussion as to how much more current, and therefore power, could be gained by using two batteries in parallel compared to a single battery with half the weight.) In our competition Tom's car proved to be slightly faster than one of his competitors who used two batteries. It was easy to compare the total weights of the two cars by lifting them by hand. It is my opinion that the lower mass made a greater difference in the quickness of the lighter car than increased current from two batteries in the heavier car. *

*For the reader's benefit, two batteries in parallel theoretically lower the combined internal resistance to less than that of just one battery. For that reason more current will be available for the motors from two batteries connected in parallel.

Tom actually found out that the added power of two batteries sometimes caused the drive wheels to "spin out" and lose control. So in order to keep from "breaking traction" some cars had to reduce power. This event provided a great challenge in maximizing both power and traction. In Tom's case, cutting mass at the expense of losing a little power maximized his performance.

When it comes to actual racing, the surface of the track makes a difference. Thinking students realized this and practiced trials on a variety of surfaces. The Penncrest High School gym floor might not have had the same surface as the floors in opposing schools, so in Tom's case, he had a home court advantage. Tom said that the Penncrest students used a similar floor in their cafeteria to practice on, one which used to be the old gym.

Why was Tom's car superior In terms of craftsmanship?

Everyone who inspected Tom's car was impressed with the exquisite machining in the motor to drive wheel drive-train. Connecting a common axle to the output shafts of two motors, in metal, requires a delicate touch and machine shop skills, as does making two precision pulleys and connecting them to the shafts. In order to do this Tom began developing his skills before taking a physics course. Tom is very interested in camera work and has tinkered with cameras for many years. He has his own home shop for building projects. In order to make some parts for a special camera project Tom approached a local machine shop last summer. The owner of the shop reviewed Tom's drawings and discovered that Tom had some skills that he, the owner, could use in his shop. Tom was given a summer job and allowed to use the shop's equipment after hours to work on his camera project. Over that summer Tom furthered his shop techniques as he learned how to use CNC (computer numerical control) and manual machines to make parts for industrial equipment. When it came to making the pulleys, axle parts and adapters for this project Tom didn't use high tech equipment; he simply used a drill press and file. He said he was lucky that the two pieces of material (¼ and ½ inch stock) which he used for making his two pulleys (aluminum and Delrin plastic) happened to be in a 2:1 size ratio. The 2:1 drive pulley ratio worked out great for performance.

The proper power drive train ratios are a key to winning. I suspect students do not spend sufficient time maximizing them. One reason is that it is hard to come up with an easy method to vary gear or pulley ratios. So most students end up using gears and pulleys

that are convenient to put into their cars but not necessarily the most efficient.

Tom Will's car body was made from clear colored Lexan, a type of plastic. He used a band saw to cut the pieces. As the picture shows the body was simple, lightweight, and strong.

As for keeping a car going straight during the sprint, most students learn the hard way that they have to include some type of durable and rugged steering adjustment. Invariably a car that cannot be steered does not go straight as expected. Wheels and axles seldom are in perfect alignment in a student's first attempt. Tom learned from last year's competition, which required cars to travel in a circle, how to build a simple but reliable turning mechanism. Although we saw several incredibly delicately fine tuned screw type steering adjustments on some other cars this year, which deserved recognition, we found that Tom simply implemented a common front end wheel axle assembly that was held in place on the body by a single screw. Loosen the screw, rotate the front end a wee bit in a corrective direction, tighten the screw, and you have it. Keep adjusting until the car goes straight: nothing complex, but very reliable.

EEVC Logo

In case of ties, the winning car is judged on how well they displayed the EEVC Logo. Tom's car had a reproduced EEVC logo that Tom had downloaded from our EEVC web page. He used Photoshop clip art to make his required index card flag. The flag displayed his name, school, and the EEVC logo in a very professional manner.

The Olympic Experience

Tom Wills is just one of many students who have participated in Physics Olympics as a part of the Penncrest High School team. Tom says that participating in Physics Olympics is a wonderful experience. He says the program helps one to think critically about design and a good way to make physics practical. Tom is in his second year of high school physics. He had Mr. Jim Ciccarelli as a junior for Physics I and currently has Mr. Robert Malkovsky for AP Physics. "Mal and Chic are amazing teachers," states Tom. They are good at connecting with students and helping students to understand physics through discussion, verbal problem review, and asking thought provoking questions. Both teachers have a way of making concepts applicable.

And, what about the thrill of experiencing an Olympic victory? Tom excitedly told me that winning second place in the electric drag, the silver medal, was the first time he had won a medal in six meets. The desire to win occurred in last year's meet when his car was "called back" as a possible Penncrest entry. It didn't make the grade last year but the call back experience motivated Tom to go for the gold again this year. And Tom's car not only won a silver medal this year but became our pick for the most outstanding car as well. Tom did not place the EEVC logo on his flag for no reason. He wanted to win our award too.

"Well Done Wills !"

From the lips of Tom's teacher, Mr. Robert Malkovsky: "Never before have so many students competed internally (at Penncrest High School) getting ready for a tournament in all of my years of preparing for an Olympic meet. I have never seen so many quality cars in the same building at the same time!"

Maybe the presence of Mal's dad, Mr. Malkovsky senior, in the "after school" hours of preparation, helped motivate the team. Mal's dad, who had built his own car, asked us to let him race it at our meet after the students had finished. Not too many people happened to see it perform. It was a great car … but his student's cars outperformed his. Hey, if you can inspire somebody to do better than you, you have done well. We need more people like Mal's father and Ron Groening getting into the high schools and spending some of their time interacting with students. It helps.

So out of the best and most competitive group in the history of Penncrest Physics Olympics electric car competition, emerged Tom Wills as a winner! How and Why? Both teacher and fellow students told me that Tom was an example of perseverance. He worked for weeks and rebuilt his car over and over again. They couldn't give a figure for the exact number of times his car broke down and refused to work. Each time Tom repaired it. Tom Wills is an example of persistence winning out over raw talent. Malkovsky said,

"When it comes to solving physics problems and doing homework Wills does it his way, persistently his way, not always the best way, but in the end he does it." "Well done Wills!"

The Frog

When asked what Tom Wills is like as an overall student Mal responded with the story of the pocketed frog.

"A student like Tom discovered a frog and picked him up. The frog told the student that if he kissed him on the lips that he the frog would turn into a gorgeous princess. The student thought for a minute and then slipped the frog into his pocket without kissing it. The frog yelled out, "How come you won't kiss me and get a gorgeous princess as a reward?"

Taking the frog back out of his pocket the student looked the frog in the eye and replied, "I don't really need nor want a beautiful princess, but a talking frog is something that I find to be very rare and I want to keep you as a frog for as long as I can!"

Next year?

Tom will graduate from Penncrest High School this year and presently is considering attending Ithaca College and majoring in film making.

Jay Y. Howson - Phoenixville High school receives the EEVC Ron Groening Award for Engineering in the 2008 Southeastern Pennsylvania Physics Olympic League

Student Jay Howson, recipient of the EEVC Ron Groening Award for Engineering, with Phoenixville physics teacher Jay Jennings.

The Eastern Electric Vehicle Club of Valley Forge Pa. presented a special engineering award at the annual final Physics Olympics meet held March 1st at Penncrest High School in Media, PA., to Jay Y. Howson IV, a senior at Phoenixville High School. The special award was made in honor of the late EEVC officer, Ron Groening of Phoenixville.

Ron Groening, long-time employee of Lockheed Martin, was himself an electrical engineer of considerable talent, highly respected and loved by his friends and peers. Ron donated a portion of his time over the years to help his local Phoenixville High School Physics Olympic team, who when Ron first began, was coached by physics teacher Carol Mandik. Ron also has assisted the EEVC for many years in choosing the "Best Overall Electric Car" from the many competitors in the annual Penncrest final meet of the season. Had Ron been present at this Olympic meet he would have been proud to present his award to Jay Howson.

Jay Jennings assumed leadership of the Phoenixville High School physics department and Physics Olympics team upon Carol Mandik's retirement a few years ago. This past season under Jenning's leadership, and with students like Jay Howson, Phoenixville suddenly became a force to be reckoned with in the league. Out of 10 teams Phoenixville placed 2nd in the first meet of the season, beating out several top teams. Points in the competition are scored not only with physics and mathematical problem solving skills but with engineering skills. Teams that score high must have students that excel in hands on engineering projects.

Jay Jennings, physics teacher at Phoenixville, states that his student, also first named Jay, is one of the most memorable students of his career. "Jay has had a substantial impact on the Physics Olympic program." Not only is Jay, the student, highly motivated to learn science, but he loves to tinker and build. Jay is currently enrolled in AP physics having taken Physics I as a junior. His presence in the Phoenixville physics lab helped to motivate others to join in the pursuit of Olympic gold. Jay and his fellow students gathered after school daily in the physics lab to brainstorm, practice Olympic events, and construct devices for competition. It was here that Jay created the outstanding support arm,

made out of soda straws, which won first place in the autumn meet and helped put Phoenixville on the Physics Olympic map. For this last meet Jay concentrated on constructing basswood bridges for the bridge breaking event. His practice bridges set records.

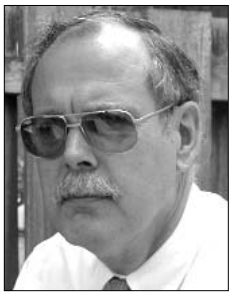
Jay Howson, John Howson IV, became seriously interested in science somewhere in the 7th grade time period. Jay's father, John Howson, works for Lockheed Martin. His mother Christine is a school teacher. One could say that their son Jay inherited a home environment conducive for engineering at his birth. His parents gave him science books to read when he was young and Jay found them particularly exciting. As far back as he can remember Jay began to do scientific tinkering at home. He became particularly fascinated with Tesla coils, high voltage electrical devices capable of producing long electrical arcs. Jay has built one capable of producing 33 inch sparks and says he has recently created fusion in a bell jar in his bedroom. The vacuum pump was borrowed from his physics teacher.

Besides participating on the Physics Olympic team for Phoenixville Jay has helped with stage crew and worked in the TV studio. This unique high school senior also finds time to spend with his girl friend Courtney who hopes to make a career in bio-medical science. Jay would like to attend the University of Maryland next year. He expects to major in physics and minor in electrical engineering.

PSE&G Award

At each end of season's meet a team score for the PSE&G cup is determined form the results of the electric car event. A team's single best score counts for the Olympic scoring. For the PSE&G Cup competition the team who has the most different cars scoring points wins the right to keep the cup until the following year. Last year Radnor won the cup in circular track racing. This year, in straight sprint racing, Penncrest dominated. Penncrest students put 5 different cars on the track and all 5 streaked across the finish line with outstanding times. Radnor who placed second in the event only had two out of 5 cars even reach the finish line.

MORE ODD DOINGS FROM THE CITY BY THE BAY
By California Pete



Gung Hay Fat Choy

On February 23 San Francisco had one of its signature events: the Chinese New Year's parade, this year celebrating the year of the rat. It was carried live on several local TV stations, and I was bemused at the name of one of the commentators: Ben Fong-Torres.

The parade was held in the pouring rain of a Pacific storm, but this is not, apparently, an unusual occurrence, and it didn't dampen the participants' spirits. They wrapped the colorful floats in clear plastic and kept going, accompanied by drummers, dragons, lions, and lots of firecrackers.

Let's just carry them

San Francisco believes in, if nothing else, political correctness and the full liberal agenda. Back in the 1990s City Hall was renovated at a cost of $300 million to make every part of it wheelchair-accessible. But one spot was omitted: The president's podium in the Board of Supervisors' chamber, which sits on a platform and is reached by a set of five steps. Doing anything about this was put off until 2004, when a supervisor arrived who uses a wheelchair. Then the fun started. After years of back-and-forth and close to $100,000 worth of studies it was decided to build a ramp, but since San Francisco's city hall is a registered historic building not just any ramp would do. With all the ancillary things the price tag for the 10-foot ramp was estimated at $1.1 million, or $100,000 per foot.

After appropriate fun was made of the project in the local papers the city council voted to scrap it, which caused the wheelchair-bound council member to threaten a lawsuit. The mayor then chimed in, urging local businesses to sue the city because it was refusing to follow the Americans with Disabilities act yet requiring businesses to comply with it.

We'll see what develops.

Making the city more inviting

Hollywood has its Walk of Fame, with bronze stars for famous entertainers set into the sidewalk along Hollywood Boulevard and Vine Street. The Board of Supervisors has approved a resolution urging the Department of Public Works to adopt of privately funded plan to install "commemorative bronze sidewalk plaques," according to the *San Francisco Chronicle*. But apparently the Supervisors hadn't bothered to read the resolution, and so didn't notice that the plaques were to be human-shaped and would mark where homeless people had died on the streets. The 2x2 foot plaques would be inscribed "with details of the deceased's lives and the circumstances of their deaths."

As an editorial in the *Chronicle* pointed out, this is just the thing to attract passers-by into restaurants and coffee shops: "A homeless person died here. Please come back soon."

Stopping the buses

San Francisco's transit authority has been experimenting with hybrid buses, but has recently run into an unexpected problem. It seems that each bus has a main power switch accessible by opening an unlocked panel on the side. Apparently some of the folks in the city's Hunters point neighborhood, where some large housing projects are located, have discovered this. In the past they had contented themselves with just stoning the buses, but now they can actually turn them off. "When that happens," say the *Chronicle*, "the drivers can't accelerate, they lose radio contact with dispatchers and the interior lights on the buses go out."

The Municipal Railway (Muni), which runs the buses, could use only conventional diesel buses in Hunters Point until the access panels could be fitted with locks.

One for the book

A while ago we were asked for permission to mention the EEVC in an upcoming book entitled The Green Parent: A Kid-Friendly Guide to Earth-Friendly Living (Kedzie Press, 2008). The book comes out April 1, and author Jenn Savedge informs us that EEVC members can get the book with free shipping at the publisher's Web site, www.kedziepress.com, at $3.00 off the list price ($9.95 total) by using the coupon code TGP2008. The publishers also promise to plant a tree for each copy sold.

NEWS UPDATE

Los of AFVs at the Geneva show

The 78th International Motor Show, held March 6-16 in Geneva, has a fine selection of electric cars and other alternate-power vehicles. Two notable exhibits are from Think: the City and the Ox. The two-seater City (above), redesigned at the end of 2007, is available with a choice of sodium or lithium-batteries, has a range of up to 180 km (112 miles) and a top speed of 100 km/hr (80 mph) from a 30 kW (peak) 3-phase motor.

The Ox is a concept vehicle platform with modular body styles. The 5-seater MPV version shown below has a range of 200 km (125 miles) and a top speed of 135 km/hr (84 miles) from a 60 kW water-cooled permanent magnet motor.

GE and Think

Part of the reason for Think Global's improved fortunes has been a $4 million investment by General Electric, which GE paired with $20 million to Massachusetts-

based lithium battery maker A123 Systems. GE also has a $5.6 million research contract with DoE to develop smaller, lower cost and better performing EV motors, according to an AP story dated March 5, along with a $1.2 million project to develop advanced density capacitors.

GE getting bigger in wind

General electric has been making deals one after the other in the wind turbine business. On February 28 GE Energy announced that it had signed a deal to provide Renewable Energy Systems Americas Inc. with wind turbines. GE Energy will receive more than $700 million to provide Renewable Energy Systems with 1.5 megawatt wind turbines for projects in 2009 and 2010. GE Energy will also provide commissioning, operations and maintenance services.

On March 6 GE announced a second wind-turbine contract worth more than $1 billion from Invenergy Wind LLC for wind-power projects in North America. GE will supply Invenergy with wind turbines that can generate 750 megawatts worth of power per year. GE expects the projects to be constructed in 2010.

GE announced a similar agreement with Invenergy in January, also worth more than $1 billion, to provide wind turbines projects to be built in 2009 in the U.S. and Europe.

Still more wind

Tetra Tech Inc. announced on February 27 that it had won three Wyoming wind energy projects worth about $150 million from PacifiCorp. The Seven Mile Hill, Glenrock and Rolling Hills wind farm projects in Wyoming will each include 66 General Electric turbines and will have the capability to generate 99 megawatts of power.

PG&E Seeks Approval For New Geothermal Energy Contract

On February 15 Pacific Gas and Electric Company announced that it is seeking approval for a 175 MW geothermal power purchasing agreement with Calpine Corporation. The agreement consolidates six existing qualifying facility agreements totaling 118 MW and adds 57 MW of new renewable energy to PG&E's supply. With this agreement, 20 percent of PG&E's contracts for future energy delivery now meet California's renewable energy standard.

Starting in September 2008, the agreement will deliver renewable energy from The Geysers Geothermal Field, located 75 miles north of San Francisco, the largest producer of geothermal electricity in the world. Commercial geothermal power has been generated continuously at The Geysers Field since 1960.

Lots of green for green

A Feb 18 story by Thomas Kostigen in *Marketwatch* reported on a Feb 14 meeting at the U.N. of 49 U.S. and European investors representing more than $8 trillion of assets "to lay out a timetable for their commitments to global climate change and to call on governments and other investors to act with their money as well." And they have plenty of clout:"The group says its investment commitments will boost energy efficiency and clean technologies as well as require tougher scrutiny of carbon-intensive investments that may pose long-term financial risk. That means investments in industries that are heavy carbon emitters are under threat. By raising the specter of divestments due to risk these investors are firing a warning shot."

GM gets on board a little

General Motors had an interesting announcement at the Geneva Auto Show: The company plans to introduce a second-generation version of the GM Hybrid System with a new, more powerful lithium-ion battery. A "mild hybrid" design, it will build upon the belt-alternator-starter hybrid technology currently available in the Saturn Vue, Saturn Aura and Chevrolet Malibu, and is expected to yield an improvement in fuel economy of up to 20%. Not exactly earth-shaking.

Arizona sees big future in solar

A recent AP story reported that the Spanish company Abengoa Solar is planning to build a 3 square mile solar power installation in the desert southwest of Phoenix, making it into one of the largest solar power plants in the world. The 280 MW plant, to be called Solana Generating Station, would be built in Gila Bend and be producing energy by 2011.

As in California, Arizona regulations, the story says, are requiring utilities to get 15% of the energy from renewable sources by 2025, and if there's one energy source Arizona has in abundance it's sunshine.

The plant will not be photovoltaic, using instead a field of mirrors (heliostats) to heat liquids that will spin turbines. One advantage of this system is that it doesn't stop suddenly if a cloud goes over the sun, and it can keep running for a while after sunset.

The story quotes Arizona governor Janet Napolitano as saying "There is no reason that Arizona should not be the Persian Gulf of solar energy,"

Solar equip[ment plant planned for NM

An AP story dated March 4 reports that Schott AG, of Mainz, Germany, has announced plans to build its North American hub for production in Albuquerque, New Mexico. "The plant will produce photovoltaic panels and receivers for solar thermal power plants. Initial plans call for a 200,000-square-foot (18,580-square-meter) facility that will employ about 350 people."

Production is expected to begin in spring 2009." As demand for renewable energy sources grows, the company said plans include expanding the plant to 800,000 square feet (74,322 square meters) and employing as many as 1500."

New Mexico, like Arizona and California, has a mandate for local utilities to generate 15 percent of their electricity sales from renewable sources by 2015 and 20 percent by 2020.

COMING EVENTS

BCI 120th Convention & Power Mart Trade Fair
April 27030, Tampa, FL. Go to www.batterycouncil.org/120th.htm
78th International Geneva Motor Show
March 6-16, Geneva. Go to www.www.salon-auto.ch/en
Public Forum: The Boston Green Tea Party: Join the Energy Revolution!
March 11, Boston. Part of NESEA's BuildingEnergy08 Conference and Trade Show, March 11-13. For information go to www.buildingenergy.nesea.org.
SOLAR 2008
May 3-8, San Diego, CA. Go to www.ases.org/solar2008/
Alternative Fuels & Vehicles National Conference & Expo 2008
May 11-14, Las Vegas. For information go to www.afvi.org/NationalConference2008/
WINDPOWER 2008
June 1-4, Houston. For information go to www.windpowerexpo.org/index.cfm.
21st Century Automotive Challenge 2008
June 7-8, Burlington County Institute of Technology and the Historic Smithville Park in Burlington County, NJ. For information contact Oliver Perry.
2008 SAE International Powertrains, Fuels and Lubricants Congress
June 23-25, Shanghai, China. Go to www.sae.org/events/pfl/
Battery Power 2008
Sept. 4-5, New Orleans, LA. Go to www.batterypoweronline.com/bp08_index.htm
Convergence 2008
October 20-22, 2008, Detroit, MI. Go to www.sae.org/events/convergence/ or call 626-744-5600.
Electric Drive Transportation Association Conference & Exposition
Dec 2-4, Washington, DC. Go to http://edta.orchidsuites.net/sites/conf2008/

MEETING SCHEDULE

Meetings are held in Room 49, Plymouth-Whitemarsh High School, 201 East Germantown Pike in Plymouth Meeting, PA, and begin at 7:00 p.m.

April 9

May 14

June 11

July 9

August 13

September 10