

March 2013

## Inside this issue:

- [Registration Open for IEEE-USA Annual Meeting](#) 1
- [By The Numbers—The IEEE GREENTEC & R5 Conference Report](#) 2
- [Science and Engineering Day at Golden High School](#) 3
- [SCS Summary and North America HVDC Interconnection](#) 4
- [Success During the Student Tracks at the R5 Conference](#) 5
- [Local Volunteers Pitch In at the IEEE 2013 Greentech and R5 Conference](#) 6
- [DSST 2013 Senior Projects](#) 7

Official newsletter of  
IEEE-Denver Section  
Published Quarterly

Editor:

Submit articles for  
consideration to:  
[hasling@ieee.org](mailto:hasling@ieee.org)

Volunteer at and attend the [IEEE EMC Symposium!](#)



[Register](#) with Sandra Nallely and Michael Kandra

August, 5– 9  
Colorado Convention Center

## Registration Open for IEEE-USA Annual Meeting

Held in beautiful Portland, Oregon in early August, this venue is the perfect opportunity to bring your family to the Pacific Northwest for a few extra vacation days. The 2013 IEEE-USA Annual Meeting will have an exciting and innovative program format. It is the first Annual Meeting produced entirely by volunteers. The event will start out with a day and half technical conference on [Sustainable Technologies](#). Ed Perkins (IEEE-USA VP Professional Activities and SusTech Conference Chair) along with Jim Morris (SusTech Conference Program Chair) and his program team have crafted a unique program centered around key Sustainable Technology topics with a mix of contributed papers, invited papers, panel discussions, and poster sessions. Full access to the SusTech Conference on Sustainable Technologies is included in the Annual Meeting registration.

As SusTech winds down on Friday afternoon, Carole Carey's (Annual Meeting Program Chair) team takes over starting with a much-requested workshop on "Conference Organizing Training" and three program tracks: sustaining the profession; sustaining the professional; and sustaining innovation.

Oregon weather in August is usually bright, dry and sunny in the upper 70s to low 90s. There are many things to do in Portland and the surrounding area. For those interested in more outdoor adventure Portland is only an hour away from Mt. Hood (and perhaps some summer skiing) and wonderful hiking areas in the Columbia Gorge, a 90 min. drive to the Pacific Coast, an hour away from Oregon's wine country, the Spruce Goose, and two hours away from Mount St. Helens National Volcanic Monument.

Early registration closes June 28. Hotel reservations must be made by 6PM July 9.



## By The Numbers- The IEEE GREENTEC & R5 Conference Report

*“A small group of thoughtful people could change the world. Indeed, it's the only thing that ever has.” - Margaret Mead*

It's been 2 months since the [IEEE Green Technologies \(GREENTECH\)](#) and the [IEEE Region 5 Conference](#) (Apr 3-7) and even if we didn't “change the world”, both programs were a fantastic success. The Denver Section and the team of conference volunteers hosted nearly 500 attendees over those 5 days. Here are some statistics of interest from both conferences.

The success and innovation of GREENTECH included the following:

- 30-40% Attendance Increase from 2012
- 60 Technical Program Committee participants
- 5-10% Conference Surplus (profit)
- \$1000 Best Papers Award Patron (CCET)
- 30 Tutorial Attendees
- Excellent Conference Management Partner (SPLTrak)
- 5-10 Student Day Pass Attendees
- 2 new Patron + 3 new Exhibitors
- Strong Industry Support (NREL) + PR Campaign

Participating countries in the conference included:

- Algeria
- Austria
- Belgium
- Canada
- China
- India
- Iran
- Ireland
- Italy
- Japan
- Morocco
- Pakistan
- Saudi Arabia
- Singapore
- Sweden
- Switzerland
- Taiwan
- Thailand
- United Kingdom
- United States

Likewise, the Region 5 conference had significant highlights and numbers to report:

- 325 attendees
- 27 Participating Universities
- 115 Robotics Students (36 Teams)
- R5 Leadership Training (35 registered) & Business Meeting (71 attendees)
- Local Support for SPAC/ SLTW/ GOLD Programs (over 50 attendees)
- 5-10% Conference Surplus (profit)
- \$1500 Software Awards to Competition Winners (National Instruments)
- 30+ Workshop Attendees (Program Management for SW Projects)
- Reusable Program Management Tools (PM Online, Website, Manual)
- 1 new Patron + 3 Exhibitors (IEEE-USA, Denver Section, Member Services)

Highlights from both conferences can be found on these websites:

- [Region 5 History Site \(Global History Network\)](#)
- [IEEE Greentech \(Facebook Site\)](#)
- [IEEE Denver Section \(Facebook Site\)](#)

Next year's program for the two conferences will be held in Corpus Christi, TX. Check out deadlines on the website here:

[The 2014 GREENTECH Call for Papers](#)

On behalf of the Denver Section and the conference committees thank you for making this a 'Mile High' successful event.

- Tim Weil, Denver Section Chair

## Science and Engineering Day at Golden High School

Mr. Scott Aurand, an incredibly talented and dedicated teacher at Golden High School, recently extended an open Invitation to the engineering and scientific communities to come and meet his classes of high school students about their career experiences. I volunteered to attend and on Thursday, May 2, 2013 in the Engineering Lab of the school, I found myself with about a dozen other employed or retired engineers from a variety of disciplines. We spread out around the room, to represent aerospace, biomedical, civil, power and other sectors of engineering. Before long, small groups of students began filtering through the classroom, and each one of us found ourselves presenting highlights of our career to curious and questioning junior and senior students.

Common questions were: How much can I make when I graduate? Where can I go to school? How did you get into engineering? Can you switch the type of engineer you are without more school?

The questions were a jump-in opportunity for all of us to expand on the experiences and rewards we all wanted to share in Science and Engineering. After a quick hour we broke for a free pizza lunch while Mr. Aurand presented a short Power Point about the numerous engineering classes offered by GHS. The models and remnants of rockets, Mars Lander mission robots, CSI forensics, Robot Arm, catapults, trebuchets, bridges, RC cars - on and on like some amazing science museum - ringed the large classroom and spilled from the shelves.

Thanks to the ongoing work of grant applications from a variety of sources, grant funding (\$100,000 over several years ) has helped the GHS Engineering program acquire equipment and software to rival a small engineering company: 3D printers, a wind tunnel, structural Stress Analyzer, Laser Engraver, 15 Vex Robots, computers, machine-shop, and Software including Solid Works, schematic capture digital design and NASA project s/w.

After the pizza, we went back on duty and met with another round of students, just as eager about their own engineering projects as we were about ours. I left later that afternoon having again learned more than I taught, grateful for the experience and proud of these eager young students and their mentor Mr. Scott Aurand.



**Above:** Golden High School, located at 701 24th St in Golden, CO has served the community of Golden for 138 years.

To see additional images, learn more about the GHS Engineering Program or to volunteer for the next GHS Career Day, go to [Golden HS](#).

- Jim Harrer, Sr IEEE Member, EMBS

## SCS Summary and North America HVDC Interconnections



Above: SCS Thyristor Valve Hall

Two Denver area IEEE organizations are supporting recognizing a high-voltage direct-current (HVDC) converter station as an IEEE Milestone. IEEE Life Fellow Member Duane Torgerson, Life Fellow Member Tom Weaver, Life Senior Member Gerhard Juette, and Life Senior Member Bob Wilson have obtained the enthusiastic support of the Denver Chapter of the Power and Energy Society/ Industrial Applications Society (March 2013) and the Denver Section Executive Committee (May 2013).

The IEEE History Committee established the program, "IEEE Milestones in Electrical Engineering and Computing." This program honors significant technical achievements in all areas associated with IEEE, administered through the IEEE History Center. Milestones recognize the "technological innovation and excellence for the benefit of humanity found in unique products, services, seminal papers and patents."

The 200 MW back-to-back HVDC Virginia Smith Converter Station (SCS) located in Sidney, Nebraska was commissioned in 1987 to provide energy interchanges between the eastern and western North American alternating current (AC) power grids. The SCS facility is capable of transferring 200 MW of power in either an east-to-west or west-to-east direction.

The east and west AC networks that connect to the SCS are comprised of large but dispersed generation and transmission systems that are operated asynchronously. These power and energy systems extend from the Pacific Ocean on the west to Atlantic Ocean on the east. Before back-to-back HVDC facilities were built, it was almost impossible to transfer power and energy between the eastern and western North American power grids (see Figure 1).

Members Torgerson, Weaver, Juette, and Wilson believe the SCS qualifies as a Milestone for the following reasons. The relative weakness of both AC networks near Sidney, Nebraska required the use of special equipment and unique control features to prevent:

- Voltage instability during normal operation
- Difficulties in recovery of

AC System Parameters	East	West
Bus Voltage (kV)	230	230
Controlled Range (p.u.)	0.95 - 1.05	
Short Circuit Capacity		
Minimum (MVA)	700	450
Maximum (MVA)	2200	1075
Frequency (asynchronous - Hertz)	60	60
Reactive Compensation		
Capacitive (MVAR)	69	136
Inductive (MVAR)	225	50
DOV Control (p.u.)	Response Time	
Below 1.25	within 2 cycles	
Below 1.15	within 250 ms	
Below 1.05	within 600 ms	
<b>SCS HVDC Parameters</b>		
Maximum Rated Power (MW)	200	
Minimum Power (MW)	20	
Voltage (kVDC)	50	
Current (amperes dc)		
Minimum	414	
Maximum	6,000	
Nominal	4,140	
DC Reactor (millihenries)	30	
Valve Arrangement	12-pulse (see Figure 2)	

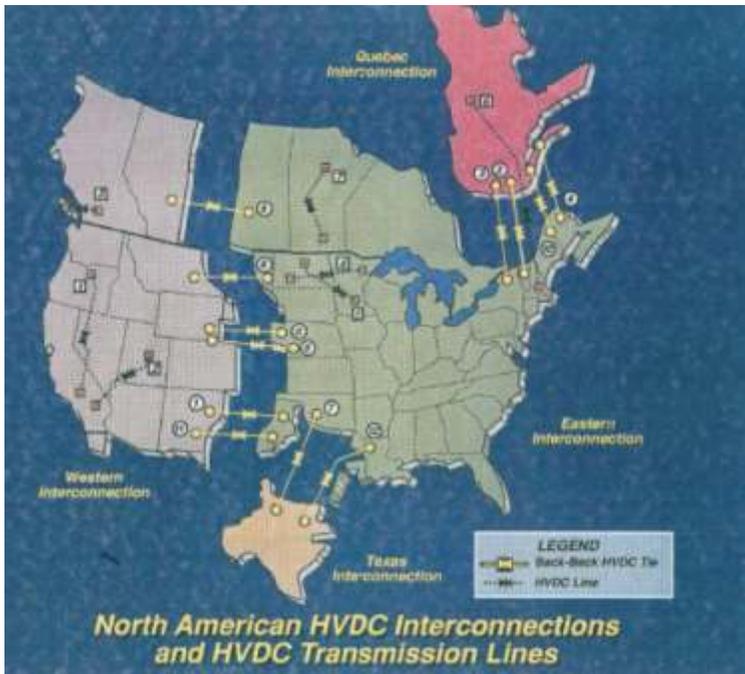
[Continued on page 5...](#)

power transmission after a fault in the AC networks

- Dynamic overvoltage (DOV) upon load rejection and AC network faults

In order to cope with these requirements, the SCS utilizes:

- Unique power/ voltage control strategies
- Fault recovery control
- Dynamic overvoltage control



The SCS is designed to be operated as an unattended facility with control via a microwave communication link from a dispatch center located approximately 150 miles away in Loveland, Colorado.

The next step is to submit the proposal to the IEEE History Committee. “We believe the Sidney Converter Station was a significant step forward in HVDC converter technology connecting electrically weak systems. We hope the IEEE History committee will grant our request for milestone status,” said Duane Torgerson. Denver Section Chair Tim Weil continued, “We are happy to support this application for this significant project. Thanks to the IEEE members who brought this proposal forward!”

- Robert E. Wilson, Sr. Life Member

Left: 1987 Map of HVDC Interconnections.

## Success During the Student Tracks at the R5 Conference

During the region 5 conference in Denver, the Saturday student track was a great success. Approximately 35 students from universities from Colorado, Texas, Louisiana and more were in attendance. The day consisted of multiple tracks for just students. Key note speaker Jim Watson presented Leadership to Success in addition to Nicole Skarke’s student training on how to host a Student Professional Activities Conference (S-PAC) or Student Professional Activities Venture (S-PAVe). This particular S-PAC was hosted by the Colorado School of Mines IEEE Student Branch as their first S-PAC. In addition to Watson’s and Skarke’s leadership and S-PAC information, a member from IEEE Discounts presented to student the perks of being an IEEE student member with a finishing Leadership Training Workshop (SLTW) presented by Anil Mehta to help region 5 student branches connect with one another and improve their student branches!

Overall, students provided positive feedback and the event was something students will attend in future conferences to come. A special thanks goes to Jim Watson, Nicole Skarke, Anil Mehta and Erik Johnson for planning the day of events. It was the team work of these four IEEE members to make such a great event happen. There are further student track plans with Jim, Nicole and Erik for the fall 2013 school semester to focus on schools located within and close to the Denver Section.

-Erik Johnson



## Local Volunteers Pitch In at the IEEE 2013 Greentech and R5 Conference

The Greentech and R5 were two huge back-to-back national IEEE events (May 4-7, 2013) that I was fortunate to participate in, and without having to leave Denver to do it!

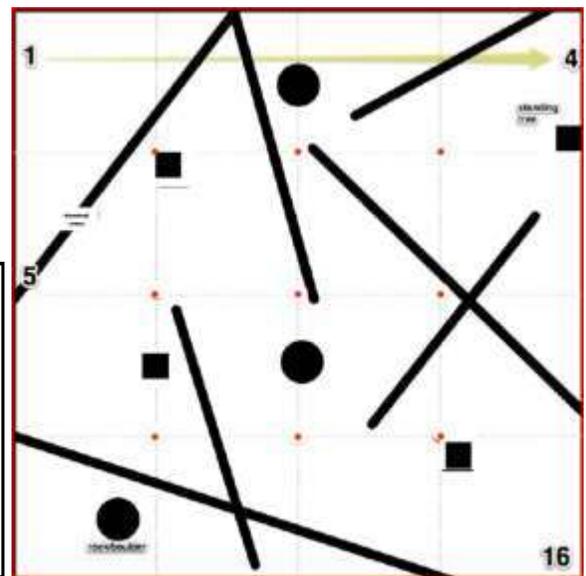
Following the insights and encouragement of our fearless Denver IEEE leaders, at the Greentech event on May 4 and 5, in the Hyatt Hotel Denver Tech Center, several Colorado IEEE student and regular member volunteers and myself worked together to sponsor an IEEE kiosk to showcase local Denver IEEE chapters and activities. Our booth was well placed between two other national IEEE kiosks, and we saw a fairly brisk business of visitors interested in our local IEEE. Several Colorado-based chapters (including PES, SPS, ComSoc, EMBS, and RAS) provided handouts and the always popular conference freebies like pencils, pens, luggage flags, all with IEEE logos. It was rewarding to engage with the many visiting students about our personal careers, experiences, and successes in the engineering profession.



On the following Saturday, May 6, I worked as a volunteer judge for the IEEE Student Robotics competition. This year's objective was to build an autonomous robot capable of navigating an 8' x 8' playing surface and collecting 'soil samples' at points specified prior to the start of the round. To collect the 'soil samples', the robots negotiated an obstacle course that simulated a terrain after a forest fire (see diagram, below). Kudos to the Metro Engineering students and faculty, who hosted the event and therefore could not compete, but worked hard to make the event a success for 26 teams of 113 students. The robot rules and competition field were similar to those of other IEEE Robotics contests from past years, but with one important difference: the obstacle course included 2" diameter pipes that the robots had to climb over or around to gather the 'soil samples' before returning to home base. This task proved to be more difficult to perform in the 5 minute time limit than anticipated. After the first trial, when none of the robots was able to successfully maneuver the gauntlet and earn enough points to separate the competitors, the effect of sleepless nights and months of preparation began to take its toll on the earnest student engineers. The Metro students hastily called a meeting with all the team leaders, with IEEE National reps also present, and practiced some very cool-headed negotiation skills to successfully negotiate a fair and equitable rules change that allowed more points to be earned in the same allotted time and same robotic field. Disaster and open rebellion were averted! The competition and judging went smoothly after that, and we were all taught or reminded that engineering is so much more than solder guns, microprocessors, and lines of software code. - Jim Harrer



**Left: Denver Volunteers David Goa, Bob Wilson, Ash Webberley and Tom Mickus. Right: A top view diagram of the Robotic 8' x8' "Playing Field" with obstacles for the robots to maneuver around while retrieving 6 'soil samples.'**



## DSST 2013 Senior Projects

What keeps students learning, in spite of the drudgery of certain lessons, and the constant draw of endless distractions? Curiosity. How can we keep students curious? Turn a casual interest into an academically-graded project. Senior Projects drive each student to create, learn, write about and publicly present the results of their efforts.

At DSST (Denver School of Science & Technology), a prize-winning high school, each senior must complete a Senior Project, write a thesis paper (printed with color photographs, documenting each step), and present it to Panelist judges from industry. As an annual [representative](#) Panelist, I have enjoyed both mentoring and judging a wide range of fascinating Senior Projects, from amazingly-bright seniors. For example, during the day, I learned useful things from 8 students, including:

- How to build a bicycle with a frame made from bamboo, epoxy glue, carbon fiber and metal kit parts (Nicholas Bollen),
- How to resurrect an ancient, junkyard Volkswagen beetle (Robert Burke),
- How to construct a chicken coop from wood rescued from old shipping pallets (Hayden Conrad),
- How to improve propulsion from an Estes rocket engine, fastened to a Styrofoam glider (Nhome Asmerome & Dustin Wilcox),
- How to construct a Go-Kart from steel tubing and a lawnmower motor (Jaime Nevarez & Aaron Bonilla),
- How to generate DC power from pedaling a bicycle, while improving fitness (Bryce Jonassen),

- How to saw and join plywood, long wooden sticks and a kit of commercial optics, into an excellent open-frame **portable 8" reflecting telescope** (Cora Schneck).

Each Panelist asked many questions of each student, probing for deep knowledge of his or her project, and encouraging them to expand their knowledge in future projects. As Panelist judges, we recorded our suggestions, and provided further guidance in Rubric format, to be read by each student. Their grades had already been determined, by their teachers and advisors, so even when we judged harshly, the students learned from the experiences of the outside Panelists, without losing any grade points.

Because of the strong academic program, the most remarkable claim to fame at DSST, is that every single graduating senior has been accepted into an accredited college, and each senior is fully prepared to do university-level work, without taking any remedial courses.

After several years of mentoring and judging Senior Projects at DSST, I still gain a lot of by participating each year, and I highly recommend other IEEE members join me. Commitments might be limited to half-day, up to 4 full days in late May, and many more days if you also volunteer to Mentor a student.

- Richard C. Rew, BSEE

***"Somewhere out there something incredible is waiting to be known."*** - Carl Sagan

### IEEE Denver Section

#### Mission Statement

Enrich the professional and personal lives of the Rocky Mountain Region members, developing them into valued contributors to society through quality programs, continuing education, career development and community service; in collaboration with IEEE, industry, government and academia.



The IEEE Denver Section is comprised of over 3600 engineers and technical professionals in the Denver - Boulder area.

<http://www.ieee-denver.org>