http://sites.ieee.org/schenectady

The next Issue of Newsletter will be published in week of 15 December 2014. Article ideas are welcome!

IEEE Schenectady Section welcomes and congratulates new IEEE and section members:
Avinash Kashyap, Cuong Nguyen and Sathish Ramani

State of New York
Public Service Commission – Technical Conference
CASE 14-M-0101- In the Matter of Reforming the Energy Vision

A technical conference will be held on **Thursday, November 6, 2014**, commencing at 9:00 a.m. and concluding at approximately 3:30 p.m. at Eisner & Lubin Auditorium, NYU Kimmel Center, 60 Washington Square South, 4th floor, New York, New York, 10012. The conference will be webcast live on the Commission's website.

9:00 A.M. - 9:15 A.M	Welcoming Remarks by Chair Zibelman
9:15 A.M. – 11:15 P.M.	Panel One: Facilitating the entry of Distributed Energy Resources (DER) by creating an attractive market for DER investments
11:15 A.M. – 11:30 A.M.	BREAK
11:30 A.M. - 1:00 P.M.	Panel Two: What kind of system information is needed to foster a market?
1:00 P.M. - 1:45 P.M.	LUNCH
1:45 P.M. – 3:15 P.M.	Panel Three: Ensuring the availability of customer information needed to foster a vigorous DER market

The details of the conference can be found here.

The Capital District's Celebration of National Engineers Week
February 26-27, 2015 – At the Albany Marriott, 189 Wolf Rd., Albany

Basic information about the event:
- 5 PDHs each day; seminars are from 8:00am-4:00pm
- 70 seminars offered in the two day event covering all disciplines
- Exhibitors & Lunches each day
- High School Bridge Competition
- Future City display
- Capital District Robotics Team
- Order of the Engineer - http://www.order-of-the-engineer.org/

Deadline for Seminar Speaker form: November 7, 2014 (Send as a Word Document NOT a PDF)
Deadline for Seminar Speaker Materials (power point, assessment of learning and speaker bio or resume): December 5, 2014

Visit www.CapitalDistrictEweek.org more information.

Invention to Overcome Constraints
John Hershey

Quite often invention will be required to get around a constraint. A constraint may be physical, cultural, and geographical or anything that blocks a straightforward solution to a problem, and two of the most prevalent constraints in the EE arts are energy and power limitations – especially when you're "workin' on the railroad."

An Energy Limitation

We encounter one significant set of such problems in monitoring transported goods for mistreatment, especially mechanical shocks. The problem is not that we are incapable of building sensors and recorders to do the monitoring but rather there is the nearly ubiquitous problem of powering our robotic detectives. If we were to continually power a shock detector/recorder on, say a railcar that would be out in the field for many months or perhaps even years, we might not be able to equip it with a battery of reasonable size that would last until replaced. So, given a battery of reasonable size, how do we deal with recording the nature and timing of a shock? How to wait until the rail car has hit something before we turn our sensor and recorder on without missing the characteristics at the **beginning** of the shock?

A great answer to this problem is taught in US5585566 "Low-Power Shock Detector for Measuring Intermittent Shock Events." The key to the invention is in the realization that mechanical shock propagates rapidly but at a sonic rather than electrical speed through a mass. The mass, if you will, "remembers" the shock as it passes through the mass. As a kid, you may have tried the experiment of talking with a friend by using two cans and a string. The voice waveform travels along the string. The string is roughly analogous to the mass as the string remembers your voice until it gets to the receiving can.

Let's look at one embodiment of the patented inventive solution. It's very straightforward and beautifully simple.

"The shock detector comprises a mechanical delay line, such as a torsional mechanical delay line or a spring and the like, to supply delayed output motion in response to input motion along a predetermined input motion axis. A transducer … is coupled to the mechanical delay line for converting the delayed output motion to an electrical signal representative of the delayed output motion." [Included is a sensing means to turn on the electronics.]

And it fulfills the motivation to utility presented in the patent's background section:

"… it is desirable to provide an improved shock detector that allows for economical and reliable operation in a power-starved environment. It is also desirable to provide a shock detector that, notwithstanding its relatively low-power consumption over presently available shock detectors, is capable of measuring any shock event in a substantially accurate manner in order to provide to users meaningful information about the shock events."

A Power Limitation

Railroads run through areas where there is no power that is easily gotten for signals, rail continuity measurements, and other functions. Batteries would need care and replacement, solar cells fail from environmental hazards such as bird droppings and outright vandalism, and a generator would need fuel. How to generate power without high recurring costs? The problem is especially frustrating when you consider that there is a train with enormous power traveling over the rails and yet none of that power is available for roadside equipment. Is there any way for transferring some of it?

Think about this the next time you pull up to a grade level crossing and watch the train roll across the track. What do you see? Nine out of ten times you'll see one of the rails on a crosstie move up and down just a little as each car's wheel truck passes over it. What you're witnessing is a very small amount of the train's kinetic energy being turned to heat by depressing that railroad tie. Suppose there were a way to take of some that energy and turn it into stored electricity. Could that be the seed of a solution?

In US Patent 7,148,581, "Rail based electric power generation system," that is exactly what is taught. One embodiment shows a way to use the moving crosstie as an energy "pump." What is claimed is the use of a capacitor attached to the crosstie that has plates that are separable but normally closed. When a railroad car's truck runs over the tie, the capacitor plates are separated and after the truck passes, a spring brings them together again into the closed position. The capacitor is constructed with a very thin, high permittivity dielectric between the plates and is capable of handling a high voltage. Before the truck separates the plates, the capacitor "pump" is "primed" with a small amount of charge that can be generated in a variety of ways such as by a piezoelectric junction that is also compressed by the passage of the truck. After the capacitor has been primed with the small amount of charge, the capacitor is disconnected and the plates are opened when the truck passes over it. As the plates are separated, the capacitance drops dramatically from its value C_C (capacitance in closed position) to C_O (capacitance in open posi-

tion). But because the charge remains constant, this drives the voltage up across the capacitor increasing the electrical energy which may be harvested by a rectifier and storage device.

Mathematically, if q is the charge placed on the capacitor in the closed position then the voltage across the capacitor in the closed position is $V_C = q/C_C$ When the capacitor plates are opened so that the capacitance goes to C_O where $C_O << C_C$, the voltage across the capacitor in the open position is $V_O = V_C(C_C/C_O)$. The energy stored in the capacitor in the closed position is $E_C = \frac{1}{2}C_C V_C{}^2$ and the energy stored in the capacitor in the open position is $E_O = \frac{1}{2}C_O V_O{}^2$ and thus the energy "pumping" action is $E_O = (C_C/C_O)E_C$. And thus the roadside equipment is able to harvest a bit of the energy of the moving train.

* *

John Hershey has a PhD in electrical engineering. He holds 196 US patents. He was elected a Fellow of the IEEE "for contributions to secure communications." He has authored or coauthored 8 technical books. Some of the material for these articles is derived from his book The Eureka Method: How to Think Like an Inventor published by McGraw-Hill. He is not a patent attorney or a patent agent. He does not presume to give legal advice.

In Closing

An inventor loves constraints – they are so very often at the center of the most intense inventive efforts. Overcoming them is fun and the sense of accomplishment is gratifying. Remember, that in order to be accorded a patent, an invention cannot be obvious.

Next Topic

In the next, sixth and final, article we will explore the inventors' responsibility to express themselves clearly. And, for many engineers, this is one of the hardest things for them to do but it is critical to the generation of effective Intellectual Property, especially patents.

IEEE-USA Government Fellowships
NEWS from IEEE-USA
2001 L Street, N.W., Suite 700
Washington, DC 20036-4928

IEEE-USA Government Fellowships Allow U.S. IEEE Members to Help Shape our Nation's Laws & Public Policy

WASHINGTON (19 September 2014) -- Sen. Jay Rockefeller (D-W.Va.) has had a government fellow in his office for 19 straight years to advise him on technology issues that come before Congress. It's a program the retiring senator appreciates.

"We work on science and innovation and all kinds of things, but you have to have somebody who knows what they're talking about," Rockefeller said Thursday after receiving an IEEE-USA Award for Distinguished Public Service. "In this office, in health care, science, technology and innovation, we've had those people, and they make all the difference in the world."

If you're interested in helping to shape our nation's laws and public policy, you should consider an IEEE-USA Government Fellowship. One-year positions are available in Congress, the State Department and the U.S. Agency for International Development.

IEEE-USA fellows enhance the effective use of scientific and technical knowledge in government and help educate the scientific and engineering community on the public policy process.

"It was one of the best years of my life," said Dr. Sherry Gillespie, who worked in former Connecticut Senator Joe Lieberman's office in 2008. "Every scientist and engineer should consider doing a year of service in public policy."

To apply for an IEEE-USA Government Fellowship, U.S. IEEE members must possess a master's degree and five years of relevant professional experience or a Ph.D. The degree requirement can be waived if the applicant has compensating experience. A candidate must be a U.S. citizen prior to selection. A stipend and travel allowance is provided. Applicants are evaluated on:

- Technical competence
- Ability to serve in a public environment
- Basic comprehension & understanding of the public policy process
- Evidence of service to IEEE & the engineering profession

The deadline to apply for a 2015-16 fellowship is 16 January 2015. Appointments run from 1 September to 31 August. IEEE-USA participates under the auspices of the AAAS Science & Technology Policy Fellowships program.

For more information on a fellowship, including a video feature, see http://www.ieeeusa.org/policy/govfel/default.asp.

IEEE-USA serves the public good and promotes the careers and public policy interests of more than 200,000 engineering, computing and technology professionals who are U.S. members of IEEE.

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2015 Nominations for Elected Officers

Call for Volunteers! The Schenectady Section needs your help! By volunteering you will meet great people and help plan professional, educational or social events in the area. These events are reimbursed and bring our IEEE dues back to the local area. Please contact Rebecaa Nold or James Barrett.

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Women in Engineering Affinity Group	Anna Topol, atopol@us.ibm.com	

IEEE Resume Lab

IEEE ResumeLab – has been launched for member use!

ResumeLab allows IEEE members to use customized templates to create resumes/CVs, letters related to the employment process, portfolios of past work, skills profiles, and video resumes. The product also provides members with the ability to conduct mock interviews. Finally, everything created in the product can be shared with colleagues, mentors, potential employers, the public, or social media via publicly-available links. Visit www.ieee.org/resumelab to see information about the product.

IEEE-USA Legislative Update:

The IEEE-USA web site offers timely summaries of legislation that concerns you! Check IEEE-USA's Legislative Action Center (www.ieeeusa.org/policy; look in the upper right).