Madison Section Newsletter

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IEEE Upcoming Meetings

IEEE SE Michigan Section: "Building Effective Security for Distributed Energy Resources"

- Friday, July 23rd 3:00 PM to 5:00 PM Central Time
- Virtual Talk
- Location:

On-Line (Link will be emailed from your registration information)

- Please Register at this event page.
- Co-Sponsored by IEEE-Madison PES/IAS Chapter

Talk: Securing our energy grid is of the highest critical importance, as many recent events have demonstrated. In this session, Mariana Hentea will be introducing to energy professionals, engineers, etc., about the design, implementation, and maintenance of a security program for distributed energy resources (DERs), smart grid, and industrial control systems. Anyone who is involved with DERs and provides security, should be up to date and strive to maintain current understanding of the specific requirements of industrial control systems and real-time constrained applications for power systems. Mariana will touch upon many topics in this regard.

Bio: Mariana Hentea has a Ph.D. in Computer Science, MS in Computer Science, MS in Computer Engineering, B.S. in Electrical Engineering, as well as a CISSP certification by ISC2 .

Mariana has held leadership positions with education institutions, private and government organizations; done Research & Development for projects designing and implementing new technologies and services in telecommunications (ATM broadband services, Voice over IP, broadband services, home networking, residential gateway, phone services, wireless applications, network management), information security assurance, real-time and embedded systems, manufacturing automation, and intelligent process control. She has also participated in curriculum development for undergraduate programs in Computer Science, Information Systems, Information Technology, and Engineering Technology; ABET accreditation; done standards development for ATM broadband services, DSL network management, and Smart Grid.

She has published papers in a broad spectrum of computer software and engineering applications for smart grid, telecommunications, steel, and chemical industries. Conducted research and published chapters and papers in Security (Smart grid, Industrial Control Systems), Networking, Network Management, Quality of Service, Multimedia Systems in Telemedicine, Wireless Applications, Intelligent Systems and Artificial Intelligence techniques (Artificial Neural Networks, Fuzzy Logic, Expert Systems, Data Mining, Intelligent Agents) for different applications in Process Control, Network Management, Information Security Management, Intrusion Detection and Prevention Systems, and Risk Management.
Developed and taught courses for CS, IT, and ET programs in Security and Networking.

She is a member of IEEE P2030 Standard Writing Group for Smart Grid, IEEE Computer Society, IEEE Control Systems Society, IEEE Power & Energy Society, IEEE Standards Association, ISC2, ISSA.d.

Note: This Virtual Meeting Posting is at the request of the IEEE-Madison PES/IAS Joint Chapter.

IEEE-Madison Review of Past Meetings

The IEEE-Madison Section Virtual Meeting on Thursday, May 27th at Noon on "Modular Data Centers and Efficient Water Cooling" was attended virtually by about 55 members and guests. Joe Ryan of Galligan Ryan & Associates showed how BIM is practically leading to rapid deployment of Data Centers using a variety of construction techniques, from pre-designed modular buildings, pre-fabricated components, and even palletized complete systems. Dale Sator discussed ways to increase Data Center Energy Efficiency by using water cooling without refrigeration. He showed three different techniques and discussed the relative efficiencies of the approaches. The session is available at IEEEtv at this LINK.

At the IEEE-Madison PES/IAS May 20, 2021 virtual session, Marina Mondello and Mike Freeman of ComEd presented a technical session and got us up to date on the drivers changing the distribution grid. ComEd and other utilities have traditional design practices that can conflict with higher penetration of newer applications such as Distributed Energy Resources (DER), energy storage, and electric vehicles.

There are many emerging challenges for the grid. For instance, in recent years the grid's resilience has been pushed by a greater number of weather events and physical and cyber terrorism. This last year the COVID-19 pandemic has forced us to create new, process techniques for continued operation and maintenance. The old paradigm of reliability was designing for high-frequency, low-impact events. Today the concept now also requires the concept of resilience which deals with low-frequency, high-impact events. Resilience is the ability to prepare for, withstand, recover from and reduce the magnitude and/or duration of disruptive events. Since 1980, there have been many years with 10 or more billion-dollar disaster events including 1998, 2008, 2011, 2012, and from 2015 to 2020.

Initially Distribution Automation (DA) in ComEd was installed on the 34 kV system as a sub-transmission with sectionalizing switches. Next was the addition of 12 kV automated reclosers in standalone and loop schemes with other feeders. A Voltage Optimization program lowers the maximum voltage possible while still delivering acceptable (above minimum) voltage to the customer with capacitors, regulators and control systems. The advantages is lower losses, and lower customer bills.
The customers' typical solar installations are used to offset the energy consumption, but the size is often twice their typical demand. Higher penetration of solar DER results in higher voltage beyond the desired range at the end of the distribution line. In addition, quick changing cloud cover causes intermittent voltage and current output which results in rapid fluctuations in voltage to customers.

This can be solved with Smart Inverters that can handle at least nine different functional modes of operations

such as: voltage and frequency ride through, reactive power controls, ramp rates, and anti-islanding. ComEd offers $250/kW rebate to large commercial and community solar projects with those functions activated and using the IEEE 1815 and IEEE 2020.5 Communication Protocols. Together the multiple functions support: voltage management, the bulk system, and communication while integrating higher penetration of renewable DERs.

The installation of DER on the distribution system effects the previous DA schemes and they need to be reconsidered by examining the following: load masking, fault identification locations and current flows, ride through settings, anti-islanding, re-configuration/contingency scenarios, and real time adaption of the DA system to respond to all the system conditions.
Utility energy storage can be installed to increase reliability and resiliency of the system. It can defer capacity upgrades by including integration of micro-grids for certain areas or at applications that could benefit with 24X7 availability such as, public safety, hospitals, etc. ComEd's goal is to break feeders into 500 customer blocks so that no more than 500 customers have a local sustained outage. This is being accomplished with a series-parallel network design.
ComEd has made a DER hosting capacity analysis on its feeders available to customers. The graphic mapping indicates how much DER can be accommodated without impacting power quality or reliability under the existing control and infrastructure configurations. A visualization map is available with dynamic scaling from the township scale down to a sixteenth-section and feeder.

ComEd has 14 different projects to demonstrate cutting-edge technologies. The partnerships include: EPRI, NREL, Argonne National Lab, ARPA-e, other utilities, and universities.
The common, core capability is to have an advanced telemetry program to support two-way power flows on the distribution system. The modern grid requires low latency and high bandwidth communication platforms utilizing fiber and newer wireless systems.

Notes for this talk are by **Don Neumeyer.**

IEEE-Madison "Committee Corner"

Don Neumeyer, Secretary-Treasurer for the IEEE-Madison PES/IAS Chapter

I just finished reading the Bill Gates book, "How to Avoid a Climate Disaster." I put a hold on a copy from the Public Library system. I think it is a great book and easy to read. He puts into logical steps the way to get to a zero carbon goal by 2050. In twelve chapters he explains global warming and the five main sources of emissions and how to reduce them and how to adapt to a warming world. The break down of societies emission sources are titled, "How We Make Things, How We Grow Things, How We Get Around, and How We Keep Cool and Stay Warm."

What I found important is which technologies and fuel combinations are the right path for the long run vs. cutting emissions by say 50% by 2030. Those short-term technologies if used in the 2020's would not be cost-effective for the 2050. For instance advanced biofuels and infrastructure are more cost effective for long haul trucks and jets than electrofuels. Diesel today is $2,21/gallon. Advanced Biofuel is $5.50/gal. A Green Premium of 103%. But electrofuel is $9.05/gal equivalent. A premium of 234%. For jet fuel the electric green premium is 296% vs. 141% for advanced biofuels. Basically batteries are not good for long haul trips because of the weight being a self defeating component. He points out that specifications for long term reliability of concrete developed earlier call for certain mix formulas which exclude current technologies capabilities. Another concept is the use of heat pumps (ground or air) for heating and cooling of buildings. The type and climate can inform one of which technology is best for building types.

It also points out one of my favorite concepts of how public policy needs to be integrated by working with technology, policy, and markets at the same time! It is a challenge, but not impossible. It takes a comprehensive strategy to drive the various components of our daily lives, move in the right direction in our purchases.

Tom Kaminski, IEEE-Madison Newsletter Editor

This past year has been a surreal experience with Covid-19 restrictions, but I feel more positive about the future. I just returned from a short camping trip to Door County Peninsula State Park sand it seems that Door County is now open for business again. Now that my family is fully vaccinated (except for the under-aged grand kids), hugs are back in style and family gatherings are welcomed events.

From January through March, I read almost all of the Sci-Fi books written by Charles Stross on a recommendation by Paul Krugman, Nobel Prize winning economist. Two series "The Merchant Princes" and "The Laundary" explore worlds that are a quantum effect "parallel" to our world. In the "Princes" series, members of a clan can travel between the worlds to North America as a feudal society, the current US, or a pre-revolutinary war British Empire roughly in the 1890s. In the Laundry" series, magic is simply high-level mathematics, where invocation of computation pokes holes into other parallel worlds. An MI5/CIA like organization exists to make sure that "demons" from these parallel worlds do not invade us. So, is this really far fetched?

The idea of parallel quantum worlds is one strange consequence of quantum physics, as is the evolving technology called "quantum computing". It has also been postulated that the quantum "vacuum" has a huge amount of energy -- sometimes referred to as "Zero Point Energy (ZPE)". Does this ZPE exist? Is it real? I am

beginning to feel that there is a rational basis for it and that there are now several companies with products that tap into this energy source. One, Global Energy Corporation, is a spin-off of the Naval SPAWAR center and is delivering a compact hybrid fusion/fission reactor to NASA. A second, Brilliant Light Power (founded by Randal Mills) claims to have developed a "plasma-based primary source of massive power from the conversion of hydrogen atoms of water molecules to dark matter, the previously unidentified matter that makes up most of the mass of the universe". A third company, Leonardo Corporation, founded by inventor Andrea Rossi, claims to have a plasma-based heat and electricity source under testing and also a light source capable of over 2500 lumens per watt of input electrical power, a factor of 8 time more efficient than the best current LED. A fourth company, Aureon Energy through the "Saffire Project" has been developing plasma-based apparatus that they will commercialize into three key markets: clean energy production, heating, and remediation of nuclear waste.

Are any of these companies' products real? If so, hold on to your hats because it will give our industry one heck of a ride!

Charles Cowie, IEEE-Madison LMAG Vice Chair

The Wisconsin Science Museum https://wiscimuseum.org/ is now open every Saturday from 10 am to 4 pm. Summer-camp group visits can be arranged for Monday through Friday. Some basic electricity and magnetism exhibits, interactive activities and demonstrations have been set up and more are planned. Versions of these activities and a virtual museum tour have been posted on the museum's YouTube channel here. Once members are willing to meet in person, I would like at least one LMAG event per year to be hosted by the Wisconsin Science Museums and held in the Village 0n Park community room. (See this link) The museum has free use of this room for 8 hours per month. I believe that would apply to IEEE meetings hosted by the museum. The Space Place has also been quite generous in providing the use of their space for IEEE events.

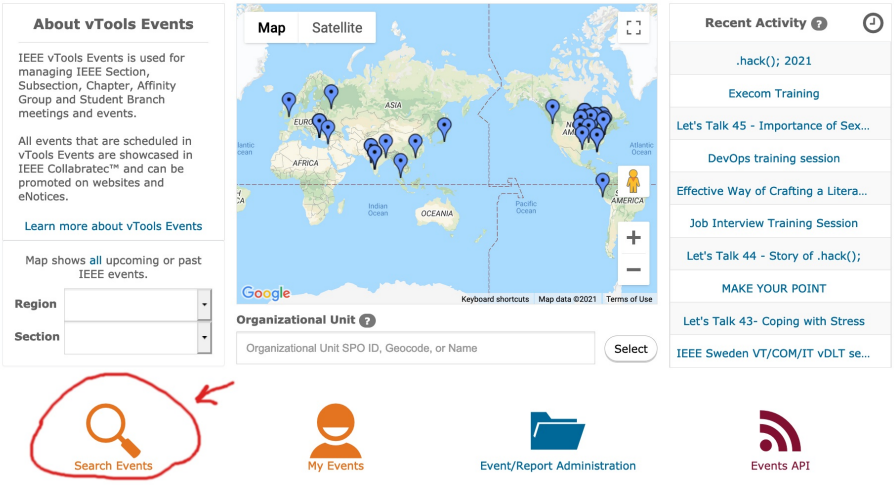
Searching for IEEE Meetings

Since the covid-19 restrictions shut down in-person meetings, there have been an increasing number of virtual meetings. It is very likely that they will continue to be held even after all restrictions for in person meetings have lifted. As an IEEE member, you can make use of the "Events" search tools to find virtual meetings of you choice from anywhere in the world.

To search for meetings you might like to attend, click on this link:

https://events.vtools.ieee.org/

Once there, click on the "Search" Icon:



You can literally find events from all over the world that you can attend. For more information on how to search, IEEE has developed this short video tutorial:

Vtools Events Search Tutorial Link

News/Announcements

- **Volunteers:** Consider giving some time to the IEEE Madison community by volunteering. We need volunteers for: YP, ECN, LMAG, PES/IAS, Section Officers, and EMB. In particular we need a volunteer for **Section Vice Chair, Section Secretary** and **Student Activities Chair**. We also are looking for volunteers to start a Madison Section Women in Engineering Affinity Group.
- Mike Stemper has resigned as Vice Chair and interim Secretary for the Madison Section. He remains PES/IAS Chair.

IEEE-Madison Slack Channel Established and Open to IEEE Members

- **What is Slack?**: Slack is a messaging application that works on most modern computing platforms, including cell phones. Many organizations use slack to quickly connect with people and conduct business. You can share files and create sub-channels for discussion. IEEE-Madison is using the free version of slack that has limited features.
- **Executive Committee Presence:** Members of the IEEE-Madison Executive Committee have joined a Slack Channel and will be available to discuss issues you might bring up.
- **For more:** See this YouTube Video on Slack.
  Also see this site: What is Slack?
- **Get an Invitation to Join the IEEE-Madison Slack Channel:** at Slack Channel.
- **Access it here:** IEEE Madison Slack Channel

IEEE Madison Leadership

- Section Chair – Hugh Schmidt
- Section Vice Chair – <open>
- Section Treasurer – Matt Nowick
- Section Secretary – <open>
- Webmaster – Nate Toth
- PES/IAS Chair – Mike Stemper
- PES/IAS Vice Chair – Dan Ludois
- PES/IAS Secretary/Treasurer- Don Neumeyer
- EMB Chapter Chair – Dennis Bahr
- Life Member Affinity Group Chair – San Rotter
- Life Member Affinity Group Vice Chair – Charles Cowie
- ECN Chair – Matt Nowick
- Young Professionals Chair – Thomas Murphy
- Members at Large: Nate Toth, Clark Johnson, Craig Heilman, Dennis Bahr

Membership Upgrades

Those interested in upgrading their IEEE membership level should be aware that the process has been streamlined with much of it on-line. The application process can start with your application as described on line here. You will have to provide the names and IEEE numbers for three Senior Members in your field. The Madison Section Chair (Hugh Schmidt, hfschmidt@wisc.edu) can help, or attend the informal networking portion of the monthly Section meetings to meet the Section Board members and discuss your intention to elevate.

About IEEE

The Institute of Electrical and Electronics Engineers or IEEE (read Eye-Triple-E) is an international non-profit, professional organization dedicated to advancing technology innovation and excellence for the betterment of humanity. IEEE and its members inspire a global community through IEEE's highly cited publications, conferences, technology standards, and professional and educational activities. It has the most members of any technical professional organization in the world, with more than 300,000 members in around 150 countries. The IEEE consists of 38 societies, organized around specialized technical fields, with more than 300 local organizations that hold regular meetings. Discover what IEEE Member Discounts can offer you. The Member Discounts portfolio consists of insurance products and programs for the home, office and travel, all at excellent group rates and reduced pricing. Visit IEEE Member Discounts to see what's available in your location and enjoy the savings. For more information, please visit: IEEE.ORG.

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