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Sections Congress 2014

Engineering Advocacy





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If there is one concept universal to all engineering projects, it would have to be that of priorities. Energy, speed, weight, cost, reliability — all these and many more jockey for position in the designer's mind.

Sometimes priorities are obvious. "Make hay while the sun shines" was a poor draw for early hominid debating societies, we infer. At the broad societal level in the 21st century, not only do we vigourously debate priorities of our government and institutions, but we expend considerable energy establishing how those priorities should be decided, i.e., constitutions.

We take a leisurely stroll through this wide panorama of priorities in this issue. The Smart or Smarter Grid can be viewed as an energy transport system that constantly assesses and responds to changing priorities. No small subject matter, we present in two parts our examination from a uniquely Canadian perspective a host of trends and technologies of this most vital component of our infrastructure.

Our own IEEE governance at the geographic level affords opportunities for every member to participate in formulating priorities through the triennial Sections Congress, mounted again this August in Amsterdam. Through the voices of participants from previous Congresses, we get the inside story of how recommendations are generated and ranked at the Section level, with some advancing for debate and prioritizing by Congress delegates from the roughly 330 sections world wide.

Last summer's devastating floods in Alberta are the jumping off point of an opinion piece by contributing editor Terry Malkinson. Who shapes the priorities around land use policies and infrastructure design? Not engineers, says Terry. A companion piece from Elmer Bourque directs our gaze to the reliability focus of Roman-era engineers, many of whose structures endure today.

The priorities of the researchers and engineers whose achievements we celebrate through the IEEE's Milestone program must have been well chosen; you can board the bus any time in this issue with the Life Members who participated in last August's IEEE Canada's Technical Tour of Central and Eastern Canada.

There's lots more good reading inside these covers. So we do hope you will — dare we say — make it a priority to sit down, put your feet up, and enjoy. ■

S'il existe un concept universel qui s'applique à tous les projets en ingénierie, c'est bien celui des priorités. Énergie, rapidité, poids, coût, fiabilité, chacun de ces éléments – et combien d'autres – sont en lutte pour une première place dans l'esprit du concepteur.

Parfois, les priorités sont évidentes. Par exemple, pour nos ancêtres qui faisaient l'expérience de l'agriculture, le cycle des saisons et les conditions météo de chaque jour leur dictaient les priorités des activités des petits groupes dans lesquels ils vivaient. Les temps ont changé et, dans la société du XXIe siècle, non seulement débattons-nous maintenant des priorités de nos gouvernements et de nos institutions, mais nous dépensons également une énergie considérable à établir la manière dont elles doivent être décidées, p. ex. les constitutions.

Dans ce numéro, nous nous attardons à vous présenter ce vaste tableau que sont les priorités. Le réseau électrique intelligent ou plus intelligent peut être considéré comment étant un système de transport d'énergie qui évalue sans cesse les priorités changeantes et qui s'y adapte. Sujet d'envergure, nous présentons en deux parties notre examen, d'un point de vue exclusivement canadien, sur un ensemble de tendances et de technologies de cette composante on ne peut plus vitale de notre infrastructure.

Notre propre gouvernance à l'IEEE offre géographiquement des occasions à chaque membre de contribuer à la formulation de priorités, grâce au Congrès triennal des sections qui se tiendra à Amsterdam, en août prochain. Des participants aux congrès antérieurs nous offrent de jeter un regard sur la manière dont les recommandations sont formulées et classées dans les sections, en plus d'un avant-goût des discussions et des priorités des délégués des quelque 330 sections dans le monde.

Les inondations dévastatrices en Alberta de l'été dernier sont à la base de l'article d'opinion de Terry Malkinson. Qui formule les priorités concernant les politiques d'utilisation des terres et de conception des infrastructures? «Pas les ingénieurs», dit Terry.

Un article complémentaire d'Elmer Bourque attire notre attention sur la fiabilité des ingénieurs de l'Empire romain, dont nombre de structures existent encore aujourd'hui.

Les priorités des chercheurs et des ingénieurs qui ont été déterminantes pour les réalisations techniques reconnues par le programme Milestone de l'IEEE doivent avoir bien été choisies. Dans ce numéro, vous pourrez grimper à bord à tout moment aux côtés des membres à vie qui ont pris part, en août dernier, à la tournée technique de l'IEEE dans le centre et l'est du Canada.

À l'intérieur de ce numéro, vous découvrirez bien d'autres excellents articles. Alors, nous espérons que vous vous fixerez comme – nous osons le dire – priorité de vous installer bien confortablement et de prendre plaisir à le lire. ■

Contents / matières

News / Nouvelles
President's Report / Rapport du président 4
Outgoing Past President's Farewell / L'adieu du président sortant ... 5
A View from the West / Nouvelles de l'ouest 7
Canadian Newslog/Coupures de presse canadienne 10

Community News / Nouvelles de la communauté
IEEE Sections Congress 2014 8
IEEE Canada members receive MGA Awards 6

IEEE Life Member Tour 2013 12

Data Mining / Forage de données
Sentiment Analysis *by Yasser Morgan* and *Abdul Bais* 32

Facility Review / Facilité avis
Green Mountain: new life for an old site *by Jon Rokne* 34

Opinion / Point de vue
Engineering Advocacy *by Terrance Malkinson* 36
Engineering Goals *by Elmer Bourque* 36

Experiential Learning / Apprentissage par l'expérience
Legend of the Oil Plug *by Elmer Bourque* 37

Engineering Management / Gestion du génie
What's New in the Literature? *by Terrance Malkinson* 40

Conferences / Conférences
IHTC 2014 38
Conferences: IEEE & Collaboration • Canada • 2014/2015 41
IEEE EPEC/CEE 2014 42



18 Paradigm Shift in the Transition from a Centralized grid to a Decentralized Grid BY **HASSAN FARHANGI**

20 Adaptive Energy Ecosystems – Improved Operability, Efficiency and Economics for Electricity and Gas Infrastructure BY **MICHAEL FOWLER**

26 LTE for Smart Grid Communication The Canadian Outlook BY **BASILE L. AGBA, SYLVAIN RIENDEAU, MERAL SHIRAZIPOUR, SURESH KRISHNAN, ANTONIO ARANIBAR** AND **DENIS MONETTE**

30 SMART Power Flow Controller BY **KALYAN K. SEN**



Amir Aghdam, Ph.D., P.Eng., FEIC, SMIEEE
2014-2015 IEEE Canada President and Region 7 Director

Every two years the leadership of IEEE Canada changes, passing the torch from one team of volunteers to the next. As many of you already know, Keith Brown has passed on the presidency to me after a highly productive tenure. Under his leadership, we experienced two years of successful activities and continued growth, as he noted in his final column. For the next two years, we will retain his invaluable expertise as he serves as the Past President. Om Malik, meanwhile, is wrapping up his six years of service as President Elect (2008-2009), President (2010-2011) and Past President (2012-2013). During those six years, in every capacity, he made major contributions to IEEE Canada, and he leaves the leadership team knowing that we will reach out to him, from time to time, for his sage advice on various issues. I have "warned" him to expect this, and he has kindly indicated his consent! This is the price you pay when you make a good reputation for yourself in this organization! On behalf of the IEEE Canada, I'd like to say a big "thank you" to Keith and to Om for all their contributions.

I would also like to take this opportunity to welcome on board Witold Kinsner as the President Elect. Witold has been participating in various discussions and activities of IEEE Canada, including on the ad hoc committee examining the structure of IEEE Canada Conferences, and Member Geographic Activities (MGA) meetings. Witold's enthusiasm, which I've personally witnessed, leaves me in no doubt that he will gain all the required experience for leading this organization at the highest level. For now, my only advice to Witold is to be prepared for the next two years as President Elect to pass very quickly! I'd also like to report there have been a number of other changes in the IEEE Canada Board, including some new Section Chairs and Activity Chairs, including the new Publications and Communications Chair, Branislav Djokic, who will be replacing Hilmi Turanli after three years of great service. My sincere thanks to those Board Members who have completed their terms, and welcome to the new Members.

We have already had a busy start to the year. An ad hoc committee, led by Wahab Almuhtadi, is working on improving the structure of IEEE Canada conferences. Another ad hoc committee, led by Raman Paranjape, newly appointed IEEE Canada Secretary, is working on improving the collaboration between IEEE Canada and major government organizations. These committees, appointed by me last November, have held important conference calls in order to explore possible ways to further improve our status as a professional organization.

The preparations for the Canadian Conference on Electrical and Computer Engineering (CCECE) in Toronto and the Electrical Power and Energy Conference (EPEC) in Calgary are underway. As every year, the CCECE is held immediately after the IEEE Canada Spring Board Meeting, and hosts the Awards Ceremony of IEEE Canada. EPEC runs this year in mid-November in Calgary. In addition to these two annual conferences, we are also hosting the new International Humanitarian Technology Conference this June, in Montreal, and are co-sponsoring the second IEEE International Conference on Wireless for Space and Extreme Environments, which will be held October 2014 in Noordwijk, the Netherlands.

It's also my distinct pleasure to use this column to extend my congratulations to all IEEE Canada Major Awards Program recipients, whose names were posted in the IEEE Canada March newsletter, as well as to the two MGA award recipients from Region 7 – profiled in this issue.

I would like to conclude my first column by thanking all those volunteers whose hard work throughout the years has distinguished IEEE Canada from many other national and international professional organizations. I am in a unique position to observe the dedication of these volunteers first hand – the very same volunteers that Om very appropriately refers to in his farewell message as "a pool of talent, knowledge, enthusiasm and willingness." It is this spirit of volunteerism that makes us all so proud of our IEEE Canada membership. ■

Tous les deux ans, les membres du leadership de l'IEEE cèdent leur place pour passer le flambeau à une autre équipe de bénévoles. Comme plusieurs d'entre vous le savent déjà, Keith Brown m'a cédé la présidence après avoir accompli un mandat où il a été extrêmement productif. Ces deux années sous sa gouverne ont été marquées par des activités réussies et par un taux de croissance constant, comme il en a d'ailleurs fait état lors de son dernier rapport à titre de président. Au cours de deux prochaines années, nous allons continuer de bénéficier de sa précieuse expérience, car il continue de siéger au conseil à titre de président sortant. Pour sa part, Om Malik conclut six années de service au sein du conseil, d'abord à titre de président désigné (2008-2009), puis de président (2010-2011) et, enfin, de président sortant (2012-2013). Pendant cette période, il a grandement contribué à l'IEEE Canada, à tous les égards. Il quitte notre équipe en sachant qu'à l'occasion nous nous tournerons vers lui pour ses judicieux conseils sur une foule de questions. Je l'ai « prévenu » de s'y attendre et, d'emblée, il y a consenti! Voilà le prix à payer quand vous vous taillez une bonne réputation dans cette organisation! Au nom de l'IEEE Canada, je dis un sincère « merci » à Keith et à Om pour l'ensemble de leurs réalisations.

J'aimerais saisir cette occasion pour souhaiter la bienvenue parmi nous à Witold Kinser, le nouveau président désigné. Witold a participé à de nombreuses discussions et activités de l'IEEE Canada, notamment à titre de membre du comité spécial chargé d'examiner la structure de nos conférences ainsi qu'aux réunions du Member and Geogaphic Activities Board (MGA). Son enthousiasme, dont j'ai été témoin personnellement, ne laisse aucun doute sur le fait qu'il saura acquérir tout ce qu'il faut pour amener notre organisation au sommet. Pour le moment, le seul conseil que je veux lui donner, c'est de se préparer pendant les deux prochaines années à titre de président désigné, car elles passent très vite! J'aimerais également souligner certains autres changements qui sont survenus au conseil d'administration, notamment l'arrivée de quelques nouveaux présidents de section et d'activités. Parmi eux, Branislav Djokic, le nouveau président des communications et publications, remplacera Hilmi Turanli, qui cède sa place après trois années de précieux services. Je remercie tous les membres sortants du conseil et je souhaite la bienvenue aux nouveaux.

Nous avons entamé une autre année qui bouillonne déjà d'activités. Un comité spécial, dirigé par Wahab Almuhtadi, travaille à améliorer la structure des conférences de l'IEEE Canada. Un autre comité spécial, dirigé par Raman Paranjape, nouveau secrétaire de l'IEEE Canada, se consacre à renforcer la collaboration entre notre organisation et de grands organismes gouvernementaux. Ces comités, que j'ai formés en novembre dernier, ont tenu d'importantes téléconférences dans le but d'explorer d'autres possibilités d'améliorer notre position d'organisation professionnelle.

Les préparatifs pour la Conférence canadienne sur le génie informatique et électrique (CCGÉI), à Toronto, et la Conférence sur l'énergie électrique (CEE), à Calgary, vont bon train. Comme c'est le cas chaque année, la CCGÉI a lieu après la réunion du conseil d'administration de l'IEEE du printemps et est l'hôte de la cérémonie de remise des prix de l'IEEE Canada. La CEE se tiendra cette année à la mi-novembre. En plus de ces deux conférences annuelles, nous allons également être l'hôte de la nouvelle Conférence internationale de la technologie humanitaire d'IEEE Canada, en juin prochain, à Montréal et coparrainer la deuxième Conference on Wireless for Space and Extreme Environments, qui se tiendra en octobre prochain, à Noordwijk, aux Pays-Bas.

J'ai également l'immense plaisir de saisir cette occasion pour féliciter tous les lauréats des prix majeurs de l'IEEE Canada, dont les noms figurent dans le bulletin de mars, ainsi que les deux lauréats du prix MGA de la Région 7, qui font l'objet d'un article dans ce numéro.

J'aimerais terminer cette première communication en remerciant tous les bénévoles qui, grâce à leur travail acharné année après année, ont permis à l'IEEE Canada de se démarquer de nombreuses autres organisations professionnelles à l'échelle nationale et internationale. Je suis aux premières loges pour observer leur engagement, ceux-là mêmes que Om définit on ne peut plus adéquatement dans son message d'adieu comme étant « [un bassin] de talent, de connaissances, d'enthousiasme et de volonté ». Un tel esprit de volontariat, c'est ce qui nous rend tous fiers d'être membres de l'IEEE Canada. ■



Om Malik
P.Eng., LFIEEE, FCAC, CEIC, FEIT, FEIC
2012-2013
IEEE Canada Past President

IEEE Canada's
Future in Competent Hands

Unlike the US that encompasses IEEE geographic Regions 1 through 6 and Regions 8 through 10, each of which includes many countries, the geographic boundary of Region 7, IEEE Canada, except for a small anomaly in Ontario, coincides with that of a single country, Canada. This places us in a unique position among the ten geographic Regions of IEEE. In addition to being an integral part of IEEE Inc., IEEE Canada is also a constituent member of the Engineering Institute of Canada (EIC), a federation of eleven Canadian engineering associations/societies of various disciplines.

Having been involved as an IEEE volunteer at all levels starting from the Section level since 1971, including 35 years at the Region executive level, it was an honour to have had the opportunity to serve at the pinnacle of this vibrant volunteer organization that oversees the affairs of IEEE Members resident in Canada.

During my two years as President, IEEE Canada, I had the pleasure of associating with numerous volunteers from all parts of this vast country and observe closely the inner workings of the organization. What impressed me greatly was the enthusiasm and commitment with which every volunteer carried out the duties entrusted to her/him. An individual alone can achieve just so much. It is the combined efforts that bear fruit and I was lucky to have had the pleasure of working with a large number of dedicated IEEE Member volunteers during my term. I would like to take this opportunity to first thank all those volunteers for their help and devotion that allowed me to sail through my commitments so smoothly. Volunteers can and do draw on the knowledge and experience of the able IEEE Canada Administrator, Cathie Lowell, who provides a well needed continuity. It was always reassuring to draw on her accumulated knowledge at any time of doubt. Thanks Cathie, for your help and advice.

IEEE Canada is strong and dynamic, thanks to its steadfast and devoted membership that, unlike a fair weather friend, is steady with a gradual positive increase even when some other IEEE Regions showed a decline in total membership.

With a total membership at about 4% of total IEEE membership, IEEE Canada has the second smallest number of members out of the 10 Regions. Despite this relatively small number, thanks to the efforts of the volunteers, IEEE Canada offers tremendous service and a very strong program to its Members that are often an envy of other Regions. The publications program within IEEE Canada, with an archival journal, one general interest technical magazine for all members within IEEE Canada and a monthly e-Newsletter, is among the strongest, if not the strongest, in the ten Regions. These publications are supplemented by a strong bilingual support and a fully bilingual website.

IEEE Canada also holds two annual conferences, one of which has been running for over 25 years. These conferences are in addition to a large number of other IEEE conferences that are held in various parts of Canada, thanks to the caliber and devotion of our Members and volunteers.

Another unique supplementary activity associated with IEEE Canada is the IEEE Canadian Foundation that offers a strong program to support the IEEE Student Branches in the Universities and Community Colleges in Canada, the IEEE

L'avenir de l'IEEE Canada
en mains compétentes

Contrairement aux États-Unis qui se répartissent dans les régions géographiques 1 à 6 et 8 à 10, aux côtés de plusieurs autres pays, les frontières géographiques de la région 7, l'IEEE Canada, correspondent, à part une exception en Ontario, à celles d'un seul pays, le Canada. Cette caractéristique nous place dans une position unique parmi les dix régions géographiques de l'IEEE. En plus de faire partie de l'IEEE inc., l'IEEE Canada est membre de l'Institut canadien des ingénieurs (ICI), une fédération de onze associations canadiennes d'ingénieurs et sociétés de diverses disciplines.

Ayant œuvré bénévolement à tous les niveaux de l'IEEE, d'abord à l'échelle locale comme responsable de section à partir de 1971, puis pendant 35 ans comme cadre régional, j'ai eu l'honneur de servir au plus haut niveau cette organisation de bénévoles particulièrement dynamique dont la mission est de veiller aux affaires des membres de l'IEEE qui résident au Canada.

Durant mes deux années à la présidence de l'IEEE Canada, j'ai eu le plaisir de m'associer à de nombreux bénévoles de toutes les régions de ce vaste pays et d'observer de près les rouages internes de l'organisation. J'ai été très impressionné par l'enthousiasme et l'engagement avec lesquels chaque bénévole s'acquittait des tâches qui lui avaient été confiées. C'est fou ce qu'une personne motivée peut accomplir! Il reste que c'est la combinaison des efforts qui porte le plus de fruits, et j'ai eu la chance d'avoir eu le plaisir de travailler avec un grand nombre de bénévoles dévoués membres de l'IEEE durant mon mandat. J'aimerais profiter de l'occasion pour remercier tous ces bénévoles pour leur aide et leur dévouement, grâce auxquels j'ai pu si agréablement remplir mes engagements. L'IEEE Canada dispose d'une administratrice compétente, Cathie Lowell, aux connaissances et à l'expérience inspirantes pour nos bénévoles. En plus d'assurer une nécessaire continuité à l'organisation, Cathie m'a toujours épaulé et bien outillé dans mes périodes de doute. Merci Cathie pour ton aide et des conseils.

L'IEEE Canada est forte et dynamique, grâce à la constance et au dévouement de ses membres qui, contrairement à ces amis des bons jours, sont devenus graduellement plus nombreux, même lorsque d'autres régions de l'IEEE tiraient de l'arrière dans leur nombre total de membres.

Avec 4 % du nombre total de membres de l'IEEE, l'IEEE Canada arrive deuxième dans le plus petit nombre de membres parmi les dix régions. Malgré ce nombre relativement petit, grâce à l'effort des bénévoles, l'IEEE Canada assure un service remarquable et offre un programme solide à ses membres, faisant souvent l'envie d'autres régions. Le programme de publications de l'IEEE Canada, avec son journal d'archives, son magazine technique d'intérêt général destiné à tous les membres de l'IEEE Canada et son bulletin électronique mensuel, figure parmi les plus solides, s'il n'est pas le plus solide des programmes des dix régions. Outre ces publications profitant de solides appuis bilingues, l'IEEE Canada compte un site Web entièrement bilingue.

L'IEEE Canada organise également deux conférences annuelles, dans un des cas depuis plus de 25 ans. Elles s'ajoutent à de nombreuses autres conférences tenues à travers le Canada, grâce à l'expertise et au dévouement de nos membres et bénévoles.

Autre volet remarquable de l'IEEE Canada, la Fondation canadienne de l'IEEE compte un solide programme d'aide aux branches étudiantes de l'organisation dans les universités et les collèges communautaires du Canada. Elle administre le Programme de prix de l'IEEE Canada, de même

Canada Awards program and some general grants. It is always a matter of pride to note the achievements of the winners of the IEEE Canada Awards.

One other point that must be mentioned is the bridge that IEEE Canada provides between IEEE and EIC. It allows us to make our mark not only within the international community as a part of IEEE but also at the national level through EIC.

Based on my observations and experience I can say that there is a pool of talent, knowledge, enthusiasm and willingness available among volunteers within IEEE Canada from which to draw its future leaders. The culture in IEEE Canada is to encourage volunteers to gradually take on more challenging roles. As their leadership skills develop they start moving towards more senior leadership positions. As they rise from the ranks, they remain in touch with and well aware of the thinking of the membership they serve. I am confident that with such a pool of volunteers from which to draw its future leaders, IEEE Canada will gather strength and continue to provide commendable service to its members. As time advances, it becomes necessary to change and there is willingness among its leadership to change with times and circumstances. ■

qu'elle accorde des bourses et des subventions générales. C'est toujours une grande fierté de souligner les réalisations des récipiendaires des prix de l'IEEE Canada.

Il faut souligner également le rôle de liaison que remplit l'IEEE Canada entre l'IEEE et l'ICI. Ce rôle permet de nous démarquer non seulement au sein de la communauté internationale, comme membres de l'IEEE, mais aussi à l'échelle nationale à travers l'ICI.

À la lumière de mes observations et de mon expérience, je puis dire que les membres de l'IEEE Canada regorgent de talent, de connaissances, d'enthousiasme et de volonté, constituant ainsi un riche bassin dont émergeront les prochains dirigeants de l'organisation. Il fait partie de la culture de l'IEEE Canada d'encourager ses bénévoles à relever graduellement de plus grands défis. Au fur et à mesure qu'ils développent leurs compétences en leadership, leurs responsabilités s'accroissent. Tout en gravissant les échelons, ils demeurent en contact avec les membres et bien au fait de leurs opinions. J'ai confiance qu'avec un tel bassin de bénévoles où elle puisera ses prochains dirigeants, l'IEEE Canada se renforcera et continuera de servir admirablement ses membres. Les temps et les circonstances changent, et la direction de l'IEEE Canada a elle aussi la volonté de changer pour répondre aux nécessités actuelles. ■

Two IEEE Canada members honoured with MGA Awards

Two members of IEEE Region 7 have been honoured with prestigious Member and Geographic Activities (MGA) Awards for 2013. The MGA Awards program recognizes excellence in regions, councils, areas, sections, chapters and student branches.

Maike Luiken is a familiar name to many in Region 7 — and in the IEEE as a whole. Luiken received an MGA Achievement Award for "outstanding and dedicated service to IEEE, employing innovative and effective ideas to increase member engagement across academia, industry and government."

Luiken has been involved with the IEEE for 17 years in various capacities; under her Chairship, Ottawa won Outstanding Large Section in 2005, and London won Outstanding Small Section in 2009 and 2011.

She has racked up a number of awards, including a Service Medal for activities in Central Canada. She is an associate editor for the IEEE Canadian Review and is an active conference organizer (she will chair the National Conference on Electrical Power in 2015). Currently she heads all activities for all IEEE Student branches in Canada.

Luiken is thankful for the nomination and says she couldn't have done it without the support of other volunteers. "I'm really thankful for everything that I've learned as an IEEE volunteer that I could also leverage in my professional career — it's a mutual affair," she says.

Mario Milicevic, a PhD student at the University of Toronto, has received an MGA GOLD Achievement Award for "significant contribution to IEEE Student Transition and Elevation Partnership (STEP), MGA and IEEE Toronto Section young professional activities."



Maike Luiken (London S.) received a 2013 MGA Achievement Award.



Mario Milicevic (Toronto S.) received a 2013 MGA GOLD Achievement Award.

Milicevic first became involved with the IEEE as a 2nd-year grad student in 2011, soon after becoming chair for the Toronto Young Professionals Affinity Group, and then a liaison between the global Students Activities Committee and global Young Professionals Committee. He has since been promoted to vice-chair of the latter.

Through these roles, Milicevic has spearheaded unique workshops, panels and networking mixers, helping to dramatically raise IEEE's profile in Toronto among young professionals. No surprise, the group recently received the first annual Best Canadian Young Professionals Affinity Group Award.

In Toronto, for example, Milicevic helped to organize a seminar with local bio-tech start-ups, as well as a career panel for engineers in non-engineering fields. "I want to expose our members to non-traditional opportunities in engineering," he says. "I'm trying to get away from an inward-thinking paradigm and think more outward." ■

Deux membres d'IEEE Canada récompensés aux Prix du CAGM

Deux membres de la région 7 de l'IEEE ont été honorés lors de l'édition 2013 des prestigieux Prix du comité des activités géographiques et pour les membres (CAGM), qui reconnaissent l'excellence dans les différentes unités géographiques.

Maike Luiken (section de London) a reçu un prix d'excellence du CAGM 2013.

Déjà connue de plusieurs membres de la région 7 et de l'ensemble de l'IEEE, Maike Luiken a reçu le Prix d'excellence du CAGM pour son service exemplaire et « son utilisation de techniques novatrices et efficaces pour impulser l'engagement des membres de l'IEEE dans les sphères universitaires, industrielles et gouvernementales. »

Mario Milicevic (section de Toronto) a reçu un prix d'excellence OR du CAGM 2013.

Luiken a joué plusieurs rôles à l'IEEE depuis 17 ans : sous sa direction, la section d'Ottawa a remporté le Prix de la Grande section exemplaire 2005 et celle de London, les Prix de la Petite section exemplaire 2009 et 2011.

Luiken s'est vu décerner plusieurs prix au fil des ans, notamment une médaille de service pour ses activités dans la région du Centre du Canada. Elle agit comme rédactrice en chef adjointe de la revue canadienne de l'IEEE, en plus d'organiser plusieurs conférences (elle présidera d'ailleurs la National Conference on Electrical Power en 2015) et de gérer les activités des branches étudiantes canadiennes de l'IEEE.

Luiken est très reconnaissante pour cette nomination et pour le soutien essentiel des autres bénévoles : « être bénévole à l'IEEE m'a appris beaucoup de choses que j'utilise aujourd'hui dans mon travail. Tout le monde y gagne. »

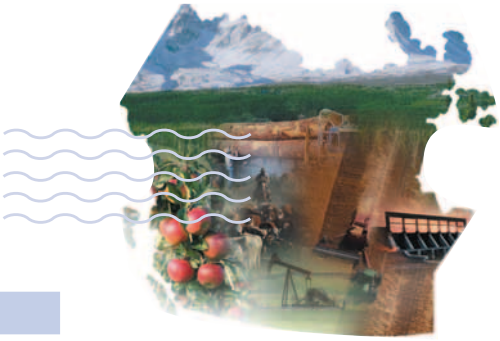
Mario Milicevic, doctorant à l'Université de Toronto, a quant à lui reçu un Prix d'excellence OR du CAGM pour son « importante contribution au programme STEP, au CAGM et aux activités des jeunes professionnels de la section de Toronto. »

C'est en 2011, peu après avoir été nommé président du Toronto Young Professionals Affinity Group, que Milicevic, alors étudiant de deuxième année à la maîtrise, s'est pour la première fois engagé auprès de l'IEEE en assurant la liaison entre le comité global des affaires étudiantes et le comité des jeunes professionnels, dont il est plus tard devenu vice-président.

Ce rôle a permis à Mario Milicevic d'organiser une grande variété d'ateliers, de conférences et d'activités de réseautage qui ont grandement contribué à faire connaître l'IEEE auprès des jeunes professionnels de Toronto, comme un séminaire réunissant des entreprises de biotechnologie en démarrage et une journée carrière s'adressant aux ingénieurs souhaitant œuvrer dans un champ connexe. Nul ne s'étonnera que, sous sa gouverne, le groupe ait été le premier récipiendaire d'un prix remis annuellement au meilleur groupe d'affinité de jeunes professionnels au Canada.

Milicevic affirme souhaiter « présenter à nos membres certaines possibilités inusitées en ingénierie » et « essayer d'ouvrir les horizons de la profession. » ■

A View from the West



By **Terrance Malkinson**

Surveillance security cameras are now commonplace for the deterrence of crime and facilitating our well-being. Matthew McClaren discusses the young and fast growing Vancouver headquartered company Avigilon [www.avigilon.com]; a global leader in digital security cameras and associated technology. ["They Like to Watch". Canadian Business. 86(19):55-59. November 25, 2013]. Information on the growth of the company, its innovations, applications, full-service customer approach, and discussions on future prospects of digital imaging surveillance technology are provided.

The Vinyl LP record is not dead. Matt Powell in his article "Vinyl Revival" [Plant: Advancing Canadian Manufacturing. 72(7):14-15. October, 2013. www.plant.ca] the resurging market with audio purists who prefer the unique characteristics of the record media over digital formats. As stated in the article record sales jumped in the US by 17.7% to 4.5 million units and analysts predict continued growth. A St-Lambert, Quebec Canadian company RIP-V [www.rip-v.com] is pressing over 2,000 LP's a day on antique presses purchased from former vinyl record manufacturers. A second article in the same issue discusses another Canadian innovation success story Colt Hockey's super-strong hockey stick. [Kick-Starting the Stick of Steel" pp 17-18]. The Colt hockey stick is a joint effort between Colt Hockey and PowerMetal Technologies, a Division of Toronto's Integran Technologies, a developer of metallurgical nanotechnologies. [www.integran.com]

Anne Casselman tells the story of Allen Eaves and his leadership of a $70M Vancouver company that caters to the world's leading research labs. This was accomplished without the help of venture capitalists. [BC Business. 41(10):40-49, October, 2013. www.bcbusiness.ca]. Stemcell Technologies Inc. [www.stemcell.com] is a privately-owned biotechnology company that develops specialty cell culture media, cell separation products and ancillary reagents for life science research. Scientifically-based and with a passion for quality, Stemcell delivers over 1500 products to more than 70 countries worldwide. Stemcell grew out of the Media Preparation Service of the Terry Fox Laboratory for Hematology-Oncology Research at the British Columbia Cancer Agency.

Trenna Hein discusses applications of scanning and optimization technology to the forestry industry in her article "Visionary Information" [Canadian Forest Industries. pp. 29-35. March-April, 2013. www.woodbusiness.ca]. Using innovative scanning technology inspection, grading and many other applications involved in the processing of lumber can be accomplished accurately and quickly. Mobile technologies allow mill personnel to interact with equipment in a safe and productive way. While on the topic of forestry in "Timber Turnaround" [Saskatchewan Business Magazine. 31-35. July-August, 2013] Penny Eaton tells the story of the rebound of the forestry industry in Saskatchewan. "The Beachcombers" is not only a television series. As told by Marcie Good beachcombing is now a growth industry "thanks to one enterprising outsider who challenged the status quo and won". [BC Business. 41(7):111-121. July, 2013]. The story of Erik Hammonds beachcombing enterprise that provides income and also is environmentally responsible is told.

The mining of natural resources is a huge economic sector in Saskatchewan. Exploration and development in the resource sector is very cyclical and the trajectory has been downward, but now showing signs of an upswing. Two recent articles in the Saskatchewan Mining Journal explore developments. "Hidden Riches" by Penny Eaton, [34(5):6-17] examines the diversity of the mining industry, how it extends well beyond the well-known traditional potash and uranium production. Gold, diamonds, rare earth elements, coal, base metals and many others are opening up new opportunities. An interesting mineral resource map of Saskatchewan is provided. In the second article "The Future is Nuclear" [34(5):23-31]; Ashleigh Mattern explores the uranium mining industry in Saskatchewan and its challenges.

The story of Bombardier's $4B business venture developing a quiet jet is featured in the October 28, 2013 issue of Canadian Business [Shhhhh…86(17):54-58]. Philip Preville discusses the development from scratch and innovative design with cutting-edge technology of Bombardier's CSeries aircraft powered by an engine so quiet that it is thought that the aircraft might revitalize downtown airports all over the world. Using new materials it is a light-weight and a fuel efficient commercial airliner that needs only 4,000 feet of runway.

The D-Wave Two, the world's first commercially available quantum computer and its development is profiled by Jeff Beer in the October 14, 2013 issue of Canadian Business [86(16):41-43]. Based in Burnaby, British Columbia; D-Wave [www.dwavesys.com] was founded in 1999 with the goal of making practical quantum computing a reality. The company currently owns over 90 patents and has over 100 pending worldwide related to quantum computing and superconducting electronics.

The November 2013 issue of Alberta Venture [www.albertaventure.com] focuses on the future of cities in Alberta. ["Let's Build Better Cities."]. Four articles: "The Battle for Alberta", Alberta's Two Newest and Hottest Neighbourhoods," "The Future of Fort McMurray", and "Developer vs. Planner vs. Architect" all have the common theme of coping with rapid expansion and conflicting visions. More than 27,000 people moved to Alberta in the first quarter of 2013 and most of these settled in urban centers. This is resulting in stressed physical infrastructure (roads, bridges, utilities, and public transit for example) that, in particular, in the inner city were not designed for. The rapidly escalating cost of home ownership is stressing and forcing many long-term residents into difficult decisions. Also included in this issue is Alberta Ventures 8th annual audit of "Alberta's Best Communities for Business"

This year marks the 50th anniversary of the Pratt & Whitney PT6 engine. The PT6 engine is used in more than 130 different applications in commercial, military, general aviation, business, helicopter, agricultural and utility aircraft. The story is told by Carroll McCormick in the September-October, 2013 issue of Wings Magazine [54(5): 40-43. www.wingsmagazine.com]. It is thought that more than 390 million hours of flight time has been logged by the reliable PT6 engine and that has been an important factor in the aviation industry. ■

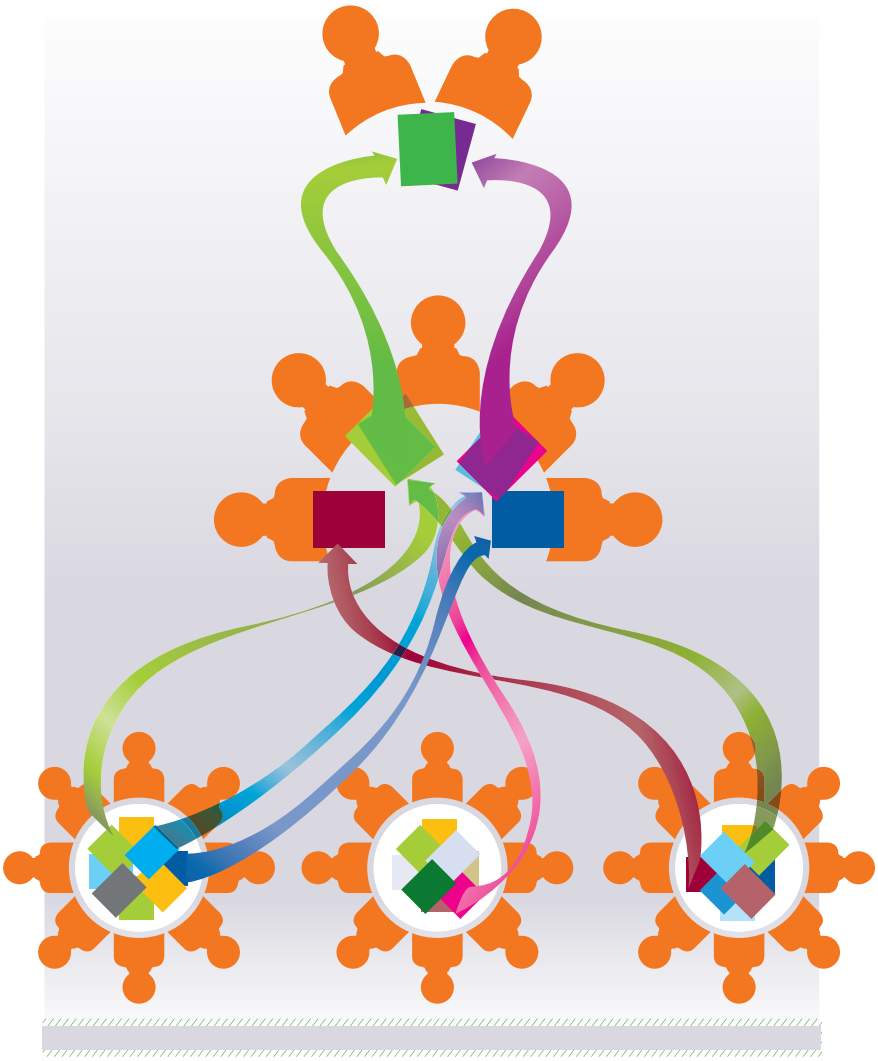
About the Author



Terrance Malkinson is a communications specialist, business analyst and futurist. His career path includes technical supervisor and medical researcher at the University of Calgary, business proposal manager for the General Electric Company, and research administrator with the School of Health and Public Safety at SAIT Polytechnic in Calgary. He is currently an international correspondent for IEEE-USA Today's Engineer, associate editor for IEEE Canadian Review, and a member of the editorial advisory board of IEEE The Institute. He was Vice-Chair of the IEEE-USA Communications Committee (2004-2010), and editor-in-chief of IEEE-USA Today's Engineer Digest (2004-2008). He was an elected Governor of the IEEE Engineering Management Society as well as past editor of IEEE Engineering Management. He is the author of more than 420 publications, and an accomplished triathlete. malkinst@telus.net

Bringing the grassroots to Sections Congress

Giving voice to IEEE's 400,000 members on future priorities isn't as unwieldy as it might sound



The process of charting the course for the IEEE's Member Geographic Activities (MGA) for the next three years has begun — and there are easy ways that members can voice their ideas, thoughts and concerns for consideration by the entirety of the global organization.

"The IEEE is its members and it has to remain its members," says Raed Abdullah, strategic planning engineer at Hydro Ottawa and volunteer with Ottawa Section. "IEEE shouldn't become a bureaucracy — it's a member organization."

By **Vawn Himmelsbach**

Though there are 10 regions representing some 330 sections, there are mechanisms in place to get your voice heard.

Within Canada (Region 7 of IEEE) each of the local sections is being asked to develop up to five recommendations. These will be merged into a list of four by the IEEE Canada board, and advanced to organizers of Sections Congress 2014 in Amsterdam, taking place this August.

The organizing committee of Sections Congress ensures there is no overlap from the 10 regions, consolidating any recommendations that are similar. Primary section delegates then vote to choose the top five; these will then be given implementation priority over the coming three years.

"None of the sections' recommendations is rejected," says Om Malik, who was president of IEEE Canada at the time of Sections Congress 2011 in San Francisco. "The delegates simply rank them in order of importance."

As it turned out in 2011, several of the top recommendations at Sections Congress were similar in nature to what was submitted by IEEE Canada.

This shouldn't be surprising. "Region 7 volunteers are very engaged and continue to be in touch with the membership as demonstrated by the outcomes of previous Sections Congresses," says Keith Brown, the Sections Congress 2011 coordinator for IEEE Canada and its current Past President.

One of the recommendations submitted by IEEE Canada in 2011, for example, was: "IEEE to develop a comprehensive long-term strategy to increase the number of next-generation youth pursuing science and engineering careers."

At Sections Congress 2011, this recommendation — word-for-word — was voted No. 1 of the top five recommendations.

Since attendance at Sections Congress is limited, the recommendations development process seeks input from the section level — and it's designed to drill down beyond executives and committee chairs to members at large, even those who aren't regularly active.

"We want to make sure we take the recommendations that we feel are a priority for everyone," says Sreeraman Rajan, defence scientist at Defence R&D Canada (DRDC), chair of IEEE Canada Area East and chair of the IEEE Ottawa chapter of Engineering in Medicine and Biology Society.

Recommendations are seen by the sections as an effective way to influence the IEEE's direction towards membership needs and expectations, says Abdullah.

It wasn't always this way. The process of developing recommendations has evolved, Abdullah says. When he first got involved with the IEEE, the recommendation development process was a one-way flow. "We went back home from Sections Congress and we waited, and there wasn't very good feedback as to whether they were succeeding on the recommendations that were voted on," says Abdullah.

In 2008, at Sections Congress in Quebec City, the IEEE gathered input from members at large

through the sections and forwarded that to IEEE headquarters. "Lots of good ideas were generated— but they were not made actionable," says Rajan.

Each Sections Congress hosts a different group of volunteers. "What is a priority today may not be a priority tomorrow," says Rajan. "There were ever-growing promises given to the members that were not being followed through. Collecting this information and not acting on it did not meet our requirements — it needed to be actionable."

The Ottawa section spoke up and the IEEE responded. In 2011 the IEEE developed a "report card" to track and report on the status of the recommendations. "That report card was an excellent move to really nail down the intent of Sections Congress, to get feedback and direction from the grassroots," says Abdullah. "There was an accountability process that was set up — it will take a while for adjustment but there's a built-in transparency there."

"We need new ideas, new plans, and questions raised. Members need to know they can be heard by IEEE as a whole."

– **Anader Benyamin-Seeyar**, Sections Congress 2014 Coordinator for IEEE Canada.

During Sections Congress 2011, an online portal was set up so attendees could exchange ideas and debate recommendations. The same idea is being considered for this year's congress.

Action has since been taken on the 2011 recommendations. Representatives of the Educational Activities Board Pre-University Education Coordination Committee agreed with the top recommendation that additional efforts were required to support and retain students who select engineering, technology or computer science programs.

The long-term plan includes proposed large-scale programs such as an early childhood engineering education program, a program to develop tools for parents and educators, rebranding of engineering, technology and computing professions, and a young engineers club program.

This aligns with two of the other top five recommendations from 2011: increased support to students in technical activities with grants to attend conferences and organization of technical competitions, and that subscription periodicals (paper or electronic) be published to target high school students.

Quick Facts on Sections Congress 2014 — www.ieee.org/sc2014

- ★ August 22 to 24, Amsterdam
- ★ Held every three years
- ★ In early May, recommendations forwarded to SC organizers from each Region
- ★ Each of IEEE's roughly 330 Sections sends delegates (usually two)
- ★ Delegates vote on recommendations and attend training sessions
- ★ Each Section has one voting delegate
- ★ Delegates individually assign a priority level to each recommendation on behalf of his/her section
- ★ Support for each recommendation is tallied and an overall-ranking presented to delegates and published widely within IEEE

Ultimately, it's about bringing the voice of the members who aren't at Sections Congress to Sections Congress. Members often see recommendations from their section — regardless of its size — reflected in those adopted and prioritized by the IEEE MGA.

"What I really like about the whole process at the section level is I got to see and participate in this collective gathering of what's really important for IEEE — to get an idea of why people have joined and what would help them in their volunteer roles," says Abdullah.

All section chairs are now being officially solicited for new recommendations for Sections Congress 2014. "We need new ideas, new plans, and questions raised. Members need to know they can be heard by IEEE as a whole," says Anader Benyamin-Seeyar, Sections Congress 2014 Coordinator for IEEE Canada, and former chair of the Teacher In-Service Program (TISP) Committee in Canada.

Members can contact their section, which will then forward the recommendations to their respective area chairs. Each Canadian area — West, Central and East — has a chance to present their recommendations to the IEEE Canada board.

"We collect and compile all the information and sort it properly," says Benyamin-Seeyar. "Usually we ask every section to put forward four to five recommendations."

Benyamin-Seeyar says this process is important, because it builds momentum and shows members the IEEE values their input. "Many people don't know we need their opinion, we need them to be with us," he says. "We need you and you need us. We need to collaborate as a team and come up with ideas and solutions."

A spinoff of this giant brainstorming effort — for the benefit of all IEEE Canada — is that members that hadn't considered getting involved before might find a reason to do so.

Simon DeWolf, former secretary and treasurer of the IEEE Canadian Atlantic Section and currently a member-at-large, first became involved with the IEEE as a student after hearing a guest lecturer at Queen's University.

"Until that time, I thought of IEEE as a magazine that people subscribed to — I didn't even know Kingston had a local section, I didn't know IEEE had geographic presence," says DeWolf.

After DeWolf started his career in computer engineering, he upgraded his membership and became a volunteer in the Canadian Atlantic Section in 2010. A year later, he was chairing the Computer Society Chapter in that section and was sent to Sections Congress 2011. He was particularly interested in the recommendations that related to getting younger people into the profession.

"Although engineering is a high-profile profession in some ways, it's not well known in high school," says DeWolf. "Teachers and counselors were not familiar with what is needed to get in."

At Sections Congress 2011 he was encouraged to see that three of the top five recommendations were focused on educating teachers and students about the benefits of an engineering career and what it takes to get there.

Indeed, these recommendations reflect what has already been a priority in Canada. DeWolf points to the *TISP Canada Courier* electronic newsletter issued quarterly by TISP Canada, which covers a variety of topics from regional activities and lesson plans to feature articles and interviews with teachers.

"At my local section level, the student branch has really picked up," says DeWolf. He attributes this, in part, to the fact that several Dalhousie professors are on the Section's executive committee, and they encourage students to participate.

Being Section secretary and treasurer, and participating in executive committee meetings, taught DeWolf a lot — not only about how the IEEE works, but also organization and networking skills. These will be helpful in his planned career migration into project management, he says.

At Sections Congress 2011, London Section was honoured as the most active Small Section globally. (At the very same Congress, IEEE Ottawa was honoured as the most active Large Section globally.) London's success was due, in part, to driving participation in new technical groups and in the Young Professionals affinity group, says Murray MacDonald, current London chair. Clearly quite involved now, MacDonald initially thought he was too busy for IEEE activities.

Continued on page 10 ›



By **Alexandre Abecassis**

MONTREAL, QC. Feb. 10, 2014. EXO U has announced that it has signed a partnership agreement for the education sector with CGI. Under this agreement, both companies will be working together in order to promote software solutions. The software solutions will provide educational institutions with a solution that will help reduce the problem of the diversified and fragmented computing environment of the educational institutions.

TORONTO, ON. Dec. 9, 2013. Researchers from IBM and from the Institute of Bioengineering and Nanotechnology have announced that they have made a nanomedicine breakthrough. More precisely, they have been able to convert common plastic materials, such as polyethylene terephthalate (PET), into non-toxic and biocompatible materials designed to specifically target and attack fungal infections. Over a billion people are affected by fungal infections in the world.

TORONTO, ON. Dec. 3, 2013. Hitachi High-Technologies Corporation and Smart Energy Instruments (SEI) have unveiled the first component of Smart Energy Instruments' planned chipset product line for smart grid applications. The chipset is a measurement and communications core for smart devices that are used in the generation and transmission of electric power. The chipset provides advanced time synchronization capability that can be used to provide real-time measurements.

TORONTO, ON. Dec. 3, 2013. Kobo has announced that its Kids Store and its tablet have been recognized with the Parent Tested, Parent Approved (PTPA) seal of approval. The Kobo Kids Store was praised by PTPA parent testers for its safe search capabilities for age-appropriate books. It is also possible to set up kids accounts and allowances. The tablet enables access to more than 1-million apps and games.

MONTREAL, QC. Dec. 3, 2013. Optimal Payments, an online payment provider, has announced that it has extended its existing partnership with 888 Holdings, a provider of online gaming services, to offer an integrated suite of payment processing services for the licensed U.S. online gaming market. The solution includes payment gateway and digital wallet services that are designed to meet the requirements of U.S. state gaming regulators.

OTTAWA, ON. Dec. 2, 2013. The Torrance Memorial Medical Center has announced that it has selected the Halogen Software Talent Management Suite for Healthcare. This software is designed to help healthcare facilities build high performing teams with the right skills, knowledge and competencies to deliver quality patient care. It is a cloud-based talent management suite.

QUEBEC CITY, QC. Nov. 26, 2013. EXFO has announced that it will donate testing units to local operators PLDT (Philippine Long Distance Telephone) and Globe Telecom following Typhoon Haiyan in the Philippines. That event has severely affected many of the Philippines' infrastructures. Those testing units will help telecommunication companies detect and analyze network failures.

RICHMOND, BC. Nov. 20, 2013. MacDonald, Dettwiler and Associates, a communications and information company, announced today that it has been authorized to proceed with development of a Payload Orbital Delivery system for the DARPA Phoenix mission. The Payload Orbital Delivery concept is a cost-effective solution used for delivering small packages to geostationary Earth orbit using surplus capacity on regularly launched communication satellites The expected contract value for full development of the flight system is US$6 million.

QUEBEC CITY, QC. Nov. 13, 2013. Opsens has announced that it has been named as one of Canada's fastest growing technology companies in the Deloitte Technology Fast 50™ awards for technological innovation, entrepreneurship, rapid growth and leadership, based on the percentage of revenue growth over five years. Opsens develops, manufactures, supplies and installs systems for measuring parameters of pressure and temperature in extreme environments.

OTTAWA, ON. Oct. 8, 2013. Espial, a provider in on-demand TV software and solutions, has announced that a Smart TV chipset vendor has signed a contract to license the Espial TV Browser for deployment in Internet-connected Smart TVs. The chipset vendor will pre-package the Espial TV Browser, with support for the latest Hybrid Broadcast Broadband specifications to simplify and accelerate deployment for Smart TV manufacturers.

VANCOUVER, BC. Oct. 8, 2013. Absolute Software Corporation has announced the launch of Absolute Safe Schools. This product is a solution that keeps students and the community safer while securing mobile devices through protection and recovery. More precisely, the solution provides rapid response resources after a theft of a protected device. ■

About the Author

Alexandre Abecassis is a patent agent and Partner at Fasken Martineau DuMoulin LLP, Lawyers and Patent and Trade -mark Agents. Send via e-mail any news clippings you would like to contribute to alexandre.abecassis@ieee.org

Alexandre Abecassis est agent de brevets associé chez Fasken Mar-tineau DuMoulin S.E.N.C.R.L., s.r.l., Avocats et agent de brevets et de marques de commerce. Veuillez faire parvenir les coupures de presse proposées par e-mail à alexandre.abecassis@ieee.org

***Sections Congress 2014**, continued from page 9* >

"If you're in the middle of your career, you tend to think you don't have time to be involved," he says. But becoming engaged, for him, was a way to get out and meet people, to network, to discover potential new career opportunities.

In 2011, most of IEEE London's recommendations gathered for Sections Congress came from committee chairs. The London section has 380 members; MacDonald would like to see more members get involved in the recommendation process to get that "true grassroots input."

Members can provide input by responding to email and newsletter blasts or by attending section meetings. Even a modest 10 percent response rate means the section would have 30-some recommendations to choose from, says MacDonald.

And members' efforts don't go unnoticed. "What's interesting is the attention paid at Sections Congress to recommendations from three years before," says MacDonald. "There is a lot of feedback."

Ultimately, the IEEE is meant to benefit everyone — from members and students to non-members and the community at large.

That's why input into recommendations is so important. They are a means of helping to shape the organization — and hold it accountable — at a grassroots level.

This engages the membership in a "democratic process," says Abdullah, "providing an opportunity to render thoughts into meaningful action and negotiate on the importance of one recommendation versus another."

For Abdullah, this process provides an infusion of energy into the IEEE. "You're the IEEE, you're part of it," he says. "You make it what it should be." ■

__Vawn Himmelsbach__ is a freelance writer who has written about business and technology for close to 20 years.



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IEEE Technical tour of Central & Eastern Canada

In late August 2013, roughly two dozen Life Members boarded a bus for a 10-day celebration of technology that made history

Milestone 1 — First Distant Speech Transmission in Canada, 1876

Milestone 2 — DeCew Falls Hydro-Electric Plant, 1898

Milestone 3 — First External Cardiac Pacemaker, 1950

Milestone 4 — Alouette-ISIS Satellite Program, 1962

Milestone 5 — First 735 kV AC Transmission System, 1965

Milestone 6 — First Submarine Transatlantic Telephone Cable System (TAT-1), 1956

Milestone 7 — Landing of the Transatlantic Cable, 1866

Milestone 8 — Reception of Transatlantic Radio signals, 1901

DeCew hydro plant in St Catharines

by **Dave Hepburn**

The old, but still vibrant, DeCew hydro plant in St Catharines has a most interesting history. And what's more, not only is it still working 24/7, it is now well on its way to creating a few more "firsts," as will shortly be revealed.

The public relations manager for Ontario Power Generation (OPG) and I met the group the afternoon of August 26 in St. Catharines; it was hot, steamy and overcast, to a tropical extent.

Nevertheless, troupers as they were, the tourists were off the bus and into the powerhouse in a trice. Their visit could not have come at a better time, because DeCew (pronounced D Q) is currently undergoing a comprehensive "Life Extension" program. This is quite extraordinary, given its age. The two original units from 1898 are alas, no longer there, but four of the remaining units which date from 1903, and are therefore already 110 years old, are being extensively renovated, with a view to keeping them in service for another 25 years or so. This obviously caught the interest of the tourists, and, to my surprise, they kept asking probing questions for over an hour-and-a-half. Given that the original time allocation was 30 minutes, and given also that everyone was gently steaming in the heat, humidity and noise (two of the generators were running at the time) that was surely a tribute to the endurance of both the visitors and the plant.

Eventually, and not without some difficulty, the tourists were coaxed back on to the bus. But just at that moment, the heavens opened and a downpour began. The rain was in fact so heavy that the driver decided to drive his bus into the main door of the power house. But busses are large and DeCew is small, and so unfortunately there was no room to take a group photograph. Nevertheless, feedback from the Toronto Section at the dinner they hosted later that evening indicated that the group considered digging into living history at DeCew was preferable to trailing around Niagara Falls soaking wet. They did however, see the statue of Nicola Tesla, the man who started it all in 1897.

Here are some further tour technical tidbits. The genesis of the DeCew plant originated in 1896, when a plan was put forward to use some of the water from the Welland Canal to generate power to send to a street railway in Hamilton, 35 miles distant. Lord Kelvin said it could not be done economically, but Nicola Tesla said it could if the voltage was high enough. Tesla won and he designed a system using 22.5 kV, 66 2/3 cycles, and TWO phases. The two original machines were 1,000 kW (1 MW), but it was the voltage (astonishing at the time) which is the basis of the IEEE historic marker, dedicated in 1998 to commemorate the centenary of its first entry into service in August 1898. The two original units were converted to 3 phase in about 1903 and, alas, were cut up for scrap during WW II. The units still running date from 1903 and each produces 6.5 MW, 28.0 MW total. At the current domestic rate of about 15 cents/kW.h, that represents revenue of about $33 million per year. Not so dusty for a centenarian!



Photos: Dave Hepburn

Peterborough Liftlock

by **Sean Dunne**

Although we don't have any milestones in Peterborough we saw an opportunity to host the LM tourists for lunch on their way from Toronto to Ottawa and to treat them to a visit to a unique Canadian engineering achievement, the Peterborough Liftlock — the World's tallest. We then acquainted them with the Canadian Canoe Museum which in its own way symbolizes Canadian engineering and innovation over four centuries.

At the Canoe Museum we had two displays one prepared by Life Member John Mackelvie on Unilogic the world's first digital logic developed in Peterborough in 1957, just ten years after the invention of the transistor. Bob Rehder, Life Member, discussed the three 100MW rotary variable frequency transformers built to interface the Hydro Quebec and Mohawk grids that are not synchronized, as well as the 735kV Air-blast Circuit Breakers built in Peterborough for Hydro Quebec. Finally a presentation by Life Member Andy Stevenson traced the long history of innovation and invention in Power Conversion which took place in Peterborough.

Our visitors got to see the Liftlock operate not once but twice before we sent them on their happy way to dinner in Ottawa.



Photos: Sean Dunne

Capital hospitality







Photos: Janet Davis

by **Janet Davis**

The Ottawa LM tour showcased our local universities. We toured the undergrad labs at the University of Ottawa and fabrication facility at Carleton University. The participants had a very interesting session seeing some of the past CAPSTONE projects on video and in the Ottawa U lab. Some also saw the light show after dark on Parliament Hill and toured the Parliament Buildings. Unfortunately CRC was not available for a tour of the milestone Alouette-ISIS Satellite Program, 1962. We ended the tour with a dinner at the hotel and some new friends. It was a fun day.

Landing of the Trans-atlantic Cable, 1866

by **Matt Baum**

Although the entire trip was informative and exciting, the Cable Station at Heart's Content was for me far and away the most exciting stop.

I had long known and thought about the fact that transatlantic communication by wire (this was before wireless, or radio) had forever speeded up communications between North America and Europe and thus revolutionized commerce between the two major trading areas. Now, to be at the actual place where this was born was an unbelievable thrill.

To also see the equipment there in place - some of which was from the original times, in 1866 - was almost beyond belief. I'm sure that all of us would liked to have spent a few days there, instead of the short time available. I'm glad that I took plenty of pictures, as this will be a favorite memory of mine forever.

1



1. The Heart's Content Cable Station - outside view; **2**. Cable Ends inside, as they enter the building; **3**. Some of the Equipment present in 1965; **4**. Some cable ends emerging on the beach. *Photos:* Matt Baum

2



3



4



Tour meets Submarine Cable Milestones in Atlantic Canada



Tour entourage at Sydney Mines, including a proud display of short section of the transatlantic cable that once was the telecommunication lifeline between North America and Europe

Photo: Patricia Manuel

by **Dirk Werle**

Whether you look at a historic map of early transatlantic telegraph cables or a modern network chart of the global fiber-optic connections, you will soon realize that the eastern seaboard of Canada has remained a hotbed of submarine telecommunication traffic for the past 150 years [1, 2].

Modern fiber-optics cables come ashore near Halifax, Nova Scotia, yet most of them have now been routed directly to Boston and New York in the United States. Remnants of old telegraph and telephone cables are still in evidence at landing sites in Newfoundland and in Nova Scotia and were eagerly inspected this summer as part of the 2013 IEEE Life Member Tour of Engineering Milestones in Central and Eastern Canada. A group of 25 members from around the world participated in the two-week long bus tour that took them from Toronto to St. John's [3].

There was growing excitement among this group of distinguished engineers traveling to the beginnings – or end points, depending on your perspective – of the most innovative and advanced submarine telecommunication infrastructure of the past two centuries. Two of the Milestones commemorate the first transatlantic telegraph cable of 1866 in Newfoundland and the first transatlantic telephone cable (TAT-1) of 1956 in Nova Scotia, respectively [4]. These submarine cables revolutionized communication between Europe and North America. The first ones shortened the news cycle during the second half of the nineteenth century from the long duration of a ship's passage across the Atlantic to a matter of seconds. Entire lines of business, let alone stock markets, started to rely on timely telegraph messaging and news services upon inauguration in the 1860s. The copper core cables became essential infrastructure of what some have termed the "Victorian Internet", manifested and celebrated by a commemorative plaque at its western submarine cable landing point in Hearts Content, Newfoundland.

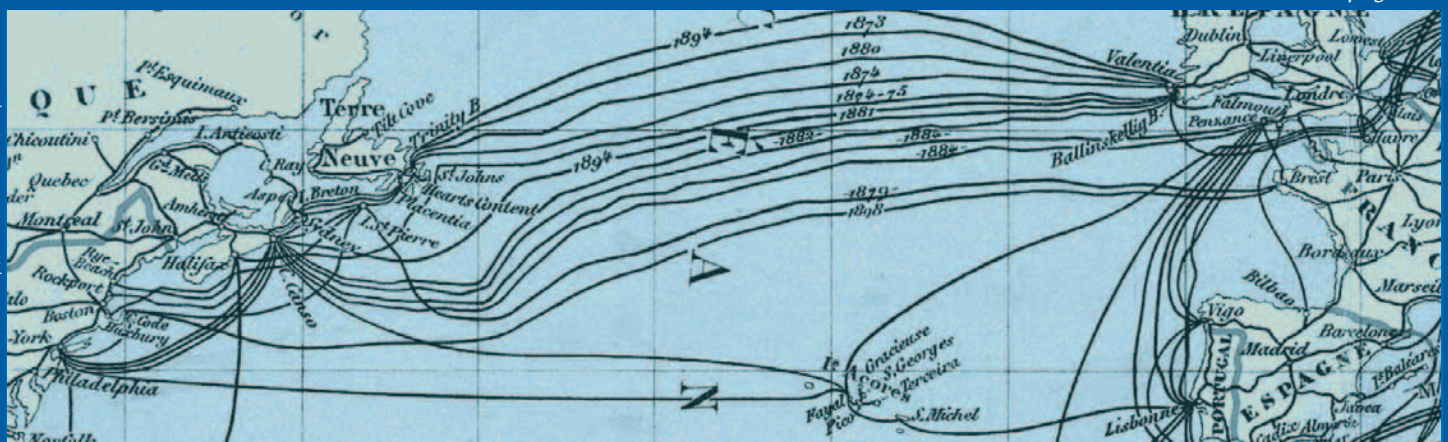


Photo: Patricia Manuel

The old landing site of the transatlantic cable in Sydney Mines was successfully searched for "evidence" by the IEEE Life Members (Source: [3])

The other "real thing" stuck out on a stretch of sandy beach near Sydney Mines, NS, where the first transatlantic coaxial telephone cable was brought ashore and into operational service in 1956 (see photo). The Tour members jumped at the opportunity to pay an impromptu visit to this rather inconspicuous site which, unbeknown to most, is located just a short drive down the street from the Sydney Mines Heritage Museum where the commemorative TAT-1 Milestone plaque has found its home.

Continued on page 16 ›



Credit: http://atlantic-cable.com/Maps/

Continued from page 15 ›

While the first set of TAT-1 cables consisted of less than a few dozen telephone lines some 50 years ago, subsequent TAT lines with greater capacity have opened telephone connections between millions of people on either side of the Atlantic. The extraordinary technological achievement of the TAT-1 consisted, among others, in the provision of reliable repeaters, each containing a set of three fragile vacuum tubes that functioned flawlessly for two decades under very hostile conditions [5].

One of the IEEE Life Members recalled the experience of a previous LM Tour that had made arrangements in London, England to see the original plans for the TAT-1 project. What an exciting way to reach back into engineering history and make hands-on connections at either end of the line! By the time TAT-1 went out of service in 1978, the present era of fiber-optics submarine cables was already dawning with the advent of TAT-8, capable of handling vast volumes of voice and data traffic. The world had changed once again! Today, this global network consists of many thousands of kilometers of submarine cable, carrying more than 95 per cent of all transoceanic telecommunications.

The submarine communication industry is expecting at least $2 billion in new investments and 50,000 km of additional cable capacity annually [6]. And wouldn't you know, that it made its North American debut long ago, during November of 1852 – even a full decade before the famed 1866 Atlantic Cable – when Engineer and Electrician Frederic Newton Gisborne (1824-1892) completed a 14 mile long underwater telegraph cable connecting Carleton Head on Prince Edward Island with Cape Tormentine, New Brunswick.

Engineers take note, there are more milestones to discover in Atlantic Canada, and in many other parts of the country for that matter!

Dirk Werle *is a geoscientist with Ærde Environmental Research in Halifax, Nova Scotia Canada. He serves as Executive of IEEE Region 7 Canadian Atlantic Section and Editor of IEEE's TISP Canada Courier Newsletter.*

References

[1] http://atlantic-cable.com/contains materials and rich illustrations of the history of the Atlantic Cable & Undersea Communications

[2] http://www.telegeography.com contains contemporary up-to-date maps and telecom resources on submarine cables

[3] http://www.ieee.ca/activities/LMs/life-member-tour-2013.htm

[4] http://www.ieeeghn.org/wiki/index.php Special:Milestones

[5] Jeremiah F. Hayes, "Paths Beneath the Seas: Transatlantic Telephone Cable Systems," IEEE Canadian Review, Spring 2006. http://www.ewh.ieee.org/reg/7/canrev/cr52/CR52_TAT.pdf (accessed 15.10.2013)

[6] http://www.terabitconsulting.com/downloads/2013-submarine-cable-market-industry-report.pdf (accessed 15.10.2013)

Message from the Life Members Chair

M. E. El-Hawary



The 2013 Canadian IEEE Life Member Technical Tour

The IEEE Life Members Committee (LMC) organizes technology-themed tours around a number of the IEEE Milestones sponsored by the IEEE History Center; Milestones celebrate technological breakthroughs or turning points. The tours are planned with Life members and their companions in mind, and so the pace of the tour is set for seniors. However, all IEEE members are welcome.

In 2012, the IEEE Life Members Committee invited Region 7 to host the 2013 IEEE Technical Tour. As Life Member Coordinator for Region 7, I worked with Dave Kemp (IEEE Canada History Committee Chair), Cathie Lowell (IEEE Canada Administrator) and Stacey Waters (IEEE LMC Staff Support) to organize and ensure that the tour was a success.

Right from the outset, it was clear to us that Canada has an abundance of milestones from coast to coast and that the time constraints on the tour's duration would not allow us to cover all sections of Region 7. A decision was reluctantly made to restrict the tour to milestones located in sections of IEEE Canada's Central and Eastern Areas. With our rich selection of milestones to choose from, the next task was to draw a balanced itinerary that allowed participants to have a relaxed visit while allowing them to visit as many locations as could fit in the schedule. Ms. Lowell undertook the major part of the organizational details, which included preparing a plan, communicating with host sections to recruit volunteers to meet, greet, and act as guides to our guests. We are very grateful to the executive committees of the sections involved in the tour for sponsoring local hospitality events in honour of the tour's participants. Selection of a tour company and securing all legal details were also arranged by Ms. Lowell, with assistance from Ms. Waters. As is clear from the foregoing reports, many section volunteers gave of their time and energy to make the tour a success. I salute and thank you all.

The IEEE Life Members Committee launched its Technical Tour program in 2009, showcasing the history and operations of the Panama Canal in an eight-day itinerary in March, 2010. The second tour was hosted by the United Kingdom in May, 2011, with participants visiting a number of historical milestones over a 10-day period. Japan hosted its nine-day tour in May, 2012.

For more details of the Panama tour, please visit:
http://www.ieee.org/societies_communities/geo_activities/life_members/panama_canal_tech_tour.html

For details of the UK tour, please visit:
http://www.ieee.org/documents/united_kingdom_tech_tour_brochure.pdf

For details of the Japan tour, please visit:
http://www.ieee.org/societies_communities/geo_activities/life_members/tech_tour_japan.html

The official details of the Canada tour are at:
http://www.ieee.org/societies_communities/geo_activities/life_members/tech_tour_canada.html



Part 1 of 2

Introduction to the Smarter Grid – Part 1

Maike Luiken, Associate Editor

The Canadian Electricity System is expected to deliver power reliably, efficiently, and at low cost with increasingly higher performance expectations, while operating conditions are changing greatly. To meet these demands, the electrical power system is evolving. One key trend is the deployment of more communications, control, and information technology — giving rise to the "Smart Grid" or "Smarter Grid" or a 'new more flexible energy network' called the "enernet" (a term coined by Bob Metcalfe, the inventor of Ethernet).

> "Electricity has become all pervasive in the world today. This has been accomplished by continued developments in power systems over the past 130 years. Although power systems engineers have always kept pace by embracing new enabling technologies as they developed, recently there has been a trend to classify the new developments under the umbrella of 'smart grid'. Smart grid embraces the entire power system and is another step in the continuing effort to make the grid more versatile, resilient and reliable."
>
> **Om Malik**, Distinguished power researcher.

SOME TRENDS AND CHALLENGES:

Electricity consumption patterns are changing
- Increasing number of DC devices
- Time of use rates and smart metering change demand patterns
- Expected addition of electrical vehicles drawing power and potentially storing power
- 50% population increase over the past 30 years in Canada – growth expected to continue through immigration

Addition of - potentially - a vast number of 'generators' from renewable energy sources into the electrical grid
- Widely distributed generation
- Stranded generation due to mismatch of generation to load
- Intermittent generation – Solar PV, Wind

DC versus AC: Interest in DC power is rising
- DC's efficiencies – potentially 5 -15% savings
- DC data centres
- Hybrid AC-DC power systems
- Building DC microgrids

High Capacity TransCanada Interconnect proposed
- HVDC transmission

New Generation opportunities
- Hydroelectric generation to potentially grow to 236 TW provided transmission capacity is in place (*)
- Tidal power

Energy Conservation is becoming policy
- Zero-Net-Energy Buildings (ZEBs) in the USA for all new commercial construction by 2030
- Mandatory Perform Achieve Trade (PAT), a trading scheme aimed at reducing energy consumption in industries across India.

Aging electrical infrastructure requires costly replacement
- Replace with "the same" or invest in new "smarter" technology – at what cost?

Increasing Interest in the development and deployment of microgrids
- Increase system resiliency
- Increase local resiliency
- Decentralization
- Open new market opportunities
- Challenges include expense, complexity, islanding and the impact of islanding microgrids on the grid

Technology developments
- Storage, including integrated storage between the electricity and gas grids, and demand side storage
- Demand side management
- Pervasiveness of power electronics
- Data analytics for predictive maintenance and dynamic assessment
- Modeling and simulation
- Integration of modern communications, control, and automation

Security risks are increasing
- Severe weather
- Physical attacks - including theft of copper
- Cyber attacks

Environmental/Sustainability/ Health concerns are mounting
- Communications/education to share factual information
- Economic concerns, such as property values

The cost of electricity
- Increasing electricity costs and their impact on the economy
- The impact of shale gas availability

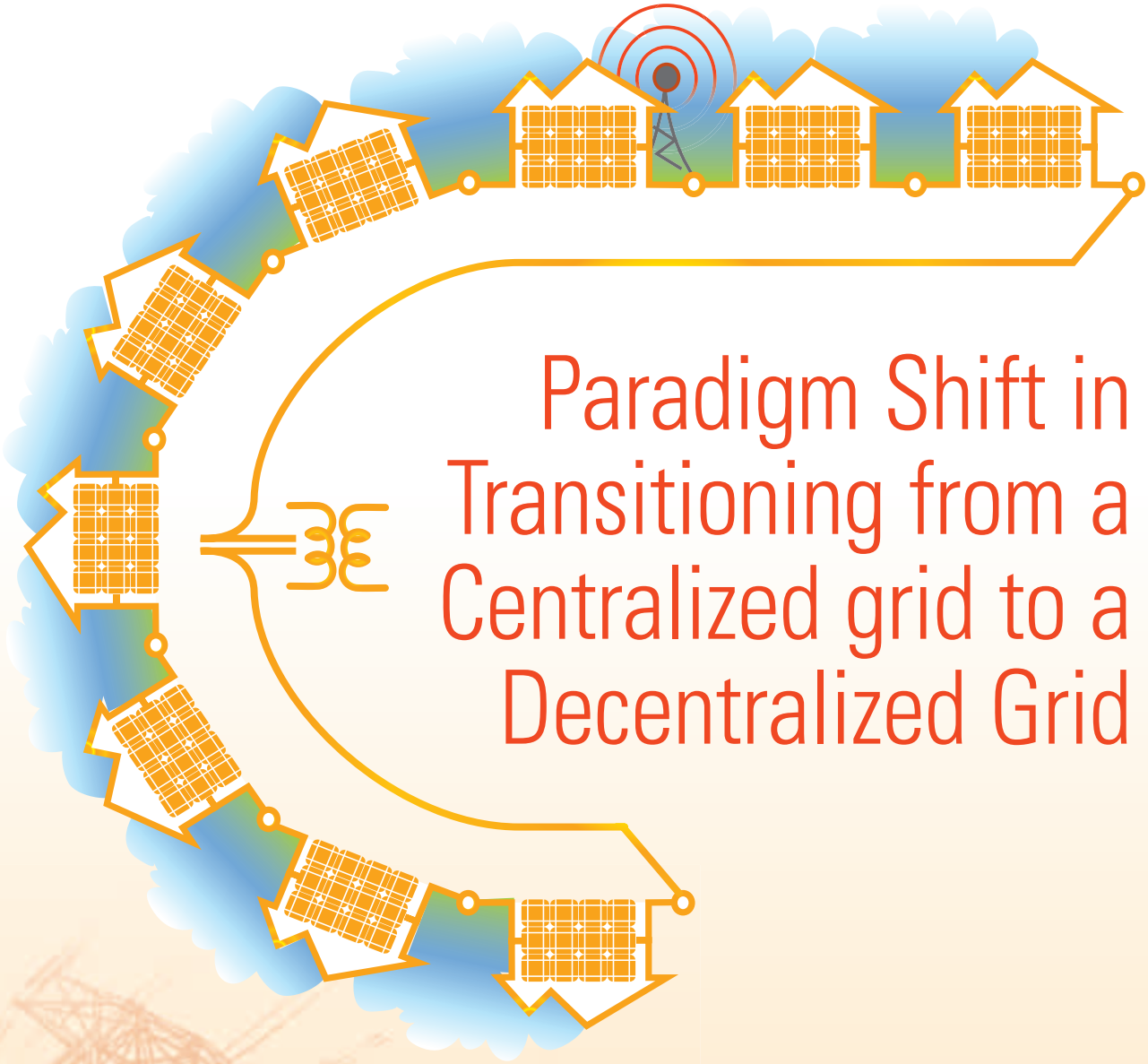
The role of nuclear power is being re-considered
- Reliable cost-effective base power with low carbon emissions
- Nuclear plant lifetime, license extensions, changing economics.

(*) Canadian Academy of Engineering, 2012, Canada: Winning as a Sustainable Energy Superpower

Higher Performance Expectations while being subjected to increasingly catastrophic risks like incidences of extreme weather, physical and cyber attacks, the intermittency of distributed renewable energy sources.

What do these developments mean to the Canadian electricity supply system now and in the future? In this issue and the next we will explore some of these issues, their implications, and potential solutions.





Paradigm Shift in Transitioning from a Centralized grid to a Decentralized Grid

Hassan Farhangi
PhD, PEng, Senior Member IEEE
Director, Group for
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British Columbia Institute of
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Canada's electrical grid has evolved over the last century through the provinces' economies, geographies and climates. While generation capacity in certain provinces has been dominated by hydroelectric power, other provinces have used nuclear or fossil fuel-based energy generation, while still others have attempted to tap into renewable sources of energy. The transmission side has seen its own share of peculiarities, reflecting Canada's vast and demanding geographical and climate conditions. Different urbanization patterns in Canada have influenced the distribution system design. Developing Canada's future Smart Grid will require attention paid to the same realities and patterns of its existing electrical grid while responding to the challenges of providing power to the country as a whole.



Smart Microgrids form an interconnected network of distributed energy systems (loads and resources) that can function connected to or separate from the overall electricity grid.

The central issue is that Canada's current centralized grid system is being challenged by increasing demand, rising costs, tightening supply, declining reserve margins and the need to minimize environmental impacts. At no time in its century-long history, has the Canadian utility industry had to confront so many diverse and concurrent challenges, as it does now. At the core of the crisis is the inability of Canada's electrical grid to respond to such challenges without a major paradigm shift, resulting in new approaches, topologies and architectures of its entire business, operational and technological processes.

Such a change is often described as an evolutionary process which helps Canadian utilities transform their legacy grid into Smart Grid. This evolutionary process is often envisioned as strategic implants of distributed control and monitoring systems within and alongside existing electricity infrastructure. Such functional and technological growth will warrant pockets of distributed intelligent systems emerging across diverse geographies. This organic growth shall allow the utility industry to shift more of the old grid's load and functions onto the new grid, thus improving and enhancing their critical services. These Smart Grid embryos, known as Smart Microgrids, will facilitate distributed generation and cogeneration of energy. They will also provide for the integration of alternative sources of energy and management of the system's emissions and carbon footprint. They will enable utilities to make more efficient use of their existing assets through demand response, peak shaving and service quality control.

At the core of this evolutionary process is therefore the ad hoc integration of complementary components, subsystems and functions under the pervasive control of a highly intelligent and distributed command and control system, developed by assimilating Smart Microgrids. Smart Microgrids form an interconnected network of distributed energy systems (loads and resources) that can function connected to or separate from the overall electricity grid. The emergence of Smart Microgrids across the utility's network will eventually transform the Utility's Centralized Grid into a Distributed (and yet interconnected) network of Smart Microgrids.

At no time in its century-long history, has the Canadian utility industry had to confront so many diverse and concurrent challenges, as it does now.

One of the basic premises of Smart Microgrids, is of course their ability to partially or fully generate the energy they require using their locally available resources; most often out of renewable sources of energy. However, what hinders wider adoption of renewable sources of energy, such as wind, solar, biomass, and wave/tide, is not solely their diffuse nature or higher cost, but also the absence of suitable devices, interface standards, application protocols, integration systems, reliable storage, appropriate policies and efficient transmission/distribution infrastructure. In particular, utility's distribution system should adopt a topology required to support two-way flow of information and power. Unfortunately, the legacy grid's architecture is not conducive to support such approaches. A new paradigm in substation design, architecture and protocols are required to help the grid take the first step towards decentralization.

The United States Department of Energy's 2035 Vision for the Electricity Grid of Future identifies the need to develop innovative technologies and solutions for the following three areas of the electricity grid:

1. Optimized utilization of assets and increasing system efficiency

2. Large scale integration of Clean Energy Sources (80% by 2035)

3. Allowing 100% customer participation in energy transactions

As such, DOE advocates significant departure from utility's hierarchical architecture, positioning Distribution Substations as "Energy Hubs". The impact of that approach is significant, as Substations could no longer operate as a "flow-through" layer in service/energy delivery, but have to be a hub where available system energy and user demand are corroborated, service needs are rationalized and stakeholders are engaged.

Continued on page 35 ›

Dr. Hassan Farhangi, *Ph.D., SM-IEEE, and PEng, is Director of Research within the Technology Centre of British Columbia Institute of Technology in Vancouver, Canada, and Adjunct Professor at the University of British Columbia (UBC) and Simon Fraser University (SFU). Dr. Farhangi is the Chief System Architect and the principal investigator of BCIT's Smart Microgrid at its Burnaby Campus in Vancouver, British Columbia, and the Scientific Director and Principal Investigator of NSERC Smart MicroGrid Network (NSMG-Net). He has published and presented numerous papers in scientific journals and conferences on Smart Grid and is a member of various international Smart Grid standardization committees such as IEC CSC TC57 WG17 (IEC 61850), Cigre WG C6.21 (Smart Metering) and Cigre WG C6.22 (Microgrids Evolution). A frequent keynote speaker at various international Smart Grid conferences, Dr. Farhangi has more than 25 years of experience in academic and applied research. Before joining BCIT, he served as Chief Technical Officer (CTO) of a number of companies involved in the design and development of systems, components and solutions for the Smart Grid. Dr. Farhangi is a member of Association of Professional Engineers and Geoscientists of British Columbia (APEG), a senior member of Institute of Electrical and Electronic Engineers (IEEE) and a nominated member of Cigre.*



Adaptive Energy Ecosystems
– Improved Operability, Efficiency and Economics for Electricity and Gas Infrastructure

Michael Fowler, Ushnik Mukherjee
Chemical Engineering Department,
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Ontario is working to manage periods of surplus baseload generation (SBG), often from emissions free nuclear power, and increasingly from intermittent renewable sources such as wind power. Thus for a 'Smart Grid' energy storage is essential. Gas energy storage offers the equivalent of a system-wide, distributed storage system during periods of surplus power, off-peak power periods, or when system operators need to immediately absorb spikes in generation during high wind periods. The convergence of the electrical grids with the natural gas distribution/storage infrastructure increases the potential flexibility for managing intermittent renewable supplies. Renewable Natural Gas and Power-to-Gas (PtG) energy storage solutions offer the ability to improve the economic and technical management of surplus off-peak power, and intermittent renewable energy. New, adaptive infrastructure like electrolyzers allows simultaneous grid stabilization, seasonal storage of bulk power, geographic transmission of energy and dispatchable regeneration of distributed renewable energy. This is achieved by bridging the electricity and gas-pipeline infrastructure together into a seamless "energy grid". The challenge is developing the gas interchangeability standards and predictive system modeling that enables researchers, planners, system operators, and industry to realize the full technical and economic potential. By establishing bidirectional energy flow between electricity grids and gas pipelines, along with the flexibility to interchange conventional natural gas with renewable gases, consumers will have access to increased renewable energy supplies at a lower cost. This has near-term potential because much of the existing energy infrastructure exists. Renewable gases, like Power-to-Gas conversion of renewable power to hydrogen, is just optimizing the existing gas distribution and electricity network capabilities to limit waste and exports to harvest more renewable energy for Ontario. The scale of improved renewable energy integration is potentially in the TWh range offering very compelling environmental gains. In addition to the economic and environmental benefits, optimizing existing infrastructure by deferring the building of new transmission will result in increased public acceptance on energy issues as pressure for new-build energy infrastructure is reduced.

Seasonal energy storage and energy distribution are required and renewable natural gas and hydrogen can provide this storage vector as they can be generated via bio-gas and electrolysis from off-peak electricity, and then stored with natural gas in existing long term underground storage facilities. Driven by the proliferation of intermittent renewable energy sources – such as wind and solar, the onset of the emerging smart grid and a shift to electric and plug-in vehicles, as well as fuel cell vehicles in the future, energy storage will play a large role in the electricity grid of the future. To make the energy network "smart", energy storage will need to be deployed, including the existing gaseous energy storage and existing thermal power plant infrastructure that can operate on renewable fuel.

Stemming from increased penetration of intermittent renewables, grid operators will have increased need to control power fluctuations, grid frequency, etc. and energy storage is an alternative to curtail renewables or operating thermal



Renewable Natural Gas and Power-to-Gas (PtG) energy storage solutions offer the ability to improve the economic and technical management of surplus off-peak power, and intermittent renewable energy.

By establishing bidirectional energy flow between electricity grids and gas pipelines, along with the flexibility to interchange conventional natural gas with renewable gases, consumers will have access to increased renewable energy supplies at a lower cost



Continued on page 22 ›

Continued from page 21 ›

plants in the off-peak periods to control system stability. By converting "excess" renewable energy and surplus baseload power into 'stored energy' via an energy hub, the constraints on increased renewable energy deployment are lifted and costly infrastructure additions (i.e. electric transmission towers and lines) are not required. Through the convergence of the electric distribution grid with the gas distribution and storage infrastructure, Ontario can achieve more flexible and adaptive operations across multiple vectors in the provincial energy system. Ontario's electricity sector is blessed with a relatively low-carbon electricity grid; however, with over 50% of the energy supplied by nuclear energy the grid has less operational flexibility to balance supply and demand during off-peak periods. Balancing the grid will be even more challenging when the existing 2,000+ MW of variable generation, like wind, is expanded to 10,000 MW of variable generation by 2018. Simply, there are and will continue to be short periods when the intermittent nature of new renewable power sources will result in surplus electricity supply being available to the grid and this surplus is a necessary and expected result of Ontario's diverse portfolio of power sources and the need to ensure peak system capacity at all times. With additional quantities of wind power, solar power, must-run hydroelectric power, the province can anticipate significant periods of surplus power going forward. To maintain electricity grid reliability, surplus electricity conditions are balanced by exporting power at low or zero prices to neighbouring states. In 2011, the Independent Electricity System Operator (IESO) reported 9 TWh of "net" electricity exports, or approximately 6.3% of Ontario's annual electricity consumption. For Ontario consumers this represents an outflow of high-value, renewable or non-carbon-emitting energy from wind, solar, biogas and nuclear. Consumers pay a premium for this high-value energy, but with no practical means of storing this quantity of surplus energy. In some circumstances, nuclear plants vent this energy in the form of heat/steam as an alternative to generating power.



The peak, daily capacity for existing gas storage systems is so large it could accommodate the entire daily energy output from Ontario's nuclear fleet.

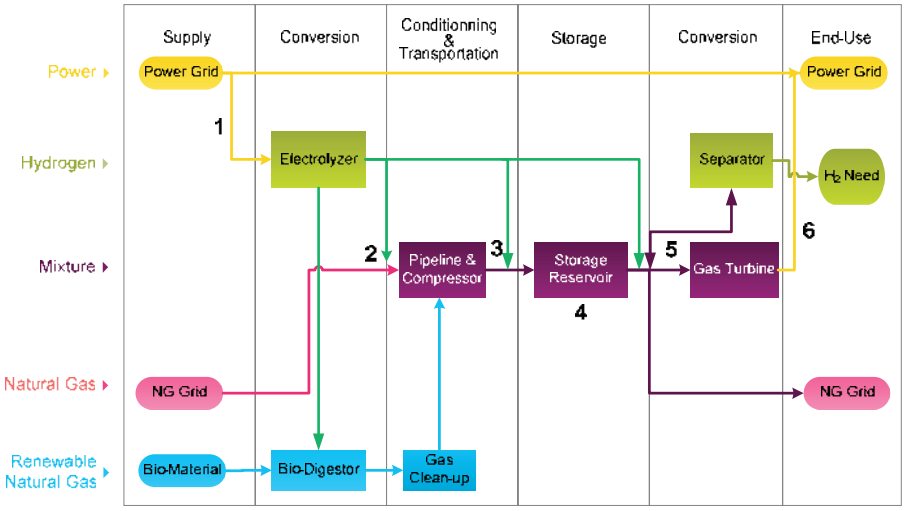

Figure 1: Basic Concept Illustration for RNG and Power to Gas

By contrast, Ontario's natural gas infrastructure can accommodate the equivalent of 80 TWh of energy that can be stored for many months. To offer a sense of scale for this energy storage, this is the equivalent of approximately 55% of the provinces annual electricity consumption. The peak, daily capacity for existing gas storage systems is so large it could accommodate the entire daily energy output from Ontario's nuclear fleet. This can be repeated for months without the need to discharge the stored energy. However, this surplus power must be converted to a gas to access this existing and cost-effective infrastructure. As a gas, surplus energy can be stored, transported and converted to dispatchable, renewable power using existing pipelines, storage and Combined Cycle Gas Turbines (CCGT). Using CCGTs with renewable fuel could optimize these assets for lower overall costs of operation.

New technologies allow Ontario to consider options for generating renewable energy directly as a gas. This includes renewable natural gas from biogas supplies injected into pipelines and storage systems. This renewable energy offers flexible end-use because it can be delivered to consumers as green power, green heat or green transportation fuel. Direct-to-gas renewables are only one means of increasing renewable integration with the provincial economy. Renewable gas can also be generated from surplus renewable electricity with utility-scale electrolyzers. This power-to-gas solution converts surplus renewable power to hydrogen gas that can be injected into the natural gas infrastructure. Historically, pipelines would be a one-way flow of electrical energy from intermittent renewables, but using the power-to-gas solution Ontario's pipeline infrastructure can be integrated with the electricity grid for bidirectional energy flows to absorb and potentially store surplus power; or use the natural gas distribution system to move the energy to another location where it can then be used to generate electricity or heat on demand. The only new infrastructure required in the system is the electrolyz-



The term "Power-to-Gas" is used to describe the process of converting electrical energy into a gaseous form, making storage and transportation via the existing natural gas infrastructure possible, bridging the power grid with the gas grid.

er. With this addition the vast natural gas infrastructure can offer the electricity system a very large, distributed, energy storage network that can also transport energy from one area of the province to another while shifting the time between generation and end-use from hours, days or months.

Renewable natural gas (RNG), also known as bio-methane, is a high BTU gas with gas quality comparable to that of conventional natural gas, upgraded from biogas produced at landfills and anaerobic digesters on farms [1]. Biogas is produced from the breakdown of organic matter via anaerobic digestion. As long as the feedstock contains carbohydrates, proteins, fats, cellulose and hemicellulose as main components, any type of biomass can be used as feedstock to the production process: agricultural residues, cow, pig and chicken manure are but a few examples. The exact composition and methane yield of biogas depends on the feedstock composition, the digestion system used and the retention time. Biogas occurs naturally from municipal solid waste, wastewater treatment, animal waste and food processing residues through fermentation processes. Historically, the gas produced was either vented to the atmosphere or gathered and flared. In recent decades, as the energy content of biogas became appreciated (its methane content is about 50% to 60%), it was increasingly used as a fuel for on-site power generators, combined heat and power generators or dual fuel engines [2]. In addition to on-site use for power generation, upgraded biogas, renamed renewable natural gas because of its composition, can be transported and distributed through the existing natural gas network to end-users. Treatment is required to meet the quality requirements of different gas appliances, reduce risks to pipeline integrity and human health. Carbon dioxide—a significant gas by-product from fermentation—is removed, as are other impurities or contaminants. Germany, Sweden and Switzerland all have defined quality standards for biogas injection into the natural gas grid, typically the upgraded gas, named as RNG, must have a methane content of more than 95% [2]. In 2012, the Canadian Gas Association gathered a panel of contributors to publish informative, non-binding guidelines on the quality of the RNG that can be injected into existing natural gas and distribution systems [3]. The delivery and use of RNG compares favourably to conventional natural gas, because, over its lifetime, this fuel emits less greenhouse gas emissions, and the source of energy used is local and based on renewable biological processes. But, for the natural gas sector, policy directives that stipulate the share of energy to be supplied from low carbon sources, analogous to the Renewable Portfolio Standards (RPS) that exist for power generation, are not yet common in all jurisdictions. Therefore, most biogas produced is directed toward power generation instead of being upgraded to RNG. The price differential between natural gas and electricity, as manifested through the spark spread, has also contributed to this trend [1]. Even so, in Germany, the top biogas producer country in Europe, where 4000 agricultural biogas production units were placed on farms at the end of 2008, the share of RNG in natural gas fuel increased from 6% to more than 15% in the year 2012 [4]. In a 2011 report on potential production of RNG from waste in Ontario, it was estimated that, in the long term, up to 6% of Ontario's current residential, commercial and industrial consumption of natural gas can be met by RNG production within the province [5].



Utility-scale energy storage is a topic that has gathered significant research interest in the past decade, especially in jurisdictions where power grid reliability is tested, with a significant and rising share of intermittent renewable power generation. The inherited operating paradigm of the power grid is such that fluctuating power demand is met by adjusting the supply of power. Given that the output of renewable energy (RE) power generators, such as wind turbines and photovoltaic cells, cannot be readily dispatched, utility-scale energy storage has been proposed as a tool to maintain grid reliability at the required level, while enabling the integration of RE sources [6]. Acting as a dispatchable load and power generator, an energy storage facility can divert energy from the power grid during times of surplus – when wind power is plentiful, but the demand is low – and deliver energy to the power grid during the time of need, keeping the energy in storage in between. The energy storage technologies that are frequently reviewed and studied for such purposes include: pumped hydro, Compressed Air Energy Storage (CAES), various types of battery storage, including repurposed electric vehicle batteries, flywheels, advanced capacitors and superconducting magnetic energy storage (SMES) [7-12]. However, all these technologies have either high costs, durability issues, or low power storage densities.

The term "Power-to-Gas" is used to describe the process of converting electrical energy into a gaseous form, making storage and transportation via the existing natural gas infrastructure possible, bridging the power grid with the gas grid. It is a novel concept which emerged from Germany in the last four years, but before that, a wide array of similar processes was also proposed in Europe, under different names; NaturalHy (Using the Existing Natural Gas System for Hydrogen), Renewable Power Methane are two examples [13, 14]. In its current form, Power to Gas is a largely industry-led initiative; among its champions are large European utility companies such as E.ON, EnBW and GDF Suez [15]. Note that this technology is now being demonstrated by RH2-Werder/Kessin/Altentreptow (RH2-WKA) at a 140MW wind farm in the German municipality of Grapzow (Mecklenburg-Vorpommern District) and with a 1MW electrolysis system supplied by Hydrogenics. The system includes a 1MW Power-to-Gas system unit producing 210Nm3 of H2 per hour. There is the option to use the hydrogen in an internal combustion engine to produce electricity or be injected directly

Continued on page 24 ›

Continued from page 23 ›



By establishing adaptive energy ecosystems, where gas pipelines and electricity transmission are integrated for bi-directional energy flows and seasonal storage, the provincial energy market will achieve improved system operability, greater system efficiency, and an overall reduction in emissions.

into the local natural gas grid depending on operational needs. The hydrogen compression and storage system stores up to 27MW Hr-1 of energy and dramatically increases the overall efficiency of the wind park by tapping into wind energy which otherwise would be shed or lost because of the lack of electrical demand, as such there is significant saving of carbon dioxide each year.

In the first step of the Power to Gas process, electricity, especially surplus electricity from renewable sources, is used in electrolysis to produce hydrogen from water. This natural gas hydrogen mixture can be transported directly to customers where it can be used as a mixture.[16] Large-scale, industrial, electrolysis technology is critical for the true convergence of the natural gas and power grids. Electrolysis-based hydrogen storage technology brings with it unsurpassed energy storage capacity, timescale, and dynamic responsiveness for grid stabilization. Informational and control systems for power and gas grids can be networked to manage this energy flow from power to gas, and then from gas back to power when, and where, these energy conversions are most beneficial to the provincial power grids. A very limited number of academic publications have considered this concept [17-22]. In natural gas engines and natural gas turbines it is found that adding hydrogen to natural gas results in a cleaner, more efficient burn. The energy yield of the process increases, and emissions are generally reduced. Hydrogen assists the complete combustion of methane, decreasing unburned hydrocarbon and carbon monoxide emissions. Although in gas turbines, nitrogen oxide emissions may increase with the addition of hydrogen, they can be offset by adjusting reactor temperature and excess air ratio. It is found that excess air ratio also proves to be important in determining process efficiency and emissions. [22 - 24]. In a potential second scenario, carbon dioxide gas is captured from natural or industrial sources, in preparation for the next step. Then, hydrogen and methane are combined in a reactor to undergo catalytic methanation, in which methane and water are released. In the last stage of the process, the methane produced is injected into the natural gas network to be stored, and transported to users. This process would typically be considered where the renewable gas injection into the pipeline would exceed 10% by volume; however, today's technology costs and lower system efficiencies make this process more of a medium to long-term opportunity.

Large-scale, industrial, electrolysis technology is critical for the true convergence of the natural gas and power grids.

In a variant of the Power to Gas process, the electrolytic hydrogen is not used to produce synthetic methane; instead, it is directly injected into the natural gas network as an additive; the resulting mixture, hydrogen-enriched natural gas (HENG) can be used as natural gas, as long as the gas composition meets end-use appliances' requirements and does not threaten the structural integrity of network components. This direct hydrogen injection is appropriate where the renewable gas volumes are typically less than 10% by volume, and this process is preferred due to technological simplicity and higher system efficiencies (>85% conversion efficiencies). In another variant, hydrogen is kept separate from natural gas in a dedicated storage space and delivered to higher-value uses, before becoming mixed with natural gas in the gas grid. The Power to Gas concepts connect the two previous themes of Renewable Natural Gas and Energy Storage: in this concept, synthetic methane is produced from water and carbon dioxide using renewable power, making it a synthetic version of RNG; also, large-scale energy storage is achieved by storing excess power, in the form of synthetic methane, within the existing natural gas network. More interestingly, Power to Gas closes the loop between two critical and extensive infrastructures which are already closely coupled, through the wide use of gas-fired power generators. In addition to the benefits of renewable natural gas and large-scale energy storage, such bidirectional conversion between key energy vectors is expected to improve the utilization of assets in both energy networks and to increase supply reliability through supply redundancy. The challenge is two-fold. While initial market penetration of renewable gases can occur today, achieving the maximum system integration, renewable penetration levels, and consumer economics will require predictive system operability modeling to assess and plan, how the energy systems (gas and electricity) can be optimized for geography, time, and energy supply/demand mixes. Industry and technology developers can use research activities and results to define the techno-economic benefits of adaptive and integrated energy infrastructure that span both electricity and natural gas grids. There are still a number of technical issues to be investigated [25], but 'Power to Gas' is a technology that is ready for commercialization. With the development of polymer electrolyte membrane (PEM) electrolyzers there will become available even higher efficiencies and lower cost hydrogen.

By establishing adaptive energy ecosystems, where gas pipelines and electricity transmission are integrated for bidirectional energy flows and seasonal storage, the provincial energy market will achieve improved system operability, greater system efficiency, and an overall reduction in emissions. There is an expected significant reduction in



greenhouse gases, as CO2 free nuclear and wind power that is currently shed or sold at a deep discount will now be effectively used and emission reductions for Ontario validated. This will ultimately result in improved consumer economics through more efficient use of energy resources. The use of hydrogen blends in the natural gas combustion process has been shown to have air emission reduction benefits. Since much of the infrastructure already exists, there is only a modest capital investment required. The existing energy storage and distribution infrastructure is simply being used in new and adaptive ways. Ontario has all the key conditions and industrial expertise to deliver on this transformative convergence of infrastructure for smart-energy-grid renewables. Repurposing existing gas grid assets for new services such as energy storage for intermittent power has the potential to provide significant value to ratepayer benefits for both electricity and gas consumers.

References

1. Mintz, M. and J. Wegrzyn, Renewable Natural Gas: Current Status, Challenges, and Issues, in Clean Cities Strategy Workshop. 2009, Department of Energy.
2. Weiland, P., Biogas production: current state and perspectives. Applied Microbiology and Biotechnology, 2010. 85(4): p. 849-860.
3. Canadian Gas Association, Biomethane Guidelines for the Introduction of Biomethane into Existing Natural Gas Distribution and Transmission Systems, in Biomethane Task Force, Standing Committee on Operations, Editor. 2012.
4. German Energy Agency. Biomethane takes off. 2013 March 27th, 2013 [cited 2013 April 10th]; Press release: Share of biomethane in natural gas fuel has more than doubled since 2012]. Available from: http://www.dena.de/en/press-releases/pressemitteilungen/biomethan-auf-der-ueberholspur.html.
5. Abboud, S. and B. Scorfield, Potential Production of Renewable Natural Gas from Ontario Wastes. 2011, Alberta innovates Technology Futures.
6. Denholm, P., et al., The Role of Energy Storage with Renewable Electricity Generation. 2010, National Renewable Energy Laboratory.
7. Ribeiro, P.F., et al., Energy storage systems for advanced power applications. Proceedings of the IEEE, 2001. 89(12): p. 1744-1756.
8. Schaber, C., P. Mazza, and R. Hammerschlag, Utility-Scale Storage of Renewable Energy. The Electricity Journal, 2004. 17(6): p. 21-29.
9. Hadjipaschalis, I., A. Poullikkas, and V. Efthimiou, Overview of current and future energy storage technologies for electric power applications. Renewable and Sustainable Energy Reviews, 2008. 13(6-7): p. 1513-1522.
10. Oudalov, A., T. Buehler, and D. Chartouni. Utility Scale Applications of Energy Storage. in Energy 2030 Conference, 2008. ENERGY 2008. IEEE. 2008.
11. Electric Power Research Institute, Electricity Energy Storage Technology Options. 2010, Electric Power Research Institute: Palo Alto, CA.
12. Vazquez, S., et al., Energy Storage Systems for Transport and Grid Applications. Industrial Electronics, IEEE Transactions on, 2010. 57(12): p. 3881-3895.
13. NaturalHy, Using the Existing Natural Gas System for Hydrogen. 2009, European Commission's Sixth Framework Programme.
14. Sterner, M., Bioenergy and Renewable Power Methane in Integrated 100% Renewable Energy Systems. 2010: Kassel University Press GmbH.
15. German Energy Agency. Power to Gas: Partner. [Partner list for the German Power to Gas strategy platform] 2013 [cited 2013 April 10th]; Available from: http://www.powertogas.info/.
16. Entchev. E, Manning, M., Coyle, I., F.Szadkowski, J. Grayden, D. Kirk, M.Swinton "Optimization and Field Demonstration of a Hybrid Hydrogen Generator/High Efficiency Furnace System", International Journal of Hydrogen Energy, l34, 10, 4611-4616 (2009).
17. Schaber, C., Mazza, P., & Hammerschlag, R. (2004). Utility-scale storage of renewable energy. Electricity Journal, 17(6), 21-29.
18. Bajohr, S., Gotz, M., Graf, F., & Ortloff, F. (2011). Speicherung von regenerativ erzeugter elektrischer Energie in der Erdgasinfrastruktur
19. Taylor, J. B., Alderson, J. E. A., Kalyanam, K. M., Lyle, A. B., & Phillips, L. A. (1986). Technical and economic assessment of methods for the storage of large quantities of hydrogen. International Journal of Hydrogen Energy, 11(1), 5-22.
20. Carden, P. O., & Paterson, L. (1979). Physical, chemical and energy aspects of underground hydrogen storage. International Journal of Hydrogen Energy, 4(6), 559-569.
21. Schouten, J. A., Janssen-van Rosmalen, R., & Michels, J. P. J. (2006). Modeling hydrogen production for injection into the natural gas grid: Balance between production, demand and storage. International Journal of Hydrogen Energy, 31(12), 1698-1706.
22. Venter, R. D., & Pucher, G. (1997). Modelling of stationary bulk hydrogen storage systems. International Journal of Hydrogen Energy, 22(8), 791-798.
23. Ma, F. Wang, Y. Liu, H. Li, Y. Wang, J. Zhao, S.. (2007). Experimental study on thermal efficiency and emission characteristics of a lean burn hydrogen enriched natural gas engine. International Journal of Hydrogen Energy. 32, p1-9.
24. Termaath, C. Skolnik, E. Schefer, R. Keller, J.. (2006). Emissions reduction benefits from hydrogen addition to midsize gas turbine feedstocks. International Journal of Hydrogen Energy. 31, p1-12.
25. Melaina, M. W., Antonia, O., and Penev, M., Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues, Technical Report, NREL/TP-5600-51995, March 2013. ■

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LTE for Smart Grid Communication

The Canadian Outlook

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Communication infrastructure requirements for various smart grid applications are now well known and LTE cellular technology is being seriously considered by many utilities around the world due to its appealing cost, performance and sustainability benefits. While most utilities prefer to deploy their own communication infrastructure for security and performance guarantee reasons, Canadian utilities are currently investigating beneficial scenarios where LTE technology can be combined with the other already deployed broadband technologies. This article discusses the feasibility of using LTE technology for smart grid applications in current Canadian settings as well as the extended vision of sharing spectrum with the public safety band.

The term smart grid has been coined for a long time. According to the CEA (Canadian Electricity Association) [1], a smart grid is nothing but a modern electricity system which uses monitoring, sensors, communications, automation and computerized processes to improve reliability, efficiency, and flexibility. In essence, a smart grid is a set of intelligent information based applications made possible by increased automation of the electricity grid encompassed by underlying automation techniques.

This article is an overview of how LTE (Long Term Evolution) technology can be used as the communication infrastructure needed to support common smart grid applications significant to Canadian utilities. Moreover, it discusses the various networking scenarios that would involve LTE. The focus of this article will be on the grid's distribution network while most of the discussed facts will apply to the transport and generation scenarios (see Fig. 1).

Canadian utilities – today's reality

Canadian electricity companies are mainly hydroelectric followed by nuclear and then fuel based. This distinction plays a role on the smart grid applications that are most significant in Canada.

Smart grid applications– latency classification

The International Electrotechnical Commission (IEC) classifies smart grid application types based on their latency requirements. This classification is summarized in Table 1 [4]. This classification is used to select the viable communication media that are suitable for each type of application within and between substations. The applications requiring 10ms or less latency are better served with optical fiber media. The others can be served with broadband wireless technologies such as LTE.

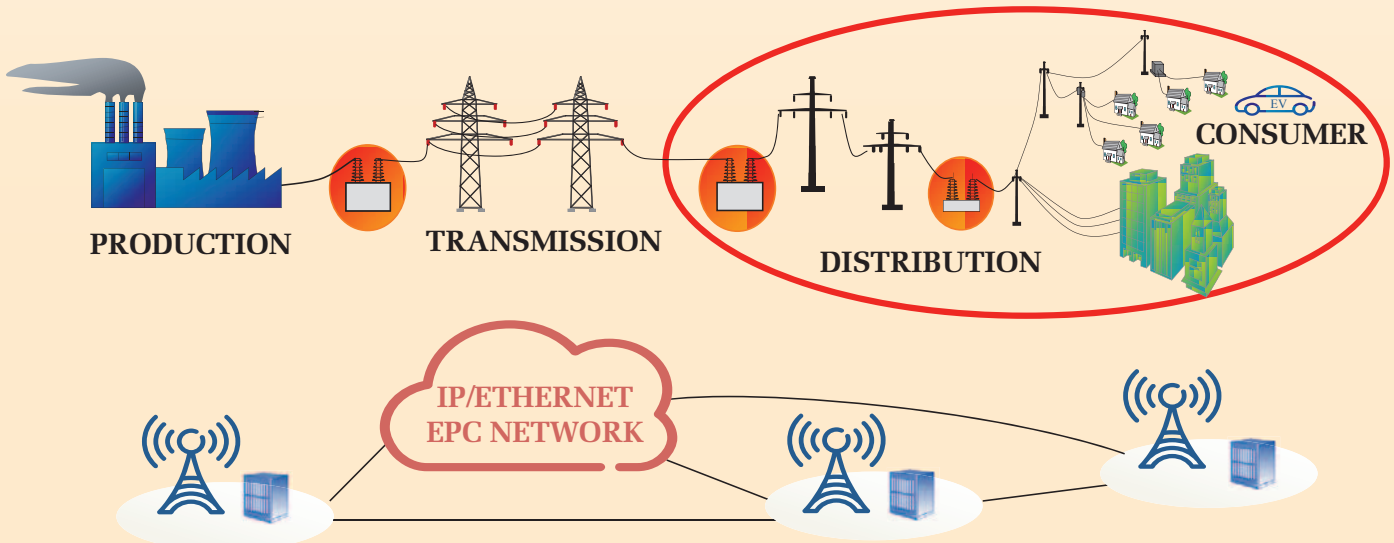

Fig. 1 Electrical grid sub-division and focus area

Fallback scenarios from private to public or public to private could be considered. This type of redundancy could be extremely useful and again will be enabled by multi operator SIM technologies.

Type/Application	Performance class	Latency Requirements
Type 1-Fast messages:		
Type 1A "trip":	P1 - P2/P3	10ms - 3ms
Type 1B "Others":	P1 - P2/P3	100ms – 20 ms
Type 2- Medium speed messages:		100ms
Type 3- Low speed messages:		500ms
Type 4- Raw data messages:	P1	10ms
Type 5- File transfer functions:		>=1000ms
Type 6- Time synchronization messages		Accuracy ±1ms or ±0.1ms

Table 1 IEC61850-5 Latency requirement classification for substation applications [4]

Based on this table the various transmission applications of smart grid can be mapped to the different types. On the other end, distribution applications, such as demand-response, asset use efficiency, and electrical vehicle applications transactions require 0.5 to 5 seconds latency. Others like DA (Distribution Automation), VVC (Volt-Var Control), fault location and distributed generation applications have transactions latency in the range of 0.1 to 60 seconds.

Characteristics of Canadian Utilities

More than 60% of Canadian production is hydroelectric [5]. This is an important factor to consider because some of the popular smart grid applications are not as critical for hydroelectric generation plants. Hydroelectric production can be more rapidly adjusted to fill the demand. The main smart grid use cases for the distribution network in Canada are AMI (Advanced Metering Infrastructure), distribution power loss reduction through VVC and improvement on the installed grid control and monitoring equipment to reduce outages duration, i.e. DA. The latency requirements of these applications make broadband wireless technologies very suitable from a cost/performance view point.

On another note, interoperability is a key requirement for Canadian utilities. Canadian utilities value for example the Interoperability Framework by the GridWise Architecture Council [3]. Other guiding bodies include, EPRI, IEC, NIST/SGIP and IEEE. LTE technology's interoperability and future proof properties are in line with Canadian utilities' inclination towards standard and interoperable technologies.

Current communication infrastructures

Canadian utilities currently use a range of communication technologies for various applications. These include optical communication, BPL (Broadband over Power Line), Satellite, Microwave, 900MHz wireless mesh, cellular 3G, mobile broadband LTE and WiMAX (Worldwide Interoperability for Microwave Access). These technologies are often selected depending on the range of applications they can cover as well as characteristics such as performance, cost, open standards and availability of equipment, in particular LTE UEs (User Equipment).

LTE Technology Possibilities and Promises

LTE is the latest 3GPP standard in use for mobile communication technology. The LTE initial standard is officially called by the 3GPP document Release 8. LTE's benefits include global standardization and future proofness, a secure ecosystem, rapid deployment with plug and play features, scalable bandwidth, simplified IP based architecture, multi-antenna support for a very low latency and QoS based (Quality of Service) and policy based traffic handling.

LTE supports peak data rates of 150Mbps downlink and 50Mbps uplink (in a 20MHz spectrum, although carriers of as low as 1.4 MHz, 3MHz, 5MHz, 10MHz and 15MHz are possible with LTE). Enhancements are achieved when advanced antenna technologies (e.g. MIMO) are used. An LTE cell can cover up to a 100 km area although best performance is achieved within a 30 km reach. LTE inherently supports interworking with existing 3GPP networks as well as non-3GPP networks (see Fig. 2).

The LTE's EPC (Evolved Packet Core) is a flat IP-based multi-access core network which makes it very suitable for interworking with, and migration from, existing technologies. The PDN-GW (Packet Data Network Gateway) can serve as such an interconnection point for 3GPP and non-3GPP access networks.

A list of further improvements of LTE is summarized in reference [2]. LTE-A or LTE-Advanced relates to Releases 10 and 11. LTE-A release 10 enhances the radio access technologies of LTE with the improved spectrum flexibility of carrier aggregation, enhanced multiple antenna transmission and relaying functionality allowing use of LTE as wireless backhaul media (as opposed to only network to UE media). LTE release 11 will include functionality for CoMP (Coordinated Multi Point) Tx/Rx for the deployment of low power network nodes under macro node coverage.

LTE release 12 and beyond is referred to as LTE-B and will address new use cases such as MTC (Machine-Type Communication) and NSPS (National Security and Public Safety) services. LTE-B will include further enhancements to multiple-antenna and CoMP technologies as well as advanced terminal receivers with always-on signals. The benefits are expected not only for macro deployments, but also for deployments with low power nodes. LTE-B will address device to device (D2D) discovery and communication, a feature highly anticipated for national safety as well as smart grid applications.

LTE for Canadian Utilities

In Canada, like many other countries, smart grid deployments included other broadband technologies (i.e. pre-LTE era technologies). To face this reality, LTE technology can be introduced in three deployment scenarios, one being a private LTE network, another using operator owned public LTE networks and a third one, and the most desirable one, being a shared network scenario with public safety LTE deployments.

Private LTE network

In this scenario, the utility company will be in charge of deploying and operating its own LTE network. This has the advantage of full network control and access to configuration parameters. Private deployments are favored for reasons of robustness and availability,

Continued on page 28 ›

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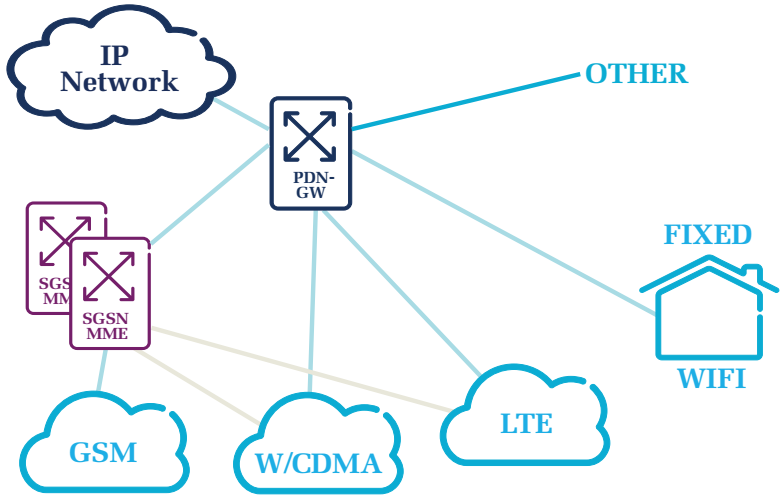

Fig. 2 EPC inter-working with various access networks.

which are not yet explicitly available in current public SLAs. This comes at the greatest cost of green field deployment and spectrum acquisition as well as considerable network under-utilization. The former is less of a problem when it comes to base station site acquisition as utilities have thorough infrastructure that can be leveraged for this mean. This type of deployment can inter-operate with existing infrastructures (e.g. WiMAX). In such an example, the WiMAX's ASN-GW (Access Service Network Gateway) can be interconnected to the EPC's PDN-WG, with possible interconnection to the EPC's PCRF as well.

even more common in the near future by allowing for multi operator SIM support. Currently the biggest concern of utilities with public network operators is the service availability, as well as lack of differentiated SLA for M2M type applications and corresponding QoS configuration, although the technology is available.

A variant of this scenario is a mix of private and public deployment. Fallback scenarios from private to public or public to private could be considered. This type of redundancy could be extremely useful and again will be enabled by multi operator SIM technologies.

LTE technology can be introduced in three deployment scenarios, one being a private LTE network, another using operator owned public LTE networks and a third one, and the most desirable one, being a shared network scenario with public safety LTE deployments.

Public LTE network

This scenario seems like the most reasonable one for Canadian utilities in the short run. Certainly less critical smart grid applications could be supported by public operator LTE networks. An example would be the AMI infrastructures where the primary requirement is the periodic relay of meter readings from collectors to the back office. New, more time critical, applications could be developed as operators offer new SLA's for specific M2M use cases and/or as the utilities migrate towards their own private LTE network. Soft SIM (Subscriber Identity Module) technology will make such transitions

Private Virtual Network Operator (PVNO)

This scenario is one of the most promising ones as a follow through with scenario B. A PVNO is nothing but an adaptation of an MVNO (Mobile Virtual Network Operator) for private use. Like MVNOs, a PVNO does not have a mobile license or mobile infrastructure, but has its own HSS (Home Subscriber Server), SIM/IMSI (International Mobile Subscriber Identity) range, billing system and core network which gives a large degree of control and management of resources. A PVNO deployment often avoids SIM lock-in by making use of embedded SIM concepts. A PVNO eliminates security and authentication issues as both SIM and HSS belong to the PVNO. Moreover, using multiple networks will provide redundancy and a more reliable PVNO. Utilities can deploy and manage their own PVNO or request the services of a PVNO service provider.

Semi-private LTE network shared with Public Safety

This last scenario is being touted in general in the United States where the public safety departments have been granted a block of 20MHz within the 700MHz band but there are currently issues with deployment costs of an LTE based Public Safety Network. One very beneficial scenario would be the split of the cost and network between utilities and first order public safeties. This is a logical strategy that could leverage on utilities' widespread grid infrastructure where substations, high voltage line towers and poles can be strategically used as base station sites. The other gain for utilities would be the avoidance of bidding on LTE spectrum or waiting for future government allocations.

LTE – Desired Enhancements

As discussed in Section II.A, current LTE performance is suitable for most smart grid applications not related to grid protection. To reach the next class of latency would be improbable by any mobile broadband technology. Despite this, improving LTE latency could provide a margin and anticipate future applications in a new latency class not yet determined.

Causes of latency in LTE networks include

- The idle to connected stated delay.
- Random access delay
- Scheduling and HARQ (Hybrid Automatic Repeat Request) retransmissions
- Latency introduced by the UE
- Non-differentiation of traffic

Delay improvement can be achieved either by configuration (e.g. use of proprietary QoS class profiles), or may require changes to the 3GPP standards. This usually comes with cost, such as increased power consumption at the UE, underutilization of resources and increased complexity.

There are other architectural changes that could improve latency and be more suitable for smart grid deployment, like colocating the P-GW and S-GW.



The true concern in Canada is the deployment scenario of choice which varies between using a public infrastructure and PVNO concepts, or the potential of network sharing with the public safety's upcoming infrastructure in the 700 MHz band.



Finally end user equipment for smart grid applications needs to focus on latency criteria and ruggedness. While the market for such UEs was initially slow there are a number of UEs being currently advertised. Many smart grid applications rely on Ethernet connectivity creating the need for LTE UEs to offer Ethernet connectivity on the client side. LTE UEs can also be enhanced to noticeably improve latency.

This paper sheds light on the Canadian perspective of using LTE technology for smart grid applications. Overall LTE technology is sufficient for most of the current applications. With upcoming enhancements LTE will be even more suitable for MTC and future smart grid applications. The true concern in Canada is the deployment scenario of choice which varies between using a public infrastructure and PVNO concepts, or the potential of network sharing with the public safety's upcoming infrastructure in the 700 MHz band.

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References

1. Canadian Electricity Association. (2010). The smart grid: a pragmatic approach, A 'state-of-play' discussion paper presented by the Canadian Electricity Association. Retrieved February 22, 2012. Available: http://www.electricity.ca/media/SmartGrid/SmartGridpaperEN.pdf.

2. Ericsson Whitepaper, "LTE Release 12-Taking another step toward the networked society", January 2013, Accessed May 2013, Available: http://www.ericsson.com/res/docs/whitepapers/wp-lte-release-12.pdf.

3. GridWise Architecture Council, "GridWise Interoperability Context-Setting Framework", July 2007, Available: http://www.gridwiseac.org/pdfs/interopframework_v1.pdf.

4. IEC61850-5, Communication networks and systems in substations, Part 5: Communication requirements for functions and device models. Available: http://www.iec.ch.

5. Statistics Canada, Table 127-0002 - Electric power generation, by class of electricity producer, Ottawa: Statistics Canada, retrieved 2013-04-26, Available: http://www5.statcan.gc.ca/cansim/a47 ■

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SMART Power Flow Controller

Kalyan K. Sen
Senior Member, IEEE

SMART power flow controller (SPFC) enhances the controllability in an electric power transmission system by using functional requirements and cost-effective solutions. If the requirement is to reduce the reactive power flow in a transmission line within a permissible limit and increase active power flow to the line's thermal limit, SPFC controls the flows of active power and reactive power in a line independently. Reduction of reactive power flow reduces losses in a transmission line, thus increasing the system's efficiency. If the requirement is to avoid grid congestion, SPFC redirects the excess power flow from an overloaded line to underloaded lines, instead of tripping the overloaded line when the power flow is needed the most. If the requirement is not to trip an overloaded line in order to avoid a possible cascaded failure and a blackout, SPFC limits the power flow in the overloaded line.

Advances in power electronics have made it possible to control the flows of active power and reactive power independently in an electric transmission line as shown in Fig. 1. An independent power flow controller redirects power flow through the desired transmission path that is otherwise underloaded or overloaded due to free flow of power.

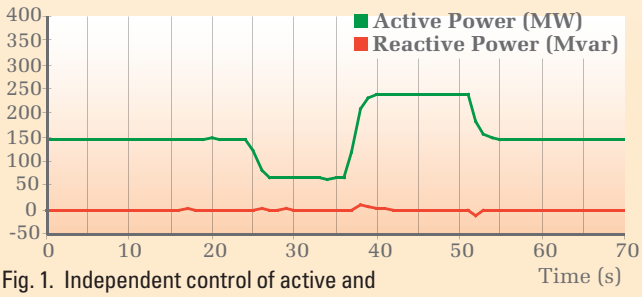


Fig. 1. Independent control of active and reactive powers in a 138-kV transmission line.

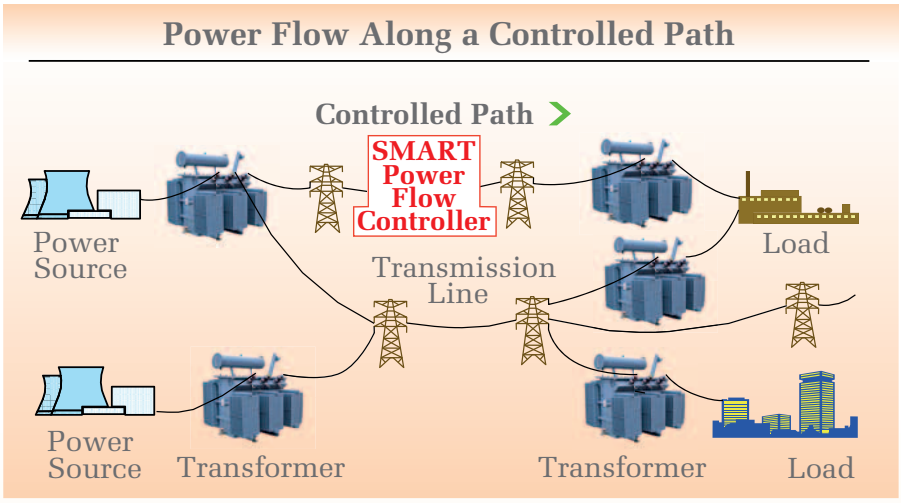
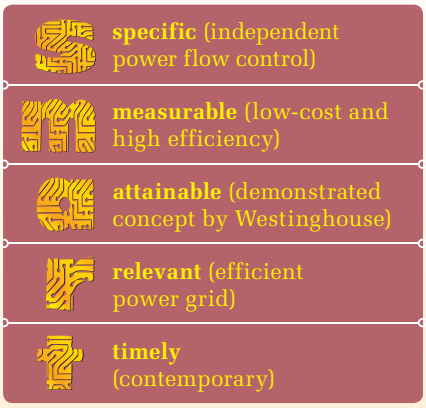


Fig. 2. Power flow along a controlled path.



The power electronics-based power flow controller, such as Unified Power Flow Controller (UPFC) is capable of providing responses in the range of milliseconds; however, the experiences from the last two decades show that the needed response time is in seconds in most utility applications as shown in Fig. 1. Therefore, it is desirable to redesign the independent power flow controller that meets the functional requirements to provide responses in seconds, which will reduce the cost to a fractional amount of the cost of power electronics-based solutions. This was the motivation to develop a SMART power flow controller whose objectives are as follows. [2]

SMART power flow controller

A SPFC, shown in Fig. 2, modifies the effective impedance (both resistance and reactance) of the transmission line between its two ends, which results in an independent control of active and reactive power flows in the line so that the useful active power flow is maximized while the less desirable reactive power flow is minimized in the controlled path.

Independent control of active and reactive power flows leads to:

- **reduction** in reactive power flow, resulting in a reduction of losses in generators, transformers, and transmission lines, which increases the overall system's efficiency
- **freeing up** the generators, transformers, and transmission lines to carry more active power

- **power flow** through the desired transmission paths that have high impedances, low power flow, and low line utilization
- **avoidance** of grid congestion by redirecting excess power flow from an overloaded line to underloaded lines, instead of tripping the overloaded line when power flow is needed the most
- **delayed** construction of new, expensive, high-voltage electric transmission lines.

The objective of this paper is to present the highlights of a SPFC that is a new technology and offers essential features, such as:

- **high reliability** with the lowest number of components that are free from becoming obsolete
- **fast enough** response for utility applications
- **easy relocation** to wherever it is needed the most, since the need for power flow control may change with time due to new generation, load, and so on
- **lowest installation** and operating costs with the highest efficiency
- **interoperability** so that components from various suppliers can be used, resulting in a global manufacturing standard, ease of maintenance, and ultimately lower cost to consumers.

Sen Transformer

The Sen Transformer (ST), shown in Fig. 3, can be designed to meet the objectives of a SPFC and the requirements to provide an independent power flow control at the lowest price. The ST consists of three primary windings that are Y-connected and placed on each limb of a three-limb, single-core transformer. As the primary voltage is applied, three induced voltages from three windings, on the secondary side, that are placed on three different limbs are combined, through series connection of the associated windings, to produce the compensating voltage (Vs's) for each phase. The number of active turns in the three windings can be varied with the use of load tap changers (LTCs). As a result, the composite voltage becomes variable in magnitude and variable in phase angle in the range of 0º and 360º, which is the key to an independent control of active and reactive power flows in a transmission line.

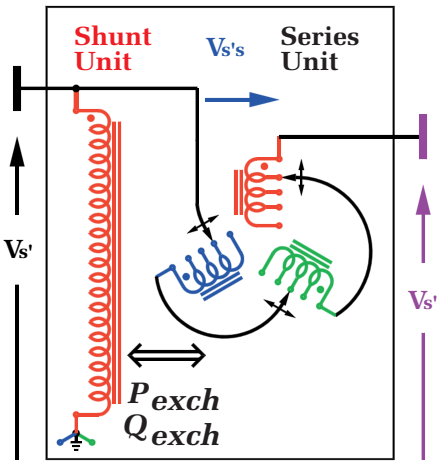


Fig. 3. Sen Transformer.

The simulated transient responses of active and reactive powers (Pr and Qr) in a transmission line due to the use of ST and the power electronics-based solution (UPFC) are superimposed and shown in Fig. 4. The natural power flows until t = 5 s. A series-connected compensating voltage (Vs's) of magnitude 0.2 pu is applied at a phase angle (b) of 300° at t = 5 s and 240° at t = 14 s. While keeping the phase angle at 240°, the magnitude of the compensating voltage is increased to 0.4 pu at t = 23 s. The line power due to the application of the UPFC is changed smoothly where as that due to the application of the ST is changed in multiple steps.

The merit of the ST is that it allows an independent control of active and reactive power flows in the line, similar to the UPFC. The UPFC can offer faster response (in ms at a given constant line impedance), but this capability cannot be utilized, as shown in Fig. 1, in order to assure continued operation under contingencies. In most utility applications in which the fast response is not required, the ST presents an economically attractive solution for power flow enhancement when compared with the UPFC, which has higher installation and operating costs than ST.

The power industry is in constant search for the most economic way to transfer bulk power along a desired path. This can only be achieved with the use of an independent power flow controller. Although the power electronics-based power flow controllers are capable of providing responses in the range of milliseconds, the experiences from the last two decades show that the needed response time is in seconds in most utility applications. A new concept in power flow control that is reliable, efficient, cost-effective, free from component obsolescence, portable, and based on proven technology should be exploited to meet today's utility's power flow control needs.

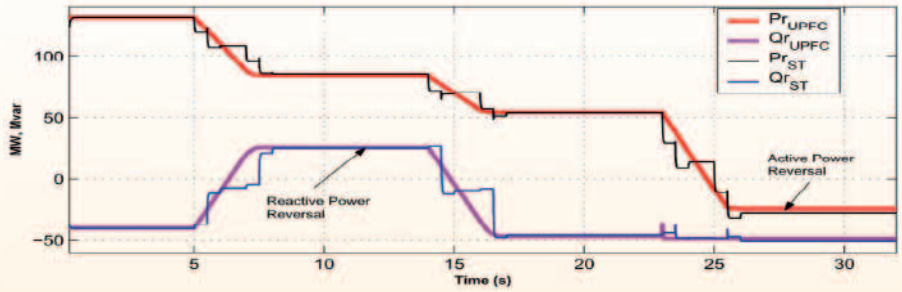


Fig. 4. ST simulation results superimposed with the results from power electronics-based solution (Faruque & Dinavahi-2007).

Reference

[1] K. K. Sen and M. L. Sen, *Introduction to FACTS Controllers, Theory, Modeling, and Applications*, Wiley & Sons and IEEE Press, 2009.

[2] M. L. Sen and K. K. Sen, *Introducing the SMART Power Flow Controller - An Integral Part of Smart Grid*, 2012 Electrical Power and Energy Conference, October, 2012, London, Ontario. ■

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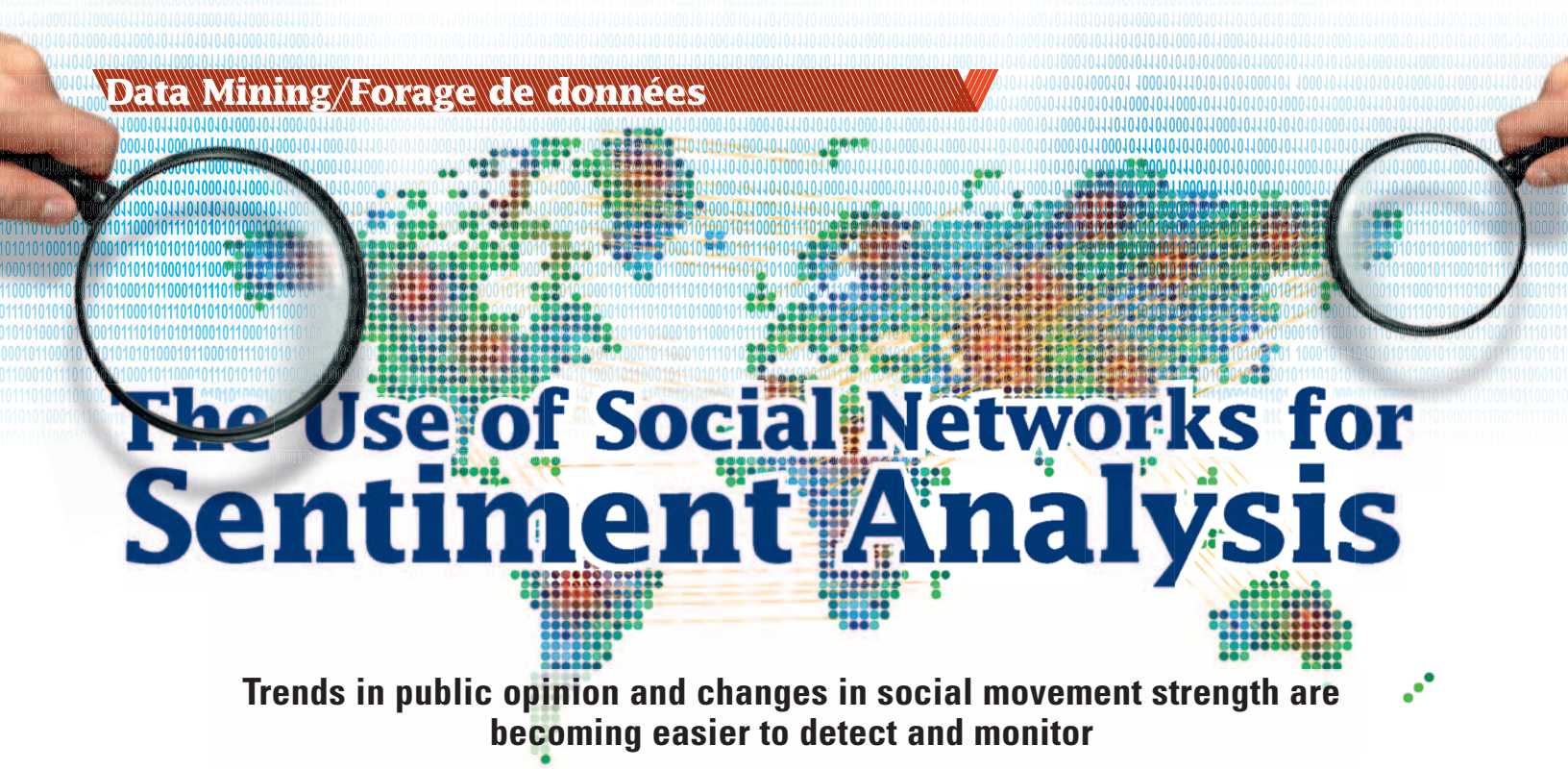

The Use of Social Networks for Sentiment Analysis

Trends in public opinion and changes in social movement strength are becoming easier to detect and monitor

Yasser Morgan and **Abdul Bais**
University of Regina

During the last four years, social networking has been used to influence political and social change in various parts of the world. The spreading use of digital social networking went through North Africa, the Middle-East, UK, France, and even Montreal. Governments and corporations alike started to feel the need to measure factors influencing social mode that are commonly hard to capture by computer algorithms. Analysis of emotional temperature by monitoring Facebook and Twitter postings or by analyzing mobile phone traffic between particular groups requires different types of algorithms compared to typical computer science analytical approaches.

Sentiment Sensing

One classical approach is to predict the inevitable clash of people in drought situations for example. Dr. Revilla, a professor of computational social sciences at George-Mason University of Virginia, has developed a tool called Riftland for the US Navy [1,2]. Riftland focuses on the area in east Africa that includes Somalia, Ethiopia, Rwanda, Uganda, and Congo, an area that has been the scene for civil unrest for quite some time. Riftland collects data from academics, government agencies, and even charitable organizations, to identify where nomadic tribes will go and whom they may clash with at times of drought or unrest.

For instance, the Riftland model would expect tribes that own radios or mobile phones to steer away from roads during war or civil unrest, but do the opposite during drought season. With a little help from satellite data combined with a good knowledge base of tribal hostility, a quantitative system of tribal favours can be developed. Favours can be exchanged at times of austerity. One can imagine that Dr. Revilla's tool can be tweaked to model other areas of the world. However, the force binding tribal members to a common behavior is much stronger than the force binding young men on the streets of Paris for example.

Since modern uprisings have used Twitter and Facebook, it makes sense to dig through both. Germany's largest political party, the Christian Democratic Union consulted Dr. Gloor of the Massachusetts Institute of Technology to apply data mining techniques on Facebook and Twitter aiming at sentiment analysis. The bigger objective is to evaluate and predict how and when protests will evolve. Dr. Gloor developed a tool called Condor that classifies participants by their clout [3,4]. For instance, an influential twitter user is the one who has many users, but follows few people. If an algorithm similar to Google's page ranking approach is applied, we can analyze Twitter users by ranking them. An interesting finding is the language used by top-ranked users which includes bold phrases like "great", "hilarious", or "disgusting". Bold language sways followers. While positive optimistic tweets heat-up a social movement, negative tweets can be used as an indication of diminishing esteem and burn-out. If tweets like idiots, lame, and never are coming from lead users, an easy prediction of dissolving protests can be made. If similar negative tweets are exchanged within the same clout, it is a sure indication of a dead movement.

Measures used by the Condor system cannot be extended across cultures due to the different use of language and little has been done to identify whether the positive and negative phrase indicators can be used across cultures or the entire process needs to be rethought [5]. Further, the Condor sensing of public sentiment is a slow detector. By the time influential users are using bold phrases, the demonstration is probably on its way to the street. Yet Condor remains a good tool for shorter term predictions and to monitor the evolution of existing protests.

E-MEME (Epidemiological Modeling of the Evolution of MEssages) is another sentiment analysis tool that expands the focus to the entire population [6]. To achieve that, data are extracted from the news to evaluate the predisposition of particular parts of the populace to certain ideas. E-MEME would have predicted the public outrage in Egypt over a border incident with Israel and could predict the effect of drought on different parts of a state.

A far more complex system developed by Lockheed-Martin is called W-ICEWS (World Integrated Crises Early Warning System) [7,8]. W-ICEWS is a social radar tool that can crunch great quantities of data from digital news media, blogs and websites, in addition to intelligence and diplomatic reports providing W-ICEWS with the ability to forecast riots, rebellions, coups, economic crises, government crackdowns and international wars months in advance [8].

An interesting feature of W-ICEWS is its ability to entertain what-if scenarios. By that, it provides the American government with a tool to influence the future, not only predict it, based on educated guesses. While, the wide multitude of influencing parameters can lead events to evolve differently than expected, W-ICEWS is our best political sentiment analysis tool developed yet.

Current systems are still vulnerable to opinion spam. User diversion from common language, the use of sarcastic language, and the spontaneous creation of new language terms have been hard to detect and analyze.

Perhaps the best news in the area is the launching of the IARPA (Intelligence Advanced Research Projects Activity) almost a year ago [9]. IARPA is an open-source application that has the potential to change our research landscape more than any other tool. The flexibility of IARPA allows programmers to customize it to analyze anything whether it is the roadside traffic cameras or the particular Wikipedia search pages that are growing in popularity, it provides social and computing researchers with newer tools in a way that was never available before.

Business Intelligence

Business corporations have been trying to extract intelligence from social networks with multiple objectives. The most direct objective is to improve business links to customers or to develop increasing loyalty as well as discovering new customers by focusing on the right demographic. But perhaps the most vital is the discovery of new business opportunities. Ambitious research is evolving even towards predicting the market value of a particular stock by analyzing the collective sentiment on that stock on the web.

In 2010 Dr. Chen from the University of Arizona analyzed the sentiment towards WalMart stock between 1999 and 2008 [10]. He presented correlation between growing disagreement and decreasing objectivity on one side and volatility on the other. Similarly low disagreements and high levels of objectivity led to higher stock volatility. In particular, sentiments of disagreement were followed by an increase in trading volume while higher levels of objectivity indicated suppressed trading volume. This analysis shows the importance of breaking down sentiment into discrete indicators. Surprisingly, efforts to influence forum participants were followed by a more conservative market. Shareholders were more likely to hold, buyers were more likely to postpone leading to a more conservative market. Generally, positive sentiments on the Web forum were correlated to lower trading volume while negative sentiment induces trading activities as shareholders defect.

Another interesting application is the prediction of movie sales by mining online reviews since these reviews, collectively, reflect the wisdom-of-crowds. It is important to realize that sentiment analysis goes beyond analyzing the volume reviews or the relevant links structures. Yu et.al presented a model that used probabilistic analysis for the reviews sentiment combined with a quality predictions model of reviews in the absence of readily available quality indicators [11]. It is possible to improve the outcome by focusing on the actionable knowledge. In all cases predicting quantifiable sales performance can be based on an artificial learning algorithm.

Conclusion

While sentiment analysis has gone beyond experimental levels into providing tangible outcomes, current research falls short of satisfying the ambitious expectations. For example, on opinion classification, there are many conceptual rules that measure opinions, and there are even more expressions (possibly unlimited) that can convey these concepts. This leads to the question of sentiment analysis accuracy of the current algorithms. To improve accuracy, systems need to include fairly large amounts of data to confirm the compliance to a certain prediction rule. But to benchmark the same rule, data needs to cover a large number of domains because a system that does well in one domain might not do well in another, as opinions in different domains can be expressed so differently.

Finally, we need to acknowledge that a completely automated system is nowhere in sight. Current systems are still vulnerable to opinion spam. User diversion from common language, the use of sarcastic language, and the spontaneous creation of new language terms have been hard to detect and analyze. Consequently, sentiment analysis systems are expected to remain captive to manual intervention, for the foreseeable future at least. Due to the real substantial need imposed by governments and industry alike, sentiment analysis is poised to remain vibrant and alive for years to come.

References:

[1] C-R. Claudio et al., "MASON RiftLand: An Agent-Based Model for Analyzing Conflict, Disasters, and Humanitarian Crises in East Africa," in Agent-Based Models and Geographical Systems: Policy Modelling, 57th Annual Meeting of the Association of American Geographers, New York, 2012.

[2] T. Gulden, J. F. Harrison, and A. T. Crooks, "Modeling Cities and Displacement through an Agent- based Spatial Interaction Model," in Proceedings of the Annual Conference of Computational Social Science Society of America, Santa Fe, NM, 2011.

[3] Intelligent Collaborative Knowledge Networks (ICKN). (2012, June) Condor. [Online]. http://www.ickn.org/condor.html

[4] F. Grippaa, M. Palazzolo, J. Bucuvalas, and Peter G., "Monitoring Changes in the Social Network Structure of Clinical Care Teams Resulting from Team Development Efforts," in Proceedings of the 3rd International Conference on Collaborative Innovation Networks (COINs), Basel, Switzerland, 2011.

[5] Hui-Hsin Wu, A.C.-R. Tsai, R.T.-H. Tsai, and J.Y.-J. Hsu, "Sentiment Value Propagation for an Integral Sentiment Dictionary Based on Commonsense Knowledge," in Proceedings of the International Conference on Technologies and Applications of Artificial Intelligence, 2011, pp. 75-81.

[6] APTIMA. (2012, June) Aptima Develops E-MEME (the Epidemiological Modeling of the Evolution of MEssages) to Track Infectiousness of Ideas across Groups and Geography. [Online]. http://www.aptima.com/news/2012/aptima-develops-e-meme-track-infectiousness-ideas-across-groups-and-geography

[7] DARPA. (2012, June) INTEGRATED CRISIS EARLY WARNING SYSTEM (ICEWS). [Online]. http://www.darpa.mil/Our_Work/I2O/Programs/Integrated_Crisis_Early_Warning_System_(ICEWS).aspx

[8] The Economist. (2012, April) What makes heroic strife. [Online]. http://www.economist.com/node/21553006?goback=%2Egde_2550249_member_110608062

[9] IARPA. (2012, June) Intelligence Advanced Research Projects Activity. [Online]. http://www.iarpa.gov/organization.html

[10] H. Chen and D. Zimbra, "AI and Opinion Mining," IEEE Intelligent Systems, vol. 25, no. 3, pp. 74-80, May-June 2010.

[11] X. Yu, Y. Liu, J. X- Huang, and A. An, "Mining Online Reviews for Predicting Sales Performance: A Case Study in the Movie Domain," IEEE Transactions on Knowledge and Data Engineering, vol. 24, no. 4, pp. 720-734, April 2012. ■

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Green Mountain:
new life for an old site

By **Jon Rokne**

Wars and conflicts, hot or cold, old or new. have a tendency to leave behind monumental installations. The Maginot Line from World War 1 [1], Dora in Trondheim, Norway [2], and the Flackturme of Vienna [3] offer three relatively recent examples while Hadrian's Wall and the Great Wall of China are two that have endured over the centuries. Other than tourist interest they no longer serve a practical purpose in the modern world.

This last summer (June, 2013) I was introduced to a conflict installation that has taken on a new role: Green Mountain Data Centre [4]. While attending the EU-China-North America Workshop on HPC Cloud and Big Data in Stavanger, Norway I attended a presentation on data storage by Knut Molaug, CEO for the Green Mountain Data Centre. It was an intriguing presentation about a site that sparks the imagination.

In 1964, at the height of the Cold War, the North Atlantic Fleet Arm of NATO needed a secure location for nuclear torpedoes to be stored and loaded covertly onto waiting submarines. The Rennesy Island north of Stavanger, Norway, was deemed to be the ideal site. Its seaward side protected from Atlantic storms by a scatter of small outer islands made for a safe harbor, while near shore depths of approximately one hundred meters gave the submarines easy access. An exclusion zone had been established seawards since the Norwegian Navy already had some installations on the island. The site was inaccessible to outsiders.

Following an agreement with the Norwegian government work on the storage facilities was begun. The work was conducted in great secrecy. With only a small access road leading to the site even the local population of the island had no inkling of the site's purpose. The facility project was ready for use in 1966.

The storage facility was constructed inside three parallel tunnels drilled 300 meters into solid granite bedrock. A freestanding building two stories high, 135 meters long and 20 meters wide was constructed in each of these tunnels. Some twenty years later another three tunnels were added making a total of six such tunnels.



Administration building. Quay and facility entry can be seen on the left side of the picture.*

As the years of cold war tension rose and fell the site's uses changed. At one point a complete field hospital was stored there. Though always well maintained and not subject to above ground depredations the old NATO site eventually fell into disuse. It was sold to the local authority in 2009.

Meanwhile a new world order was emerging that made demands of its own. Information technology, propelled by the widespread use of Internet and Internet enabled activities, created global demands for computing cycles and safe storage of data.

Information technology and connectedness are now an integral part of how modern society communicates. Certain sections of communications data, say from research facilities, government or industry, must necessarily be available and stored with a high degree of reliability while also being physically secure. Basic requirements for maintaining a constant quality of high level protection include: ample physical and data storage space, efficient cooling, inexpensive power, and effective security. The modern information industry does not need submarines armed with torpedoes to maintain safety but it still requires locations that offer a high degree of security. The old NATO site was a database storage facility in waiting.



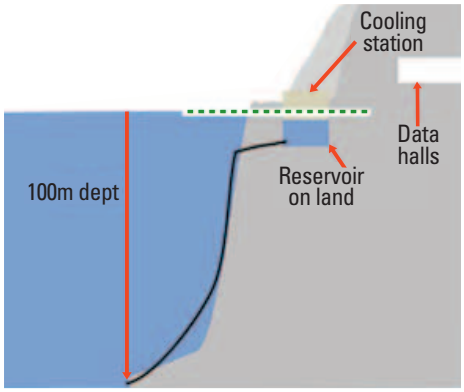
An interior view from the cooling station where the seawater cools the water in the facility (one of two independent systems).*

Seeing this potential, Smedvig [5], a wholly owned former shipping company, acquired a lease on the decommissioned NATO site from the local authority with the intention of creating an environmentally responsible 'green' database storage centre.

Smedvig is currently adding further refinements to the site with plans of renting space where customers install their own equipment.

Now named Green Mountain Data Centre, it has three independent underground power feeds from a local utility consortium's (green) water sources. Fire risk has been reduced by lowering oxygen levels and it has redundant standby generators capable of powering the complete installation. As well, it is noted that the site's natural low seismic risk and protection from electromagnetic pulses are added safety features.

A new combined seawater intake, power switching and transforming station has been constructed outside the main facility. Equipment can be cooled using seawater at a temperature of eight degrees Celsius year round. All of the equipment is twinned to obtain a 99.99997% up time. The schematic below from [4] shows the layout of the cooling system.





The interior hallway of one of the buildings.



View into the telecommunications room.

Following Dr Molaug's excellent presentation some conference attendees were invited to visit the site. What followed was fascinating adventure into the heart of a mountain that conjured up my Norwegian childhood memories of trolls and their magic realms.

Electricity is supplied by two independent feeds at 220KV. In addition there is emergency power available provided by a set of Perkins diesel powered generators. Due to the distance from the substation with the generators and the step-down transformers the supply cables to the interior of the mountain still run at 2.2KV to minimize transmission losses.

Following the tour of the external buildings we proceeded to the main facilities located inside the mountain. Knut Molaug had access to this part of the facility through a biometric scanner located about 200 meters inside the mountain. From the inside he opened a massive blast door, an inheritance left from the military past. It was about 9 by 14 feet of two foot thick concrete moving slowly on a track. As we entered we were reminded that the air inside had reduced oxygen as a precaution against catastrophic fires.

We walked through the halls on both levels. Everywhere there were remains of the original purpose of the installation being removed and upgraded to house modern computation and data storage installations.

After our intriguing visit into the heart of Green Mountain we got out into the daylight. This time the trolls let us go.

The tour of the facility gave us an insight into the workings of a modern data storage facility that embodies all of the current criteria of such a facility: remote, efficient, secure and reliable. Other facilities exist, but most do not fulfill the criteria as fully as Green Mountain.

All of us were impressed with the facility and we were thankful that Knut Molaug took the time to give us such an interesting tour of a modern data center. ■

References

[1] http://lostimagesofww2.com/photos/places/maginot-line.php

[2] http://www.battlefieldsww2.com/Dora_Trondheim.html

[3] http://www.tourmycountry.com/austria/flak-towers-vienna.htm

[4] http://greenmountain.no*

[5] http://smedvig.no

Paradigm Shift *Continued from page 19* ›

To realize that vision, significant research in new and innovative substation command and control, and data collection and decision support systems would be required. In particular, an environment is required to develop the following technologies:

- **Development of Intelligent Optimization and Conservation Systems for Efficient Delivery of Services to Consumers**
- **Development of Command & Control Technologies for Substations operating as an Energy Hub**
- **Development of reliable communication technologies, protocols and systems to enable end-to-end integration of the utility system, from source to socket, supporting energy transactions between all stakeholders in the utility network. Stakeholders who could be consumers, as well as producers of energy.**

It is time for Canadian technologists, engineers, utilities and researchers to work together and begin the process of developing the blueprint for Canada's future Smart Grid; a modern, resilient and reliable Grid, capable of supporting our country's diverse geography, economy and urbanization patterns.

Suggested Readings

1. US Dept of Energy, "Application of Automated Controls for Voltage and Reactive Power management", Final Report, Dec 2012.
2. US Dept of Energy, "Visioning the 21st Century Electricity Industry: Strategies and Outcomes for America", Feb 2012
3. Maryam Nasri, Hassan Farhangi, Ali Palizban and Mehrdad Moallem, "Application of Intelligent Agents in Smart Grids for Volt/VAR Optimization and Conservation Voltage Reduction", Submitted to: IEEE Canada Electrical Power and Energy Conference, London, Ontario, Oct 2012
4. Moein Manbachi, Hassan Farhangi, Ali Palizban and Siamak Arzanpour, "Real-Time Adaptive Optimization Engine Algorithm for Integrated Volt/VAr Optimization and Conservation Voltage Reduction of Smart Microgrids", submitted to CIGRÉ Canada Conference, Montreal, Sept 2012
5. Hassan Farhangi, Chapter on "Smart Grid and ICT's Role in its evolution", Green Communications: Theoretical Fundamentals, Algorithms and Applications, Published:September 20, 2012 by CRC Press, edited by Jinsong Wu; Sundeep Rangan; Honggang Zhang
6. Giuseppe Stanciulescu, Hassan Farhangi, Ali Palizban and Nikola Stanchev, "Communication Technologies for Smart Microgrid", IEEE PES Conference, Washington DC, Jan 2012
7. Moein Manbachi, Maryam Nasri, Babak Shahabi, Hassan Farhangi, Ali Palizban, Siamak Arzanpour, Mehrdad Moallem and Daniel C. Lee ,"Real-Time Adaptive VVO/CVR Topology Using Multi Agent System and IEC 61850-Based Communication Protocol", Publication pending in IEEE Transactions on Sustainable Energy. ■







Engineering Advocacy

By **Terrance Malkinson**

The IEEE, through the diversity of its societies, councils and members, through its body of knowledge, through its well-researched standards, and through advanced emerging knowledge, has and must continue to advocate aggressively on responsible public and private development. The recent flood in Western Canada is but one case of the many environmental and infrastructure catastrophes occurring with increasing frequency globally. In the case of the flood the response of many is to conveniently blame it on climate change. But was this really the cause? Is climate change the result of human activity and if so is the real etiology congruent with popular thinking? Engineers are in the best position to authoritatively answer these questions and advise governments.

Environmental concerns are often only enforced when they do not interfere with business interests. An example might be a national company whose management discontinued supplying plastic bags for its customers at check-out for very valid environmentally responsible reasons. However, the company quickly discovered that sales

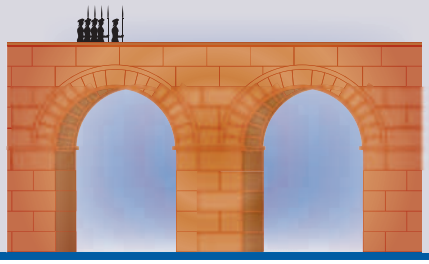
The mission of the IEEE is to foster technological innovation and excellence for the benefit of humanity and its vision is to be essential to the global technical community and to technical professionals everywhere, and be universally recognized for the contributions of technology and of technical professionals in improving global conditions.

Engineering Goals

A tourist recently mentioned visiting Rome three decades ago

Some 250 to 300 bridges span the Tiber River going through Rome. Signs are posted on the bridges built since the Second World War… "Pedestrians only" or "Cars and Pedestrians only". The ones built by the Romans carry trains, heavy traffic, busses; everything, no problem.

The engineering goals were certainly different. The Romans believed in the Key Stone, the last stone in the arch, after it was in place, bridge loading strengthened the arch structure. The Romans did not know the strength of materials as well as the post WWII designers, and so built the bridges strong enough to survive, and so they did. Engineering was much more refined in 1945, and it was known how to build a bridge just strong enough and with a minimum of materials (minimum cost).



This is fine while the bridge was new, the concrete was strong, and the re-enforcing steel bars were new.

With time, rust and weathering of concrete took their toll and now in the seventies (the time of the visit), 30 years later, these new bridges left much to be desired, as they were no longer safe for heavy traffic. Normally bridges are built to carry loads for 50 years and in some cases 100 years (like the Straight Crossing to PEI). Bridge inspection and maintenance is the pro-

plummeted, particularly impulse purchasing, and so the bags were quietly returned and sales picked-up. The shareholders were happy – the environment was not.

Floods have occurred since the beginning of time and nature through experience is able to self-mitigate corrections with each occurrence. Perhaps the reason for the damages caused by the flood was many years of poor public policy and an unwillingness of government leaders to seek advice from and act upon the concerns and advice of professionals who have the specialized knowledge and experience. Allowing structures to be built adjacent to flowing water or in a known flood plain; clear-cutting of vast areas of forest in the mountains and foothills; removal of naturally created flood plains whose function was to act as reservoirs for excess water; funding bridges (economically) without the capacity to withstand cyclical high and fast water, are but a few examples of irresponsible public policy.

Our planet is a living biosphere from the highest altitudes to the greatest depths. Every component has a purpose and exists for a reason – perhaps for reasons that we do not and may never fully understand. Climate change is multi-factorial in etiology. Difficult decisions are on the horizon and it will take courage to change our current practices.

We must use our engineering skills and sense of responsibility to the world's population to ensure that all development and growth is in synchrony with the fundamental and inescapable nature of this planet. Most importantly we must communicate our engineering and scientifically proven concerns effectively to political and business decision-makers. Business and political agendas should not compromise our responsibilities as citizens, as professionals and as engineers to all on earth. ■

cess that resulted in signs being posted on the bridges of Rome.

We continue to be reminded that engineering is an iterative process. In this case, the iteration is a third of a century for the modern bridge and 20 centuries for the Roman built bridge. The Romans have no worries!

Should minimum cost be a (short-term) goal in such projects?

We wonder what the Roman signs say today, another 30 years later. Has anyone been to Rome recently?

Elmer Bourque *BA, BScEE, FEC*

Experiential Learning
Apprentissage par l'expérience

Legend of the Oil Plug

By **Elmer Bourque**

ONCE UPON A TIME a diligent NB Power employee called Mac strapped on his spurs and started climbing a pole. This happened somewhere in the southern lands of New Brunswick on a warm sunny day. The task of the day was to secure an oil sample from a transformer on a distribution feeder. Oil samples are taken from time to time to determine if the transformers are still in good shape or if soon they must be replaced. In those early days, the distribution voltage was 4000 volts. A high enough number to cause great respect to be given to equipment so energized.

The climb was successful. The oil sample was secured. With some oil now on his fingers, and the plug, the oil plug took on a life of its own and decided to evade the employee like a boy catching a fish with his bare hands. Being resourceful, Mac stuck his thumb immediately in the oil hole to prevent the oil from escaping.

The oil in the transformer guarantees that the current through it takes expected paths. Without the oil, the transformer will fail catastrophically, and this employee did not want such an event over his head… in more ways than one!

After the initial panic, he counted his blessings. He then resolved to make himself as comfortable as he could while maintaining his thumb on the oil opening. Visions of falling asleep on the job were not comforting. Going hungry then fleetingly came to mind, but these were thoughts he had to dispel, for the moment, in any case. Prayer probably was the only viable option that conserved energy while his bones were starting to feel the stress of the predicament.

Someone must have been at the heavenly controls, for this old man came sauntering down the road on his daily walk.

"Hello, I think I'm in trouble" Mac said. The old man replied "What seems to be the trouble?" As Mac explained as quickly as possible his predicament, he asked the old man if he could toss up the oil plug. Mac could see it, down at the bottom of the pole in the grass. The old man agreed, but he was old and his pitching arm was no longer what it used to be. He picked up the plug, mustered up all his strength and let her fly.

Well, Mac almost got it, and it went right on by. Just out of reach of the end of his fingers, and down it went again. Fortunately, he was able to turn his head fast enough to see it bounce and disappear into the longer grass. The old man looked in that space and could not find it. "Well, what now?" Mac thought silently. Just as things were looking pretty bad, the old man said, "I found it!"

To increase his chance of catching it, Mac took his hard hat and used it as a catcher's mitt. This met with success on the second toss. Now he had one thumb on the oil hole, occupying one hand, and another holding the hard hat, which of course contained the plug. There were no hands left to grab the plug and end this predicament. A few more litanies must have been forthcoming, as our Mac did make it down the pole in due course.

This event is certain to have taught Mac respect for the overwhelming force of gravity. To this day he still counts his blessings and has no doubt in the power of prayer! ■

Elmer Bourque *(LSMIEEE) is currently associated with Kestrel Power Engineering of Toronto as a senior engineer. Following graduation he developed numerical control software for the New Brunswick Research and Productivity Council. In 1974, he joined New Brunswick Power where he worked for 31 years as a system performance engineer responsible for power system stability and proper control by commissioning and maintaining fault recording equipment, area generation control, generator excitation, stabilizers, and governor systems. He is recipient of the 2012 IEEE Canada J.J. Archambault Eastern Canada Service Medal.*

N.Ed. "Experiential Learning" shares the real-life lessons of our readers that only experience can teach. If you have a tale to tell, then target it to our Managing Editor, Bruce Van-Lane, **vanlane@ieee.org**. It can be about your "schooling," or that of a colleague's – all we ask is that it be **true!**

IEEE Canada IHTC 2014 International Humanitarian Technology Conference
IEEE Canada présente l'IHTC 2014 Conférence internationale de la technologie humanitaire

MONTREAL, CANADA–JUNE 1-4, 2014 • WWW.IHTC.IEEE.CA MONTRÉAL (CANADA), DU 1ER AU 4 JUIN 2014 • WWW.IHTC.IEEE.CA

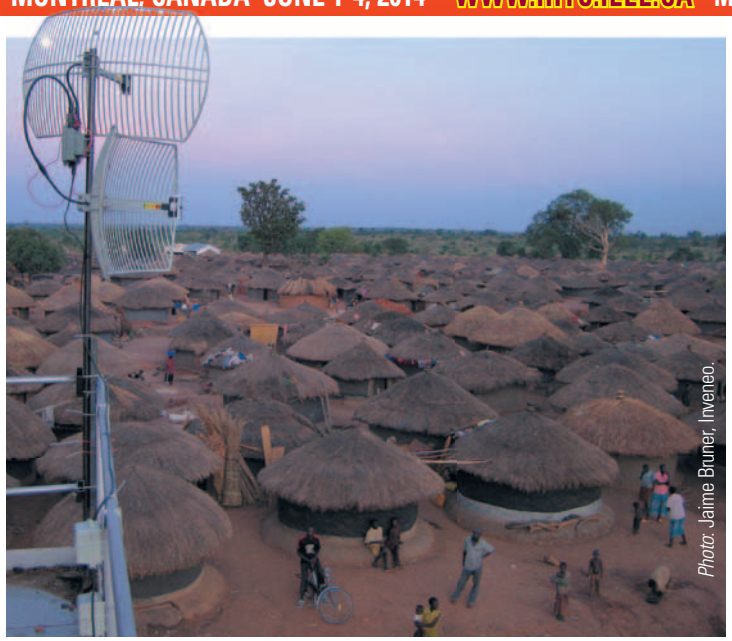
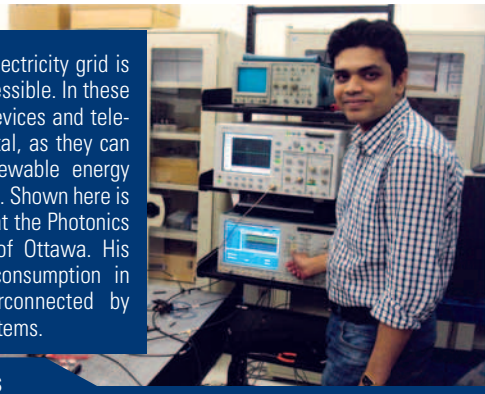


Photo: Jaime Bruner, Inveneo.

Student Paper Contest

In many developing countries the electricity grid is either not reliable or not widely accessible. In these situations, low-power consuming devices and telecommunication architectures are vital, as they can be more easily supported by renewable energy sources coupled with energy storage. Shown here is Mr. Mehdi Hasan, a M.Sc. student at the Photonics Technology Laboratory, University of Ottawa. His paper describes reduced power consumption in broadband wireless access interconnected by coherent optical communication systems.



Concours d'articles étudiants

La fiabilité du réseau de distribution de l'électricité demeure un problème dans plusieurs pays en développement. Dans ces circonstances, il est crucial d'utiliser une architecture et des appareils à faible consommation, facilement alimentés par des sources d'énergie renouvelable et stockable. M. Mehdi Hasan, étudiant de maîtrise au Centre de recherche en photonique de l'Université d'Ottawa, a rédigé un article décrivant la faible consommation énergétique des services d'accès sans fil très large bande reliés par un système de communication optique.

This conference will focus on: humanitarian applications of technology to improve the lives of underserved peoples (including aboriginal/indigenous peoples); technologies for the disabled; health-related technologies; technologies to assist in disaster situations, and educational programs on humanitarian engineering. The conference will feature outstanding keynote speakers, workshops, a student paper competition and peer-reviewed papers. Technology-oriented papers, and papers describing social and economic factors related to humanitarian technology implementation are welcome.

CALL FOR PAPERS

The technical program committee invites you to submit a 200-300 word abstract of a paper in any of the following track areas:

1. Mobile Health (mHealth), Medical Technology, and Telemedicine
2. Operations, supply chain and logistics in humanitarian aid and disaster response
3. Water and Agricultural Technologies
4. Off-grid Power, Renewable Energy and Resilient Power Grids
5. Connectivity and Communications Technologies
6. Humanitarian and/or Sustainable Engineering Programs, Educational Technologies, Course Materials, and Curricula
7. Data and Personal Security Technologies for Humanitarian Applications
8. Underwater Wireless Communications for Humanitarian Applications
9. Underwater Robotics for Humanitarian Applications
10. Community Engagement and Social and Economic Factors in Humanitarian Engineering

IHTC 2014 proceedings will be published on IEEE Xplore.

Submission: PDF-format can be uploaded to **http://www.bytematters.com/veda/ihtc.aspx**. Detailed information on paper format and submission procedure can be found on the conference website.

Cette conférence porte sur les utilisations humanitaires de la technologie pour améliorer les conditions de vie des groupes mal desservis, notamment les peuples autochtones, et des personnes handicapées ou malades, sur les technologies utilisées lors de catastrophes naturelles et sur les programmes de formation en ingénierie humanitaire. Ces thèmes seront abordés par des conférenciers hors pair et feront l'objet d'ateliers, d'un concours d'articles étudiants et d'articles évalués par les pairs. Les articles sur la technologie ou les facteurs socioéconomiques en lien avec ses applications humanitaires sont les bienvenus.

DEMANDE DE COMMUNICATIONS

Le comité du programme technique vous invite à proposer un résumé d'article de 200 à 300 mots dans l'un des domaines suivants :

1. La santé mobile, la télémédecine et la technologie médicale
2. L'exploitation, la chaîne d'approvisionnement et la logistique de l'aide humanitaire et des secours en cas de catastrophe
3. Les technologies agricoles et hydrauliques
4. L'électricité autonome, l'énergie renouvelable et la résilience des réseaux électriques
5. La connectivité et les technologies de la communication
6. Les programmes d'ingénierie humanitaire ou durable, les technologies de l'éducation, le matériel éducatif et les cursus
7. Les technologies de protection de la personne et des données à des fins humanitaires
8. Les technologies sous-marines de communication sans fil à des fins humanitaires
9. La robotique sous-marine à des fins humanitaires
10. L'engagement communautaire et les facteurs socioéconomiques de l'ingénierie humanitaire

Les actes de l'IHTC 2014 seront publiés sur IEEE Xplore.

Dépôt : Pour téléverser un fichier en format PDF : **http://www.bytematters.com/veda/ihtc.aspx**. Des précisions concernant les documents en format papier et les procédures de dépôt sont disponibles sur le site Web de la conférence.

WHY ATTEND?

- ★To learn about advanced interdisciplinary problems across a broad spectrum of technical fields.
- ★To gain insights into the latest emerging technologies.
- ★To attend various symposia/tracks offering expertise.
- ★To hear high-profile speakers who will address the most pressing issues in the above fields of interest.
- ★To hear interesting and informative papers and presentations.
- ★To network and establish strategic partnerships with the best and brightest of your profession in academia, industry and government
- ★Interesting social/partner programs.
- ★Explore shopping and entertaining opportunities in Montreal.
- ★Opportunity to earn Continuing Education Units.

POURQUOI PARTICIPER?

- ★Pour en savoir plus sur certains problèmes interdisciplinaires complexes.
- ★Pour mieux comprendre les technologies émergentes.
- ★Pour faire le plein de connaissances dans les nombreux symposiums offerts.
- ★Pour entendre des conférenciers de renom parler des enjeux critiques de leur domaine.
- ★Pour l'intérêt et la pertinence des présentations et articles proposés.
- ★Pour faire du réseautage et des partenariats stratégiques avec des chefs de file issus de tous les milieux.
- ★Pour les programmes partenaires et sociaux
- ★Pour profiter des attraits commerciaux et touristiques de Montréal.
- ★Pour les unités de formation permanente.

IMPORTANT DATES

Deadline for Abstract Submission	**March 30, 2014**
Notification of Abstract Acceptance	**April 5, 2014**
4-page IEEE format Full Paper Due	**April 25, 2014**
Reviewers' Feedback to Authors	**May 1, 2014**
Camera-Ready Papers and Copyright Forms Due	**May 5, 2014**

DATES À RETENIR

Dépôt du résumé	**30 mars 2014**
Avis d'acceptation du résumé	**5 avril 2014**
Dépôt de l'article de 4 pages (format IEEE)	**25 avril 2014**
Rétroaction des lecteurs critiques	**1er mai 2014**
Dépôt de l'article final et des formulaires sur les droits d'auteur	**5 mai 2014**

For detailed up-to-date information, visit the IHTC2014 Conference web site: **http://www.ihtc.ieee.ca**

Pour des renseignements à jour et détaillés, rendez-vous sur le site Web de l'IHTC 2014 : **http://www.ihtc.ieee.ca**

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SUPPORT FOR SECTION AND STUDENT BRANCH INITIATIVES

Region 7 sets SIGHT on humanitarian efforts

Improving the lives of all people through technology has long been IEEE's mission. But now it's easier for members to engage in community projects that specifcally benefit the underserved and the underprivileged.

The IEEE Humanitarian Ad Hoc Committee has initiated a program called the Special Interest Group on Humanitarian Technology (SIGHT), aimed at creating opportunities for members to devote their talents to humanitarian work.

Most regions have ad hoc humanitarian activities. "IEEE Canada is unique in the sense that from the beginning we decided to create a standing committee for a humanitarian program at the regional level," says Alfredo Herrera, a volunteer on the IEEE SIGHT steering committee, and an Otttawa Section member.

SIGHT provides a structure for members to organize with their local section or student branch to work on humanitarian projects. They can apply to form a SIGHT and gain support and funding from IEEE.

The program is a significant force for change, says Holly Schneider Brown, program manager of corporate development with IEEE. "We believe IEEE is a strong potential task force of volunteers for solving community problems."

"The program aims to inspire, enable and connect IEEE members, especially those who want to use their engineering skills to give back to the community, but don't know how to get involved," says Brown.

SIGHT is already operational in 17 countries. Typically, projects involve supporting sustainable technology initiatives that impact energy, healthcare, sanitation and interconnectivity — everything from assistive technologies to solar power and mine clearing.

One project in Chile, for example, introduces children in remote villages to technology through robotic Lego sets. Another provides electricity in Haiti, by donating equipment to communities and helping them create franchises so they can become self-sufficient.

IEEE Canada had an early start in its humanitarian efforts. Dr. Ferial El-Hawary, chair of the IEEE Canada Humanitarian Initiatives Committee, was president when the Region created both its ad hoc and standing committees, the latter being unique to the IEEE as a whole.

"Ferial has made a significant impact in getting these efforts off the ground, and in getting IEEE to be a key player locally and globally. She has made things happen," says Herrera.

To date, SIGHT has been working to create project-focused chapters at the section level, but there are "learning and gestation" stages a group needs to mature through in order to deliver a sustainable solution in lockstep with a community need, says Herrera. "This year, IEEE Canada SIGHT groups will work on growing to maturity."

SIGHT will be offering workshops to interested members; one of these will be at IHTC 2014, along with a workshop on the IEEE Teacher In-Service Program (TISP). Members can also subscribe to the newsletter, join the Facebook page and check out the website ("n" repeated in technology): http://www.ieee.org/special_interest_group_on_humanitarian_technnology.html

"These projects come from the grassroots and members are very passionate about them," says Brown. "We're trying to harness their passion and build the program around that." ■

Vawn Himmelsbach



By **Terrance Malkinson**

Engineering Management: What's New in the Literature?

LEADERS OF EIGHT high-performing companies discuss their strategies for motivating staff, clients and themselves in the October 2013 issue of Entrepreneur ["The Best Innovators in Business." 41(10): 36-48. www.entrepreneur.com]. Author Jennifer Wang muses on why entrepreneurship attracts many talented and ambitious individuals when the failure rate is so high. She then goes on with reference to Daniel Pink's book Drive: The Surprising Truth About What Motivates Us where the author believes that satisfaction depends upon having the right goals. Profiles of chief executives of the eight high-performing companies provide insights into how to inspire and sustain motivation and how this leads to success.

"THE NEW RENAISSANCE Is in Our Hands" is the title of an article by Rolf Jensen in the September-October 2013 issue of The Futurist [47(5):52-55. www.wfs.org]. The author believes that our trust in government, business, religion and many other institutions is low. We are as a consequence seeking advice from, forming mutually beneficial one-on-one relationships, and placing trust in each other. The author goes on to describe that an age of individual initiative is looming. Signs include the growth in social media where increasing numbers of people form opinions and make decisions based upon the posted experiences of others. Individuals are respecting and placing their trust in peers who are like themselves. A number of visions of the future of this trend are provided.

A SECOND ARTICLE in The Futurist, "Top 10 Disappearing Futures" [pp. 22-39] provides important insights on what, might disappear in the next 15-20 years. Compiled by members and friends of The World Future Society ten disappearing futures are discussed in detail. Concluding the article is a lengthy list of additional things that may disappear by 2030. Today with emerging technologies, business re-engineering, and global competition occupations and skills become obsolete quickly. The savvy person needs to continuously scan their environment, analyze trends, and network with others in order to ensure their personal and career success.

"SIX WAYS to Sink a Growth Initiative" is the title of an article by Donald Laurie and J. Bruce Harreld in The July-August 2013 issue of Harvard Business Review [91(7/8):82-90, www.hbr.com]. The authors discuss six traps to avoid to improve the chances of a company's venture to succeed. Traps discussed include: 1). failing to provide the right kind of oversight, 2). not putting the best, most experienced talent in charge, 3). assembling the wrong team and staffing up prematurely, 4). taking the wrong approach to performance assessment, 5). not knowing how to fund and govern a start-up, and 6). failing to leverage the organizations core capabilities.

"THE NEW UNDERCLASS" is the title of a report by Charlie Gillis and Chris Sorensen in MacLean's Magazine. [126(2):38-45. January 21, 2013]. The authors discuss employment challenges facing ambitious and well educated young Canadians. The November 11 issue of MacLean's provides their annual ranking of Canadian Universities with a number of other articles on the University experience.

CONNECTIVITY and mobile technology when used effectively improve productivity. Communication technologies can also impede productivity if misused. One area of misuse is multi-tasking while at a meeting. Michael Lowe in his article "Attention! Coping with Multi-Tasking Attendees" [Meetings and Conventions, 48(3):31-42, March 2013, www.mcmag.com] discusses the importance of practicing interpersonal respect for participants at a business meeting. The author provides tactics that the chairperson can use for keeping participants engaged rather than attending to their communication devices.

THE COVER STORY of the May 2013 issue of Scientific American [308(5):36-51. www.scientificamerican.com] is a special report on "The Future of Manufacturing." Ricardo Hausmann in his introduction suggests that even though most manufacturing growth now takes place in other countries, the machinery, materials, and know-how emanates from the developed world. Five accompanying articles discuss how information is becoming the driver for technological innovation in manufacturing. Other topics discussed are the economic consequences and benefits of humans and robots working together, seven next-generation materials that will change the way the world is made, 3-D printing, nano-machines and the future of digital simulations.

INSIGHTS FROM new research on techniques entrepreneurs can use to achieve peak productivity are provided in "Get More Done." [Inc. – The Magazine for Growing Companies, 62-70, April 2013, www.inc.com]. Based on discussions with leading neuroscientists, psychologists and behavioural economists, Issie Lapowsky provides seven strategies that will assist you in getting the most out of your day and your employees. A second article in the same issue of Inc. profiles "The Eight Best Industries for Starting a Business" [pp. 58-61]. Based on extensive research, the authors provide what they believe are the best emerging business sectors destined for growth.

THE 100 HOTTEST Innovations of the Year are profiled in the December, 2013 issue of Popular Science [283(6):22- 79. December, 2013. www.popsci.com]. This is the 26th Annual, "Best of What's New reports" where leading innovations that will shape the future in a variety of areas are discussed. Time magazine www.time.com has published its ranking of the 25 Best Inventions of the year in the November 15, 2013 issue [pp.69-83]. This is followed by an interesting article by Jeffrey Kluger "The Spark of Invention" [pp. 84-89] on opinions about who inventors are, how they do their work and which countries used to be, and will be, the most inventive.

BILL LYDON discusses in his article "Cybersecurity Strategy and Actions" [InTech 60(5):12-17. September-October, 2013. www.isa.org/intech] how the Automation Federation and The National Institute of Standards and Technology are leading the way in developing a framework for the protection of US critical infrastructure. Implementation of a cyber-security framework has been called for by Presidential Executive Order 13636. This order calls for the development of a national cyber security framework that includes "standards, methodologies, procedures, and processes that align policy, business, and technological approaches to address cyber risks and help owners and operators of critical infrastructure identify, assess, and manage cyber risk" As electronic technologies continue to evolve cyberattacks present a serious and growing threat to our well-being.

MANCHESTER UNITED is the English football (soccer) club that is considered to be one of the most successful and valuable franchises in sports. Sir Alex Ferguson recently retired (May, 2013) as manager/coach of the club after 26 seasons. Some have called him the greatest coach in history. Harvard Business School Professor Anita Elberse reports on his management approach in Harvard Business Review [91(10):116-125. October, 2013. www.hbr.com]. In this article, she details eight components of his management style, that are not just applicable to sports but also provides valuable strategies in business and life.

CORPORATE VENTURING discusses advantages and strategies on company investment in promising start-ups to gain knowledge and agility. [Harvard Business Review [91(10):86-94. October, 2013]. Venture funding is always a risky proposition. Josh Lerner provides a six step approach that will help companies avoid the pitfalls of this practice. These include: align goals, streamline approvals, provide powerful incentives, tolerate failure, stick to your commitments, and harvest valuable information. ■

Conferences

IEEE Canada & Collaboration 2014–2015



WEST

2014 IEEE CONFERENCE ON COMPUTATIONAL COMPLEXITY (CCC)
2014-06-11...14, Vancouver, BC
http://computationalcomplexity.org/

2014 16TH INTERNATIONAL SYMPOSIUM ON ANTENNA TECHNOLOGY AND APPLIED ELECTROMAGNETICS (ANTEM)
2014-07-13...17, Victoria, BC
http://antem.ee.umanitoba.ca/

2014 9TH INTERNATIONAL CONFERENCE ON COMPUTER SCIENCE & EDUCATION (ICCSE)
2014-08-22...24, Vancouver, BC
http://ieee-iccse.org/

2014 23RD INTERNATIONAL CONFERENCE ON PARALLEL ARCHITECTURE AND COMPILATION (PACT)
2014-08-23...27, Edmonton, AB
www.pactconf.org

2014 IEEE 39TH CONFERENCE ON LOCAL COMPUTER NETWORKS WORKSHOPS (LCN WORKSHOPS)
2014-09-08...11, Edmonton, AB
http://www.ieeelcn.org/

2014 IEEE 39TH CONFERENCE ON LOCAL COMPUTER NETWORKS (LCN)
2014-09-08...11, Edmonton, AB
http://www.ieeelcn.org/

2014 IEEE 6TH INTERNATIONAL SYMPOSIUM ON WIRELESS VEHICULAR COMMUNICATIONS (WIVEC)
14 Sep - 15 Sep 2014, Vancouver, BC
http://www.ieeevtc.org/wivec2014/

2014 IEEE 80TH VEHICULAR TECHNOLOGY CONFERENCE (VTC FALL)
2014-09-14...17, Vancouver, BC
http://www.ieeevtc.org/vtc2014fall/

INTELEC 2014 - 2014 IEEE INTERNATIONAL TELECOMMUNICATIONS ENERGY CONFERENCE
2014-09-28...10-02, Vancouver, BC
http://www.intelec.org/

2014 IEEE INTERNATIONAL CONFERENCE ON SOFTWARE MAINTENANCE AND EVOLUTION (ICSME)
2014-09-29...10-03, Victoria, BC
http://icsme2014.org/

2014 IEEE INDUSTRY APPLICATIONS SOCIETY ANNUAL MEETING
2014-10-05...09, Vancouver, BC
http://www.ewh.ieee.org/soc/ias/2014/

2014 IEEE ELECTRICAL POWER & ENERGY CONFERENCE (EPEC)
12 Nov - 14 Nov 2014, Calgary, AB
http://sites.ieee.org/epec2014/

2015 ANNUAL IEEE SYSTEMS CONFERENCE (SYSCON)
2015-04-13...16, Vancouver, BC
http://www.ieeesystemscouncil.org/

CENTRE



2014 27TH BIENNIAL SYMPOSIUM ON COMMUNICATIONS (QBSC)
01 Jun - 04 Jun 2014, Kingston, ON
http://www.ece.queensu.ca/apps/symposium/

2014 IEEE NORTH AMERICAN SCHOOL ON INFORMATION THEORY (NASIT)
2014-06-18...21, Toronto, ON
http://www.fields.utoronto.ca/programs/scientific/13-14/infotheory/

2014 IEEE 15TH INTERNATIONAL WORKSHOP ON SIGNAL PROCESSING ADVANCES IN WIRELESS COMMUNICATIONS (SPAWC)
2014-06-22...25, Toronto, ON
http://www.spawc2014.org/

2014 TWELFTH ANNUAL CONFERENCE ON PRIVACY, SECURITY AND TRUST (PST)
23 Jul - 24 Jul 2014, Toronto, ON
http://pst2014.ryerson.ca/

2014 IEEE 14TH INTERNATIONAL CONFERENCE ON NANOTECHNOLOGY (IEEE-NANO)
2014-08-18...22, Toronto, ON

EAST

2014 IEEE CANADA INTERNATIONAL HUMANITARIAN TECHNOLOGY CONFERENCE - (IHTC)
2014-06-01...04, Montreal, QC
http://htc.ieee.ca/

2014 IEEE 12TH INTERNATIONAL NEW CIRCUITS AND SYSTEMS CONFERENCE (NEWCAS)
2014-06-22...25, Trois-Rivières, QC
http://www.newcas2014.org/

IGARSS 2014 - 2014 IEEE INTERNATIONAL GEOSCIENCE AND REMOTE SENSING SYMPOSIUM
2014-07-13...18, Quebec City, QC
www.igarss2014.org

2014 IEEE PHOTONICS SOCIETY SUMMER TOPICAL MEETING SERIES
2014-07-14...16, Montreal, QC
www.ipc-ieee.org

2014 INTERNATIONAL CONFERENCE ON INNOVATIVE DESIGN AND MANUFACTURING (ICIDM)
2014-08-13...15, Montreal, QC
http://www.icidm2014.org/

OCEANS 2014
2014-09-14...19, St. John's, NL
www.oceans14mtsieeestjohns.org

2014 IEEE WORKSHOP ON ADVANCED RESEARCH AND TECHNOLOGY IN INDUSTRY APPLICATIONS (WARTIA)
2014-09-29...30, Ottawa, ON
http://www.ewh.ieee.org/r7/ottawa/ias/WARTIA/index.htm

2015 IEEE 28TH CANADIAN CONFERENCE ON ELECTRICAL AND COMPUTER ENGINEERING (CCECE)
2015-05-03...06, Halifax, NS
http://www.ieee.ca/ccece15

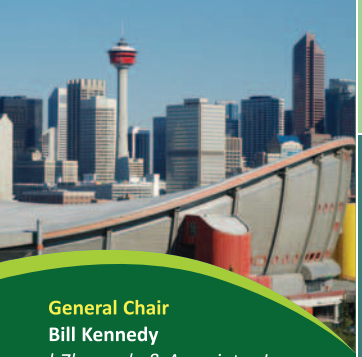
2015 15TH IFAC SYMPOSIUM ON INFORMATION CONTROL PROBLEMS IN MANUFACTURING (INCOM)
2015-05-11...13, Ottawa, ON
http://www.incom2015.org/

2015 IFIP/IEEE INTERNATIONAL SYMPOSIUM ON INTEGRATED NETWORK MANAGEMENT (IM)
2015-05-11...15, Ottawa, ON
http://im2015.ieee-im.org or www.im2015.org

2015 IEEE MTT-S INTERNATIONAL CONFERENCE ON NUMERICAL ELECTROMAGNETIC MODELING AND OPTIMIZATION (NEMO)
2015-08-11...14, Ottawa, ON
http://nemo-ieee.org/

2015 IEEE ENERGY CONVERSION CONGRESS AND EXPOSITION
2015-09-20...24, Montréal, QC
http://www.ecce2015.org/





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Conference Website
http://sites.ieee.org/epec2014/

CALL FOR PAPERS

IEEE EPEC 2014

Electrical Power and Energy Conference

Partnership Between Industrial Users and Power Providers

http://sites.ieee.org/epec2014/

November 12-14, 2014, Calgary, AB, Canada

Fourteenth annual Electrical Power and Energy Conference (EPEC 2014) will take place in Calgary, AB, Canada from November 12 to 14, 2014. The objective of EPEC 2014 is to provide a forum for the exchange of electrical applications technology related to electrical power and energy generation, distribution systems and utilization. The focus for this year's conference will be on partnerships between industrial users and power providers by bringing together industrial users, power providers, manufacturers, consultants and academia to discuss cutting edge topics of interest to all stake holders.

In addition to making technical contribution to EPEC 2014, bring your family to enjoy the culturally diverse, creative and cosmopolitan city with a warm welcoming spirit.

Topics: Papers are invited on all topics of interest related to electric power and energy and especially papers with the following focus:

1. Industrial System Designation (ISD) Partnerships
2. Renewable power generation in Alberta
   - Integration Challenges
   - New technology developments
3. Co-generation
   - New developments
   - Integration
4. Controls
   - 61850 'Goose Messaging'
5. Grounding Philosophy
6. Reactive Power
7. Large Drives
   - Challenges
   - Applications
8. Regulation / Deregulation
   - Experience in Alberta
   - Future developments
   - Integrated system modeling and dynamics
9. Protection
   - Renewable energy integration
   - New developments
10. Smart Grid interoperability

Paper Submission:

The format of the paper should follow the IEEE conference papers style. EPEC 2014 will only accept the electronic submission of a full paper in English with maximum six pages in double column format (submission website address to be announced shortly). Detailed information on paper format and submission procedure can be found on the conference web. Papers presented at the conference will be included in the EPEC 2014 proceedings that will be included in EI Compendex, IEEEXplore and ISI.

Important Dates:

April 30 2014	**Submission of full papers in PDF and organized session proposals**
June 10 2014	**Submission of tutorial and workshop proposals**
June 30 2014	**Notification of paper and tutorial/workshop acceptance**
July 20 2014	**Submission of final camera-ready papers**

Exhibitions:

There will be an exhibition site at the conference. Companies and institutions who are interested are encouraged to contact the exhibition chair for further information.

For more information on EPEC 2014, please contact:

Bill Kennedy, General Chair
b7kennedy & Associates Inc.
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For detailed up-to-date information, please visit the EPEC 2014 confe rence web site

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APPEL POUR PUBLICATIONS

CEE IEEE 2014

Conférence sur l'énergie électrique

Partenariat entre les usagers industriels et les fournisseurs d'énergie

http://sites.ieee.org/epec2014/

12-14 novembre 2014, Calgary, AB, Canada

La quatorzième conférence annuelle sur l'énergie électrique (CEE 2014) aura lieu à Calgary, AB, Canada, du 12 au 14 novembre 2014. L'objectif de CEE 2014 est de fournir un forum d'échange sur les technologies des applications électriques liées à l'énergie électrique et la production d'énergie, les systèmes de distribution et l'utilisation. L'objectif de la conférence de cette année sera les partenariats entre les industriels et les fournisseurs d'énergie en regroupant des utilisateurs industriels, des fournisseurs d'électricité, des fabricants, des consultants et des universitaires pour discuter de sujets à la fine pointe et d'intérêt pour toutes les parties prenantes.

En plus de faire une contribution technique à CEE 2014, amener votre famille pour profiter d'une ville culturellement diversifiée, créative et cosmopolite avec un esprit chaleureux et accueillant.

Sujets : Les articles sont sollicités sur tous les sujets d'intérêt liés à l'alimentation et à l'énergie électrique, en particulier des articles mettant l'accent sur:

1. Partenariats pour la désignation des systèmes industriels
2. Génération de puissance renouvelable en Alberta
   - Défis de l'intégration
   - Nouveaux développements technologiques
3. Cogénération
   - Nouveaux développements
   - Intégration
4. Commande
   - 'Messagerie Goose' 61850
5. Philosophie de mise à terre
6. Puissance réactive
7. Grands entrainements
   - Défis
   - Applications
8. Règlementation / Dérèglementation
   - Expérience en Alberta
   - Développements futurs
   - Modélisation des systèmes intégrés et dynamique
9. Protection
   - Intégration des énergies renouvelables
   - Nouveaux développements
10. Réseaux intelligents et interopérabilité

Soumission d'articles:

Le format de l'article doit suivre le style pour les articles des conférences de l'IEEE. CEE 2014 accepte seulement la soumission électronique d'un document complet en anglais avec un maximum de six pages au format de double colonne (l'adresse du site Web pour la soumission des articles sera annoncée sous peu). Des informations détaillées sur le format des articles et la procédure de soumission peuvent être trouvées sur le site Web de la conférence. Les communications présentées lors de la conférence seront incluses dans les comptes rendus de la conférence CEE 2014 qui seront publiés dans EI Compendex, IEEEXplore et ISI.

Dates importantes:

30 avril 2014	**Soumission des articles complets en format PDF et des propositions de séance organisée**
10 juin 2014	**Soumission des séances didactiques et des ateliers**
30 juin 2014	**Notification d'acceptation des séances didactiques et des ateliers**
20 juillet 2014	**Soumission de la version finale des articles**

Exposition industrielle:

Il y aura un lieu pour les expositions industrielles lors de la conférence. Les entreprises et les institutions intéressées sont invitées à communiquer avec le Président Expositions industrielles pour plus d'informations.

Pour plus de renseignements sur la conférence CEE 2014, s'il vous plaît contactez :

Bill Kennedy, Président général
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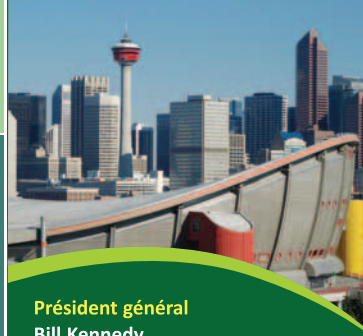

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