THE CANADIAN ACADEMY OF ENGINEERING
Leadership in Engineering Advice for Canada

L'ACADÉMIE CANADIENNE DU GÉNIE
Chef de file en matière d'expertise-conseil en génie pour le Canada

NEWSLETTER / COMMUNIQUÉ

Number 73 Summer 2014

A newsletter for the information of the Academy, and a record for other engineering academies and organizations

Inside this issue:

President's Message

Submitted by Pierre Lortie, M.C., FCAE to the 2014 AGM

Richard Marceau has been a formidable President of the Canadian Academy of Engineering. Under his leadership, two local sections have been established, our involvement in the Trottier Energy Future Project has been reset on a sound footing, the Task Force on Engineering in Canada's Northern Oceans has accomplished much progress and, to cap his outstanding accomplishments, Richard, in cooperation with Dr. Clem Bowman, have published "*Canada: Becoming a Sustainable Energy Powerhouse*", the report of their Energy Pathways Task Force.

Despite the enormous burden created by his health condition, Richard has remained engaged in the affairs of the Academy and continues to provide counsel and encouragement. Frankly, the Academy is better because Richard was at the helm.

A CHALLENGE

Canada would be a better place if evidence-based policy was the accepted norm in public policy making. This raises the question: is this a quixotic challenge? For sure, managing the interface between science and technology, society and public policy has proved a daunting task around the world. Reflecting on the course of affairs in recent decades, one forms the sentiment that the debates in Canada and abroad within the scientific communities were mainly on governance and political legitimacy of science and technology, failing to distinguish policy for science from science for policy, to recognize that science and technology have

(Continued on page 12)

Annual Report

Submitted by Richard J. Marceau, FCAE, Past President, to the 2014 AGM

I have had the privilege of serving the Canadian Academy of Engineering as President for two years now. During this time, we have introduced significant improvements to its structures and processes, and accelerated its policy-influencing activities. Examples of our accomplishments include initiating the creation of local sections of the Academy, thereby extending its footprint across Canada; partnering more closely than ever with its sister Academies, especially within the Council of Canadian Academies; doubling the number of its task forces; leading the successful restructuring of the Trottier Energy Futures Project research partnership which is on track to provide remarkable findings by the end of this year; launching a book on energy which deserved a six-page supplement in the Globe and Mail only a month ago; greatly intensifying its internal communications and public outreach; and renewing and strengthening its internal governance and management. In my remarks here today, I will share the details of what we have accomplished, and some of the challenges that lie ahead. Even so, we can be very proud of the road we have journeyed together…

(Continued on page 18)

New Fellows 2014

Standing, left to right: Peter G. Noble; Ray Gosine; Baining Guo; Jim Beckett; Argyrios Margaritis; Claude Laguë; Ding-Yu Peng; Douglas A. Buchanan; Brian Garrod; Paul Acchione; Gilbert Bennett; Chris Huskilson; Yu Sun; Janusz A. Kozinski; Shen-En Qian

Seated, left to right: Sri Krishnan; Kevin Englehart; Clément Fortin; Ross Peters; Heather Sheardown; Nancy E. Hill; Dimitry Sediako; Edward McBean; Xiaotao T. Bi; Pierre G. Lafleur

Not in attendance: Jonathan Beddoes; Andrew Benedek; Uwe Erb; Judy Fairburn; Ibrahim J. Gedeon; Clermont Gignac; Feridun Hamdullahpur; Terry W. Hennigar; Steve E. Hrudey; Earl A. Ludlow; Carmine Marcello; Lloyd A. McCoomb; Nicole A. Poirier; Charles Randell; Robert J. Reid; Ted Robertson; Edward Sargent; Jeanette M. Southwood; Afzal Suleman; Owen Tobert; James Tranquilla; Arun J. Valsangkar; John Vlachopoulos; C. Peter Watson

THE CANADIAN ACADEMY OF ENGINEERING
Leadership in Engineering Advice for Canada

L'ACADÉMIE CANADIENNE DU GÉNIE
Chef de file en matière d'expertise-conseil en génie pour le Canada

Contact Information

1402 - 180 Elgin Street
Ottawa, Ontario, K2P 2K3, Canada
Phone: (613) 235-9056 — Fax: (613) 235-6861
info@cae-acg.ca — www.cae-acg.ca

President: Pierre Lortie
president@cae-acg.ca
(514)878-8863

Executive Director: Kevin Goheen
kgoheen@cae-acg.ca
(613) 235-9056 x 223

Office Manager: Valérie Broadfoot
vbroadfoot@cae-acg.ca
(613) 235-9056 x 222

Board of Directors 2014/2015

Annual Meeting 2014

The CAE's 2014 Annual Meeting was held at the Sheraton Hotel Newfoundland in picturesque St. John's on June 26. The day's activities included the AGM, induction of new Fellows and symposium sessions featuring the work of two of the Academy's task forces.

Board members at the AGM: Yves Beauchamp, Richard Marceau, Doug Ruth along with Executive Director Kevin Goheen.

At the Annual General Meeting, a special resolution regarding the CAE's Articles of Continuance and new By-laws was approved. A full description of the proceeding is described in the draft minutes, which are available to Fellows in the Fellows' section of the website. President-Elect Doug Ruth announced that the 2015 Annual Meeting will be held in the GTA/Hamilton area. The dates will be announced soon. The reports presented at the AGM by now Past President Richard Marceau and incoming President Lortie can be found elsewhere in this newsletter.

The morning symposium session featured the work of the Task Force on Engineering in Canada's Northern Oceans and was chaired by Ian Jordaan, FCAE. The presentations can be found on this project's page on the CAE website. During the afternoon session chaired by Clem Bowman, FCAE, the Energy Pathways Task Force reported on its work and launched its latest publication, "Canada: Becoming a Sustainable Energy Powerhouse." This book is available for download from the publications page of the CAE website. More details on the technical sessions may be found on pp. 8 and 11.

Clem Bowman (left) being presented his certificate by Richard Marceau (right)

Twenty-five of the 49 new Fellows were present at the induction ceremony, as well as Clem Bowman, one of this year's two new Honorary Fellows. Clem is an outstanding Canadian chemical engineer who has, with the participation of colleagues, formulated a vision of a National Energy Strategy. Throughout a long career spanning sixty years he has provided exceptional leadership in the development of Canada's petroleum resources, notably with Imperial Oil, Syncrude Canada, the Alberta Oil Sands Technology and Research Authority (AOSTRA) as its Chairperson, the Alberta Research Council as its President, and the Canadian Academy of Engineering as leader of the Energy Pathways Project. Furthermore, he pioneered the widely used ProGrid methodology for decision making and continues as Advisor to the Bowman Centre for Commercialization of Technology, Western University Research Park in Sarnia.

The second new Honorary Fellow, Sir Terry Matthews, was unable to be in attendance; plans are in the works to present his fellowship at a special meeting in Fall 2014. Terry is a highly unusual blend of talented engineer, technology visionary, and evangelical salesman who has an enviable international reputation for leadership in innovation. Through his hard work and tenacity he has become one of Canada's most successful entrepreneurs. He has founded or funded over 90 companies that have developed and sold new Canadian technologies around the world, creating wealth and providing thousands of jobs for Canadian engineers in the process. He has set up organizations to provide mentoring and funding that are helping others do the same. He has given back richly to the community, making contributions and donations, representing millions of dollars and in kind, to improve and enhance healthcare, education and entrepreneurship.

The lunch included addresses by fellow engineer Senator Joseph Day, Ed Martin, President and CEO of Nalcor Energy, and Claude Laguë, who brought news from the Canadian Engineering Memorial Foundation (CEMF). In lieu of speakers' gifts, the Canadian Academy of Engineering is making a donation to the CEMF on their behalf. The CEMF was formed in 1990 by visionary and well-known engineer Claudette MacKay-Lassonde, FCAE and several colleagues in response to the tragedy at École Polytechnique on December 6, 1989. The CEMF is a charitable organization funded entirely through donations and partnerships with corporations and universities.

Senator Joseph Day

Fellows in the News

Paul Amyotte has been elected president of Engineers Canada for 2014-2015. Dr. Amyotte will lead the Engineers Canada Board in support of the provincial and territorial engineering regulatory bodies to advance the engineering profession and its self-regulation in the public interest. Dr. Amyotte is a Professor of Chemical Engineering and the C.D. Howe Chair in Engineering at Dalhousie University.

John Bandler, Professor Emeritus of Electrical and Computer Engineering at McMaster, has seen his latest play "The Trial of Naomi Verne" open at the Hamilton Fringe Festival, to positive reviews.

Nemy Banthia was the recipient of the 2013 Aftab Mufti Medal of the International Society for Structural Health Monitoring of Intelligent Infrastructure (ISHMII). The award was conferred at the annual conference of ISHMII held recently in Hong Kong. The award recognizes Dr. Banthia's work in detecting corrosion in reinforced concrete bridges using active infrared thermography. Dr. Banthia is a Professor of Civil Engineering and a Senior Canada Research Chair in Infrastructure Rehabilitation at the University of British Columbia, Vancouver, Canada. He is also the Scientific Director of the newly created Canada-India Research Center of Excellence (IC-IMPACTS).

CAE Treasurer Yves Beauchamp has been named to the Ordre national du Québec. He is cited for his formidable management skills, first demonstrated at l'École de technologie supérieure (ÉTS) and most recently at development of the Outremont Site of the University of Montreal.

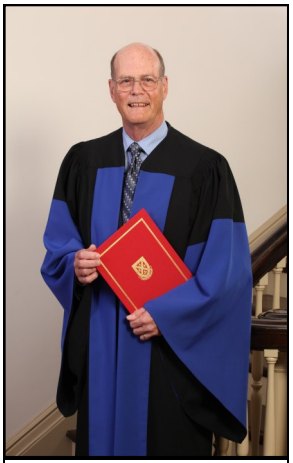
James E. C. Carter has been appointed an Officer of the Order of Canada "for his contributions to industry and for helping to drive the economic development and prosperity of his province."

Amit Chakma, President of Western University, is one of the 2014 recipients of the Michael P. Malone International Leadership Awards, sponsored by the Association of Public and Land-grant Universities . The annual awards recognize individuals who have made significant contributions to international education at public and land-grant institutions.

Jamal Deen, McMaster University, has received the highest degree and honour – Doctor Honoris Causa, from Universitat Rovira i Virgili (URV) in Tarragona, Catalonia, Spain. This honour was in recognition of his exceptional achievements as a scholar and educator and as well as for extraordinary collaborations with colleagues at URV.

Waguih ElMaraghy co-hosted the 47th Manufacturing Systems Conference at the University of Windsor's Intelligent Manufacturing Systems Centre, April 28 - May 2.

Bernard Etkin received the American Institute of Aeronautics and Astronautics Aerospace Guidance, Navigation, and Control Award for 2014. This award was given to Etkin "For outstanding achievement in and dedication to research and education in the field of guidance, navigation and control for over a half century" and was presented January 14, 2014, at the AIAA Science and Technology Forum and Exposition in National Harbor, Maryland. In June, 2014, Professor Etkin passed away (see In Memoriam).



W. Macdonald Evans
Photo: Bernard Clark

Congratulations to W. Macdonald Evans, who was cited by Queen's University at its 2014 Spring Convocation with an honorary doctorate. Mac was President of the Canadian Space Agency from 1994 to 2001, guided the development of the Canadian Astronaut and RADARSAT programs and negotiated Canada's role in the International Space Station.

Congratulations to University of Alberta Professors Murray Ross Gray and Zhenghe Xu on the renewal of their Canada Research Chair appointments.

Gerald Heffernan has expanded his legacy of support for entrepreneurship at University of Toronto Engineering with a $5 million gift to fund new fellowships and further develop the Entrepreneurship Hatchery. Half of Heffernan's gift will fund the Heffernan Commercialization Fellowships, and half will provide space for The Entrepreneurship Hatchery at its new home within the Centre for Engineering Innovation & Entrepreneurship, now named the Heffernan Hatchery in his honour.

Professor Keith Hipel led a delegation to meet the leaders of the Chinese Academy of Engineering, including its President Zhou Ji, in Beijing. Keith was representing the Academy of Science of the

(Continued on page 5)

Fellows in the News (cont'd)

(Continued from page 4)

Royal Society of Canada. Keith was elected as president of the RSC's Academy of Science for a two year term in 2013.

Biao Huang, Professor of Chemical & Materials Engineering at the University of Alberta, is the recipient of APEGA's 2014 Research Excellence Award. This award recognizes professionals in academia or industry who have conducted innovative research in engineering or geoscience that has been successfully applied to improve our economic and social well-being. Dr. Huang is a leader in the research of process-control systems, specifically predictive, inferential-sensing research with oil sands processes.

Global National has spotlighted Professor Praveen Jain, Queen's University as an 'Everyday Hero', for his green electronic inventions.

Digvir Jayas, distinguished professor and Vice-President (Research and International) at the University of Manitoba, received the 2014 Kishida International Award on July 16. Given by the American Society of Agricultural and Biological Engineers, the award recognizes the impact of Jayas' work on improving grain storage and preserving crop yields around the world, particularly in China and India. Prof. Jayas' opinion piece on preserving harvests was published in the March 24, 2014 edition of "The Hill Times".

Tom Jenkins, Chairman of OpenText, was featured in the annual "Power and Influence" magazine, a joint publication of the Hill Times newspaper and Embassy magazine, for his influence in technology and government.

Brenda Kenny, President and CEO of the Canadian Energy Pipeline Association, was named to the 2014 Alberta's Most Influential People list.

Pierre Lassonde received an Honorary Doctorate from York University at its June 13th Convocation. According to York "Pierre's $25 million donation to establish the Lassonde School of Engineering is a transformative gift that has given us the resources and the confidence to make York University a truly world class centre for engineering education."

Leah Lawrence became Chair of the Calgary Chamber of Commerce on January 1, 2014. In February 2014, Ms. Lawrence was appointed to the Board of Directors of CO2 Solutions Inc., an innovator in the field of enzyme-enabled carbon capture technology. Ms. Lawrence currently serves as President of Clean Energy Capitalists Inc., a private company that helps develop renewable and alternative energy projects.

Pierre Lortie described the Charter violations of Bill C-23, the Fair Elections Act, to the Procedure and House affairs committee on April 8, 2014. Lortie, who chaired the Royal Commission on Electoral Reform and Party Financing in the late '80s and early '90s, now works for Dentons Canada. Mr. Lortie's opinion piece on manufacturing was published in the March 10, 2014 edition of "The Hill Times."

Congratulations to David Lynch, named to the new Alberta Innovation Council. Dr. Lynch has been the Dean of Engineering at the University of Alberta since 1994.

Professor Om P. Malik was awarded the "Immigrant of Distinction Lifetime Achievement Award" by Immigrant Services Calgary in March 2014. This award is presented to an immigrant who has achieved outstanding success in his or her chosen career path or professional field and will have made significant contributions to the City of Calgary in the areas of professional achievement, community building and philanthropic endeavours.

2014 Killam Laureates seated with Governor General David Johnston, with Killam Trustees and the vice-president of the Canada Council for the Arts
Andreas Mandelis, front row, second from right

Andreas Mandelis, University of Toronto, is the recipient of the 2014 Canada Council Killam Prize in the field of engineering. Mandelis is a leading scientist and engineer in diagnostic applications of lasers in applied physics, materials science and biomedical engineering. He is a pioneer in establishing the fields of diffusion-wave and photoacoustic

(Continued on page 6)

Fellows in the News (cont'd 2)

(Continued from page 5)

sciences and technologies. His vision and research leadership have produced significant advancements in diagnostic instrumentation for manufacturing, optoelectronics, biosensors and biomedical imaging. The Killam Prizes were created to honour eminent Canadian scholars and scientists actively engaged in research, whether in industry, government agencies or universities.

John McLaughlin, former President of the CAE, has taken on a new role as Scholar in Residence at UNB's Dr. J. Herbert Smith Centre for Technology Management & Entrepreneurship. He will be responsible for expanding its community and enhancing the curriculum.

Javad Mostaghimi was awarded the 2013 Robert W. Angus Medal by the Canadian Society for Mechanical Engineering, for outstanding contributions to the management and practice of mechanical engineering. He has also been honoured with the University of Toronto Faculty of Applied Science & Engineering's Research Leader Award. Professor Mostaghimi is the U of T Distinguished Professor in Plasma Engineering and founding Director of the Centre for Advanced Coating Technologies (CACT).

Eric Newell has received the Distinguished Friend of Education award from the Council for Advancement and Support of Education and the 2014 Friend of Education award from the Canadian Council for the Advancement of Education. In addition, Mr. Newell will be one of four recipients of the Public Policy Forum's Peter Lougheed Award for Leadership in Public Policy presented in recognition of exceptional Western Canadian policy leadership with a national impact. It will be awarded at the PPF's Annual Western Dinner on 23 October.

Doug Perovic, Professor of Materials Science and Engineering at U of T, recently shared his expertise with CBC and Global News about black box technology and its role in the Flight MH370 disaster. Professor Perovic currently teaches the only forensic engineering course in Canada, where he challenges students to apply engineering design concepts to real-world problems – learning the tools they need for high-level sleuthing.

Gerry Price, Chairman & CEO, Price Industries Ltd., has announced a $14.5-million expansion of their Winnipeg manufacturing/research headquarters that will create 150 new jobs over the next five years. Price Industries is North America's largest manufacturer of air distribution, heating, ventilation and air conditioning products for the non-residential sector.

C. Ravi Ravindran, Professor of Advanced Materials and Manufacturing Processes at Ryerson University and Director of the Centre for Near-net-shape Processing of Materials, is the 2013-2014 President of ASM International. He was spotlighted in Advanced Materials & Processes magazine in January 2014.

Mohini Sain of the University of Toronto has been elected as a Fellow of the Royal Society of Chemistry.

Indira Samarasekera, President and Vice-Chancellor, University of Alberta, has been elected as a Foreign Associate of the US' National Academy of Engineering. She was cited for mechanistic understanding of steel casting processes for improved productivity. She also received an honorary doctorate from the University of Toronto in June.

Adel Sedra, Adjunct Professor and Professor Emeritus at the University of Waterloo, was recently appointed to the Order of Ontario. His citation noted "His seminal work has resulted in major developments in fields ranging from medical technology to wireless communications. Mr. Sedra co-authored *Microelectronic Circuits*, the best-selling engineering textbook in history."

Mamdouh Shoukri was awarded an honorary Doctor of Science degree during McMaster's Spring convocation ceremonies. He is serving his second term as President and Vice-Chancellor of York University. As a former dean of engineering at McMaster, Shoukri spearheaded a major expansion of the faculty, nearly doubling its enrolment and faculty complement and as Vice-President (Research & International Affairs) he helped make the McMaster Innovation Park a reality.

Slobodan P. Simonovic was an invited guest with the Academia Sinica, Taipei, Taiwan in April 2014. He stayed at the Academia Sinica to share his experience on climate change risk analysis and water resources management. He participated in the discussions with colleagues from Taiwan on their large scale program under the title: Taiwan Integrated research Program on Climate Change Adaptation technology. His stay involved visits, discussions and lectures at the Academia Sinica (Taipei), National Taiwan University (Taipei), National Science and Technology Center for Disaster Reduction (Taipei), National Central

(Continued on page 7)

Fellows in the News (cont'd 3)

(Continued from page 6)

University (Jhongli City), and National Chiao Tung University, (Hsinchu City). Prof. Simonovic visited Tongji University in Shanghai (end of May) to attend the celebration of publication of his book "Systems Approach to Management of Disasters - Methods and Applications" in Chinese language. The celebration organized by Prof. Chuangfeng HAN, Professor of Tongji University and translator of the book was attended by the University dignitaries (including the Vice-President of the University), guests from the Chinese Academy of Sciences, University and government, and graduate students. The Chinese version of the book is published by and available from the Science Press http://www.sciencep.com/. The English version of the book, published in 2011, is available from Wiley and Sons http://ca.wiley.com/WileyCDA/WileyTitle/productCd-0470528095.html

Peter Watson will become Chair of the National Energy Board in August 2014. For years, Mr. Watson has been at the centre of Alberta's energy and environment policies, as deputy minister for environment, deputy minister for energy and top bureaucrat for the executive committee and head of the civil service.

Jean Zu, Chair, Mechanical & Industrial Engineering, University of Toronto, has won the American Society for Engineering Education's Donald E. Marlowe Award for Distinguished Education Administration. This award recognizes an administrator who makes significant ongoing contributions to education for engineering.

A number of Fellows of the Canadian Academy of Engineering were part of the development of the collaborative paper, The 2013 Great Alberta Flood: Actions to Mitigate, Manage and Control Future Floods, in response to the recent flooding in that province. This paper was created to provide proactive recommendations to be used for future flood mitigation. FCAEs Kim Sturgess, Maja Veljkovic, David B. Chalcroft, Darrel Danyluk and Steve E. Hrudey were part of the report's authorship team.

Nine Canadian engineers made the Thomson Reuters "World's Most Influential Scientific Minds" 2014 list, including CAE Fellows Ned Djilali, Tongwen Chen and David P. Wilkinson.

CAE Fellows Honoured by IEEE Canada

A number of Fellows of the CAE were recently honoured by IEEE Canada:

Ling Guan, Ryerson University, received the C. C. Gotlieb Award "For outstanding contributions to multimedia computing and communications"

Wenyung Li, British Columbia Transmission Corporation, was given the Power Award "For contributions to methods and applications in power system reliability "

Jamal Deen, McMaster University, received the J. M. Ham Outstanding Engineering Educator Award "For outstanding contributions in engineering education &dedication to students" and

Gamal Refai-Ahmed, GE Global Research, received the R. H. Tanner Industry Leadership Award "For sustained leadership in product development and industrial innovation."

Canadian Society of Mechanical Engineering

The Canadian Society of Mechanical Engineering recently announced its 2014 honourees, which included a number of CAE Fellows. Dr. Sheldon Green of the University of British Columbia and Dr. John McPhee of the University of Waterloo were made CSME Fellows and Dr. Cristina H. Amon, Dean of the Faculty of Engineering and Applied Science at the University of Toronto, won the Robert W. Angus Medal, which was established in 1957 to honour the late Professor Angus who taught for many years in Mechanical Engineering at the University of Toronto. It is awarded annually to a Canadian engineer for outstanding contributions to the management and practice of mechanical engineering.

2014 Ontario Professional Engineers Awards

We are pleased to report that four of our Fellows will be honoured at the 2014 Ontario Professional Engineers Awards, the ceremony to be held in November.

Raafat Mansour of the University of Waterloo and David Naylor of Ryerson University are receiving Medals for R&D, and Bin Wu, also of Ryerson, is being cited for Engineering Excellence. Finally, Brian Garrod, of Hatch Mott MacDonald, will also be awarded an Engineering Excellence Medal.

Canada: Becoming a Sustainable Energy Powerhouse

Public Launch of the Canadian Academy of Engineering's book 'Canada: Becoming a Sustainable Energy Powerhouse'[1] - June 26, 2014, St. John's Newfoundland

Highlights of this CAE energy book were presented at Symposium 2 at the Academy's Annual Meeting on June 26.

This book was a follow-up to the Academy's previous energy book 'Canada: Winning as a Sustainable Energy Superpower', which demonstrated that Canada has the energy resources to be a sustainable energy superpower. The new book focusses on early projects that would represent an important first step – i.e. becoming an energy powerhouse.

Symposium 2 at the Annual Meeting emphasized the key message that Canada's energy exports are based largely on two products, hydrocarbons and electricity. Canada was built east and west by big national-scale projects, railways and highways as examples of transportation assets and microwaves and satellites as communication assets. Two big east-west energy infrastructure projects are now required to complete our nation-building: pipelines to safely transport hydrocarbons and derived products, and a national grid to tap undeveloped hydroelectric power and to unlock stranded power.

East-west pipelines for the flow of hydrocarbons and derived products would counter current corporate economics that lead to shipping raw bitumen outside the country, and that are not in the long-term interest of Canada. According to the Honourable Frank McKenna, Canada's current habit of selling its raw energy resources to the highest bidder 'represents value destruction on a scale never witnessed before in this country'[2]. As Dr. Jim Stanford[3], author of a chapter in our new book, noted, 'scraping and selling tar' is a poor substitute for a national energy strategy. To reverse this current disturbing trajectory, pipelines are needed to bring the oil sands bitumen to various sites across the country to produce high value fuel and petrochemical products.

A national east-west electricity grid for tapping into Canada's huge hydroelectric power potential, with north-south regional hubs, would enable a ten-fold increase in the sale of low greenhouse-gas power to the USA. Electricity represents enormous energy value-added and builds on an area where Canada has world leading engineering and construction expertise. A national grid would also level power costs across the country and would be a major stimulus to a renewed manufacturing capability.

The following specific presentations were delivered at the Symposium:

Clem Bowman welcomed delegates to Symposium 2 and noted that the panel would present a 'story' about how big projects in transportation, in energy and in communication created the Canada we know. He emphasized that these big projects became the foundation of Canada's Innovation Strategy with each project creating a torrent of entrepreneurial activity. He described nine new big projects that would continue building Canada and connect the East and the West.

Katherine Albion, Director, Bowman Centre, Sarnia-Lambton Research Park, presented convincing evidence provided by Jim Stanford that demonstrated that Canada has become de-industrialized in the early part of this century through the rapid escalation of minimally upgraded exports.

Mark Shrimpton, Principal of Stantec Consulting Ltd. described how Newfoundland's offshore petroleum development has been a 21st century case study of the innovation that flows from a truly big project.

Walter Petryschuk, Associate Bowman Centre at the Sarnia-Lambton Research Park, identified the enormous wealth that could be generated over the next few decades by upgrading bitumen in Canada to value-added products. He stated that the birthplace of the Canadian petroleum industry (Sarnia-Lambton) is the logical location for the first of a series of new upgrading refineries.

Jatin Nathwani, Executive Director, Waterloo Institute for Sustainable Energy, laid out the dimensions of a national power grid fed by new hydroelectric projects. He noted that this would enable a tenfold increase in our sales of low greenhouse electricity to the United States, and in turn help North America meet its greenhouse gas targets.

Gilbert Bennett, Vice-President, Lower Churchill, Nalcor Energy, described the exciting Muskrat Falls hydroelectric project now under construction with its innovative pathways to the final market. He noted that this project illustrates many of the challenges that Canada has faced in implementing big national projects requiring public private sector collaboration.

Ray Gosine, Associate Vice-President Research, Memorial University, described Pierre Gingras' innovative hydroelectric complex for the Mackenzie River. Unlike the doomed natural gas pipeline of the past century, this project would create a chain of revenue producing infrastructure that would give the Northwest Territories a major role in Canada's future.

Finally, the co-editors of this book, Richard Marceau and Clem Bowman, noted that Canada should not be defensive about the small and narrowing greenhouse-gas penalty for the oil sands bitumen in comparison with other major world crude oils. Canada

(Continued on page 9)

In Memoriam

The Canadian Academy of Engineering offers its condolences on the death of the Fellows listed below. If you are aware of the passing of a Fellow not listed, please contact Valérie Broadfoot at vbroadfoot@cae-acg.ca.

Bernard Etkin, elected in 1987, passed away on June 26, 2014. Etkin led an accomplished career that spanned 50+ years of aeronautical research, consulting, teaching, and academic leadership. He joined the University of Toronto's Department of Aeronautical Engineering in 1942, and helped found the Institute for Aerospace Studies (UTIAS) in 1950. He was a Founding Fellow of the Canadian Academy of Engineering and a Fellow of the Royal Society of Canada, the American Institute of Aeronautics and Astronautics and the Canadian Aeronautics and Space Institute. He was inducted into the Order of Canada in 2003.

Pierre Franche, elected in 1998, passed away on March 13, 2014. Pierre graduated in engineering from McGill University in 1955. He started working at Shawinigan Chemicals then later worked for the federal government where he held, among others, the positions of Director of Parks Canada and Director of National Harbours Board. In 1974, he completed his Masters' thesis in management at Oxford University. In 1982, he became CEO of VIA Rail Canada. He served as the Executive Director of the Canadian Academy of Engineering from 1997 to 1999. He distinguished himself by his integrity, his team spirit, and by his vision and realization of ambitious projects.

Francis T. Hartman, elected in 2003, passed away on March 15, 2014. Francis had been with the department of Civil Engineering at the University of Calgary since 1991 as a Professor and held a Chair in Project Management. He was the driving force behind establishing and sustaining the Project Management program at the U of C. In collaboration with industry from the Engineering, Construction, Technology and IT sectors, Francis created a successful research and PhD program. He also established research and teaching collaborations with international associations and universities. His contributions to research and its impact on industry practices were unparalleled through his many journal publications, books and book chapters, seminars and conferences.

Gerald G. Hatch, elected in 1989, passed away on June 9, 2014. He graduated with honours in Metallurgical Engineering from McGill in 1944 and with a Doctor of Science from the Massachusetts Institute of Technology in 1948. Gerry was the founder of HATCH Ltd., a global consulting engineering firm which currently has more than 12,000 employees in 65 offices on six continents. He was a member of the Canadian Mining Hall of Fame, the Canadian Science and Engineering Hall of Fame, and the Order of Canada. Gerry was especially proud of his technical and philanthropic associations with the Faculties of Engineering at McGill University and McMaster University, as well as his association with the Canadian Institute for Advanced Research (CIFAR).

Canadian Society for Civil Engineering

The Canadian Society for Civil Engineering recently held its 2014 meeting in Halifax. A number of CAE Fellows were honoured. They are: Carl Haas, of the University of Waterloo who won the Walter Shanly Award for construction practice; Murat Saatcioglu, of the University of Ottawa, winner of the Whitman Wright Award for advancement of IT in Civil Engineering; Kerry Rowe of Queens, a co-winner of the Donald R. Stanley Award for environmental engineering and. G. Ward Wilson and Michel Aubertin, two of the authors of the paper that won the Thomas C. Keefer Medal for best hydrotechnical, transportation or environmental engineering paper.

Canada: Becoming a Sustainable Energy Powerhouse (cont'd)

(Continued from page 8)

should follow the lead of U.S.A. vehicle manufacturers who reduce their vehicle mileage over their entire fleet and not on individual car models. Canada should present its low-greenhouse gas emissions record on an integrated energy basis over our entire energy industry, rather than having individual components dissected and controlled by international trade regulations. They believe that the following twin energy strategy would unite our country in spirit and action in a way that few other national strategies could, while building Canada's economy and its capacity to accelerate investments in technologies which will eventually reverse climate change:

1. A network of east-west pipelines, supporting the upgrade of our non-renewable and renewable energy resources into higher-value fuels and petrochemicals for sale to both North American and global markets.
2. A national grid with the ability to transmit large blocks of power east-west and north-south and thus enable a major increase in the sale of low-greenhouse gas electricity to the U.S.A.

[1] Canada: Becoming a Sustainable Energy Powerhouse, ISBN: 978-1-928194-00-2
[2] Bitumen- Adding Value: Canada's National Opportunity Conference, May 21/22, 2013
[3] Globe and Mail Sustainable Energy Supplement, May 21, 2014

Trottier Energy Futures Project Update

by Oskar Sigvaldason, FCAE, TEFP Project Manager

Background and Context:

The initiative for the Trottier Energy Futures Project (TEFP) came from Lorne Trottier, FCAE, though the Trottier Family Foundation (TFF). Lorne Trottier is an engineer, businessman and philanthropist. He co-founded Matrox, a Montreal-based company specializing in computer graphics. He is a Member of the Order of Canada and a Fellow of the Canadian Academy of Engineering. TFF is providing required funding for the Project.

The goal of the Project is to assess and select strategies for reducing greenhouse gas (GHG) emissions in Canada by 80% by 2050, relative to 1990. To address this daunting challenge, Lorne Trottier arranged to have the Project jointly sponsored by the Canadian Academy of Engineering (CAE) and the David Suzuki Foundation (DSF).

General Approach:

The approach to the Study includes:

i) Assembly of a broad based team of specialists covering the full range of disciplines required for the Project, including specialists in energy systems, environmental science, economics, systems analysis, and various specialty disciplines such as bio-fuels, agriculture and forestry, urban planning, etc...

ii) Preparation of a series of working paper to assess the potential for reducing GHG releases for every sector in Canada that produces or consumes GHGs. This includes defining GHG reduction relations with associated cost representations for all GHG sources and sinks, for each of the provincial and territorial jurisdictions across Canada.

iii) Use of two mathematical models for selecting an overall combination of transformation strategies for achieving targeted net reduction in GHG releases across Canada, at minimum overall cost. The two models are:

- the TIMES Canada optimization model developed at the GERAD Research Centre in Montreal. The TIMES Canada model is the Canadian version of the TIMES/MARKAL family of optimization models, originally developed by the International Energy Agency (IEA). Ongoing development and use of this family of models continues to be coordinated globally through IEA-ETSAP (Energy Technology Systems Analysis Program).
- Canadian Energy System Simulation Program (CanESS), originally developed by What If? Technologies
  Both models have been calibrated with Canadian data for the 1976 to 2010 period, using data from the National Energy Board, Statistics Canada, Natural Resources Canada and Environment Canada.
  For the models, Canada's energy-environmental system is represented by separate representations of the various sectors of the Canadian economy, by the thirteen provincial and territorial jurisdictions, and in a multi time period context, from 2010 to 2060.

iv) A four person Expert Review Panel for providing quality assurance and general direction oversight. The members are:

- Andre Plourde; Energy Economist and Dean of Public Affairs, Carleton University; Chair of Expert Review Panel
- John Leggat, FCAE; former Assistant Deputy Minister (Science & Technology) for Canada's Department of National Defence, and former President, CAE; Rapporteur for Expert Review Panel
- Miguel Anjos; Canada Research Chair at École Polytechnique, specializing in energy systems, and
- Ken Ogilvie; Environmental Policy Consultant to Governments, Business and Environmental Organizations; Vice Chair, Sustainable Development Technologies Corporation

v) The Project Manager is Oskar Sigvaldason, FCAE, reporting directly to a Project Board, including Richard Marceau, FCAE, representing the CAE and Chair of the Project Board; Lorne Trottier, FCAE, TFF; and Peter Robinson, CEO, DSF. Project coordination is being provided by Kevin Goheen, for CAE, and by Mara Kerry, for DSF. The CAE is Executing Agency for the Project.

Early Observations:

The Work Plan for the Project is very ambitious, especially for such a large and complex undertaking. There is still substantial analysis and investigation to be carried out, before the Report can be finalized. The Final Report is scheduled for release at the end of 2014. There are some very preliminary observations from work completed to date, which may be of general interest.

- For Scenarios with significant overall GHG emission reduction constraints, there will be early economic opportunities for increasing the role of electricity in Canada, especially with transforming end uses in several sectors away from burning of fossil fuels towards electrification. This will apply especially in jurisdictions having existing and additional low cost sources of renewable electricity.
- Canada is in an especially favoured position with substantial additional renewable electricity sources available for development at competitive cost. This represents an economic opportunity for Canada, especially with greater integration of electricity supply systems for achieving overall reductions of GHG emissions in North America. Again, this applies especially for Scenarios with major GHG reduction constraints in the two countries.
- There are significant opportunities for reducing GHG emissions in Urban Regions, especially with implementing fundamental changes in the way in which such Regions are planned and developed.

Engineering in Canada's Northern Oceans

Engineering in Canada's Northern Oceans: Research and Strategies for Development
A Study for the Canadian Academy of Engineering

by Ian Jordaan, FCAE, Chair, Task Force on Engineering in Canada's Northern Oceans

Summary
The study is being conducted by a team comprising FCAEs Ken Croasdale, Robert Frederking, Ian Jordaan (Chair) and Peter Noble. Presentations on ongoing work were given at the recent Annual Meeting of the Academy in St John's on June 26, 2014. The power point presentations have been made available on the Academy website for interested persons. A report is being prepared on the study together with its conclusions and recommendations.

The areas of study are Canada's northern oceans, the Arctic and Atlantic, and waters and seas that are part of or adjacent to these oceans, including the waters within and around the Canadian archipelago. The various islands are separated from each other and the continental mainland by a series of waterways, the Northwestern Passages. The technical emphasis of the report is the study of engineering needs for future development in northern oceanic waters. The focus is primarily on natural resource development and infrastructure needs for other activities such as Arctic community re-supply and Arctic shipping and maritime safety and security.

The study commences with a review of recent reports, including two of the Centre for the North (CFN 2011, 2013). These reports emphasize the importance of climate change, infrastructure, emergency response & SAR as well as commodity prices in northern development. Climate change will improve the accessibility of northern marine waters; an increase in shipping is possible but there are complicating factors. It is concluded that "the way that the risks and benefits of economic development are weighted and managed must make sense to Northerners, keep their interests front and centre, and effectively capture the Northern context." Leveraging public-private cooperation and partnerships is advocated. "Boom-bust" issues, for instance when mining activities create substantial activity, and then decline, can be an important issue in planning. Transportation infrastructure in Northern communities is significantly more expensive to develop than in the South and at present is sparse. Warming, permafrost degradation, declining viability of winter roads must be taken into account in new designs. The importance of marine transportation is emphasized. CARD (2013) in their Arctic Development Roadmap, focussed on the oil and gas industry and consulted extensively with industry. The principal issues raised were environmental protection, ice management, ice mechanics and loading, station-keeping in ice and environmental characterization.

For the subject report an inventory of Canadian centres oriented towards northern research has been carried out, together with a detailed review of present-day Canadian expertise. Canadian contribution to codes and standards, many of them international, has been summarised. The report includes a set of case studies of Canadian involvement in northern engineering in the following areas: Beaufort Sea, East Coast of Canada, Caspian Sea, Barents Sea, Voisey's Bay, Arctic islands and pilot production, Arctic Pilot Project. An inventory of mineral resources and port infrastructure has also been undertaken. Barriers to development are seen as transportation, infrastructure, energy and people.

Past use of the Northwest Passages has been reviewed, including the voyage of the S.S. Manhattan, and Canada's icebreaker design and construction of the 1970's. The Canmar fleet and in particular the Kigoriak, as well as the Beaudril fleet, have been reviewed. Canada's EER capability is viewed as being a world leader. Recent shipping activities have been centred on the MV Arctic, MV Umiak, MV Nunavik. In Canada's waters, destination shipping, for example associated with mining activities, is seen as the important activity. Canadian infrastructure to support northern marine activities is sparse, in contrast to Russia, which has year round activities and considerable infrastructure. Russian continues to expand its capability for Arctic marine operations.

The study group conducted a brief review of climate change and in particular its influence upon shipping. The conditions in the Northwest Passage are known to be highly variable from year to year. The IPCC finding of a warming trend and thinner ice is accepted, but any use of this trend in planning of transportation and engineering activities must be considered in the light of year-to-year variability, and the possibility of old ice in the passageways of the Passage. In brief, IPCC is accepted but interpretation in Arctic is far from straightforward. Engineers must account for all relevant uncertainties in their planning. Concerns regarding permafrost degradation and road construction have been noted.

With regard to Arctic sovereignty, it is important to emphasize the need to have a strong presence. A sovereign state is represented by one centralized government that has supreme independent authority over a geographic area. There are responsibilities associated with this authority. For an Arctic State, in the 21st century, these responsibilities and obligations can only be satisfied by the extensive use of technology, including ships, aircraft, and remote monitoring systems. The Polar

(Continued on page 15)

President's Message (cont'd)

(Continued from page 1)
limitations and, therefore, accept that their most valuable contribution is to inform policy, not make it.

The mission of the Canadian Academy of Engineering is to provide leadership and expert advice on the implications of strategic choices about the potential of technology, engineering, design and innovations, their economic effects and to enhance, through the application and adaptation of scientific and engineering principles, the well-being of Canadians and the creation of wealth in Canada.

There are very few examples where natural science and technology can alone inform sound public policies. The establishment of the Council of Canadian Academies in 2005, an umbrella organization formed to coordinate and facilitate the participation of Fellows of the Royal Canadian Society, the Canadian Academy of Engineering and the Canadian Academy of Health Sciences who are recognized experts of the topic under study, was the answer to the need to ensure the relevance of the expert advice. It is fair to say that the assessments made over the years have generally complied with the standards of balanced, evidence-based and independent advice.

Notwithstanding the significant contribution of the CCA to sound public policy making since its inception, the fact remains that the Council is dependent on "government money" and, consequently, acts mainly in response to specific requests made by policymakers. There is no doubt that this is an important and valuable role and that the CAE contribution to the work of the CCA is in line with the purpose of our Academy. However, we must not delude ourselves that this useful but limited contribution of the CAE meets our mission which is **to provide leadership….**with respect to the economic, environmental and societal implications stemming from the science and technological dimensions of policy choices.

A PATH TOWARDS A LEADERSHIP POSITION

It may seem paradoxical but the first step in the journey towards an influential leadership position in the Canadian polity depends on the ability of the CAE to promote cross fertilisation between industry, academia and public administration, in Canada and through international collaboration with foreign academies. Alone, it is unlikely that the CAE can attain the stature and respect its Fellows yearn for their Academy. We must join forces with similar organizations that are equipped to contribute to the analysis and elaboration of evidence-based policy through expert advice complementary to the one our Fellows can provide.

This is clearly the case with our sister academies. Hence, the need to strengthen our cooperation and multiply joint endeavours with them. We also need to reach out and partner with other organizations recognized for the depth and quality of their expertise in policy analyses where natural science and technology constitute a significant dimension of the matter under study.

In pursuit of this goal, we have initiated extensive discussions with the Conference Board of Canada to organize of a series of joint conferences on issues of considerable importance for the future well-being of Canadians. These joint conferences will be structured around two themes: industrial competitiveness and infrastructures.

The first theme, industrial competitiveness, stems from a growing recognition that competitiveness of Canadian industry and the role of technology in improving competitiveness are national issues. In these conferences, the role of technology in shaping the future structure of specific industries and the success of companies in global expansion would be considered. Also considered would be the role of design and technology in enhancing their competitiveness and their contribution to the Canadian economy. The conferences would aim at identifying the benefits and impediments to adding value to current activities and make recommendations for the future.

We envisaged a series of forums on individual sectors of the industry to be held across the country over the next 24 months, in a location where their center of gravity is located. For example, a forum on the oil and gas industry would be held in Alberta, for automotive in Ontario and for aerospace in Quebec. This approach would have the advantage of mobilizing resources and expertise residing in our regional sections. The main outcome of each of these forums would be a report outlining the path towards global competitiveness. It is also envisaged that a national conference will be held at the end to collect the results, identify the problems and solutions common to several or all sectors and develop a consensus for action.

The second theme would be focused on the adequacy of our infrastructures. Canada is facing serious infrastructure challenges which, if not addressed, will hinder our competitiveness, jeopardize our ability to take advantage of buoyant foreign markets and to diversify our export destinations and, because of their vulnerability to unforeseen climatic hazards lead to disasters of untold social and financial costs.

At the present time, we are considering a series of four national conferences on this thematic to be held over a period of 18 to 24 months.

(Continued on page 13)

President's Message (cont'd 2)

(Continued from page 12)

In the coming weeks, the CAE will reach out to Fellows whose area of expertise and interests lie in the field of a particular industry forum to invite them to contribute to a discussion paper describing the relative position of the industry and the key challenges facing the sector, to participate in defining the program and to identify potential participants. The same process will be followed for the national conferences on infrastructure.

Some may wonder why the CAE does not undertake this program on its own. The fact is that, although the Academy is in a positive financial situation, it does not possess the resources needed to organize such a conference program and prepare the reports necessary to influence private and public decision-making nor the financial means to finance the endeavor. In the final analysis, this is a case where financial constraints lead us to a better approach that will enable the Academy and its Fellows to exercise the authoritative and effective leadership role we are expected to play in Canadian society.

THE POLITICS AND PRACTICE OF SCIENTIFIC AND TECHNOLOGY ADVICE

At our last Annual General Meeting in Montreal, disturbing data on Canadians' attitudes towards hard evidence and rational debate was presented.[1] Anecdotal reports, exceptional events and populism dominate policy debates and shape public opinion, a process amplified by the ubiquitous social media. Policy makers are very concerned by this evolution since it significantly curtails the range of options open for consideration and irremediably leads to policies likely to produce more damage than good. They are generally keen to arrest the debasing of scientific knowledge as a fundamental component of policy making but find it very difficult to blend the various strands of scientific advice and empirical evidence into coherent and implementable policies. They are confronted with the facts that policy decisions are strongly influenced by values and science is complex and does not provide complete answers.

Opportunities, constraints and dilemmas associated with scientific advances and rapid technological developments come to the fore in many countries. Scientific advice operates at the interstices of the policy and public domains, and is therefore subject to the vagaries of public discourse. From climate change to cyber-security, poverty to pandemics, food technologies to fracking, controversies continue to erupt at the boundaries between science and society.

In many countries, we see the politics of scientific advice being actively debated. Next August, the International Council for Science will host the first international summit on scientific advice. Exploration of these issues needs to be undertaken anew in Canada. The CAE should take the lead in organizing a national conversation on the importance of evidence-based policies and the best approaches to embed sound scientific advice into policy making as a matter of course. Canadians are fortunate to live in a knowledge-based society. This permeates all sectors of activities, including our governments and parliaments. Consequently, we should also examine the issues related to capacity building in the science-policy interface. The objective should be to develop a consensus for an effective science advisory process that leads to better government decisions, minimize crises and unnecessary controversies, and capitalize on opportunities to improve the quality of life of Canadians, while creating value and wealth.

Here again, a series of forums across Canada that would bring together our Fellows concerned by this state of affairs, practitioners in the art of policy making and other experts would appear to be the most effective venue. Clearly, an interdisciplinary approach is an absolute necessity. Our sister academies would be invited to join and support the effort as well as institutes of public policy with experience in this area.

CONCLUSION

The CAE has done an excellent job over the past years. Much of this success is due to the outstanding contribution of Kevin Goheen and our dedicated staff.

For the future, there is no doubt that the management of the ambitious program I outlined which focuses on the articulation of evidence-based policies and action plans to strengthen the international competitiveness of Canada's industries, to ensure that our infrastructures meet in the most efficient way our economic and social needs and are resilient and able to contain natural disasters and to promote the use of sound scientific advice in policy making will place a significant administrative burden on our staff. For this is not their only task.

The program calls for the participation and sustained commitment on the part of our Fellows. This is as it should be: the Fellows make the CAE and not vice versa. The purpose of the CAE is to recognize and to bring together the most successful and most talented engineers from all areas of engineering sectors to provide independent and expert advice on issues of national importance pertinent to engineering and technology. Thus, it is our collective and individual responsibility to bring our experience and knowledge to bear on issues of vital importance to Canadian society. And for the CAE, its role is to provide Fellows with the means and mechanisms to make this happen.

[1]Graves, Frank – *Shifting Social and Economic Outlook*, presentation to the Canadian Academy of Engineering, EKOS, June 2013

Call for Nominations

The Board of Directors of the CAE is inviting nominations of new Fellows. The form and guidelines are available in the Fellows' section of our website. Note as well that our office maintains a list of prominent Canadian engineers who, for some reason, have never been nominated for Fellowship. Upon request, we will send you this list, in case you are interested in correcting one or more of these oversights. Completed files are due at our office by 1 October in order to allow adequate time for the new preliminary screen and editing process. The final version is due 31 October.

On a related topic, over the years, there has been internal criticism that our Fellowship base favours the Academic sector. Recently, we have put in place a number of measures designed to drive our annual intake towards a more even split of Academic, Private Sector and Government/Non Profit. We also track the number of women we have admitted. The data from the 2014 intake, compared with the most recent elections at the US National Academy of Engineering and the UK's Royal Academy of Engineering, indicate that our efforts are having a positive effect.

CAE: 50 total, 42% Academic, 36% Private Sector, 22% Government & Non Profit, 12% Women.
NAE: 67 total, 60% Academic, 34% Private Sector, 6% Government & Non Profit, 10% Women.
RAE: 60 total, 48% Academic, 35% Private Sector, 17% Government & Non Profit, 5% Women.

Section News

Calgary: The Section has met twice so far in 2014. They have provided a list of suggestions for modifying the Fellowship election process and our communications protocols. On June 25, the CAE Board formally approved their Terms of Reference. Congratulations to interim leadership Ross Douglas and Kim Sturgess for your efforts to bring the creation of this section about.

Engineers Canada News

As the national organization of Canada's engineering regulatory bodies, Engineers Canada works closely with its 12 constituent associations to deliver national programs that contribute to advancing the engineering profession and its self-regulation in the public interest. There are more than 270,000 members of the engineering profession.

Policy Governance
Engineers Canada has implemented a Policy Governance model, which is a practical approach for the Board to ensure organizational performance reflects the best interests of the constituent associations. This model of governance also allows for better connection between the goals of the constituent associations and the execution of work on the part of Engineers Canada. The Board established comprehensive policies in Ends, Governance Process, Board-Management Delegation, and Executive Limitations categories, which can be found on our website.

Organizational Realignment
To better achieve the Ends policies, Engineers Canada has been realigned into two divisions: *Regulatory Affairs* and *Business Development and Services*. This resulted in the appointment of Kathryn Sutherland, FEC, P.Eng., LL.B., as Vice-President, Regulatory Affairs, and Guy Legault, MBA, FCPA, FCGA, CAE, as Vice-President, Business Development and Services.

New Board
Engineers Canada is pleased to welcome Paul Amyotte, FEC, FCAE, P.Eng., as its president for the 2014–2015 term. Dr. Amyotte was elected at our Annual General Meeting in Saint John, New Brunswick, in May. Dr. Amyotte will lead the Engineers Canada Board in support of the provincial and territorial engineering regulatory bodies to advance the engineering profession and its self-regulation in the public interest. He will be joined by the following members of the Executive Committee: Digvir Jayas, FCAE, President-Elect, FEC, P.Eng. (APEGM); Past-President W. James Beckett, FEC, FCAE, P.Eng., (APEGA); Diane Freeman, FEC, P.Eng. (PEO); Stéphane Bilodeau, ing. (OIQ); Catherine Harwood, FEC, P.Eng. (APEY); and Engineers Canada's Chief Executive Officer Kim Allen, FEC, P.Eng. They will be supported by the Engineers Canada staff in Ottawa.

Award Winners
Engineers Canada was proud to honour the accomplishments of nine remarkable professional engineers and projects during the Engineers Canada Awards Gala in May at our Annual General Meeting. Watch the recipient videos on our YouTube channel.
Explore www.engineerscanada.ca to get more information on these and other Engineers Canada activities or sign up for our weekly newsletter at www.engineerscanada.ca/e/pu_newsletter.cfm. You can also follow Engineers Canada on Twitter, Facebook, LinkedIn and YouTube.

Engineering in Canada's Northern Oceans (cont'd)

(Continued from page 11)

icebreaker CCGS Diefenbaker will be available when completed in some years' time. In the meantime Canada has very limited capability; the Arctic Offshore Patrol Vessels, now being designed and built, have limited ice transiting capability. While there is little evidence at present of a challenge to Canada's sovereignty in the north, Canada is ill-prepared to address any future challenge.

Innovative activities are advocated. Engineering research is needed in the areas of ice structure interaction, ice loads on ship hulls in heavy ice, and efficient ice-worthy propulsion systems. The team proposes for consideration several "visionary" projects and programs within the list below.

Recommendations

1. Education

Improved access to educational facilities in engineering and technology by northerners is seen as a priority, and we advocate the commencement of instruction in engineering and technology at CHARS linked to expertise in other Universities in Canada, for example Memorial University. The concept could be similar to the Ny-Ålesund research facility in Svalbard which is managed by the Norwegian government.

2. Arctic LNG—Clean Green Fuel for the north

The Arctic has an abundant supply of natural gas both in the Beaufort Sea region and in the Arctic Archipelago. Arctic communities and activities need fuel. It is proposed to develop an Arctic LNG Public-Private partnership to supply LNG both for fuelling government Arctic operations and supplying local community needs would provide clean green fuel Arctic fuel which would, for example, allow year round icebreaker operations

3. Mobile Arctic Engineering Research Platform

In this concept an iceworthy ship would be developed to be the engineering experiment itself, rather than a platform for science laboratories. Ice transit experiments, hull and propeller loads, study of towing of arrays in ice, ice management strategy development, experiments to develop support of sub-sea developments in ice are possible functions, with Nanisivik as a possible northern base.

4. Canadian Arctic Railway along the McKenzie Valley from Hay River to Inuvik

A Canadian Arctic Railway would provide a two-way system which could be used to deliver materiel for northern construction as well as fuel and other essentials for local communities presently serviced by summer barge traffic on the McKenzie River. The system could bring Arctic oil to southern markets, and the rail road would provide a strong logistics link to the western arctic which would improve infrastructure; reinforce Canadian Arctic Sovereignty. Further, the system would allow for development of other natural resources such as mining and forest product, along its route. Possibly fuelled by LNG.

5. International Arctic Ocean-Space Engineering Experimental Station (IAOSEES)

A permanent base is proposed on Hans Island, which is currently disputed territory in the Kennedy Channel between Canada and Denmark. The IAOSEES (pronounced *Eye-Oh-Seas*) would be jointly managed by Canada and Denmark as a shared facility available to members of the Arctic Couincil. There is a need for large scale experimentation to further advance Arctic marine & offshore engineering.

6. Northern Involvement

It is recognized that traditional knowledge plays a role in engineering for Northern Oceans and that there is benefit from close relationships between engineers and Northern residents through organizations such as the Centre for the North, CFN, which provides a forum for research and dialogue on Northern and Aboriginal issues.

References

CFN 2011. Bristow, Marta and Gill, Vijay. 2011. *Northern Assets: Transportation Infrastructure in Remote Communities.* Ottawa: The Conference Board of Canada.

CFN 2013. Fournier, Stefan, and Margaret Caron-Vuotari. 2013. *Changing Tides: Economic Development in Canada's Northern Marine Waters*. Ottawa: The Conference Board of Canada.

CARD 2012. *Arctic Development Roadmap*. Center for Arctic Resource Development, C-CORE, St John's

Governance Changes

June and July 2014 saw many governance changes for the CAE, several of these being a result of the requirements of the Canada Not-for-profit Corporations Act. At the AGM on June 26, Fellows accepted the Special Resolution regarding the CAE's Articles of Continuance and By-law changes. The CAE has since received its certificate of continuance from Industry Canada.. The AGM minutes, Certificate and Articles of Continuance and approved By-laws are now available to Fellows on the private Information for Fellows' page on the website.

To make the new By-laws clearer and more succinct, some content previously included in the old By-laws was removed and is now being presented in the form of CAE policies. To date, the Board of Directors has approved seven policies. These are available for review on the private Information for Fellows' page on the website and cover the following topics: Canadian Anti-Spam Legislation (CASL); Fellowship Designation; Length of Executive Officer's Terms; Fellowship Nomination and Election; Privacy; Travel Expense; Unpaid Dues.

Of special note is the new Fellowship Designation policy, which states that, as a requirement of the Federal Not-for-profit Corporations Act, only Active Fellows are Members of the CAE. Therefore in French, a Fellow will now be referred to as Fellow de l'Académie canadienne du génie (FACG). Should you have any questions about the new By-laws or policies, please contact Executive Director Kevin Goheen at kgoheen@cae-acg.ca.

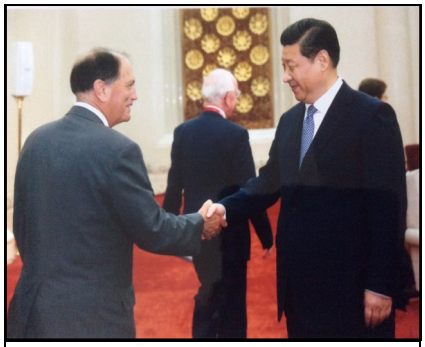
Council of Canadian Academies Update

So far, 2014 has been a very busy year for the Council. In all, we have released three expert panel reports: Aboriginal Food Security in Northern Canada: An Assessment of the State of Knowledge, Environmental Impacts of Shale Gas Extraction in Canada, and Enabling Sustainability in an Interconnected World. The next report slated for release, The State of Science Culture in Canada, is scheduled for later this summer, with a launch date to be determined soon. This last panel is chaired by Dr. Arthur Carty, FCAE. To learn more about our assessments and expert panels, please visit the Assessments in Progress page on our website.

In other news, Elizabeth Dowdeswell, President and CEO of the Council, was named Ontario's next Lieutenant-Governor by Prime Minister Stephen Harper. Ms. Dowdeswell will succeed the Honourable David Onley as the 29th Lieutenant Governor of Ontario this summer. The Council is extremely proud of Ms. Dowdeswell and wishes her the best as she starts this exciting opportunity.

For more information, and to keep up to date on Council news, please visit our website (www.scienceadvice.ca), or connect with us on Twitter, Facebook, or LinkedIn.

CAETS News



Bob Evans, FCAE, representing the Canadian Academy of Engineering, meets China's President Xi Jinping at the CAETS Convocation.

The CAE is an active member of the International Council of Academies of Engineering and Technological Sciences (CAETS). Professor Robert Evans represented the CAE at the 2014 CAETS meeting, which was held in Beijing, June 1-5. The theme was "Engineering and the Future of Humankind" and it was jointly sponsored by UNESCO. www.icest2014.cae.cn

Bob was nominated by the CAE to sit on CAETS council for 2015-2017, and was elected by the delegates. At the meeting, he presented a report summarizing our 2013 Advanced Manufacturing conference. Other delegates compared and contrasted it to similar work in their countries. Delegates also heard a major report on hydraulic fracturing, or "fracking", and the explosion of interest worldwide in using this technique to enhance natural gas production. The discussion was led by the NAE, with participation from both the CAE (China) and ATSE. The CAETS Energy Committee, of which Bob is a member, is working on a comprehensive report "Transitioning to a Lower Carbon Economy – Engineering Opportunities in the Building and Transportation Sectors". It is expected to be released next year. The next CAETS meeting will be held in Delhi, in October 2015.

Separately, the CAE continues planning for the second of two bi-lateral technical meetings on Clean Coal technology, in conjunction with the Indian National Academy of Engineering. Having secured key funding from Ryerson University, the meeting will be held in Toronto in July 2015. We are currently developing the program and seeking further industrial and government participation.

Sponsors

We wish to thank and recognize the generous support of the sponsors of our 2014 Annual Meeting:

GOLD SPONSORS

Council of Canadian Academies
Conseil des académies canadiennes

MEMORIAL UNIVERSITY

Queen's University
Faculty of Engineering and Applied Science

uOttawa

UNIVERSITY OF TORONTO

SILVER SPONSORS

Carleton University | Faculty of Engineering and Design

DALHOUSIE UNIVERSITY
Inspiring Minds

HATCH

nalcor energy

ONTARIO POWER AUTHORITY

ONTARIO POWER GENERATION

PEG Newfoundland and Labrador
PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

petroleum RESEARCH
newfoundland & labrador

UNB
UNIVERSITY OF NEW BRUNSWICK

POLYTECHNIQUE MONTRÉAL

RYERSON UNIVERSITY

UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGY

The Canadian Academy of Engineering also acknowledges with appreciation the financial support of Newfoundland Power

President's Annual Report (cont'd)

(Continued from page 1)

Local Sections of the Academy

In June of 2012, I announced that a priority of my mandate would be to stimulate the development of local Sections of the Academy, with the goal of intensifying the engagement of our Fellows. This simply follows the long-held belief of thinking globally, and acting locally. In March of 2013, we formally announced the creation of the Montreal Section. Currently, we are very close to announcing the creation of a section in Calgary. Elsewhere, progress continues, slowly but surely. Of course, with only 620 Fellows distributed across our immense country, assembling the critical mass of Fellows needed to create a section isn't always easy. We must proceed carefully, create sections where it makes sense, and support those Fellows who wish to be more active in the manner that is the most appropriate, wherever they may be.

Council of Canadian Academies

We have also made slow progress on the thorny issue of financial support from the Council of Canadian Academies. In October 2013, after much debate and soul-searching, the three founding Academies supported the Council's request for the renewal of its federal funding, following a Council Board resolution announcing its willingness to explore greater financial support for the Academies. Unfortunately, progress essentially ground to a halt until April of this year when I took the initiative of leading the preparation of a letter to the Chair of the Council, Dr. Margaret Bloodworth, signed by all three Academies, requesting more timely action. A response was received at the end of May, and discussions have resumed.

In the meantime, various Council Board members have been informed of the urgency of addressing the growing dissatisfaction of the Academies on this front. I have often pointed out that, if I were a Board member of the Council of Canadian Academies, I would be deeply concerned with the increasing sense of disenfranchisement felt by its three founding Academies. In other words, as a Council Board member, would I not be thinking that it just might be a question of survival? Please don't misunderstand the Academy's position: we recognize the important work done by the Council of Canadian Academies, we continue to be fully supportive, and we are focused on a fruitful long-term relationship. However, it is also time for the Council to recognize that it must evolve. In the meantime, the Federal Government has deferred its decision to renew funding for one year. The need for greater harmony between the Council and its founding Academies cannot have been helpful in its bid for renewed funding.

Trottier Energy Futures Project

Another important initiative that I have shepherded during my time as President has been the Trottier Energy Futures Project, a project initiated over four years ago by Academy Fellow Lorne Trottier in partnership with the David Suzuki Foundation. The purpose of this study is to determine how Canada could reduce its carbon emissions by 80% of 1990 levels, and do so by the year 2050. A year ago, despite the publication of a few reports, the Academy identified the need for better project management and a stronger technical support structure. As a result, I strongly advocated for a different approach which was finally approved by the Project Board in December, 2013. I am very pleased to say that the project is now on track for arriving at a fully successful outcome by December of this year.

We are presently exploring an extension of the partnership in 2015 for the purpose of rapidly bringing the project's findings to the attention of government, industry, and eventually Canadians of all walks of life. We are anxious to leverage the project and its findings for enhancing public awareness of the Academy, both nationally and internationally.

I especially wish to acknowledge the vision and courage of our colleague and Fellow, Lorne Trottier, for initiating this ambitious project, including the Academy in his plans, and staying with it through many highs and lows over the years!

Public Engagement

This leads us to the topic of the Academy's public outreach activities. Over the past two years, the Academy has been quite active in organizing or participating in national fora, including conferences, presentations, appearances before government committees, and publications.

In May, 2013, a highly successful conference was held in Sarnia entitled "Bitumen – Adding Value: Canada's National Opportunity." This conference was organized as a direct result of our Energy Pathways Task Force's successful June 2012 publication entitled "Canada: Winning as a Sustainable Energy Superpower." Shortly thereafter, our June 2013 Symposium, under the leadership of this year's new president, Pierre Lortie, successfully addressed the important and timely topic of Canada's future in manufacturing.

I have also been invited to present the Academy's views on energy on many different occasions. These have included the Canadian District Energy Association's Annual Meeting in June 2012, the Toronto Forum for Global Cities in October 2012, the University of New Brunswick's Deneen/Andrews lecture series in February 2013, a meeting of the Professional Engineers of

(Continued on page 19)

President's Annual Report (cont'd 2)

(Continued from page 18)

Ontario in March 2013, the Council for Clean and Reliable Electricity's Annual Energy Leaders Roundtable in April 2013, and the 2013 Ontario Power Conference, also in April 2013. In February 2013, I was also invited to speak before the Standing Committee of the House of Commons on Industry, Science and Technology, on "the state of engineering in Canada."

In the second half of 2013, Clem Bowman and I jointly published two "op eds" in the Ottawa Hill Times on controversial topics related to "energy". The Hill Times also published op eds by Academy Fellows Pierre Lortie on advanced manufacturing, Leah Lawrence on the markets for Canadian energy products, and Digvir Jayas on food security. The National Post published an article by Saeed Mirza on infrastructure renewal, and an op ed by Kim Sturgess on yet another timely topic, water management.

In January 2014, I provided a response to the Federal Government's position paper entitled "Seizing Canada's Moment: Moving Forward in Science, Technology and Innovation" based on the work that Clem Bowman and I have published on what we call Canada's "Big Project Innovation Strategy." All in all, there is growing evidence that the Academy's voice is being heard, and that our positions may have contributed to the Federal Governments recent announcement of its historic 10-year Infrastructure Plan.

Governance and Communications

In the past year, the Academy has had to comply with new federal laws for not-for-profit corporations. As a result, we have created new Articles of Continuance and revised the existing By-laws to be compliant with the updated Federal Not-For-Profit Corporations Act: these are submitted to you today for your approval. Yesterday, the Board approved a new Executive Term Policy allowing for two-year presidential terms, which will bring our Academy's presidential mandate in line with our two sister academies, where presidents serve for two years rather than one. This will ensure greater continuity and consistency of the Academy's actions over time, and more timely reaction to issues as they arise. This is an initiative which began under John Leggat's tenure as president over five years ago, which we have finally brought to fruition.

The Academy has also significantly upgraded its website, improved its internal communications with its Fellows through LinkedIn, and established an Academy presence on Twitter and Facebook. Under Dr. Peter Frise's leadership, the Academy's Fellowship Committee has continued to recommend up to 50 high-quality candidates for election to Fellowship every year, while achieving better balance among academic, industry and government candidates.

Academy Task Forces

At our Symposium today, you are learning of the progress made by our two active Academy Task Forces, the new Task Force on Engineering in Canada's Northern Oceans, led by Fellows Ian Jordaan and Ken Croasdale, and the long-standing Energy Pathways Task Force, led by Dr. Clem Bowman and myself.

As this is my last opportunity to speak to you as your President, I will abuse of executive privilege to trump my dear colleague and very good friend, Clem Bowman, and announce that our task force is launching its next book entitled "Canada: Becoming a Sustainable Energy Powerhouse" this very afternoon! This is a follow-up to our book published only two years ago entitled "Canada: Winning as a Sustainable Energy Superpower." In fact, the book to be officially launched today was showcased in a six-page energy supplement published nationally by the Globe and Mail on May 21st. I could continue on this topic for hours, but Clem will never forgive me, so I'll stop here! I hope you enjoy the Panel session, and eventually our new book.

The Future

Beyond the many projects described above, the Academy's greatest priority remains the need to find ways of engaging more Fellows in Academy-related activities. Each and every one of you is an engineer of stature, nationally recognized for his or her importance to the profession and society … we must do a better job of motivating each and every one of our Fellows to contribute to the Academy in some small, ordinary way … over time, the result can end up being … extraordinary …

I must now take a moment to speak of myself, only because there is something at play that affects my ability to maintain my commitment to the Academy in the immediate future. Three months ago, I was diagnosed with cancer of the blood. I have been undergoing chemotherapy ever since. My immune system is presently compromised, and I am dealing with parts of my bone structure which have also been compromised. That is the bad news. I also have good news: I have been diagnosed early and there is much reason for optimism. Because of this however, in the coming year, I will need to step back from the Academy. If all goes well, I will be able to return to the Board in 2015.

Whatever the outcome, there is no sense in dwelling on anger, sadness and unhappiness. The late Jack Layton said it best: hope is better than fear, love is better than anger, and optimism is better than despair.

So let us hope, love and be optimistic on our way to making our Academy, a better Academy, our country, a better country, and our world, a better world. Our children, grandchildren and great-grandchildren are counting on us … and engineers can do this better than anyone else.

Executive Director's Message

I hope this summer issue of our newsletter finds you enjoying a time of rejuvenation and refreshment.

Thanks to the well-known hospitality of Newfoundland, many of us enjoyed our 2014 Annual Meeting in St. John's, the first one the CAE has held in Atlantic Canada. Those of you who attended this meeting learned firsthand about the work of our two task forces and the advances we have made in our business practices. Thank you to our Executive who provided an overview of our accomplishments over the past two years. We were also very pleased to announce that we will be partnering with successful organizations on conferences on the intersection of public policy and engineering. Those ideas are discussed elsewhere in this issue.

It leaves me to comment on the financial health of the Academy. Our financial results for FY2013 demonstrated a record amount of revenue, excess revenue over expenses and net assets. This has been achieved by:

Cost cutting: Every supplier to the CAE has been evaluated over the past two years. Those that were deemed not cost effective have been replaced. We have achieved material savings in translation services, telecommunications, IT support, printing, and postage. Costs in FY2015 will be a challenge as we will be moving our office before the end of FY2014, due to our landlord, the Council of Canadian Academies, requiring us to vacate our space as part of their cost-cutting measures. The search for appropriate space is ongoing and a top priority.

Revenue growth: We currently have three sources of revenue: fellowship fees, sponsorship of our Annual Meeting, and overhead charges from research projects. The Board decided two years ago to increase the fellowship fees so that, on an inflation-adjusted basis, they matched what the founding Fellows paid 28 years ago. Expect regular due increases to match inflation; we, in turn, will be providing more opportunities for Fellows to participate in activities, either through the conferences noted above, or the activities of local Sections. Annual Meeting sponsorship hit a record $95,480 for our 2013 Montreal meeting, about 50% greater than the previous record, thanks to the efforts of then President-Elect Pierre Lortie and the symposium committee. Finally, a change in the management structure of the Trottier Energy Futures Project allowed us to increase the overhead charge to be commensurate with the amount of effort we have put into the project over the previous three years.

We are budgeting a more modest excess of revenue over expenses this year of $35,000, compared to $67,773 in FY2013 and breakeven in FY2012. This budget reflects our expectation of very good results from our recent Annual meeting, though not quite the record of 2013. In addition, we have some one-time charges associated with legal advice for our By-law changes and a major website upgrade.

Some final notes on matters financial are that we have revised our investment policies and monitoring procedures to strengthen oversight, and we have worked with our external auditor and office manager to reconcile the reporting of our internal budget documents with our annual financial statements. This will improve clarity for our Board and Fellows. And last, while we have had good service from our external auditor for a number of years, best practices in risk management suggest that it is prudent to change them periodically, so we are currently requesting bids for our FY2015 audit.

If any Fellows have questions about our finances which are not available in the financial statements posted on our website, please do not hesitate to contact me.

Enjoy the rest of summer! We look forward to a busy Fall at the Academy.

Kevin Goheen, PhD, P.Eng.

HAVE YOU UPDATED YOUR PERSONAL INFORMATION ON THE CAE WEBSITE YET?

Your biography, as well as technical groups, functions, sectors and keywords, are now publicly accessible on the CAE website. If you have not yet updated these, then the data in your profile will be the information which was supplied at the time of your induction and may be out of date.

Please take a moment to login to the website using your username and password to review the information and make any necessary updates.