



The Bowman Centre For Sustainable Energy

CANADA'S ENERGY FUTURE
SUMMER 2021 NEWS

Mission:

*“Catalyze big energy projects which drive
Canada’s energy strategy and generate
sustainable wealth and jobs”*

Highlights:

- Queen’s University TEAM Reports For 2020/2021
- Hydrogen Gas Storage
- ProGrid™ Methodology Software Marketability



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Note from Marshall

President's Report

Our focus over the past year or so continued to be on a sustainable energy future for Canada. The importance of our work to research and promote energy projects has increased in importance as Canadians begin to connect how we use energy and how much we use, with the consequential impacts of climate change.

I am repeatedly surprised by how a group of volunteers, working together, can achieve so many deliverables in such a short time. Our submission to the IAAC for example was completed in a matter of days; mostly because we are confident in our approach to assessing large energy projects. Our collaboration with IEEE EPEC2020 and CAE to deliver the Second Richard Marceau Energy Symposium came together in a matter of a few months; mostly because of our ongoing engagement and collaboration with other organizations.

We have received encouragement and positive publicity, as well as an increasing presence online. Our positive tone and determination to share our ideas is being recognized. We will continue this because we have a sense of urgency to our work. Even when international goals are set in the distant future, they depend on positive actions being taken today.

Marshall Kern,
President



Marshall Kern,
President

Impact Assessment Agency of Canada Submission (IAAC)

The Impact Assessment Agency of Canada was recently launched by the Federal Government. As part of the work to build capacity, the IAAC requested submissions with the goal of determining appropriate work procedures and decision-making strategies. With our published work on the topic of making decisions in the dimensions of (1) economic performance, (2) societal readiness, and (3) environmental performance, as well as the decision-making methodology of ProGrid®, we prepared a submission. If our submission were accepted, we know that our recommendations would lead to the IAAC being able to make assessments that are fully independent, impartial, completely integrated with existing knowledge. Further, we know that the IAAC would be able to have meaningful consultations with Indigenous communities, and stakeholders in the project. Unfortunately the submission was not accepted.

Second Richard Marceau Energy Symposium

Over 50 people attended the live presentation of the Second Richard Marceau Energy Symposium. The immediate feedback from attendees was very positive. Another 35 people have enjoyed the recording posted on the site below. <https://vimeo.com/490553541>. The Symposium was a collaboration with the IEEE Electric Power & Energy Conference, and the Canadian Academy of Engineering. We are grateful for the sponsorship by Memorial University Newfoundland, McGill University, and Dr. Ben Luan of Western University.

Capstone Design Competition 2021

Gary Locke and Ed Brost (BCSE Associates) were judges for the Annual Capstone Design Competition on May 29, 30, 2021 in a Virtual Format. This event is a collaboration between The Department of Chemical and Biochemical Engineering at Western University, London, Ontario and the Sarnia-Lambton Western Research Park. The Capstone Project gives fourth year undergraduates an opportunity to work on process design projects which offer real world situations. Hydrogen & Fuel studies took first place.

Queen's TEAM Technology Engineering And Management Department of Chemical Engineering



The Bowman Centre
For Sustainable Energy

TEAM

The Bowman Centre for Sustainable Energy continues our long-standing collaboration with **Queen's University**. We have sponsored and supported two projects over the 2020-2021 academic year.

The first project is titled: “*Electrification of Transport as a Driving Factor for a Transition*”.

The researchers are: *Phillip Lombard, Zirong Liu, & Olivia Skocaj*.

Despite policies that the Canadian Government has put in place to limit emissions and support renewable energy; an implementable, robust, and detailed transition plan has not been put in place to limit the risk an energy transition will have to our economy. To reduce social and economic upheaval, we need to develop and implement transition plans supported by the majority of Canadians and ideally with all political parties' support or at least supporting the plan's broad objectives.

This research project analyzed global and national economies, trends and current plans to provide perspectives and realistic recommendations to the Canadian Government, NGOs, and funding agencies to inspire action and change. This research outlines some specific short-term and long-term goals for policymakers in the hopes of breaking the current impasses on reaching environmental objectives.

OUR COVER STORY:

The second project is titled: “*Techno-Economic Feasibility Analysis of Hydrogen Storage in Salt Caverns*”.

The researchers are: *Alastair Murray, Elaine Monteiro, & Iain Kaufman-O'Keefe*.

This analysis is very detailed and covers electrolytic generation of hydrogen, storage in a salt cavern, and end uses of the product hydrogen (and oxygen). The report delivered an engineering design and economics of the concept from initial design through to 10-years of operation. The Bowman Centre for Sustainable Energy is taking this report forward to stakeholders and proponents of a hydrogen hub in Sarnia-Lambton.

Bowman Center Contributions to Hydrogen & Electric Vehicle Impact on the Oil Sands

Ontario Hydrogen Submission

The Ontario Government issued an engagement document to assist in preparing a hydrogen strategy. The Bowman Centre for Sustainable Energy strongly supports a hydrogen hub. We cooperated with the Sarnia Lambton Economic Partnership as they prepared a major submission in support of locating the hydrogen hub in Sarnia Lambton. The Bowman Centre for Sustainable Energy filed our own submission in support of a hydrogen hub in Sarnia Lambton. *We continue to press forward, independently and with other organizations, to promote hydrogen generally, and a hydrogen hub in Sarnia, Lambton specifically.*

White Paper and Publicity

In the summer of 2020 we released and distributed widely a white paper (a policy paper). “**Electric Vehicle (EV) Impact on the Oil Sands**” about preparing a nation for the future. Associates Ed Brost, Marshall Kern, and Peter Smith, co-authored the paper. *We demonstrate that the impact of EVs could significantly impact oil prices very soon.* It isn't a question of how many EVs are sold each year, but rather the total global fleet of EVs that will have a direct impact on demand for fossil fuels. When an EV replaces an ICE vehicle, the demand for fuel disappears. When enough EVs are in use, then simple economics shows there will be a permanent and growing change in the demand for fossil fuels, and a change in the price for crude oil. *The white paper lays out the urgency of and criteria for a robust transition plan for Canada's Energy Sector.*

BITUMEN UN-STRANDED

Turning the Oil Sands Barrel UPSIDEDOWN

by ©Ed Brost and Dr. Clement Bowman, March 2021

As the 21st century unfolds, could decarbonization lead to a lucrative future for bitumen?

The last century saw strong growth in the road, marine, and air transportation sectors. This led to solid growth in oil production. In the 1950s, global oil production was 10 million barrels per day¹. The end of the last century saw 70 million barrels per day, and by 2019 (pre-COVID-19), 100 million barrels per day². Will this turn out to be too much oil leading to stranded reserves?

Unlike other resources, crude oil consists of components appealing to different markets. Gasoline demand comes mainly from light-duty vehicles, metaphorically referred to as the ‘top of the barrel’. Jet fuel demand appeals to aviation markets. Diesel fuel demand is soaked up primarily in heavy-duty applications³. Material near the barrel bottom is too heavy for use as fuels, so it is ‘converted’ into valuable streams. “Conversion” units proved to be lucrative investments as they convert otherwise low-value material into high-value gasoline, jet, and diesel fuels.

Finally, there is the “bottom” of the barrel, the residue. This low-value residue is used for asphalt and other durable products.

Historically, refiners preferred oil barrels containing a ‘top’ of the barrel that extended deep into the barrel. That is where the native gasoline, jet, diesel precursors, and conversion unit feeds reside. As a result, parts of the oil barrel have different values. Over the last century, the top of the barrel had the highest value and values dropped moving down the barrel. The deeper the high-value components extend down the barrel, the better as there would be less of the bottom of the barrel material **‘to get rid of.’**

This oil barrel value spectrum is important because once a barrel of oil is extracted from the earth’s crust, products from the entire barrel must be sold. Even if low value components must be sold at prices below the aggregate oil barrel price. This spectrum of values down the barrel continued through the last century. Will that continue to be true as a decarbonizing 21st century unfolds?

The first part of the 21st century saw breathtaking advances in battery technologies. In the second decade, the world saw exponential growth in electric vehicle (EV) sales. Cumulatively, by 2020 there were over 10 million EVs busily driving around not burning petroleum-based fuels. By 2025 cumulative EVs will reach 40 million worldwide. This is the point that cumulative EVs will begin to impact oil prices by creating a chronic and growing supply-demand imbalance.

¹ book_wote_energy_oil.xls (earth-policy.org) - http://www.earth-policy.org/datacenter/pdf/book_wote_energy_oil.pdf,

² Short-Term Energy Outlook - U.S. Energy Information Administration—https://www.eia.gov/outlooks/steo/report/global_oil.php,

³ For convenience, this list of products derived from crude oil is short. Many other, albeit lower volume, products are also derived from crude oil such as liquefied petroleum gas products (LPG), precursors for plastics, chemicals and others. However, in the aggregate, these products dwarf the volume of fuel products manufactured from crude oil.

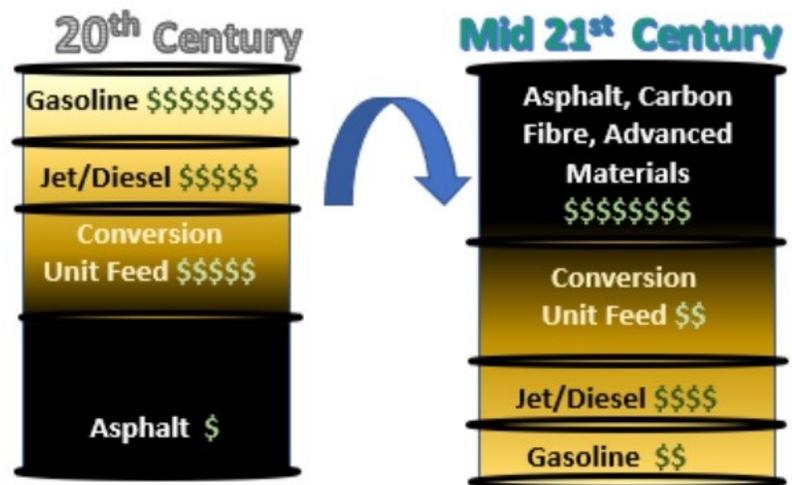
BITUMEN UN-STRANDED

This impact will be low initially but will grow as EVs attain longer range, their prices decrease, and charging stations become ubiquitous. Growth in the electrification of transport, spurred on by government policies supporting their decarbonization goals, will lead to oil price drops due to liquid fuels' oversupply. This brings us back to the oil barrel.

Recall that once a barrel of oil is extracted, all components in that barrel must be sold. Crude oils rich in fuel precursors could be disadvantaged *because* of their high fuel content. Crude oils rich in the bottom of the barrel might be advantaged. Why? *Because EVs need road asphalt*. Processing light crudes, albeit at lower rates due to low fuel margins and ample supply, will lead to asphalt shortages.

Demand for motorized transportation in the developing world is growing so we expect asphalt demand to increase as the 21st century unfolds. Therefore, asphalt prices, the bottom of the barrel, may rise while top of the barrel prices drop.

One way for refiners to take advantage of this trend is to choose oil barrels rich in asphalt and lean in fuels. Astute refiners processing oil barrels deep in quality asphalt means they would have less low value fuel volumes to sell into an over-supplied fuels market.



The profit, later in the 21st century, will be at the bottom of the barrel.

A research program to find nonfuel uses for bitumen conducted by Alberta Innovate's Bitumen Beyond Combustion (BBC) reinforces this trend. Asphalt plus advanced high carbon materials such as carbon fibre could turn bitumen into a 'crude oil of choice, especially as the oil sands sector continues to advance its own decarbonizing performance.

Decarbonization could turn the 20th -century oil barrel economics upside down. If, or when, that happens bitumen resources may not be stranded after all.

ProGrid™ Methodology

The **ProGrid™ Methodology**, owned and licensed by the Bowman Centre, has been upgraded significantly to not only evaluate economic and environmental attributes of new projects, but also with attention to social readiness of Canadians for such ventures. ProGrid™ is a powerful tool which can evaluate the benefits/impacts of proposed projects.

The Bowman Centre for Sustainable Energy has recently evaluated the following projects: with encouraging and positive results.

- Hydrogen Gas Storage in Salt Caverns
- Carbon fibre from Alberta's Oil Sands Bitumen
- Towards a Canadian Electrical Grid

For more information on how this powerful state of the art software can work for your company OR if you would like to participate in our evaluation process please contact: President, Marshall Kern or Vice President, Don Greaves

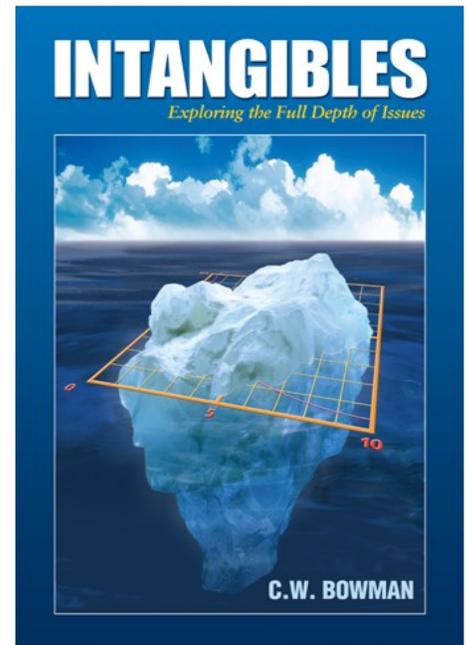
The Book: *INTANGIBLES, Exploring the Full Depth of Issues* was written by Dr. C. W. Bowman

Bowman, C. W. (2005). *Intangibles: Exploring the Full Depth of Issues*. Sarnia, Ontario: Grafiks Marketing & Communications.

INTANGIBLES may help you to understand how ProGrid software can work for you.

Intangibles has received excellent reviews by many including but not limited to:

- Dr. R.B. Robert Church
- Alberta Science and Research Authority
- R.R. Marshall
- Director, Network and Corporate Development
- Ontario Centres of Excellence
- Centre for Material and Manufacturing
- Dr. Andrew M. Sherman
- Member of the Board
- Centre for Automotive Materials and Manufacturing (CAMM)



Our digital 'look' continues to be improved by lead Associates *Karen Minty, Don Greaves & team*. Together they have launched a new website which is easier to navigate and one which delivers a clear picture of who the Bowman Centre for Sustainable Energy is, our focus and more options to connect with us.



bowmancentre.com



[@BowmanCentre SustainableEnergy](https://www.facebook.com/BowmanCentreSustainableEnergy)



[Bowman Centre for Sustainable Energy](https://www.linkedin.com/company/Bowman-Centre-for-Sustainable-Energy)

Dr. C.W. Bowman “Clem” is a Canadian Chemical Engineer and the Founder of the Bowman Centre for Sustainable Energy.

Inception Date: October 4, 2010.

“Clem”, is a Former Vice President Research, Esso Petroleum Canada.

Dr. C.W. Bowman “Clem” is the Former Chair, Canadian Academy of Engineering, Energy Task Force, AND Founding Chair, of the Alberta Oil Sands Technology and Research Authority (AOSTRA). He is the recipient of the Order of Canada and the Global Energy Prize.



With leadership from our founder *Dr. Clement Bowman*, The Bowman Centre for Sustainable Energy has launched the following three books with positive feedback from supporters and governments across Canada.

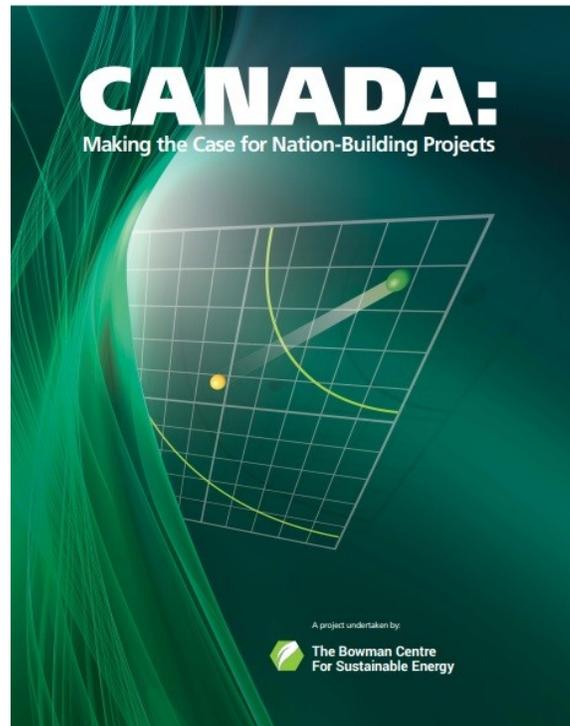
2012: CANADA: Winning as a Sustainable Energy Superpower

2014: CANADA: Becoming a Sustainable Energy Powerhouse

2020: CANADA: Making the Case for Nation-Building Projects

“Canada seems to have lost its way when it comes to advancing projects on a nation-building scale. Once a united and mighty nation capable of accomplishing Big Projects, Canada now sits stagnant in its own inability to internally consult, collaborate and come to a consensus to move forward towards a sustainable energy future.”

Executive Summary by Marshall Kern
CANADA: Making the Case for Nation-Building Projects



Read “CANADA: Making the Case for Nation-Building Projects” and previous books on our website.

BOWMAN CENTRE NEWS

About Us: Many of the Bowman Centre for Sustainable Energy Associates have participated actively in the Canadian Academy of Engineering's Energy Pathways work. They have been part of a network of over 100 public and private sector engineers and executives who have contributed to identifying a number of new big energy projects that will create wealth and jobs for Canadians over this current half century. These are the visionaries who continue the tradition of nation building through big innovative energy projects. **All Bowman Centre for Sustainable Energy Associates are volunteers giving of their time *pro bono*.**

Associates:

Clement Bowman

Founder of Bowman Centre, October 4, 2010;

Former Chair, CAE Energy Task Force; Founding Chair, AOSTRA

Marshall Kern

President

Don Greaves

Vice President

Lynne Hicks

Secretary & Business Manager

Joe Simon

Treasurer

Paul Beaudet

Retired Lawyer, Civil Litigation and Estate Planning & Corporate Law Cases

Tim Bechard

Business Executive—Environmental Services, Waste Management & Recycling Industries

Dennis Bernhard

Senior Executive Morgan Stanley, Merrill Lynch and Deutsche Bank, Former Chairman Cansolv Technologies, Executive Director Carbovate Development Corp., Director 5G Automatika LTD.

Ed Brost

President, JE&M Consulting Ltd.

F. Pierre Gingras

Hydroelectricity Specialist, Hydro-Quebec (retired)

Terrence Hoffman

Principal Chemical Engineer, Polysar Ltd. (retired)

Eddy Isaacs

Former CEO, Alberta Innovates—Energy and Environment Solutions

Gary Locke

Technical Manager, and Section Head of Process Technology, Imperial Oil and Assignment with Exxon Research & Engineering

Ben Luan

Professor at Western University, London ON

John Kramers

President, Owl Ventures Inc.

Maike Luiken

President-Elect, IEEE Canada; Former Director, Bluewater Technology Access Centre, Lambton College

Karen Minty

College Professor/Corporate Trainer/TV Talk Show Host/Lambton College Personality Insights

Walter Petryschuk

Former Polysar, Suncor, NRC Executive

David Sanborn Scott

Vice-President International Association for Hydrogen Energy

Peter R. Smith

Energy Consultant, TransAlta (retired)

Ashok Uppal

Research Associate, Imperial Oil Limited (retired)

Guy Van Uytven

Power System Consultant

John M. Ward

Vice President, BlueGreen Innovation Group

Don Wood

Vice-President, Logistics and Business Development, Polysar (retired)