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*An international collaborative network of advanced scientific thinking*

NGO in Special Consultative status with the Economic and Social Council of the **United Nations** (ECOSOC)

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April 24, 2018

### For the attention of

Greg Fergus, MP, PC  
**Parliamentary Secretary** to the **Minister of Innovation, Science and Economic Development**  
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### *Copia conforme:*

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Hon. Greg Fergus,

First of all, I wish to thank you for the opportunity of meeting you with our colleagues on April 5<sup>th</sup> on the interdisciplinary theme of clean soil and water, and responsible waste management.

During this prolonged and productive exchange involving multi-disciplinary and forward-looking expertise present, we have collectively seen fit to project for possible implementation into the Canadian infrastructure of innovative and sustainable clean technologies that cope with soil, water and waste contamination.

We stress that we must determine *a priori* common values, and also develop **standards** and **appropriate criteria** that meet these values. An example of an inconsistency, when there are no values – with regards to the capacity to viably use soils – is the practice of destroying biomass and then adding petroleum-based fertilizers for agriculture. If, instead, biomass were judiciously and scientifically reintroduced to soils, there would be no need for such fertilizers. Furthermore for each cost unit rise of petroleum, there is a three-fold increase in fertilizer cost, augmenting capitalization risks as well as food costs. We should avoid such incoherence in national security and affairs. Such unsustainability just does not make common sense!

Over the past decades our society has pursued and implemented many technologies and practices without sufficient attention to the precautionary principle and to unintended consequences.

The following Government of Canada announcement of April 12, 2018, is a strong indication that this dire situation is acknowledged and there is an intention to attempt to rectify it (*See Annex G*):

**“Government of Canada launches Expert Panel  
to help Canada tap into trillion-dollar opportunity  
from clean growth and climate action”**

“The global **demand for cleaner economic growth** is opening up tens of trillions of dollars of opportunity around the world—giving Canadian developers of clean solutions access to new markets and creating good jobs for Canada's middle class. The federal government is investing in climate action and clean competitiveness to ensure Canadians can participate in and prosper from these opportunities, today and in the decades ahead.”

<http://markets.businessinsider.com/news/stocks/government-of-canada-launches-expert-panel-to-help-canada-tap-into-trillion-dollar-opportunity-from-clean-growth-and-climate-action-1021318217>

We in **Planetary Association for Clean Energy (PACE)** view this pivotal Government announcement as a step promulgated by our 2 submissions to the Hon. **Catherine McKenna** and the Hon. **François-Philippe Champagne** (*See Annex H*): pre-Budget consultation on February 1, 2016, entitled, ***Enhancing budgetary efficacy & outreach by promoting and applying advanced Clean Energy Science and Technology***, and, Letter dated February 22, 2016).

We take this view since the Government’s policy reiterates our analysis of the economic viability of clean energy science and technology: in capital and borrowing savings, in creation of quality employment and creativity, and finally of durable international promotion of novel national aptitudes. We also note that the launching of an **Expert Panel** is a valuable fundamental step towards our proposal for a **National Task Force** that is built upon the constitutional framework that governs Canada and typical infrastructure implementation process that is currently on-going. We are therefore forwarding this communication to the Expert Panel as well.

In line of our discussions earlier this month, we are proposing to you a step-by-step process in transmitting know-how and about our network’s 50-years of hands-on experience in alternative sustainable practices, procedures and processes to your staff, stakeholders and experts. Perhaps we could initiate with a 2-day seminar, followed by articulated detailing. We assume that such work from our network’s experts could be covered from a budgetary allocation from your Ministry, assuring their expenses and processing costs.

Based on hundreds of years of accumulated experience of key PACE members in innovative technologies and environmental sciences, the following are examples of current practices that merit to be evaluated under a different perspective of clean growth and climate action:

**Nuclear waste** at Port Hope (\$1.3 billion), Chalk River (\$1.2 billion), Ontario  
Sidney Nova Scotia **tar ponds** (\$400 million plus), Hamilton Harbour (\$130 million plus)  
Oil extraction and lakes of **toxic waste** at Fort McMurray, Alberta  
**Mine tailings ponds** and piles  
**Municipal waste landfills**

*Note that over time all these storage facilities will leak into our environment*

**Chemicalization of Agriculture**

Toxic pesticides, herbicides, and fertilizers are killing the soil biome and result in contaminating our soils and water. Unsustainable agriculture practices cause at least 70% of our water pollution due to leaching chemicals and improper handling of pathogen-rich, untreated manure.

## Degradation of health of plants, animals, and humans

Geo-Engineering and aerial spraying: in an attempt to reduce sun's rays on earth various metals, nanoparticles, and other components are being constantly sprayed on the planet. A major component of the spray is aluminum which is toxic and kills microorganisms, compacts soil, and acts as a desiccant. Without healthy biome trees, plants, animals, and humans cannot thrive. Excessive use of pharmaceuticals reduces overall immunity and excreted pharmaceuticals contaminate our water.

The more technologies **work with nature and enhance natural processes** the more sustainable and clean they will be.

We are suggesting strategies supporting clean innovative solutions commensurate with clean growth and climate action.

1. Provide funding for 'innovative' initiatives & technologies to "work with nature & enhance natural processes".
2. Develop 'new, appropriate criteria based on common values' (vs. current criteria used for selecting projects / initiatives). For the innovative directions needed, which is also why we have proposed after decades of peer review a National Task Force concept. These should also be compatible with Indigenous perspectives.
3. Develop 'new measurable selection criteria and standards' for any 'clean, innovation solutions' being considered for funding (i.e., innovative- identify components of innovative technologies, strategies/approaches needed; new approaches that 'work with nature'/versus chemical approaches used for years. These could be harmonized with the United Nations Sustainable Development Goals, ISO standards development, as being articulated by several Canadian municipalities.
4. Apply appropriate performance evaluation criteria to ensure that there is a realistic level of evidence that the technology has been applied and may be a viable approach - to be used in an alternate way, or to address a new issue/setting not previously demonstrated; credibility of company or individuals; years the individual/company have been working in environmental/related issues). Ensure the application process is feasible, and with no undesirable consequence.

We are enclosing, by way of example, past proposals for clean solutions and sustainable technologies:

1. Renewal of the **Kemptville Campus Education and Community Hub** -Education & Training, Health & Wellness, and Economic Development as umbrella of climate change resiliency and low carbon innovation (Annex A)
2. **Thawing Permafrost** - potential solution to eliminate the methane production in northern lakes. (Annex B)
3. **Restoration of Frame Lake, Yellowknife, Northwest Territories, and Enhancement of Fish Habitat.** (Annex C)
4. **Recycling of organics - social enterprise** - compost, grow, and feed vulnerable populations in the urban core with healthy, sustainable food. (Annex D)
5. **Importance of Compost** by Compost Council of Canada. (Annex E)
6. **Enhancement of Lac Leamy, Quebec, National Capital Region.** (Annex F)

We hope that this communication and proposal is to your satisfaction and await your comments and steps toward a national co-ordination towards successful clean growth.

Yours sincerely,

Dr. Andrew Michrowski, President (signed)

Joseph Kennedy, P.Eng. , Director (signed)

## ANNEX A

### **Renewal of the Kemptville Campus Education and Community Hub focusing on: Education and Training, Health and Wellness, and Economic Development under the umbrella of climate change resiliency and low carbon innovation**

When the **University of Guelph** announced its departure from the **Kemptville Agriculture Campus** (643 acres and facilities) a proposal was made to establish a **Centre of Excellence** focused on environmental issues & sustainable agriculture. North Grenville (NG) took over the Campus, so such an activity may be incorporated within the Campus.

#### **Current Situation and Problem**

Waterways including the Rideau River Watershed through NG are becoming increasingly contaminated and full of algae. It is accepted that at least 70% of water contamination is due to agricultural practices.

Clean water is the most important ingredient and nutrient to maintain good health of soil, plants, animals, and humans and can significantly improve the delivery of nutrients to all cells. Because of the critical state of affairs in the agriculture sector the current practices need to be changed and for a start a strong focus on the basic and fundamental requirements for healthy soils and clean water. Our soil has been at risk for decades and nothing is being done to change destructive practices.

**Ontario Ministry of Agriculture, Food and Rural Affairs** has issued a draft **Agricultural Soil Health and Conservation Strategy**. The environmental, economic, and social benefits of soil health and conservation are clearly stated on page 7 of OMAFRA's document, "Sustaining Ontario's Agricultural Soils". Some salient and alarming statements are:

- 82 per cent of Ontario's farmland is estimated to be losing organic matter
- 82 per cent, most of Ontario's agricultural soils, are currently estimated to be emitting CO<sub>2</sub> to the atmosphere rather than increasing soil carbon
- Only about 20 per cent of Ontario cropland reportedly received manure in 2011 (most likely raw, pathogen-rich unstable manure was applied).
- 54 percent of Ontario's cropland has a risk of erosion above the annual rate of soil regeneration

Let us go back 33 years to 1984. After 2 years of preparation, the **Standing Senate Committee on Agriculture, Fisheries and Forestry**, under Chairman, **Hon. H.O. Sparrow** tabled the report, **SOIL AT RISK - Canada's Eroding Future**. This was a major undertaking and a thorough Canada-wide study. The following quotes are contained in this report:

"We cannot afford the luxury of waiting for a crisis to make the effects of the loss of agricultural land apparent to everyone, for by then it will be too late."

"Civilization as we know it cannot survive the continuing loss of topsoil at current rates."

"There must be an awareness that policies and programs initiated with the best intentions can inadvertently lead to serious side effects."

"In order to bring about the required changes in information, attitude and practice, it will require a quantum leap in the attention being paid to research and extension activities."

"A vast amount of technical information is available. One difficulty is that there is no systematic approach and there are not enough qualified people available to provide "a technology transfer". This information transfer tends to be haphazard, rather than targeted to priority management areas."

"Because of economic considerations-namely, poor returns, volatile prices, rising input costs, and generally a lack of economic stability, farmers have not been able to practice what they know they should."

"Soil erosion may well be the most underrated yet most damaging natural resource problem of the 80s. Must we wait for crisis conditions before action is taken to safeguard our scarce and dwindling soil resource base?"

“Responses to date by government and the agricultural community have been out of scale with the magnitude and severity of the problem which only threatens to worsen before it gets better. The need is urgent for a major, well-organized and adequately funded response to soil erosion and soil degradation.”

“There is a major difference between soil and forest and fisheries. Forests can be replanted and managed. Fisheries can be restocked. But once our soil is gone, that is the end of economic agricultural production. Our children's grand-children will not see a rejuvenation of our soils.”

“In Southwestern Ontario, the erosion problem has caused a loss in corn yields of some 30 to 40 per cent.”

“On lands affected by salinization in the Prairies, crop yields have been reduced by 10 to 75 per cent, even though farmers have increased their use of fertilizer.”

In the past 33 years our soils are much worse now than in 1984. Governments, the University of Guelph, and farmers adopted chemicalized and unsustainable practices that killed our soils, contaminated our water and produced products loaded with toxic chemicals, pharmaceuticals, and very little nutrition. We need to bring our agricultural practices back into balance with natural processes.

It is time to re-think and re-set our practices. Healthy soils are the foundation of a healthy and prosperous population and play a critical role in food security, biodiversity, storing and filtering water, mitigating climate change, and more. The current agricultural practices and the use of toxic chemicals such as fertilizers, herbicides, and pesticides and poorly managed pathogen-rich manure do not seem to be working on a sustainable basis. The primary focus of the proposed Centre of Excellence would be Sustainable Agriculture Practices that support clean water, healthy soils and healthy microbiome. This is critical because healthy microbe and carbon-rich soils sequester huge amounts of CO<sub>2</sub> but with the heavy addition of chemicals soil organic carbon is destroyed and soil life reduced resulting in our agricultural soils actually releasing carbon.

Also, the demand for organically grown food in Ontario is at least 300% more than what is being produced in Ontario resulting in organically grown food to be imported into Ontario (data from COG – Canadian Organic Growers).

### **Solutions**

There are several new approaches to clean water and to stimulate the natural processes of agriculture being developed even by groups in eastern Ontario. The NG Campus could provide a focus for such groups.

There is an imperative and widespread need for new, economical approaches and technologies to improve water quality and this requires a fundamental change in attitude towards water from currently treating water as an inert commodity to treating water as a living substance. For example, Water for Life Technologies (WFLT), a local company, has been working with the quantum and atomic levels of water and its components for several years. There are some thirty isotopes of water and even hydrogen and oxygen are much more complex than the conventional knowledge indicates. WFLT's Revitalizer which is made in the Kemptville area is environmentally safe (no chemicals, no moving parts, nor power required) and enhances natural processes. Installations of WFLT systems have been carried out in Canada, U.S., India, South Korea, and South America including several dozens of farms. Farmers are reporting increased crop yields, healthier plants and animals, increased animal production, and reduction of odours and pathogens.

Using subtle energies at specifically prescribed resonant frequency patterns WFLT has developed and proven an effective and low-cost system that improves land and water eco systems including increasing oxygen throughout large bodies of water including the bottom sediment. Because water is such a good conductor the treatment of large bodies of water is possible. With increased oxygen, aerobic conditions prevail to support nature's self-cleaning processes to clarify the water and reduce nutrients in the water column thus reducing algae and excess macrophytes. Also, pathogens do not thrive in aerobic conditions.

## ANNEX B

### Thawing Permafrost and assessment of potential solution to eliminate the methane production in northern lakes.

Permafrost which covers millions of square kilometers of the northern countries is thawing and releasing massive amounts of carbon into the environment in the form of carbon dioxide, water containing organic carbon, and methane. This release of carbon will dwarf any other greenhouse gas (GHG) producing activity on the planet. Water, rich in organic carbon, is collecting in lakes in the north and rapidly uses up the available oxygen in the lakes producing carbon dioxide. The lakes quickly become deprived of oxygen (anoxic) and then start producing methane due to the activated aerobic microbes scavenging the oxygen from the carbonates. There are now thousands of lakes in the north that are bubbling with the release of methane gas which is a potent greenhouse gas (26 times worse than carbon dioxide). Also, under anoxic conditions pathogens will thrive but not under aerobic conditions. So, under anoxic conditions one would experience not only toxic and potent GHGs but also pathogens. It could become unhealthy for many forms of life.

WCI's EOS-2000 (Enhanced Oxygen System) generates energy waves at specifically prescribed frequency patterns to impact the water by increasing the mass transfer at the air water interface by orders of magnitude and thus providing benefits to improve water eco systems including increasing oxygen throughout large bodies of water including the bottom sediment. With increased oxygen, aerobic conditions prevail to support nature's self-cleaning processes. This oxygen will prevent the formation of methane. Because water is such a good conductor the energy waves of the EOS-2000 may be attenuated with devices containing Radionically programmed crystals. It is proposed that such a combination may prevent the generation of methane throughout large areas of tundra estimated up to 100 km<sup>2</sup> per unit since permafrost is frozen and or melting water.

The EOS System is a portable, self-contained, solar powered system that requires no infrastructure, less than 30 minutes to install (even in remote locations) and has no operating cost. The EOS-2000 has received Certificates of Approval from the **Ontario Ministry of the Environment and Climate Change** (MOECC) and has also been awarded the **Ottawa CleanTech Award** for 2015 and **Zielony Laur** (Green Leaf award from Poland in 2015). It has been proven successful in remediation of various polluted water bodies including:

Wastewater lagoons  
Recreational lakes and ponds  
Stormwater ponds  
Water reservoirs

Some EOS units have been maintaining aerobic conditions and enhancing lakes and lagoon operations continuously for over 10 years. It is proposed to select an area of about 100 km<sup>2</sup> in which methane generation is a known problem and to run a two-year pilot operation. During the pilot project several parameters and mechanisms will be monitored. After finalizing the report of the pilot project the viability of the solution can be evaluated and a major roll-out strategy developed.

With the help and involvement of universities which are actively doing research on the problem of thawing permafrost select a 100 km<sup>2</sup> area and develop a monitoring protocol for a pilot project. This initiative would involve the installation of an EOS-2000 and attenuating system at the selected site. The selected university to carry out monitoring and reporting of the pilot project and assessment of the capability of the EOS-2000 to effectively maintain aerobic conditions throughout an area of 100 km<sup>2</sup> to prevent the formation and generation of methane.

A three-year pilot project to assess capability of the EOS-2000 to effectively maintain aerobic conditions throughout an area of 100 km<sup>2</sup> to prevent the formation and generation of methane would cost \$ 470,000.

## Annex C

### **Solution and Proposal for Restoration of Frame Lake, Yellowknife, NWT and Enhancement of Fish Habitat**

*Note that Frame Lake (middle of City of Yellowknife) was badly damaged by mine tailings from Giant Mine*

Project participants: PACE, Tides Canada, Carleton University, Department of Earth Sciences, Queen's University, University of Alberta City of Yellowknife, Government of Northwest Territories, and Yellowknives Dene First Nation

Frame Lake is 84 hectares in area with a maximum depth of 6.5 metres located in the centre of Yellowknife, NWT. Residents of Yellowknife and visitors are not able to enjoy recreational activities on Frame Lake because of the following concerns:

- Thick layer of organic muck on the bottom
- Excessive aquatic plants rooted in the muck
- Leaches
- Pathogens
- Anoxic conditions resulting in lack of fish
- High level of contaminants including arsenic

Many years in the past Frame Lake was seriously impacted by mining operations and contaminants such as arsenic are major concerns which also impact water bodies associated with mining sites worldwide. Frame Lake has been dead for years and many studies have been carried out on the lake. To remedy the above problems, PACE proposes to install an EOS-2000 (Enhanced Oxygen System) for water and wastewater remediation. The EOS-2000 is solar powered and generates energy waves at specifically prescribed frequency patterns that increases gas transfer rate (oxygen) across water-air boundary in large bodies of water providing benefits to improve water eco systems including increasing oxygen throughout the water body including the benthic zone. With increased oxygen, aerobic conditions prevail to support nature's self cleaning processes.

The current condition of Frame Lake does not and will not support a fish population. The EOS-2000 can re-oxygenate the water, stabilize ORP, digest bottom organic sediment and improve aerobic conditions so that a sustainable fish population can begin to be established.

There has been much written on the ways to immobilize arsenic. Because the EOS creates strong aerobic conditions at the bottom benthic zone many favorable biological, biochemical, and chemical reactions take place. First, the organic muck starts to digest and aerobic bacteria (microbes) increase rapidly by orders of magnitude. Microbes also produce a multitude of beneficial enzymes. The anoxic black muck digests to a light aerobic compost-like stable material containing humus-like matter providing many possible mechanisms to bind up the arsenic compounds in the insoluble mature humic acids and humin. Besides absorption, adsorption, complexation, chelation there can also be coacervation where by mere hydrogen bonding a large macro molecule can entrap compounds or metals or metalloids like arsenic or their derivative, without actual chemical bonding. Some metallic compounds of arsenates, like those of phosphates, may also be complexed with humates. Complexation of arsenic also occurs through adsorption with mineral cations of Fe and Mg.

Also, because every element has a specified frequency we believe that as a backup we can program a frequency device with inverse frequencies to cancel out the effect of arsenic, cadmium, copper, aluminum, and other contaminating and bio-inhibitory metals. When Frame Lake is healthy and able to support fish again, a fish restoration program is to be carried out.

The plan is to install an EOS-2000 and complete sampling and monitoring to determine baseline conditions, train local staff and establish protocols, monitor progress of restoration by experts and local trained environmental staff, restore health and vitality to Frame Lake, Create conditions suitable for fish population growth and diversification, re-stock fish, and transfer equipment & know-how to City of Yellowknife and local First Nations, at a cost of \$ 755,000. After three

years equipment and knowhow will be transferred to City of Yellowknife so that local and trained people will be able to maintain the quality and fish in Frame Lake.





## Annex D

### **Recycling of organics to support the development of a social enterprise to compost, grow, and feed vulnerable urban populations with healthy and sustainable food.**

**St. Joe's Church** in downtown Ottawa and located amongst the **University of Ottawa** campus has been operating a "Supper Table" for 30 years serving meals to 100 to 300 vulnerable people each day (<http://www.stjsuppertable.ca/>). Food is obtained from a variety of sources including the Ottawa Food Bank, local farms, donations, and local urban gardens. St. Joe's is part of a city-wide network of procuring and distributing food to the City's growing vulnerable population. Local farmers are encouraged to contribute land to grow the food operated mainly by volunteers coordinated by a staff person (<http://www.ottawafoodbank.ca/community-harvest/>). The **National Capital Commission** which controls a "Greenbelt" around Ottawa is starting to make land available for young new farmers (see <http://justfood.ca/>). For four years, St. Joe's has operated on-site composting of organics and intensive gardens (12 raised beds) and now plans to expand the model of composting organics and intensive gardens in other high-density areas of the City.

The mission of St. Joe's is to support and expand the "Supper Table" program through education, awareness, and participation of the local area residents to recycle their organic waste, produce healthy sustainable food and to be self-sufficient. Based on St. Joe's years of experience and networking related to recycling organics, composting, gardening, and feeding the vulnerable the expanded program can transform and inspire communities.

Many years of experience in designing, building, and operating composting facilities throughout North America and Eastern Europe and supporting sustainable organic and chemical-free agriculture are available. Through a five-year collaborative research program with **Agriculture Canada**, a simple on-site naturally aerated base composting system was developed and the system is commercialized. It is proposed that these proven organic and sustainable practices be implemented through St. Joe's existing composting, gardening, and Supper Table program and then expanded and incorporated throughout Ottawa through the existing and growing **Food Bank** network. Interested "vulnerable" people using the services of the food banks and shelters will be trained to be "compost" and "garden" "Geeks" to help operate and expand the program. Labor for the Social Enterprise is provided by volunteers.

It is estimated that the new "Social Enterprise" would be self-sufficient after four years.

The current chemical based agriculture practices are contributing to about 70% of our contaminated water and have mined the life from our soils. The carbon content is reduced to the point that soils are now emitting carbon to the atmosphere rather than absorbing carbon as healthy soils do. By recycling carbon (compost) back to the soils and improving the health of soils, soils will again provide a carbon sink and such a reversal alone could make a significant impact on greenhouse gas generation and climate change. Most urban centers around the world are faced with challenges as to how to feed the growing vulnerable populations and this proposed program may provide a viable model for a solution.

The plan is to hire and train full-time coordinator for composting and gardens and scheduling volunteers etc., to hire full-time business manager to establish the "Social Enterprise" and develop new sites, partnerships for supply of organics for composting and food to serve, develop branding and marketing program, responsible for reporting and evaluating. Furthermore, the refinement and improvement of existing on-site composting and garden facilities at the 2 current sites would also include new vermin-composting facilities. Manuals, videos, and training programs for composting and intensive gardening "Geeks" would be developed, along with education and awareness information including website and apps.

A four-year program leading to a self-sufficient and sustainable social enterprise including travel, staffing, supply and maintenance of equipment, professional services, sampling and analytical work, report writing. Labor is provided to the social enterprise by volunteers. The budget is \$ 416,000 over 4 years.

## Annex E

### Compost – the Superman of Soil Health



We all know that compost is good for soils. It helps to increase organic matter, which improves soil structure. Better structure allows soils to infiltrate and hold more water, a real benefit to crop health and yields. But compost can do a lot more than that. In fact, it can be seen as the super-hero of soil health. Why? Because it has a set of special “powers” that can seem almost magical, once we look past its unassuming exterior and take a closer look at what is happening in the soil.

Take fertility, for instance. As with Clark Kent, who has always hidden his super powers behind geeky glasses and a clumsy manner, compost typically hides its potency behind low NPK numbers. However, to see what compost can really do, we have to look more closely at what happens in natural systems. Forests and prairies, for instance, do not have the benefit of synthetic fertilizers, yet their overall productivity far outstrips that of farmland. The high levels of productivity and fertility found in prairies and forests are produced by soil micro-organisms – the creatures of the soil food web. Microscopic bacteria break down organic wastes, absorbing their nutrients; fungi do the same, but specialize in tougher-to-degrade, woody materials. Certain species of bacteria and fungi can also absorb nutrients directly from minerals. When these organisms are then consumed by larger creatures, such as protozoa and nematodes, many of these nutrients are released back into the soil in plant-available form. This is called nutrient cycling – a very powerful natural process. Also, as you might expect, the more of these organisms there are, hard at work in the soil, the higher the level of fertility.

So, you might ask, if this natural fertility is so potent, why do I need to add fertilizer to maximize my yield? Can these organisms not provide enough fertility for a good crop? The answer is “it depends”. A large, diverse soil food web can provide a lot of natural fertility, enough to greatly reduce fertilizer needs on farms. However, the key words here are “large” and “diverse”. Many of our agricultural practices have been very hard on the food webs in farm soils. In particular, microbial diversity is often low. But this is where compost, like Superman, can really punch above its weight. Unlike almost any of the other soil-health best management practices, compost is a triple-threat: it doesn’t just feed the soil food web and protect its habitat; it also enhances the web’s diversity. Over time, the consistent application of compost results in the development of large, diverse, and well-balanced populations of soil microbes – which constitute, in essence, the very definition of a healthy soil. This enhanced soil food web can boost natural fertility to higher and higher levels. This process has little to do with the compost’s NPK levels; instead, it has everything to do with soil health.

This good news story, moreover, does not stop with fertility. Studies have shown that compost can be instrumental in raising disease resistance in soils, reducing the need for pesticides. Plants have immune systems, just like we do. And again, as with people, these protective systems are very dependent on partnerships with microbes. Scientists are just beginning to unravel this fascinating story, but we already know enough to understand how important these partnerships can be. For instance, some plants depend on microbes to send warning messages when a pest or disease arrives in an area, allowing them to prepare their defenses in advance. Others form partnerships with groups of microbes to fight off diseases through the production and release of antibiotics or other defense mechanisms. In one case, researchers found that soils were completely suppressive of a particular disease if a “consortium” of 17 species of microbes were present. If even one species was missing, however, the disease was not suppressed.

This is where we can clearly see the value of diversity. Having a large and diverse soil food web greatly increases the likelihood that the necessary microbial partners will be present when a disease attacks. Applying compost each season, particularly when it comes from a variety of different feedstocks, continually boosts and supports this diversity, while also providing the good critters with food energy and a safe habitat.

So, if we just look at NPK levels, we are only seeing Clark Kent. When we look deeper at the role compost plays in building and supporting the soil food web and healthy soils, we begin to see the super hero behind the mild-mannered exterior.

However, there is one thing here that does not follow the Clark Kent/Superman analogy, and that is the time frame involved. Compost takes a while to effect its changes; there are no phone booths in the soil available for instantaneous costume changes. Patience and a systematic, consistent approach are needed to allow all of compost's super powers to reveal themselves. It takes a few years to build up the soil food web to where it can provide these benefits.

Finally, compost produces its benefits more quickly when it is combined with the other soil-health best management practices: keep the soil covered with residues or cover crops; keep live roots in the ground; maximize diversity through crop rotations and multi-species covers; and minimize soil disturbance. Farmers who have adopted most or all of these practices report higher yields, lower costs, greater profitability, and little or no negative environmental impact. Real sustainability that is the stuff of heroes.

## **Annex F**

### **Enhancement of Lac Leamy**

In 2017, Lac Leamy experienced closures because of high bacteria count. By installing a Revitalizer/EOS-2000, healthy aerobic conditions will be maintained, and water quality will be significantly enhanced to ensure safe, healthy and pleasing recreational use. It is best to install equipment early in the summer to prevent to initiation of any harmful biological cycles such as algae. NCC who is responsible for Lac Leamy indicated that closure of the Lac is a rare occurrence but if it happens again this year remedial measures may be considered.

## **Annex G**

### **Government of Canada launches Expert Panel to help Canada tap into trillion-dollar opportunity from clean growth and climate action**

PRESS RELEASE PR Newswire / Apr. 12, 2018, 01:33 PM

TORONTO, April 12, 2018 /CNW/ - The global demand for cleaner economic growth is opening up tens of trillions of dollars of opportunity around the world—giving Canadian developers of clean solutions access to new markets and creating good jobs for Canada's middle class. The federal government is investing in climate action and clean competitiveness to ensure Canadians can participate in and prosper from these opportunities, today and in the decades ahead.

Canada's financial sector has an important role to play in unlocking the potential of clean growth in Canada. That was the focus of a round table discussion, today, on sustainable finance, with the Governor of the Bank of England, Mark Carney, and Canadian business leaders. The round table was hosted by the Minister of Environment and Climate Change, Catherine McKenna, and the Minister of Finance, Bill Morneau. Accelerating action to support sustainable finance is an important part of Canada's G7 presidency.

At the round table, representatives of Canada's business and financial sectors—including banks, pension funds, insurers, and the energy sector—discussed what Canada needs to do to avoid missing out on the opportunities associated with clean growth as well as the climate-related risks—such as more intense forest fires, storms, and floods—that could affect their operations and financial outlook.

The Ministers announced the creation of the Expert Panel on Sustainable Finance, to be chaired by Tiff Macklem, Dean of the University of Toronto's Rotman School of Management and former Senior Deputy Governor of the Bank of Canada. The Expert Panel will consult members of the business community about the opportunities associated with sustainable finance. The Expert Panel will also explore the opportunities and challenges for companies facing voluntary standards for corporate disclosure of the financial risks associated with climate change.

The Expert Panel builds on the work of the Task Force on Climate-related Financial Disclosures (TCDF), led by Michael Bloomberg, established by the Financial Stability Board, and chaired by Governor Carney. The Task Force is recognized worldwide for its ground-breaking work to develop voluntary recommendations on climate-related information that companies can disclose to help investors, lenders, and others make sound financial decisions.

Other members of the Expert Panel are

Andy Chisholm, member of the Board of Directors of the Royal Bank of Canada

Kim Thomassin, Executive Vice-President, Legal Affairs and Secretariat, Caisse de dépôt et placement du Québec

Barbara Zvan, Chief Risk and Strategy Officer, Ontario Teachers' Pension Plan

The four panel members will complete their work and provide recommendations to the federal government by the fall of 2018.

#### **Quotes**

"We know that the environment and the economy go hand in hand. Around the world, leading financial markets are paying more and more attention to climate change. Here in Canada, investors want quality information to help manage the risks of climate change and profit from the opportunities that clean growth creates. Better climate information is

good news for investors, companies, and Canadians."

- Catherine McKenna, Minister of Environment and Climate Change

"Markets need the right information to manage the transition to a low-carbon economy. At last year's G20, the private-sector-led TCFD presented the framework for enhanced climate disclosures, and now providers of capital controlling over \$80 trillion of assets are supporting its implementation. With climate risks and opportunities entering the mainstream of capital markets, I am heartened to see Canada moving forward in the creation of an expert panel on sustainable finance."

- Mark Carney, Governor of the Bank of England and Chair of the Financial Stability Board

#### Quick Facts

According to the World Bank, the Paris Agreement will help open up nearly \$23 trillion in new opportunities for climate-smart investments in emerging markets around the world, between now and 2030.

#### Related Products

[Expert Panel on Sustainable Finance](#)

[Terms of Reference for the Expert Panel on Sustainable Finance](#)

#### Associated Links

[Task Force on Climate-related Financial Disclosures](#)

[G20 Green Finance Study Synthesis Report 2017](#)

[Canadian Securities Regulators Report on Climate Change-Related Disclosure Project](#)

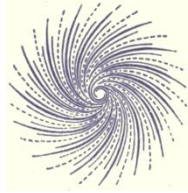
[Canada Infrastructure Bank](#)

[Environment and Climate Change Canada's Twitter page](#)

[Environment and Natural Resources in Canada's Facebook page](#)

SOURCE Environment and Climate Change Canada

## Annex H



### **Planetary Association for Clean Energy, Inc. (PACE Inc.)**

100 Bronson Avenue, Suite 1001  
OTTAWA, Ontario K1R 6G8  
Canada  
paceincnet@gmail.com

## **Submission**

To: the Hon. **Catherine McKenna, Minister of Environment and Climate Change**

To: **François-Philippe Champagne**, Parliamentary Secretary to the **Minister of Finance**

with regards to **pre-Budget consultation**, February 1, 2016  
St. George's Parish, 415 Piccadilly Avenue, Ottawa

### ***Enhancing budgetary efficacy & outreach by promoting and applying Clean Energy Science and Technology***

Recognized as a NGO in special consultative status with the United Nations, the **Planetary Association for Clean Energy** (PACE) Inc. is an independent international collaborative network of advanced scientific thinking. It was conceived by Parliament's first woman Speaker, Senator **Muriel M. Fergusson**, and co-founded by scientist Senator **Chesley W. Carter**, M.Sc. while chair of 2 Senate standing committees on Science and Health in the early 1970s. With his stewardship, the PACE network was able to confirm the phenomena of acid rain and of ozone layer depletion for Canadian policy decision-makers, resulting in international treaties. It also facilitated the world's first "blue-bin" recycling initiative, here in Ottawa.

With the **National Research Council of Canada**, and the personal intercession of the Prime Minister, the Rt. Hon. **Pierre E. Trudeau**, by July 1976 PACE founders gave the highest priority to identifying and reviewing advanced [clean energy technologies](#) – not only how they perform but also why. The founders included Dr. **Marcel Vogel**, chief scientist at IBM

(developed memory systems for computers) and Dr. **Henry K. Puharich** (MD, physicist, micro-electronics developed hearing aids, water-as-a fuel-on-demand, and insights on the worldwide lossless transmission of electrical energy).

**We wish to indicate that:**

**Advanced and emerging clean energy technologies, by their new vistas and significantly lower capital requirements, permit flexibility in budgeting for socio-economic development, new revenues, novel employment projection, and the potential mastering of positive climate change outcomes.**

Briefly, examples of clean energy science and technology are:

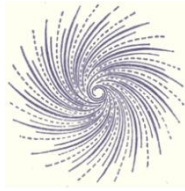
- Production of stand-alone electric power for dwellings could cost, with advanced lightweight units at one-time costs of up to \$ 5,000 for 10 - 20 years of supply. This is particularly significant for remote applications.
- Ultra-efficient propulsion technology 3 times more power than jet turbines, noiseless, with optimized manoeuvrability: a Canadian technology.
- Water as a fuel from electrolysis / micro-electronic systems can, according to econometric modelling, with articulate, step-by-step nation/ region scale implementation decrease public expenditure, improve GDP, boost employment, balance trade, benefit the quality of environment and significantly address climate change issues.
- Ultra-rapid on-site nuclear waste decontamination protocols can decrease post-nuclear exercises to near-zero costs, allow recycling of existing infrastructure and avoid long-term radioactivity burden.
- Novel wastewater / waste ponds clean-up can transform toxic sludge at low-cost into clean recreation, quality fertile soil within short order.
- HV electricity transmission lines cost at least \$ 1,000,000/km and have a loss rate of about 30%. Yet commercial quantity of power can be delivered, worldwide, for about \$ 1 M, for transmitter & receiver and negligible loss.

In our assessment, we believe that creative focus on such clean energy science and technology options, the government's objectives can be met with great efficacy and abbreviated time-lines.

This is the proper time, platform and modality for implementation of advanced and ethical clean energy.

We do respect your transparency and attentiveness.

Dr. Andrew Michrowski  
Prof. Monique Michaud



## Planetary Association for Clean Energy, Inc.

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*An international collaborative network of advanced scientific thinking*

NGO in Special Consultative status with the Economic and Social Council of the **United Nations** (ECOSOC)

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February 22, 2016

### For the attention of:

Hon. Catherine McKenna  
**Minister of Environment and Climate Change**  
Ottawa, Ontario

[ec.ministre-minister.ec@canada.ca](mailto:ec.ministre-minister.ec@canada.ca)

Dear Ms. McKenna:

First of all, I wish to thank you for the opportunity that you and your colleague, **François-Philippe Champagne**, Parliamentary Secretary to the **Minister of Finance** provided both Prof. **Monique Michaud**, M.Sc.A. and I to make a submission with regards to the federal government's pre-Budget consultation on February 1, 2016, entitled, ***Enhancing budgetary efficacy & outreach by promoting and applying advanced Clean Energy Science and Technology.***

As President of the **Planetary Association for Clean Energy (PACE)**, I wish to bring to your attention several decades of independent scientific research and of peer review into advanced clean technology. The objective of such analysis was to determine efficiency, universality, sustainability, ethics and affordability. Our independent, collective data show that emerging technologies are maturing into valid options for improved transportation, heating and other human needs, and that their introduction will benefit the economy, the environment and also public well-being.

### About PACE

Recognized as a NGO in special consultative status with the **United Nations** (ECOSOC), the **Planetary Association for Clean Energy (PACE)** Inc. is an independent international collaborative network of advanced scientific thinking. It was conceived by Parliament's first woman Speaker, Sen. **Muriel M. Fergusson**, and co-founded by scientist Sen. **Chesley W. Carter**, M.Sc. while chair of 2 Senate standing committees on Science and on Health, in the early 1970s. With his stewardship, PACE network confirmed the phenomena of acid rain and of ozone layer depletion for Canadian policy makers, resulting in international treaties. It also facilitated the world's 1st "blue-bin" recycling initiative, here, in your riding!

With the **National Research Council of Canada**, and the personal intercession of the Prime Minister, the Rt. Hon. **Pierre E. Trudeau**, by July 1976, PACE founders gave the highest priority to identifying and reviewing advanced clean energy technologies – not only how they perform but also why and where they do so. The founders included Dr. **Marcel Vogel**, chief scientist at **IBM San Jose** (developed memory systems for computers) and Dr. **Henry K. Puharich** (MD, physicist, micro-electronics for hearing aids and for phonon water-as-a fuel-on-demand, and strategic analyses for **Pentagon's** Joint Chiefs of Staff, Senator Carter and Prime Minister Trudeau on worldwide, lossless transmission of electrical energy).

Furtherance of this long-term peer examination was made under contract to the Division of Energy, **NRC of Canada** in 1985, involving 330 peer reviewers in the PACE worldwide network, later published as ***The emerging energy science.***



These findings were later echoed and confirmed by a multi-agency initiative by the US government when it was to identify which technologies would be required by America for world leadership well into the next century, 2000 onwards.

We, therefore, have significant technologies to recommend.

Currently some are already manufacturer prototypes, others are independently verified by third parties and ready to be manufactured. With proper participation and inputs, most recommended inventions could quite rapidly be brought onto the public domain. Furthermore, a number of approaches for environmental cleanup require little in the way of cost or material. Various forums and UN agencies, including **UNITAR/IATAFI**, have confirmed some of our initial observations<sup>1</sup>

The main challenge is opening the minds of people to see that these low-cost interventions are effective, and that expensive measures will not be needed in many cases - with substantial value for widespread application at savings for the common good. Some of the advanced clean technologies are of potential application in federal strategies as announced for Iraq, Lebanon, Jordan and Syria in helping successfully accomplish aid missions in the rapid on-site provision of power, water, sanitation and clean-up. We can supply documentation, descriptions and other data - to the extent that proprietary information and intellectual property are protected – for your due diligence. We fully expect this information to enable uptake of these proposals into policy by this government for implementation during your present term in public office. In 2007, we received an inquiry to model the potential scope of worldwide benefits provided from

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<sup>1</sup> **Beyond the remedial actions of conservation and environmental clean-up: The introduction of clean science and technology by governmental and societal agencies.** Submission. United Nations' World Commission on Environment and Development, Geneva, 1986. 4 p.  
**Una propuesta de tecnología escalar en materia de energía limpia.** Proceedings. Jornadas Internacionales Multidisciplinarias Sobre Medio Ambiente y Contaminación por el Hombre. Universidad de Mendoza, Mendoza, Argentina, 1987. 10 p.  
**Introducción a la Ciencia y Tecnología Limpia Mediante la Intervención de las Agencias Nacionales Gubernamentales y Sociales.** Universidad de Mendoza, Mendoza, Argentina, 1987. 8 p.  
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**Loesungsmöglichkeiten der weltweiten Umweltkrisen.** Proceedings. Internationaler Kongress für Freie Energie. Einsiedeln, Switzerland. October 29, 1989. 5 p.  
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**Clean energy review:** technical and scientific discussion. Submission. Canadian Environmental Assessment Agency Panel reviewing the concept for deep geologic disposal of nuclear fuel wastes proposed by Atomic Energy of Canada Limited. August 8, 1995. 24 p.  
**Brown's Gas in the Toronto Healthy House.** Submission. Canada Mortgage and Housing Corporation, Ottawa. 1996. 8p.  
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**Advanced transmutation processes and their application for the decontamination of radioactive nuclear wastes.** Proceedings. 2nd International Low Energy Nuclear Reactions Conference. Department of Chemistry, Texas A&M University, College Station., September 13-14, 1996. 10 p.  
**Scalar waves reviewed.** Proceedings. 4<sup>th</sup> International Symposium on New Energy. Academy of New Science. Fort Collins. 1997. 5 p.  
**Brown's Gas - current research report.** Proceedings. 4<sup>th</sup> International Symposium on New Energy. Academy of New Science. Fort Collins, 1997. 4 p.  
**Free Energy: socio-economic and political implications.** Invited lecture, Concordia University, January 26-27, 1998. 50p.  
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**Plasma discharges, charge clusters.** Proceedings. USPA, Columbus. July 16-19, 1999. 10 p.; also: PACE, Ottawa, Ottawa, 2000.  
**Brown's Gas applications.** PACE, Ottawa. June 2000.  
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**Enhancing budgetary efficacy & outreach by promoting & applying clean energy science and technology.** Submission: Pre-budget consultation to Hon. Catherine McKenna, Minister of Environment and Climate Change & F-P. Champagne, Parliamentary Secretary, Minister of Finance. 2016. 2p.

implementation of clean energy science & technology. For global clean-up and surface revitalization alone, we forecast over a 10-15 years, an international demand of about US\$ 150 billion, with the creation of about 650,000 jobs. By way of comparison, to attain a similar goal with current technology, the cost would exceed US\$ 2 Trillion. Canada's portion of this clean energy implementation opportunity alone could well exceed its proportion its 2% of the world's economy if your government determines that spear-heading clean energy science and technology in appropriate policy: US\$ 3B of new GDP, probably 32,500 to over 50,000 full-time jobs. Because most of the know-how would be "in-house": this estimate could then be enhanced to configure into US\$ 5 – 10B of additional world's demand, and up to about 75,000 jobs. Similar new vistas are open for 1) energy provision and, 2) generation & deployment of clean on-site, on-demand, quality water (mostly from advanced atmospheric systems at costs and requirements well below current methods). So the potential of new development horizons and employment can accrue with each series of applications and good, thorough planning.

In one suggestive, narrative, low-key start-ups would thoroughly confirm and assess, with community involvement & deployment, the world's surface stress situation, optimize alternative protocols, assess likely link to specific waste strategies, design full-size prototypes, conduct clean-up ops in typical sites. Meanwhile, protocol optimization would probably be done with the **City of Ottawa**, the Polish **Instytut Ekologii Terenów Przemysłowych**, Quebec's **Cité de la Biotechnologie de St Hyacinthe**, etc. R&D co-operation would be sought with governmental, commercial, defence and academic institutions. In this scenario, such work with these parties would be merely a continuation of existing relationships with the PACE network.

### ***National Task Force scenario / "Futures Secretariat"***

One scenario involves, as first planned by several Senators after a national science policy review, a **"Futures Secretariat"** under the direct purview of the **Prime Minister's Office / Privy Council Office**. With the superimposition of the exercises with **National Research Council of Canada**, and international networking and consultation in our network, we consider the setting up of a **"National Task Force"**. Its activities and nature as described below in two tables.<sup>2</sup>

## **NATIONAL TASK FORCE**

**Industry - R & D Laboratories / Centres of Excellence – Universities - Utilities**

### **The steps of Technology Transfer for Clean Energy systems**

#### **• IDENTIFY**

*Scan Energy Systems which may serve national interests*

#### **• ASSESS COOPERATIVELY**

*Determine scientific and technological **feasibility***

*Determine **economic desirability** on regional/national/international basis (e.g.: reduction of public & private debts)*

*Determine **environmental repercussions** on regional/national/international basis (including +/- factors)*

#### **• COMMAND PROTOTYPES**

***Test systems** within representative industry, R&D Laboratories, Universities, Utilities and custom-made fabricators*

#### **• SIZE-UP**

***Go ahead/abort** for each step & application level (climate, geography, bio-region, distribution, and infrastructure)*

***Final evaluation** by additional considerations of **environmental, socio-cultural and human rights issues***

*Weigh decisions against **ways & means** of various governments (balance of payments & intra-regional transfers)*

***Verify industry training, tooling, timing, budgeting abilities***

***Verify universities and governmental structures ability** to adjust*

***Take procedural action:** taxation, regulatory mechanisms, standards that impede application*

### **Earlier Energy Crises and the Federal Debt**

<sup>2</sup> Adapted from earlier versions since our 1986 submission to the **United Nations' World Commission on Environment and Development**, Geneva

A few decades ago, public debt soared noticeably as a result of oil-supply & pricing panic. Unable to accept alternatives to oil, and due to rejecting a major cost-saving proposal from PACE for electricity transmission without wires, the government was pressured into investing in nuclear plants. As no private-sector business wanted the extreme liabilities, building nuclear power stations entailed billions in public spending in unrecoverable costs and servicing debt. This resulted in radioactive waste buildup and conflicts over how and where to store it; nobody wants it in their backyard.

Often a toxic buildup has been left to worsen over time; the poor or minorities end up living beside the poisoned waterways and drinking contaminated water because those communities can't afford cleanup assumed to be very expensive. The old thinking has failed to bring affordable solutions. In particular, boil-water conditions on First Nations reserves have not been resolved. For this, a low-cost, on-site water generation (portable to community-level) approach from our network may be able to meet this need in a timely manner - without expensive, remote, treatment plants.

Increasingly, corrosion caused by acid rain, by multiple frequency electron-stripping (material surface excitation from the widespread wireless microwave technology) is putting major infrastructure at risk. Potential instability of tall buildings, bridge weakening, road, railway and pipeline degeneration and of many engineering installations are being recognized. **More rapid corrosion than previously observed subjects extremely severe pressure on budgets**.

Either public money is expended preventively, and often, just upkeep of essential buildings, bridges and other structures, or it's spent on insurance payouts, healthcare costs and rebuilding, if the structures are allowed to collapse. PACE network is researching the new forms of corrosion and is exploring a system that may slow down corrosion and help restrain maintenance costs. Although successfully utilized, an anti-corrosion discovery is so far outside mainstream thinking that, again, it requires minds and political will open to new concepts. Meanwhile, monitoring structural safety and shoring up what can be saved until the solution is confirmed will be needed.

**Contrary to assumptions, clean energy does not need to cost more.** Since advanced clean technology does not sacrifice biological systems, it is compatible with sustainable agricultural production while supports general wellness.

### **Brighter Economic Prospects without Environmental Degradation & Corrosion**

When Germany's leaders started to consider energy-paradigm transition, they found that clean energy would reduce those end-loaded costs which the oil, nuclear and chemical industries have handed down to us. Chair Prof. **Josef Gruber's Technical University of Hagen** econometric report for the federal government, and investigations by the **Chancellor's** office also noted significant saving for the national economy if pollution-caused corrosion and breakdown could be averted, not to mention discontinuing oil imports for which Germany had been dependent of foreign sources.

Hon. **Sheila Copps** learned that it made economic sense for Canada to have a clean environment. When she held the Environment portfolio under Prime Minister **Jean Chretien's** leadership, Ms Copps began working to convince the oil industry to clean up its act. Recently in a **CBC radio** interview, Albertan company spokespersons admitted that it was the extreme decline in oil prices that prompted their installing solar panels at oil rig sites. Thus they would still have something to sell, if the price dropped so low that they couldn't extract oil anymore and still make any profit.

A notable common denominator of advanced clean-energy technologies is that recently-invented materials have allowed devices to be built that were not possible in the past. Novel manufacturing processes designs can keep costs low and pricing competitive. Based on experience and demonstration projects undertaken so far, PACE can offer substantial savings both to the public purse and for businesses which build upon this emerging clean-energy paradigm. These clean technology inventions can greatly reduce the constant obligation of buying fuel, a cost formerly regarded as inevitable.

Opening the market to new clean technologies enables meeting & potentially exceeding greenhouse-gas reduction targets in both time and volume. Doing this in a way that helps poorer nations can also raise Canada's positive image.

If Canada provides a welcome mat to develop these new inventions and processes here, we can foresee the ability of all businesses to create large numbers of new jobs, more than replacing those lost when older products are discontinued.

In addition to newly-employed people having income to spend thus raising GDP, along with economic advancement of our country Canadians will enjoy improved quality of life. One of those improvements will be no longer inhaling exhaust

from traditional combustion engines. Although catalytic converters did reduce visible smog, the noise of motors and blackened snow banks in winter remind urban dwellers that we are still breathing in by products of burning fuel. And thanks to that same mitigation technology which made exhaust less visible, we are now also inhaling nanoparticles of platinum, a metal not ideal for human respiratory health.

## **Advances in Process and Systems: examples confirmed by PACE scientific participants**

### **1. Electrical Transmission cost savings**

Traditional long-distance HV transmission lines cost at least \$1,000,000 per kilometre <sup>3</sup> even more than the dams or fuel-based generating stations. Over such distances, electricity loss occurs at a rate of about 30%, another cost that may be left off the books due to assuming this cannot ever be improved. A successful alternative which avoided that unseen cost was demonstrated over a century ago, in 1904, when the Tesla Magnifying Transmitter (**TMT**) sent electric power from Long Island to Los Angeles with a loss of only 2%.

In the 1986 – 87, through the intercession of PACE led by **West Virginia University's** Departments of Electrical and of Mechanical & Aerospace Engineering (with the world's largest independent research organization, **Battelle Institute** of Columbus, Ohio) <sup>4</sup> made to the Government of Canada the offer of a 2 -3 year test project to send 100 Megawatts -- a minimum commercial quantity - from ANY location in Canada (even NWT/Yukon) to their facilities in Morgantown. The consortium expected wireless transcontinental transmission to cost only US\$ 4.59 million dollars, i.e., less than the same as 1 kilometer of high-tension wiring and its supporting structures. For this lossless-transmission proof-of-concept project, no government money was to be involved. The **Gamma Institute**, **McGill University** and **Université de Montréal** reviewed and publicly endorsed the concept from both economic and environmental analyses. Other behind-the-scene sponsors for the day-long Ottawa panel review were the Board of Directors of **IBM**, Armonk and West Virginia Governor **Rockefeller**. A Montreal philanthropist was ready to pay the costs for the test project, which included building the transmitter and receiver. Mrs. **Mila Mulroney** and Hon. **Marcel Massé** asked for examination of the matter, so experts at **National Research Council** offered to complete a similar project for only \$300,000, using data from research at the **CN Tower** in Toronto. However, without giving any justification (or perhaps just unable to believe it could be done), officials rejected the free offer. Note that the US consortium observed in their lab physics analysis that the rate of power processed (rate of energy conversion) versus energy developed with the Tesla system has a power efficiency orders of magnitude superior of anything available today!

In 2001, a proposed Russian <sup>5</sup> update design for a near-lossless Europe-Asia "**SWEPS**" grid would connect 3 or more major solar power plants of equal capacity – located in Spain, Far Eastern region of Russia and in Astrakhan near the Caspian Sea. Its computer simulation model suggests that solar power could be generated 24 hours per day for 6 months annually, without the need of electric accumulators or night-time back-up electricity generation. During the winter months, electricity from solar power plants could be transmitted from Africa, India and Australia. Cost for Eurasian coverage: about US\$ 20 to 100 million (instead of billions of capital expenditure for current conventional technology).

### **2. Production of stand-alone electric energy**

Enough electric power for typical Canadian dwellings -- from 15 to 20 kWh -- can be produced in-situ with advanced, light-weight, nearly maintenance-free, small-sized units which have already been invented. These include: ultra-efficient printed photovoltaic system (identified by the **Texas A&M University**, **Argonne Laboratory** and the **CIA** as the most efficient solar power generator, over 95% efficient, at about 2 cents/kWh); Motionless Energy Generator (MEG); advanced-materials frictionless wind turbines, and more. An end-user would make a one-time outlay, ranging from less than \$2,000 to \$5,000 (depending on which system is chosen) and be service for 10 – 20 years. Over that time and on top of financial savings due to not needing to buy fuel, there would be the peace-of-mind supply stability, even extreme weather, natural disasters, and other disruptions. On a vaster scale, such power availability would not disable bank machines, communications, food supply and, ultimately, national security.

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<sup>3</sup> Three-phase AC 1,2MV - 10 GW - 1,000km extra-high-voltage power transmission lines cost US\$1,300,000/km, and the entire transmission system including transformer substations and electrical equipment costs \$5,100,000/km to install, as per Mogillis, - **Hydro Quebec**, IREQ -Varennes. 1991.

<sup>4</sup> **Distribution of electrical power by means of terrestrial cavity resonator modes**. West Virginia University, December 5, 1986.

<sup>5</sup> **All-Russian Research Institute for Electrification of Agriculture** (before pro-petroleum energy policy restructuring in Russian Federation).

### **3. Ultra efficient Propulsion technology for vehicles, transit, wheelchairs, aircraft, drones**

Several PACE scientists consulted for this summary recommend adopting the **Thornson Drive**, a Canadian technology. Cost may be possibly less than \$1,000 per truck / bus engine. With an efficiency providing three times more power than a jet turbine engine, the propulsion system is remarkably noiseless, requiring very little input power, with excellent manoeuvrability and capability for lift. The system could find exceptional opportunities for carriers for the disadvantaged, for effortless all-terrain transport during natural disasters such as earthquakes, remote regions, including meltdowns of permafrost, etc. According to **NASA** analyses, 'star-light' energy would be enough to navigate *Thornson-Drive*-fitted spacecraft in outer space.

### **4. Water as a fuel**

Hydroxy gas, Brown's Gas, HHO, other names apply to this well-demonstrated resource. PACE co-founder **Andrija Puharich** drove several times his 3-bedroom motor home/lab, between Mexico to Canada, with a few litres of as-available water as its fuel source - no gasoline. In his design, pressing the gas pedal with a micro-electronic resonating system that creates the de-composed water gas on-demand, without storage. The **US Navy** wanted his phonon technology for noiseless subs, and **Rolls Royce** for their advanced turbines.

- In Australia, Prof **Yull Brown** demonstrated to NSW parliamentarians (and recorded in NSW **Hansard**) a 4WD drive 1000 kilometres drive on 1 litre of tap water – releasing cool water vapour! Such systems are easy to retrofit in current engines, as was demonstrated by a team of top Australian electronics engineers and scientist.
- In the 1990s, **NASA** technology transfer regime offered to the US car industry to test such technology before some congressmen diverted the allotted budget. According to recently-declassified U.S. government documents, Brown's Gas was deemed to be the key energy, water generation and life-support system for self-sustaining lunar colonies as early as the late 1970s.
- In Germany, a favoured application was intended for neighbourhood central heating system for massive cost run-downs and greater reliability as well as efficiency in both a national econometric study and in a high-level federal department policy review.
- In Korea the Brown's Gas technology is favoured for large saunas, industrial scale BBQs, and incineration (both small scale as for hospital wastes or large scale regional municipality facilities) and has been awarded presidential prizes for excellence. A recently released study by a federal science centre has demonstrated remarkable improvement in fuel efficiency with the technology for engines.
- People's Republic of China has an interesting application, which it licences internationally, for on-demand desalination of seawater in mega vessels, saving space for cargo in lieu of tanks and ballast. It has been reported that several thousand post-graduates have been trained in the Brown's Gas technology for dozens of industrial applications.
- In Quebec, an innovation exercise Shawinigan within **Hydro Québec** considered this system as an energy storage modality when hydroelectric production is otherwise underutilized during summer for conversion into electricity during the lower electricity production winter phase when surface water freezes
- In Alberta, the **Alberta Research Council** reported exceptional thermal efficiency with the technology, almost at nuclear energy levels, with proprietary protocols. BTU efficiencies significantly exceed petroleum products. The technology could allow on-site reduction of bituminous oil sands, probably without surface disturbance and extraction of specific fuels-on-demand: a great bonus for environmental, climate-change and capital recovery.

The technology is exceptionally favoured for **magneto hydrodynamics (MHD)** for direct conversion to electricity, where it could be installed in refurbished aging nuclear reactors, with all the infrastructure for delivery intact, offering massive reduction in budgeting as well as more power delivery – all with the bonus of atmosphere-neutrality that would very rapidly exceed climate-change targets.

## 5. Ultra-rapid on-site nuclear waste decontamination:

Protocols for about 10 methods of rapidly-reducing radioactivity to near-background levels are now well understood.<sup>6,7</sup> A few years ago, **AECL Chalk River Reactor** engineer **Mark Porringa** successfully demonstrated several and reported on such protocols to Canadian and United States decision-makers. Concerted will for environmental protection may prod through-put. Efforts are continuing to enable implementation in several countries with radioactivity issues. Exceptional results have been obtained with “natural radioactivity materials” tests of NORM-contaminated petroleum fittings, water filtration equipments, fertilizer residues, etc. in drastically reducing their “half-life” emissions from billions of years to several hours in a British Columbia permit facility

Neutralizing radioactivity at near-zero cost will permit recycling of existing structures and infrastructure, and avoidance of long-term burdens for both public and private sectors. By achieving ultra-rapid, on-site decontamination from the Fukushima disaster, a Japanese consortium of academe/industry/government expects to enhance and accelerate return to civil society back to pre-disaster quality.

## 6: Waste water / waste ponds clean-up:

A “*pro bono*” concept demonstration conducted by PACE network in Poland enabled cleanup of WWII German and Soviet-military occupation sites where toxic chemical sludge had accumulated to a depth of as much as 7 meters. The successful protocols “tweak” Nature’s to catalyse restorative processes. For a few tens of thousands of dollars per site -- mostly spent on logistics of bringing equipment from Canada to Poland -- these toxic ponds became swimming-quality lakes within days to weeks. The Canadian embassy in Warsaw, as well as local/regional governments made big PR with the spectacular results. In contrast, the **European Union**’s conventional approach would cost over 5 million Euros per pond, with full or partial recovery not expected for at least a few years.

Yet in **Sydney**, Nova Scotia, when the same procedure was proposed for toxic ponds, there was rejection; likewise, more recently, for the well-publicized **Montréal** wastewater efflux into the Saint Lawrence River. Apparently experts-in-charge assume that only brute-force methods are effective against an unruly Nature. They tend to ignore the evidence for familiarity & current funding formula, for lack of the kind of political will expressed by Polish municipal & regional officials.

In Sydney, over a decade, vast amounts of cement and aggregate were poured into the tar ponds — and equally vast amounts of money. The expected cost was \$400 million: \$280 million federal, and \$120-million provincial funds. Solidified matter stopped movement of toxins but did not neutralize them. As containment erodes, the same compounds will start to leak out again. We might well wonder what will be possible to be done at that future time. So was that expensive, hard-measures method the best use of public money? If the Canadian people had been informed about the alternative proposal which had a track record of success in Poland, they might well have wanted their government to test that low-cost, Nature-friendly approach. We should also question the waste of all those construction supplies. Concrete of course requires beach sand, a finite resource which is being taken from sites around the world. (Though desert sand exists in abundance, it cannot be used for concrete.)

More recently, an Ontario municipal authority actively embraced new thinking. In autumn of 2015, prompted by urging from organic farmers in that area, the **Town of Hawkesbury**, Ontario began applying the PACE system for its treatment. That town should soon realize budget savings alongside promoting sustainable local & organic food production. That is the kind of integrative thinking needed to deal with many sites in rural and northern Canada where water-treatment plants really cannot be constructed.

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<sup>6</sup> **Advanced transmutation process and its application for the decontamination of radioactive nuclear wastes** Proceedings of Congress 2000, **University of Alberta** Edmonton, May 29-30, 2000

<sup>7</sup> **Submission regarding Bill C-27 An Act respecting the long-term management of nuclear fuel waste:** Standing Senate Committee on Energy, the Environment and Natural Resources. May 23, 2002



## PACE Request to meet the Minister, provide a Briefing to Members of Parliament

PACE stands ready to provide your Ministry with more details of the advances as researched by our interdisciplinary network over several decades. If such innovative solutions are included in your plans for a future diversified Canadian energy 'mix' less vulnerable to wide-area shutdown, we foresee significant budget savings as well as prosperity in Canadian work force and businesses able to benefit from these opportunities. Toward this end, we request:

- 1) A meeting with you and your staff as soon as can be arranged concerning the realistic potentials for applying clean-energy technology into the Canadian national socio-economic mainstream.
- 2) An active role by your ministry, in coordination with the **Minister of Environment and Climate Change**, to schedule a Briefing to be given by PACE members. We propose giving a presentation to Parliamentary committees responsible for technological innovations, science, and climate change. Also the areas of resources and finance are intertwined with the issue of applied sciences emerging into the economy with new inventions.

We urge that this presentation be made open not only to Parliamentary Committee members directly concerned with technology, innovation and the environment, but also to all interested MPs from any party in the House of Commons, as well as extending the same invitation to Senate members.

Indeed, in the requested initial meeting with you as Minister of Environment and Climate Change, we would welcome your advice concerning which other Ministers and committees should attend such a briefing.

Because our network and directors knew his father, I believe Right Honourable **Justin Pierre James Trudeau** himself may be interested.

Our presenters can describe in more detail the peer-reviewed documentation for the new inventions and approaches, such as those mentioned above, and outline expected costing for their implementation.

Please advise us of a date for our proposed briefing as soon as this is known, so that our associates, possibly from around the globe, can schedule their availability, and assemble briefing documents to be submitted to the appropriate clerk for translation and distribution to attendees. Holding this briefing in a Parliamentary Committee room will facilitate ease of access by all office-holders.

We urge that this presentation be made open not only to Parliamentary Committee members directly concerned with technology, innovation and the environment, but also to all interested MPs from any party in the House of Commons, and interested Senate members.

We indeed hope that the Right Honourable **Justin Trudeau**'s election promise of funding for clean energy technologies will be expressed in federal leadership at the level of R&D funding for breakthrough inventions. Attention from Cabinet ministers, it is to be hoped, will energize investors to participate in the emerging clean paradigm. This will improve access to the marketplace for new devices of the types we have investigated and found to be valid.

We look forward to receiving an invitation to a meeting with you concerning these discoveries.

Thank you for taking action to improve Canada's future economic and environmental outlook.

We thank you also for your response.

Yours sincerely,

Dr Andrew Michrowski  
President